Windy Gap Firming Project

401Water Quality Certification Technical Report - Appendices

Municipal Subdistrict
Northern Colorado Water Conservancy District

Prepared for:
Water Quality Control Division
Environmental Data Unit

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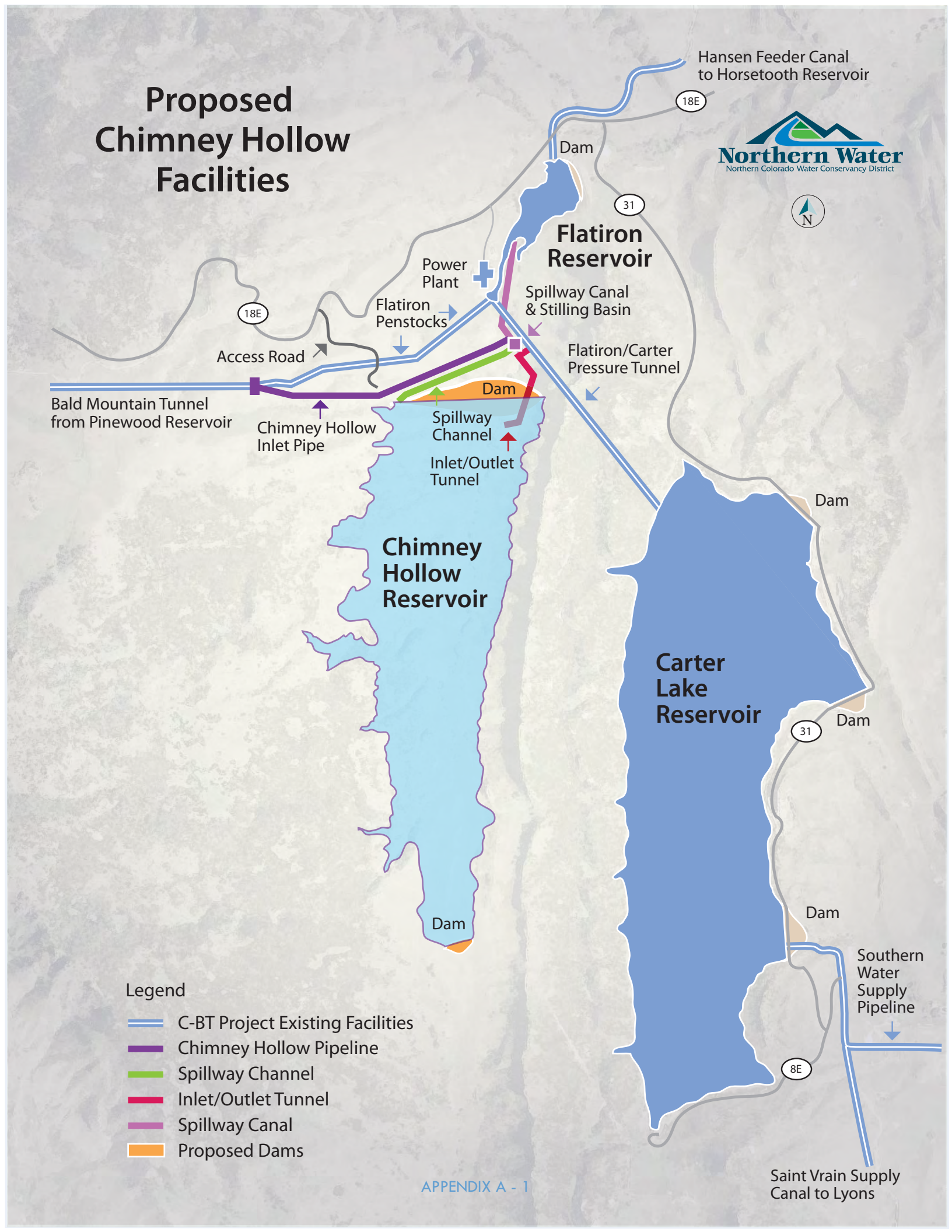

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RECLAMATION
Managing Water in the West

Record of Decision

Windy Gap Firming Project Final Environmental Impact Statement

Approved:

Michael J. Ryan /s/ 12-19-2014
Michael J. Ryan, Regional Director Date
Great Plains Region
Bureau of Reclamation
Department of the Interior

Mission Statements

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To manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Introduction

This Record of Decision for the proposed Windy Gap Firming Project (WGFP) in north central Colorado is prepared in accordance with the procedural requirements of the Council on Environmental Quality (CEQ) regulations[1] for the National Environmental Policy Act (NEPA) of 1969 (as amended). This Record of Decision is a concise public record of the Bureau of Reclamation's (Reclamation) decision regarding the proposed project. A Record of Decision is prepared at the end of an environmental impact statement (EIS) process and applies to actions for which the EIS has been prepared. Reclamation completed the Final EIS for the WGFP (FES 11-29) in December 2011. By regulation, a Record of Decision cannot be finalized until at least 30 days after the Environmental Protection Agency publishes a notice in the *Federal Register* stating the Final EIS was filed. The Environmental Protection Agency's notice was published on December 9, 2011.

Reclamation was the lead federal agency for preparation of the Final EIS. Cooperating agencies[2] include the U.S. Army Corps of Engineers, Western Area Power Administration, and Grand County, Colorado. The Regional Director of Reclamation's Great Plains Region is the responsible federal official for the Final EIS and Record of Decision.

The proposed WGFP is a collaborative effort among multiple water providers and users (Participants) represented by the Municipal Subdistrict, Northern Colorado Water Conservancy District (Subdistrict). The proposed WGFP would entail construction of a new water storage reservoir that would provide more reliable water deliveries to Front Range and West Slope communities and industry. The project would add water storage and related facilities to the Subdistrict's existing Windy Gap Project to enable delivery of a firm annual yield of about 30,000 acre-feet to project Participants. The proposal includes construction of new reservoir facilities for storing Windy Gap water. The nature and scope of Reclamation's decisions are described in this Record of Decision.

This Record of Decision is the capstone of the decision-making process that signals completion of the contract negotiation process; extensive planning and coordination between the proponent, communities, the State of Colorado, and federal agencies; project-related determinations; and other activities that resulted in clearly described federal actions, agreements and commitments for this project.

Project Background and Brief Summary

The Windy Gap Project, owned and operated by the Subdistrict, was completed in 1985. Windy Gap Project water is conveyed through Reclamation's Colorado-Big Thompson (C-BT) Project

[1] Council on Environmental Quality Regulations For Implementing The Procedural Provisions Of The National Environmental Policy Act, 40 CFR Parts 1500-1508.
[2] 40 CFR 1501.6

facilities through an existing Windy Gap contract with the Subdistrict and the Northern Colorado Water Conservancy District (District). The Windy Gap Project was originally planned to divert an estimated long-term annual average of 56,000 acre feet (AF) of water from the Colorado River. The Windy Gap Project has not provided the expected yield due to its junior water rights, periodic lack of unused capacity (conveyance and storage) in the C-BT Project, and demands to date not requiring the full yield of the Windy Gap Project. The Subdistrict concluded that the firm yield (the amount it can guarantee annually) of the Windy Gap Project is actually zero because it is unable to deliver Windy Gap water to Colorado's Front Range community Participants, or the Middle Park Water Conservancy District, in all years. In addition, the existing Windy Gap Project is not able to provide annual carry-over water storage for the Middle Park Water Conservancy District on the West Slope.

Because of the deficiency in water deliveries and lack of storage, the Windy Gap Project Participants and Middle Park Water Conservancy District have not been able to fully rely on Windy Gap Project water for meeting a portion of their annual water demand. As a result, the Participants, working through the Subdistrict, initiated the proposed WGFP, which would firm all or a portion of their individual Windy Gap Project water allotment units to meet a portion of existing and future municipal and industrial water requirements. The Middle Park Water Conservancy District, an original Participant in the Windy Gap Firming Project, separately negotiated an agreement with the Subdistrict to assure approximately 2,300 acre feet of the Windy Gap Project water supplies provided to it by the Subdistrict will be firmed, hence improving the reliability of its Windy Gap water supply for users in Grand and Summit counties, Colorado.

NEPA Process

Several methods were used to inform the public and solicit comments, including public meetings in July 2003, publication of a Notice of Intent in the *Federal Register* on September 8, 2003, and distribution of a scoping announcement in September 2003 prior to three public scoping meetings in Granby, Loveland, and Lyons, Colorado. An agency scoping meeting was also held to gather input from federal, state, and local government agencies. Reclamation received about 160 written submissions during the scoping period on a broad range of potential issues. More information on the public involvement process is included in Final EIS Chapter 4 Consultation and Coordination.

Completion of the Draft EIS was announced in the *Federal Register* (73 FR 50999) and made available to the public for a 60-day comment period from August 29, 2008 to October 28, 2008. A compact disc of the entire Draft EIS and a hard copy of the Executive Summary were sent to more than 650 individuals, entities, and agencies. Also, the Draft EIS was posted on Reclamation's website and hard copies were made available upon request, and at identified libraries and Reclamation offices. During the comment period, Reclamation held two open house/public hearings to provide an opportunity for the public to learn more about the alternative actions and formally comment on the Draft EIS. Notice of the public hearings was included with the distribution of the Draft EIS and publication in local and regional media outlets. Public hearings were held in Loveland on October 7, 2008 and the Town of Granby on October 9, 2008.

Requests were made to extend the 60-day comment period. The comment period was extended until December 29, 2008, providing a total of 122 days. During that time, Reclamation received 1,150 letters, comment forms, and recorded oral and written statements made at two public

hearings. Written and oral comments were received from 65 government agencies and officials, 18 organizations, 44 businesses, and 1,026 individuals.

Reclamation reviewed and considered all of the comments received on the Draft EIS. Responses to substantive comments are included in Volume 2 − Appendix F of the Final EIS.

Reclamation completed the Final EIS for the WGFP (FES 11-29) in December 2011. The Environmental Protection Agency's Notice of Availability for the Final EIS was published in the *Federal Register* on December 9, 2011.

In November 2012 Reclamation issued the WGFP Final EIS Errata Sheet and a Supplemental Information Report. The Errata Sheet disclosed corrections to the Final EIS that were discovered internally or through public comments after release of the document. The majority of the corrections were minor; one correction involved new information regarding protocol to calculate the Colorado Multiple Metric Index for assessment of aquatic invertebrates. A previous version of the Multiple Metric Index protocol was used for the Final EIS analysis. The Multiple Metric Index was subsequently calculated using the most current protocol, analyzed for differences in effects, and documented in the Supplemental Information Report. The Supplemental Information Report concluded that the updated Multiple Metric Index values did not substantially change the analysis or findings in the WGFP Final EIS.

Information on the project purpose and need, alternatives, environmental consequences, and mitigation[3]/environmental commitments contained in this Record of Decision is summarized from the Final EIS and associated documents (Fish and Wildlife Mitigation Plan [incorporated into the Final EIS], Errata Sheet, and Supplemental Information Report) consistent with NEPA Regulations[4]. The Decision Rationale section of this Record of Decision considers information in the Final EIS and associated documents along with information from other relevant sources[5], such as other commitments made by the Subdistrict, determinations about the WGFP's consistency with Senate Document No. 80 and Section 14 of the 1939 Reclamation Project Act, and views of other agencies with jurisdiction.

Final EIS Purpose and Need for the Windy Gap Firming Project

The Final EIS, completed in December 2011 contained the following purpose and need for the WGFP, "The purpose of the WGFP is to deliver a firm annual yield of about 30,000 AF of water from the existing Windy Gap Project to meet a portion of the water deliveries anticipated from the original Windy Gap Project and to provide up to 3,000 AF of storage to firm water deliveries for

[3] 40 CFR 1508.20 defines mitigation as: avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and; compensating for the impact by replacing or providing substitute resources or environments.

[4] 40 CFR 1505.2(b).

[5] 40 CFR 1505.2(b).

the MPWCD. Firm water deliveries from the Windy Gap Project are needed to meet a portion of the existing and future demands of the Participants" (Final EIS p 1-4).

Alternatives Considered in Detail in the Final EIS

Issues derived from scoping and public involvement and extensive screening of more than 170 different alternatives using NEPA criteria and Clean Water Act Section 404(b)(1) guidelines (in cooperation with the Corps), led to the development of four action alternatives and the No Action Alternative [6]. The alternative development process is described in detail in the Final EIS, Chapter 2. The five alternatives analyzed in detail are presented below.

No Action Alternative

A No Action Alternative is required under NEPA.[7] This alternative consists of continuation of operations under existing agreements between Reclamation and the Subdistrict for conveyance of Windy Gap Project water through C-BT Project facilities and the reasonably foreseeable enlargement of Ralph Price Reservoir by the City of Longmont. The No Action Alternative defines what Participants are expected to do if Reclamation does not approve any of the action alternatives. Under the No Action Alternative, Participants would maximize delivery of Windy Gap water according to their demand, water rights, availability of storage in Granby Reservoir, and existing Adams Tunnel conveyance constraints. The City of Longmont has preliminarily evaluated the enlargement of Ralph Price Reservoir by raising the dam and increasing storage capacity by 13,000 AF. Participants that do not have a currently defined storage option would take delivery of Windy Gap water whenever it is available within the capacity of their existing water systems and delivery points under the terms of the existing contract between Reclamation, the Subdistrict, and the District. In the future, due to increased demands, Windy Gap diversions would increase regardless of whether or not one of the action alternatives is implemented. Construction costs were estimated to be $31,000,000 (in 2005 dollars) with no change in annual operations and maintenance costs from existing conditions.

Alternative 2 - Chimney Hollow Reservoir (Proposed Action)

Alternative 2 includes construction of a 90,000 AF Chimney Hollow Reservoir on the East Slope, along with the ability to store, or preposition, C-BT Project water in Chimney Hollow Reservoir. Water would be conveyed to Chimney Hollow Reservoir via a new pipeline connection to existing East Slope C-BT Project facilities. New connections between Chimney Hollow Reservoir and C-BT Project facilities would allow delivery of water to Participants using existing C-BT Project infrastructure. No new West Slope infrastructure would be needed to divert or convey water to the

[6] 40 CFR 1502.14. In addition, this term includes alternatives that are technically and economically practical or feasible and meet the purpose and need of the proposed action (46 CFR 46.420(b)).

[7] 40 CFR 1502.14 (d). In this section agencies shall: Include the alternative of no action.

East Slope. Prepositioning is a method of water operation. It involves the use of available Adams Tunnel capacity to deliver C-BT Project water into Chimney Hollow Reservoir to occupy storage space that is not occupied by Windy Gap water. The delivery of C-BT Project water from Granby Reservoir into Chimney Hollow Reservoir would create space for Windy Gap water in Granby Reservoir. When Windy Gap water is diverted into Granby Reservoir, the C-BT Project water in Chimney Hollow Reservoir would be exchanged for a similar amount (after taking water losses into account) of Windy Gap water in Granby Reservoir. Total allowable C-BT Project storage or yield would not change. Construction costs were estimated to be $223,400,000 and annual operations and maintenance costs were expected to be $795,000 for this alternative (in 2005 dollars).

Alternative 3 - Chimney Hollow Reservoir and Jasper East Reservoir

Alternative 3 is a combination of a 70,000 AF Chimney Hollow Reservoir on the East Slope and a 20,000 AF Jasper East Reservoir on the West Slope. A new 1-mile-long pipeline would connect Jasper East Reservoir to the existing Windy Gap pipeline that delivers water to Granby Reservoir. The existing C-BT Willow Creek Pump Station, forebay, and portions of the canal and pipeline would be relocated. The availability of a new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Jasper East Reservoir or Granby Reservoir. Thus, when Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Jasper East Reservoir until there is sufficient capacity to transfer water to Chimney Hollow Reservoir. Construction costs were estimated to be $240,100,000 and annual operations and maintenance costs were expected to be $1,375,000 for this alternative (in 2005 dollars).

Alternative 4 - Chimney Hollow Reservoir and Rockwell/Mueller Creek Reservoir

Alternative 4 is a combination of a 70,000 AF Chimney Hollow Reservoir on the East Slope and a 20,000 AF Rockwell/Mueller Creek Reservoir (Rockwell Reservoir) on the West Slope. Deliveries to and from Rockwell Reservoir would require a new connection to the existing Windy Gap pump station and a new 3.3-mile-long pipeline to Rockwell Reservoir. As with Alternative 3, the availability of a new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Rockwell Reservoir or Granby Reservoir. When Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Rockwell Reservoir until there is sufficient capacity to transfer water to Chimney Hollow Reservoir. Construction costs were estimated to be $252,400,000 and annual operations and maintenance costs were expected to be $1,730,000 for this alternative (in 2005 dollars).

Alternative 5 - Dry Creek Reservoir and Rockwell/Mueller Creek Reservoir

Alternative 5 is a combination of a 60,000 AF Dry Creek Reservoir on the East Slope and a 30,000 AF Rockwell Reservoir on the West Slope. Water deliveries to and from Rockwell

Reservoir would require a new pipeline and connection to the existing Windy Gap pump station. A new 3.4-mile-long pipeline connection to C-BT facilities would convey Windy Gap water to Dry Creek Reservoir. A new 2.1-mile-long pipeline also would be needed to deliver water from Dry Creek Reservoir to Carter Lake. As with Alternatives 3 and 4, the availability of a new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Rockwell Reservoir or Granby Reservoir. When Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Rockwell Reservoir until there is sufficient capacity to transfer water to Dry Creek Reservoir. Construction costs were estimated to be $287,700,000 and annual operations and maintenance costs were expected to be $2,240,000 for this alternative (in 2005 dollars).

Final EIS Environmental Consequences of the Windy Gap Firming Project

This section summarizes impacts identified in the Final EIS on resources that were of particular concern to the public, agencies, and the Participants.

Surface Water Hydrology - Colorado River Flows

All of the alternatives, including no action, result in increased diversions from the Colorado River (Final EIS pp. 3-36 and 3-84). The No Action Alternative diverts the least amount and therefore has the least effect on river flow quantity. Alternative 2 – Chimney Hollow Reservoir diverts approximately six percent more volume in an average year than the No Action Alternative (Final EIS Table 2-6). Alternatives 3 and 4 would divert approximately 10% more than the No Action Alternative in average years, while Alternative 5 would divert approximately 11% more (Final EIS Table 2-6). In dry years, there is no difference between No Action and action alternatives in the quantity of water diverted from the Colorado River (Final EIS p. 3-32).

Stream Morphology - Colorado River Flushing Flows

All of the alternatives, including no action, result in a net reduction of channel maintenance (flushing) flows below Windy Gap Reservoir (Final EIS p. 3-101). However, Final EIS analysis determined that streamflow would remain sufficient for channel maintenance (sediment transport without channel aggradation) (Final EIS p. 3-101). Flushing flows are estimated to occur 23 days per year on average under the No Action Alternative, and 20 days for the action alternatives (Final EIS Table 2-6). The WGFP Fish and Wildlife Mitigation Plan increases the Subdistrict's previous required flushing flow commitment from 450 cubic feet per second (cfs) to 600 cfs for action alternatives (Final EIS Appendix E p. 15).

Surface Water Quality

Colorado River

Under the No Action Alternative, water quality nutrient constituents are expected to remain within standards except dissolved oxygen, however several constituents will be adversely affected (Final EIS Table 2-6). For the action alternatives, Colorado River nutrient quantities are expected to be more favorable than under the No Action Alternative as a result of mitigation measures. Nutrient mitigation aimed at "neutralizing" the effects of increased Windy Gap Project pumping from April to August on Three Lakes System (Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir) nutrients, are expected to benefit Colorado River water quality year round (e.g., waste water treatment plant improvements would improve water quality year round) (Final EIS p. 3-200).

Stream temperature standards are exceeded under existing conditions during summer months (Final EIS p. 3-108), and these exceedances would increase under no action and the action alternatives (Final EIS p. 3-139). For action alternatives, mitigation of stream temperature exceedances is addressed in the Fish and Wildlife Mitigation Plan. With this mitigation, the action alternatives are anticipated to have stream temperature benefits that would not occur under the No Action Alternative (Final EIS p. 3-203).

Three Lakes System

All alternatives, without mitigation, would degrade Three Lakes System water quality compared to existing conditions (Final EIS pp. 3-192 to 3-194). Action alternative mitigation requires that the project be "nutrient neutral" (Final EIS p 3-200). Nutrient neutral means the Subdistrict will offset any nutrient increases in the Three Lakes System from the WGFP by taking measures that reduce nutrient quantity by an equal amount. Under action alternatives, the Subdistrict would also commit to participate and fund ongoing water quality studies for the Three Lakes System (Final EIS p. 3-204). With mitigation, the action alternatives are anticipated to have water quality benefits that would not occur under the No Action Alternative.

East Slope Reservoirs

Without mitigation, all alternatives including no action would be expected to degrade water quality in Front Range reservoirs (Final EIS pp. 3-198 to 3-199). "Nutrient neutral" mitigation implemented on the West Slope for action alternatives is expected to provide similar water quality benefits to water conveyed to East Slope reservoirs.

Aquatic Resources - Colorado River

The Final EIS concludes that aquatic populations will not be significantly adversely affected under any of the alternatives (Final EIS p. 3-224), and in particular the Gold Medal fishery designation on the Colorado River is not expected to be affected (Final EIS p. 3-225).

Anticipated increases in Windy Gap diversions under the No Action Alternative would be less than action alternatives. Thus, the No Action Alternative effect on Colorado River and aquatic habitat quantity would be slightly less than for the action alternatives (Final EIS Table 2-6).

Without mitigation, modeling indicated temperature standard exceedances would increase from existing conditions in 4 out of the 15 years evaluated for all alternatives (Final EIS Table 2-6). No Action Alternative exceedance of the chronic and acute temperature standards were modeled to occur at a slightly lower frequency and duration than action alternatives (Final EIS Table 2-6). Higher stream temperatures may result in less fit individuals and possible fish mortality, particularly if the acute temperature standard is exceeded frequently (Finale EIS Table 2-6). Stream temperature mitigation is expected to reduce the potential for increases in exceedances for the action alternatives (Final EIS p. 3-203).

Flushing flows and water quality mitigation measures for stream temperature and nutrients implemented under the action alternatives are expected to improve aquatic habitat quality for fish and macroinvertebrates in comparison to the No Action Alternative (Final EIS p. 3-237).

Recreation – West Slope

In key boating reaches downstream of Kremmling, there is no substantive difference in the effects of the alternatives on boating days and economic impacts (Final EIS p. 3-342 and 3-343). The action alternatives include mitigation to provide preferred flows during the Gore Race in August (Final EIS p. 3-410), which would not be provided under the No Action Alternative.

Predicted effects to aquatic habitat under all alternatives are unlikely to measurably impact sport fishing on the Colorado River or Willow Creek (Final EIS Table 2-6).

For the No Action Alternative, Granby Reservoir surface area in the summer would decrease 2% on average in the summer (Final EIS Table A-22) and boat ramps would remain accessible except in dry years when water levels could drop below the Arapaho Bay boat ramp in August. With modified prepositioning under Alternative 2 – Chimney Hollow Reservoir, Granby Reservoir surface area would decrease 4% on average in the summer (Final EIS p. 3-353 and Table A-22). Effects to boat ramps would be similar to the No Action Alternative. For the remaining action alternatives, Granby Reservoir water levels would decrease slightly less than under the Proposed Action with similar potential effects to boat ramps (Final EIS Table 2-6).

Environmentally Preferable Alternative

The Council on Environmental Quality's NEPA regulations require federal agencies to identify the alternative or alternatives they consider to be environmentally preferable in the Record of Decision[8]. The Department of the Interior's NEPA regulations clarify that it is not necessary that the environmentally preferable alternative or alternatives be selected for implementation in the Record of Decision[9].

Reclamation evaluated the impact of each alternative on natural resources to determine the environmentally preferable alternative or alternatives. This evaluation was based on the analysis

[8] 40 CFR 1505.2(b)[9] 46 CFR 46.450 and 43 CFR 43.450
[9] 46 CFR 46.450 and 43 CFR 43.450

in the Final EIS including the Fish and Wildlife Mitigation Plan, Supplemental Information Report, and Errata Sheet. The evaluation determined that the environmentally preferable alternative varies for each natural resource analyzed.

The following determinations were made regarding the identification of the environmentally preferable alternative:

- The No Action Alternative was determined to be the environmentally preferable alternative for Colorado River flows, quantity of Colorado River aquatic habitat, vegetation, and wildlife resources. The reduced quantity of water diversions and land area permanently impacted by reservoir development were the primary reasons the No Action Alternative was environmentally preferable for these resources.
- The action alternatives were determined to be environmentally preferable for lake, reservoir and Colorado River water quality, and Colorado River aquatic habitat quality downstream of the Windy Gap Project. The principal reasons for this are implementation of mitigation measures to reduce nutrient loading and mitigation to improve stream temperatures.
- Alternative 2 – Chimney Hollow Reservoir and Alternative 3 – Chimney Hollow and Jasper East Reservoirs were environmentally preferable for endangered species due to payment of depletion compensation to the Upper Colorado River Endangered Fish Recovery Program to benefit certain threatened and endangered species and absence of impacts on lynx.
- Alternative 2 – Chimney Hollow Reservoir is environmentally preferable to other action alternatives in terms of water flows due to lower diversion quantities compared to other action alternatives.
- The No Action Alternative is environmentally preferable in terms of permanent wetland impacts. Alternative 2 – Chimney Hollow Reservoir would have about one more acre of impacts compared to the No Action Alternative, while the remaining action alternatives have the potential to permanently affect several more wetland acres.
- There was no substantive difference in effects between the No Action and action alternatives for stream morphology and floodplains, groundwater, east slope aquatics, soils, geology/paleontology, air quality, and noise resources, and therefore all alternatives perform comparably in terms of environmental preference.

The Final EIS identified a number of reasonably foreseeable actions with the potential to cumulatively impact resources affected by the WGFP. In many cases, these reasonably foreseeable actions have a similar cumulative effect on both the No Action Alternative and action alternatives. One notable exception is the Windy Gap Enhancement Plan, which would only be implemented if an action alternative is selected. The Enhancement Plan comprises a Colorado River aquatic habitat project, which is expected to have a cumulative beneficial effect on Colorado River aquatic habitat.

Based on the information cited above, Reclamation considers both the No Action Alternative and Alternative 2 - Chimney Hollow Reservoir to be the environmentally preferable alternatives, because of each alternative's relative overall effect on natural resources.

Comments Received on the Final EIS

Reclamation received comment letters from eleven interested parties concerning the WGFP Final EIS. Comment letters were received from the U.S. Environmental Protection Agency, Trout Unlimited, Upper Colorado River Alliance, National Wildlife Federation, Alex Wiegers, Save the Poudre, Travis Morse (Headwaters Partners, LLC), Dorothy Dines, Greater Grand Lake Shoreline Association, Jeff Thompson, and Save the Colorado. Several of the comment letters contained comments regarding similar subjects. Reclamation developed the following responses to these recurring comment topics. These responses do not replace the specific responses developed for each individual substantive comment, which are available in the administrative record.

Comment	Reclamation Response
WATER QUALITY	
Concern that the WGFP Final EIS water quality baseline/existing condition for Granby Reservoir, Shadow Mountain, Grand Lake and Horsetooth Reservoir does not accurately represent current conditions.	Water quality conditions at any given time are extremely variable in these water bodies. In order to describe a representative "existing condition" that could be used for comparative purposes, a calibrated model was used to develop the existing condition using a 15-year period of hydrologic record (this period was defined as a representative subset of the larger 47-year hydrologic modeling period). This same 15-year period of hydrologic record was also used to simulate no action and the action alternatives. This approach allowed for assessment of a very wide range of hydrologic conditions and allowed for a direct comparison of simulated existing conditions to simulated altered conditions.
Concern that water quality data is averaged annually, which could increase the uncertainty of the results.	Water quality modeling results are presented in the Final EIS on a daily time step for Granby Reservoir, Shadow Mountain Reservoir and Grand Lake, showing all simulated short-term variations. For Horsetooth Reservoir and Carter Lake, the BATHTUB model was applied. This model generates average annual results. The BATHTUB model results have not been averaged over an entire year. The BATHTUB model is a well-established and widely applied tool for lake water quality assessment and management. Following comments on the Draft EIS, Reclamation, with EPA's acknowledgement, determined that development of a new water quality model for Horsetooth Reservoir and Carter Lake was cost and time prohibitive, and that providing development of additional information on mitigation was a more productive approach.
Concern that the "nutrient neutral" mitigation should be described in more detail.	Although all of the specific actions necessary to mitigate nutrient loading resulting from the WGFP have not been identified, the mitigation measure would require the Subdistrict to submit a nutrient reduction plan to Reclamation and the Corps of Engineers for approval, and to document 1:1 nutrient reductions prior to the completion of WGFP construction and operation (Final EIS, p. 3-413).
Concern that the Grand Lake clarity analysis did not address non-algal particulates (aka silt).	The WGFP Final EIS discussed both clarity and turbidity. Turbidity was defined within the Final EIS as "a cloudy condition in water due to suspended silt or organic matter." The Final EIS thoroughly analyzed effects on clarity and turbidity within the Surface Water Quality section of Chapter 3 (Final EIS, pp. 3-106 – 3-205).
STREAM MORPHOLOGY	
Concern about stream morphology due to the reduction in frequency of certain larger "flushing flows."	As described in the WGFP Final EIS, historic and existing condition data indicate that the morphology of the Colorado River channel below Granby Reservoir and Windy Gap Reservoir has remained stable over the past 60 years even with changes in the timing and quantity of flows with the construction of Granby Reservoir and other water projects. The Final EIS

Comment	Reclamation Response
	analysis indicates that the channel is likely to remain stable under the WGFP. These conclusions were based on collection of field data, collaboration with Colorado Parks and Wildlife, river cross-sectional analyses, and hydrologic modeling used to evaluate changes in flow duration, changes in channel maintenance flows, and sediment transport. Reclamation considered the information provided in the 2011 Nehring et al. report regarding potential adverse stream morphology impacts below Windy Gap Reservoir due to the reduction in larger flushing flows. Reclamation's review of the report did not find any mention of measurement of channel embeddedness, collection of sediment or other stream channel physical data, evaluation of sediment movement/deposition below Windy Gap or similar data to support the statements made in the report.
Concern that the 600 cfs flushing flow in the Fish and Wildlife Mitigation Plan would only be required when there is more than 60,000 acre feet of Windy Gap water in storage.	The State of Colorado's Fish and Wildlife Mitigation Plan 600 cfs flushing flow is not conditioned on the amount of Windy Gap water in storage. These are two separate mitigation measures. First, the 450 cfs requirement in the 1980 Memorandum of Understanding Between Municipal Subdistrict, Northern Colorado Water Conservancy District and Division of Wildlife, Colorado Department of Natural Resource, Relating to Minimum Stream Flow in Association with the Windy Gap Diversion Project would be increased to 600 cfs. The remainder of the first measure would remain the same – 600 cfs for 50 hours once every three years, if such flows are naturally available. The second mitigation measure – ceasing all pumping for at least 50 hours under certain conditions when Windy Gap Project water storage exceeds 60,000 acre feet – is a separate, stand-alone measure.
Concern that the proposed 600 cfs flushing flow is insufficient for channel maintenance.	The intent of the 600 cfs flushing flow is to provide a minimal amount of guaranteed flushing flows, recognizing that a larger range of channel maintenance flows are still needed to support river ecological functions. The channel maintenance flow analysis indicates that although the frequency of larger flows would decrease with the WGFP, there would still be a reasonable distribution of higher flows to maintain the condition of the channel and aquatic habitat. It should be noted that the maximum Windy Gap water right diversion is 600 cfs, so any curtailed diversion cannot increase flushing flows by more than this amount. Colorado Parks and Wildlife (CPW) had information on changes in channel maintenance flows for use in the evaluation of flushing flow during development of the Fish and Wildlife Mitigation Plan. The State's Fish and Wildlife Mitigation Plan identified what it considered to be reasonable mitigation for the direct and indirect effects of the project, including a recommendation for flushing flows of 600 cfs, which was incorporated into the Final EIS. In addition, the U.S. Fish and Wildlife Service approved of the findings in the Fish and Wildlife Coordination Act Report on March 9, 2012, which included the recommended flushing flow mitigation identified in the Fish and Wildlife Mitigation Plan, and agreed that the measures to avoid, minimize, and mitigate impacts to fish and wildlife resources from implementation of the Preferred Alternative [Alternative 2] adequately addressed identified effects.
STREAM TEMPERATURE	
Recommendations for a one degree or more buffer for the chronic temperature	The State of Colorado, as the entity with jurisdictional responsibility for managing the fish and wildlife of the state, developed and approved the mitigation measures to be implemented, including the acute and chronic

Comment	Reclamation Response
water quality standard (Maximum Weekly Average Temperature or MWAT) mitigation trigger similar to the acute temperature water quality standard mitigation trigger.	temperature mitigations, as part of the Fish and Wildlife Mitigation Plan. The Fish and Wildlife Mitigation Plan was incorporated into the Final EIS. In addition, the U.S. Fish and Wildlife Service's Fish and Wildlife Coordination Act Report included the temperature mitigations identified in the Fish and Wildlife Mitigation Plan and agreed that the measures to avoid, minimize, and mitigate impacts to fish and wildlife resources from implementation of the Preferred Alternative adequately addressed the identified effects of the WGFP.
AQUATICS	
Concern that the Final EIS fails to recognize the importance of variable flows for aquatic health.	The Final EIS includes discussion on the importance of variable flows to aquatic life (pp. 3-205 to 3-238), and includes the following summary, "Estimated changes in Colorado River streamflow under the Proposed Action are not expected to adversely impact stream channel characteristics that create and maintain aquatic habitat. Streamflows would remain sufficient to transport sediment, prevent channel aggradation, and maintain spawning habitat." (Final EIS, p. 3-226)
NEHRING REPORT	
Concern that information contained in the 2011 Nehring et al. report was not used in the Final EIS.	Data in the Nehring report (Colorado River Aquatic Resource Investigations. Federal Aid Project F-237R-18. June 2011) was reviewed by Reclamation prior to publication of the Final EIS to identify if there was any significant new data in this report relevant to the analysis that would change the effects determination. The new macroinvertebrate data presented in the report was considered in concert with the other data sources cited in the Final EIS; the new data was within the range of the data contained in the Final EIS and was considered in the evaluation of potential effects. Consequently, the Final EIS included information on the decrease in the abundance of the Pteronarcys stonefly and mottled sculpin, but Reclamation did not find the report's conclusions regarding the existing physical condition of the Colorado River below Windy Gap Reservoir useful in determining the environmental consequences in the Final EIS. The 2011 Nehring et al. report does not provide documentation to substantiate the report's position regarding the magnitude or duration of flows required to clean cobble-boulder substrates. Data was not collected on stream water temperature for the report and the report did not quantify areas of rooted aquatic vegetation or fine substrate deposition. Physical parameters were not measured, analyzed, or modeled. The study was limited to the collection of biological data.
GRANBY RESERVOIR SPILLS	
Concern that the Final EIS hydrologic modeling did not contain a "forecasting function" to predict Granby Reservoir spills.	The annual decision to pump Windy Gap water takes into consideration many factors including snowpack, Granby Reservoir C-BT and Windy Gap contents, precipitation, Big Thompson River basin forecasts, and orders for Windy Gap and C-BT water. Incorporating a forecasting function in the model would require making a number of assumptions regarding the variables listed above, in which case it may or may not improve the accuracy of model output. Forecasting does not eliminate Windy Gap spills as evidenced by historic Windy Gap spills in 1995, 1996 and 2011. For example, Windy Gap water was pumped in May and June of 1995, yet Granby Reservoir spilled in July that year. The year 1995 was one of the five wettest years in the study period, yet over 14,000 acre-feet of Windy Gap water was pumped as late as early June that year. Similarly, almost 7,000 AF was pumped in April and May 2010 and Granby Reservoir would have spilled that year had pre-emptive measures not been taken to avoid a spill. As the model is configured

Comment	Reclamation Response
	without a forecasting function, Windy Gap diversions occur as long as there is storage space available. As a result, Windy Gap diversions may be overstated in some wet years; however, historic operations show that Windy Gap water would be pumped in some wet years under existing conditions. Inclusion of a forecasting function may prohibit Windy Gap pumping in some above average and wet years that would otherwise occur as evidenced by Windy Gap diversions in 1995 and 2010. A forecasting function in those instances would decrease the accuracy of the model results. Thus, the lack of a forecasting function in the WGFP model may overstate Windy Gap diversions in some wet years under existing conditions resulting in higher flows in May, June, and July if water pumped earlier in the year is spilled. As pointed out in the WGFP Final EIS, it is difficult to ascertain in which wet years pumping should be less under existing conditions since the decision to pump depends on numerous factors and does not follow defined rules. This issue does not affect Windy Gap diversions in average and dry years when Granby Reservoir does not fill; therefore, Windy Gap pumping, net depletions to the Colorado River and associated impacts are accurately estimated in dry years, which are typically more critical for aquatics, water quality, and other flow-related resources. The lack of a forecasting function also has minimal effect on model results for the Proposed Action and Alternatives 3, 4, and 5 because Windy Gap diversions early in the season would be stored in firming reservoirs as opposed to Granby Reservoir and as a result, these diversions would not be spilled. Therefore, the lack of a forecasting function really only affects existing conditions and the No Action Alternative.
NO ACTION ALTERNATIVE	
Concern that the Final EIS No Action Alternative is speculative and inappropriate.	The No Action Alternative presents the future without the WGFP. It describes the WGFP Participants actions if Reclamation does not allow the proposed connections to C-BT facilities. This includes foreseeable actions by the Participants. For most Participants, this includes continuing to take Windy Gap deliveries and increasing those deliveries as water demand increases within the capacity of the existing Windy Gap Project facilities and available storage in Granby Reservoir. One Participant would drop out of the Windy Gap Project. The City of Longmont would pursue enlargement of Ralph Price Reservoir to store its Windy Gap water. While there is no guarantee that enlargement of Ralph Price Reservoir would acquire all of the regulatory authorizations, it is a reasonable action for the City of Longmont, and no fatal flaws were discovered in review of this alternative in the WGFP Final EIS. In the case of existing contracts, prior court decisions and CEQ guidance define no action as no change to existing contracts. For WG, this means Reclamation would continue operation under the existing contract between Reclamation and the Subdistrict for conveyance of Windy Gap water through the C-BT Project system (see CEQ 40 Questions, #3). The majority of the hydrologic impacts included under the No Action Alternative entail increased Windy Gap diversions by Participants that they can currently call for without any infrastructure changes or additional authorizations or approvals from Reclamation. It is unreasonable to assume that Windy Gap diversions would remain status quo under the No Action Alternative.

Comment	Reclamation Response
SENATE DOCUMENT No. 80	
Concern that the review for Firming Project compliance with Senate Document 80 has not been completed.	The question of compliance with Senate Document No. 80 must be answered before Reclamation takes action. In the case of the WGFP, this determination must occur before executing an amendment of the existing carriage contract or issuing a new unused capacity contract.

Reclamation's Decision for the Windy Gap Firming Project

Decision

The Regional Director, as delegated by the Secretary of the Department of the Interior, has determined that the Final EIS for the proposed Windy Gap Firming Project satisfies the requirements of NEPA. Based upon the Final EIS and other considerations, the Regional Director has decided to implement Alternative 2 – Chimney Hollow Reservoir. This alternative includes construction of the new Chimney Hollow Reservoir; pre-positioning of C-BT water in Chimney Hollow Reservoir; a new pipeline to convey water to the new reservoir from existing C-BT facilities; a pipeline to re-introduce water to C-BT facilities from Chimney Hollow Reservoir; and issuance of a new unused capacity contract. This decision includes the following specific actions by Reclamation:

1. Approval of a new contract between Reclamation, the Subdistrict, and the District that specifies the terms and conditions of an up-to-40 year contract between these entities. This contract would allow use of unused capacity in the C-BT Project on an if-and-when available basis. The contract will also include operational and water accounting changes for the C-BT Project system to allow water storage and exchange between the C-BT and Windy Gap projects.

2. Approval of a Reclamation special use permit authorizing connection of the Subdistrict's proposed Chimney Hollow Reservoir to Reclamation's C-BT Project facilities.

Decision Rationale

Reclamation considered a range of information in selecting Alternative 2 – Chimney Hollow Reservoir for implementation. Information provided in the Final EIS, supporting information, public and agency comments, and information provided by the Subdistrict during contract negotiations were all considered. Comments on the Draft EIS from government agencies, Tribes, public and private organizations, and individuals were carefully reviewed by the lead and cooperating agencies (Appendix F of the Final EIS). West Slope community support for the proposed contract also factored into Reclamation's decision (Appendix A). Details regarding key decision-making considerations are provided below. These considerations also represent Reclamation's rationale for deciding between the two environmentally preferable alternatives –

the No Action Alternative and Alternative 2 – Chimney Hollow Reservoir. The key decision-making considerations include:

- meeting the purpose and need,
- Final EIS issues and environmental consequences,
- draft contract comments
- other Subdistrict commitments,
- Senate Document No. 80 and Reclamation Project Act of 1939 Section 14 consistency determinations,
- views of other agencies with jurisdiction by law,
- Subdistrict's preferred alternative,
- Indian Trust Assets, and
- consistency with Reclamation's mission.

Meeting the Purpose and Need

Each of the action alternatives, including Alternative 2 – Chimney Hollow Reservoir, responds similarly to the purpose and need for the proposed action as described in Chapter 1 of the Final EIS (p. 1-4). They would each provide approximately 26,000 AF of firm annual yield to the Participants and 429 AF of firm annual yield to the Middle Park Water Conservancy District. The No Action Alternative is estimated to only provide 1,229 AF of annual firm yield to the Participants with no firm yield for the Middle Park Water Conservancy District.

Final EIS Issues and Environmental Consequences

Reclamation has reviewed and considered all of the issues, environmental consequences, and mitigation measures in the Final EIS. Reclamation believes Alternative 2 – Chimney Hollow Reservoir with implementation of the mitigation measures identified in the Final EIS (see Appendix E) will provide valuable environmental and socioeconomic benefits, and responds well to many of the issues identified by interested parties.

Draft Contract Comments

Reclamation solicited public comments on the draft unused capacity contract to be executed between Reclamation, the Subdistrict, and the District. Reclamation received comments from the Subdistrict, Grand County Board of Commissioners, Upper Colorado River Alliance, Trout Unlimited, McDonald Water Policy Consulting, Roger Drotar, Save the Colorado, and Save the Poudre: Poudre Waterkeeper. Reclamation considered all of the comments and made revisions to the contract as appropriate.

Other Subdistrict Commitments

The commitments identified below were made by the Subdistrict outside of the WGFP Final EIS process.

Colorado River Monitoring and Enhancements

During contract negotiations the Subdistrict committed to pay no less than $1,500,000 to be used exclusively for monitoring and enhancement of the Colorado River between Granby and Windy Gap reservoirs. The funds will be contributed to and used through the Learning by Doing Cooperative Effort. The Learning by Doing Cooperative Effort was established by the Subdistrict, District, Grand County Board of Commissioners, Middle Park Water Conservancy District, and the Colorado River Water Conservation District for the purpose of maintaining and, where

reasonably possible, restoring or enhancing the condition of the aquatic environment in Grand County, Colorado.

Subdistrict Agreements with Third Parties

The Subdistrict has entered into multiple third-party agreements to monitor or enhance Colorado and Fraser river environmental conditions. The agreements are the Intergovernmental Agreement for the Learning by Doing Cooperative Effort, WGFP Enhancement Plan, Windy Gap Bypass Funding Agreement, WGFP Intergovernmental Agreement, and Letter to the Colorado River Water Conservation District Regarding Incidental Uses of Enhancement Water. Reclamation considered these agreements and weighed the benefits the agreements would have if an action alternative is implemented. Reclamation believes the commitments in these agreements represent opportunities for gains in the aquatic and ecosystem knowledge-base of the upper Colorado River and enhancements to aquatic habitat. Reclamation also believes these agreements are a reflection of the community involvement in the Proposed Action and a mechanism to address community concerns beyond the scope of the Final EIS.

Commitments If WGFP Is Not Implemented

During contract negotiations, the Subdistrict agreed to contract terms requiring implementation of certain provisions even if the WGFP is not implemented. Appendix B lists these commitments. Reclamation believes this provides benefits in the upper Colorado River basin that may not otherwise be achieved. Any commitments in Appendix B that require Reclamation to make a decision will be reviewed, prior to implementation, to determine if site-specific NEPA analysis or a supplement to the Final EIS needs to be prepared.

Senate Document No. 80 and Reclamation Project Act of 1939 Section 14 Consistency Determinations

Prior to entering into a contract that would allow use of C-BT Project unused capacity, Reclamation must determine that the unused capacity contract is consistent with the provisions of Senate Document No. 80 and Reclamation's authority under Section 14 of the Reclamation Project Act of 1939 (43 U.S.C. § 389). The following prerequisite determinations and considerations have been completed:

1. Reclamation determined that the proposed unused capacity contract is consistent with the provisions of Senate Document No. 80 (Appendix C).

2. Reclamation determined that the proposed unused capacity contract is consistent with its authority under Section 14 of the Reclamation Project Act of 1939 (Appendix D).

Views of Other Agencies with Jurisdiction by Law

The State of Colorado developed, approved, and adopted the WGFP Fish and Wildlife Mitigation Plan. On October 6, 2011, Reclamation was notified by the State of Colorado that the Fish and Wildlife Mitigation Plan, which was incorporated into and made a part of the Final EIS as Appendix E, comprehensively addresses impacts to Colorado's fish and wildlife resources. The Fish and Wildlife Mitigation Plan is the official position of the State with regard to mitigation of impacts from the WGFP.

On March 9, 2012, the U.S. Fish and Wildlife Service approved the findings in the Fish and Wildlife Coordination Act Report and agreed that the measures to avoid, minimize, and mitigate impacts to fish and wildlife resources adequately addressed identified effects from implementation

of the Preferred Alternative (Alternative 2 – Chimney Hollow Reservoir). The WGFP Fish and Wildlife Coordination Act Report incorporated the mitigation measures included in the State's Fish and Wildlife Mitigation Plan.

On December 4, 2012, the Grand County Board of County Commissioners approved Resolution No. 2012PA-12-1, granting the Municipal Subdistrict of the Northern Colorado Water Conservancy District acting by and through the Windy Gap Firming Project Water Activity Enterprise a permit to engage in the Windy Gap Firming Project. Subsequent to this approval, the Grand County "1041 Permit"[10] was issued by the Chairman of the Permit Authority on December 4, 2012. On December 6, 2012, the Board of Directors of the Municipal Subdistrict of the Northern Colorado Water Conservancy District acting by and through the Windy Gap Firming Project Water Activity Enterprise adopted Resolution MS-319-12-12 to accept the Grand County Windy Gap Firming Project 1041 Permit. On September 22, 2014, Grand County, their Senate Document No. 80 representative, the Colorado River Water Conservation District, and the Middle Park Water Conservancy District submitted letters to Reclamation indicating agreement with the negotiated contract terms and conditions, and encouraging Reclamation to move forward with execution of the contract (Appendix A).

The Corps of Engineers does not intend to make a determination on issuance of a Clean Water Act Section 404 permit for the WGFP until Reclamation's issuance of this Record of Decision. The State of Colorado Clean Water Act Section 401 Water Quality Certification process is expected to be completed in coordination with the Section 404 permit process.

Western Area Power Administration relocation of the transmission line at the Chimney Hollow Reservoir site is evaluated in the Final EIS. The analysis includes identification of standard construction mitigation measures for transmission line construction. Western Area Power Administration can use the Final EIS in making a final determination regarding relocation of the transmission line.

Subdistrict Preferred Alternative

The Subdistrict prefers Alternative 2 – Chimney Hollow Reservoir. This alternative has the lowest construction and annual operation and maintenance costs of the suite of action alternatives considered in the Final EIS. Reclamation considered this preference in its decision-making.

Indian Trust Assets

Indian Trust Assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Department of the Interior policy requires Reclamation identify any impact on Indian Trust Assets (Department Manual Part 512 Section 2). Reclamation consulted the USGS Indian Lands Areas Judicially Established maps and the Bureau of Indian Affairs Treaty and Agreement Lists to establish if treaties, agreements or assets existed in the WGFP area. No Indian Trust Assets were identified in the project area. Consequently, no impacts to Indian Trust Assets would occur from implementation of Alternative 2 – Chimney Hollow Reservoir.

Consistency with Reclamation Mission

Based on the findings in the Final EIS, Alternative 2 – Chimney Hollow Reservoir is consistent with Reclamation's mission of managing, developing, and protecting water and related resources in an environmentally and economically sound manner in the interest of the American public.

[10] Colorado Revised Statute 24-65.1-101.

Mitigation/Environmental Commitments

Reclamation is required in the Record of Decision to state whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not[11]. The Final EIS describes the predicted impacts of Alternative 2 – Chimney Hollow Reservoir and identifies practicable mitigation measures/environmental commitments to avoid or minimize those impacts. As part of this decision, Reclamation is requiring the mitigation measures/environmental commitments identified in the Final EIS be implemented as part of Alternative 2 – Chimney Hollow Reservoir. It is Reclamation's express intent that mitigation measures/environmental commitments identified in this Record of Decision assigned to the Subdistrict be binding commitments.

The Corps of Engineers, Western Area Power Administration, and Grand County may require additional mitigation measures as part of their evaluation for compliance with Section 404 Clean Water Act requirements, transmission line relocation, and county 1041 permitting, respectively. The Subdistrict may be required to obtain other federal, state, and local permits, approvals, and agreements for the WGFP. Each agency will be responsible for enforcing mitigation measures included in their respective permits, agreements, or decisions for implementation of the WGFP. It is probable that these will contain some of the same mitigation measures contained herein. In that case, Reclamation, the Corps of Engineers, Western Area Power Administration, Grand County, and other entities, as appropriate, may cooperate through their respective authorities to assure that the objective of the mitigation measure is accomplished.

Reclamation Mitigation/Environmental Commitments

Cultural Resources

The following cultural resource mitigation measures must be implemented:

- Reclamation executed a Memorandum of Agreement (MOA) with the Colorado State Historic Preservation Office regarding the WGFP. Reclamation must adhere to the stipulations of that MOA. The MOA stipulates that:
  - I. Prior to any construction of the WGFP, Reclamation's Eastern Colorado Area Office will inventory the remaining 17.2 acres in the Area of Potential Effect and consult with State Historic Preservation Office on eligibility and effects of the WGFP pursuant to 36 CFR 800, including mitigation that will be set forth in an amendment to this MOA.
  - II. Regarding Historic Properties, the Eastern Colorado Area Office will consult with State Historic Preservation Office on effects after more details of the WGFP are available, including mitigation that will be set forth in an amendment to the MOA.

Indian Trust Assets

Reclamation has not identified any Indian Trust Assets that would be affected by the WGFP to date. If Reclamation is made aware of any Indian Trust Assets that will be affected by the project, Reclamation will consult with the appropriate Tribe(s) to identify and mitigate any effects.

[11] 40 CFR 1505.2(c)

Threatened and Endangered Species

Reclamation will reinitiate Section 7 Endangered Species Act consultation for this project if any of the reinitiation conditions identified in the U.S. Fish and Wildlife Service's Biological Opinion for the project dated February 12, 2010 transpire.

Subdistrict Mitigation/Environmental Commitments

The Subdistrict's construction and operation of Chimney Hollow Reservoir must be consistent with the evaluation in the WGFP Final EIS. The Subdistrict operation of the Windy Gap Project must be consistent with both the Final Environmental Statement for the Windy Gap Project (Statement No. FES 81-20) and the WGFP Final EIS. Such compliance is required except under emergency conditions, and unless additional and appropriate environmental investigations are completed by Reclamation and approval is then given to the Subdistrict to alter construction or operations.

The Alternative 2 – Chimney Hollow Reservoir mitigation measures/environmental commitments identified in the Final EIS and Fish and Wildlife Mitigation Plan are contained in Appendix E of this Record of Decision. The Subdistrict must implement the mitigation measures/environmental commitments contained in Appendix E to mitigate the adverse impacts of Alternative 2 – Chimney Hollow Reservoir identified in the Final EIS.

Summary

Alternative 2 – Chimney Hollow Reservoir represents years of work by the Participants and the Subdistrict to develop a solution to reliably meet their water needs. The Subdistrict worked extensively with communities and entities on the West Slope to reach agreement on responding to concerns with the project and providing benefits for the West Slope. This is reflected in letters from Grand County, the Colorado River Water Conservation District, and the Middle Park Water Conservancy District to Reclamation (Appendix A). Reclamation's decision to implement Alternative 2 – Chimney Hollow Reservoir with the mitigation identified in Appendix E responds to the Participant's future water needs, implements practicable measures to avoid or minimize environmental impacts from firming the Windy Gap Project yield, and provides benefits that would not be achieved under the No Action Alternative. These factors are the basis for Reclamation's decision to implement Alternative 2- Chimney Hollow Reservoir.

Appendix A

Grand County, Colorado River Water Conservation District, and Middle Park Water Conservancy Letters

BOARD OF COMMISSIONERS

JAMES L. NEWBERRY
District I, Winter Park 80482
MERRIT S. LINKE
District II, Granby 80446
GARY BUMGARNER
District III, Kremmling 80459

E-Mail: grndcty1@co.grand.co.us
PHONE: 970/725-3100
Fax: 970/725-0565
LURLINE UNDERBRINK CURRAN
County Manager
ANTHONY J. DICOLA
County Attorney

September 22, 2014

Michael J. Ryan
Regional Director
Great Plains Regional Office
Bureau of Reclamation
P.O. Box 36900
Billings, MT 59107-6900

Re: 2014 Contract for the Introduction, Storage, Carriage, Exchange, Substitution, and Delivery of Water for Municipal Subdistrict, Northern Colorado Water Conservancy District, Colorado-Big Thompson Project, Colorado ("2014 Contract")

Dear Mike,

We want to thank you for giving Grand County the opportunity to comment during the negotiation process for the 2014 Contract, and for taking our concerns into consideration. Protecting the Colorado River and Grand Lake while east slope beneficiaries use the Colorado-Big Thompson Project for water supply has been one of Grand County's most pressing concerns since before the project was constructed. We believe that consultation with Grand County during the 2014 Contract negotiations is an indication of Reclamation's commitment to open decision-making on matters involving operations of the Colorado-Big Thompson Project.

As part of the negotiation process, Grand County, the Municipal Subdistrict, Northern Water, the Colorado River Water Conservation District, and the Middle Park Water Conservancy District met last week to discuss several of the remaining key issues of concern to the west slope. At that meeting, we were able to agree on language that is reflected in the draft of the 2014 Contract dated September 17, 2014. Recognizing the progress that the parties have made to resolve many issues, Grand County requests that Reclamation move forward to approve the 2014 Contract, once the Record of Decision for the Windy Gap Firming Project ("ROD"), Reclamation's Senate Document 80 Compliance Determination, and negotiation of a "side-agreement" on no-waiver language is complete. We would also request that Grand County be consulted on drafts of these documents as well.

P.O. BOX 264 HOT SULPHUR SPRINGS CO 80451

Thank you again for accommodating Grand County's role under Senate Document 80 and as a consulting agency for the Windy Gap Firming Project. We are encouraged by the serious efforts that have been made by all the parties.

Sincerely,

Gary Bumgarner	Merrit Linke	James Newberry
Commissioner, Chairman	Commissioner	Commissioner

cc: Ann Castle
Eric Wilkinson
Eric Kuhn
Peter Fleming
Barb Green
David Taussig

Colorado River District

Protecting Western Colorado Water Since 1937

September 22, 2014

Mr. Eric Wilkinson Via Email
Mr. Don Carlson
220 Water Avenue
Berthoud, CO 80513

Mr. Mike Ryan Via Email
P.O. Box 36900
Billings, MT 59107-6900

Re: Windy Gap Carriage Contract

Dear Eric, Don and Mike:

I want to thank each of you for working with the River District and the other interested West Slope parties on the Windy Gap Carriage Contract. Eric recently provided me with a redline version of the proposed contract dated September 17, 2014. Although the formal negotiation process sometimes made it difficult for the West Slope entities to ensure their interests were fully addressed, we believe that the September 17th version of the proposed contract represents a reasonable compromise amongst the parties to the contract and that it adequately covers the West Slope's primary interests in the Windy Gap Project.

We understand that there are only a few more steps to complete Reclamation's approval process for the project, including (1) a Record of Decision, (2) a written determination (which may be part of the R.O.D.) by the Secretary or her designee that the Windy Gap Firming Project and the proposed carriage contract will be operated consistent with, and will not cause the Colorado-Big Thompson Project to violate, Senate Document 80, and (3) a mutual "no waiver" agreement between the River District, Grand County, the Middle Park Water Conservancy District, Northern Water, the Municipal Subdistrict, and Reclamation regarding certain factual and legal issues. Once those items have been completed, we believe that the September 17th version of the Windy Gap carriage contract should be executed promptly. We look forward to working with the parties with that goal in mind.

Sincerely,

R. Eric Kuhn

Cc: Lurline Underbrink Curran, Grand County Manager
Peter Fleming, General Counsel Colorado River District
Rodney Smith Jr., Office of the Solicitor U.S. Department of the Interior

201 Centennial Street / PO Box 1120 • Glenwood Springs, CO 81602
(970) 945-8522 • (970) 945-8799 Fax
www.ColoradoRiverDistrict.org

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September 22, 2014

Mr. Michael J. Ryan
Regional Director
Great Plains Regional Office
Bureau of Reclamation
P.O. Box 36900
Billings, MT 59107-6900

RE: 2014 Contract for the Introduction, Storage, Carriage, Exchange, Substitution, and Delivery of Water for Municipal Subdistrict, Northern Colorado Water Conservancy District, Colorado-Big Thompson Project, Colorado ("2014 Contract")

Dear Mr. Ryan:

This letter is written on behalf of Middle Park Water Conservancy District. Representatives of Middle Park Water Conservancy District attended most of the negotiating sessions on the Carriage Contract and appreciated the opportunity both before and after those sessions to provide input on the Carriage Contract. Middle Park Water Conservancy District, uniquely, receives water from the Municipal Subdistrict for West Slope users in Grand and Summit Counties.

Middle Park Water Conservancy District supports the approval by the Bureau of Reclamation of the Carriage Contract, subject to any reservations stated by either the Grand County Commissioners or the Colorado River Water Conservation District, in their correspondence.

Thank you again for the opportunity to monitor the negotiations.

Very truly yours,

Duane Scholl

Duane Scholl, President
Middle Park Water Conservancy District

Appendix B

ENVIRONMENTAL COMPONENTS TABLE

Windy Gap Firming Project
Proposed Mitigation and Enhancement Measures with No Project
8/26/14

Item #	Proposed Mitigation/Enhancement Measure	Out-of Pocket Cost of Proposed Measure (Note 1)	EIS Mit.	Other
1	Increased Flushing Flows			
	a. Increase current 450 cfs requirement to 600 cfs (50 hours every 3 years)	$ -	X	
	b. New measure - 1,200 cfs for 72 hours every 6 years (if/when flows available)	$ -		1041 Permit
2	Temperature Mitigation			
	a. Two real-time temperature gages	$ 50,000	X	
	b. Pumping reductions when temperature standards are exceeded,with some limitations	$ -	X	
3	Nutrient Mitigation			
	a. C Lazy U non-point conservation measures	$ 800,000	X	
	b. E Diamond H non-point conservation measures	$ 200,000	X	
4	Participate in LBD Management Committee	$ -		LBD Agreemnt
5	Windy Gap Dam Modifications/Bypass Study	$ 250,000		Bypass Study
6	Rancher Settlement - Kremmling area stream/irrigation improvements	$4,000,000		Rancher Agreement
7	Provide funding to LBD for monitoring and improvement of aquatic habitat in the Colorado River between Granby Dam and Windy Gap	$1,500,000		Contract
8	Provide up to 3,000 af of water each year to Grand County. Water to be provided only after all pumping demands for WGFP participants has been met. Grand County will be responsible to pay energy cost to pump this water.	$ -		IGA (Similar)
9	Provide up to 4,500 af of carry-over for Grand County for end of year pumping water supply provided above.	$ -		IGA (Similar)
10	Provide fund to reimburse for water measurement structures on Colorado River between Granby Res. And Kremmling.	$ 380,000		IGA (Similar)
11	Shoshone Outage Protocol - Subdistrict agrees to operate to maintain 1250 cfs flows at Shoshone when plant is not operating, with limitations based on amount of Windy Gap water in storage	$ -		IGA
12	Subdistrict agrees, with certain limitations, to cooperate with future RICD, instream flows, Denver's west slope agreements, etc.	$ -		IGA, Decree
13	Subdistrict agrees to contribute funds to the Endowment Fund of the Upper Colorado River Wild & Scenic Stakeholder Group	$ 50,000		IGA
14	Subdistrict agrees to contribute funds to implement a bypass around or through Windy Gap Reservoir if the WG Bypass Study demonstrates benefit to Colorado River - contingent on matching funding from State	$2,000,000		Bypass Study
15	Provide payments required by the Upper Colorado River Recovery Program for water depletions	$ -	X	As Appropriate
16	Middle Park would continue to annually receive up to 3,000 acre-feet of Subdistrict water, if available, under the 1985 Agreement	$ -		1985 Agreement

Total Estimated Cost of All Mitigation + Enhancement Measures: **$9,230,000**

Note (1) Cost of water-related measures are not estimated. Water-related measures provide additional value and will reduce yield of project in most cases.

Appendix C

Senate Document No. 80 Determination

GP-1000
WTR-4.00

MEMORANDUM

To: Central Files
Attn: GP-6300 (MChastain)

From: Michael J. Ryan
Regional Director

Subject: Senate Document No. 80 Determination

Teams for the Bureau of Reclamation, the Northern Colorado Water Conservancy District (District), and the Municipal Subdistrict (Subdistrict) have been negotiating a contract that would allow the Subdistrict to use excess (defined as "Unused" in the contract) capacity in the Colorado-Big Thompson Federal Reclamation Project (Project) for the Subdistrict's existing Windy Gap Project and future Windy Gap Firming Project. The negotiating teams have proposed a draft Contract No. 15XX650003 (2014 Contract[1]) to their respective principals for approval. As part of Reclamation's approval process, Reclamation must determine whether the 2014 Contract is consistent with the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80, the congressional report that is part of the Project's authorization, which is incorporated here as Attachment 1. This document provides that determination.

The 2014 Contract contains several provisions that address this portion of Senate Document No. 80. The main provisions are found in Article 3, which states the general principles and the process for use of Project Unused Capacity. Starting with the general principles, the 2014 Contract states that the availability of Unused Capacity is "subject to the need for the use of said Project Works for Project purposes and the provisions of this 2014 Contract to satisfy . . . the 'Manner of Operations of Project Facilities and Auxiliary Features' portion of Senate Document No. 80." Through this language, the 2014 Contract expressly makes operations subject to the relevant portions of Senate Document No. 80 and its requirements.

[1] Capitalized terms used in this document have the same meaning as in the 2014 Contract.

Moving next to the process provisions of Article 3, the 2014 Contract specifies a process that considers Senate Document No. 80 requirements in several places. First, the Subdistrict's proposed operation under Article 3(a)(i) considers not only water to be used on the East Slope, but it also considers "Enhancement Water," which is "Subdistrict Water[2] held in accounts maintained by the Subdistrict" for various West Slope interests.[3] This provides an opportunity for East Slope and West Slope interests to collaborate on the Subdistrict's operational proposal to meet their mutual interests and comport with their agreements. The Article 3 provisions are consistent with Senate Document No. 80 intent to preserve the rights and interests of both the West and East slopes.[4]

Second, Article 3(c) calls for the Secretary to consult with various East Slope and West Slope interests to solicit their views on the Subdistrict's operation proposal. Under Article 3(c)(iv), these consultations expressly include a consultation with Grand County's Senate Document No. 80 representative, the River District, and others that the Secretary deems appropriate "regarding potential impacts, if any, of the Subdistrict's Proposal on the operation of the Project pursuant to the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80." This consultation process is consistent with Senate Document No. 80's requirement that Reclamation consider the views of West Slope interests to administer the Project as "an unprejudiced agency in a fair and efficient manner, equitable to all parties having interests therein."

Third, Article 3(d)(i)(1) expressly states that certain criteria for the Secretary's decision include a determination that "[t]he introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water will not cause a violation of the 'Manner of Operations of Project Facilities and Auxiliary Features' portion of Senate Document No. 80, including court decisions interpreting Senate Document No. 80." By inclusion of this determination, the 2014 Contract ensures that the Secretary will make decisions regarding the Subdistrict's Proposal that will not cause a violation of Senate Document No. 80.

In addition to Article 3, the 2014 Contract also contains provisions that recognize agreements between East Slope entities and West Slope entities. In my view, these agreements reflect a

[2] Article 1(u) defines "Subdistrict Water" as "the quantity of water yielded by the Windy Gap Water Rights. The water yielded from the Windy Gap Water Rights is not Project Water."

[3] Article 1(i) defines "Enhancement Water" as "Subdistrict Water held in accounts maintained by the Subdistrict for the Middle Park Water Conservancy District ("Middle Park"), and for the Board of County Commissioners of Grand County ("Grand County"), including water provided by the Subdistrict for contractual obligations, all pursuant to the Colorado Water Conservancy Act (C.R.S. 37-45-101 et. seq.), the Agreement of April 1980, and the Supplement thereto dated March 1985, between the Subdistrict, the Colorado River Water Conservation District ("River District"), Grand County, Middle Park and the Northwest Colorado Council of Governments ("NWCCOG"), and the Windy Gap Firming Project Intergovernmental Agreement ("WGFP IGA") approved by Grand County on December 4, 2012 between the Subdistrict, Grand County, the River District, Middle Park and NWCCOG.

[4] Senate Document No. 80, Colorado Big-Thompson Project, dated June 15, 1937 at 2-3.

compromise between East Slope and West Slope entities regarding their respective interests. The 2014 Contract acknowledges these agreements and the compromises they reflect, but the 2014 Contract does not attempt to substitute a federal role for the role of each respective entity. Instead, Reclamation has respected its role under Senate Document No. 80 to administer the Project as "an unprejudiced agency in a fair and efficient manner, equitable to all parties having interests therein." The 2014 Contract addresses these agreements in two ways.

First, the Subdistrict must comply with Article 14 of the 2014 Contract, which addresses "Federal, state, and local permits, approvals, and licenses ('Permits and Approvals') for the construction, implementation, and operation of the Windy Gap Firming Project." These Permits and Approvals include those issued by West Slope entities. Article 14 leaves such Permits and Approvals to their own enforcement mechanisms, but also establishes a process for Reclamation and the Subdistrict to negotiate for benefits that are "comparable, in scope and cost, but not additional level of environmental benefit" if certain circumstances arise where environmental benefits contemplated by such permits and approvals are not being provided. Second, Article 15 addresses "other identified agreements" that the District and the Subdistrict may have with third parties, many of which are with West Slope entities. Like Article 14, Article 15 leaves such agreements to their own enforcement mechanisms, but also establishes a process for Reclamation and the Subdistrict to negotiate for benefits that are "comparable, in scope and cost, but not additional level of environmental benefit" if certain circumstances arise where environmental benefits contemplated by other identified agreements are not being provided. Articles 14 and 15 in the 2014 Contract reflect Reclamation's role as the "unprejudiced agency" operating the Project in a way that does not replace East Slope or West Slope interests, but allows the agreements and compromises reached between the East Slope and the West Slope to be honored and continued.[5]

The final provision addressing Senate Document No. 80 concerns future negotiations that may occur to renew the 2014 Contract. To address Grand County's unique role under Senate Document No. 80, Article 2 states that: "[t]he Secretary will notify the Grand County Board of County Commissioners when renewal negotiations have been requested. Any such renewal negotiations will be open to the public." This provision clarifies that entities affected by Senate Document No. 80 will have an opportunity to participate in future contract renewal discussions.

In conclusion, my determination is that the 2014 Contract meets the requirements of the relevant portions of Senate Document No. 80. The 2014 Contract ensures that the primary purposes of the Project as described in Senate Document No. 80 continue to be effectuated. In the 2014 Contract, Reclamation has maintained its role as the "unprejudiced agency" operating the Project by incorporating a process to solicit views from affected West Slope interests as it makes operational decisions, and Reclamation has respected the compromises made by East Slope and West Slope interests in their agreements and regulatory activities. Finally, Senate Document No.

[5] As further indication of the 2014 Contract's intent to not to affect agreements that may exist between the East Slope and West Slope, Article 24 expressly states that the 2014 Contract "in no way modifies, or affects the enforcement of, any contracts, agreements, or any other contractual obligations of the Subdistrict or the District with entities which are not party to this 2014 Contract."

80 recognizes and underscores Grand County's interests related to the Project. The 2014 Contract attends to these interests. As a result of this, a September 22, 2014 Grand County letter to Reclamation encourages execution of the 2014 Contract.

I have reviewed this memorandum and found it legally sufficient.

Concur/Non-Concur:

_____ _____

Solicitor Date

Note: Attachment 1 (Senate Document No. 80) referenced in the above Senate Document No. 80 Determination has been omitted from Appendix C for the purpose of abridging this Appendix.

Appendix D

Reclamation Project Act of 1939 Section 14 Determination

GP-1000
WTR-4.00

MEMORANDUM

To: Central Files
Attn: GP-6300 (MChastain)

From: Michael J. Ryan
Regional Director

Subject: Section 14 Determination

Teams for the Bureau of Reclamation, the Northern Colorado Water Conservancy District ("District"), and the Municipal Subdistrict ("Subdistrict") have been negotiating a contract that would allow the Subdistrict to use excess capacity (defined as "Unused Capacity" in the 2014 Contract) in the Colorado-Big Thompson Federal Reclamation ("Project" or "Project Works") for the Subdistrict's existing Windy Gap Project and future Windy Gap Firming Project. The negotiating teams have proposed a contract, denominated Contract No. 15XX650003 ("2014 Contract"[1]) to their respective principals for approval. As part of Reclamation's approval process, Reclamation must determine whether the 2014 Contract is consistent with Section 14 of the Reclamation Project Act of 1939, 43 U.S.C. § 389, the statutory authority for the 2014 Contract. This document provides that determination.

Section 14 states that:

> The Secretary is … authorized, for the purpose of orderly and economical construction or operation and maintenance of any project, to enter into such contracts for exchange or replacement of water, water rights, or electric energy or for the adjustment of water rights, as in his judgment are necessary and in the interests of the United States and the project.

43 U.S.C. § 389. Here, the exchanges in question are temporary exchanges between Project Water and Subdistrict's Water through a method of operation and accounting referred to as Prepositioning. Prepositioning will allow the Subdistrict to fill its to-be-constructed facility on the East Slope, Chimney Hollow Reservoir, with Project Water. Placing Project Water in Chimney Hollow then creates space in Granby Reservoir, one of the Project's West Slope facilities where Subdistrict Water will be introduced. Once Subdistrict Water is pumped into

[1] Capitalized terms here have the same meaning as in the 2014 Contract.

Granby Reservoir, an instantaneous exchange will occur between Project Water and Subdistrict Water, resulting in Subdistrict Water in Chimney Hollow Reservoir and Project Water in Granby Reservoir. Prepositioning is intended to address conveyance limitations that reduced the firm yield of the Windy Gap Project.

Throughout the public negotiation process for the 2014 Contract, Reclamation indicated that 4 substantive areas—control, liability, environment, and pricing—are important to meet the requirements of Section 14 that the exchange contract be "necessary and in the interests of the United States and the project." Each substantive area is addressed below.

Control

Because the 2014 Contract entails the use of Project Works and exchanges of Project Water, it is necessary for Reclamation to maintain appropriate controls over the use of these federal resources. Control is addressed in primarily Article 3 of the 2014 Contract. Article 3(c) creates a process to consult with entities that are affected by various aspects of Project operations, such as water users on the East Slope and the West Slope and hydropower interests, to determine what Project interests may be affected by the Subdistrict's Proposals to utilize Unused Capacity at any given time. Further, Article 3(d)(i)(2)-(3) states that, among other criteria, a Subdistrict Proposal "will not adversely affect Project Water or power contractors" or "cause the Project to be operated in a manner to increase the risk to Project Works or public safety." These criteria protect the interests of the Project and the United States by protecting the beneficiaries' interests and the physical integrity of the Project.

Article 8(f) also provides Reclamation with additional operational flexibility and control by stating that "Project Water may be directly released from Chimney Hollow Reservoir to Project Works to meet Project purposes." Having this option for moving Project Water serves the interest of the Project and the United States because it will increase flexibility in the Project and allow Reclamation more options to meet Project needs.

Article 12(b) protects Reclamation's control over the Project by stating that Subdistrict Water will spill before Project Water. If physical water is spilled, the first water spilled is Subdistrict Water on the West Slope in Project Works that is not Enhancement Water. This provision serves the interest of the Project and the United States because it protects the West Slope water from spilling as much as possible without harming Project Water supplies.

Liability

Because the Project will be used to store and convey Subdistrict Water, the Project must have protections to ensure that the Project and the United States are not liable for claims that may arise from the presence of Subdistrict Water in Project facilities. Article 21(a) of the proposed 2014 Contract states that;

> "[t]he Subdistrict agrees, to the extent allowed by law, to indemnify the United States and all of its representatives from all damages resulting from suits, actions or claims of any character brought on account of any injury to any person or property arising out of any act, omission, neglect, or misconduct in the manner or method of performing any construction, care, operation, maintenance,

> supervision, examination, inspection, or other duties of the Subdistrict or the United States concerning the Chimney Hollow Reservoir, the Windy Gap Project and the Windy Gap Firming Project regardless of who performs those duties. Provided, however, that the Subdistrict does not waive its rights and protections under the Colorado Governmental Immunities Act, C.R.S. § 24-10-101, et seq., as amended, or similar or successor statutes."

Additionally, under Article 21(b), the Subdistrict has named Reclamation as a beneficiary under its liability insurance policy. Such insurance is a backstop to the indemnity provision described above that provides a source of funding to address potential damages in the future. Read together, the provisions of Article 21 provide as much protection that the Subdistrict, as a state governmental entity in Colorado, can offer regarding indemnity. These provisions provide a level of protection for the Project and the United States, and mitigate against additional risk that the Project is undertaking relative to Subdistrict Water. Accordingly, these provisions serve the interests of the Project and the United States because of the protections they provide.

Environment

Because the Windy Gap Firming Project will result in additional diversions of water from the Colorado River Basin to the East Slope, it is appropriate for Reclamation to consider the environmental effects of this use in the 2014 Contract to ensure that the Windy Gap Firming Project complies with applicable environmental protections. The 2014 Contract recognizes these environmental matters in several articles.

Article 13 of the 2014 Contract requires that the Subdistrict comply with all mitigation measures from Reclamation's records of decision for the Windy Gap Project and the Windy Gap Firming Project. In addition, the Subdistrict commits to pay no less than $1.5 million to the Learning by Doing Cooperative Effort described in the Intergovernmental Agreement for the Learning by Doing Cooperative Effort, for monitoring and enhancement of the Colorado River between Granby Reservoir and Windy Gap Reservoir.

The Subdistrict must comply with Article 14 of the 2014 Contract, which addresses "Federal, state, and local permits, approvals, and licenses ('Permits and Approvals') for the construction, implementation operation, of the Windy Gap Firming Project."

Article 15 of the 2014 Contract recognizes that the Subdistrict has executed several "Other Identified Agreements" (as set forth in Exhibit C to the contract) with entities not a party to the 2014 Contract that provide environmental benefits. The Subdistrict has committed to provide certain of these benefits even if the Subdistrict decides in the future to not construct Chimney Hollow Reservoir.

Articles 13-15 contain safeguards to ensure that environmental commitments are being met. If the Subdistrict is not fulfilling its applicable commitments, a process to notify, meet and confer, and to identify a comparable remedy, is established. Potential suspension of Prepositioning and potential contract termination is an available remedy if the disputes over environmental benefits remain unresolved. The substantive provisions of Articles 13-15, including the safeguards, recognize a level of environmental benefit that the Windy Gap Firming Project will provide.

These benefits, regardless of their origin, are in the best interest of the Project and the United States because they stand to improve environmental conditions surrounding the Project and its operation.

Pricing

The pricing structure of the 2014 Contact is in the best interests of the Project and the United States in 3 ways. First, the 2014 Contract contains a provision that the first $84,525 annually will be a general credit to the Reclamation Fund. Such funding maintains the funding levels of the 1990 Windy Gap Amendatory Contract, keeping the Reclamation Fund whole, which is in the best interest of the Project, the United States, and Reclamation generally.

Second, half of the remaining federal revenues will be used in the best interest of the Project and the United States because they will be spent on Major Rehabilitation and Replacement [MR&R] maintenance activities. Under Reclamation's contractual arrangements with the District, these additional federal expenditures to maintain the Project will be reimbursed in accordance with the District's 1938 repayment contract. MR&R expenditures not reimbursed by the District will be reimbursed by federal power contractors in accordance with their existing repayment contracts with the United States through the Western Area Power Administration.

Third, the remaining half of the federal revenues will be used in the best interests of the Project and the United States because they will provide additional funding for Reclamation expenses associated with MR&R costs across the Reclamation program. Providing additional funds to accomplish MR&R maintenance across Reclamation's portfolio of water resources facilities is in the best interest of the Project, the Reclamation program, and the United States.

Conclusion

Overall, it is my determination that the 2014 Contract is in the best interest of the Project, the Reclamation program, and the United States. The provisions described above maintain the benefits that Reclamation currently derives from the Windy Gap Project, and go further to provide additional benefits to the Project and entities that benefit from the Project, Reclamation and the United States.

I have reviewed this memorandum and found it legally sufficient.

Concur/Non-Concur:

_____ _____

Solicitor Date

Appendix E

Subdistrict's Mitigation/Environmental Commitments

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
1	**Surface Water Hydrology**		
1a (FEIS p. 3-400 and FWMP Table 1)	Reduced flows in Colorado River below Windy Gap diversion.	To assure that water diverted from the Colorado River is used as efficiently as possible; all Participants in the WGFP shall have water conservation plans in accordance with the requirements of CRS § 37-60-126 prior to the initial delivery of any water after construction of the WGFP.	Current minimum bypass flows below Windy Gap Reservoir would continue per existing agreements except as modified by the FWMP.
1b (FEIS p. 3-401 and FWMP p. 14)	Lower water levels in Granby Reservoir as a result of prepositioning.	In any year when Granby Reservoir is projected to fall below an elevation of 8,250 feet, modified prepositioning, which reduces the delivery of C-BT water from Granby Reservoir to Chimney Hollow Reservoir, would be implemented to maintain higher water levels in Granby Reservoir. Details of this measure would be developed by the Subdistrict and incorporated into a proposed agreement between Reclamation and the Subdistrict with evaluation by the Corps. The objective is to minimize the adverse effects of prepositioning on water levels in Granby Reservoir.	This measure would minimize any potential negative effects on aquatic resources and recreation in Granby Reservoir that may be caused by reduced water levels from prepositioning.
2	**Stream Morphology and Floodplains**		
2a (FWMP pp. 14-15)	A decrease in the frequency of 2-year peak discharge and in-channel maintenance flows in the Colorado River below Windy Gap Reservoir.	Flushing flows from the original Windy Gap Project (1980 MOU) would be modified to increase from 450 cfs to 600 cfs. In any year when flows below Windy Gap Reservoir have not exceeded 600 cfs for at least 50 consecutive hours in the previous two years, and total Subdistrict water supplies in Chimney Hollow and Granby Reservoirs exceed 60,000 AF on April 1, the Subdistrict would cease all Windy Gap pumping for at least 50 consecutive hours to enhance peak flows below Windy Gap Reservoir.	This measure is also expected to address project effects on quality of fish habitat.

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		The Subdistrict will coordinate with Colorado Department of Parks and Wildlife and other water suppliers, including Denver Water, to maximize benefits of the higher flows and minimize any potential negative impacts to aquatic resources.	
3	**Surface Water Quality**		
3a (FEIS pp. 3-203, 3-204, and 3-403; FWMP pp. 15 and 16)	Colorado River temperature between Windy Gap Reservoir and Williams Fork may exceed the 18.2°C chronic Maximum Weekly Average Temperature or the 23.8°C Daily Maximum state standard as a result of WGFP diversions that lower flows in the Colorado River. Impacts are most likely in the occasional years when WGFP diversions occur after July 15.	The Subdistrict will work with Denver Water to install, operate, and maintain two continuous real-time temperature monitoring stations on the Colorado River – one at the Windy Gap gage and one upstream of the confluence with the Williams Fork River. For the purposes of this mitigation, the threshold temperatures will be the following, as measured at the temperature monitoring stations identified above: 1. MWAT Chronic Threshold: 18.2º C (64.8º F), based on current Maximum Weekly Average Temperature (MWAT) Chronic Standard. 2. DM Acute Threshold: 23.8º C (74.8º F), based on current Daily Maximum (DM) Acute Standard. For the period after July 15th of each year: 1. At such times as the Weekly Average Temperature (WAT) exceeds the MWAT Chronic Threshold, the Subdistrict will reduce or curtail WGFP pumping at the Windy Gap diversion to the extent necessary to maintain temperatures within the MWAT Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold. 2. Pumping for the original Windy Gap Project, now and after the WGFP is in operation, may occur at any time that the Windy Gap water rights are in priority and sufficient space is available in Lake Granby that such water pumped will not be reasonably expected to spill from the reservoir. Therefore, WGFP pumping will be defined as pumping that occurs at such times as the Northern Colorado Water Conservancy District determines, based on its most probable forecasts of inflows to Lake Granby, that a spill of water from Lake Granby is reasonably foreseeable. All other pumping will be considered to be for the original Windy Gap Project.	This measure is also expected to address effects on quality of fish habitat.

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		At such times as the Daily Maximum temperature is within 1º C of the DM Acute Threshold, the Subdistrict will reduce or curtail pumping for the original Windy Gap Project or the WGFP at the Windy Gap diversion to the extent necessary to maintain temperatures within the DM Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold. In the future, the 1 degree buffer may be altered, based on experience, to maintain compliance with the DM Threshold. The temperature mitigation measures identified above will be suspended in the event that and at such times as there is no material causal relationship between Windy Gap Project or Windy Gap Firming Project operations and any exceedence of the MWAT Chronic threshold or DM Acute threshold at the monitoring stations identified above. For the purposes of this Paragraph a "material causal relationship" is defined as either an actual measureable impact on temperature using readily available monitoring technology or a modeled impact on temperature that is not *de minimus* and is based on a computer model or studies accepted by the Colorado Division of Wildlife. The Subdistrict will cooperate with future studies to determine what factors, other than flow changes, have effects on water temperatures in the Colorado River below Windy Gap. The Subdistrict will use the Windy Gap Project Bypass Valve and Auxiliary Outlet to the maximum extent practicable to release colder water without causing adverse effects to the Windy Gap Project facilities or operations for the bypass of water that is otherwise bypassed from the Windy Gap Project. This measure is intended to make releases of water from these outlets deeper in the reservoir that may be colder than water bypassed over the spillway. These requirements would be documented in the contract negotiations or in a separate operating or working agreement between Reclamation and the Subdistrict.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
3b (FEIS pp. 3-200, 3-201, 3-202, 3-203, 3-403; FWMP p. 3-17)	Additional WGFP pumping would increase nutrient (nitrogen and phosphorus) loading in Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake, resulting in increased chlorophyll *a* and manganese (Mn) concentrations and a decrease in dissolved oxygen (DO).	The Subdistrict would be required to submit a nutrient reduction plan to Reclamation and the Corps for approval. The plan must be in place prior to the construction and operation of the WGFP. Currently, the Subdistrict's plan includes point source nutrient reductions from Fraser Sanitation District Waste Water Treatment Plant discharges in the Fraser River basin and nonpoint source nutrient reductions from agricultural land (E-Diamond H Ranch and C-Lazy-U Ranch) in the Willow Creek watershed. The incremental nutrient loadings from the Proposed Action compared to existing conditions would be an additional 6,128 kg/year of total nitrogen and 778 kg/year of total phosphorus (FEIS Table 3-115). Currently identified nutrient reduction measures (Fraser Sanitation District Waste Water Treatment Plant, E-Diamond H Ranch, and C-Lazy-U Ranch) would offset about 54 percent of the WGFP total nitrogen loadings to the Three Lakes or 3,343 kg/year. Thus, about 2,785 kg/yr of additional nitrogen reduction measures need to be identified. The Subdistrict will be responsible for developing other nonpoint source nutrient reduction measures or other actions elsewhere in the watersheds upstream of Windy Gap Reservoir to meet the total nitrogen reduction levels needed to provide at least a 1:1 reduction in TN and TP loadings to the Three Lakes. The Subdistrict will submit to Reclamation and the Corps for approval a monitoring program and annual results to ensure that proposed nutrient reduction measures and any additional unidentified point and nonpoint source mitigation measures are effective in offsetting all of the nitrogen and phosphorus loading to the Three Lakes attributable to the WGFP. Nutrient reduction measures would be implemented in an adaptive management approach with the results of monitoring used to demonstrate the effectiveness and need for additional or less mitigation. To measure the effectiveness of nonpoint source mitigation measures, a monitoring program would be developed for the E-Diamond H Ranch and C-Lazy-U Ranch. The Subdistrict initiated water quality monitoring on Willow Creek near the C-Lazy-U Ranch and on Church Creek near	Nutrient loading to the Three Lakes system from additional Windy Gap pumping would be offset by nutrient reductions that could occur in the Willow Creek, Fraser River, and Colorado River watersheds above Windy Gap. Nutrient reductions would result in a year-round improvement to water quality in streams where nutrient reduction measures are implemented. The reduced nutrient loading to the Three Lakes by upgrading the Fraser WWTP and nonpoint source BMPs would likewise reduce the nutrient load delivered to the East Slope in Carter Lake, Horsetooth Reservoir, and the C-BT system.

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		the E-Diamond H Ranch in 2010 to begin establishing a baseline for water quality prior to implementing nonpoint source mitigation measures. Similar monitoring would be established for other locations where nonpoint source nutrient reduction measures are identified.	
3c (FEIS p. 3-404)	Dissolved oxygen concentrations are predicted to remain above the 6.0 mg/L standard. DO could fall below the fish spawning standard of 7.0 mg/L between Windy Gap Reservoir and Williams Fork at low flows; however, reduced DO occurring as a result of the WGFP is most likely to occur during the summer months outside of the spring and fall spawning seasons.	Mitigation for temperature (4a) and aquatic resource effects should improve and maintain DO levels above the state standard. Any plan to monitor and mitigate DO changes would be evaluated by the Corps. If DO concentrations fall below the standards and result in water quality standards violations that are attributable to Windy Gap Project pumping, Reclamation, the Corps, and the Subdistrict will discuss the violations and, if necessary, identify and implement additional mitigation measures to address the DO violations.	
3d (FEIS p. 3-204)	Construction-related water quality impacts.	A construction Stormwater Management Plan would be developed and implemented for new facility construction to reduce erosion and sediment delivery to nearby streams and water bodies as part of a Colorado NPDES Stormwater Permit.	
3e (FEIS p. 3-204)	Continue ongoing cooperative studies to improve water quality in Three Lakes and East Slope C-BT reservoirs.	The Subdistrict would commit to continued participation and funding of the ongoing Nutrient Studies, with participation and collaboration by Reclamation, Northern Colorado Water Conservancy District, and Grand County, to better understand water quality issues in the Three Lakes system and provide guidance for future management decisions.	
4	**Vegetation**		
4a (FEIS p. 3-253 and 3-413; FWMP p. 18)	Temporary impact to 123 acres of vegetation during construction of Chimney Hollow Reservoir.	A revegetation plan for all disturbed areas, in accordance with the Stormwater Management Plan, shall be developed by the Subdistrict and approved by Reclamation and the Corps. The revegation plan will be developed in coordination with Colorado Department of Parks and Wildlife and incorporate Colorado Department of Parks and Wildlife	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		Oil & Gas Best Management Practices where appropriate. The revegation plan shall include: • Establishing well-defined construction limits to minimize vegetation disturbance. • Minimizing the length of time that soils are exposed. • Salvaging topsoil from weed free disturbed areas to aid in revegetation. • Applying soil amendments, mulches, organic matter, and other measures as needed to facilitate revegetation. • Using native seed and planting shrubs and trees according to site-specific conditions and vegetation communities. Species selection would be coordinated with local agencies such as Larimer County Open Space and the Colorado Department of Parks and Wildlife. • Monitoring revegetation until native vegetation cover is at least 70 percent of the original vegetation cover in accordance with Colorado NPDES stormwater permitting requirements. Corrective actions would be implemented as needed to ensure that adequate vegetation cover of native species is established.	
4b (FEIS pp. 3-253 and 3-254)	Introduction of noxious weeds	A weed management plan shall be prepared by the Subdistrict prior to construction disturbances and will be updated periodically in accordance with the Colorado Noxious Weed Control Act and in cooperation with Larimer County weed programs. Key components of the plan shall include: • Requiring that equipment be washed and inspected prior to entering the project area to prevent importing weeds on vehicle tires and mud. • Limiting the use of fertilizers that may favor weeds over native species. • Using periodic inspections and spot controls to prevent weed establishment. If terrestrial, semiaquatic, or aquatic weeds invade an area, an integrated weed management process to selectively combine	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		management techniques (biological, chemical, mechanical, and cultural) to control the particular weed species would be used.	
5	**Wetlands and Adjacent Riparian Habitats**		
5a (FEIS p. 3-406, FWMP Table 2)	Temporary disturbance of about 0.2 acre of wetlands during Chimney Hollow Reservoir construction.	Avoid, minimize, and mitigate wetland impacts as specified in 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as evaluated by the Corps.	Temporarily disturbed wetlands would be restored following construction.
5b (FEIS p. 3-407, FWMP Table 2)	Permanent impact to about 2 acres of wetlands at Chimney Hollow Reservoir.	Avoid, minimize, and mitigate wetland impacts as specified in 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as evaluated by the Corps. Wetlands would be mitigated by contribution to an approved wetland mitigation bank. Habitat enhancement at Chimney Hollow Reservoir as identified in the FWMP may include wetland and riparian habitat creation on the lake shoreline. Any wetland creation work would need to be evaluated by the Corps.	Under modified prepositioning, there would be greater water level fluctuations and lower water levels in Chimney Hollow Reservoir; thus establishment of shoreline wetlands may be difficult.
5c (FEIS p. 3-407, FWMP Table 2)	Permanent impact to about 0.5 acre of waters of the U.S. along Chimney Hollow.	Avoid, minimize, and mitigate water impacts as specified in 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as evaluated by the Corps.	Creation of large open water reservoir.
6	**Wildlife**		
6a	Loss of 810 acres of elk winter range, mule deer winter range and concentration area, and black bear foraging area at Chimney Hollow.	See 6b.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
6b (FEIS pp. 3-285, 3-286, 3-406 and 3-408; FWMP pp. 18 to 20)	General loss of habitat for other terrestrial species, birds, amphibians, reptiles, and butterflies at Chimney Hollow.	The Subdistrict will develop a Chimney Hollow Reservoir Site Wildlife Habitat Mitigation Plan to replace the values provided by habitat lost or altered by construction of Chimney Hollow Reservoir. Mitigation of impacts to wildlife resources will involve a combination of mitigation strategies and tools, including: • Restoring habitats temporarily disturbed during reservoir and facility construction • Working with Larimer County to restore or enhance degraded habitat surrounding Chimney Hollow Reservoir • Working with Colorado Department of Parks and Wildlife and Larimer County to establish hunting access on the Chimney Hollow property • Conducting management and education activities to minimize human wildlife conflicts • Implementing a migratory bird management plan • Implementing seasonal restrictions and buffer zones Details of this plan will include: **Restoration of Temporary Disturbances.** The temporary loss of 123 acres of wildlife habitat will be mitigated through reclamation and revegetation of all habitats disturbed during construction and relocation of the transmission line and towers. Temporary loss of vegetation communities due to construction of dams, pipelines, staging, and access roads will be restored with plantings and seed mixes that replicate the vegetation cover types. Vegetation restoration of the transmission line corridor will involve working closely with Western Area Power Administration to incorporate strategies for maintenance of stable low-growing vegetative communities that include mechanical cutting, removal of timber, on-site treatment of slash, and planting sustainable, low-growing shrubs and grasses. Plantings and seed mixes will focus on restoring diverse vegetation communities that provide wildlife forage, particularly during fall and winter. A reclamation plan will be developed as part of the construction program and the Stormwater Management Plan.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		Habitat Enhancement. Subdistrict will work with Larimer County to develop a land management plan that will include habitat enhancement of vegetation communities surrounding Chimney Hollow Reservoir, which involves planting native species beneficial to wildlife where appropriate. The Subdistrict will provide $50,000 to Larimer County to use in their ongoing habitat management plan. A weed control plan would be developed in cooperation with Larimer County prior to implementing habitat enhancement to improve the quality of lands not specifically within the areas of vegetation enhancement. Weed management will focus on monitoring restored habitats and implementing an integrated weed management approach of mechanical, chemical, and biological control strategies. Integrated weed management strategies also will be used to control existing areas of noxious and invasive species, particularly large patches of thistle and cheatgrass. The weed management plan will be developed prior to construction disturbances and updated periodically through implementation of wildlife enhancement. **Hunting Opportunities.** Larimer County will develop a land management plan for the Chimney Hollow area. As part of this process, the Subdistrict and Larimer County will work with Colorado Department of Parks and Wildlife and Larimer County to explore opportunities to provide seasonal hunting on portions of the Chimney Hollow Reservoir site and open space to assist with game management and provide additional recreation. **Minimization of Human-Wildlife Conflicts.** The displacement of elk and bear into surrounding residential areas as they search for lost food resources will be offset by the habitat enhancement activities and hunting opportunities described above. Additionally, the Subdistrict will work with Larimer County and Colorado Department of Parks and Wildlife to reduce/eliminate wildlife attractants from recreation facilities and establish education/outreach programs and information kiosks/signs informing the public on the	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		dangers of close interactions with wildlife, and methods to avoid and minimize potentially dangerous encounters. **Implementing Migratory Bird Avoidance Plan.** The active nesting season for most migratory bird species in Colorado is between April 1 and August 15. Over the past few years, the U.S. Fish and Wildlife Service and Colorado Department of Parks and Wildlife have suggested that the best way to avoid a violation of the Migratory Bird Treaty Act is to remove vegetation outside of the active breeding season. The Subdistrict will develop Best Management Practices in accordance with Colorado Department of Parks and Wildlife guidance to avoid disturbing active bird nests at the Chimney Hollow Reservoir site. *Note: Implementing these Best Management Practices demonstrates a good faith effort to avoid incidental violation of the Migratory Bird Treaty Act, but does not guarantee that migratory birds will not still nest in some areas despite these efforts.* **Seasonal Restrictions and Buffer Zones for Raptors.** Avoidance and mitigation options for nesting raptors at the Chimney Hollow Reservoir site consists of: 1) conducting nest surveys prior to construction, 2) establishing reasonable site-specific buffers and seasonal restrictions, 3) implementing seasonal restrictions to avoid and minimize disturbance, and 4) removing inactive nests from the transmission line corridor, construction footprints, reservoir pool area, or other areas of permanent impacts. Currently, there are no expected permanent impacts to existing raptor nests; however, there is the possibility that a new active raptor nest could be established in areas slated for disturbance or inundation. The intent of any mitigation is to encourage individual raptor pairs to nest at selected and more secure locations. Best Management Practices will be developed in accordance with Colorado Department of Parks and Wildlife guidance to avoid, minimize and mitigate potential impacts.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
6c (FEIS p. 3-285)	Temporary loss of 123 acres of wildlife habitat disturbed during construction of Chimney Hollow and relocation of the transmission line and towers.	See 6b. Vegetation would be restored with plantings and seed mixes that replicate the vegetation cover types. Vegetation restoration of the transmission line corridor will involve working closely with Western Area Power Administration to incorporate strategies for maintenance of stable lowgrowing vegetative communities that include mechanical cutting, removal of timber, on-site treatment of slash, and planting sustainable, low-growing shrubs and grasses. Plantings and seed mixes will focus on restoring diverse vegetation communities that provide wildlife forage, particularly during fall and winter. A revegetation plan will be developed as part of the construction program and the Stormwater Management Plan (3d above).	
7	**Threatened and Endangered Species**		
7a (FEIS p. 3-295)	Preble's Meadow jumping mouse at Chimney Hollow.	A Preble's Meadow jumping mouse habitat evaluation will be conducted at the Chimney Hollow Reservoir site prior to construction. If present, a mitigation plan will be developed.	
7b (FEIS pp. 3-295 and 3-409; FWMP p. 17)	Depletion to Colorado River impacts T&E fish.	The Service issued a Biological Opinion on February 12, 2010 for the Preferred Alternative indicating WGFP coverage under the Upper Colorado River Programmatic Biological Opinion with participation in the Upper Colorado River Recovery Program and payment of a depletion fee for additional depletions of 21,317 AF attributable to the WGFP. The Endangered Species Act Section 7 consultation process will be completed when the Subdistrict pays the depletion fee.	
8	**Geology**		
10a (FEIS p. 3-300; FWMP Table 2)	Potential for uncovering fossils during Chimney Hollow Reservoir construction.	Prior to construction, the Subdistrict will contract with a professional paleontologist to review the Chimney Hollow Reservoir site for potential fossils. If the likelihood for finding important fossils is high, a paleontologist would then provide orientation to Subdistrict staff and construction inspectors on where fossils might be found and in recognizing them. Prior to construction, Denver Museum of Nature and	No currently known geologic formations containing potential paleontological resources would be affected by construction of Chimney Hollow Reservoir and facilities; however, plant and invertebrate fossils

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		Science and University of Colorado Museum paleontologists would be notified that excavation work could potentially discover paleontological resources and they will be contacted to participate in an assessment of the significance of a find. In the event that construction activities uncover concentrations of fossil remains or unusually large specimens, work in the area of the discovery will be suspended until the significance of the find is evaluated. The Subdistrict/construction contractor will immediately contact a professional paleontologist, as well as Denver Museum of Nature and Science and University of Colorado Museum paleontologists to evaluate the find and make recommendations. Work would resume once significant fossils are examined and/or recovered and removed from the site.	could be present in some sandstone formations.
9	**Soils**		
9a (FEIS p. 3-308; FWMP Table 2)	Temporary and permanent loss of soil during Chimney Hollow Reservoir construction.	Prior to and during construction, the Subdistrict will: • Clearly define construction limits to minimize soil disturbance. • As identified in 4h above, develop an erosion control plan as part of the required Stormwater Management Plan under the Colorado National Pollutant Discharge Elimination System permit to reduce the potential for erosion from disturbed areas or capture sediments on-site. This will include integration with the revegetation plan. • Salvage suitable topsoil from areas of temporary disturbance, where possible, to aid in revegetation following construction. • Use soil amendments or additional site preparation techniques to revegetate disturbed areas with poor topsoil suitability.	
10	**Air Quality**		
10a (FEIS p. 3-312 and 3-409; FWMP Table 2)	Dust and vehicle emissions during Chimney Hollow Reservoir construction.	The Subdistrict will prepare a fugitive particulate emissions control plan and BMPs would be developed in order to meet requirements for Colorado Air Quality Control Standards. A copy of the plan will be provided to Reclamation.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
		The Subdistrict will ensure construction equipment (especially diesel equipment) meets opacity standards for operating emissions. The Subdistrict will stabilize disturbed areas as soon as possible to reduce dust sources. This may include, but not limited to, watering down disturbed surfaces.	
10b (FEIS p. 3-316 and 3-409; FWMP Table 2)	Increased ambient noise and vibration from construction of Chimney Hollow Reservoir.	The Subdistrict will implement Best Management Practices to minimize noise. These will include, but not be limited to: • Ensure construction equipment functions as designed and conforms to applicable noise emission standards. • Require the contractor to adhere to project work hour restrictions. • Restrict access to construction areas so that the public will not be in close proximity to loud equipment or blasting. • Develop a blasting schedule and notification process approved by Reclamation prior to when blasting is anticipated to occur. Precede blasting with a warning alarm. Blasting plans would include the implementation of seismographs for vibration measurements and air blast recordings for noise. • Locate operating equipment (e.g., pump stations) in structures designed to minimize radiated noise outside the structure, and design structures to meet local noise ordinance requirements. • The Subdistrict will develop and submit to Reclamation, a noise monitoring and noise mitigation plan if activities are expected to exceed maximum permissible noise levels.	
11	**Land Use**		
11a (FEIS p. 3-410; FWMP Table 2)	Sandstone quarry operations could be affected by the southern access road to Chimney Hollow Reservoir.	Quarry access will be maintained.	

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
11b (FEIS pp. 3-331 and 3-410; FWMP Table 2)	Increased construction traffic on CR 18E and CR 31 and impacts to roads during reservoir construction and from recreation access to Chimney Hollow Open Space managed by Larimer County.	The Subdistrict will comply with all applicable Larimer County Road and Bridge Department regulations and work with the county to minimize impacts to roads and maintain traffic safety.	
12	**Recreation**		
12a (FEIS pp. 3-352 and 3-410; FWMP p. 17)	Preferred rafting and kayaking flows in Big Gore and Pumphouse of the Colorado River would decrease.	Subdistrict would curtail WGFP diversions during the annual Big Gore Race in August if flows at the Kremmling gage drop below the preferred range (1,250 cfs).	The WGFP would both decrease and increase by less than 3 days per year, on average, the number of days within the preferred boating flow range. Curtailment of WGFP for temperature mitigation per 4a above may periodically increase summer flows.
12b (FEIS p. 3-411; FWMP Table 1)	Effects on recreational fishing in the Colorado River downstream of the Windy Gap diversion from habitat loss and temperature impacts between Windy Gap and the Blue River.	Stream temperature mitigation measures in the FWMP developed in accordance with CRS § 37-60-122.2 would reduce impacts to fish (see 3a above).	
13	**Cultural Resources**		
13a (FEIS p. 3-367)	Twenty-four eligible or potentially eligible cultural resources could be impacted by construction of Chimney Hollow Reservoir.	The Subdistrict would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Contractors and subcontractors also would be instructed on procedures to follow if previously unknown archeological resources are uncovered during construction.	Reclamation is responsible for specific cultural resource environmental commitments.

FEIS and/or FWMP*	Resource Impacts	Mitigation/Environmental Commitments	Notes
14	**Visual Quality**		
14a	Temporary impacts from construction of Chimney Hollow Reservoir.	Vegetation and wildlife habitat environmental commitments will address this impact (see 4a and 6b above).	
14b (FEIS p. 3-376: FWMP Table 2)	Permanent changes in landscape.	Vegetation and wildlife habitat environmental commitments will address this impact (see 4a and 6b above). Aboveground structures would be constructed with materials that complement the adjacent existing landscape.	
14c (FEIS p. 3-376 and 3-411; FWMP Table 2)	Relocation of transmission line.	The relocated transmission line will use nonspecular, nonreflective wire and insulators, with monopoles finished to complement the sky background or forest background.	Western Area Power Administration would work with Larimer County and the Subdistrict on the final alignment to further reduce visual impacts.
15	**Socioeconomics**		
15a (FEIS p. 3-411; FWMP Table 2)	Property acquisition.	Any properties required to be purchased for the project would be purchased by the Subdistrict for just compensation following an appraisal in accordance with the Water Conservancy Act (CRS § 27-45-101 to 153) and other applicable state laws.	
15b	Lost recreational boating value in the Colorado River in some years due to lower flows.	The Subdistrict would curtail diversion during the annual Big Gore Race as needed (see 12a above) to avoid socioeconomic effects associated with this event.	Although preferred boating flows are not always met, rafting and kayaking opportunities would remain (i.e., flows would rarely drop below minimum boating flows).
15c	Reduction in aesthetic value in Grand Lake if algae concentrations increase.	Nutrient mitigation measures (see 3b above) would offset nutrient loading from increased WGFP pumping that could contribute to algae growth.	

*FEIS is the Final EIS; FWMP is the Fish and Wildlife Mitigation Plan.

Note: Any submittals required by the FEIS mitigation plan will be evaluated by the Corps for compliance with Section 404 Clean Water Act requirements. With some resource issues, the Corps may require additional mitigation measures.

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Regional Office
P.O. Box 36900
Billings, MT 59107-6900

IN REPLY REFER TO
GP-4100
WTR-4.00

DEC 19 2014

Mr. Mike Applegate
Northern Colorado Water Conservancy District
220 Water Avenue
Berthoud, CO 80513

Mr. Dennis Yanchunas
Municipal Subdistrict, Northern Colorado Water Conservancy District
220 Water Avenue
Berthoud, CO 80513

Subject: Understanding of Contract No. 15XX650003 Hereinafter Referred to as the 2014 Contract for the Introduction, Storage, Conveyance, Exchange Substitution and Delivery of Water for Municipal Subdistrict, Northern Colorado Water Conversancy District, Colorado-Big Thompson Project, Colorado

Dear Mr. Applegate and Mr. Yanchunas:

This is to confirm our mutual understanding that upon execution of the 2014 Contract, the 1990 Windy Gap Contract shall be held in abeyance for the remaining term of the 1990 Windy Gap Contract except as provided in Article 5(a), Article 5(c), and Article 22(b) of the 2014 Contract. If a court of competent jurisdiction were to declare the 2014 Contract invalid, as expressed in Article 22(b) of the 2014 Contract, the 1990 Windy Gap Contract will be enforceable in accordance with its provisions, for the remaining term of the 1990 Windy Gap Contract.

If you are in agreement with the above understanding, please countersign this original and the two duplicate original letters where indicated below.

By: Dennis Yanchunas
Dennis Yanchunas, President and Chairman of the Board
Municipal Subdistrict, Northern Colorado Water Conservancy District

By: Mike Applegate
Mike Applegate, President and Chairman of the Board
Northern Colorado Water Conservancy District

The duplicate originals are furnished for your records.

If you have any questions, please contact Ann Petersen, by phone or e-mail at: 406-247-7752, or lapetersen@usbr.gov.

Sincerely,

Michael J. Ryan
Regional Director

cc: Mr. Rodney Smith
Attorney-Advisior
125 South State Street, Suite 6201
Salt Lake City, UT 84138

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Regional Office
P.O. Box 36900
Billings, MT 59107-6900

IN REPLY REFER TO:
GP-1000
WTR-4.00

DEC 19 2014

MEMORANDUM

To: Central Files
Attn: GP-6300 (MChastain)

From: Michael J. Ryan
Regional Director

Subject: Section 14 Determination

Teams for the Bureau of Reclamation, the Northern Colorado Water Conservancy District ("District"), and the Municipal Subdistrict ("Subdistrict") have been negotiating a contract that would allow the Subdistrict to use excess capacity (defined as "Unused Capacity" in the 2014 Contract) in the Colorado-Big Thompson Federal Reclamation ("Project" or "Project Works") for the Subdistrict's existing Windy Gap Project and future Windy Gap Firming Project. The negotiating teams have proposed a contract, denominated Contract No. 15XX650003 ("2014 Contract"[1]) to their respective principals for approval. As part of Reclamation's approval process, Reclamation must determine whether the 2014 Contract is consistent with Section 14 of the Reclamation Project Act of 1939, 43 U.S.C. § 389, the statutory authority for the 2014 Contract. This document provides that determination.

Section 14 states that:

> The Secretary is ... authorized, for the purpose of orderly and economical construction or operation and maintenance of any project, to enter into such contracts for exchange or replacement of water, water rights, or electric energy or for the adjustment of water rights, as in his judgment are necessary and in the interests of the United States and the project.

43 U.S.C. § 389. Here, the exchanges in question are temporary exchanges between Project Water and Subdistrict's Water through a method of operation and accounting referred to as Prepositioning. Prepositioning will allow the Subdistrict to fill its to-be-constructed facility on the East Slope, Chimney Hollow Reservoir, with Project Water. Placing Project Water in Chimney Hollow then creates space in Granby Reservoir, one of the Project's West Slope facilities where Subdistrict Water will be introduced. Once Subdistrict Water is pumped into Granby Reservoir, an instantaneous exchange will occur between Project Water and Subdistrict

[1] Capitalized terms here have the same meaning as in the 2014 Contract.

Water, resulting in Subdistrict Water in Chimney Hollow Reservoir and Project Water in Granby Reservoir. Prepositioning is intended to address conveyance limitations that reduced the firm yield of the Windy Gap Project.

Throughout the public negotiation process for the 2014 Contract, Reclamation indicated that 4 substantive areas—control, liability, environment, and pricing—are important to meet the requirements of Section 14 that the exchange contract be "necessary and in the interests of the United States and the project." Each substantive area is addressed below.

Control

Because the 2014 Contract entails the use of Project Works and exchanges of Project Water, it is necessary for Reclamation to maintain appropriate controls over the use of these federal resources. Control is addressed in primarily Article 3 of the 2014 Contract. Article 3(c) creates a process to consult with entities that are affected by various aspects of Project operations, such as water users on the East Slope and the West Slope and hydropower interests, to determine what Project interests may be affected by the Subdistrict's Proposals to utilize Unused Capacity at any given time. Further, Article 3(d)(i)(2)-(3) states that, among other criteria, a Subdistrict Proposal "will not adversely affect Project Water or power contractors" or "cause the Project to be operated in a manner to increase the risk to Project Works or public safety." These criteria protect the interests of the Project and the United States by protecting the beneficiaries' interests and the physical integrity of the Project.

Article 8(f) also provides Reclamation with additional operational flexibility and control by stating that "Project Water may be directly released from Chimney Hollow Reservoir to Project Works to meet Project purposes." Having this option for moving Project Water serves the interest of the Project and the United States because it will increase flexibility in the Project and allow Reclamation more options to meet Project needs.

Article 12(b) protects Reclamation's control over the Project by stating that Subdistrict Water will spill before Project Water. If physical water is spilled, the first water spilled is Subdistrict Water on the West Slope in Project Works that is not Enhancement Water. This provision serves the interest of the Project and the United States because it protects the West Slope water from spilling as much as possible without harming Project Water supplies.

Liability

Because the Project will be used to store and convey Subdistrict Water, the Project must have protections to ensure that the Project and the United States are not liable for claims that may arise from the presence of Subdistrict Water in Project facilities. Article 21(a) of the proposed 2014 Contract states that;

> "[t]he Subdistrict agrees, to the extent allowed by law, to indemnify the United States and all of its representatives from all damages resulting from suits, actions or claims of any character brought on account of any injury to any person or property arising out of any act, omission, neglect, or misconduct in the manner or method of performing any construction, care, operation, maintenance, supervision, examination, inspection, or other duties of the Subdistrict or the

United States concerning the Chimney Hollow Reservoir, the Windy Gap Project and the Windy Gap Firming Project regardless of who performs those duties. Provided, however, that the Subdistrict does not waive its rights and protections under the Colorado Governmental Immunities Act, C.R.S. § 24-10-101, et seq., as amended, or similar or successor statutes."

Additionally, under Article 21(b), the Subdistrict has named Reclamation as a beneficiary under its liability insurance policy. Such insurance is a backstop to the indemnity provision described above that provides a source of funding to address potential damages in the future. Read together, the provisions of Article 21 provide as much protection that the Subdistrict, as a state governmental entity in Colorado, can offer regarding indemnity. These provisions provide a level of protection for the Project and the United States, and mitigate against additional risk that the Project is undertaking relative to Subdistrict Water. Accordingly, these provisions serve the interests of the Project and the United States because of the protections they provide.

Environment

Because the Windy Gap Firming Project will result in additional diversions of water from the Colorado River Basin to the East Slope, it is appropriate for Reclamation to consider the environmental effects of this use in the 2014 Contract to ensure that the Windy Gap Firming Project complies with applicable environmental protections. The 2014 Contract recognizes these environmental matters in several articles.

Article 13 of the 2014 Contract requires that the Subdistrict comply with all mitigation measures from Reclamation's records of decision for the Windy Gap Project and the Windy Gap Firming Project. In addition, the Subdistrict commits to pay no less than $1.5 million to the Learning by Doing Cooperative Effort described in the Intergovernmental Agreement for the Learning by Doing Cooperative Effort, for monitoring and enhancement of the Colorado River between Granby Reservoir and Windy Gap Reservoir.

The Subdistrict must comply with Article 14 of the 2014 Contract, which addresses "Federal, state, and local permits, approvals, and licenses ('Permits and Approvals') for the construction, implementation operation, of the Windy Gap Firming Project."

Article 15 of the 2014 Contract recognizes that the Subdistrict has executed several "Other Identified Agreements" (as set forth in Exhibit C to the contract) with entities not a party to the 2014 Contract that provide environmental benefits. The Subdistrict has committed to provide certain of these benefits even if the Subdistrict decides in the future to not construct Chimney Hollow Reservoir.

Articles 13-15 contain safeguards to ensure that environmental commitments are being met. If the Subdistrict is not fulfilling its applicable commitments, a process to notify, meet and confer, and to identify a comparable remedy, is established. Potential suspension of Prepositioning and potential contract termination is an available remedy if the disputes over environmental benefits remain unresolved. The substantive provisions of Articles 13-15, including the safeguards, recognize a level of environmental benefit that the Windy Gap Firming Project will provide. These benefits, regardless of their origin, are in the best interest of the Project and the United

States because they stand to improve environmental conditions surrounding the Project and its operation.

Pricing
The pricing structure of the 2014 Contact is in the best interests of the Project and the United States in 3 ways. First, the 2014 Contract contains a provision that the first $84,525 annually will be a general credit to the Reclamation Fund. Such funding maintains the funding levels of the 1990 Windy Gap Amendatory Contract, keeping the Reclamation Fund whole, which is in the best interest of the Project, the United States, and Reclamation generally.

Second, half of the remaining federal revenues will be used in the best interest of the Project and the United States because they will be spent on Major Rehabilitation and Replacement [MR&R] maintenance activities. Under Reclamation's contractual arrangements with the District, these additional federal expenditures to maintain the Project will be reimbursed in accordance with the District's 1938 repayment contract. MR&R expenditures not reimbursed by the District will be reimbursed by federal power contractors in accordance with their existing repayment contracts with the United States through the Western Area Power Administration.

Third, the remaining half of the federal revenues will be used in the best interests of the Project and the United States because they will provide additional funding for Reclamation expenses associated with MR&R costs across the Reclamation program. Providing additional funds to accomplish MR&R maintenance across Reclamation's portfolio of water resources facilities is in the best interest of the Project, the Reclamation program, and the United States.

Conclusion
Overall, it is my determination that the 2014 Contract is in the best interest of the Project, the Reclamation program, and the United States. The provisions described above maintain the benefits that Reclamation currently derives from the Windy Gap Project, and go further to provide additional benefits to the Project and entities that benefit from the Project, Reclamation and the United States.

I have reviewed this memorandum and found it legally sufficient.

Concur/Non-Concur:

Solicitor

12/12/14
Date

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Regional Office
P.O. Box 36900
Billings, MT 59107-6900

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GP-1000
WTR-4.00

DEC 19 2014

MEMORANDUM

To: Central Files
Attn: GP-6300 (MChastain)

From: Michael J. Ryan
Regional Director

Subject: Senate Document No. 80 Determination

Teams for the Bureau of Reclamation, the Northern Colorado Water Conservancy District (District), and the Municipal Subdistrict (Subdistrict) have been negotiating a contract that would allow the Subdistrict to use excess (defined as "Unused" in the contract) capacity in the Colorado-Big Thompson Federal Reclamation Project (Project) for the Subdistrict's existing Windy Gap Project and future Windy Gap Firming Project. The negotiating teams have proposed a draft Contract No. 15XX650003 (2014 Contract[1]) to their respective principals for approval. As part of Reclamation's approval process, Reclamation must determine whether the 2014 Contract is consistent with the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80, the congressional report that is part of the Project's authorization, which is incorporated here as Attachment 1. This document provides that determination.

The 2014 Contract contains several provisions that address this portion of Senate Document No. 80. The main provisions are found in Article 3, which states the general principles and the process for use of Project Unused Capacity. Starting with the general principles, the 2014 Contract states that the availability of Unused Capacity is "subject to the need for the use of said Project Works for Project purposes and the provisions of this 2014 Contract to satisfy . . . the 'Manner of Operations of Project Facilities and Auxiliary Features' portion of Senate Document No. 80." Through this language, the 2014 Contract expressly makes operations subject to the relevant portions of Senate Document No. 80 and its requirements.

Moving next to the process provisions of Article 3, the 2014 Contract specifies a process that considers Senate Document No. 80 requirements in several places. First, the Subdistrict's proposed operation under Article 3(a)(i) considers not only water to be used on the East Slope,

[1] Capitalized terms used in this document have the same meaning as in the 2014 Contract.

but it also considers "Enhancement Water," which is "Subdistrict Water[2] held in accounts maintained by the Subdistrict" for various West Slope interests.[3] This provides an opportunity for East Slope and West Slope interests to collaborate on the Subdistrict's operational proposal to meet their mutual interests and comport with their agreements. The Article 3 provisions are consistent with Senate Document No. 80 intent to preserve the rights and interests of both the West and East slopes.[4]

Second, Article 3(c) calls for the Secretary to consult with various East Slope and West Slope interests to solicit their views on the Subdistrict's operation proposal. Under Article 3(c)(iv), these consultations expressly include a consultation with Grand County's Senate Document No. 80 representative, the River District, and others that the Secretary deems appropriate "regarding potential impacts, if any, of the Subdistrict's Proposal on the operation of the Project pursuant to the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80." This consultation process is consistent with Senate Document No. 80's requirement that Reclamation consider the views of West Slope interests to administer the Project as "an unprejudiced agency in a fair and efficient manner, equitable to all parties having interests therein."

Third, Article 3(d)(i)(1) expressly states that certain criteria for the Secretary's decision include a determination that "[t]he introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water will not cause a violation of the 'Manner of Operations of Project Facilities and Auxiliary Features' portion of Senate Document No. 80, including court decisions interpreting Senate Document No. 80." By inclusion of this determination, the 2014 Contract ensures that the Secretary will make decisions regarding the Subdistrict's Proposal that will not cause a violation of Senate Document No. 80.

In addition to Article 3, the 2014 Contract also contains provisions that recognize agreements between East Slope entities and West Slope entities. In my view, these agreements reflect a compromise between East Slope and West Slope entities regarding their respective interests. The 2014 Contract acknowledges these agreements and the compromises they reflect, but the 2014 Contract does not attempt to substitute a federal role for the role of each respective entity.

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[2] Article 1(u) defines "Subdistrict Water" as "the quantity of water yielded by the Windy Gap Water Rights. The water yielded from the Windy Gap Water Rights is not Project Water."

[3] Article 1(i) defines "Enhancement Water" as "Subdistrict Water held in accounts maintained by the Subdistrict for the Middle Park Water Conservancy District ("Middle Park"), and for the Board of County Commissioners of Grand County ("Grand County"), including water provided by the Subdistrict for contractual obligations, all pursuant to the Colorado Water Conservancy Act (C.R.S. 37-45-101 et. seq.), the Agreement of April 1980, and the Supplement thereto dated March 1985, between the Subdistrict, the Colorado River Water Conservation District ("River District"), Grand County, Middle Park and the Northwest Colorado Council of Governments ("NWCCOG"), and the Windy Gap Firming Project Intergovernmental Agreement ("WGFP IGA") approved by Grand County on December 4, 2012 between the Subdistrict, Grand County, the River District, Middle Park and NWCCOG.

[4] Senate Document No. 80, Colorado Big-Thompson Project, dated June 15, 1937 at 2-3.

Instead, Reclamation has respected its role under Senate Document No. 80 to administer the Project as "an unprejudiced agency in a fair and efficient manner, equitable to all parties having interests therein." The 2014 Contract addresses these agreements in two ways.

First, the Subdistrict must comply with Article 14 of the 2014 Contract, which addresses "Federal, state, and local permits, approvals, and licenses ('Permits and Approvals') for the construction, implementation, and operation of the Windy Gap Firming Project." These Permits and Approvals include those issued by West Slope entities. Article 14 leaves such Permits and Approvals to their own enforcement mechanisms, but also establishes a process for Reclamation and the Subdistrict to negotiate for benefits that are "comparable, in scope and cost, but not additional level of environmental benefit" if certain circumstances arise where environmental benefits contemplated by such permits and approvals are not being provided. Second, Article 15 addresses "other identified agreements" that the District and the Subdistrict may have with third parties, many of which are with West Slope entities. Like Article 14, Article 15 leaves such agreements to their own enforcement mechanisms, but also establishes a process for Reclamation and the Subdistrict to negotiate for benefits that are "comparable, in scope and cost, but not additional level of environmental benefit" if certain circumstances arise where environmental benefits contemplated by other identified agreements are not being provided. Articles 14 and 15 in the 2014 Contract reflect Reclamation's role as the "unprejudiced agency" operating the Project in a way that does not replace East Slope or West Slope interests, but allows the agreements and compromises reached between the East Slope and the West Slope to be honored and continued.[5]

The final provision addressing Senate Document No. 80 concerns future negotiations that may occur to renew the 2014 Contract. To address Grand County's unique role under Senate Document No. 80, Article 2 states that: "[t]he Secretary will notify the Grand County Board of County Commissioners when renewal negotiations have been requested. Any such renewal negotiations will be open to the public." This provision clarifies that entities affected by Senate Document No. 80 will have an opportunity to participate in future contract renewal discussions.

In conclusion, my determination is that the 2014 Contract meets the requirements of the relevant portions of Senate Document No. 80. The 2014 Contract ensures that the primary purposes of the Project as described in Senate Document No. 80 continue to be effectuated. In the 2014 Contract, Reclamation has maintained its role as the "unprejudiced agency" operating the Project by incorporating a process to solicit views from affected West Slope interests as it makes operational decisions, and Reclamation has respected the compromises made by East Slope and West Slope interests in their agreements and regulatory activities. Finally, Senate Document No. 80 recognizes and underscores Grand County's interests related to the Project. The 2014 Contract attends to these interests. As a result of this, a September 22, 2014 Grand County letter to Reclamation encourages execution of the 2014 Contract.

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[5] As further indication of the 2014 Contract's intent to not to affect agreements that may exist between the East Slope and West Slope, Article 24 expressly states that the 2014 Contract "in no way modifies, or affects the enforcement of, any contracts, agreements, or any other contractual obligations of the Subdistrict or the District with entities which are not party to this 2014 Contract."

I have reviewed this memorandum and found it legally sufficient.

Concur/Non-Concur:

Solicitor

12/12/14
Date

Attachment

DUPLICATE ORIGINAL

2014 Contract No. 15XX650003

UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

(Reclamation)

2014 CONTRACT FOR THE INTRODUCTION, STORAGE, CONVEYANCE, EXCHANGE, SUBSTITUTION, AND DELIVERY OF WATER FOR MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT, COLORADO-BIG THOMPSON PROJECT, COLORADO

("2014 Contract")

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Exhibit A (Annual Charges for Excess Capacity and In-Lieu Water)
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Exhibit C (Other Identified Agreements)
Exhibit D (Environmental Components Table)
Exhibit E (Standard Contract Articles)
Exhibit F (Criteria for the Integrated Operations of the Colorado-Big Thompson and Windy Gap Projects)

UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

2014 CONTRACT FOR THE INTRODUCTION, STORAGE, CONVEYANCE, EXCHANGE, SUBSTITUTION, AND DELIVERY OF WATER FOR MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT, COLORADO-BIG THOMPSON PROJECT, COLORADO

This 2014 Contract is dated December 19, 2014, and is made pursuant to the Federal Reclamation Laws (Act of June 17, 1902, (32 Stat. 388), and acts amendatory thereof and supplementary thereto, particularly, but not limited to, Section 14 of the Reclamation Project Act of 1939 (43 U.S.C. 389) (the "1939 Act"); Section 4 of the Act of June 25, 1910 (36 Stat. 836), the Sundry Civil Expenses Appropriations Act for 1922 (43 U.S.C. § 395) (the "Contributed Funds Act"), Subsection B of Section 4 of the Act of December 5, 1924 (43 Stat. 702) and the Finding of Feasibility dated December 21, 1937; the Act of August 9, 1937 (50 Stat. 595); and Senate Document No. 80, Colorado Big-Thompson Project, dated June 15, 1937 (Senate Document No. 80), among the UNITED STATES OF AMERICA (United States), the MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT (Subdistrict) and the NORTHERN COLORADO WATER CONSERVANCY DISTRICT (District). The United States, Subdistrict, and District are each sometimes hereinafter individually called "Party", and sometimes hereinafter collectively called "Parties".

WHEREAS, the following statements are made in explanation:

EXPLANATORY RECITALS

(a) The United States and the District have entered into Contract No. 9-07-70-W0020, formerly Contract No. Ilr-1051 (dated July 5, 1938, as amended and supplemented) ("Repayment Contract") relating to the construction, irrigation repayment, operation, maintenance and replacement ("OM&R") of the Colorado-Big Thompson Project (Project) for the development and use of the waters of the Colorado and Big Thompson Rivers.

(b) The Subdistrict has been organized for the purpose of developing a water supply independent of the Colorado-Big Thompson Project. Commencing in 1981, with completion having occurred in 1985, the Subdistrict has constructed the Windy Gap Project. The water yielded from the Windy Gap Project is not Project Water. The Windy Gap Project was constructed to allow for the introduction, storage, conveyance, exchange, substitution, and delivery of water yielded from the Windy Gap Project through Unused Capacity in Project Works. The Subdistrict has requested the contracting parties to enter into this 2014 Contract.

(c) The United States, District and Subdistrict entered into Contract No. 4-07-70-W0107 ("1990 Contract," also known as the Amendatory Contract), formerly Contract No. 14-06-700-7497 ("1973 Contract"). Pursuant to these contracts, the Subdistrict has used Unused Capacity of the Project.

(d) The District, pursuant to the Repayment Contract, is responsible for the OM&R of certain Project facilities, which, as established in this 2014 Contract, may be used for the introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water.

(e) The 1990 Contract and 1973 Contract do not explicitly address Prepositioning and the storage of Project Water in Chimney Hollow Reservoir.

(f) The Final Environmental Statement for the Windy Gap Project was filed on April 28, 1981 and designated Statement No. FES 81-20. The Regional Director's Record of Decision for the Windy Gap Project is dated June 18, 1981. ("Windy Gap Project")

(g) The Final Environmental Impact Statement for the addition of the Windy Gap Firming Project to the Windy Gap Project was filed on December 9, 2011 and designated Statement No. FES 11-29. The Regional Director's Record of Decision is dated December 19, 2014.

NOW, THEREFORE, in consideration of the premises and the mutual covenants herein contained, it is hereby agreed:

DEFINITIONS

1. The definitions of terms used in this 2014 Contract apply only in this 2014 Contract and are not definitions for any other contract or agreement. Where used in this 2014 Contract, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

(a) "Active Storage Capacity" shall mean: for Granby Reservoir, the volume of water that can be stored above the minimum water surface elevation required for pumping at the Farr Pumping Plant and below its normal high water line; and, for Chimney Hollow Reservoir, the volume of water that can be stored in the reservoir above the invert of its primary outlet works and below its normal high water line.

(b) "Active Storage" shall mean the volume of water residing in a reservoir's Active Storage Capacity.

(c) "Administrative Spill" shall mean a release of Project Water (in excess of minimum release requirement) from/through the outlet works or spillway of Granby Reservoir Dam for the purpose of maintaining the Administrative Volume at or below 465,568 acre-feet.

(d) "Administrative Volume" shall mean the total, combined amount of Project Water concurrently stored in the Active Storage Capacity of Granby Reservoir and Chimney Hollow Reservoir.

(e) "Chimney Hollow Reservoir" shall mean a reservoir and appurtenant facilities constructed in Larimer County by the Subdistrict. The Subdistrict will own and operate Chimney Hollow Reservoir as a part of the Windy Gap Project. Chimney Hollow Reservoir will not be a facility of the federal Colorado-Big Thompson Project.

(f) "Chimney Hollow Reservoir Water" shall mean Subdistrict Water that has been stored in Chimney Hollow Reservoir.

(g) "District" shall mean the Northern Colorado Water Conservancy District, which is a party to the Repayment Contract.

(h) "District Works" shall mean those single purpose Project works owned, operated, and maintained by and at the expense of the District.

(i) "Enhancement Water" shall mean Subdistrict Water held in accounts maintained by the Subdistrict for the Middle Park Water Conservancy District ("Middle Park"), and for the Board of County Commissioners of Grand County ("Grand County"), including water provided by the Subdistrict for contractual obligations, all pursuant to the Colorado Water Conservancy Act (C.R.S. 37-45-101 et. seq.), the Agreement of April 1980, and the Supplement thereto dated March 1985, between the Subdistrict, the Colorado River Water Conservation District ("River District"), Grand County, Middle Park and the Northwest Colorado Council of Governments ("NWCCOG"), and the Windy Gap Firming Project Intergovernmental Agreement

("WGFP IGA") approved by Grand County on December 4, 2012 between the Subdistrict, Grand County, the River District, Middle Park and NWCCOG.

(j) "Facility Energy Charge" shall mean the charges for each Project pumping facility used in the conveyance of Subdistrict Water or In-Lieu Water and shall be computed as the total kilowatt-hours (kWh) used at the pumping facility during the Fiscal Year; divided by the total volume of water pumped at the pumping facility during the Fiscal Year, in acre-feet; multiplied by the unit price per kilowatt-hour from the annual energy only rate of Loveland Area Project Rate for the current Fiscal Year as published by Western Area Power Administration.

(k) "Fiscal Year" shall mean the fiscal year of the United States, which is the period October 1 through the next September 30.

(l) "Major Rehabilitation and Replacement (MR&R)" shall mean major, non-recurring maintenance activities designed to ensure the continued safe, dependable and reliable delivery of authorized project benefits, that are greater than $100,000 in total cost.

(m) "Operation, Maintenance and Replacement (OM&R) Costs" shall mean the sum of the costs incurred for the administration and OM&R of the Joint Works, as defined in the Repayment Contract, excluding Green Mountain Reservoir, which are utilized for the introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water, exclusive, however, of any electrical energy costs for pumping either Project Water or Subdistrict Water through Project Works. This shall include costs of MR&R, as defined in Article 1(l) of this 2014 Contract.

(n) "Physical Spill" shall mean a release of water (in excess of minimum release requirement) from/through the outlet works or spillway of Granby Reservoir Dam or Willow Creek Dam for the purpose of attempting to maintain the Granby Reservoir water surface elevation at or below the elevation of 8279.5 feet.

(o) "Power Interference" shall mean the charge paid to the United States for reducing or interrupting the generation of power by Project Works utilizing Project Water as described in Article 6(d).

(p) "Preposition or Prepositioning" shall mean the method of operation and the accounting for Project Water, which occurs when Project Water is introduced, stored, conveyed, exchanged, substituted, and delivered in Chimney Hollow Reservoir pursuant to this 2014 Contract and the Record of Decision dated December 19, 2014 and as further described in the Final Environmental Impact Statement (FES 11-29).

(q) "Project," "Project Works," and "Project System" shall, for the purpose of this 2014 Contract, mean the Colorado-Big Thompson Federal Reclamation Project and its facilities, exclusive of Green Mountain Reservoir.

(r) "Project Water" shall mean, for the purpose of this 2014 Contract, all water that accrues to Project Works located in Grand County, Colorado under the water rights decreed to the Project.

(s) "Secretary," shall mean Secretary of the Interior or his or her duly authorized representative.

(t) "Skim Water" shall mean water which is diverted from the Big Thompson River at Olympus Dam or Dille Tunnel through Project Works for generating hydropower at one or more of the Project's powerplants. Skim Water is non-consumptively used and returned to the Big Thompson River near the mouth of the Big Thompson Canyon.

(u) "Subdistrict" shall mean the Municipal Subdistrict of the Northern Colorado Water Conservancy District, Colorado.

(v) "Subdistrict Water" shall mean the quantity of water yielded by the Windy Gap Water Rights. The water yielded from the Windy Gap Water Rights is not Project Water.

(w) "Unused Capacity" shall mean that capacity of Project Works that is in excess of the needs of the Project, as further provided for in this 2014 Contract.

(x) "Windy Gap Water Rights" shall mean those water rights defined in the decrees entered on October 27, 1980 in Civil Action No. 1768, District Court, Grand County, State of Colorado and Case Nos. W-4001, 80CW108, and 85CW135, District Court, Water Division No. 5; the Decree entered on February 6, 1989 in Case No. 88CW169, District Court, Water Division No. 5, State of Colorado; and the Decree entered on July 19, 1990, in Case No. 89CW298, District Court, Water Division No. 5, State of Colorado ("Windy Gap Decrees"), including any subsequent diligence or other related decrees or amendments thereto.

TERM OF CONTRACT

2. This 2014 Contract shall begin at the date following execution by all Parties and extend for a period of 40 years. Except as this 2014 Contract may be terminated, the Subdistrict may request, in writing to the Secretary, renewal of this 2014 Contract. Upon such renewal request, the Secretary will enter into good faith negotiations, which shall be upon mutually agreeable terms and conditions and any such renewal shall be in accordance with the applicable federal laws and policies and State laws in effect at that time; provided that negotiations for such renewal shall be initiated not later than one year prior to the expiration of this 2014 Contract. The Secretary will notify the Grand County Board of County Commissioners when renewal negotiations have been requested. Any such renewal negotiations will be open to the public.

SUBDISTRICT USE OF UNUSED CAPACITY IN THE PROJECT

3. (a) General Principles.

(i) Subdistrict Water may, subject to the requirements of this 2014 Contract, be introduced, stored, conveyed, exchanged, substituted, and delivered into and from Project Works. The Parties agree that the Project has Unused Capacity at certain times and under certain hydrologic conditions. The Parties share a mutual goal of utilizing this Unused Capacity in the Project to maximize water availability and reliability for the Subdistrict's Windy Gap Project. The Parties agree that the use of Project Works to accomplish that goal by the introduction, storage, conveyance, exchange, substitution and delivery of Subdistrict Water in and through Project Works shall be subject to the need for the use of said Project Works for Project purposes and the provisions of this 2014 Contract to satisfy the requirements of Section 14 of the 1939 Act and the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80. This 2014 Contract does not address whether or not Unused Capacity might exist for additional purposes.

(b) Subdistrict Proposal for use of Unused Capacity.

(i) The Subdistrict shall submit a proposal ("Subdistrict Proposal" or "Proposal") for use of Unused Capacity in the Project for the introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water in and through Project Works pursuant to this 2014 Contract on or before November 1 of each year ("Proposal"). The Proposal shall include a 12-month forecasted schedule of the estimated amount of Subdistrict Water, including Enhancement Water, proposed to be introduced into Granby Reservoir, stored in Granby Reservoir, conveyed, exchanged, substituted, and delivered through and from the Project Works. The schedule shall provide monthly volume estimates and include designated delivery points.

The Parties will mutually inform one another of short term and long term facility maintenance issues which could affect scheduling.

(c) Secretarial Review of Subdistrict Proposal and Consultations.

(i) The Secretary shall review the Subdistrict Proposal.

(ii) The Secretary shall consult with the District regarding potential impacts, if any, of the Subdistrict's Proposal.

(iii) The Secretary shall consult with such entities as he or she deems appropriate regarding potential impacts, if any, of the Subdistrict's Proposal on hydropower.

(iv) The Secretary shall consult with the District, the representative designated by Grand County pursuant to Senate Document No. 80, and such others, including the River District, as he or she deems appropriate regarding potential impacts, if any, of the Subdistrict's Proposal on the operation of the Project pursuant to the "Manner of Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80, and other legal obligations.

(v) The Secretary shall review the Subdistrict's Proposal for potential impacts, if any on risk to Project Works or public safety.

(d) Criteria for Secretarial Decision.

(i) The Secretary shall, based on a review of the Proposal and the consultations identified in this Article 3, make a decision on the Proposal for use of Unused Capacity in the Project for the introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water by the Subdistrict using all of the following criteria:

1. The introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water will not cause a violation of the "Manner of

Operations of Project Facilities and Auxiliary Features" portion of Senate Document No. 80, including court decisions interpreting Senate Document No. 80, or other applicable laws;

2. The introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water will not adversely affect Project Water or power contractors;

3. The introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water will not cause the Project to be operated in a manner to increase the risk to Project Works or public safety.

(ii) The Secretary shall make a decision on the Proposal in a reasonable amount of time and inform the Parties and other affected entities of the decision. The Proposal shall be implemented unless it will cause a material violation of one of the criteria identified in Article 3(d)(i) above. If the Proposal cannot be implemented because of a material violation of this Article 3(d), the Secretary shall inform the Parties and other affected entities and shall meet and confer with the Parties and other affected entities as soon as practicable in an effort to identify and resolve any issues resulting from the review of the Proposal. If the Secretary ultimately determines that the Proposal does not meet the criteria specified in this Article 3(d), the Secretary shall inform the Parties of such determination in writing. The Secretary's determination may be a partial approval of the Subdistrict's Proposal or an approval of the Proposal with modifications deemed necessary by the Secretary to meet the criteria of this Article 3(d).

(iii) The Subdistrict shall provide any additional information regarding the Proposal as circumstances require. The Proposal may be revised on an as-needed basis if circumstances change (including without limitation: changes in hydrologic conditions, conveyance facility outages, and delivery requirements). The Parties shall consult on an ongoing

basis after the determination is made by the Secretary at such times and frequencies as the Secretary or any of the Parties request. The Parties understand that a change in circumstances (including without limitation: subsequent hydrologic conditions, conveyance facility outages, and delivery requirements) may cause or require the Secretary to revise his or her initial approval for the use of Unused Project Capacity. Such revision shall be based on the criteria identified in this Article 3(d). In those circumstances, the Secretary will consult with the Subdistrict and District and other affected entities as soon as is reasonably possible to develop a revised Subdistrict Proposal.

(iv) In the event of emergency circumstances, the Parties understand the Secretary may need to make decisions and take actions without prior consultation to protect life and property. In those circumstances, the Secretary will consult with the Subdistrict and District as soon as is reasonably possible.

(e) Reservation of Rights and Defenses. If the Secretary rejects, in whole or in part, the Subdistrict Proposal after the process described in this Article 3, then the Subdistrict and District reserve all rights to challenge the rejection under applicable law and the United States reserves all defenses under applicable law.

LIMITATION ON TOTAL STORAGE OF PROJECT WATER

4. The Administrative Volume shall not exceed 465,568 acre-feet. In any year in which the April 1st or subsequent projection by the District anticipates a Physical Spill, Project Water then in storage in Chimney Hollow Reservoir shall not be released to satisfy delivery requirements to Project allottees if such release would allow the capture and storage of additional Project Water in Granby Reservoir. In addition, Prepositioning by directly delivering Project Water into Chimney Hollow Reservoir will not occur when the water level in Granby Reservoir

is projected to fall below an elevation of 8,250 feet in the then current water year, in accordance with the mitigation measure specifically pertaining to Prepositioning as generally described in FES 11-29 for the Windy Gap Firming Project. Project Water stored in Chimney Hollow Reservoir will be accounted for as outlined in Article 11.

BILLING AND PAYMENTS

5. (a) Beginning on the effective date of this 2014 Contract and extending to the earlier of (1) five years from the effective date of this 2014 Contract or (2) the date that water is first stored in Chimney Hollow Reservoir (excluding water needed for testing purposes), the Subdistrict shall be responsible for making the following payments:

(i) Payment to the United States of charges as specified in Article 7 of the 1990 Contract; and

(ii) Payment to the District of charges as specified in Article 8 of the 1990 Contract; and

(iii) Payment to be used exclusively for the monitoring and enhancement of that reach of the Colorado River between Granby Reservoir and Windy Gap Reservoir as specified in Article 13(c) of this 2014 Contract.

(b) Following the date specified in Article 5(a) above, and for the remaining term of this 2014 Contract the Subdistrict shall be responsible for making the following payments:

(i) Payment to the United States on or before December 31 of each year of the components as further described in Article 6 of this 2014 Contract; and

(ii) Payment to the District of charges as specified in Article 7 of this 2014 Contract.

(c) During that period specified in Article 5(a) above, the charges collected shall be distributed by the United States in accordance with the policies, rules, regulations, and statutes that govern the administration of the 1990 Contract. During that period specified in Article 5(b) above, the charges collected pursuant to Articles 6(a) and 6(b) of this 2014 Contract shall be credited to the Reclamation Fund after disbursing the District's appropriate share according to Article 22 of the Repayment Contract and *Northern Colorado Water Conservancy District v. United States*, Case No. 07-637C (Ct. Cl.). The charges collected pursuant to Article 6(c) through 6(e) of this 2014 Contract shall be the sole property of the United States.

(d) The charges annually credited to the Reclamation Fund in accordance with Article 5(c) above, shall then be distributed as follows:

(i) The initial funds, equal to $84,525 or the total of the funds received, whichever is less, shall be credited to the Reclamation Fund as a general credit, which shall be deposited into the United States Treasury;

(ii) One-half of the remaining amount credited to the Reclamation Fund after debiting the amount specified in Article 5(d)(i) above, if any, shall be used by Reclamation to address current or future Project MR&R costs. The use of these funds shall be at the discretion of Reclamation and credited in accordance with Reclamation policy. Any MR&R costs incurred by the United States for Joint Works purposes and paid for with funds available under this subarticle shall be allocated in accordance with Article 7(d) of this 2014 Contract and the Repayment Contract.

(iii) One-half of the remaining amount credited to the Reclamation Fund after debiting the amount specified in this Article 5(d)(i), if any, shall be deposited by Reclamation in an account to be used to address current or future MR&R costs on any

Reclamation water infrastructure. The use of these funds shall be at the discretion of Reclamation and credited in accordance with Reclamation policy.

(e) All other revenues arising out of this 2014 Contract, including, among others, those accruing from power generation derived from use of Subdistrict Water, but excluding those arising pursuant to Articles 7(a), (b), (c), (d), and (e) of this 2014 Contract, shall become the sole property of the United States.

CHARGES PAYABLE TO THE UNITED STATES

6. Charges described and required in this Article 6 shall be applicable only during the period specified in Article 5(b) of this 2014 Contract.

(a) *CHARGE FOR USE OF UNUSED CAPACITY*

The charge pursuant to this Article 6(a) shall be $34.00 per acre-foot for Subdistrict Water delivered to Subdistrict allottees or their designees on the East Slope of the Continental Divide including deliveries to Chimney Hollow Reservoir. Beginning with the period specified in Article 5(b) of this 2014 Contract, this charge will be annually increased by 1.79%, per the attached Exhibit A, which is hereby made a part of this 2014 Contract. Subdistrict Water that is first delivered to Chimney Hollow Reservoir and is subsequently delivered to allottees on the East Slope either directly or by exchange or substitution shall only be required to pay the charge pursuant to this Article at the time that Subdistrict Water is stored directly or by exchange in Chimney Hollow Reservoir.

(b) *CHARGE FOR IN-LIEU WATER*

This charge pursuant to this Article 6(b) shall be $34.00 per acre-foot for Project Water delivered to Subdistrict allottees or their designees on the East Slope of the Continental Divide in accordance with Article 9 of this 2014 Contract (In-Lieu Water). Beginning with the period

specified in Article 5(b) of this 2014 Contract, this charge will be annually increased by 1.79%, per the attached Exhibit A.

(c) *PUMPING CHARGE*

This charge pursuant to this Article 6(c) for each acre-foot of Subdistrict Water or In-Lieu Water that shall be deemed as pumped through Farr, Flatiron, or Willow Creek Pumping Plants. The charge will be based upon each individual Facility Energy Charge. The Facility Energy Charge will be adjusted annually to reflect the current Loveland Area Project energy only firm power rate for the current Fiscal Year. The total Facility Energy Charge for the Fiscal Year shall be computed as the sum of the charges for each individual facility as follows:

(i) For Willow Creek Pumping Plant – an amount calculated by multiplying (1) the acre-feet of Subdistrict Water introduced into Willow Creek Reservoir (net after losses are assessed) less the acre-feet of any Subdistrict Water spilled from Willow Creek Reservoir during the Fiscal Year, by (2) the Willow Creek Facility Energy Charge.

(ii) For Farr Pumping Plant – an amount calculated by multiplying (1) the acre-feet of Subdistrict Water or In-Lieu Water delivered to the East Slope either directly or by exchange during the Fiscal Year divided by 0.95, by (2) the Farr Facility Energy Charge.

(iii) For Flatiron Pumping Plant – an amount calculated by multiplying (1) the acre-feet of Subdistrict Water or In-Lieu Water delivered either directly or by exchange from Carter Lake during the Fiscal Year divided by 0.95, by (2) the Flatiron Facility Energy Charge.

(d) *POWER INTERFERENCE CHARGE*

A charge pursuant to this Article 6(d) for each acre-foot of Project Water delivered directly into Chimney Hollow Reservoir, or Skim Water that is displaced by the movement of Subdistrict Water through the Project and that is deemed as bypassing the Pole Hill, Flatiron, or Big

Thompson Power Plants as appropriate. The charge will be based upon each individual facility's per acre-foot generation factor and the Loveland Area Project composite (energy plus transmission) firm power rate for the current Fiscal Year. The total Power Interference charge for the Fiscal Year shall be computed as the sum of the charges for each individual facility as follows:

(i) For Pole Hill Power Plant – an amount calculated by multiplying (1) the acre-feet of Skim Water that is displaced by the movement of Subdistrict Water through the Project and that is deemed to have bypassed the Pole Hill Power Plant, by (2) a generation factor of 0.70 MWh per acre-foot, by (3) the Loveland Area Project composite power rate for the current Fiscal Year.

(ii) For Flatiron Power Plant – an amount calculated by multiplying (1) the acre-feet of Skim Water that is displaced by the movement of Subdistrict Water through the Project and that is deemed to have bypassed the Flatiron Power Plant plus the acre-feet of Project Water physically delivered into Chimney Hollow Reservoir, by (2) a generation factor of 0.90 MWh per acre-foot, by (3) the Loveland Area Project composite power rate for the current Fiscal Year.

(iii) For Big Thompson Power Plant – an amount calculated by multiplying (1) the acre-feet of Skim Water that is displaced by the movement of Subdistrict Water through the Project and that is deemed to have bypassed the Big Thompson Power Plant, by (2) a generation factor of 0.16 MWh per acre-foot, by (3) the Loveland Area Project composite power rate for the current Fiscal Year.

(e) *OM&R*

An annual OM&R charge pursuant to this Article 6(e) for OM&R Costs of Joint Works (as defined in the Repayment Contract) computed by dividing the OM&R Costs for the Fiscal Year

by the total acre-feet of all water conveyed through the Adams Tunnel during the said Fiscal Year and multiplying the quotient by the total acre-feet of Subdistrict Water delivered to Chimney Hollow Reservoir either directly or by exchange from Granby Reservoir (divided by 0.95 to account for losses) plus the amount of Subdistrict Water delivered directly or by exchange from Granby Reservoir through East Slope Project Works for the Subdistrict (divided by 0.95 to account for losses) during that Fiscal Year, excluding Enhancement Water, but including Project Water delivered in-lieu of Subdistrict Water pursuant to Article 9 of this 2014 Contract.

(f) No further arrangements and/or compensation, other than arrangements and compensation provided for in this 2014 Contract or in amendments thereof as herein provided, will be required to effect introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water into, through, in, or from the Project System.

CHARGES PAYABLE TO THE DISTRICT

7. Charges described and required in this Article 7 shall be applicable only during the period specified in Article 5(b) of this 2014 Contract.

The charges to be paid to the District for each Fiscal Year by the Subdistrict for Subdistrict Water introduced, stored, conveyed, exchanged, substituted, or delivered either to Chimney Hollow Reservoir or to Subdistrict allottees or their designees under the terms of this 2014 Contract, shall be the sum of the following:

(a) An Adams Tunnel conveyance charge calculated by dividing the total acre-feet of water, excluding Enhancement Water, delivered for the Subdistrict by 0.95 and multiplying the quotient by $0.25.

(b) An amount toward costs of the administration, OM&R of District Works utilized for the introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water. Such amount shall be computed by dividing said costs for the applicable District Works for the Fiscal Year by the total acre-feet of all water conveyed through the applicable District Works during the said Fiscal Year and multiplying the quotient by the total acre-feet of Subdistrict Water delivered through the applicable District Works either directly or by exchange, including Project Water delivered in-lieu of Subdistrict Water pursuant to Article 9 of this 2014 Contract.

(c) Any special service, amortization, or OM&R charges as may be required to provide additional facilities needed to effect introduction or delivery of Subdistrict Water into or from the Project System.

(d) The District and the United States jointly perform OM&R for the Joint Works of the Project pursuant to the Repayment Contract. Annually, by November 1, the District shall provide the United States their actual OM&R Costs incurred from the previous Fiscal Year associated with the Joint Works of the Project as well as the District's estimated OM&R Costs for the upcoming Fiscal Year. The United States shall estimate and bill the Subdistrict in advance pursuant to Article 6(e) of this 2014 Contract for the Subdistrict's proportionate share of OM&R Costs incurred by the United States and the District. The advance payment will be adjusted annually for actual costs. The United States shall credit to the District its proportionate share of the OM&R payment made to the United States by the Subdistrict on the District's bill due under the Repayment Contract. The United States' and the District's proportionate share of the Subdistrict payment of OM&R Costs shall be in the same proportion as the United States' and the District's incurred OM&R Costs for Joint Works in the applicable year.

(e) No further arrangements and/or compensation, other than arrangements and compensation provided for in this 2014 Contract or in amendments thereof as herein provided, will be required to effect introduction, storage, conveyance, exchange, substitution, and delivery of Subdistrict Water into, through, in, or from the Project System.

DELIVERY, MEASUREMENT, AND ACCOUNTING FOR SUBDISTRICT WATER

8. Consistent with and subject to the provisions of this 2014 Contract:

(a) Subdistrict Water may be considered to be available for delivery at any delivery point in the Project System (including but not limited to Granby Dam, Willow Creek Dam) and from Chimney Hollow Reservoir. Tracking or accounting for Subdistrict Water through each delivery point in the Project Works and from Chimney Hollow Reservoir shall be maintained at a level that allows for an accurate accounting of any account balances, losses, spills and monetary charges.

(b) Subdistrict Water and Project Water may be delivered in place of each other at any time and at any point within the Project System.

(c) Subdistrict Water may be introduced, stored, conveyed, exchanged, substituted, and delivered into and from Project Works.

(d) Enhancement Water may be delivered from Granby Reservoir unless there are physical constraints on such deliveries, in which case it may be delivered from Willow Creek Reservoir.

(e) Exchanges or substitutions of Subdistrict and Project Water may include, without limitation,

(i) Exchange or substitution between Granby Reservoir and Chimney Hollow Reservoir as part of the Prepositioning operations;

(ii) Exchange or substitution between Granby Reservoir and Carter Lake Reservoir, Horsetooth Reservoir, or other delivery points for delivery to the Subdistrict;

(iii) Exchange or substitution between Chimney Hollow Reservoir and Carter Lake Reservoir, Horsetooth Reservoir, or other delivery points for delivery to the Subdistrict;

(iv) Direct release from Chimney Hollow to the Project System for delivery to the Subdistrict;

(v) Exchange or substitution between Chimney Hollow Reservoir and Granby Reservoir or Willow Creek Reservoir for delivery of Enhancement Water.

(f) Project Water may be directly released from Chimney Hollow Reservoir to Project Works to meet Project purposes. The decision to make such releases will be made by consensus of the Parties, provided that neither the District nor the Subdistrict will oppose a Reclamation proposal for release of Project Water from Chimney Hollow Reservoir if that proposal does not result in an unacceptable loss of Windy Gap Project yield or an additional charge or expense to the Subdistrict related to Power Interference charges or other related operational charges or expenses.

IN-LIEU WATER DELIVERIES

9. Project Water may be delivered in-lieu of Subdistrict Water and charged against the Subdistrict's account pursuant to Article 11 of this 2014 Contract and operating criteria which were jointly developed by the District and the Subdistrict in December of 1991 and which were approved by Reclamation on February 14, 1992. These operating criteria associated with

the delivery of In-Lieu Water are entitled *Criteria for Integrated Operations of the Colorado-Big Thompson and Windy Gap Projects* as attached as Exhibit F and by this reference made a part of this 2014 Contract.

ADDITIONAL FACILITIES

10. (a) The Subdistrict shall, at its own expense, construct such additional facilities as may be needed for the introduction of Subdistrict Water into the Project Works, or to deliver Subdistrict Water from the Project Works. All plans for construction and/or OM&R of Subdistrict facilities that involve Project right-of-way and/or Project Works shall be submitted to the Secretary and the District for review. The Secretary will determine whether to approve the plans, construction and OM&R, prior to the Subdistrict undertaking such construction and OM&R.

(b) The Subdistrict shall provide, at its own expense, for the construction, OM&R of such additional facilities as may be required by the United States and the Colorado State Engineer for the measurement of Subdistrict Water introduced into or delivered from the Project Works: Provided, That where such measurement can be accomplished by existing facilities of the Project Works or District Works, such measurement will be provided without additional cost to the Subdistrict.

ADDITIONAL REPORTING REQUIREMENTS

11. The Secretary shall require the following reporting in addition to Article I of Exhibit E of this 2014 Contract:

(a) The Subdistrict shall provide to the Secretary a water accounting of all Subdistrict Water introduced into the Project System and the amount of Subdistrict Water

delivered and the amount of Project Water in Chimney Hollow Reservoir. This accounting shall be done on a daily time step and shall be provided when requested. This information shall describe in acre-feet the total amount of Subdistrict and Project Water introduced and stored in Chimney Hollow Reservoir, and the amount and delivery point of all Subdistrict Water deliveries made from Project Works and Chimney Hollow Reservoir. The Subdistrict shall also annually by January 31 provide a report that documents the daily water accounting information for the preceding calendar year relevant to Subdistrict Water, including Enhancement Water.

(b) The Subdistrict shall provide reports to the Secretary showing accounting of Enhancement Water delivered to Middle Park or Grand County on a daily time step report.

LOSSES AND SPILLAGE

12. Subdistrict Water shall be subject to the following:

(a) Losses:

(i) 5% loss shall be charged on any Subdistrict Water introduced into the Project System on the West Slope.

(ii) 5% loss shall be charged on any Subdistrict Water remaining in storage in the Project System on the West Slope on March 31 of any calendar year, excluding all Subdistrict Water introduced into the Project System in that calendar year.

(iii) 5% loss shall be charged on any Subdistrict Water delivered through the Project System from the Project facilities on the West Slope either directly or by exchange to either Chimney Hollow Reservoir or a Windy Gap allottee or its designee on the East Slope.

(iv) 5% loss shall be charged on any Chimney Hollow Reservoir Water directly introduced into and physically delivered through the Project System on the East Slope

from Chimney Hollow Reservoir. If Subdistrict Water is released and directly delivered from Chimney Hollow Reservoir to a Windy Gap allottee or its designee, the amount of Subdistrict Water delivered at the Project delivery point shall equal the release made from Chimney Hollow Reservoir for the delivery to the Windy Gap allottee or its designee multiplied by 0.95. This loss will not be assessed if Chimney Hollow Reservoir Water or Project Water stored in Chimney Hollow Reservoir is delivered from Project Facilities, by exchange.

(v) No losses will be charged on Project Water stored in Chimney Hollow Reservoir.

(b) Spillage:

(i) Whenever the Secretary shall notify the Subdistrict that Project storage or conveyance capacity occupied by Subdistrict Water is required for Project operations, the Subdistrict, shall cause to be delivered or evacuated the required amount of Subdistrict Water from the Project System. Such Subdistrict Water not so delivered or evacuated shall be subject to spill.

(ii) If the Administrative Volume exceeds 465,568 acre-feet an Administrative Spill will occur. The water spilled shall be considered Project Water.

(iii) If the Administrative Volume is less than or equal to 465,568 acre-feet and a Physical Spill occurs, the water spilled shall be accounted in the following order:

1. Subdistrict Water in Project Works on the West Slope that is not Enhancement Water; then

2. Enhancement Water; then

3. Project Water.

(iv) Subdistrict Water may be introduced into the Project System during an Administrative Spill for immediate exchange to Chimney Hollow Reservoir as part of

Prepositioning. It is expressly recognized that an Administrative Spill may occur at Granby Reservoir as a result of Prepositioning or the storage of Project Water, by exchange, in Chimney Hollow Reservoir. The Secretary may not approve the introduction of Subdistrict Water into the Project System during an Administrative Spill if such introduction would increase the risk to Project Works or public safety.

ENVIRONMENTAL COMPLIANCE AND COMMITMENTS

13. Environmental Compliance:

(a) The Subdistrict shall comply with all mitigation measures and environmental commitments identified in the April 28, 1981 Record of Decision for the Windy Gap Project and the December 19, 2014 Record of Decision for the Windy Gap Firming Project, attached as Exhibit B and hereby made a part of this 2014 Contract which set forth mitigation measures and environmental commitments in connection with the Windy Gap Project and Windy Gap Firming Project. The Subdistrict shall submit to the Contracting Officer by January 31 of each year a report, satisfactory to the Contracting Officer, which certifies progress in the previous year regarding successful implementation of the mitigation measures and environmental commitments in a timely manner.

(b) The Subdistrict shall be responsible for the costs of all current and future compliance with National Environmental Policy Act (NEPA), Endangered Species Act, and related environmental and cultural resource laws and regulations; mitigation measures; and environmental commitments identified in the Windy Gap Project and Windy Gap Firming Project Records of Decision and associated with the use of Project Unused Capacity identified in this 2014 Contract.

(c) The Subdistrict shall pay over the course of ten years, commencing with the execution of this 2014 Contract, no less than $1,500,000 to be used exclusively for the monitoring and enhancement of that reach of the Colorado River between Granby Reservoir and Windy Gap Reservoir. Payment of this amount will be in accordance with a schedule submitted by the Subdistrict at the time of execution of this 2014 Contract. Of the total $1,500,000 payment, no less than $250,000 shall be paid within the period described in Article 5(a) of this 2014 Contract. The funds will be contributed directly to and used in the Learning by Doing Cooperative Effort. Reclamation may participate in one or more committees in the Learning by Doing Cooperative effort.

(d) The failure to comply with this Article may be cause for suspending water deliveries in whole or in part or termination of this 2014 Contract. The United States shall provide the Subdistrict written notice which specifies with particularity the claimed failure by the Subdistrict to comply with this Article. The Subdistrict and Reclamation shall meet and confer as soon as reasonably possible to determine what action, if any, is needed by the Subdistrict. If after 60 days from the date of such notice the Subdistrict has not come into compliance or made arrangements to come into compliance with this Article, the United States may suspend delivery of Subdistrict Water or the delivery of Chimney Hollow Reservoir Water either directly or by exchange, in whole or in part, until the Subdistrict is in compliance. If, after 60 days from the initial date of suspension of delivery of Subdistrict Water or Chimney Hollow Reservoir Water the Subdistrict has not come into compliance, or has not made arrangements to come into compliance with this Article, the United States may terminate this 2014 Contract in accordance with Article 19.

PERMITS AND APPROVALS

14. (a) The Subdistrict must obtain all Federal, State, and local permits, approvals, and licenses ("Permits and Approvals") for the construction, implementation, and operation of the Windy Gap Firming Project that are required at the time of execution of this 2014 Contract.

(b) The Subdistrict must maintain all Permits and Approvals required by Article 14(a) above.

(c) The Subdistrict shall, on an annual basis, confirm that the Permits and Approvals required by Article 14(a) above, remain in place and that there is no litigation involving such Permits and Approvals that could lead to termination of the Permits and Approvals.

(d) If litigation regarding the Permits and Approvals required by Article 14(a) above, extends beyond 3 years and the Subdistrict is not providing the environmental benefits contemplated by the Permits and Approvals required by Article 14(a) above, the United States may request that the Subdistrict and the United States meet and confer for the purpose of identifying mutually agreeable measures until the litigation is resolved. If the Subdistrict and United States cannot agree on mutually agreeable measures, the United States may suspend Prepositioning until the litigation is resolved.

(e) If there is a final judicial determination, not subject to appeal, that a Permit or Approval required by Article 14(a) above, is terminated, and if the Subdistrict is not providing the environmental benefits contemplated by the terminated Permit or Approval, the United States may notify the Subdistrict that additional environmental measures may be required to provide a comparable in scope and cost, but not additional level of environmental benefit. If after 60 calendar days from the date of such notice the Subdistrict has not agreed to provide a

comparable, in scope and cost, but not additional level of environmental benefit, the United States may suspend delivery of Subdistrict Water or the delivery of Chimney Hollow Reservoir Water either directly or by exchange, in whole or in part, until the Subdistrict is in compliance. If, after 60 calendar days from the date of suspension of delivery of Subdistrict Water or Chimney Hollow Reservoir Water the Subdistrict has not come into material compliance with the requirements of this Article 14(e), the United States may terminate this 2014 Contract at any time upon 60 calendar days advance notice in writing to the Subdistrict.

(f) This Article 14 does not affect the review described in Article 3 of this 2014 Contract.

OTHER IDENTIFIED AGREEMENTS

15. (a) The Subdistrict has entered into the following agreements with non-federal parties, which are not incorporated within this 2014 Contract (the "Other Identified Agreements") but are listed in Exhibit C.

(b) The Subdistrict shall, on an annual basis, confirm that the Other Identified Agreements are in existence and that there is no litigation regarding the validity or enforcement of the Other Identified Agreements.

(c) If litigation regarding the Other Identified Agreements extends beyond 3 years and the Subdistrict is not providing the environmental benefits contemplated by the Other Identified Agreements the United States may request that the Subdistrict and the United States meet and confer for the purpose of identifying mutually agreeable measures until the litigation is completed. If the Subdistrict and United States cannot agree on mutually agreeable measures, the United States may suspend Prepositioning until the litigation is completed.

(d) If there is a final judicial determination, not subject to appeal, that the Subdistrict is in violation of the Other Identified Agreements, and if the Subdistrict is not providing the environmental benefits contemplated by the Other Identified Agreements, the United States may notify the Subdistrict that additional environmental measures may be required to provide a comparable, in scope and cost, but not additional level of environmental benefit. If after 60 calendar days from the date of such notice the Subdistrict has not agreed to provide a comparable, in scope and cost, but not additional level of environmental benefit, the United States may suspend delivery of Subdistrict Water or the delivery of Chimney Hollow Reservoir Water either directly or by exchange, in whole or in part, until the Subdistrict is in compliance. If, after 60 calendar days from the date of suspension of delivery of Subdistrict Water or Chimney Hollow Reservoir Water the Subdistrict has not come into material compliance with the requirements of this sub-article, the United States may terminate this 2014 Contract at any time upon 60 calendar days advance notice in writing to the Subdistrict.

(e) If Chimney Hollow Reservoir is not operational during any period of this 2014 Contract subsequent to the date defined in Article 5(a), the Subdistrict shall provide the environmental measures identified in Exhibit D during any such period.

(f) Regardless of provisions in this Article 15 to the contrary, the Subdistrict shall not be required to implement any environmental measure or other requirement of an Other Identified Agreement if the Subdistrict is prevented from performing a requirement of an Other Identified Agreement or from implementing an environmental measure as the result of the actions of a person or entity that is not a Party to this 2014 Contract. If the Subdistrict is prevented from performing a requirement of an Other Identified Agreement or from implementing an environmental measure as the result of the actions of a person or entity that is not a Party to this 2014 Contract, then the Subdistrict shall notify the Secretary, and the

Subdistrict and the Secretary will meet and confer to determine if an alternate, mutually acceptable environmental measure, comparable in scope and cost, but not additional level of environmental benefit, is available. If the Subdistrict and the Secretary do not agree on an alternate environmental measure, comparable in scope and cost, but not additional level of environmental benefit, then the Secretary may notify the Subdistrict that additional environmental measures may be required to provide a comparable in scope and cost, but not additional level of environmental benefit. If after 60 calendar days from the date of such notice the Subdistrict has not agreed to provide the comparable, in scope and cost, but not additional level of environmental benefit, the United States may suspend delivery of Subdistrict Water or the delivery of Chimney Hollow Reservoir Water either directly or by exchange, in whole or in part, until the Subdistrict is in compliance. If, after 60 calendar days from the date of suspension of delivery of Subdistrict Water or Chimney Hollow Reservoir Water the Subdistrict has not come into material compliance with the requirements of this Article 15(f), the United States may terminate this 2014 Contract at any time upon 60 calendar days advance notice in writing to the Subdistrict.

(g) This Article 15 does not affect the review described in Article 3 of this 2014 Contract.

LIMITATION ON RIGHTS OF SUBDISTRICT

16. In addition to all the other terms, conditions and covenants contained within this 2014 Contract, it is specifically understood and agreed by and between the Parties hereto, that the rights of the Subdistrict hereunder are subject to the following terms, conditions and limitations, to all intents and purposes as though set forth verbatim herein, and made a part hereof by reference to wit:

(a) All the provisions of Section 13(c) of the Boulder Canyon Project Act, approved December 21, 1928 (45 Stat. 1057).

(b) The provisions of Section 14 of the Colorado River Storage Project Act, approved April 11, 1956 (70 Stat. 105).

(c) The terms and provisions of the Repayment Contract, including supplements and amendments thereof, dated July 5, 1938, between the United States and the District.

(d) The provisions of Section 14 of the 1939 Reclamation Act.

WATER RIGHTS ASSOCIATED WITH THE WINDY GAP PROJECT

17. (a) The Subdistrict agrees to coordinate with Reclamation on all legal matters involving the Windy Gap Water Rights, specifically including all matters relating to water rights and water rights administration of the Windy Gap Water Rights. For purposes of this Article, coordination shall include, but not be limited to, sharing in advance copies of any proposed filings in the Colorado Water Court with Reclamation and providing Reclamation an opportunity to comment.

(b) The Secretary has determined that Prepositioning is consistent with applicable federal law. However, should a court conclude that Prepositioning is not consistent with applicable law, future Windy Gap Firming Project operations shall not include Prepositioning unless the appropriate authority is obtained by the Subdistrict. The Secretary shall have no obligation to obtain any such authorizations.

(c) The Subdistrict agrees that it will include in its Application to amend the water rights for the Windy Gap Project the following language: "The Subdistrict requests that

any decree entered in this case provide that 'Nothing herein shall modify, affect, or otherwise change the [Blue River Decree]."

NO EFFECT ON REPAYMENT CONTRACT

18. This 2014 Contract shall not modify or amend the Repayment Contract in any respect. This 2014 Contract shall not be a basis for any direct or indirect interpretation or construction of any provision of the Repayment Contract for any purpose. This 2014 Contract does not establish any factual or legal precedent, concession, or determination by the District or the United States regarding the Repayment Contract. The United States and the District do not, by virtue of this 2014 Contract, waive or relinquish any legal or factual position regarding the Repayment Contract.

RIGHT OF THE UNITED STATES TO TERMINATE FOR MATERIAL NON-COMPLIANCE

19. Except as expressly provided in this 2014 Contract, in the event of material non-compliance by the Subdistrict with this 2014 Contract, the United States shall provide the Subdistrict with written notice, which specifies with particularity the claimed failure by the Subdistrict. The Subdistrict and the United States shall meet and confer as soon as reasonably possible to determine what action, if any, is needed by the Subdistrict to correct any material non-compliance with this 2014 Contract. If after 60 calendar days from the date of such notice the Subdistrict has not come into compliance or made arrangements to come into compliance with the material terms and conditions of this 2014 Contract, the United States may suspend delivery of Subdistrict Water or the delivery of Chimney Hollow Reservoir Water either directly or by exchange, in whole or in part, until the Subdistrict is in compliance. If, after 60 days from

the date of suspension of delivery of Subdistrict Water or Chimney Hollow Reservoir Water the Subdistrict has not come into material compliance, or has not made arrangements to come into material compliance with this 2014 Contract, the United States may terminate this 2014 Contract at any time upon 60 calendar days advance notice in writing to the Subdistrict.

DISPOSITION OF FUNDS UPON TERMINATION

20. If this 2014 Contract is terminated at any time pursuant to Article 19 of this 2014 Contract, and at the time of termination, the Subdistrict has on deposit with the United States and the District funds which are in excess of charges for any water released for, or to be delivered to, the Subdistrict up to the date of termination, any such excess funds will be promptly refunded by the United States and the District to the Subdistrict: Provided, however, that if the termination is for any cause other than as set forth in Article 19 of this 2014 Contract, any unused funds on deposit with the United States or the District will be retained by the United States and the District to be applied by the United States and the District on any damages incurred by the United States or the District by reason of the failure of the Subdistrict to comply with the terms of this 2014 Contract.

LIABILITY OF THE SUBDISTRICT FOR THE UNITED STATES

21. (a) The Subdistrict agrees, to the extent allowed by law, to indemnify the United States and all of its representatives from all damages resulting from suits, actions or claims of any character brought on account of any injury to any person or property arising out of any act, omission, neglect, or misconduct in the manner or method of performing any construction, care, operation, maintenance, supervision, examination, inspection, or other duties of the Subdistrict or the United States concerning the Chimney Hollow Reservoir, the Windy

Gap Project and the Windy Gap Firming Project regardless of who performs those duties. Provided, however, that the Subdistrict does not waive its rights and protections under the Colorado Governmental Immunities Act, C.R.S. § 24-10-101, et seq., as amended, or similar or successor statutes. The Subdistrict does not agree to indemnify the United States for any damages arising from intentional torts or malicious actions committed by employees of the United States. Nothing in this Article limits the rights of the Subdistrict to performance of the terms of this 2014 Contract that may be available under applicable Federal law.

(b) The Subdistrict has provided liability insurance to Reclamation evidenced by an ACORD Certificate dated April 24, 2014. The Subdistrict will reauthorize the same or similar liability insurance each year unless insurance is either not available or not affordable. Affordability shall be determined in the Subdistrict's sole discretion. In the event similar insurance is not reauthorized and if the Subdistrict is unable or unwilling to provide equivalent protection, the Subdistrict shall provide written notice to Reclamation, and the Parties shall thereafter meet and confer to seek a mutually acceptable alternative. No other Article of this 2014 Contract is reopened upon occurrence of such event, unless the Parties mutually agree otherwise.

SEVERABILITY

22. (a) In the event that any one or more of the provisions contained herein shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this 2014 Contract, but this 2014 Contract shall be construed as if such invalid, illegal or unenforceable provisions had never been contained herein, unless the deletion of such provision or provisions would result in such a material change so as to cause the fundamental benefits afforded the Parties by this

2014 Contract to become unavailable or materially altered. If the deletion of such provision or provisions of this 2014 Contract is a material change, the Parties will meet and discuss potential amendments to the 2014 Contract, in accordance with applicable law and policy, to address such material change.

(b) If this 2014 Contract is found invalid by a court of competent jurisdiction, then the 1990 Contract shall remain enforceable, in accordance with its provisions, including but not limited to the term of the 1990 Contract.

NOT ENFORCEABLE BY NON-PARTIES

23. This 2014 Contract does not confer, and is not intended to confer, any benefit, right, or remedy to persons or entities not party to this 2014 Contract.

NO MODIFICATION OF AGREEMENTS

24. This 2014 Contract in no way modifies, or affects the enforcement of, any contracts, agreements, intergovernmental agreements, or any other contractual obligations of the Subdistrict or the District with entities which are not a party to this 2014 Contract.

PROTECTION OF WATER AND AIR QUALITY

25. (a) This 2014 Contract shall not modify, amend, or change in any respect Supplement No. 10 to the Repayment Contract, dated October 23, 2013, titled "Supplement of Contract Between The United States of America And The Northern Colorado Water Conservancy District For Addressing Commitments Associated With Meeting The Grand Lake Clarity Standard," which is incorporated within this 2014 Contract. *Provided, That* the United States does not warrant the quality of the water delivered to the Subdistrict and is under no

obligation to furnish or construct water treatment facilities to maintain or improve the quality of water delivered to the Subdistrict.

(b) The Subdistrict shall comply with all applicable water and air pollution laws and regulations of the United States and the State of Colorado; and shall obtain pursuant to Article 14(a) of this 2014 Contract, all required permits or approvals from the appropriate Federal, State, or local authorities necessary for the delivery of water by the Subdistrict.

(c) This Article shall not affect or alter any legal obligations of the Secretary to provide drainage or other discharge services.

STANDARD CONTRACT ARTICLES

26. The standard contract articles applicable to this 2014 Contract are listed below. The full text of these standard articles is attached as Exhibit E and is hereby made a part of this 2014 Contract by this reference.

A. Charges for Delinquent Payments

B. General Obligation – Benefits Conditioned Upon Payment

C. Confirmation of the 2014 Contract

D. Notices

E. Contingent of Appropriation or Allotment of Funds

F. Officials Not to Benefit

G. Changes in Subdistrict's Organization

H. Assignment Limited – Successors and Assigns Obligated

I. Books, Records and Reports

J. Equal Employment Opportunity

K. Compliance with Civil Rights Law and Regulations

L. Certification of Nonsegregated Facilities

M. Medium for Transmitting Payments

N. Contract Drafting Considerations

IN WITNESS WHEREOF, the parties hereto have executed this 2014 Contract as of the day and year first above written.

THE UNITED STATES OF AMERICA

By _____
Michael J. Ryan
Regional Director
Great Plains Region
Bureau of Reclamation

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By _____
Mike Applegate
President and Chairman of the Board

Attest: ERIC W. WILKINSON
Secretary _____

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

(Seal)

MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By _____
Dennis R. Yanchunas
President and Chairman of the Board

Attest: ERIC W. WILKINSON
Secretary _____

MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT

(Seal)

EXHIBIT A

ANNUAL CHARGES FOR USE OF EXCESS CAPACITY AND IN-LIEU WATER

Articles 6(a) and 6(b) of the 2014 Contract

Article 5(a) of the 2014 Contract, allows the Subdistrict to make payments in the same amount as the 1990 Contract for the earlier of (1) five years from the effective date of this 2014 Contract or (2) the date that water is first stored in Chimney Hollow Reservoir (excluding water needed for testing purposes). This table assumes that option (1) is the earlier of the two and therefore, the charges as established in Article 6(a) and 6(b) begin in year annual 2019 (5 years from the effective date of this 2014 Contract). If Chimney Hollow Reservoir is available to store water within the next five years then this Exhibit shall be superseded and replaced.

Number	Year	Rate	Index Factor
1	2014	Per 1990 Contract	N/A
2	2015	Per 1990 Contract	N/A
3	2016	Per 1990 Contract	N/A
4	2017	Per 1990 Contract	N/A
5	2018	Per 1990 Contract	N/A
6	2019	$34.00	1.79%
7	2020	$34.61	1.79%
8	2021	$35.23	1.79%
9	2022	$35.86	1.79%
10	2023	$36.50	1.79%
11	2024	$37.15	1.79%
12	2025	$37.82	1.79%
13	2026	$38.50	1.79%
14	2027	$39.18	1.79%
15	2028	$39.89	1.79%
16	2029	$40.60	1.79%
17	2030	$41.33	1.79%
18	2031	$42.07	1.79%
19	2032	$42.82	1.79%
20	2033	$43.59	1.79%
21	2034	$44.37	1.79%
22	2035	$45.16	1.79%
23	2036	$45.97	1.79%
24	2037	$46.79	1.79%
25	2038	$47.63	1.79%
26	2039	$48.48	1.79%
27	2040	$49.35	1.79%
28	2041	$50.23	1.79%
29	2042	$51.13	1.79%
30	2043	$52.05	1.79%
31	2044	$52.98	1.79%
32	2045	$53.93	1.79%
33	2046	$54.89	1.79%
34	2047	$55.88	1.79%
35	2048	$56.88	1.79%
36	2049	$57.89	1.79%
37	2050	$58.93	1.79%
38	2051	$59.98	1.79%
39	2052	$61.06	1.79%
40	2053	$62.15	1.79%

EXHIBIT B

RECORD OF DECISION FOR THE WINDY GAP PROJECT AND THE RECORD OF DECISION FOR THE WINDY GAP FIRMING PROJECT

Record of Decision

I. Introduction

This document is a concise public record of the Department of the Interior's decision associated with the Windy Gap Project, Colorado, covered in the Colorado-Big Thompson/Windy Gap Projects Final Environmental Statement (FES 81-20).

The decision is whether or not to approve the use of the Colorado-Big Thompson Project carriage facilities to transport Windy Gap Project water in compliance with article 12 of the carriage contract (No. 14-06-700-7497 dated October 3, 1973) among the United States, the Municipal Subdistrict of the Northern Colorado Water Conservancy District (subdistrict), and the Northern Colorado Water Conservancy District.

Article 12 stipulates that environmental impacts must be assessed before Windy Gap Project water (developed and managed by the subdistrict) can be conveyed through the Bureau of Reclamation's Colorado-Big Thompson Project.

II. Description of Alternatives

A. Viable Alternatives

1. No Action (includes continued operation of the Colorado-Big Thompson Project).

No Action would consist of continuation of the present water supplies for the Windy Gap service area (cities of Estes Park, Boulder, Loveland, Longmont, and Greeley; and Platte River Power Authority). The projected water supply annual shortfall of 32,400 acre-feet would probably be partially met by the conversion of water use on approximately 15,000 acres of agricultural lands to municipal and industrial uses. More stringent water use restrictions would be implemented in the service area.

2. Windy Gap Project: Preferred Alternative

The Windy Gap Project would divert a long term annual average of about 56,000 acre-feet from the Upper Colorado River Basin near Granby, Colorado. The diverted water would be pumped from the West Slope through Colorado-Big Thompson Project facilities to the East Slope cities of Estes Park, Boulder, Longmont, Greeley, Loveland, and Platte River Power Authority. The project has been planned and would be constructed and operated by the Municipal Subdistrict of the Northern Colorado Water Conservancy District.

The project consists of a diversion dam 27 feet high, a reservoir with about 122 surface acres, a 600 ft^3/s pumping plant, and a pipeline about 31,000 feet long.

B. Alternatives Considered But Not Selected

1. Water conservation and management
2. Alternative water supplies
3. Alternative project features

III. Environmentally Preferrable Alternative

The environmentally preferred alternative in this case differs depending upon the affected area. West Slope interests consider No Action the best alternative as opposed to East Slope interests who prefer Windy Gap. Without Windy Gap the West Slope would be spared the water depletions caused by the project and other localized impacts caused by construction of the diversion and appurtenant facilities. On the other hand, the East Slope would experience an accelerated conversion of water use on agricultural lands to municipal and industrial uses and more intense restrictions of existing water use.

IV. Important Factors Which Should Be Considered for Each Alternative

With a No Action alternative the water supply needs of the Windy Gap service area would probably be met by some combination of conversion of agricultural water rights and severe water use restrictions. Up to 15,000 acres of agricultural land in and around the service area would need to be converted in order to partially meet the projected "shortfall" of 32,400 acre-feet annually by the year 2000. It is currently the State of Colorado's policy to avoid agricultural water rights conversion whenever possible, and the cities within the service area already have water conservation programs in effect. None of the environmental impacts summarized in Table II-10 of the FES would occur with a No Action scenario.

With the Windy Gap Project agricultural water right conversion to municipal and industrial use would be slowed considerably and the projected (year 2000) water needs of the service area would be satisfied. An additional net annual average of 88 million kilowatts of energy would be generated by conveying an annual average of 56,000 acre-feet of water through the Colorado-Big Thompson Project. As indicated in Table II-10 of the FES, there would be some residual impacts due to construction and operation of the Windy Gap Project; however, there will be no long-term significant impacts because of substantial mitigation commitments by the subdistrict.

V. Adoption of Mitigation Measures

The Supreme Court of Colorado overruled the Water Court which granted a conditional water right to the subdistrict to divert water for the Windy Gap Project. The Supreme Court found that a conditional water

right could not be granted until the subdistrict defines a plan to adequately mitigate the potential harm to prospective water use within the Upper Colorado River Basin. Subsequently, the subdistrict entered into agreements with various interests to mitigate potential damage from Windy Gap's diversion.

Attachments 1 and 2 of the FES include agreements among the subdistrict and parties affected by the project. These agreements stipulate measures which will substantially reduce the environmental and socioeconomic impacts of the project. Many other commitments are itemized in the applications which the subdistrict has made to the Forest Service, Bureau of Land Management (BLM), and the Corps of Engineers in order to acquire the necessary permits and/or easements to construct and operate project features associated with lands and programs which they administer.

The following major mitigation measures have been agreed to by the subdistrict: (1) about 11,000 acre-feet of the average annual project yield of 56,000 acre-feet will be commited to maintain minimum "instream" flows (2) existing and some future water rights will be protected; (3) disturbed soil and vegetation will be reclaimed; (4) various commitments by the subdistrict to West Slope interests will protect prospective West Slope uses of Colorado River water; and (5) threatened and endangered fish will be protected by resolution of the subdistrict to provide certain conservation measures.

VI. Monitoring and Enforcement of Mitigation Commitments

The Windy Gap Project is not a Federal project. Therefore, control of monitoring and enforcement of Federal concerns associated with Windy Gap must be handled indirectly in most cases.

Federal regulations for which the subdistrict are responsible are the requirements for permits and easements to use BLM and Forest Service lands; a dredge and fill permit issued by the Corps of Engineers; and a contract for water conveyance through Bureau of Reclamation facilities.

In addition, the subdistrict has agreed to mitigation of project water depletions in order to protect West Slope water users, threatened and endangered fish, aquatic biota, and others.

The subdistrict, in cooperation with West Slope interests (e.g., ranchers, local governments, etc.), the BLM, Forest Service, Fish and Wildlife Service, Colorado Division of Wildlife, Corps of Engineers, Bureau of Reclamation, and others have integreated monitoring and enforcement of Federal regulatory requirements and mitigation commitments into contract specifications and operating plans for the project.

The subdistrict's construction inspectors and management personnel will assure enforcement of these specifications and plans.

Compliance with article 12 of the carriage contract has been accompli:
and use of the Colorado-Big Thompson carriage facilities in accordanc
with contract 14-06-700-7497 is hereby:

Approved: R. E. Martini
Regional Director
Bureau of Reclamation
Lower Missouri Region

Date: JUN 19 1981

Windy Gap Firming Project Intergovernmental Agreement (WGFP IGA)

The Municipal Subdistrict, Northern Colorado Water Conservancy District and its Windy Gap Firming Project Water Activity Enterprise, Board of County Commissioners of Grand County, Colorado, Middle Park Water Conservancy District, Colorado River Water Conservation District and Northwest Colorado Council of Governments enter into this Windy Gap Firming Project Intergovernmental Agreement ("WGFP IGA") as of the latest date of execution of this WGFP IGA by the Parties.

I) Definitions.

A. "1980 and 1985 Agreements" are the April 30, 1980 "Agreement Concerning the Windy Gap Project and the Azure Reservoir and Power Project" ("1980 Agreement") and the March 29, 1985 "Supplement to Agreement of April 30, 1980" ("1985 Agreement").

B. "Accounting Year" for the Middle Park Water Apportionment will begin on August 1st and end on July 31st the following calendar year. Middle Park's Accounting Year shall become effective on August 1 following execution of this WGFP IGA.

C. "Active Storage" for Chimney Hollow Reservoir is that reservoir capacity contained between the invert of the reservoir outlet works and the normal high water line in Chimney Hollow Reservoir, or in the case of Alternative Reservoirs, the total capacity available for storage and release for the benefit of the WGFP.

D. "Amendatory Contract" is the Amendatory Contract for the Introduction, Storage, Carriage, and Delivery of Water for Municipal Subdistrict, Northern Colorado Water Conservancy District, Colorado-Big Thompson Project, Colorado dated March 1, 1990 among Reclamation, the Subdistrict and Northern Water and any amendments, replacements, or supplements thereto necessary to implement the WGFP.

E. "Carryover Balance" is a portion of a Water Apportionment that is available for use pursuant to this WGFP IGA that can be stored for multiple years.

F. "Carryover Balance Limitation" is the maximum total Carryover Balance that can be credited to Middle Park or Grand County at any point in time.

G. Chimney Hollow Reservoir ("Chimney Hollow Reservoir") is that reservoir located on the East Slope identified in the Final Environmental Impact Statement for the Windy Gap Firming Project as the proposed action and any reservoir or reservoirs on the East Slope that are constructed as an alternative or in addition to the reservoir identified in the Final

Environmental Impact Statement ("Alternative Reservoir"), provided that the cumulative active storage capacity of Chimney Hollow Reservoir and any Alternative Reservoirs does not exceed 90,000 acre feet.

H. Colorado River Water Conservation District, ("River District") is a political subdivision of and a body corporate under the laws of Colorado, created by the provisions of C.R.S. §§ 37-46-101, et seq., for the purposes stated therein.

I. Grand County ("Grand County") is a county of the State of Colorado created by Article XIV of the Colorado Constitution and C.R.S. § 30-5-128, for the purposes stated therein.

J. Middle Park Water Conservancy District ("Middle Park") is a political subdivision of the State of Colorado, created under the provisions of C.R.S. §§ 37-45-101, et seq., for the purposes stated therein.

K. Municipal Subdistrict, Northern Colorado Water Conservancy District, ("Subdistrict") is a political subdivision of the State of Colorado, and formed under the provisions of C.R.S. §§ 37-45-101, et seq., for the purposes stated therein and as created by the Decree dated July 6, 1970, Weld County District Court, State of Colorado.

L. Municipal Subdistrict, Northern Colorado Water Conservancy District, Windy Gap Firming Project Water Activity Enterprise ("WGFP Enterprise") is a water activity enterprise of the Subdistrict organized under and pursuant to Article X, Section 20, of the Colorado Constitution and C.R.S. §§ 37-45.1-101 et seq.

M. "Net Credited Storage," is the amount of Windy Gap Project Water pumped at the Windy Gap Pumping Plant and conveyed to Granby Reservoir less any losses charged pursuant to the Amendatory Contract.

N. Northern Colorado Water Conservancy District ("Northern Water") is a political subdivision of the State of Colorado, created under the provisions of C.R.S. §§ 37-45-101, et seq., for the purposes stated therein, and is referenced in but not a party to this WGFP IGA.

O. Northwest Colorado Council of Governments ("NWCCOG") is a regional planning commission organized pursuant to C.R.S. § 30-28-105, and an association of local governments contracting pursuant to Article XIV, Section 18 of the Colorado Constitution and C.R.S. §§ 29-1-201, et seq., comprising municipalities and counties within the geographic boundaries of the Colorado counties of Grand, Eagle, Summit, Jackson, Routt, and Pitkin.

P. "Prepositioning" is the manner of integrated operations of the Colorado-Big Thompson Project and WGFP described in the Final Environmental Impact Statement for the WGFP and as may be authorized by Reclamation in the Amendatory Contract and/or Reclamation's Record of Decision for the WGFP.

Q. "Pumping Costs" incurred by Middle Park or Grand County pursuant to this WGFP IGA are 110% of the average electrical power costs of pumping for the Windy Gap Project for that year on a per acre-foot basis for Net Credited Storage.

R. United States Army Corps of Engineers ("USACE") is referenced in but not a party to this WGFP IGA.

S. United States Bureau of Reclamation, Department of the Interior ("Reclamation") is referenced in but not a party to this WGFP IGA.

T. "Water Apportionment" is Windy Gap Project Water that is made available for use by West Slope Parties pursuant to this WGFP IGA.

U. "West Slope Parties" are Grand County, Middle Park, the River District, and NWCCOG.

V. Windy Gap Firming Project ("WGFP") is a proposed project that will use the Windy Gap Water Rights and that is described in the Final Environmental Impact Statement and Record(s) of Decision.

W. "WGFP Completion" is the first time that the combined volume of Windy Gap Project Water stored in Chimney Hollow Reservoir and Windy Gap Project Water stored on behalf of WGFP Participants in Granby Reservoir is equal to 32% of the Active Storage of the constructed capacity of Chimney Hollow Reservoir.

X. WGFP Participants ("WGFP Participants") are those entities identified in the Final Environmental Impact Statement for the Windy Gap Firming Project, and also their successors and assigns, that hold a water allotment contract for the Windy Gap Project and own or are otherwise allocated a portion of the storage capacity of Chimney Hollow Reservoir.

Y. "Windy Gap Project" is an existing water supply system defined in Part II.A. of the 1980 Agreement.

Z. "Windy Gap Project Participants" are those entities that hold a water allotment contract for the Windy Gap Project.

AA. "Windy Gap Project Water" is any water stored or diverted pursuant to the Windy Gap Water Rights. Both the Windy Gap Project and the Windy Gap Firming Project will divert and store Windy Gap Project Water. Windy Gap Project Water will be diverted under the Grand County 2012 WGFP ("1041") Permit unless the Subdistrict notifies Grand County that it will divert under the original 1980 Windy Gap Project Permit. Only Windy Gap Project Water diverted under the terms and conditions of the 2012 WGFP ("1041") Permit may be stored in Chimney Hollow Reservoir.

BB. "WG Volumetric Limits" shall be those limitations set forth in Paragraph 34 of the 1980 Agreement, as modified by Paragraph 2 of the 1985 Supplemental Agreement. The WG Volumetric Limits are not affected or modified by this WGFP IGA.

CC. "Windy Gap Water Rights" are defined in the Decrees entered on October 27, 1980 in Civil Action No. 1768, District Court, Grand County, State of Colorado and Case Nos. W-4001, 80CW108, and 85CW135, District Court, Water Division No. 5; the Decree entered on February 6, 1989 in Case No. 88CW169, District Court, Water Division No. 5, State of Colorado; and the Decree entered on July 19, 1990, in Case No. 89CW298, District Court, Water Division No. 5, State of Colorado ("Windy Gap Decrees") and any subsequent diligence or other related decrees or amendments thereto.

II) Relationship to 1980 and 1985 Agreements.

This WGFP IGA supplements and partially amends the 1980 Agreement and the 1985 Agreement. The 1980 Agreement, as amended and supplemented by the 1985 Agreement, and the 1985 Agreement, remain valid and enforceable except as explicitly modified by this WGFP IGA. In the event of a termination of this WGFP IGA for any reason the 1980 and 1985 Agreements shall be enforceable according to their terms as if this WGFP IGA did not exist. While there are several signatories to the 1980 Agreement in addition to the undersigned parties, the rights of those additional signatories under the 1980 Agreement are not altered by this WGFP IGA.

III) Terms of the Agreement

A. Enhancements. The benefits provided in this WGFP IGA are in addition to and are not a substitute for the mitigation required by governmental agencies with jurisdiction over the WGFP.

B. Notification of Intent to Proceed with Windy Gap Firming Project.

1) The Subdistrict will proceed as expeditiously as reasonably possible using its best efforts to cause the construction of Chimney Hollow Reservoir. The Subdistrict shall notify the West Slope Parties in writing whether or not it intends to proceed with the Windy Gap Firming Project within 10

years of the issuance of the 404 Permit for the WGFP by the United States Army Corps of Engineers ("USACE") or upon execution of construction contracts for Chimney Hollow Reservoir, whichever occurs first.

2) This WGFP IGA shall terminate upon written notice to the West Slope Parties that the Subdistrict does not intend to proceed with the WGFP.

3) If the Subdistrict notifies the West Slope Parties that it intends to proceed with the WGFP, then it shall have the right under this WGFP IGA, but not the obligation, to construct and operate a total of 90,000 acre feet of storage on the Front Range. If the Subdistrict proceeds with the WGFP, then it shall provide all of the West Slope mitigation required by the Records of Decision for the WGFP and satisfy all of the obligations set forth in this WGFP IGA, regardless of the storage capacity that is authorized by the 404 Permit issued by the USACE, or the storage capacity that is ultimately constructed or utilized for the WGFP.

C. Except as necessary to ensure compliance with this WGFP IGA, all parties agree not to take any official action that results in a restriction of the right of the Subdistrict to construct, operate and use the full 90,000 acre feet of storage capacity of the Chimney Hollow Reservoir or Alternative Reservoir.

1) In the event of a breach of this obligation by Grand County, Paragraph IV. H. 2) of this WGFP IGA shall terminate and be of no further force or effect and the benefits provided to Grand County pursuant to Paragraph III.F. of this WGFP IGA and to Middle Park pursuant to Paragraph III.E. of this WGFP IGA shall be subject to the proportional reduction determined using the methods described in III.D.1.

2) In the event of a breach of this obligation by the River District, Paragraph IV. H. 2) of this WGFP IGA shall terminate and be of no further force or effect and the benefits provided to Grand County pursuant to Paragraph III.F. of this WGFP IGA and to Middle Park pursuant to Paragraph III.E. of this WGFP IGA shall be subject to the proportional reduction determined using the methods described in III.D.1.

3) In the event of a breach of this obligation by Middle Park, Paragraph III.E. of this WGFP IGA shall terminate and Middle Park shall receive water pursuant to the 1980 and 1985 Agreements, and the benefits provided to Grand County pursuant to Paragraph III.F. of this WGFP IGA shall be subject to the proportional reduction determined using the methods described in III.D.1 .

4) In the event of a breach of this obligation by NWCOG, Paragraph IV. H. 2) of this WGFP IGA shall terminate and be of no further force or affect and the benefits provided to Grand County pursuant to Paragraph III.F. of

this WGFP IGA and to Middle Park pursuant to Paragraph III.E. of this WGFP IGA shall be subject to the proportional reduction determined using the methods described in III.D.1.

5) The consequences provided for in Paragraphs III.C.1), III.C.2), III.C.3), and III.C.4) shall be suspended in the event that the Subdistrict later obtains the right to construct, operate, and use the full 90,000 acre feet of storage capacity of the Chimney Hollow Reservoir or Alternative Reservoir.

D. Proportional Reduction.

1) If a binding regulatory event, judicial determination, other implementation of existing or future legal requirements or restrictions, or other formal action of any entity causes or results in a permanent reduction in firm yield of the WGFP, other than a prohibition on prepositioning, then the West Slope Parties agree that the amount of water they receive pursuant to Paragraph III of this WGFP IGA will be subject to proportional reduction. The Parties agree to jointly determine the amount of said proportional reduction at the time the event takes effect or, as an alternative to the proportional reduction, identify measures that can be implemented to mitigate the reduction in firm yield of the WGFP. A proportional reduction shall be made to the Middle Park Water Apportionment and to the Grand County Water Apportionment under this WGFP IGA. In the event that the Parties cannot jointly determine what the proportional reduction should be, the issue of what constitutes a proportional reduction shall be resolved by a panel of three experts, one selected by the West Slope Parties, one selected by the WGFP Enterprise, and the third selected by the experts selected by the West Slope Parties and the WGFP Enterprise. If the determination of the expert panel is not acceptable, any Party may pursue any available judicial remedies.

2) If a binding regulatory event, judicial determination, other implementation of existing or future legal requirements or restrictions, or other formal action of any entity causes or results in a prohibition of prepositioning , then the West Slope Parties agree that the amount of water they receive pursuant to Paragraph III of this WGFP IGA shall be reduced in accordance with this Paragraph III.D.2).

(a) Middle Park Variable Water Supply will be reduced by reducing the 700 acre feet option in spill years in proportion to the amount of Windy Gap Project Water stored on August 1 in Chimney Hollow and Granby Reservoir, combined, as compared to the full storage capacity of Chimney Hollow Reservoir. If Middle Park elects to receive its portion of pumping in spill years, there shall be no reductions.

(b) Grand County Variable Water Supply shall not be subject to reductions.

(c) Middle Park Annual Water Supply shall not be subject to reductions.

(d) Grand County annual amount of Transfer Water shall be reduced by 15%.

E. Middle Park Water Apportionment.

1) Middle Park Election to Receive Water.

The provisions of the 1980 and 1985 Agreements which relate to the operation of the Windy Gap Project and the rights and interests of Middle Park shall remain in place until such time as WGFP Completion, and the approval of this WGFP IGA by the Water Court, Water Division No. 5 by Decree not subject to appeal.

(a) Middle Park shall have the right, within 1 year of WGFP Completion, to make a one-time and irrevocable election as to whether it will receive water pursuant to this WGFP IGA or receive water pursuant to the 1980 and 1985 Agreements.

(b) If a binding regulatory event, judicial determination, or other implementation of existing or future legal requirements or restrictions occurs as provided in Paragraph III. D. then Middle Park shall have the right to make an election as to whether it will receive water pursuant to this WGFP IGA, or receive water pursuant to the 1980 and 1985 Agreements. Subdistrict shall notify Middle Park within 60 days of each regulatory event, judicial determination, or other implementation of existing or future legal requirements or restrictions and shall explain to Middle Park the effect(s) of the event, determination, or implementation on water available to Middle Park pursuant to this WGFP IGA. If Middle Park has not made this election pursuant to a previous event, this election will be made by Middle Park within one year after written notification of each event.

(c) In the event that Middle Park elects to continue to receive water pursuant to the 1980 and 1985 Agreements following WGFP Completion, such water shall be available for use on August 1 of the Accounting Year immediately following pumping (except that any water pumped in August will be credited to the current Accounting Year), and any such water, which is unused on July 31st of that Accounting Year shall be transferred to Grand County on August 1st for use in accordance with Paragraph III. F. 2) and Paragraph III.F.4).

2) If Middle Park elects to receive water in accordance with this WGFP IGA, its apportionment will consist of the Middle Park Annual Water Supply and the Middle Park Variable Water Supply.

3) Middle Park Annual Water Supply.

(a) For the purposes of this WGFP IGA, Middle Park's Annual Water Supply is the combination of the 850 acre feet of Water defined in Section III.E.3)(b) and the 1,450 acre feet of Water defined in Section III.E.3)(c). Middle Park Annual Water Supply is not eligible to become a part of or contribute to the Middle Park Carryover Balance.

(b) 850 acre feet of Water. The Subdistrict and WGFP Enterprise will dedicate and set aside annually, but not cumulatively, at no cost to Middle Park, 850 acre feet of Windy Gap Project Water, which shall be available each and every year.

(c) 1,450 acre feet of Water.

(i) If the combined amount of Windy Gap Project Water stored in Chimney Hollow Reservoir and Windy Gap Project Water stored on behalf of WGFP Participants in Granby Reservoir at any time between the start of pumping of the Windy Gap Project and August 1st of any year is equal to or greater than 32% of the constructed capacity of Chimney Hollow Reservoir, the Subdistrict and WGFP Enterprise will dedicate and set aside at no cost 1,450 acre feet of water for Middle Park.

(ii) If the combined amount of Windy Gap Project Water stored in Chimney Hollow Reservoir and Windy Gap Project Water stored on behalf of WGFP Participants in Granby Reservoir at any time between the start of pumping of the Windy Gap Project and August 1st of any year does not equal or exceed 32% of the constructed capacity of Chimney Hollow Reservoir, the 1,450 acre feet of water will be reduced at the same proportion as the maximum amount of storage of Windy Gap Project Water stored in Chimney Hollow Reservoir and Windy Gap Project Water stored on behalf of the WGFP Participants in Granby Reservoir during the period between the start of pumping and August 1 is to 32% of the constructed capacity of Chimney Hollow Reservoir.

(iii) The Subdistrict and WGFP Enterprise shall provide Middle Park with the April 1st water supply forecast and any subsequent forecasts, which shall be used for planning

purposes to estimate the amount, if any, of the reduction in the 1,450 acre feet of water.

(iv) In the event that Middle Park receives less than 1450 acre feet of water pursuant to paragraph III.E.3)(c)(ii), Middle Park may retain and use any unused Annual Water Supply from the prior Accounting Year to make up the difference between the amount which it receives pursuant to paragraph III.E.3)(c)(ii) and 1450 acre feet of water.

(d) The Middle Park Annual Water Supply is available to Middle Park during the Accounting Year. Unused water from the Middle Park Annual Water Supply from the prior Accounting Year will transfer on August 1st to Grand County pursuant to Paragraph III.F.2) unless some portion of the water from the prior year is required to make up for the reduction in the 1450 acre feet of Water pursuant to Paragraph III.E.3)(c)(iv). Grand County shall, subject to the limitations in Paragraph III.F.4), have the right to use Middle Park Annual Water Supply transferred from Middle Park to Grand County in accordance with this Paragraph III.E.3)(d).

(e) Middle Park's Annual Water Supply will not be reduced by any losses charged pursuant to the Amendatory Contract.

4) Middle Park Variable Water Supply.

(a) Middle Park's Variable Water Supply is the water supply defined in this Paragraph III.E.4). Only Middle Park's Variable Water Supply is eligible to become part of or contribute to Middle Park's Carryover Balance and will be credited immediately upon pumping.

(b) The Subdistrict and WGFP Enterprise will provide a water supply forecast to Middle Park on April 1st.

(c) If the April 1st forecast does not anticipate a spill of Windy Gap Project Water, Middle Park may, on May 1st of that year, elect to receive 3.8% of the Windy Gap Project Water that will be diverted in the current water year in excess of 15,000 acre feet Net Credited Storage, up to a maximum of 1,500 acre feet Net Credited Storage as further limited by Middle Park's Carryover Balance Limitation. If the Windy Gap Project Participants have a need for additional water but do not wish to pay for the costs of additional pumping prior to such time as Middle Park has received 1,500 acre feet of Variable Water Supply, and the Windy Gap Water Rights are still in priority, Middle Park may request that the Subdistrict continue diversions of Windy

Gap Project Water up to the 1,500 acre feet maximum, as limited by Middle Park's available Carryover Balance Limitation.

(d) If the April 1st forecast anticipates a spill of Windy Gap Project Water or if a spill has actually occurred, Middle Park shall, by May 1st, elect whether it will:

(i) Receive 3.8% of the Windy Gap Project Water diverted and stored in the current water year in excess of 15,000 acre feet Net Credited Storage, up to a maximum of 1,500 acre feet of Net Credited Storage, and as further limited by Middle Park's available Carryover Balance Limitation. If the Windy Gap Project Participants have a need for additional water but do not wish to pay for the costs of additional pumping prior to such time as Middle Park has received 1,500 acre feet of Variable Water Supply, and the Windy Gap Water Rights are still in priority, Middle Park may request that the Subdistrict continue diversions of Windy Gap Project Water up to 1,500 acre feet maximum, as limited by Middle Park's Carryover Balance Limitation; or

(ii) Receive from the Subdistrict and WGFP Enterprise by substitution such additional amount of Windy Gap Project Water stored in Chimney Hollow Reservoir as is required to result in a total Carryover Balance of 700 acre feet of Middle Park Variable Water Supply, which 700 acre feet shall not be subject to spill; or

(iii) Middle Park may elect to not receive any Middle Park Variable Water Supply.

(e) Middle Park shall pay to the Subdistrict the Pumping Costs for pumping the Middle Park Variable Water Supply which it elects to receive pursuant to Paragraph III.E.4).

5) The Subdistrict will release Middle Park Annual Water Supply and Middle Park Variable Water Supply at the request of Middle Park for all beneficial uses allowed by the 1980 Agreement and 1985 Agreement. Such uses shall include direct use or use by substitution, augmentation, or exchange, including but not limited to, exchange into Wolford Mountain Reservoir or replacement to Denver Water by entities that have Middle Park Contracts, and any other use authorized in a subsequent written agreement between Middle Park, the Subdistrict, and WGFP Enterprise.

F. Grand County Water Apportionment.

1) For the purposes of this WGFP IGA, the Grand County Water Apportionment consists of the Grand County Transfer Water, the Grand County Interim Transfer Water, and the Grand County Variable Water Supply described in this Paragraph III.F. The Grand County Water Apportionment shall be used as directed by Grand County and consistent with this WGFP IGA.

2) Grand County Interim Transfer Water and Grand County Transfer Water.

(a) Grand County Transfer Water is any of the Middle Park Water Apportionment received by Middle Park which is transferred to Grand County on August 1st of each year pursuant to Paragraph III.E.1)(c) and Paragraph III.E.3)(d).

(b) Commencing on the first day of August, but no less than 12 months after the execution of this WGFP IGA, the Subdistrict shall make available for Grand County's use 50% of any of the Middle Park Water Apportionment that is unused from the previous year (the "Grand County Interim Transfer Water"). Upon WGFP Completion, the Grand County Interim Transfer Water shall vest as 100% of the water provided by Paragraph III.E.1)(c) and Paragraph III.E.3)(d). In the alternative, the Subdistrict's provision of the Grand County Interim Transfer Water will cease upon notice pursuant to III.B.2) that the Municipal Subdistrict does not intend to proceed with the WGFP.

(c) Grand County Transfer Water must be either: (1) used between August 1st and October 15th of the then current water year, or (2) on October 15th become Grand County Carryover Balance, as limited by Grand County's available Carryover Balance Limitation.

(d) Grand County's Transfer Water shall not be subject to any losses charged pursuant to the Amendatory Contract until such water is transferred to Grand County's Carryover Balance, at which time it will be assessed the appropriate losses, if any, specified in the Amendatory Contract.

3) Grand County Variable Water Supply shall include the following elements:

(a) Concurrent Pumping.

(i) Grand County Concurrent Pumping shall become available at WGFP Completion.

(ii) Grand County may, by May 1st of each year, elect to receive 3.8% of the Windy Gap Project Water diverted and stored in the current water year in excess of 15,000 acre feet Net Credited Storage, up to a maximum of 1,500 acre feet Net Credited Storage, and as further limited by Grand County's available Carryover Balance Limitation.

(b) Additional Pumping.

(i) Grand County Additional Pumping shall become available at WGFP Completion.

(ii) If Windy Gap Project Participants and WGFP Participants have a need for additional water but do not wish to pay for the costs of additional pumping prior to such time as Grand County has received 1,500 acre feet of water from Concurrent Pumping and the Windy Gap Water Rights are still in priority, Grand County may request that the Subdistrict continue Windy Gap Project Water diversions up to a combined maximum of 1,500 acre feet of Concurrent and Additional Pumping, as further limited by the available Grand County Carryover Balance Limitation. The Subdistrict and WGFP Enterprise will make best efforts to provide five (5) days advance notice of the anticipated end of pumping for Windy Gap Project Participants and WGFP Participants.

(c) End of Year Pumping.

(i) Prior to WGFP Completion, Grand County may request that the Subdistrict continue Windy Gap Project Water diversions if the Windy Gap Project Participants have a need for additional water but do not wish to pay for the costs of additional pumping and the Windy Gap Project Water Rights are in priority, as limited by the Grand County Carryover Balance Limitation.

(ii) After WGFP Completion, Grand County may request that the Subdistrict continue Windy Gap Project Water diversions if the Windy Gap Project Participants, WGFP Participants, and Middle Park have a need for additional water but do not wish to pay for the costs of additional pumping and the Windy Gap Project Water Rights are in priority, as limited by the Grand County Carryover Balance Limitation.

(d) Grand County's Variable Water Supply shall be credited to Grand County's Carryover Balance immediately upon pumping.

(e) Grand County shall pay pumping costs for the Grand County Variable Water Supply provided pursuant to Paragraph III.F.3).

4) The Subdistrict will release the Grand County Water Apportionment from Granby Reservoir at the request of Grand County or its designee for diversion for irrigation, domestic, municipal or industrial uses on the West Slope that do not require a change of the Windy Gap Water Rights. The Parties will use their best efforts to effectuate the purposes of the Grand County Water Apportionment in a manner that does not require a change of the Windy Gap Water Rights. The Parties acknowledge that Grand County intends to time such releases for beneficial use in a manner that results in optimizing the benefits to aquatic and recreation resources within the County and furthering the goals of the Learning by Doing Cooperative Effort (Exhibit 1). The Parties intend that the Grand County Water Apportionment not be diverted for irrigation, domestic, municipal or industrial uses upstream of the confluence of the Colorado River and Blue River by any person or any entity.

(a) The Parties intend for the reservoir releases of the Grand County Water Apportionment to increase the flow of water through the County above flows that would otherwise exist. To accomplish these objectives, the River District will make good faith efforts to arrange for the delivery of the Grand County Water Apportionment for diversion and beneficial use for irrigation, domestic, municipal or industrial uses on the Colorado River or its tributaries, below the confluence of the Blue and Colorado Rivers. Unless otherwise directed by Grand County, the River District's efforts will be focused on diversion and beneficial use downstream of the confluence of the Colorado and Roaring Fork Rivers but upstream of the Utah State Line.

(b) Grand County and the Subdistrict may request annual reports of the beneficial use made of the Grand County Water Apportionment. Any dispute regarding such use will be resolved in accordance with the Conflict Resolution provisions of this WGFP IGA (Paragraph VI.O.). Regardless of the outcome of any dispute regarding this paragraph, the Parties agree that the River District shall not bear any liability regarding the beneficial use of, or the failure to arrange for the beneficial use any of, the Grand County Water Apportionment.

(i) Following is a list of representative, but not exclusive, beneficial uses that the Parties agree satisfy the intent of this paragraph III.F.4):

Diversion for irrigation (including agriculture, lawn watering, parks, and stock-water), domestic, municipal, or industrial uses by: the Grand Valley Irrigation Company (irrigation, including uses incident of irrigation); Grand Valley Water Users Association (including irrigation, power generation, and uses incident to those uses); Orchard Mesa Irrigation District (irrigation, irrigation lift/pumping, power generation, and exchanges incident to such uses); Palisade Irrigation District (irrigation); Mesa County Irrigation District (irrigation); Ute Water Conservancy District (including municipal); Town of Clifton (municipal); Silt Water Conservancy District (irrigation and domestic); Town of Silt (municipal); Town of New Castle (municipal); City of Rifle (municipal); Battlement Mesa (municipal); diversions at the Bluestone or Town of Debeque intakes (municipal, irrigation, and industrial); substitutions in lieu of releases from Wolford Mountain Reservoir or Ruedi Reservoir for municipal, irrigation or industrial uses under the River District's water marketing program; substitutions in lieu of releases from, or exchanges into, Williams Fork Reservoir to increase the amount of, or flexibility of use, of water in Grand County's account in Williams Fork Reservoir; transit losses attributable to such uses as may be assessed by the State Engineer.

5) The Parties agree that, if Grand County determines then-current stream flow conditions in the County are sufficient to satisfy the purposes of the releases of water as described in Paragraph III.F.4), including downstream of the confluence of the Colorado and Blue Rivers, then the Grand County Water Apportionment may be exchanged or substituted for water that otherwise would be released from Wolford Mountain Reservoir, Green Mountain Reservoir or Williams Fork Reservoir in order to assist Front Range and West Slope water users in managing limited water supplies for use in the upper Colorado River basin.

G. Priority of Pumping. The right of Middle Park and Grand County to pump additional water pursuant to Paragraphs III.E.4)(c), III.E.4)(d)(i) and III.F.3)(b)(ii) shall be shared on an equal basis between Middle Park and Grand County.

H. Middle Park and Grand County Water Apportionments, Carryover Balances, and Carryover Balance Limitations.

1) Subject to the provisions of this Paragraph III.H., Middle Park and Grand County may each have a Carryover Balance derived from Water Apportionments made available pursuant to Paragraphs III.E.4), III.F.2) and III.F.3). The maximum Carryover Balance available to Middle Park

and Grand County shall not exceed their respective Carryover Balance Limitation.

2) Middle Park shall have the right to a Carryover Balance Limitation of 3,000 acre feet for its Variable Water Supply for use in the then current or subsequent water years.

3) Grand County Carryover Balance Limitations.

   (a) Upon execution of this WGFP IGA and until WGFP Completion, Grand County shall have the right to accrue a maximum of 7,500 acre feet of Carryover Balance for use in the then current or subsequent water years.

   (b) Upon WGFP Completion Grand County's Carryover Balance Limitation shall be reduced to 6,000 acre feet until at such time as the Windy Gap Project Water stored in Chimney Hollow Reservoir has reached, at any point in time, 85% of the constructed active storage capacity of Chimney Hollow Reservoir .

   (c) At such time as the Windy Gap Project Water stored in Chimney Hollow Reservoir has reached, at any point in time, 85% of the constructed active storage capacity of Chimney Hollow Reservoir, Grand County's Carryover Balance Limitation shall be reduced to 4,500 acre feet

   (d) The permanent Grand County Carryover Balance Limitation shall be 4,500 acre feet. If Chimney Hollow Reservoir construction begins but is not completed as a result of actions by the West Slope Parties, any water stored in this account will revert to the Subdistrict.

4) Except during the first fill of Chimney Hollow, during which Paragraphs III.H.3) controls, Middle Park and Grand County can share a combined Carryover Balance Limitation of 7,500 acre feet. Middle Park and Grand County shall notify the Subdistrict before or during pumping of their intent to share the Carryover Balances and the respective amounts of water to be stored for each.

5) Any Carryover Balance of Middle Park or Grand County shall be reduced by any losses, if any, charged pursuant to the Amendatory Contract. Middle Park and Grand County shall be provided with documentation of such charges before any such reductions.

6) Any Variable Water Apportionment and any Carryover Balance made available to Middle Park or Grand County pursuant to this WGFP IGA shall be subject to a pro rata share of monetary charges, payable by Middle

Park or Grand County as applicable, for storage of Windy Gap Project Water in Granby Reservoir, if any, assessed pursuant to the Amendatory Contract. The Parties will advocate to Reclamation that no monetary charges be assessed for storage of Windy Gap Project Water in Granby Reservoir.

7) The Parties will advocate that Reclamation adopt specific and different shrink charges for introduction and storage of Windy Gap Project Water on the West Slope and conveyance and delivery of Windy Gap Project Water to the east slope.

8) All Carryover Balances referred to in this paragraph III.H. shall be Net Credited Storage.

I. Spill Criteria:

1) 1st to spill - Grand County Carryover Balance over 1,500 acre feet.

2) 2nd to spill - Any remaining Grand County Carryover Balance, any Middle Park Carryover Balance, and any Windy Gap Project Water stored on behalf of the WGFP Participants proportionally, based on Carryover Balances and Windy Gap Project Water in storage on behalf of the WGFP Participants as of the date(s) of spill.

3) 3rd to spill – Windy Gap Project Water stored on behalf of Windy Gap Project Participants that are not WGFP Participants.

J. No Paper Spills. In the event that Middle Park or Grand County have a Carryover Balance and the total amount of Colorado-Big Thompson Project water in active storage in Granby Reservoir and Chimney Hollow Reservoir, combined, reaches 465,568 acre feet, Middle Park's and Grand County's Water Apportionments will only spill in the event of a physical spill from Granby Reservoir. Any physical spill of Windy Gap Project Water will be allocated between WGFP Participants, Middle Park, and Grand County in accordance with Paragraph III.I.

K. Minimum Pumping. If Windy Gap Project Water is not already being pumped, the Subdistrict shall not be required to pump Variable Water Supply for any party unless the Subdistrict's water supply forecasts predict that there will be a minimum of 1,000 acre feet of water available for diversion and storage under the Windy Gap Water Rights at the time of the proposed pumping during the current pumping season.

L. Pumping Costs. Pumping Costs shall be payable 30 days after the submission of an invoice by the Subdistrict at the end of the then current pumping season to the appropriate entity. The invoice shall include the actual bills from the

power provider. In the event of a delinquency or failure to pay Pumping Costs by Middle Park or Grand County, the Subdistrict shall suspend release of any Variable Water Supply held by the Subdistrict for that entity and all future pumping for the delinquent Party pursuant to this WGFP IGA until any delinquent payments have been made in full.

IV) Additional Provisions

A. Wolford Protection. The Subdistrict, and the WGFP Enterprise agree that the Windy Gap Project and the WGFP will be operated in a manner that does not diminish the ability of the Colorado River Water Conservation District to capture the natural flow of Muddy Creek up to a maximum of 65,998 acre feet pursuant to the water rights, applicable permits, and operating criteria for Wolford Mountain Reservoir.

B. Future Uses. The Subdistrict and WGFP Enterprise agree to not place a call under the Windy Gap Decrees on any present or future water rights on the Colorado and Fraser Rivers and their tributaries above Windy Gap Reservoir; Provided, however, the Windy Gap Project and WGFP may divert any water which can be diverted in priority at the decreed point of diversion without placing a call as described above except for water provided as described in paragraph IV. M. of this WGFP IGA.

C. Open Space. Upon execution of this WGFP IGA, the Subdistrict agrees to impose a deed restriction on the sale of any parcel that requires subsequent development of the parcel to be approved subject to the existing Grand County Rural Land Use Process in conformance with C.R.S. § 30-28-403, as it exists now or may be amended in the future; provided, however, that nothing in this WGFP IGA or in the deed restriction shall affect or preclude the sale or development of such parcel(s) pursuant to provisions of existing or future law that allow the sale or development of lands in a manner that is not within the definition of a "subdivision" or "subdivided land".

D. Public Access. Upon execution of this WGFP IGA, the Subdistrict will make arrangements with Northern Water to provide public access to that portion of Willow Creek located on Northern Water's lands for as long as Northern Water owns the lands adjacent to Willow Creek, if and to the extent that the public access will be managed by the Colorado Division of Parks and Wildlife or other entity acceptable to Northern Water.

E. Jasper Reservoir Conditional Water right. The Subdistrict will abandon the conditional water right for Jasper Reservoir upon WGFP Completion.

F. Recording and Telemetry Devices. Recording and telemetry devices for flow measuring devices approved by the Colorado State Engineer will be acquired, installed, operated, maintained and replaced by and at the expense of the

WGFP Enterprise if it is able to obtain permanent access agreements allowing the WGFP Enterprise to install, operate, maintain, and replace such devices.

G. Water Accounting. The Subdistrict agrees to submit detailed daily water accounting to the State of Colorado Division Engineer as required by the Division Engineer and provide copies to the West Slope Parties.

H. Future Water Development.

1) Compact Curtailment Plan. The Signatories agree to cooperate in good faith toward the development of a plan to avoid and address a potential curtailment of existing Colorado water rights under the provisions of the 1922 Colorado River Compact and the 1948 Upper Colorado River Compact. The Signatories agree to meet and confer before the Municipal Subdistrict or WGFP Enterprise take any action pursuant to Paragraph IV.H.3. of this WGFP IGA.

2) The Subdistrict and WGFP Enterprise agree that, without the prior express written consent of Grand County and the Colorado River Water Conservation District, they will not (a) acquire any existing water rights in Grand County; (b) construct additional water supply facilities in Grand County, (c) appropriate new water rights in Grand County; or (d) appropriate any new water rights in Water Division No. 5 that will result in depletions of water from Grand County.

3) Compact Curtailment Actions.

(a) To the extent, and during such time that the operation of the Windy Gap Project or WGFP, or the exercise of the Windy Gap Project Water Rights, is or may in the future be curtailed, limited, or otherwise restricted as the result of, or for the purpose of, compliance with the 1922 Colorado River Compact or 1948 Upper Colorado River Compact ("Compact Curtailment"), the Municipal Subdistrict or WGFP Enterprise may take any actions or use any existing or future facilities as may be required to provide a water supply to the Municipal Subdistrict or WGFP Enterprise, as limited by and subject to the WG Volumetric Limits ("Compact Curtailment Actions") and the express obligations of the Subdistrict and WGFP Enterprise under this WGFP IGA. The Municipal Subdistrict or WGFP Enterprise may undertake such Compact Curtailment Actions as may be necessary to prudently plan and prepare in advance of any potential Compact Curtailment; Provided however, that any such advance Compact Curtailment Actions will be implemented only during such time that the quantity of water that would otherwise be diverted under the Windy Gap Water Rights is reduced as the result of a Compact

Curtailment. The West Slope Parties may oppose any Compact Curtailment Actions in any forum.

(b) Nothing in this WGFP IGA, including without limitation Paragraphs IV.H.1) and IV.H.2) above, shall affect, limit, or otherwise restrict the right of the Municipal Subdistrict or WGFP Enterprise to take any actions or to use any existing or future facilities as required to provide a water supply to the Municipal Subdistrict or WGFP Enterprise, as limited by and subject to the WG Volumetric Limits, in the event, to the extent, and during such time that the operation of the Windy Gap Project or WGFP, or the exercise of the Windy Gap Project Water Rights, is or may in the future be curtailed, limited, or otherwise restricted as the result of or for the purpose of compliance with the 1922 Colorado River Compact or 1948 Upper Colorado River Compact. Nothing in this WGFP IGA shall limit or restrict the right of West Slope Parties to oppose any such actions or use of any such existing or future facilities.

(c) Nothing in this Paragraph IV.H.3 shall be construed to 1) allow the Subdistrict or WGFP Enterprise to increase the yield of the WG Project or WGFP at times other than when the quantity of water that would otherwise be diverted under the Windy Gap Water Rights is reduced as the result of the enforcement of the 1922 Colorado River Compact or 1948 Upper Colorado River Compact, or 2) use any banked or stored water in a manner that causes an increase in the yield of the Windy Gap Project or WGFP at times other than when the quantity of water that would otherwise be diverted under the Windy Gap Water Rights is reduced as the result of the enforcement of the 1922 Colorado River Compact or 1948 Upper Colorado River Compact.

(d) Nothing in this Paragraph IV.H.3) shall affect the obligations of the Subdistrict and WGFP Enterprise under Paragraph III. of this WGFP IGA.

4) Nothing in this WGFP IGA shall affect, limit, or otherwise restrict the right of the Municipal Subdistrict to fully utilize the Windy Gap Water Rights and associated existing facilities in Grand County or any existing or future facilities on the East Slope, or existing or future water rights in Water Division No. 1 in a manner that will not exceed the WG Volumetric Limits. The West Slope Parties reserve the right to oppose any actions taken by the Subdistrict intended to achieve the WG Volumetric Limits using existing or future facilities or water rights that are not expressly authorized by the 1980 Agreement, the 1985 Supplemental Agreement, and this WGFP IGA.

5) Any consent of Grand County under Paragraph IV.H.2) shall not be construed as a limitation on or waiver of any review, approval, or permit authority, or a predetermination of any action to be taken thereunder by Grand County.

6) Nothing in this WGFP IGA shall affect, limit, or otherwise restrict the maintenance, repair, replacement or rehabilitation of the existing Windy Gap Project facilities, replacement facilities, or rehabilitated facilities located in Grand County.

I. CWCB Instream Flow. The Subdistrict and WGFP Enterprise will support the entry of a decree in accordance with applicable law for a CWCB instream flow on the Colorado River mainstem from the confluence of the Blue and Colorado Rivers to a point immediately upstream of the confluence of the Eagle and Colorado Rivers if a) the CWCB instream flow is not used as a basis for imposing restrictions or limitations on the WGFP, b) the West Slope Parties agree that they will never assert in any forum that the CWCB Instream flow be used as a basis for restrictions or limitations on the WGP or WGFP, and c) the right is subject to substantively the same terms and conditions as are set forth in the Findings of the CWCB in declaring its intent to appropriate dated _____, 2011.

J. Grand County RICD. Subdistrict and WGFP Enterprise will not oppose the entry of a decree in Case No. 10CW298 consistent with the draft decree dated September 20, 2012 and stipulation attached as Exhibit 2 to this WGFP IGA.

K. Shoshone Outage Protocol.

1) For purposes of this WGFP IGA, the Shoshone Outage Protocol means that the Windy Gap Project and WGFP will operate as described in this paragraph IV.K.1), IV.K.2), and IV.K.3) during periods when the Shoshone Power Plant is shutdown or otherwise not able to divert the full amount of its 1,250 cfs senior water right due to repair, maintenance, or other reasons ("Shoshone Outage"). When the Windy Gap Project's participation in the Shoshone Outage Protocol is in effect pursuant to this WGFP IGA, the Windy Gap Project and WGFP will bypass the amount of water that the Windy Gap Project and WGFP would have been required to bypass if the Senior Shoshone Call had been in effect in order to result in a flow of not more than 1,250 cfs at the Dotsero gage on the Colorado River (not including any water released for endangered fish species purposes). For purposes of this WGFP IGA, a Shoshone Outage does not include a shutdown of the Shoshone Power Plant for regularly scheduled maintenance for a cumulative period of 17-days during the period of November 1 through March 15.

2) The Windy Gap Project and WGFP will operate in accordance with the Shoshone Outage Protocol from July 16-April 14 of each year. Prior to WGFP Completion, the Windy Gap Project and WGFP may operate in accordance with the Shoshone Outage Protocol during the period of April 15-July 15 on a voluntary cooperative basis. Following WGFP Completion, the Windy Gap Project and WGFP will operate in accordance with the Shoshone Outage Protocol during the period April 15 – July 15 at any time during this period when the combined amount of Windy Gap Project Water stored in Chimney Hollow Reservoir and Windy Gap Project Water stored on behalf of WGFP Participants in Granby Reservoir is greater than 50% of the Active Capacity of Chimney Hollow Reservoir.

3) Participation in the Shoshone Outage Protocol by the Windy Gap Project and WGFP during the period of April 15-July 15 will be limited to a total maximum volume of foregone pumping equal to 10,000 acre feet (30 days with one pump running) in one year, a total of 20,000 acre feet (60 days with one pump running) in any 3 consecutive year period, and a total of 30,000 acre feet (90 days with one pump running) in any 5 consecutive year period.

4) The Subdistrict agrees that it will participate in good faith in negotiations to achieve permanent management of the flow of the Colorado River to address certain flow changes that result during a Shoshone Outage.

L. Cooperative Effort for Aquatic Environment. The Subdistrict and the WGFP Enterprise, Grand County, Middle Park, and the River District agree to participate in the Learning by Doing Cooperative Agreement ("Cooperative Agreement") as defined in the Intergovernmental Agreement for The Learning by, Doing Cooperative Effort which is attached as Exhibit 1 but which is not a part of or incorporated within this WGFP IGA. Any amendments to the Cooperative Agreement shall not require amendment or modification of this WGFP IGA.

M. Colorado River Cooperative Agreement. The Subdistrict and the WGFP Enterprise agree not to oppose or otherwise interfere with the efforts to obtain such court decrees and approvals as are necessary for the Colorado River Cooperative Agreement to the extent that the court decrees and approvals do not adversely affect the WGFP or Windy Gap Project. The Subdistrict further agrees that it will not divert water that would not have been available but for the actions of the Management Committee or Grand County pursuant to the Learning by Doing process.

N. Wild and Scenic. Within one year of issuance of an acceptable permit for the WGFP, the Subdistrict shall pay $50,000 and the River District shall pay $25,000 to the Endowment Fund of the Upper Colorado River Wild and Scenic Stakeholder Group for use to protect Wild and Scenic resources

identified in the Colorado River from Kremmling downstream to No Name. The Subdistrict's contribution provided herein shall satisfy the obligation of the Subdistrict and WGFP Enterprise to contribute endowment funds for Wild and Scenic purposes under this WGFP IGA. The Subdistrict agrees that the River District's contribution provided herein shall satisfy the obligation of the River District to contribute endowment funds for Wild and Scenic purposes under the WGFP IGA. The Subdistrict will contribute 20% of the amount contributed by the River District, not to exceed $5,000 annually adjusted annually by the Denver-Boulder-Greely CPI-U, for annual operating costs of the Upper Colorado River Wild and Scenic Stakeholder Group.

O. Windy Gap Water Right Diversion at Granby Reservoir. Absent the express written consent of Grand County and the River District, the Subdistrict and WGFP Enterprise agree that neither will divert water at Granby Reservoir under the priority of the Windy Gap Decrees or during free-river conditions.

P. Bypass of Windy Gap Reservoir. The Subdistrict will enter into an agreement with Colorado Division of Parks and Wildlife to provide up to $250,000 to study methods for bypass of flows, sediment, and/or fish around or through Windy Gap Reservoir and identify potential modifications that would provide tangible benefits to aquatic resources below Windy Gap Reservoir. The implementation of recommendations resulting from the study will not constitute a violation of or require amendment of this WGFP IGA or the 1980 and 1985 Agreements.

V) West Slope Parties' Commitments

A. No Opposition to WGFP. The West Slope Parties will not oppose final state and federal approvals of the WGFP, subject to performance of this WGFP IGA by the Subdistrict and WGFP Enterprise and the performance of such mitigation, requirements, and conditions as are required in those approvals, including but not limited to the Records of Decision by Reclamation and USACE, the Amendatory Contract, 401 Certification, or the 404 Permit. Nothing herein shall affect any 1041 authority of Grand County.

B. Reopen Approvals or Authorizations. The West Slope Parties will not request that any governmental approval or authorization of the Windy Gap Project or the WGFP be subject to provisions that have the effect of reopening the governmental approval or authorization. For a period of five years from the date of the first diversions into the constructed Chimney Hollow Reservoir, no party will unilaterally request, or cause others to request, that the United States Army Corps of Engineers or other regulatory agency with jurisdiction and authority over the WGFP, reopen a permit or license for the Windy Gap Project or WGFP for any reason except as may be necessary to preserve any right to undertake such action prior to expiration of any applicable legal deadline or statute of limitation. Each party reserves the right to oppose any

such efforts to reopen the permits or licenses for the Windy Gap Project or WGFP. This Paragraph V.B. is not intended to prevent the West Slope Parties from commencing any legal action to enforce this WGFP IGA or to request enforcement of specific terms of federal permits.

C. Windy Gap Reservoir Conditional Storage Right. The West Slope Parties will not oppose future applications to make the remaining conditional portion (1,101.14 acre feet) of the existing Windy Gap Reservoir storage right absolute.

D. Modification of Windy Gap Decree. The West Slope Parties will consent to the entry of a decree modifying the existing Windy Gap Decrees to incorporate this WGFP IGA and will not assert that a change of the Windy Gap Water Rights is required for the operations of the Windy Gap Project or WGFP in a manner consistent with this WGFP IGA.

VI) Further Agreements of the Parties

A. Reform of Invalid Provisions. Wherever possible each provision of this Agreement shall be interpreted and implemented to be effective and valid under applicable law. If any provision or portion of this WGFP IGA is determined to be invalid or unenforceable by a final, non-appealable order or decision of any judicial or administrative body with jurisdiction, the Parties agree to reform this WGFP IGA to replace any such invalid or unenforceable provision with a valid and enforceable provision that comes as close as possible to the intention of the invalid or unenforceable provision. The provisions of this WGFP IGA shall be reasonably and liberally construed to achieve the intent of the Parties.

B. No Party will oppose final state, local and federal approvals of the WGFP, subject to performance of this WGFP IGA by the Subdistrict and WGFP Enterprise and the performance of such mitigation, requirements, and conditions as are required in those approvals, including but not limited to the Records of Decision by Reclamation and USACE, the WGFP Amendatory Contract, 401 Certification, or the 404 Permit. Nothing herein shall affect any 1041 authority of Grand County.

C. The Subdistrict agrees that conditions of the federal authorization for the WGFP will include provisions that substantially conform to the following:

1) the total volume of Colorado-Big Thompson Project water stored in the combination of Granby and Chimney Hollow Reservoirs will not exceed 465,568 acre feet. For the purposes of this Paragraph of the WGFP IGA, the amount of Colorado-Big Thompson Project water in storage in Granby Reservoir shall be the amount of Colorado-Big Thompson Project water

stored above the invert of the Farr Pumping Plant Intake and below the normal high water line; and

2) in any year in which the April 1st or subsequent projection by Northern Water anticipates a spill at Granby Reservoir, Colorado-Big Thompson Project water then in storage in Chimney Hollow Reservoir shall not be released to satisfy delivery requirements to Colorado-Big Thompson Project Allottees if such release would allow the capture and storage of additional Colorado-Big Thompson Project water in Granby Reservoir.

D. Nothing in this WGFP IGA shall be construed to limit the discretion of the Northern Colorado Water Conservancy District or Reclamation regarding the operation of the Colorado-Big Thompson Project, including, without limitation the pre-emptive release of Windy Gap Project water from Granby Reservoir that may increase the risk of or result in a spill of water provided to Middle Park or Grand County (any such spill in accordance with Paragraph III.I of this WGFP IGA).

E. Except as necessary to comply with the express terms of this WGFP IGA, nothing in this WGFP IGA shall be construed to limit the discretion of the Subdistrict or WGFP Enterprise regarding the operation of the Windy Gap Project or Windy Gap Firming Project, including, without limitation, the pre-emptive release of Windy Gap Project Water from Granby Reservoir that may increase the risk of or result in a spill of water provided to Middle Park or Grand County in accordance with Paragraph III.I of this WGFP IGA (any such spill in accordance with Paragraph III.I of this WGFP IGA).

F. The Parties agree that performance of this WGFP IGA, compliance with any mitigation requirements for the WGFP imposed by a federal or state agency, and compliance with the requirements of a Grand County 2012 Windy Gap Firming Project ("1041") Permit for the WGFP shall constitute full and complete satisfaction of the obligations of the Subdistrict and WGFP Enterprise to set forth and complete a plan with respect to the WGFP which satisfies the requirements of C.R.S. § 37-45-118(1)(b)(II) of the Water Conservancy Act.

G. This WGFP IGA does not limit, change or expand the role of or protections afforded to all Parties with interests in the Colorado-Big Thompson Project as described in the Manner of Operation provisions of Senate Document No. 80, the 1961 Principles to Govern the Release of Water at Granby Dam To Provide Fishery Flows Immediately Downstream In The Colorado River ("1961 Principles"), and the Blue River Decrees. Water released from Granby Reservoir pursuant to this WGFP IGA shall be in addition to the then current bypass of water under the 1961 Principles.

H. The obligations of the Parties to this WGFP IGA shall exist upon execution of this WGFP IGA unless otherwise specified in this WGFP IGA.

I. Except to the extent and unless it is terminated, this WGFP IGA shall be incorporated within and be a non-severable part of the Windy Gap Decrees. The Subdistrict will not divert water into Chimney Hollow Reservoir unless this WGFP IGA is incorporated within the Windy Gap Water Rights.

J. The West Slope Parties agree to not assert that the WGFP and Moffat Collection System Project are interdependent or interrelated.

K. This WGFP IGA is an agreement between the Parties and does not bind or limit the authority or jurisdiction of agencies of the United States of America.

L. Performance of the portions of this WGFP IGA that require the expenditure of funds are subject to future budgeting and appropriation of funds by the governing bodies of the Subdistrict, WGFP Enterprise, Middle Park, Grand County, and the River District. The Parties agree to make good faith efforts to appropriate such funds.

M. The Parties agree that this WGFP IGA is an intergovernmental agreement pursuant to Article XIV, Sec. 18 of the Colorado Constitution and C.R.S. §§ 29-1-201 et. seq. inclusive, among all governmental entities hereto. In addition to any other remedy provided by law, the Parties further agree that the terms and conditions of this WGFP IGA are enforceable by specific performance and agree not to bring any defense to specific performance based on the doctrine of governmental immunity. The Parties also agree that a breach of this WGFP IGA will cause irreparable harm sufficient for injunctive relief.

N. The Parties agree to work cooperatively to implement a stipulated resolution of the Green Mountain Reservoir Administrative Fill dispute.

O. The Parties agree that if a dispute arises on any matter covered by this WGFP IGA, the Parties will confer in good faith and endeavor to resolve the concern. If the Parties reach an impasse, they will select a neutral third party mediator who would seek an acceptable voluntary solution to the conflict. For conflicts that involve a technical or scientific matter, the neutral third party mediator may select an independent technical or scientific expert, acceptable to the Parties involved in the mediation, to review and make a recommendation on the matter. If the conflict cannot be resolved through the efforts of the mediator, then the affected Parties may pursue any available legal or administrative recourse. Nothing herein shall preclude the commencement of any action that would otherwise be barred by a statute of limitations or the timely participation in any judicial or administrative process.

P. This WGFP IGA is the result of negotiations between the Parties and their respective counsel. These negotiations produced numerous drafts that were prepared by one or more of the Parties. The Parties agree that these drafts, including omissions, do not provide or represent evidence of intent of any Party and may not be relied upon for purposes of construction and enforcement of this WGFP IGA or for any other purpose.

Q. Suspension and Termination of 1041 Permits. The Subdistrict and WGFP Enterprise shall not be obligated to perform or comply with Paragraphs III. E. through L. or IV.K. (SHOP) of this WGFP IGA during any period of suspension of the WGFP 1041 Permit issued by Grand County. This WGFP IGA shall be terminated and of no further force or effect if the WGFP 1041 Permit issued by Grand County is terminated or revoked. During such time of suspension, or in the event of termination or revocation of the WGFP Permit (1041), the 1980 Agreement, as amended and supplemented by the 1985 Agreement, and the 1985 Agreement, shall be in full force and effect according to their terms.

1) Suspension of 1041 Permit. The Subdistrict and WGFP Enterprise shall not be obligated to perform or comply with Paragraphs III.E through L, or IV.K. (SHOP) of this WGFP IGA during any period of suspension of the WGFP 1041 Permit issued by Grand County.

   (a) During such time of suspension, the 1980 Agreement, as amended and supplemented by the 1985 Agreement, and the 1985 Agreement, shall be in full force and effect according to their terms.
   (b) Any water stored on behalf of Grand County or Middle Park pursuant to Paragraph III.H. at the time the WGFP Permit (1041) suspension is imposed shall not be available for use by Grand County or Middle Park during the time of the suspension, but will be available for use pursuant to Paragraph III.H. at such time as the suspension is not in effect. Any such water shall be subject to all reductions, charges, restrictions and requirements applicable to the storage of water under this WGFP IGA, the Amendatory Contract, and any other contracts or laws applicable to the storage of water on behalf of Middle Park and Grand County. Any such payments shall be made by Grand County or Middle Park, as appropriate, at such time as the suspension is not in effect and prior to the use of such water.

2) Termination or Revocation. In the event the WGFP Permit (1041) is revoked or terminated, any water stored on behalf of Grand County or Middle Park pursuant to Paragraph III.H. shall revert to the ownership and control of the Subdistrict. The Subdistrict will reimburse Grand County and Middle Park respectively for 91% of any pumping costs incurred by

the respective entity associated with the water stored on behalf of Grand County or Middle Park pursuant to Paragraph III.H.

VII) No Waiver

A. The Parties do not agree:

1) Whether amendment of the Blue River Decree or Senate Document No. 80 is required to authorize the storage of Colorado-Big Thompson Project water in Chimney Hollow Reservoir;

2) Whether a change of water right is required to allow the storage of Windy Gap Project Water in Chimney Hollow Reservoir; or

3) Whether the Section 390b(d) of the Water Supply Act of 1958 requires Congressional approval for the Windy Gap Firming Project.

4) Notwithstanding these disagreements, the West Slope Parties will not object to, litigate or otherwise dispute in any forum the storage of Colorado-Big Thompson Project water in Chimney Hollow Reservoir or the storage of Windy Gap Project Water in Chimney Hollow Reservoir in accordance with, and subject to the following provisions:

(a) The total volume of Colorado-Big Thompson Project water stored in the combination of Granby and Chimney Hollow Reservoirs will not exceed 465,568 acre feet. For the purposes of this Paragraph of the WGFP IGA, the amount of Colorado-Big Thompson Project water in storage in Granby Reservoir shall be the amount of Colorado-Big Thompson Project water stored above the invert of the Farr Pumping Plant Intake and below the normal high water line.

(b) In any year in which the April 1st or subsequent projection by Northern Water anticipates a spill at Granby Reservoir, Colorado-Big Thompson Project water then in storage in Chimney Hollow Reservoir shall not be released to satisfy delivery requirements to Colorado-Big Thompson Project beneficiaries if such release would allow the capture and storage of additional Colorado-Big Thompson Project water in Granby Reservoir.

(c) The implementation of this WGFP IGA.

(d) The Parties do not waive any rights regarding any other changes to the historical operations of the Colorado-Big Thompson Project or Windy Gap Project.

B. No Waiver – Colorado-Big Thompson. The Parties agree that the dispute concerning storage of Colorado-Big Thompson Project water in Chimney Hollow Reservoir has not been litigated. The Parties agree that, except as provided for in this WGFP IGA, in entering into the agreement and not litigating or otherwise objecting in any forum to the legal issues specified in Paragraph VII.A., above, that this WGFP IGA shall never give rise to any claim, defense, or theory of acquiescence, bar, merger, issue or claim preclusion, promissory estoppel, equitable estoppel, waiver, laches, unclean hands or any other similar position or defense concerning any factual or legal position regarding the Parties' respective positions regarding the storage of Colorado-Big Thompson Project water and the Parties' respective interpretations of Senate Document No. 80, the 1961 Principles, the 1938 Repayment Contract, Reclamation Law, the Blue River Decrees, or Colorado law. The Parties further agree that they do not intend this WGFP IGA to have the effect of precedent or preclusion on any factual or legal issue in any other matter. The Parties expressly reserve their rights to assert any legal or factual position or challenge the legal or factual position taken by any other party or entity on any other matter.

C. No Waiver – WGFP. The Parties agree that the dispute concerning storage of Windy Gap Project Water in Chimney Hollow Reservoir has not been litigated. The Parties agree that, except as provided for in this WGFP IGA, in entering into this WGFP IGA and not litigating or otherwise objecting in any forum to the legal issues specified in Paragraph VII.A, above, that this WGFP IGA shall never give rise to any claim, defense, or theory of acquiescence, bar, merger, issue or claim preclusion, promissory estoppel, equitable estoppel, waiver, laches, unclean hands or any other similar position or defense concerning any factual or legal position regarding the Parties' respective positions regarding the storage of Windy Gap Project Water in Chimney Hollow Reservoir and the Parties' respective interpretations of federal or Colorado law. The Parties further agree that they do not intend this WGFP IGA to have the effect of precedent or preclusion on any factual or legal issue in any other matter. The Parties expressly reserve their rights to assert any legal or factual position or challenge the legal or factual position taken by any other party on any other matter.

D. The Parties do not agree whether Grand County has the authority to regulate the WGFP pursuant to C.R.S. §§ 24-65.1-101, *et seq.*

1) Notwithstanding these disagreements, the Subdistrict will not object to, litigate, or otherwise dispute in any forum the authority of Grand County to require a permit for the WGFP issued by Grand County pursuant to C.R.S. §§ 24-65.1-101, *et seq.* (1041 Permit), including any terms and conditions thereof once said Permit has been accepted by the Subdistrict.

2) With the exception of a challenge to Grand County's authority to require a permit for the WGFP, the Subdistrict does not waive or relinquish its rights to raise any defense or assert in any forum that it has fully complied with and is not in violation of the WGFP 1041 Permit.

3) The Subdistrict does not waive or relinquish its rights to object to, litigate, or otherwise dispute in any forum the authority of Grand County to modify, amend or terminate the WGFP 1041 Permit or to require a 1041 Permit or other Grand County permit or authorization for any other existing or future project, action, or other activity of the Subdistrict.

E. Preservation of Governmental Powers. Except as specifically provided herein, nothing in this WGFP IGA shall be construed as a limitation on or waiver of any review, approval, or permit authority, or a predetermination of any action taken thereunder, by any governmental or quasi-municipal entity including, without limitation, the regulatory or quasi-judicial power or authority of Grand County.

F. No Third-Party Beneficiaries. This WGFP IGA does not and is not intended to confer any rights or remedies upon any person or entity other than the Parties.

MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT

ATTEST:

Secretary

Date: 1/3/13

By: _____
President

WINDY GAP FIRMING PROJECT WATER ACTIVITY ENTERPRISE

ATTEST:

Secretary

Date: 1/3/13

By: _____
President

ATTEST:

COLORADO RIVER WATER CONSERVATION DISTRICT

_____ By:_____

Secretary President

Date:_____

ATTEST:

BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF GRAND, COLORADO

Tina L. Rosene By: Nancy Stuart

Clerk and Recorder Chairman

Date: 12/4/2012

ATTEST:

NORTHWEST COLORADO COUNCIL OF GOVERNMENTS

Sherry Rooptat By: [illegible]

Secretary Chairman

Date: 1/24/2013

ATTEST:

_____

Secretary

Date:_____

MIDDLE PARK WATER CONSERVANCY DISTRICT

By:_____

President

Exhibit 3

List of Related Agreements

1. Intergovernmental Agreement between the Northern Colorado Water Conservancy District, Grand County, Middle Park Water Conservancy District and Colorado River Water Conservation District
2. Memorandum of Understanding, Grand Lake Clarity Project (Umbrella Agreement)
3. Clarity Supplement to the 1938 Repayment Contract
4. Windy Gap Bypass Funding Agreement
5. Processed Material Supply Agreement (Gravel Pit Agreement)
6. Windy Gap Decree
7. Grand County RICD Stipulation
8. Learning by Doing Cooperative Effort
9. Green Mountain Reservoir Administration
10. Contracts for Delivery of Water to Grand Valley
11. Amendatory Contract
12. Letter from Subdistrict to River District re: no opposition to use of WG water for uses incidental to irrigation such as fish screen, fish ladder, etc
13. Letter from NW to GC stating how the 5,412.5 will be made permanent

Intergovernmental Agreement between the Northern Colorado Water Conservancy District, Grand County, Middle Park Water Conservancy District and Colorado River Water Conservation District (referred to collectively as the "Parties").

The Parties agree as follows:

1. Delivery of 5,412.5 acre feet of water from Granby Reservoir

    a. The Parties agree that the Colorado-Big Thompson Project should be operated by an unprejudiced agency in a fair and efficient manner, equitable to all parties having interests therein, and in conformity with Paragraphs (a) through (l) of the "Manner of Operations of Project Facilities and Auxiliary Features" of Senate Document No. 80. The Parties agree that Reclamation has been designated as the agency to oversee the operation of the Colorado-Big Thompson Project.

    b. The Parties agree to support and not challenge the implementation of the Granby 5412.5 Contract(s).

    c. The Parties agree that Northern Water shall enter into a contract for the delivery of C-BT Project Water to an entity or entities in Mesa County, Colorado for municipal recreational use in the amount of 5,412.5 acre feet annually.

        i. The Parties agree that the contract is subject to the written concurrence of the United States, which concurrence will be at the end of the contract.

        ii. The Parties do not object to the inclusion of the following language to implement the United States' concurrence (such language is general background language that is not intended to modify, change, or amend the applicable law):

            1. The United States hereby concurs with the [description of specific contract].
            2. As the owner of Granby Reservoir and the Colorado-Big Thompson Project, the United States, Department of the Interior, Bureau of Reclamation ("Reclamation"), hereby concurs with and approves this contract among the Northern Colorado Water Conservancy District and the [applicable West Slope municipal entities].
            3. Reclamation hereby confirms its determination that the contract is consistent with all applicable legal authority and maintains the appropriate balance amongst all parties having interests in the Colorado-Big Thompson Project operations required by Senate

Document No. 80, the 1938 Repayment Contract and the Blue River Decrees.

4. This concurrence is in addition to, and shall not modify or amend, the 1938 Repayment Contract in any respect. This concurrence shall not be a basis for any direct or indirect interpretation or construction of any provision of the 1938 Repayment Contract for any purpose. This concurrence does not establish any factual or legal precedent, concession, or determination by Northern Water or the United States. The United States and Northern Water do not, by virtue of this concurrence, waive or relinquish any legal or factual position.

d. Support for 10825 Solution. The Parties will support the contracting process to provide 5,412.5 acre-feet of water for the endangered fish from Ruedi Reservoir, plus an additional 2,000 acre-feet from Ruedi Reservoir to address concerns associated with the delivery of 5,412.5 acre feet from Granby Reservoir, in accordance with the letters from the Colorado parties to Michael J. Ryan, Regional Director, United States Bureau of Reclamation dated August 16 and August 17,2012.

e. Deliveries of 5412.5 acre feet under the Recovery Program. The Parties agree to coordinate through the Learning by Doing Cooperative Effort ("Cooperative Effort") to provide input to the U.S. Fish and Wildlife Service ("USFWS") for its determination of the release schedule from Granby Reservoir of the 5,412.5 acre feet to be delivered to an entity or entities in Mesa County for municipal recreational use. Following the annual determination, the parties agree to confer through the Cooperative Effort to coordinate the releases of other available water supplies with the 5,412.5 acre feet of water to maximize the environmental benefits. The storage and delivery from Granby Reservoir pursuant to this paragraph 1.e. shall be at no cost or charge to any entities on the West Slope.

f. Exchanges or Substitutions to Green Mountain Reservoir ("GMR"). When releases from Granby Reservoir for Municipal-Recreational contracts are not also needed to meet targeted stream flows in the 15 Mile Reach this water may be stored in GMR by exchange or substitution pursuant to any federal contracts or approvals which may be required, consistent with the March 2012 Finding of No Significant Impact issued by Reclamation for the Colorado Water Users' Commitment to Provide 10,825 acre-feet to the 15 Mile Reach and Reclamation's implementation of the Record of Decision. All Parties will advocate to Reclamation that any exchanges or substitutions to GMR pursuant to any federal contracts or approvals which may be required for the delivery or management of water released from Lake Granby made in accordance with Paragraph 1.e. above be provided at no cost under an Operational Memorandum of Understanding or other similar agreement with Reclamation. In the event that Reclamation requires payment for any exchanges or substitutions to GMR associated with releases from

Granby Reservoir made in accordance with Paragraph 1.e. above, the Parties shall, in good faith, work with all water users to allocate such costs at that time.

g. Perpetual Deliveries If the Recovery Program No Longer Exists. Northern Water agrees to deliver 5,412.5 acre feet of water per year in perpetuity from Granby Reservoir pursuant to municipal-recreational contracts with an entity or entities in Mesa County, Colorado in a form similar to that attached as Exhibit 1. These or similar contracts would be utilized if the releases are no longer required for protection of the endangered fish under the Upper Colorado River Basin Recovery Program.

i. The Parties agree that the delivery of 5,412.5 acre feet of water in perpetuity is not contingent on or related to the successful permitting and construction of the Windy Gap Firming Project.

ii. The Parties further agree that an additional benefit that will be realized from the perpetual delivery of the 5412.5 acre feet of water is to maintain and enhance the aquatic environment in Grand County and that the water will be used for no other purpose within Grand County.

iii. The storage and delivery of water from Granby Reservoir pursuant to this paragraph 1.g. shall be at no cost or charge to any entities on the West Slope.

iv. The Parties agree to coordinate through the Cooperative Effort on the timing, schedule, and amounts of perpetual release of 5412.5 acre-feet of water so as to maximize the benefits and the results of efforts to maintain and enhance the aquatic environment in Grand County.

v. If the Recovery Program no longer exists, then the Parties will attempt to maintain the ability to exchange or substitute water into GMR, and the timing, schedule and amounts of release of the 5412.5 acre feet of water each year to an entity or entities in Mesa County, Colorado will be coordinated through the Cooperative Effort so as to maximize the benefits and the results of efforts to maintain and enhance the aquatic environment in the Colorado River mainstem downstream of Granby Reservoir to the Grand Valley. Should there be a cost associated with the exchange or substitution of the released 5,412.5 acre feet of water from Granby Reservoir into GMR, the Parties will allocate such costs at that time.

h. 5412.5 Acre Feet of Water Additive. Water released from Granby Reservoir pursuant to this Agreement shall be in addition to the bypass of water under the 1961 Principles to Govern the Release of Water at Granby Dam to Provide Fishery Flows Immediately Downstream in the Colorado River ("1961 Principles") and any other water released from, or bypassed through, Granby Reservoir, including but not limited to, the water made available to Middle Park Water Conservancy District and Grand County pursuant to the WGFP IGA.

2. Support of Green Mountain Reservoir Administration Solution. The Parties agree to work cooperatively to implement a stipulated resolution of the Green Mountain Reservoir Administration Fill Dispute.

3. Shoshone Outage Protocol and Permanent Shoshone Solution. The Parties agree to work cooperatively to implement a stipulated resolution of the Shoshone Outage Protocol, consistent with Exhibit 2 [Draft Administrative Protocol]. Northern Water agrees that it will participate in good faith in negotiations to achieve permanent management of the flow of the Colorado River to address certain flow changes that result during a Shoshone Outage.

4. Wild & Scenic Commitment. Northern Water shall pay $200,000.00 and the River District shall pay $100,000.00 to the Endowment Fund of the Upper Colorado River Wild and Scenic Stakeholder Group for use to protect Wild and Scenic resources identified in the Colorado River from Kremmling to No Name. Northern Water's contribution provided herein shall satisfy its obligation to contribute endowment funds for Wild and Scenic purposes under this Agreement. The River District's contribution provided in this Agreement and the River District's contribution provided for in the WGFP IGA shall satisfy the River District's obligation to contribute endowment funds for the Upper Colorado River Wild & Scenic Stakeholder Group. Northern Water will contribute 80% of the amount contributed by the River District, not to exceed $20,000 annually adjusted annually by the Denver-Boulder-Greely CPI-U, for annual operating costs of the Upper Colorado River Wild and Scenic Stakeholder Group.

5. CWCB Instream Flow. Northern Water will not oppose the entry of decrees in Cases No. 11CW159, 11CW160, 11CW161, Water Division No. 5 consistent with the draft decree dated September, 2012 and stipulation attached as Exhibit 3 to this Agreement, and in accordance with the applicable law for a CWCB instream flow on the Colorado River mainstem from the confluence of the Blue and Colorado Rivers to a point immediately upstream of the confluence of the Eagle and Colorado Rivers provided the right is subject to substantively the same terms and conditions as are set forth in the Findings of the CWCB in declaring its intent to appropriate dated July 12, 2011.

6. Grand County RICD. Northern Water will not oppose the entry of a decree in Case No. 10CW298 consistent with the draft decree dated September 20, 2012 and stipulation attached as Exhibit 4 to this Agreement.

7. Compact Curtailment Plan. The Signatories agree to cooperate in good faith toward the development of a plan to avoid and address a potential curtailment of existing Colorado water rights under the provisions of the 1922 Colorado River Compact and the 1948 Upper Colorado River Compact.

8. No Opposition to Colorado River Cooperative Agreement. Northern Water agrees not to oppose or otherwise interfere with the efforts to obtain such court decrees and approvals as are necessary to implement Articles I.B.1.f.; I.B.1.g; I.B.2.b;I.B.2.c; I.B.2.e; I.B.4; III.A.3.b;III.A.4; III.B.7; III.B.8; III.B.14; III.E.1.b; III.E.9; III.E.10; III.E.11; III.E.13;III.E.15; III.E.17; III.E.20; IV.A.1; IV.G; V; and VI of the Colorado River Cooperative Agreement, to the extent that the court decrees and approvals, including applications for reasonable diligence or to make absolute in whole or in part the

conditional water rights in Case No. 11CW152 or the implementation of these court decrees and approvals do not adversely affect the yield of the Colorado-Big Thompson Project, materially increase the cost of operations of the Colorado-Big Thompson Project, or adversely affect the operation of the Colorado-Big Thompson Project.

9. No Opposition to Windy Gap Firming Project IGA. Northern Water will not interfere with the management and delivery of Windy Gap Project Water stored in the C-BT Project if the management and delivery of Windy Gap Project Water is pursuant to the WGFP IGA and the Amendatory Contract between Northern Water, the Subdistrict, and the United States.

10. Grand Lake Clarity. Northern agrees that it will participate in implementing a solution to achieve the State Clarity Standard for Grand Lake, and along with Grand County, will use its influence and authority to see that the Bureau of Reclamation does the same.

11. Temperature Standards. Northern Water will not independently propose changes to State Water Quality Control Commission temperature standards for the reaches affected by the WGFP without first working through the Cooperative Effort.

12. No Waiver. The Parties do not agree:

    a. Whether amendment of the Blue River Decree or Senate Document No. 80 is required to authorize the storage of C-BT Project water in Chimney Hollow Reservoir;
    b. Whether a change of water right is required to allow the storage of Windy Gap Firming Project Water or C-BT Project water in Chimney Hollow Reservoir; or
    c. Whether Section 390b(d) of the Water Supply Act of 1958 requires Congressional approval for the Windy Gap Firming Project.
    d. Notwithstanding these disagreements, the West Slope Parties will not object to, litigate or otherwise dispute in any forum the storage of C-BT Project water in Chimney Hollow Reservoir or the storage of Windy Gap Firming Project water in Chimney Hollow Reservoir in accordance with, and subject to the following provisions:
        i. The total active volume of C-BT Project water stored in the combination of Granby Reservoir and Chimney Hollow Reservoirs will not exceed 465,568 acre-feet. For the purposes of this Paragraph, the amount of C-BT Project water in storage in Granby Reservoir shall be the amount of C-BT Project water stored above the invert of the Farr Pumping Plant Intake and below the normal high water line.
        ii. In any year in which the April 1st or subsequent projection by Northern Water anticipates a spill at Granby Reservoir, C-BT Project water then in storage in Chimney Hollow Reservoir shall not be released to satisfy delivery requirements to Colorado-Big Thompson Project Allottees if such release would allow the capture and storage of additional C-BT Project water in Granby Reservoir.

iii. The Parties do not waive any rights regarding any other changes to the historical operations of the C-BT Project or Windy Gap Project.

13. No Waiver – CBT. The Parties agree that the dispute concerning storage of C-BT Project water in Chimney Hollow Reservoir has not been litigated. The Parties agree that, in entering into this Agreement and not litigating or otherwise objecting in any forum to the legal issues specified in Paragraph 12, above, that this Agreement shall never give rise to any claim, defense, or theory of acquiescence, bar, merger, issue or claim preclusion, promissory estoppel, equitable estoppel, waiver, laches, unclean hands or any other similar position or defense concerning any factual or legal position regarding the parties respective position regarding the storage of CB-T Project water and the Parties' respective interpretations of Senate Document No. 80, the 1961 Principles, the 1938 Repayment Contract, Reclamation Law, the Blue River Decrees, or Colorado law. The parties further agree that they do not intend this Agreement to have the effect of precedent or preclusion on any factual or legal issue in any other matter. The parties expressly reserve their rights to assert any legal or factual position or challenge the legal or factual position taken by any other party on any other matter.

14. No Waiver – WGFP. The Parties agree that the dispute concerning storage of Windy Gap Project Water in Chimney Hollow Reservoir has not been litigated. The parties agree that in entering into this Agreement and not litigating or otherwise objecting in any forum to the legal issues specified in Paragraph 12, above, that this Agreement shall never give rise to any claim, defense, or theory of acquiescence, bar, merger, issue or claim preclusion, promissory estoppel, equitable estoppel, waiver, laches, unclean hands or any other similar position or defense concerning any factual or legal position regarding the parties respective position regarding the storage of Windy Gap Firming Project water in Chimney Hollow Reservoir and the Parties' respective interpretations of federal or Colorado law. The Parties further agree that they do not intend this Agreement to have the effect of precedent or preclusion on any factual or legal issue in any other matter. The parties expressly reserve their rights to assert any legal or factual position or challenge the legal or factual position taken by any other party on any other matter.

15. Preservation of Rights. This Agreement does not limit, change or expand the role of or protections afforded to all Parties with interests in the Colorado-Big Thompson Project as described in the Manner of Operations provisions of Senate Document 80 (Senate Document No. 80, 75th Congress, 1st Session, January 15, 1937, entitled "Colorado-Big Thompson Project, Synopsis of Report on Colorado-Big Thompson Project, Plan of Development and Cost Estimate Prepared by the Bureau of Reclamation, Department of the Interior), the 1961 Principles, and the Blue River Decrees (Final Judgment entered on October 12, 1955, in Consolidated Cases No. 5016 and 5017 and the Findings of Fact and Conclusions of Law and Final Decree entered on October 12, 1955, in Consolidated Cases Nos. 2782, 5016, and 5017 ("Consolidated Cases") by the United States District Court, District of Colorado ("1955 Decree"), and all supplemental or amendatory orders, judgments, and decrees in said cases, including, without limitation, the Decree entered on April 16, 1964, therein ("1964

Decree") and the Supplemental Judgment and Decree dated February 9, 1978 ("1978 Judgment")).

16. Preservation of Governmental Power. Except as specifically provided herein, nothing in this Agreement shall be construed as a limitation on or waiver of any review, approval, or permit authority, or a predetermination of any action taken thereunder, by any governmental or quasi-municipal entity.

17. Open Space. Upon execution of this Agreement, Northern Water agrees to negotiate with Grand County in good faith to place deed restrictions to protect open space on Northern Water's lands, including compliance with the existing Grand County Rural Land Use Process that allows cluster development in conformance with C.R.S. § 30-28-403, as exists now or may be amended in the future.

18. Public Access. Northern Water agrees to provide public access to that portion of Willow Creek located on Northern Water's lands, for as long as Northern Water, or any entity affiliated with Northern Water, owns the lands adjacent to Willow Creek, provided that the public access will be managed by the Colorado Division of Parks and Wildlife or other entity acceptable to Northern Water.

19. Dispute Resolution. The Parties agree that if a dispute arises on any matter covered in this Agreement, the Parties will confer in good faith and endeavor to resolve the concern. If the Parties reach an impasse, they will select a neutral third party mediator who would seek an acceptable voluntary solution to the conflict. For conflicts that involve a technical or scientific expert, the neutral third party mediator may select an independent technical or scientific expert, acceptable to the parties involved in the mediation, to review and make a recommendation on the matter. If the conflict cannot be resolved through the efforts of the mediator, then the affected parties may pursue any available legal or administrative recourse. Nothing herein shall preclude the commencement of any action that would otherwise be barred by a statute of limitations or the timely participation in any judicial or administrative process.

20. Specific Performance. The Parties agree that this Agreement is an intergovernmental agreement pursuant to Article XIV, Sec. 18 of the Colorado Constitution and C.R.S. § 29-1-201 et. Seq. inclusive, among all governmental entities hereto. The Parties further agree that the terms and conditions of this Agreement are enforceable by specific performance and agree not to bring any defense to specific performance based on the doctrine of governmental immunity.

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

ATTEST:

_____ By:_____

Secretary President

Date:_____

COLORADO RIVER WATER CONSERVATION DISTRICT

ATTEST:

_____ By:_____

Secretary President

Date:_____

BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF GRAND, COLORADO

ATTEST:

Sara L Rosene By: Nancy Stuart

Clerk and Recorder Chairman

Date: 1-2-13

Krystine ann Wakefield, Deputy Clerk

MIDDLE PARK WATER CONSERVANCY DISTRICT

ATTEST:

_____ By:_____

Secretary President

Date:_____

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

ATTEST:

Secretary

Date: 01/11/13

By: _____

President

COLORADO RIVER WATER CONSERVATION DISTRICT

ATTEST:

_____

Secretary

Date: _____

By: _____

President

BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF GRAND, COLORADO

ATTEST:

_____

Clerk and Recorder

Date: _____

By: _____

Chairman

MIDDLE PARK WATER CONSERVANCY DISTRICT

ATTEST:

Secretary

Date: 2/1/13

By: _____

President

STATE OF COLORADO }
} SS.
County of Grand }

At a regular meeting of the Board of County Commissioners for the Grand County, Colorado, held at the Grand County Administration Building in Hot Sulphur Springs on Tuesday, the 4th day of December, 2012 there were present:

Nancy Stuart, Commissioner Chairman
James L. Newberry, Commissioner
Gary Bumgarner, Commissioner
Anthony J. DiCola, County Attorney
Lurline Underbrink Curran, County Manager
Sara L. Rosene, Clerk of the Board

when the following proceedings, among others, were had and done, to wit:

RESOLUTION NO. 2012-12-2

A RESOLUTION APPROVING AND AUTHORIZING THE CHAIRMAN OF THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF GRAND, STATE OF COLORADO TO EXECUTE THE WINDY GAP FIRMING PROJECT INTERGOVERNMENTAL AGREEMENT, THE WINDY GAP BYPASS FUNDING AGREEMENT, THE INTERGOVERNMENTAL AGREEMENT FOR THE LEARNING BY DOING COOPERATIVE EFFORT, AND A PROCESSED MATERIAL SUPPLY AGREEMENT, AND AUTHORIZING WHITE AND JANKOWSKI TO EXECUTE ON BEHALF OF GRAND COUNTY A RECREATIONAL IN-CHANNEL DIVERSION STIPULATION WITH THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT AND THE MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT

WHEREAS, the Board of County Commissioners of the County of Grand, State of Colorado was presented a Windy Gap Firming Project Intergovernmental Agreement ("WGFP IGA") by and between the Municipal Subdistrict, Northern Colorado Water Conservancy District ("Subdistrict") and its Windy Gap Firming Project Water Activity Enterprise ("WGFP Enterprise"); Middle Park Water Conservancy District; Colorado River Water Conservation District; Northwest Colorado Council of Governments; and the Board of County Commissioners of the County of Grand, State of Colorado, a copy of which is appended hereto and is incorporated in full herein by reference; and

WHEREAS, the WGFP IGA, in part, supplements and partially amends the April 30, 1980 "Agreement concerning the Windy Gap Project and the Azure Reservoir and Power Project" and the March 29, 1985 "Supplement to Agreement of April 30, 1980" pursuant to the terms and provisions contained within the WGFP IGA; and

WHEREAS, the benefits provided for within the WGFP IGA are in addition to and are not a substitute for the mitigation required by governmental agencies with jurisdiction over the Windy Gap firming Project; and

WHEREAS, Grand County recognizes that other West Slope parties to the WGFP IGA will not be able to sign the WGFP IGA until other associated closing documents have been finalized, such as Reclamation's SD80 determination and Reclamation's agreement that the West Slope parties have not waived applicable legal positions, and that finalizing those documents could take several months; and

WHEREAS, the effective date of the WGFP IGA shall be the date of full execution by all parties thereto; and

WHEREAS, the Board was presented a Windy Gap Bypass Funding Agreement ("WG Bypass Funding Agreement") by and between the Municipal Subdistrict of the Northern Colorado Water Conservancy District ("Subdistrict") and its Windy Gap Firming Project Water Activity Enterprise ("WGFP Enterprise"), Trout Unlimited, Upper Colorado River Alliance, and the Board of County Commissioners of Grand County, Colorado, a copy of which is appended hereto and is incorporated in full herein by reference; and

WHEREAS, the WG Bypass Funding Agreement includes but is not limited to financial obligations by the Subdistrict and WGFP Enterprise for engineering, permitting and construction of the Windy Gap Bypass pursuant to the terms and conditions of the Agreement, said obligations being in addition to and not a substitute for mitigation required by governmental agencies with jurisdiction over the Windy Gap Firming Project, and in addition to and not a substitute for the Windy Gap Firming Project Enhancement Plan; and

WHEREAS, the effective date of the WG Bypass Funding Agreement shall be the date of full execution by all parties thereto; and

WHEREAS, the Board was presented a Intergovernmental Agreement for the Learning by Doing Cooperative Effort ("Learning by Doing IGA") by and between Northern Colorado Water Conservancy District; the Municipal Subdistrict, Northern Colorado Water Conservancy District; Middle Park Water Conservancy District; Colorado River Water Conservation District; and the Board of County Commissioners of the County of Grand, State of Colorado, a copy of which is appended hereto and is incorporated in full herein by reference; and

WHEREAS, the Learning by Doing IGA sets forth terms and provisions under which the parties implement a cooperative, iterative and on-going process as described within the Agreement to maintain, and when reasonably possible, restore or enhance the aquatic environment in the Colorado, Fraser, and Williams Fork River Basins, upstream of the Colorado River confluence with the Blue River; and

WHEREAS, the effective date of the Learning by Doing IGA shall be the date of full execution by all parties thereto; and

WHEREAS, the Board was presented a Processed Material Supply Agreement by and between Northern Colorado Water Conservancy District ("Northern Water"), a copy of which is appended hereto and is incorporated in full herein by reference; and

WHEREAS, Northern Water agrees to allow Grand County to use its sand and gravel quarry located on the Northern Water Ranch, County Road 40, Grand County, Colorado as a source of processed material for county road maintenance and construction activities pursuant to the terms and conditions of the Agreement; and

WHEREAS, the duration of the Processed Material Supply Agreement is five (5) years commencing on the date of execution of the Agreement; and

WHEREAS, White and Jankowski, LLP, special counsel to the Board, presented a request for authorization to execute on behalf of Grand County a Recreational In-Channel Diversion ("RICD") Stipulation by and between the Board of County Commissioners of the County of Grand, State of Colorado, as Applicant, and Northern Colorado Water Conservancy District and Municipal Subdistrict, Northern Colorado Water Conservancy District, as Opposers; and

WHEREAS, said RICD Stipulation shall be filed in District Court, Water Division 5, Colorado Case Number 2010CW298 concerning the confirmation by Grand County of conditional water rights associated with two proposed whitewater parks in and on the Colorado River: the Hot Sulphur Springs Whitewater Park and the Gore Canyon Whitewater Park; and

WHEREAS, the Board has reviewed the aforesaid Agreements and the Stipulation and has determined that executing the Agreements and authorizing the execution of the Stipulation is in the best interest of the health, safety, and welfare of the citizens of Grand County.

NOW THEREFORE, be it resolved by the Board of County Commissioners of the County of Grand, State of Colorado that the Windy Gap Firming Project Intergovernmental Agreement, the Windy Gap Bypass Funding Agreement, the Intergovernmental Agreement For The Learning By Doing Cooperative Effort, and the Processed Material Supply Agreement be and are hereby approved, and the Chairman is authorized to execute the Agreements.

BE IT FURTHER RESOLVED, that Grand County recognizes that other West Slope parties to the WGFP IGA will not be able to sign the WGFP IGA until other associated closing documents have been finalized, such as Reclamation's SD80 determination and Reclamation's agreement that the West Slope parties have not waived applicable legal positions, and that finalizing those documents could take several months.

BE IT FURTHER RESOLVED, that White and Jankowski, LLP be and is hereby authorized to execute on behalf of Grand County the Recreational In-Channel Diversion Stipulation in District Court, Water Division 5, Colorado Case Number 2010CW298.

Upon motion duly made and seconded the foregoing resolution was adopted by the following vote:

Nancy Stuart ..... Aye

James L. Newberry ..... Aye

Gary Bumgarner ..... Aye

Commissioners

STATE OF COLORADO }
} SS.
County of Grand }

I, ..., County Clerk and ex-officio Clerk of the Board of County Commissioners in and for the County and State aforesaid do hereby certify that the annexed and foregoing Order is truly copied from the Records of the Proceedings of the Board of County Commissioners for said Grand County, now in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said County, at Hot Sulphur Springs, this ..... day of ..... A.D. 20.....

County Clerk and ex-officio Clerk of the Board of Commissioners.

.....

STATE OF COLORADO }
} SS.
County of Grand }

At a regular meeting of the Board of County Commissioners for the Grand County, Colorado, held at the Grand County Administration Building in Hot Sulphur Springs on Tuesday, the 24th day of January, 2012 there were present:

Nancy Stuart, Commissioner Chairman

James L. Newberry, Commissioner

Gary Bumgarner, Commissioner

Anthony J. DiCola, County Attorney

Lurline Underbrink Curran, County Manager

Sara L. Rosene, Clerk of the Board

when the following proceedings, among others, were had and done, to wit:

RESOLUTION NO. 2012PA-12-1

A RESOLUTION BY THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF GRAND SETTING AS THE PERMIT AUTHORITY AND GRANTING THE MUNICIPAL SUBDISTRICT OF THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT ACTING BY AND THROUGH THE WINDY GAP FIRMING PROJECT WATER ACTIVITY ENTERPRISE A PERMIT TO ENGANGE IN AN ACTIVITY PREVIOUSLY DESIGNATED AS AN ACTIVITY OF STATE INTEREST PURSUANT TO THE BOARD OF COUNTY COMMISSIONERS OF GRAND COUNTY RESOLUTION 1978-5-4, FOR THE 2012 WINDY GAP FIRMING PROJECT (2012 WGFP).

WHEREAS, on or about June 11, 2012, the Municipal Subdistrict of the Northern Colorado Water Conservancy District acting by and through the Windy Gap Firming Project Water Activity Enterprise (Subdistrict) submitted an application, under protest, for a permit pursuant to Resolution No. 1978-5-4, as amended, which permit is commonly referred to as a "1041 Permit". The application was submitted for approval of a "Municipal and Industrial Water Project" as contemplated in Chapter 5 of Resolution 1978-5-4, as amended; and

WHEREAS, the construction and operation of the 2012 WGFP constitutes a designated matter of State Interest pursuant to part 1 of Article 65.1, Title 24, of the C.R.S. 1973, and the "Grand County Administrative Regulations for Areas and Activities Designated As Matters of state Interest", adopted by Resolution No. 1978-5-4; and

WHEREAS, the proposed project is generally described as Chimney Hollow Reservoir located on the East Slope of Colorado identified in the Final Environmental Impact Statement (FIES) for the Windy Gap Firming Project as the proposed action and any reservoir or reservoirs on the East Slope that are constructed as an alternative or in addition to the reservoir identified in the FEIS (Alternative Reservoir), provided that the cumulative active storage capacity of Chimney Hollow Reservoir and any Alternative Reservoirs does not exceed 90,000 acre feet. The use of the reservoir will cause additional depletions from the Colorado River in Grand County as well as prepositioning of federal water of the Colorado Big-Thompson Project in a non-federal facility.

WHEREAS, the description of the project, a history of the purpose and need for the project, a description of the affected environment, and an analysis of the environmental consequences are discussed in detail in the Windy Gap Firming Project Final Environmental Impact Statement, November, 2011, prepared by the United States Bureau of Reclamation (hereinafter referred to as FEIS and made an exhibit to the public hearing file); and

WHEREAS, the operation 2012 WGFP will cause impacts in Grand County; and

WHEREAS, notice as required by Resolution 1978-5-4, as amended, of the filing of the application, and of all hearings are complete and properly published. Hearings were held on August 1 and 2, 2012, August 28, 2012, October 2, 2012, October 30, 2012, November 8, 2012, November 14, 2012, and November 20, 2012. A record was made of all hearings. The Board of County Commissioners setting as the Permit Authority has received oral evidence in the form of testimony and informational statements, and written evidence in the form of letters, statements, comments, recommendations, reports, studies, closing arguments and other documentation from the Subdistrict, County staff, various groups and governmental entities, and members of the general public; and;

WHEREAS, a list of exhibits received is attached hereto as "Exhibit A", and the closing arguments received are attached hereto as "Exhibit B"; and

WHEREAS, the evidence was considered based upon the probative value placed thereon by the Permit Authority, and the findings and resolution herein are based upon the record as a whole. References to exhibits and testimony herein are related to the record of proceedings before the Permit Authority. Such references are for convenience only, are not intended to be all inclusive, and do not necessarily include all portions of the record upon which the findings are based; and

WHEREAS, the following persons and entities appeared at the proceedings:

Grand County
- Lurline Underbrink Curran, County Manager
- Anthony J. DiCola, Esq., County Attorney
- Robert Franek, Esq., Assistant County Attorney
- Barbara L. Green, Esq., Environmental Counsel
- David C. Taussig, Esq., Water Counsel
- Katherine Morris, Water Quality Specialist
- Peggy Bailey, Tetra Tech.

Municipal Subdistrict of the Northern Colorado Water Conservancy District
- Eric Wilkinson, General Manager
- Jeff Drager, Project Manager
- Peggy Montano, Esq.

Lane Wyatt, Northwest Colorado Council of Government

Colorado River Water Conservation District
- Eric Kuhn, General Manager
- Jason Turner, Esq.

Middle Park Water Conservancy District/Stanley Cazier, Esq.

Town of Grand Lake
- Judy Burke, Mayor
- David Hook, Town Manager

Trout Unlimited
- Amelia Whiting, Esq.
- Greg Espergren
- Rob Firth

Upper Colorado River Alliance

Steve Bushong, Esq.
Bud Isaacs
Scott Fifer, Resource Engineering
Norman Carpenter
Town of Hot Sulphur Springs
Christine Lee
Jack Zielinski
Jon Ewert, Colorado Parks and Wildlife
Rebecca Mitchell, Colorado Department of Natural Resources
Kirk Klancke
John Stahl
Steve Paul
Scally O'Donnell
Robert Jackson
Merritt Linke

WHEREAS, the application was reviewed under the Grand County Administrative Regulations for Areas and Activities Designated as Matters of State Interest (Grand County Land Use and Environmental Regulations);

WHEREAS, the 2012 WGFP must provide assurance that it complies with all required federal, state, regional and county planning policies regarding land use and water resources; and

WHEREAS, the Subdistrict must show that it is utilizing the water from the 2012 WGFP in the most efficient manner, including recycling, re-use, and conservation; and

WHEREAS, the Permit Authority has heard evidence that the 2012 WGFP will exacerbate or cause impacts in Grand County to the following :

- Water quality and quantity
- Aquatic habitat including temperature and flushing flow
- Distribution and composition of riparian and wetland vegetation
- Water clarity in Grand Lake

NOW THEREFORE BE IT RESOLVED, based on the evidence and testimony admitted at the public hearings, the Permit Authority of Grand County finds as follows with regard to the application submitted by the Subdistrict for the 2012 WGFP.

FINDINGS OF FACT AND PERMIT CONDITIONS

Based on Subdistrict request for vested right and limitations stated in the application, Windy Gap Firming Project Intergovernmental Agreement (WGFP IGA), and evidence and testimony submitted at the public hearing, the following general conditions are applied and shall be met by the Subdistrict:

Condition 1. Water pumped under the original Windy Gap Project 1041 Permit cannot be stored at any time in Chimney Hollow Reservoir or any Alternative Reservoir for Windy Gap Firming Project (WGFP) that may be constructed as allowed in the IGA. In advance of each pumping season the Subdistrict will advise Grand County of the volume of water orders for that year for its Windy Gap Project participants and WGFP participants. All water pumped shall be assumed to be for the WGFP, which is subject to the 2012 Permit Conditions, unless the Subdistrict notifies Grand County as soon as it knows, but in advance of pumping, that water will be pumped under the original Windy Gap Project 1041 Permit rather than under the 2012 Permit. The Subdistrict will maintain daily records to account for and track the amount of water pumped

under each permit separately from the time that pumped water is introduced into Granby Reservoir until it is delivered to the individual participants with daily accounting records provided to Grand County on a monthly basis. Any change in the operation from WGFP to the Windy Gap Project will be for a valid operational reason, based on the Subdistrict's representation.

The 2012 WGFP Permit shall be suspended if the Windy Gap project is found to be in violation of the 1980 Windy Gap Project 1041 Permit. The 2012 WGFP may resume operation as soon as the Windy Gap Project is no longer in violation of the 1980 Windy Gap 1041 Permit.

Condition 2. The permit for the 2012 WGFP will be in effect for the life of the project and considered a vested right as long as the project is in compliance with the terms and conditions of all permits and approvals for the 2012 WGFP Permit.

Condition 3. The 2012 WGFP Permit is not transferrable to any other entity unless the County approves such transfer by Resolution.

Condition 4. This 2012 WGFP Permit shall allow construction of Chimney Hollow Reservoir (the reservoir located on the East Slope identified in the Final Environmental Impact Statement for the Windy Gap Firming Project as the proposed action) and any reservoir or reservoirs on the East Slope that are constructed as an alternative or in addition to the reservoir identified in the Final Environmental Impact Statement; provided that the cumulative active storage capacity of Chimney Hollow Reservoir and any alternative reservoirs does not exceed 90,000 AF, as long as the environmental impacts in Grand County are as reviewed and approved by the Permit Authority during the public hearing process for the 2012 WGFP.

Condition 5. The 2012 WGFP shall not exceed the volumetric limits stated in the WGFP IGA for the Windy Gap project and 2012 WGFP. The 2012 WGFP Permit is contingent upon the participant's use of water in compliance with the Windy Gap decrees and Colorado law.

Section 5-306 – Grand County Regulations for Areas and Activities Designated as Matters of State Interest.

Criterion 1(a) <u>The Need For The Proposed Project Can Be Substantiated.</u>

The need for the proposed project is substantiated as follows:

The 2012 WGFP will firm the anticipated yield of the Windy Gap project.

The 2012 WGFP will meet a 34% water supply deficit for the project participants within the Northern Colorado Water Conservancy District boundaries by providing 90,000 acre feet of reservoir storage to provide a firm yield to the project of 30,000 acre feet.

The 2012 WGFP will firm the yield of the water provided to the Middle Park Water Conservancy District in the 1980 and 1985 Supplemental Agreements for the Windy Gap Project.

Criterion 1(a) has been satisfied.

Criterion 1(b) <u>Assurances of Compatibility of the Proposed Water Project with Federal, State, Regional and County Planning Policies Regarding Land Use and Water Resources.</u>

The Permit Authority finds that with regard to Criterion 1(b) there are impacts caused by the 2012 WGFP, which would be mitigated with the following conditions which shall be met by the Subdistrict:

Condition 6. In order to satisfy the Subdistrict's compliance with its obligations under section

37-45-118(1)(b)(IV) of the Water Conservancy Act, the 2012 Permit shall not take effect until the WGFP IGA has been executed, and is conditioned upon the Subdistrict' s continued compliance with its obligations under the WGFP IGA. The Permit Authority reserves jurisdiction with regard to this condition in the event any signatory to the WGFP IGA refuses to sign.

Condition 7. While the Subdistrict is not a party to the Grand Lake Clarity Agreement, the Permit Authority has relied on the Clarity Memorandum of Understanding in determining whether the 2012 WGFP complies with its 1041 Regulations; therefore, the 2012 Permit shall not be effective until the Clarity MOU, Clarity Supplement to the 1938 Repayment Contract and Contributed Funds Act Agreement (CFA Agreement) for executing the Colorado- Big Thompson (C-BT) West Slope Collection System Technical Review of Alternatives and Analysis and Plan of Study have been executed. The Subdistrict shall provide County with a status report, every two years, on the progress of meeting the State Water Clarity Standard for Grand Lake. The Permit Authority reserves jurisdiction with regard to this condition in the event any signatory to the applicable agreement(s) refuse to sign.

Condition 8. The Permit Authority has relied upon the Related Documents identified in the WGFP IGA in determining whether the 2012 WGFP complies with its 1041 Regulations; therefore, this 2012 Permit shall not be effective until those Related Documents have been executed or finalized, and Grand County has been provided with copies of same. The Permit Authority reserves jurisdiction with regard to this condition in the event any signatory for a Related Document(s) refuse to sign.

Condition 9. The storage of water in Chimney Hollow Reservoir shall not commence until the water court approves the Windy Gap decree as amended by incorporation of the WGFP IGA. The Subdistrict shall provide Grand County with documentation of this approval.

Condition 10. The 2012 WGFP Permit shall not be effective until issuance of necessary state and federal permits and approvals for the 2012 WGFP, and this 2012 Permit is contingent upon Subdistrict's continued compliance with those permits and approvals. If there is a conflict between a term and/or condition in the 2012 WGFP Permit and a state or federal permit or approval, the term or condition that is the more restrictive shall control, unless otherwise preempted. Subdistrict shall provide Grand County with copies of all approved federal and state permits and approvals issued for the 2012 WGFP, which shall be attached to this permit. Following is a list of anticipated state and federal permits and approvals (this may not be a complete list):

- Clean Water Act 404 permit
- Colorado Department of Public Health and Environment ("CDPHE") 401 certification
- Fish and Wildlife Mitigation Plan, C. R. S. § 37-6-122.2
- Water Conservancy Act, C.R.S. § 37-45-101 et seq.
- Amendatory Contract and companion documentation of Bureau of Reclamation determination of compliance with Senate Document 80
- Record of Decision issued by Bureau of Reclamation
- Record of Decision issued for Corps of Engineers

Condition 11. The 2012 WGFP Permit shall terminate and be in no force and effect if construction of Chimney Hollow Reservoir, as defined in Condition 4 of this 2012 WGFP Permit, has not begun within ten (10) years of the latter of the issuance of the Record of Decision for the 2012 WGFP by Bureau of Reclamation or by the Corps of Engineers.

Condition 12. Diversions and pumping associated with the 2012 WGFP must cease if the Grand County Water Apportionment provided by the WGFP IGA is not available for release in accordance with the WGFP IGA. In such circumstances, any Windy Gap Project Water delivered to Middle Park Water Conservancy District shall be delivered in accordance with the 1980 and 1985 Agreements in the water year (August 1 to July 31) following the pumping season in which

WGFP pumping was curtailed because the Grand County Water Apportionment provided by the WGFP IGA was not available for release in accordance with the WGFP IGA.

Condition 13. To show compliance with the 2011 Grand County Master Plan provision about Economic Base - Recreation and Tourism Based Industry, and Criterion 5-306(g) (Public Outdoor Recreation Areas), the County has relied upon the public access provided in paragraph IV D of the WGFP IGA.

Condition 14 . Compliance with the conditions in this 2012 WGFP Permit shall constitute compliance with the Northwest Colorado Council of Governments 208 Plan.

Criterion 1(c) Municipal And Industrial Water Projects Shall Emphasize the Most Efficient Use of Water, Including, to the Extent Permissible Under Existing Law, the Recycling and Reuse of Water, Urban Development, Population Densities, and Site Layout and Design Of Storm Water and Sanitation Systems Shall Be Accomplished In A Manner That Will Prevent the Pollution of Aquifer Recharge Areas.

The Permit Authority finds that with regard to Criterion 1(c) there are impacts caused by the 2012 WGFP, which would be mitigated with the following conditions which shall be met by the Subdistrict:

Condition 15. Prior to delivery of water through the 2012 WGFP, Subdistrict shall provide the County with documentation of conservation plans for all municipal project participants and lessees and shall continue to provide documentation that participants are complying with the Water Conservation Act with regard to updating the conservation plans as required by state law.

Condition 16. Subdistrict shall provide written notice to the County when units of the 2012 WGFP are sold or leased and verification that the new owner or lessee has complied with the Water Conservation Act.

Condition 17. Within 30 days of acceptance of this 2012 WGFP Permit, the Subdistrict shall provide the County with written documentation of how use of water for fracking satisfies criterion c of the Grand County 1041 Regulations, if at all.

Condition 18: This 2012 WGFP Permit is subject to the Subdistrict's compliance with the terms and conditions of the 1980 Agreement and 1985 Supplement that remain in effect after execution of the WGFP IGA.

Criterion 1(d) Provisions to Insure that the Proposed Water Project Will Not Contaminate Surface Water Resources.

The Permit Authority finds that with regard to Criterion 1(d) there are impacts caused by the 2012 WGFP, which would be mitigated with the following conditions which shall be met by the Subdistrict:

Condition 19 . See condition #7.

Condition 20. Prior to the beginning of construction for Chimney Hollow Reservoir, the Subdistrict shall provide Grand County with a copy of an executed agreement between the Subdistrict and the wastewater treatment provider(s) to mitigate nutrient loading. This agreement shall include provision for allocating the cost of improvements and additional operation and maintenance costs, if any, associated with those improvements.

Condition 21. The Subdistrict shall submit the Nutrient Reduction Plan required by Bureau of Reclamation to Grand County for review at the same time it is submitted to Bureau of Reclamation and the Corps of Engineers.

Condition 22. Within six months of issuance of the last Record of Decision for the 2012 WGFP, the Subdistrict shall submit to the County for review and approval of a robust monitoring plan to assure that nutrient loading from the 2012 WGFP for total nitrogen and total phosphorus is reduced to the 1:1 level that the Subdistrict has agreed to achieve.

Within six months of issuance of the last Record of Decision for the 2012 WGFP, the Subdistrict shall submit to the County for review and approval a monitoring plan for manganese, bioavailable mercury, dissolved oxygen, and chlorophyll a in the Three Lakes. The plan should also include monitoring for Secchi disc depth July through September of each year in Grand Lake and Shadow Mountain Reservoir. The monitoring plan shall include a schedule for monitoring and reporting and Subdistrict shall provide a publicly accessible data base, and submit to Grand County summary reports on a schedule and in a form approved by Grand County. Following implementation of the WGFP, if monitoring shows increasing trends in manganese, bioavailable mercury, or chlorophyll a, or decreasing trends in dissolved oxygen and Secchi disc depth in Grand Lake, the Subdistrict and Grand County will evaluate and determine the cause for the changes in the trends. If it is determined that these trends are attributable to the WGFP, the Subdistrict will develop and implement a mitigation plan to eliminate the impact of the 2012 WGFP on those constituents.

Criterion 1(e) <u>The Proposed Water Project is Capable of providing Water Pursuant to Standards of the Colorado Department of Health.</u>

This Criterion does not apply to this project.

Criterion 1(f) <u>The Proposed Diversion of Water from the Source Development Area Will Not Decrease the Quality of Peripheral or Downstream Surface or Subsurface Water Resources in the Source Development Area Below that Designated by the Colorado Water Quality Control Division on January 15, 1974 and Effetive June 19, 1974 or Below Stricter Standards Subsequently Adopted.</u>

The Permit Authority finds that with regard to Criterion 1(f) there are impacts caused by the 2012 WGFP, which would be mitigated with the following conditions which shall be met by the Subdistrict:

Condition 23. Installation of the real time water temperature gauges required by the Fish and Wildlife Mitigation Plan shall be a condition of this 2012 Permit and the Subdistrict must verify every spring, before the beginning of pumping, that these gauges are in good working order, that they remain so during the time of the year when the standard is in effect, and that they are replaced or repaired when necessary and timely to their need in reporting temperature.

Condition 24. The Subdistrict will address temperature mitigation as follows:

- Temperature Thresholds. For the purposes of this Condition, the threshold temperatures will be the stream temperature standards adopted by the state Water Quality Control Commission then in effect.
- Grand County, Subdistrict, Trout Unlimited, Upper Colorado River Alliance will not, and Subdistrict will assure that Northern Colorado Water Conservancy District will not, independently propose changes to the temperature standards for the reaches affected by the WGFP without first working through Learning by Doing.

Under the currently applicable temperature standards, the following would apply.

- MWAT Chronic Threshold Exceedances - Reduction or Curtailment of WGFP Pumping . At such times as the Subdistrict is diverting under the 2012 Permit and the Weekly Average Temperature (WAT) exceeds the MWAT Chronic Threshold, the Subdistrict will reduce or curtail WGFP pumping at the Windy Gap diversion to the

extent necessary to maintain temperatures within the MWAT Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold.

- DM Acute Threshold Exceedances - Reduction or Curtailment of Pumping for the WGFP and the original Windy Gap Project (under both the 2012 Permit and original Windy Gap Project Permit). At such times as the Daily Maximum temperature is within 1°C of the DM Acute Threshold, the Subdistrict will reduce or curtail pumping for the original Windy Gap Project or the WGFP at the Windy Gap diversion to the extent necessary to maintain temperatures within the DM Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold. In the future, the 1 degree buffer may be altered, based on experience, to maintain compliance with the DM Threshold.

- Limitations on Reduction or Curtailment of Windy Gap Pumping or WGFP Pumping. The temperature mitigation measures identified above will be suspended in the event that and at such times as WGFP or, in the case of acute standards for both WGFP and the original Windy Gap, stops pumping and the temperature does not improve based on actual measurable effect. In that circumstance, WGFP and/or original Windy Gap may resume pumping. The LBD process will be used to evaluate the effect of the WGFP on temperature exceedances. Whether curtailment of pumping improves stream temperature will be tested on a periodic basis as determined by Learning by Doing.

- Use of the Windy Gap Bypass Valve and Auxiliary Outlet. The use of the Windy Gap Project Bypass Valve and Auxiliary Outlet will be considered by Learning by Doing, as appropriate.

Condition 25. Because the delivery of the 10825 endangered fish water from Granby Reservoir is an essential consideration for compliance with the Endangered Species Act and compliance with the temperature standard, the Subdistrict must participate in securing approval of the 10825 agreement and must arrange with Northern to do the same.

Criterion 1(g) <u>The Proposed Development and the Potential Diversions of Water from the Source Development Area Will Not Significantly Deteriorate Aquatic Habitats, Marshlands and Wetlands, Groundwater Recharge Areas, Steeply Sloping or Unstable Terrain, Forests and Woodlands, Critical Wildlife Habitat, Big Game Migratory Routes, Calving Grounds, Migratory Ponds, Nesting Areas and the Habitats of Rare and Endangered Species, Public Outdoor Recreational Areas, and Unique Areas of Geologic, Historic or Archaeological Importance.</u>

The Permit Authority finds that with regard to Criterion 1(g) there are impacts caused by the 2012 WGFP, which would be mitigated with the following conditions which shall be met by the Subdistrict:

Condition 26. Within six (6) months of issuance of Record of Decision by the Corps of Engineers for 2012 WGFP, the Subdistrict shall prepare and submit to Learning by Doing Management Committee, for review, approval and implementation, a fish and aquatics invertebrates monitoring plan. The monitoring data shall be provided to the Learning By Doing effort and monitoring shall continue as long as the Learning by Doing effort requires this data. If the bypass/through is constructed, the Subdistrict shall adapt and fund the monitoring plan as necessary in consultation with the Management Committee of Learning by Doing.

Condition 27. If a bypass/by through channel is constructed the design shall include a plan for minimizing blowing dust. If such plan is implemented, blowing dust shall not constitute a violation of the 1980 Windy Gap Project 1041 Permit or the 2012 Permit.

Condition 28. The bypass/by-through study shall commence on or before issuance of this 2012 Permit. If the results of the study demonstrate that the bypass/by-through will benefit the

Colorado River as defined in the Scope of Work/Request for Qualifications (RFQ) Windy Gap Reservoir Modifications Study, November 2012, RFQ# PBA-1324, implementation and construction of the bypass/by-through shall proceed in accordance with the Windy Gap Bypass Funding Agreement.

If the bypass/by-through is implemented and constructed, the Subdistrict shall contribute no less than $2 million.

Condition 29. If, during a five (5) year period, natural conditions meet or exceed flows of 600 c.f.s. required by the Fish and Wildlife Mitigation Plan so that the Subdistrict is not required to make releases or bypass water to achieve the required flow, and a flow of 1200 c.f.s. has not occurred for 72 consecutive hours, then in the sixth year, Subdistrict shall provide a 1200 c.f.s. flow for 72 consecutive hours.

Condition 30. Subdistrict shall prepare and submit to Grand County, for approval, a monitoring plan to establish a baseline for riparian vegetation along the Colorado River From Windy Gap Dam to the lower terminus of the Kemp-Breeze Wildlife Area and on Willow Creek, below Willow Creek Reservoir, within sixty (60) days of issuance of the Record of Decision by the Corp of Engineers. The operation of the WGFP will not adversely impact the distribution and composition of riparian and wetland vegetation along the Colorado River below Granby Reservoir and below the Windy Gap diversion, and on Willow Creek, below Willow Creek Reservoir. The Learning by Doing Management Committee will determine if additional follow-up monitoring of riparian vegetation is necessary based on observed conditions.

Condition 31. See Condition #8.

BE IT FURTHER RESOLVED that conditions # 6, #7, #8, #10, #17, #19, #21, #22, #25, #26, #30, and #31 above are, in whole or in part, precedent to and must be met prior to the effective date of the 2012 WGFP Permit; and

BE IT FURTHER RESVOLVED that conditions # #9, #11, #13, #14, #15, #20, #23, #27, and #28 above are, in whole or in part, precedent to and must be met prior to the use of the 2012 WGFP after the 2012 WGFP Permit becomes effective; and

BE IT FURTHER RESOLVED that condition #1, #2, #3, #4, #5, #6, #7, #10, #12, #15, #16, #18, #19, #22, #23, #24, #26, #27, #28 and #29 above, in whole or in part, are subsequent to and must be met after the 2012 WGFP is in operation.

CONCLUSIONS OF LAW AND PERMIT CONDITIONS

The 2012 WGFP complies with all provisions of the following Grand County Regulations:
Section 5-306 1(a)

The following Grand County Regulations are not applicable to the 2012 WGFP:
Section 5-306 1(e)

Upon compliance with the permit conditions set forth above, the following Grand County Regulations would be satisfied:
Section 5-306 1(b)
Section 5-306 1(c)
Section 5-306 1(d)
Section 5-306 1(f)
Section 5-306 1(g)

Based on the foregoing Findings and Conclusions, the Permit attached hereto is issued subject to the conditions listed in the Findings of Fact above.

The Permit Authority has relied on various agreements and documents associated with the WGFP IGA in making its Findings of Fact and Conclusions of Law and Permit Conditions. The Permit Authority will execute the WGFP IGA and Related Documents when presented in final form.

The conditions stated herein may be modified or deleted following public hearing.

If any of the conditions of the 2012 WGFP Permit (or portions thereof) are found to be unenforceable, the enforceability of the remaining conditions (or portions) will not be affected; however the Permit Authority, upon a finding of unenforceability may reopen public hearings, pursuant to the Applicant's right to Notice and Hearing as provided in the Grand County Regulations, to determine whether in the absence of said condition(s) the 2012 WGFP would comply with applicable County regulations.

Moved and approved by the Permit Authority this 4th day of December, 2012. Nunc Pro Tunc November 20, 2012.

Upon motion duly made and seconded the foregoing resolution was adopted by the following vote:

Nancy Stuart ..... Aye

James L. Newberry ..... Aye

Gary Bumgarner ..... ~~Aye~~ Nay

Commissioners

STATE OF COLORADO }
} SS.
County of Grand }

I, ..., County Clerk and ex-officio Clerk of the Board of County Commissioners in and for the County and State aforesaid do hereby certify that the annexed and foregoing Order is truly copied from the Records of the Proceedings of the Board of County Commissioners for said Grand County, now in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said County, at Hot Sulphur Springs, this ..... day of ..... A.D. 20.....

County Clerk and ex-officio Clerk of the Board of Commissioners.

.....

EXHIBIT "A" to Resolution 2012PA-12-1

List of Exhibits
Windy Gap Firming Project
1041 Permit
August 1 & 2, 2012, 8:30 a.m. and all subsequent hearing dates

Grand County Exhibits

(1) Letter of Application dated June 11, 2012 and Grand County 1041 Application of Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the Windy Gap Firming Project Water Activity Enterprise date June 11, 2012.

(2) Letter dated June 21, 2012 from Anthony J. DiCola, County Attorney to Peggy E. Montano, deeming the 1041 Application to be complete.

(3) Public Notice – Middle Park Times, June 21, 2012.

(4) Proof of Publication – Middle Park Times, June 21, 2012.

(5) List of Agencies and Interested Parties notified.

(6) Public Review Sheets (no names or signatures).

(7) Grand County Letter mailed with electronic copies of Application to Review Agencies dated June 13, 2012.

(8) WGFP IGA Draft dated July 3, 2012 and Draft Closing Documents;
Draft Memorandum of Understanding: Grand Lake Clarity Project dated 4-26-12; Draft Intergovernmental Agreement between Northern Water Conservancy District, Grand County, Middle Park Water Conservancy District and Colorado River Water Conservation District dated 6-4-12. Draft Processed Material Supply Agreement dated 6-20-12;

(9) Letter from Northwest Colorado Council of Governments dated July 6, 2012.

(10)Letter of from Carol Sidofsky & Dave Hazelrigg dated July 9, 2012.

(11)Letter of from Melanie Zwick dated July 9, 201.2

(12)Letter from Colorado Parks and Wildlife dated July 9, 2012.

(13)July 9, 2012 Update to Section IV.C of WGFP IGA Draft dated July 3, 2012.

(14)Certificate of Recommendation to Grand County Planning Commission dated July 11, 2012.

(15)Grand County Planning Commission Meeting Minutes dated July 11, 2012.

(16)Grand County Planning Commission Resolution No. 2012-7-1.

(17)Certificate of Recommendation to Grand County Permit Authority dated August 1 and 2, 2012.

(18)Grand County Public Hearing reminder and link to Certificate of Recommendation mailed and emailed to Interested Parties dated July 24, 2012.

(19)Email revisions dated July 25, 2012: Certificate of Recommendation to Grand County Permit Authority dated August 1 and 2, 2012.

(20)Letter from Paul Hollrah dated July 22, 2012

(21)Letter from Kirk Klancke dated July 24, 2012.

(22)Email from Jon Weimer dated July 24, 2012.

(23)Email from Jim Ross dated July 24, 2012.

(24)Grand County email dated July 27, 2012 to Interested Parties: Tentative WGFP 1041 Permit Agenda August 1 & 2, 2012.

(25)Opinion Column in the July 27, 2012 Sky Hi News by Kirk Klancke, Headwaters Chapter of Trout Unlimited and Windy Gap Hearing Meeting Reminder on Front Page.

(26)Email from Charles W. Howe, dated July 29, 2012.

(27)Email from Ken Gillis, Ouray Ranch Homeowner's Association dated July 30, 2012.

(28)Email from Jeff Metzger dated July 30, 2012 with attached letter to BOCC dated August 1, 2012 for Public Hearing testimony.

(29)Email from Peggy Montano dated July 30, 2012 with regard to two (2) errors in the Certificate of Recommendation.

(30)Letter from Richard E. Newton dated July 30, 2012.

(31)Email dated July 31, 2012 from Ron Johnson.

(32)Letter dated July 31, 2012 from Dennis G. Buechler and Suzanne O'Neill, Colorado Wildlife Federation.

(33)Senate Document No. 80, Colorado-Big Thompson Project, Synopsis of Report dated 1937

(34)Letters documenting Grand Lake clarity issues: 1954

(35)Public Law 95-450, creating the Arapaho National Recreation Area and Colorado Big Thompson Project, dated October 11, 1978.

(36)Agreement Concerning the Windy Gap Project and the Azure Reservoir and Power Plant dated April 30, 1980.

(37)Resolution No. 1980-6-1,dated June 17, 1980, A Resolution Of The Grand County Permit Authority Granting To The Municipal Subdistrict, Northern Colorado Conservancy District, A Permit To Engage In An Activity Previously Designated An Activity Of State Interest Pursuant To The Board Of County Commissioners Of Grand County Resolution No. 1978-5-4, As Amended (Design, Construction and Operation of Applicant's Windy Gap Project, Reservoir and Pipeline as proposed).

(38)Agreement dated July 7, 1980 between Grand County and Middle Park Water Conservancy District.

(39)Corps of Engineers Record of Decision, Windy Gap Project, June 8, 1981.

(40)Bureau of Reclamation Record of Decision, Windy Gap Project, Colorado, June 18, 1981.

(41)Final Environmental Statement Colorado-Big Thomson Windy Gap Projects Colorado dated April 28, 1981.

(42)Supplement to Agreement of April 30, 1980, entitled "Agreement Concerning the Windy Gap Project and the Azure Reservoir and Power Project.

(43)Report by Coley/Forrest, Inc. date July 2007: Grand County: Its Economy & Water Resources.

(44)Walsh Aquatic Consultants, Inc.: Update of [Walsh] February 1, 2008 Technical Review of revised Windy Gap Firming Project Aquatic Resources Technical Report (Dec 2007) and [Walsh] November 23, 2009 Technical Review of Preliminary Draft WGFP Fish and Wildlife Plan (August 2009) based on new information (update dated 01/10/11).

(45)Amended and Restated Transmission and Pumping Service Agreement, Contract No. TS-08-0026, dated June 13, 2008, between Tri-State, Mountain Parks Electric and the Municipal Subdistrict.

(46)Letter from Barbara J.B. Green dated 12-29-08 to Will Tully and Chandler Peter: Northern Colorado Water Conservancy District, Windy Gap Firming Project, Grand County Cooperating Agency Comments, Windy Gap Firming Project Draft Environmental Impact Statement.

(47)Stream Management Plan, Grand County, Colorado – Phase 3 dated August 2010.

(48)Intergovernmental Agreement for the Learning By Doing Cooperative Effort date August 27, 2010.

(49)Colorado River Aquatic Resources Investigations, Federal Aid Project F-237R-18, R. Barry Nehring, General Professional V, Co-Authors Brian Heinold and Justin Pomeranz, June 2011.

(50)Windy Gap Firming Project – CD's: Final Environmental Impact Statement dated and Response to DEIS Comments dated November 2011; Technical Reports dated June 2012

(51)Colorado's Official State Position regarding Fish and Wildlife Mitigation Plans, The Colorado Lawyer, February 2012, Vol.41, No.2 [page 41] and Letter dated 12-9-10 from Tim Monahan, First Assistant Attorney General re: fish and wildlife mitigation requirements under state law.

(52)Email from David Taussig dated July 18, 2012 regarding Windy Gap Decrees.

(53)Draft Request for Proposals dated 7-27-12: Windy Gap Reservoir Modifications

(54)Grand County Administrative Regulations for Areas and Activities Designated as Matters of State Interest (1041 Regulations).

(55)Peggy E. Montano letter dated July 31, 2012 to Jack DiCola, Esq. re: legal issues concerning the requested 1041 permit from Grand County for the Windy Gap Firming Project.

(56) Grand County Planning Commission CD, West Grand Firming Project, dated July 11, 2012

(57)Grand County Power Point Presentation presented at Hearing.

(58)Factors Controlling Transparency in Grand Lake, Colorado prepared by James McCutchan, Jr., dated April 2, 2010, and Revised July 2, 2010 & March 9, 2012.

(59)Municipal Subdistrict Response to Commissioners Inquiries dated August 23, 2012.

(60)Staffs Modified Conditions 1-32.

(61)Staff Condition for Grand Lake Clarity.

(62)Staffs Modified condition #22.

(63)Staffs Modified Condition #24.

(64)Staffs Modified Condition #30.

(65)Memo from Barbara Green Dated November 6, 2012, regarding 303(d)Listing.

(66)Historical Analysis of the Redtop Valley Ditch Use on the Miller Hereford.

(67)Memo from Karen Rademacher to Alan Berryman and Jeff Drager dated December 5, 2008.

(68)Comparison of 1980 Agreement and Proposed WGFP IGA, Draft of October 19, 2012.

(69)WGFP Bypass Funding IGA, November 12 Distribution Draft.

(70)Staff Modified Condition 1-31, November 8, 2012.

(71) Staff modified Conditions 27-30.

(72)WGFP Final Environmental Impact Statement Errata dated November 2012.

(73)WGFP Supplemental Information Report dated November 2012.

November 20, 2012 Hearing

(1)Staff Proposed Permit Condition.

(2)WGFP – IGA.

(3)Draft MOU Grand Lake Clarity Project.

(4)Overview of Clarity Supplement to 1938 Repayment Contract.

(5)Windy Gap Bypass Funding Agreement.

(6)Draft Scope of Work Request for Qualifications (RFQ) Windy Gap Reservoir Modifications Study, November 2012, RFQ#PBA-1324

(7)Processed Material Agreement

(8)Draft-Northern Agreement

(9)Draft IGA for Learning by Doing
(10)Proposed Agreement between Grand County and Middle Park

(11)Overview of WGFP-IGA Enhancements offered along with Colorado River Basin Proposal and Fish and Wildlife Enhancement and Mitigation Plans.

Colorado River Water Conservation District Exhibits

A. Green Mountain Reservoir Administrative Protocol Draft dated 7-13-12.

B. Shoshone Outage Protocol Operating Agreement - Draft dated 6-4-12: Agreement Among the United States Department of the Interior, Bureau of Reclamation, the State of Colorado, Division of Water Resources, Denver Water, The Colorado River Water Conservation District, The Middle Park Water Conservancy District, The Northern Colorado Water Conservancy District, The Municipal Subdistrict, Northern Colorado Water Conservancy District, The Grand Valley Water Users Association, The Orchard Mesa Irrigation District, and The Grand Valley Irrigation Company.

C. Upper Colorado River Wild & Scenic Stakeholder Group Summary of Alternative Management Plan.

D. Environmental Assessment: Finding of No Significant Impact - Colorado Water Users' Commitment to Provide 10,825 acre-feet to the 15-Mile Reach of the Upper Colorado River, Great Plains Region, Eastern Colorado Area Office dated March 2012.

E. Colorado River District Eric Kuhn WGFP 1041 Permit Testimony August 1-2, 2012.

Municipal Subdistrict Exhibits

A. Letter dated July 30, 2012 from Peggy E. Montano re: WGFP witness summary and list of exhibits for public hearing.

B. Exhibits presented at the July 11, 2012 Grand County Planning Commission hearing.

C. Annual deliveries to WGF and Spill Years from 1950 to 1996.

D. Deliveries with Windy Gap Firming from 1950-1996.

E. Flows in Colorado River at Windy Gap Historic Flows 2002, 2010, 2011, 2012.

F. 2011 flows with 100,000 acre-feet pumped Windy Gap Firming.

G. 2012 Colorado River flows with enhancements.

H. 2010 Colorado River flows with enhancements.

I. Bar Chart with flushing flows above 600 cfs.

J. Graphic of waste water treatment plants on which nutrient reductions in the three lakes system are possible.

K. Graphic of three waste water treatment plants for nutrient reductions are focused.

L. Nutrient reduction non point source evaluation graphic.

M. A photograph Windy Gap Reservoir to illustrate by or through pass.

N. CLazyU Ranch and Miller-Hereford Agricultural Properties.

O. Windy Gap Firming Project Summary of Mitigation and Enhancement Measures.

P. Letter from Peggy Montano, Legal Counsel for Municipal Subdistrict, dated August 1, 2012 regarding conditions of the 1041 Permit.

Q. Municipal Subdistrict Power Point Presentation presented at the Hearing.

Trout Unlimited Exhibits

A. Letter Dated July 30, 2012 from Mely Whiting, Legal Counsel, Trout Unlimited Colorado Water Project re: WGFP Testimony and Exhibits.

B. Power Point Slides: Windy Gap Firming Project 1041 Permit Trout Unlimited August 2012.

C. EPA letter dated 12-19-2008 to Michael Ryan, Bureau of Reclamation re: WGFP DEIS.

D. Carol Rushin, EPA letter dated 12-24-08 to Colonel David C. Press, Corps of Engineers regarding Public Notice No. 200380523.

E. Western Resource Advocates letter dated 12-29-08 to Kara Lamb and Will Tully, Bureau of Reclamation and Chandler Peter, Corps of Engineers re: Comments on WGFP DEIS and 404 Permit Application.

F. Letter from Barbara J.B. Green dated 12-29-08 to Will Tully and Chandler Peter: Northern Colorado Water Conservancy District, Windy Gap Firming Project, Grand County Cooperating Agency Comments, Windy Gap Firming Project Draft Environmental Impact Statement.

G. Thomas E. Remington, Director Colorado Division of Wildlife letter date 12-29-08 to Will Tully, Bureau of Reclamation re: WGFP Draft EIS comments.

H. Trout Unlimited letter dated 12-29-08 to Will Tully, Bureau of Reclamation and Chandler Peter, Corps of Engineers re: Comments on WGFP DEIS.

I. Moffat Expansion and WGFP: Impacts of Mitigation from Colorado Wildlife Commission Hearing 5-6-11 from Western Resource Advocates.

J. Public Comment Letter date 11-7-2011 to Governor Hickenlooper signed by Grand County business owners.

K. EPA letter date 2-6-12 to Tim Carey, Corps of Engineers re: EPA remaining concerns on WGFP following FEIS release.

L. EPA letter dated 2-6-12 to Michael Ryan, Bureau of Reclamation re: EPA comments on WGFP Final EIS.; CEQ # 20110413.

M. Analysis of The Relationship Between Minimum Flow Below Windy Gap And Water Temperature Above The Williams Fork, by Blair Hanna, AMEC Earth and Environmental 2/5/2009.

N. Detailed Comments Public Notice No. 200980523 WGFP DEIS.

O. Trout Unlimited Power Point Presentation presented at Hearing.

Upper Colorado River Alliance Exhibits

A. Letter dated July 30, 2012 from Steve Bushong of Porzak, Browning & Bushong re: Summary of WGFP Witness Testimony and Exhibit Disclosures.

B. Colorado River Aquatic Resources Investigations, Federal Aid Project F-237R-18, R. Barry Nehring, General Professional V, Co-Authors Brian Heinold and Justin Pomeranz, June 2011.

C. Steve Bushong, Attorney for UCRA letter dated 1-3-12 to Michael Collins and Will Tully, Bureau of Reclamation; and John Bezdek, Asst. Solicitor, Department of Interior re: WGFP EIS.

D. Steve Bushong, Attorney for UCRA letter dated 2-3-12 to Michael Collins, Lucy Maldonado and Mike Ryan, Bureau of Reclamation; and John Bezdek, Asst. Solicitor, Department of Interior re: WGFP EIS.

E. Mely Whiting, Legal Counsel, Trout Unlimited letter dated 1-31-12 to Michael Collins, Lucy Maldonado and Mike Ryan, Bureau of Reclamation; and John Bezdek, Asst. Solicitor, Department of Interior re: WGFP Final EIS.

F. EPA letter date 2-6-12 to Tim Carey, Corps of Engineers re: EPA remaining concerns on WGFP following FEIS release.

G. EPA letter dated 2-6-12 to Michael Ryan, Bureau of Reclamation re: EPA comments on WGFP Final EIS; CEQ # 20110413.

H. Andrew Todd, Ph.D., USGS letter dated 4-29-11 to Melanie Wasco, EPA re: EPA comments on the development of a comprehensive water temperature impact analysis for WGFP EIS.

I. Graph: Colorado River average daily flow at Hot Sulphur Springs 1904-1994.

J. Bureau of Reclamation Record of Decision, Windy Gap Project, Colorado, June 18, 1981.

K. Resolution No. 1980-6-1,dated June 17, 1980, A Resolution Of The Grand County Permit Authority Granting To The Municipal Subdistrict, Northern Colorado Conservancy District, A Permit To Engage In An Activity Previously Designated An Activity Of State Interest Pursuant To The Board Of County Commissioners Of Grand County Resolution No. 1978-5-4, As Amended.

L. Thomas E. Remington, Director Colorado Division of Wildlife letter date 12-29-08 to Will Tully, Bureau of Reclamation re: WGFP Draft EIS comments.

M. Carol Rushin, EPA letter dated 12-24-08 to Colonel David C. Press, Corps of Engineers regarding Public Notice No. 200380523.

N. Letter dated 12-29-08 from Fritz Holleman, Attorney for Chimney Rock Ranch, of Porzak, Browning & Bushong re: WGFP Draft EIS.

O. Letter from Barbara J.B. Green dated 12-29-08 to Will Tully and Chandler Peter: Northern Colorado Water Conservancy District, Windy Gap Firming Project, Grand County Cooperating Agency Comments, Windy Gap Firming Project Draft Environmental Impact Statement with Exhibits A-G.

P. Colorado Division of Wildlife, Colorado River near Parshall, Fish Survey and Management Information.

Q. WGFP 1041 Hearing, August 1-2, 2012, Upper Colorado River Alliance Presentation.

Public Exhibits

A. Letter from Town of Kremmling received August 2, 2012.

B. Email from Mike Collins, Mountain Meadows HOA dated August 1, 2012.

C. Letter from Stephanie Young, Ouray Ranch HOA & Brain Young, Ouray Ranch Angler's Club dated July 31, 2012.

D. Letter from Richard Sprague dated August 2, 2012.

E. Email from Jim Woodside (forwarded from McCranewood@g.com) dated August 2, 2012.

F. Email from Brad McDaniel dated August 2, 2012.

G. Norm Carpenter, Graph of Colorado River below Windy Gap, Peak Day Streamflow.

H. Letter with attachments from Judy Burke, Mayor, Town of Grand Lake, dated August 1, 2012.

I. Aerial Photographs of Grand Lake dated August 30, 2011, and September 8, 2011.

J. Presentation by Canton O'Donnell, President of Three Lakes Watershed Assoc., dated August 2, 2012.

K. Comments by K. John Stall dated August 2, 2012.

Exhibit "B" to Resolution No. 2012PA-12-1

List of Closing Arguments

1. Closing Argument by Municipal Subdistrict, Northern Colorado Water Conservancy District dated 8-23-2012

2. Closing Statement by Trout Unlimited dated 8-23-2012

3. Letter from Hershal Deputy, Mayor of the Town of Hot Sulphur Springs received 8-22-2012

4. Closing Comments by Upper Colorado River Alliance dated 8-23-2012

5. Closing Statement by Grand County Staff dated 8-23-2012

PERMIT ISSUED TO CONDUCT

A DESIGNATED ACTIVITY OF STATE INTEREST

OR

TO ENGAGE IN DEVELOPMENT IN A

DESIGNATEGD AREA OF STATE INTEREST

IN

THE COUNTY OF GRAND, STATE OF COLORADO

FOR THE

2012 WINDY GAP FIRMING PROJECT (2012 WGFP)

Pursuant to administrative regulations and guidelines for administration heretofore adopted by the Board of County Commissioners of Grand County, said County has received an application from the Municipal Subdistrict of the Northern Colorado Water Conservancy District acting by and through the Windy Gap Firming Project Water Activity Enterprise (hereinafter referred to as Applicant) for a permit for the 2012 WGFP involving the following matter of state interest:

> Development of a Municipal and Industrial Water project as required by Chapter 5 of the Grand County Regulations for Areas and Activities Designated as Matters of state Interest, to wit:

Design, construction, and operation of a dam and reservoir generally described as Chimney Hollow Reservoir located on the East Slope of Colorado identified in the Final Environmental Impact Statement (FIES) for the Windy Gap Firming Project, November, 2011, as the proposed action and any reservoir or reservoirs on the East Slope that are constructed as an alternative or in addition to the reservoir identified in the FEIS (Alternative Reservoir), provided that the cumulative active storage capacity of Chimney Hollow Reservoir and any Alternative Reservoirs does not exceed 90,000 acre feet. Pursuant to and in accordance with Resolution No. 2012PA-12-1, the Permit Authority has approved the application with conditions.

This Permit authorizes the Applicant to:

1. Operate the 2012 WGFP in Grand County, utilizing Chimney Hollow Reservoir or Alternate Reservoir as proposed in the application and approved by the Permit Authority with conditions.

2. For the following period: From the date of the issuance of the permit and for the life of the project. If all conditions of approval are not met or complied with as required, this permit may be suspended or revoked for cause.

3. In accordance with the plans and/or specifications approved by the Permit Authority on the 20th day of November, 2012 as well as the Guidelines for Administration adopted by Grand County for: Municipal and Industrial Water Projects as set forth in Resolution No. 1978-5-4, by the Grand County Board of County Commissioners.

4. On the condition that the Applicant proceeds in conformity with Resolution No. 2012PA-12-1, to which this Permit is attached.

Any Notice to the applicant shall be sent to:

General Manager,
Northern Colorado Water Conservancy District
Municipal Subdistrict of Northern Colorado Water Conservancy District
220 Water Avenue,
Berthoud, CO. 80513

With a Copy to:

Trout Raley, Montaño, Witwer & Freeman P.C.
1120 Lincoln Street, Suite 1600
Denver, CO. 80203

This Permit is valid for use only by the Applicant and may not be transferred without approval of the Permit Authority. In the event the Applicant fails to notify Grand County, in writing, whether or not it intends to proceed with the WGFP within 10 years of issuance of the 404 Permit for the WGFP by the United States Army Corps of Engineers, or upon execution of construction contracts for Chimney Hollow Reservoir, whichever occurs first, this Permit may be revoked by the Permit Authority.

Dated this 4th day of December, 2012. (Nunc Pro Tunc – November 20, 2012).

Nancy Stuart

Nancy Stuart,
Chairman, Permit Authority

INTERGOVERNMENTAL AGREEMENT FOR THE LEARNING BY DOING COOPERATIVE EFFORT

This Intergovernmental Agreement (Agreement) is entered into between the NORTHERN COLORADO WATER CONSERVANCY DISTRICT (Northern Water); THE MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT (Subdistrict), GRAND COUNTY BOARD OF COUNTY COMMISSIONERS (Grand County) MIDDLE PARK WATER CONSERVANCY DISTRICT (Middle Park) and COLORADO RIVER WATER CONSERVATION DISTRICT (River District), collectively, the "parties."

WHEREAS, Northern Water, the Subdistrict, Grand County, Middle Park, the River District, and Denver Water desire to engage in a cooperative, iterative and on-going process (Cooperative Effort) to maintain, and when reasonably possible, restore or enhance the aquatic environment in the Colorado, Fraser, and Williams Fork River Basins, upstream of the Colorado River confluence with the Blue River (the Cooperative Effort Area); and

WHEREAS, in addition to other data and information, this Cooperative Effort will rely on the information contained in the draft Grand County Stream Management Plan (SMP). The current draft SMP is dated August 2010, but the parties anticipate that the SMP will evolve over time with the addition of real time information and data; and

WHEREAS, this Cooperative Effort is intended to address impacts that may be associated with existing operations by Northern Water, the Subdistrict, Denver Water, Grand County, and other water users in the Cooperative Effort Area. Any new impacts to the aquatic environment projected to be caused by the Subdistrict's proposed Windy Gap Firming Project will be addressed by mitigation plans to be developed by regulatory agencies as part of the permitting process for the Windy Gap Firming Project; and

WHEREAS, the parties to this Cooperative Effort will develop a process to monitor the stream conditions to identify and respond to potential changes in or desired improvements to the aquatic environment, based upon the concepts embodied in this Agreement; and

WHEREAS, the Cooperative Effort will allow the participants to identify and react to changes in the aquatic environment in a manner that maximizes the benefits to be realized from the defined resources available to the entities, and that minimizes adverse changes to the aquatic environment whenever possible; and

WHEREAS, the parties are authorized to enter into this Agreement by, *inter alia,* Section 29-1-201, *et seq*., C.R.S.; Section 29-10-101, *et seq*., C.R.S.; and Article XIV, Section 18(2) of the Colorado Constitution.

NOW THEREFORE, the parties agree to implement this Cooperative Effort in accordance with the following provisions:

I. Guiding Principles

The overarching goal for the Cooperative Effort is to maintain and, where reasonably possible, restore or enhance the condition of the aquatic environment in Grand County. The Upper Colorado River system and the Fraser and Williams Fork rivers serve as a critical municipal, agricultural, recreational and industrial water supply source for the state as a whole and provide important aquatic habitat. The participants in the Cooperative Effort have a mutual interest in protecting the aquatic environment and commit to work together in a cooperative and comprehensive manner to address issues related to maintaining and, when reasonably possible, enhancing the condition of the aquatic environment in Grand County. To that end, the parties agree to the following principles to build and promote a stable, permanent, relationship that respects the interests and legal responsibilities of the parties, while achieving the goals of the Cooperative Effort.

A. The Cooperative Effort will not seek a culprit for changes in the condition of the stream, but will provide a mechanism to identify issues of concern and focus available resources to address those issues.

B. The parties to this Agreement have been involved since 2009, along with numerous other West Slope entities, in negotiating the Windy Gap Firming Project Intergovernmental Agreement (WGFP IGA) to resolve longstanding issues. The Subdistrict has committed to Grand County a substantial, but defined amount of resources described in the WGFP IGA and the Windy Gap Firming Project Fish and Wildlife Enhancement Plan authorized by the Colorado Wildlife Commission for the purpose of maintaining, restoring or enhancing the portions of the Upper Colorado watershed. Northern Water also has committed other resources. Grand County commits to using the resources provided for the sole purpose of implementing the Cooperative Effort. In addition, Grand County, Middle Park and the River District agree to contribute resources to the Cooperative Effort on an ongoing basis, as available and appropriate. Because resources available to the Parties are limited, the use of those resources will be prioritized as part of the Cooperative Effort.

C. The Cooperative Effort does not constitute mitigation for the Windy Gap Firming Project. The Subdistrict agrees to undertake all Mitigation Measures related to Windy Gap Firming Project required in the Record of Decision (ROD) for the Windy Gap Firming Project to be issued by the Bureau of Reclamation (Reclamation) and the 404 Permit to be issued by the Corps of Engineers (COE). The parties to the Cooperative Effort agree not to pursue a challenge to the Mitigation Measures described in the ROD for Windy Gap Firming Project. All the parties to the Cooperative Effort will work in good faith to implement the Cooperative Effort in a way that complements the Mitigation Measures.

D. If the Management Committee desires additional resources beyond the resources provided by the Subdistrict and Northern Water, and those resources contributed by Denver Water, Middle Park, Grand County and the River District, to implement the Cooperative Effort, the parties will work with other stakeholders, granting agencies, and

identify other sources of funding to provide additional resources. If mutually defined additional resources are still desired, the parties may agree to consider contributing more of their own resources on a case-by-case basis and within the context of the other principles listed herein. Each party retains its sole discretion whether to provide any additional resources without future judgment or prejudice by the other parties.

E. The parties to this Agreement agree that active participation in the Cooperative Effort by Northern Water and the Subdistrict will commence after issuance and acceptance by the Subdistrict of the ROD and all permits necessary for the Windy Gap Firming Project. Prior to the issuance and acceptance of the ROD and the permits, the parties agree that they will continue to work together on completing and improving the draft SMP.

F. The parties acknowledge that actions not the subject of other contractual obligations that would impair a party's ability to meet its water supply commitments will not be undertaken as part of the Cooperative Effort, unless agreed to voluntarily by the owner of the water supply.

G. For a period of five years from the date of the first diversions into the constructed WGFP, no party will unilaterally request, or cause others to request, that the Reclamation or other applicable regulatory agencies reopen a permit or license for the Windy Gap Firming Project for any reason. Each party reserves the right to oppose any such efforts to reopen the permits or licenses for the Windy Gap Firming Project.

II. The Cooperative Effort

A. Organization.

1. **Management Committee**. The parties will form a Management Committee within six months after this Agreement becomes effective.

2. **Representation.** The initial Management Committee will comprise six members, one representative each from Grand County; the City and County of Denver, acting by and through its Board of Water Commissioners (Denver Water); the River District; Middle Park; Northern Water and the Subdistrict (one member to represent both); and Trout Unlimited. The Management Committee may decide to invite others to be members, such as representatives from agricultural, environmental, recreational, industrial, and governmental interests. It is anticipated that the Colorado Division of Parks and Wildlife will be invited to be a member of the Management Committee and the United States Forest Service will be invited to play an advisory role in the Management Committee. Any decision to add other members to the Management Committee will be by consensus, with consideration being given to the resources and contributions other potential members may provide to the Cooperative Effort.

3. **Decision-making.** The Management Committee will operate by consensus. The Management Committee will make a good faith effort to resolve any issues. If the good faith effort does not result in consensus, the Management Committee will implement the Conflict Resolution process.

4. **Organizational Structure**. The Management Committee may establish a not-for-profit organization to implement the Cooperative Effort if it determines that such a vehicle is the most effective means for accomplishing its objectives.

B. **Tasks and Responsibilities**. The following are expected under the Cooperative Effort:

1. **Continue to Improve the Grand County Stream Management Plan.** Phase 1, 2, and 3 of the draft SMP have been completed. The parties will continue to adapt and improve the draft SMP cooperatively as additional information is developed, the understanding of desired stream conditions is better defined, and the management goals for each stream reach are agreed upon.

2. **Management Goals and Priorities.** The Management Committee will define the management goals for each stream reach of interest. By way of example, one reach may be managed to increase the fishing experience for rainbow trout, while another reach may be managed for a specific stream characteristic such as macro-invertebrate diversity. Which management goals are practicable for a specific reach could be influenced by the resources available for use in that reach. It is expected that the Management Committee might also define secondary management goals for specific reaches. Once the management goals for the stream reaches are agreed upon, the Management Committee will prioritize the reaches based upon the agreed upon management goals, the desired stream conditions for each reach, and the available resources.

3. **Coordinate with the Reclamation and COE.** If applicable, the Management Committee may work with Reclamation and the COE to coordinate, to the extent practicable, Mitigation Measures for WGFP with the management goals, priorities and projects undertaken as part of the Cooperative Effort. The Management Committee will work to ensure that the Subdistrict is not required to engage in duplicative or conflicting actions, nor implement measures that do not accomplish their stated benefits.

4. **Water Quality Standards.** The Colorado Department of Public Health and Environment (CDPHE) has listed several stream segments in the Cooperative Effort Area on the 2010 303(d) list of impaired waters. The Cooperative Effort will participate in developing the appropriate management actions for these segments.

5. **Monitoring Plan.** The ability to fully identify "cause and effect" relationships in a complex aquatic environment is difficult. Therefore, the parties agree to implement a monitoring plan to identify undesirable changes in, and agree upon desired modifications to, the aquatic environment, and to measure the effectiveness of actions taken to protect or improve the aquatic environment. This approach will allow the available resources to be focused on avoiding problems, responding to changing conditions, and achieving agreed-upon goals. The Cooperative Effort will rely on existing data and new data gathering under existing programs to provide the primary source of information for designing the management goals and for prioritizing those goals and reaches where the goals will be applied. The Management Committee can initiate additional monitoring, data gathering and analysis, and may choose to focus on specific measurable indicators, as circumstances warrant, to guide in applying the resources and to monitor the effectiveness of the resources in meeting a management goal. The principles of the potential monitoring plan are described in Attachment A.

6. **Implementation.** The Management Committee will review the results of monitoring to evaluate the effectiveness of the Cooperative Effort and of the allocation of available resources in meeting the management goals and priorities. The results of the monitoring program also may be used to identify measures that might be desirable to maintain or improve the stream environment.

7. **Independent Experts.** The Management Committee may retain independent experts and consultants if deemed necessary to perform the Committee's work. The cost of such independent experts and consultants shall be allocated among the parties as agreed to by the Management Committee.

8. **Operations Plan**. The Management Committee will develop an annual operations plan to maximize the stream environmental benefits of the available resources (including water commitments, system flexibility and funding). The plan will explore opportunities for coordinated operations of diversion structures and reservoir releases among all water users in Grand County, including Northern Water; the Subdistrict; the Bureau of Reclamation, Denver Water; Middle Park; River District; and in-county diversions for agricultural, municipal, industrial, and others uses. The purpose of coordinated operations is to allow the water users to meet the supply requirements of their systems, while maximizing the effectiveness of the Cooperative Effort. Subject to any contractual commitments regarding system operations, all water users retain sole discretion over their water supply system demands and opportunities and available system flexibility. The decisions and actions by the Management Committee in developing and implementing the operations plan shall take into account water rights priorities, draft SMP flow ranges as they change over time, naturally

occurring hydrologic conditions, recreational flow needs, CWCB instream flows, and the results of monitoring.

9. **Incorporate New Knowledge into Management Actions.** As the results of testing various operational changes, monitoring the effectiveness of measures, and collecting and analyzing additional data, the Management Committee will have new information to inform its decision-making. The Management Committee will address data management and access issues in a timely fashion.

10. **Obtain and Manage Funding.** The Management Committee will explore whether the most effective use of funds made available for the benefit of the stream environment is to set up an endowment fund dedicated to the goals of the Cooperative Effort. For example, the interest from such a fund could be used as matching funds for grants. The Management Committee also will research available sources of funding for planning, monitoring and implementing measures identified during the Cooperative Effort, including, but not limited to grants, contributions, or assessments.

11. **Weekly Coordination.** The Management Committee will conduct weekly coordination meetings or calls from May through September or at such other times as mutually agreed by the Management Committee. The purpose of these meetings/calls is to highlight upcoming operational issues, discuss potential options to reduce possible negative impacts to the aquatic environment, and to coordinate implementation of actions under the Cooperative Effort. The Management Committee can agree to include other entities in the meetings or calls, as a general practice or as warranted. However, the other entities participating in these calls would act as advisors only unless they were providing water, usable resources, or system flexibility to a particular solution or action of the Management Committee.

12. **Annual Review and Stream Management Plan Adaptations.** The Management Committee will conduct an annual review in January or February before the next spring and summer field season to assess whether management goals are being met, evaluate the monitoring data gathered, assess the use of available resources, identify additional data and analysis needs, determine if refinements are needed to the Grand County draft SMP or the operations plan, and provide an annual summary to each of the parties.

III. Conflict Resolution

The parties agree that, if the Management Committee cannot adequately address an issue to the satisfaction of one of the parties, the parties will confer in good faith and endeavor to resolve the concern.

Where the Management Committee cannot make a decision by consensus, and any single entity believes that issue warrants mediation, the Management Committee will select a neutral third party mediator who would seek an acceptable voluntary solution to the conflict.

For conflicts that involve a technical or scientific matter, the neutral third party mediator may select an independent technical or scientific expert, acceptable to all parties, to review and make a recommendation on the matter. If the conflict cannot be resolved through the efforts of the mediator, then the Management Committee would agree to disagree, and move forward with the other elements of the Cooperative Effort where they had reached agreement.

In the specific case of water resources committed to Grand County by the WGFP IGA and the Northern Agreement, if the Management Committee cannot reach consensus on the use of that water, then Grand County shall manage and control the in-stream use of the water to accomplish the purposes of the WGFP IGA and the Northern Agreement.

If the conflict cannot be resolved by the efforts of the mediator and the Management Committee is prevented from moving forward with the other aspects of the Cooperative Effort, then the parties can pursue any available legal or administrative recourse.

IV. Effective Date

This Agreement shall become effective upon the issuance and acceptance by the Subdistrict of the ROD and permits necessary for the Windy Gap Firming Project.

V. Miscellaneous Provisions

A. Regulatory Action or Litigation

In the event any person or entity files a petition to Reclamation, Corps of Engineers or other regulatory agency for regulatory action, or commences litigation, which would materially adversely affect the Windy Gap Firming Project (Adverse Action), the parties to the Cooperative Effort agree to meet and discuss in good faith the potential detrimental effect of such Adverse Action, with the goal of determining whether any action by one or more parties could avoid the Adverse Action or mitigate its impact on the affected party. Each party agrees to evaluate in good faith whether it can implement changes in its operations or undertake other efforts that would achieve this goal, and to implement any such efforts as may be agreed to by the parties. If the Windy Gap Firming Project is denied an acceptable ROD or permit, or if the Subdistrict decides not to proceed with its project, then the Subdistrict shall provide notice to the parties to this Agreement within ten days of the decision and shall be released from its obligation to participate in the Cooperative Effort.

B. No Property Rights or Servitude

Nothing in this Agreement shall be deemed or construed as granting or creating any property right or servitude whatsoever on any party's water rights or facilities. The foregoing sentence shall not impair the rights of any party to specific performance of this Agreement.

C. **No Operating Obligation**

Except for certain obligations in the WGFP IGA and Northern Agreement, nothing in this Agreement shall be deemed or construed as creating any obligation on any party to operate its raw or treated waterworks system in any particular manner, so long as the party complies with the terms of this Agreement. Each party retains sole and exclusive discretion concerning the operation of its system.

D. **Right of Specific Performance**

If any party shall fail to cure any default or breach of this Agreement within 120 days after receipt of notice from the non-defaulting or non-breaching party, then the non-defaulting or non-breaching party may elect to file suit, without further notice, for specific performance of this Agreement. The parties agree that the terms and conditions of this Agreement are enforceable by specific performance, and the parties hereby waive any defenses to specific performance based on the doctrine of sovereign immunity

E. **Force Majeure**

A party shall be excused from performing its obligations under this Agreement during the time and to the extent that it is prevented from performing by a cause beyond its control, provided that such nonperformance is beyond the reasonable control of, and is not due to the fault or negligence of the party not performing.

F. **Severability**

If any provision of this Agreement shall prove to be illegal, invalid, unenforceable or impossible of performance, the remainder of this Agreement shall remain in full force and effect.

G. **Assignment**

Neither this Agreement nor any of a party's rights, obligations, duties or authority hereunder may be assigned in whole or in part without the prior written consent of the other parties.

H. **Colorado Law**

This Agreement shall be construed in accordance with the laws of the state of Colorado.

I. **Termination**

This Agreement will remain in effect unless terminated in writing by all the parties.

J. **Admission of New Parties**

The original parties to this Agreement may, upon unanimous consent, admit new parties upon such terms and conditions as they determine appropriate.

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By: Mike Applegate
Michael Applegate, President

Date: 12/19/2012

Attest: Frederick W. Williams
Secretary

Date 12/19/2012

MUNICIPAL SUBDISTRICT, NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By: Les Williams
Les Williams, President

Date: 1/3/13

Attest: Frederick W. Williams
Secretary

Date 1/3/13

COLORADO RIVER WATER CONSERVATION DISTRICT

By:_____

Date:_____

MIDDLE PARK WATER CONSERVANCY DISTRICT

By:_____

Date: _____

GRAND COUNTY BOARD OF COUNTY COMMISSIONERS

By: Nancy Stuart
Chairman

Date: 12/4/12

ATTEST: Rita L. Rosene

ATTACHMENT A
Monitoring Plan

Some level of effective monitoring of the stream environment is essential to understanding and measuring success of applied prescriptions. The Management Committee will design an Aquatic Resource Monitoring Plan, which will cover the Cooperative Effort Area. The Monitoring Plan will focus on understanding the resource and preparing to measure the success of the applied prescriptions.

The Monitoring Plan will be developed and implemented as part of the Cooperative Effort, and will incorporate the elements of the monitoring plan prepared during Phase 3B of the draft SMP that the Management Committee determines are appropriate. The monitoring data will be used by the Management Committee for its decision-making. For example, monitoring will be used to identify changes in the aquatic environment, identify critical stream reaches, assign priorities for action steps, evaluate the effectiveness of actions taken, and to modify and refine strategies for achieving goals of the Cooperative Effort.

The elements of the plan will be determined as part of the Cooperative Effort. The Plan could include some or all of the following elements:

- Identification of key stream segments and groundwater to monitor.
- Existing hydrologic conditions.
- Specific existing ecological conditions at key locations.
- Permanent stream transects to monitor and evaluate any future changes in ecological conditions (e.g., shifts in riffle/pool ratios, increases in sedimentation, reduction in stream habitat diversity) associated with changes in channel maintenance and applied flushing flows proscribed in the Cooperative Effort.
- Establish key indicators of aquatic life and stream health (e.g., fish biomass) and threshold levels at specific locations that reflect increases or declines in aquatic life and stream health from application of measures defined in the Cooperative Effort.

Windy Gap Bypass Funding Agreement

The Municipal Subdistrict of the Northern Colorado Water Conservancy District and its Windy Gap Firming Project Water Activity Enterprise, the Board of County Commissioners of Grand County, Colorado, Trout Unlimited, and Upper Colorado River Alliance (UCRA) ("Parties") enter into this Windy Gap Bypass Funding Agreement ("WG Bypass Funding Agreement) as of the latest date of execution of this WG Bypass Funding Agreement by the Parties.

I. Definitions

A. "Bypass Study" is the study to be conducted by Colorado Parks and Wildlife as defined in Paragraph 2.3 of the WGFP Enhancement Plan and the Scope of Work/ Request for Qualifications, Windy Gap Reservoir Modifications Study dated November 2012, RFQ# PBA-1324 (attached as Exhibit "1" and fully incorporated herein by reference).

B. "Chimney Hollow Reservoir" is that reservoir located on the East Slope identified in the Final Environmental Impact Statement for the Windy Gap Firming Project as the proposed action and any reservoir or reservoirs on the East Slope that are constructed as an alternative or in addition to the reservoir identified in the Final Environmental Impact Statement, ("Alternative Reservoir"), provided that the cumulative active storage capacity of Chimney Hollow Reservoir and any Alternative Reservoirs does not exceed 90,000 acre feet.

C. "CPW" is Colorado Parks and Wildlife.

D. "Grand County" is a county of the State of Colorado created by Article XIV of the Colorado Constitution and C.R.S. § 30-5-128, for the purposes stated therein.

E. "Subdistrict" is the Municipal Subdistrict, Northern Colorado Water Conservancy District, which is a political subdivision of the State of Colorado, formed under the provisions of C.R.S. §§ 37-45-101, *et seq.*, for the purposes stated therein and as created by the Decree dated July 6, 1970, Weld County District Court, State of Colorado.

F. "Technical Advisory Team" is the team as defined in the Bypass Study.

G. "Trout Unlimited" is a non-profit organization with offices in the State of Colorado. Its mission is to conserve, protect and restore North America's cold water fisheries and their watersheds.

H. "Upper Colorado River Alliance (UCRA)" is a 501(c) (3) nonprofit Colorado corporation whose mission includes protecting and preserving the aquatic health, riparian health, water resources and environment of the upper Colorado River Basin.

I. "Windy Gap Project" is an existing water supply system that diverts Windy Gap Project Water from the Colorado River just below its confluence with the Fraser River pursuant to the Windy Gap Water Rights.

J. "WGFP" is the Windy Gap Firming Project that is described in the Final Environmental Impact Statement and Record(s) of Decision for the Windy Gap Firming Project.

K. "Windy Gap Bypass" is a modification to the existing Windy Gap Dam as necessary to bypass flows through and/or around Windy Gap Reservoir to meet the Study Objectives and Guidelines identified in the Bypass Study.

L. "Windy Gap Project Water" is any water stored or diverted pursuant to the Windy Gap Water Rights.

M. "Windy Gap Water Rights" are defined in the Decrees entered on October 27, 1980 in Civil Action No. 1768, District Court, Grand County, State of Colorado and Case Nos. W-4001, 80CW108, and 85CW135, District Court, Water Division No. 5; the Decree entered on February 6, 1989 in Case No. 88CW169, District Court, Water Division No. 5, State of Colorado; and the Decree entered on July 19, 1990, in Case No. 89CW298, District Court, Water Division No. 5, State of Colorado ("Windy Gap Decrees") and any subsequent diligence or other related decrees or amendments thereto.

N. "WGFP Enhancement Plan" is the Windy Gap Firming Project Fish and Wildlife Enhancement Plan" dated June 9, 2011 that was approved by the Colorado Wildlife Commission and the Colorado Water Conservation Board. The WGFP Enhancement Plan defines the "Upper Colorado River Habitat Project."

O. "WGFP Enterprise" is the Municipal Subdistrict, Northern Colorado Water Conservancy District, Windy Gap Firming Project Water Activity Enterprise, which is a water activity enterprise of the Subdistrict organized under and pursuant to Article X, Section 20, of the Colorado Constitution and C.R.S. §§ 37-45.1-101 *et seq.*

II. Relationship to 1980, 1985 and 2012 Agreements. This Agreement does not modify or amend in any respect the April 30, 1980 "Agreement Concerning the Windy Gap Project

and the Azure Reservoir and Power Project," the March 29, 1985 "Supplement to Agreement of April 30, 1980" and the 2012 WGFP Agreement (IGA) (collectively the "1980, 1985, and 2012 Agreements"). This WG Bypass Funding Agreement is not, and will not be, incorporated within the 1980, 1985 and 2012 WGFP Agreement, but will be a Related Agreement.

III. Terms of the Agreement

A. The benefits provided in this WG Bypass Funding Agreement are in addition to and are not a substitute for the mitigation required by governmental agencies with jurisdiction over the WGFP. The benefits provided in this WG Bypass Funding Agreement are in addition to and not a substitute for the WGFP Enhancement Plan.

B. WG Bypass Funding Agreement Payments.

1. The Subdistrict and WGFP Enterprise shall provide up to $500,000 for engineering and permitting of the Windy Gap Bypass at such time as all final required WGFP permits and authorizations have been issued and accepted, the Windy Gap Bypass Study has been completed, and there is no appeal pending at that time.

2. The Subdistrict and WGFP Enterprise shall provide $2,000,000, less the amount expended pursuant to Paragraph III.B.1, for the construction of the Windy Gap Bypass at such time as a contract for the construction of WGFP has been issued without litigation by the Parties: a) for the purpose of challenging the validity or adequacy of any local, state or federal permit or approval required for the construction and operation of the WGFP; or b) regarding the Windy Gap Project, Windy Gap Project Water Rights, or other rights and obligations related to the operation of the Windy Gap Project and WGFP other than an Application or other action brought by the Subdistrict for the purpose of confirming the rights associated with the WGFP. Nothing in this paragraph shall limit the County's right to enforce the Windy Gap Project Permit.

3. Donation of Land and Perpetual Operation and Maintenance for the Windy Gap Bypass. The Subdistrict and WGFP Enterprise shall donate an easement or right-of-way for the Windy Gap Bypass if required for the construction, operation and use of the bypass/pass through. The Subdistrict and WGFP Enterprise shall be responsible for the perpetual Operation and Maintenance of the Windy Gap Bypass.

C. WG Bypass Funding Agreement Requirements

Funding as set forth in Paragraph III. B. is subject to the following conditions:

1. The Bypass Study shall be conducted in accordance with Exhibit "1" or such other Scope of Work approved by CPW and acceptable to the Parties and Technical Advisory Team.

2. The Bypass Study must demonstrate that a Windy Gap Bypass will provide a benefit to the Colorado River consistent with the Study Objectives as included in Exhibit "1".

3. The performance of the Bypass Study or this WG Bypass Funding Agreement shall not require an amendment to or modification of the WGFP Enhancement Plan or any modification or supplement of the existing Windy Gap Firming Project Environmental Impact Statement.

4. The Parties agree that CPW shall be an integral part in obtaining all local, state, and federal permits for the Windy Gap Bypass. The Parties will cooperate with CPW for the purpose of obtaining such permits.

5. This WG Bypass Funding Agreement shall be a condition of any 1041 Permit for the WGFP issued by Grand County. This WG Bypass Funding Agreement shall not be, and shall terminate in the event that it is a condition of, incorporated within, or otherwise made a requirement of any other local, state, or federal permit or other approval for the WGFP.

D. The construction and operation of the Windy Gap Bypass shall not at any time cause, and shall not be operated in a manner, which will result in any adverse impact on, injury to, or other restriction or limitation on the exercise of the Windy Gap Water Rights and the operation and maintenance of the Windy Gap Project and WGFP, including, without limitation, a loss of yield, restrictions on the time and amount of pumping of the Windy Gap Project and WGFP, or an increase in demonstrated material cost of operation and maintenance of the Windy Gap Project and WGFP other than the direct cost of operation and maintenance of the Windy Gap Bypass. The Subdistrict and WGFP Enterprise shall also have the right to suspend or modify the operation of the Windy Gap Bypass for the purpose of avoiding injury or adverse impacts to downstream property or resources or to avoid a violation of any applicable laws.

E. There is no warranty or guarantee by the Subdistrict or WGFP Enterprise with respect to whether the construction and operation of the Windy Gap Bypass will provide any benefit to the downstream aquatic environment or other resources.

The Subdistrict and WGFP Enterprise shall have no further obligation under this WG Bypass Funding Agreement to take additional actions or measures in the event that the Windy Gap Bypass does not provide the anticipated results or benefits to the downstream aquatic environment or other resources.

F. The Subdistrict and WGFP Enterprise have no obligation to provide additional funds for the permitting, design, and construction of a Windy Gap Bypass.

G. The Parties will work together cooperatively, collaboratively, diligently, and in concert with others, in good faith to secure any required additional funding to construct the preferred alternative identified by the Bypass Study.

1. The Parties, CPW and the Technical Advisory Team shall first meet and confer for the purpose of selecting a preferred alternative consistent with Exhibit "1". If, after the best efforts of the Parties, CPW and Technical Advisory Team, sufficient funding is not available for the preferred alternative, the Parties, CPW and the Technical Advisory Team shall identify any alternatives that meet the Study Objectives and Guidelines set forth in Exhibit "1", and that can be constructed utilizing available funds. If an acceptable alternative can be identified, the Parties, CPW and the Technical Advisory Team may elect to construct the selected alternative with available funds. If an acceptable alternative that can be constructed using available funds cannot be identified or agreed upon, the Parties shall continue to work together cooperatively, collaboratively, diligently, and in concert with others (including the Schmuck Children's Trust), in good faith until such additional funds are obtained to construct the preferred or acceptable alternative Windy Gap Bypass.

H. Termination of this WG Bypass Funding Agreement. This WG Bypass Funding Agreement shall terminate in the event that the Subdistrict and WGFP Enterprise provide written notice to Grand County that they will not pursue the WGFP.

I. Enforcement. In addition to any other remedy provided by law, the Parties further agree that the terms and conditions of this WGFP Bypass Funding Agreement are enforceable by specific performance and agree not to bring any defense to specific performance based on the doctrine of governmental immunity.

J. Preservation of Governmental Powers. Except as specifically provided herein, nothing in this Agreement shall be construed as a limitation on or waiver of any review, approval, or permit authority, or a predetermination of any action taken there under, by any governmental or quasi-municipal entity including, without limitation, the regulatory or quasi-judicial power or authority of Grand County.

K. No Third Party Beneficiary. This WG Bypass Funding Agreement does not create, and no person or party is entitled to assert, Third Party Beneficiary Status with respect to this WG Bypass Funding Agreement or the construction, operation and maintenance of the Windy Gap Bypass.

L. Dispute Resolution. The Parties agree that if a dispute arises on any matter covered in this WG Bypass Funding Agreement, the Parties will confer in good faith and endeavor to resolve the concern. If the Parties reach an impasse, they will select a neutral third party mediator who would seek an acceptable voluntary solution to the conflict. For conflicts that involve a technical or scientific expert, the neutral third party mediator may select an independent technical or scientific expert, acceptable to the parties involved in the mediation, to review and make a recommendation on the matter. If the conflict cannot be resolved through the efforts of the mediator, then the affected parties may pursue any available legal or administrative recourse. Nothing herein shall preclude the commencement of any action that would otherwise be barred by a statute of limitations or the timely participation in any judicial or administrative process.

M. UCRA and Trout Unlimited Withdrawal. For clarity, the purpose and objective of UCRA and Trout Unlimited's participation in this WG Bypass Funding Agreement is to ensure construction of the Windy Gap Bypass in a timely and expedient fashion and will work cooperatively and in good faith with the Parties to achieve that result. If, however, for any reason UCRA or Trout Unlimited determines this objective is not being achieved, they reserve their respective rights to withdraw from the WG Bypass Funding Agreement and pursue any and all available legal remedies.

N. Integration of Understandings. This WG Bypass Funding Agreement is intended as the complete integration of all understandings between the Parties. No prior or contemporaneous additions, deletions, or other amendment hereto shall have any force or affect whatsoever, unless embodied herein in writing. No subsequent novation, renewal, addition, deletion or other amendment hereto shall have any force or effect unless embodied in a written agreement executed and approved by the Parties.

BOARD OF COUNTY COMMISSIOSNERS OF THE COUNTY OF GRAND WATER

By: Nancy Stuart
Chairman

MUNICIPAL SUBDISTRICT, NORTHERN COLORADO CONSERVANCY DISTRICT

By: [illegible]
President

ATTEST: _____
Clerk & Recorder

12/4/12
Date

ATTEST: _____
Secretary

1/3/13
Date

WINDY GAP FIRMING PROJECT WATER ACTIVITY ENTERPRISE

ATTEST: _____
Secretary

1/3/13
Date

By _____
President

1/3/13
Date

TROUT UNLIMITED

By _____

Date _____

UPPER COLORADO RIVER ALLIANCE

By _____

Date _____

ATTEST: _____
Clerk & Recorder

_____
Date

ATTEST: _____
Secretary

_____
Date

WINDY GAP FIRMING PROJECT WATER ACTIVITY ENTERPRISE

ATTEST: _____
Secretary

By _____
President

_____
Date

_____
Date

TROUT UNLIMITED

By Amelia S. Whiting

Date 12-20-2012

UPPER COLORADO RIVER ALLIANCE

By V A Isaacs
V.A Isaacs

Date 12-5-12

Exhibit "1"

Draft

SCOPE OF WORK
REQUEST FOR QUALIFICATIONS (RFQ)
WINDY GAP RESERVOIR MODIFICATIONS STUDY
November 2012

RFQ# PBA-1324

The Colorado Division of Parks and Wildlife (CPW) is requesting Statements of Qualifications (SOQs) from qualified consultants to conduct as study of the conceptual design and evaluations of Windy Gap Reservoir modifications intended to improve the aquatic habitat in the vicinity of and downstream of the Windy Gap Reservoir.

Background
This study is being conducted as specified in the Windy Gap mitigation and enhancement plans submitted by Municipal Subdistrict of the Northern Colorado Water Conservancy District (Subdistrict) and approved by the Colorado Parks and Wildlife Commission in June 2011.

Study Objectives
The purposes of this RFQ is to obtain a proposal from a consultant or team of consultants to conduct a study that will evaluate, prioritize and recommend modifications to the existing Windy Gap Dam and related work necessary in order to bypass flows through and/or around Windy Gap Reservoir (WG Study). The objective of those modifications is to improve the aquatic biological health of the Colorado River at and below Windy Gap Reservoir, including reducing sedimentation and stream channel armoring problems; supporting a healthy riparian zone; and accommodating flows anticipated in the future.

Project Oversight
The consultant or consultant team will be chosen according to State statute. CPW and members of the Technical Advisory Team (the Team) will participate in the evaluation and ranking of SOQs. The Technical Advisory Team will also review and provide technical advice and input to CPW regarding the Statement of Work approved for the contract, as well as reviewing the alternative(s) identified during the project work, and other matters identified in this document. CPW will direct and manage the WG Study consistent with the contract and provide regular updates to the Technical Advisory Team. The Team will provide additional advice and input to CPW as needed on the conduct of the WG Study.

The Technical Advisory Team will be comprised of two representatives each from:

- Colorado River Water Conservation District
- Trout Unlimited
- Denver Water
- Grand County
- Middle Park Water Conservancy District
- Municipal Subdistrict of the Northern Colorado Water Conservancy District
- Schmuck Children's Trust
- Upper Colorado River Alliance.

Guidelines for the WG Study and Potential Modifications to the Windy Gap Dam (Guidelines)

The WG Study is subject to the following Guidelines

A. The study recommendations must not negatively impact the ability of the Subdistrict and Denver Water to exercise its water rights. If the WG bypass/flow-through provides a benefit to the Subdistrict in exercising its water rights, such as reduced need for maintenance or sedimentation removal, those benefits will be described.

B. Solutions must be proposed and implemented in ways that do not negatively impact the location or amount of water available to lawfully divert at headgates or other diversion points within the reach where the proposed work will be completed and will not negatively impact the rights and obligations contained in that Supplemental Agreement between the Subdistrict and Schmucks dated April 2, 1982 and the October 14, 1977 receipt and option contract between the municipal subdistrict and Howard Schmuck.

C. Study recommendations shall seek to facilitate recovery of aquatic species diversity, including mayflies and stoneflies, sculpin, trout, and other species.

D. The Study results shall seek to reduce harmful silt releases, reduce the capture of coarser materials, improve stream temperatures for coldwater vertebrates and invertebrates, reduce rooted aquatic vegetation, improve water quality, accommodate movement of species upstream and downstream of the Windy Gap Reservoir, and provide other benefits that have or may be identified associated

with reconnecting the Colorado River upstream and downstream of Windy Gap Reservoir.

E. Study recommendations shall seek to prevent stream bed armoring and embeddedness.

F. The final report for the study will describe the expected aquatic benefits, permanence of the benefits, ongoing maintenance concerns, impacts on riparian zone, ability to perform under expected low flow and high flow conditions, additional public benefits and any other factors deemed important by the CPW and the Technical Advisory Team.

G. The specific in-channel improvement activities associated with the Upper Colorado River Habitat Project as described in the Fish and Wildlife Enhancement Plan will be determined in an effort separate from this RFQ.

H. The WG bypass/flow-through should be conceptually designed to accomplish and, to the extent practicable, optimize the purposes and objectives described above under Study Objectives, while being cost efficient and subject to these Guidelines. The WG bypass/flow-through should be sufficiently planned and/or designed to allow a reasonable cost estimate for each option, with the understanding that more planning, permitting and design will be needed before implementing the selected option.

Study Budget and Funding

The budget for the WG Study is $250,000. The Windy Gap Firming Project (WGFP) Intergovernmental Agreement (IGA) between the Municipal Subdistrict and CPW provides $250,000 to CPW for this Study. The funding is expected to be transferred to CPW prior to December 31, 2012.

Study Area

The study area for the WG bypass/flow-through will be the Upper Colorado River from immediately upstream of the confluence of the Colorado and Fraser Rivers to an area immediately downstream of the Windy Gap Reservoir, although a larger area will be considered in identifying the benefits of such a structure.

Schedule

CPW anticipates hiring a consultant and beginning the WG Study in February 2013 and that the study will be completed by October 1, 2013. The approved contract will identify the WG Study schedule.

Work Tasks
The WG Study work tasks are as follows:

- Develop engineering alternatives for a structure that will bypass flows through and/or around Windy Gap Reservoir to best achieve the Study Objectives and consistent with the Guidelines for the WG Study and Potential Modifications to the Windy Gap Dam, above.
- Review available data. The Technical Advisory Team will provide a list of existing studies to be included in the background research. If necessary, perform sediment sampling to characterize sediment load upstream and downstream of Windy Gap Reservoir, and embeddedness upstream and downstream of Windy Gap Reservoir, and identify additional data needs and submit to Technical Advisory Team.
- Evaluate hydrology for alternatives including ability to pass peak flows and low flows and the ability of the new structures to withstand high flows.
- Perform hydraulic analysis of identified hydrology for the ability to move fine sediment and coarse bed loads.
- Meet with Technical Advisory Team to discuss preliminary alternatives.
- Evaluate ability of each alternative to affect sediment transport, sediment deposition, water quality (effects on temperature and/or nutrients) and fish passage.
- Identify any alternatives with fatal flaws or inability to satisfy the Guidelines.
- Provide cost estimates for alternatives.
- Identify ongoing operation and maintenance requirements of each alternative and associated costs.
- Identify permitting requirements of each alternative.
  Assess relative ability of proposed alternatives to improve the aquatic environment and enhance river conditions to meet the purposes and objectives in Study Objectives and within the Guidelines.
- Provide a matrix that summarizes each option by cost, hydraulic benefits, aquatic benefits, and constraints/issues.
- Provide a recommended course of action that meets the Study Objectives and consistent with the Guidelines.

Deliverables
Technical Memorandum (draft and final versions). The CPW and Technical Advisory Team will review the draft Memorandum and provide comments to the Consultant.

Selection of Preferred Option. CPW and the Technical Advisory Team will cooperate in selecting the mutually acceptable WG bypass/flow-through

design to implement consistent with the Study Objectives and consistent with the Guidelines for the WG Study and Potential Modifications to the Windy Gap Dam, above

Funding of Construction of Preferred Option
CPW and the Technical Advisory Team are proceeding with this RFP to investigate, and analyze potential alternatives, as well as to designate a preferred alternative that best accomplishes the purposes and objectives set forth the Study Objectives and consistent with the Guidelines for the WG Study and Potential Modifications to the Windy Gap Dam, above utilizing the $250,000 committed by the Subdistrict to complete the study. Alternatives for the funding for the construction of the bypass/flow-through have not been specifically identified. Commitments for funding are being evaluated by the Subdistrict, Denver Water, and the State of Colorado with the intent of developing a new, mutually acceptable agreement among the members of the Technical Team and CPW regarding the commitment to, amount of, and conditions associated with, funding the WG bypass/flow-through (the "Implementation Agreement"). If the cost to implement the selected preferred alternative exceeds the amount committed in the Implementation Agreement, the Technical Team, CPW and others as appropriate will cooperatively pursue additional funding. If, after the best efforts of the parties, the additional funding cannot be obtained voluntarily, the Technical Team and CPW may elect to modify the selected preferred alternative utilizing the findings of the WG Study to allow construction to proceed within the budget of the committed funds.

Flow Regime
This WG Study is not meant to address or evaluate the flow regime, including flushing flows, necessary to protect or optimize aquatic biological health of the Colorado River at and below Windy Gap Reservoir.

Reporting
Reporting shall include monthly updates to the Project Manager and one meeting with the Technical Advisory Team in order to discuss the preliminary alternatives.

Monitoring Criteria

A. Performance Measures and Standards:
The following performance measures and standards shall apply:

Timeline and deliverables: The following deliverables will be completed by the dates stipulated in the contract

1) Technical Memorandum (draft and final versions).

2) Selection of Preferred Option. .

B. Reporting Requirements Monthly reports shall be submitted to the CPW Project Manager and will be reviewed by the Technical Advisory Team

C. Monitoring Requirements: The State will monitor the Consultant's performance by reviewing the monthly reports prior to making payments.

D. Noncompliance Resolution: Any problems with the project will follow the resolution process outlined below, before the remedies in Section 15 are immediately applied. In the event the State and the Consultant need to escalate a case regarding noncompliance, the following Resolution Team members and responsibilities have been identified.

Division of Parks and Wildlife	Consultant
State / CPW TITLE (PERSON'S NAME) • Entry point contact to the resolution process • Is responsible for ascertaining the project impacts based on the information provided • Owns resolution of most issues • Responsible for contacting CPW Leadership Team Resolution Project Manager in writing for situations which cannot be resolved at project level	Consultant / Project Manager – TITLE, CONSULTANT NAME (PERSON'S NAME) • Entry point contact to the resolution process • Owns resolution of most issues
Resolution Project Manager – CPW Leadership Team • CPW advocate during the resolution process • Is responsible for ascertaining the timeline and financial impacts based on the information provided • Owns the problem and the overall action plan • Provides written notification to the Consultant identifying the	Consultant / Resolution Project Manager – TITLE, CONSULTANT NAME (PERSON'S NAME) • Consultant advocate during the resolution process • Obtains additional resources, as needed • Works to ensure that Consultant parties are properly informed throughout the resolution • Responsible for contacting next

noncompliance issue and expected actions on the part of the Consultant in order to remedy the situation • Obtains CPW and DNR approval for the action plan • Works to ensure that all parties are properly informed throughout the resolution • Responsible for contacting next level Resolution Manager if needed	level Resolution Manager for the Consultant if needed

DRAFT

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol
Denver, Colorado 80203
Phone (303) 866-2471
Fax (303) 866-2003

John W. Hickenlooper
Governor

October 6, 2011

Will Tully
Bureau of Reclamation
11056 West County Rd. 18E
Loveland, CO 80537

RE: Windy Gap Firming Project, Fish & Wildlife Mitigation Plan

Dear Mr Tully:

Enclosed is the fish and wildlife mitigation plan for the Windy Gap Firming Project, which constitutes the official State of Colorado position with regard to mitigation of impacts from this project to these resources.

Under Colorado law, any applicant for any water diversion, delivery, or storage facility in Colorado which requires an application for a permit, license, or other approval from the United States must inform the Colorado Water Conservation Board, Wildlife Commission, and Division of Wildlife of its application and submit a fish and wildlife mitigation proposal. Once there is agreement on reasonable mitigation actions between the Colorado Water Conservation Board and the Colorado Wildlife Commission, that agreement becomes the official state position on mitigation of impacts to fish and wildlife resources. This official state position must then be communicated to each federal, state, or other governmental agency from which the project applicant must obtain a permit, license, or other approval.

This letter is to inform you that this process has been completed for the Windy Gap Firming Project, and the State of Colorado has adopted the enclosed fish and wildlife mitigation plan pursuant to 37-60-122.2 of the Colorado Revised Statutes. I believe that this mitigation plan comprehensively addresses impacts to Colorado's fish and wildlife resources, and I urge its consideration in the Federal permitting process.

Sincerely,

John W. Hickenlooper
Governor

Enclosures:

Windy Gap Firming Project Fish and Wildlife Mitigation Plan
Windy Gap Firming Project Fish and Wildlife Enhancement Plan

Windy Gap Firming Project

Fish and Wildlife Mitigation Plan

Prepared for:
The Colorado Wildlife Commission
In accordance with CRS 37-60-122.2

Prepared by:
Municipal Subdistrict
Northern Colorado Water Conservancy District

June 9, 2011

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EXECUTIVE SUMMARY

The Municipal Subdistrict of the Northern Colorado Water Conservancy District (Subdistrict), on behalf of 13 East Slope Windy Gap Project participants, is pursuing a project that will improve the reliability of the water supplies and deliveries from the existing Windy Gap Project. The purpose of this Fish and Wildlife Mitigation Plan (FWMP) for the Windy Gap Firming Project (WGFP) is to comply with the requirements of Colorado State law (CRS 37.60.122.2), including the Procedural Rules for the Wildlife Commission (Chapter 16).

The WGFP is also required to comply with the National Environmental Policy Act (NEPA) by preparing a Final Environmental Impact Statement (FEIS) and with Section 404(b) (1) of the Clean Water Act by applying for a "404 Permit." As part of the 404 permit process, a 401 certification from the Colorado Department of Public Health and Environment is required.

The WGFP participants are committed to comply with all mitigation measures required by the FWMP, the FEIS (and associated Record of Decision), the 404 Permit, and the 401 Certification.

The Subdistrict is also submitting a separate Fish and Wildlife Enhancement Plan (Enhancement Plan) in cooperation with Denver Water to enhance fish and wildlife resources over and above the levels existing without the WGFP and Moffat Project.

In addition to the required mitigation measures in the FWMP and enhancements in the Enhancement Plan, the Subdistrict is participating with several East Slope and West Slope water users, numerous state and federal agencies, and West Slope private entities to enhance the flows in the Colorado River in Grand County by managing and coordinating the release of approximately 5,400 AF of water (1/2 of 10825 Water) that will benefit the Upper Colorado River Endangered Fish Recovery Program.

The goal of the Subdistrict and the WGFP participants is to mitigate for environmental impacts of the WGFP through the measures identified in this Fish and Wildlife Mitigation Plan and to improve the aquatic and riparian habitat of the Colorado River in Grand County with measures identified in the separate Enhancement Plan, while at the same time improving the reliability of the Windy Gap Project water supplies.

This FWMP for the WGFP addresses two main impact areas. On the East Slope the proposed action primarily consists of the construction and operation of a new 90,000 AF water storage facility, Chimney Hollow Reservoir. Although there will be no new construction on the West Slope and all future operations of the Windy Gap Project will be within historic water rights limitations, there will be increased diversions of Colorado River water over the actual amounts historically diverted.

The associated impacts to the Colorado River stream and aquatic resources are addressed in this plan.

With respect to the Colorado River below the Windy Gap diversion, both the WGFP and Denver Water's Moffat Collection Project (Moffat Project) diversions can sometimes have cumulative, or combined, impacts to the river. Since the Moffat Project is also seeking approval through the state and federal regulatory processes, both the Subdistrict and Denver Water have agreed to cooperate in a process of simultaneous development of the mitigation and enhancement plans pursuant to CRS 37-60-122.2. The WGFP Enhancement Plan is being provided to the Wildlife Commission concurrently with this FWMP in a separate document.

WINDY GAP FIRMING PROJECT
FISH AND WILDLIFE MITIGATION PLAN

1.0 INTRODUCTION

The Windy Gap Firming Project (WGFP) is a proposed water supply project that would provide more reliable water deliveries to Front Range and West Slope communities and industries. The Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the WGFP Water Activity Enterprise (Subdistrict) is seeking to construct the project on behalf of the 13 WGFP Participants. Project Participants include the City and County of Broomfield; the towns of Erie and Superior; the cities of Evans, Fort Lupton, Greeley, Lafayette, Longmont, Louisville, and Loveland; the Little Thompson Water District; the Central Weld County Water District; and the Platte River Power Authority.

This Fish and Wildlife Mitigation Plan (FWMP) was developed to satisfy the requirements of Colorado Revised Statute (CRS) 37-60-122.2 and outlines the actions that Project Participants will implement to mitigate the impacts that the WGFP may have on fish and wildlife. The FWMP also addresses concerns regarding WGFP impacts that were identified by CDOW staff in a detailed review of the DEIS impacts. The Subdistrict has also prepared a separate Fish and Wildlife Enhancement Plan (Enhancement Plan), pursuant to CRS 37-60-122.2 to address issues raised by Colorado Division of Wildlife and other stakeholders regarding the current condition of the aquatic environment on the Colorado River, which includes proposed enhancement measures to enhance fish and wildlife resources over and above levels existing without the WGFP.

2.0 PROJECT BACKGROUND

2.1 COLORADO-BIG THOMPSON PROJECT

The Colorado-Big Thompson Project was developed by the U.S. Bureau of Reclamation on behalf of the Northern Colorado Water Conservancy District between 1938 and 1957. The project was designed to provide water for agricultural, municipal, and industrial beneficial uses. The C-BT Project provides supplemental water to 33 cities and towns and is used to help irrigate more than 600,000 acres of northeastern Colorado farmland. On average, about 220,000 AF of water is delivered to northeast Colorado.

Twelve reservoirs, 35 miles of tunnels, 95 miles of canals, and 700 miles of power transmission lines comprise the complex C-BT collection, distribution, and power systems. Willow Creek Reservoir, Shadow Mountain Reservoir, Grand Lake, and

Lake Granby on the west of the Continental Divide collect and store C-BT water from the upper Colorado River basin. Water is pumped from Lake Granby into Shadow Mountain Reservoir where it flows by gravity into Grand Lake. From there, the 13.1-mile Adams Tunnel transports the water under the Continental Divide to the East Slope.

Once the water reaches the East Slope, it is used to generate electricity as it descends almost one-half mile through five power plants on its way to Colorado's Front Range. Carter Lake, Horsetooth Reservoir, and Boulder Reservoir store the water. C-BT water is delivered as needed via canals and pipelines to supplement native water supplies in the South Platte River Basin.

2.2 WINDY GAP PROJECT

During the 1960s, the cities of Boulder, Greeley, Longmont, Loveland, Fort Collins, and the Town of Estes Park determined that additional water supplies were needed to meet their projected municipal demands. The Municipal Subdistrict, Northern Colorado Water Conservancy District, consisting of the incorporated areas of the six entities, was formed in 1970 to develop the Windy Gap Project. Prior to project construction, the Platte River Power Authority acquired all of the City of Fort Collins' allotment contracts, as well as one-half of the City of Loveland's and one-half of the Town of Estes Park's contracts. Allotment contracts are used to allocate 480 units of Windy Gap Project water. Each Windy Gap unit represents a yield of up to 100 AF and, similar to C-BT units, can be bought and sold. The Windy Gap unit holders have changed since the original project was completed.

The Windy Gap Project consists of a diversion dam on the Colorado River, a 445-AF reservoir, a pumping plant, and a 6-mile pipeline to Lake Granby. Currently, Windy Gap Project water is stored and conveyed through C-BT Project facilities prior to delivery to Windy Gap Project allottees. Middle Park Water Conservancy District contractees on the West Slope use Windy Gap water to replace out-of-priority diversions by release of water directly from Lake Granby to the Colorado River.

2.2.1 Windy Gap Project Environmental Impact Statement

In April 1981, Reclamation completed the Final EIS on the effects of using C-BT Project facilities for the "storage, carriage and delivery" of Windy Gap Project water. The 1981 Record of Decision (ROD) for the original Windy Gap Project EIS allowed Reclamation to negotiate a contract with the Subdistrict and the NCWCD for the storage, conveyance, and delivery of Windy Gap Project water using facilities of the C-BT Project.

The original EIS determined that about 56,000 AF of water could be diverted annually from the Colorado River and that about 48,000 AF would be available for delivery to East Slope Windy Gap unit holders after subtracting 3,000 AF for MPWCD and allowances for various storage and conveyances losses. Windy Gap diversions are limited to a rate of 600 cfs and occur primarily during the months of

April to July. Total Windy Gap diversions are measured at the Adams Tunnel and are limited to a maximum of 90,000 AF in any one year and a maximum of 650,000 AF during any consecutive 10-year period pursuant to the *Agreement Concerning the Windy Gap Project and Azure Reservoir and Power Project*, dated April 30, 1980 and the Windy Gap water rights.

2.2.2 Mitigation Measures Included in the Original Windy Gap EIS

The 1981 Windy Gap Project EIS and ROD, as well as subsequent agreements, included a variety of mitigation measures to compensate and offset the effects associated with construction of the Windy Gap Project and its water diversions. Operational mitigation measures are still in place and funding and compensatory mitigation measures have been paid. Mitigation measures are summarized below.

Minimum Streamflow. A Memorandum of Understanding between the Municipal Subdistrict, Northern Colorado Water Conservancy District, NCWCD, and Colorado Division of Wildlife (June 23, 1980) established the following minimum streamflows on a 24-mile reach of the Colorado River downstream of the Windy Gap Project to the mouth of the Blue River that apply when the Windy Gap Project is pumping:

- From the Windy Gap Diversion Point to the mouth of the Williams Fork River: 90 cfs
- From the mouth of the Williams Fork River to the mouth of Troublesome Creek: 135 cfs
- From the mouth of Troublesome Creek to the mouth of the Blue River: 150 cfs

If flows are less than those specified above, Windy Gap must curtail diversions except that the project cannot be required to bypass more than the natural inflow. Additionally, bypass of at least 450 cfs for at least 50 hours during the period of April 1 through June 30 is required at least once every 3 years**.**

Endangered Species. Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service concluded with a Biological Opinion (March 13, 1981) determination that Windy Gap depletions, with the conservation measures listed below is not likely to jeopardize the existence of the endangered squawfish or humpback chub. The Subdistrict agreed to payment of $100,000 for a habitat project and $450,000 for biological investigations on the Colorado River as conservation measures to compensate for the adverse effects of the Windy Gap Project. Specific conservation and recovery measures included:

- The establishment of backwater habitat areas along the mainstem of the Colorado River
- Support of a field research team for 3 years to evaluate habitat improvement techniques for endangered fish
- Bypass flow agreements with CDOW for trout habitat to benefit Colorado River endangered fish downstream of the project area

Azure Agreement. Western Slope objections to the Windy Gap project were resolved in the *Agreement Concerning the Windy Gap Project and the Azure Reservoir and Power Project* dated April 30, 1980, entered into by the Subdistrict and several West Slope entities that had been opposed to the project because of anticipated West Slope impacts. Following negotiations between the Subdistrict and the Colorado River Water Conservation District (CRWCD), a settlement was reached and mitigation measures acceptable to the parties were identified. Other parties to this agreement included: the Northwest Colorado Council of Governments (NWCCOG), Grand County, MPWCD, Three Lakes Water and Sanitation District, the towns of Granby and Hot Sulphur Springs, Winter Park Water and Sanitation District, and 30 ranchers. The purpose of this agreement was to provide compensation to West Slope entities from the transbasin diversion of water and associated impacts. Principal agreements included:

- A commitment by the Subdistrict to fund the construction of the Azure Reservoir and Power Plant, or if infeasible, fund an alternative project or a cash payment to the CRWCD
- Payment of $25,000 to Grand County for salinity studies of the Colorado River
- Payment of $150,000 to the Town of Hot Sulphur Springs for assistance in improving its water treatment facility and $270,000 for improving its wastewater treatment facility
- Payment of $500,000 to plan, construct, and design facilities needed for ranchers to maintain their diversion structures on the Colorado River
- An agreement by the Subdistrict to subordinate its Windy Gap decrees to all present and future in-basin irrigation, domestic, and municipal uses, excluding industrial uses, on the Colorado and Fraser rivers and their tributaries above the Windy Gap Reservoir site
- An agreement by the Subdistrict to volumetric limits on diversions, which included a maximum single-year diversion of 90,000 AF/year and a maximum of 650,000 AF during any consecutive 10-year period. Per the 1985 *Supplement to the 1980 Azure Settlement Agreement*, these diversion limitations apply to deliveries through the Adams Tunnel, as opposed to diversions at Windy Gap Reservoir
- An agreement by the Subdistrict to bypass flows necessary to meet senior downstream water rights
- An agreement by the NCWCD to allow Grand County's use of a rock and gravel quarry on their property
- An agreement by the Subdistrict to cooperate with CDOW and others to allow public use for recreation at Windy Gap Reservoir

In return for these mitigation measures, West Slope interests agreed to drop objections to the Windy Gap conditional water right decrees and cooperate with all the necessary permitting requirements to allow construction of the project.
The 1985 *Supplement to the 1980 Azure Settlement Agreement* was later signed on March 29, 1985 by the Subdistrict, CRWCD, NWCCOG, Grand County

commissioners, and the MPWCD. This agreement was implemented after the planned Azure Reservoir was determined infeasible. The 1985 agreement included the following compensation to West Slope entities:

- Payment of $10.2 million, which was used to fund construction of Wolford Mountain Reservoir on Muddy Creek north of Kremmling, and release of obligations for funding of the Azure Project
- The Subdistrict's agreement to set aside annually, but non-cumulatively, at no cost to the MPWCD, 3,000 AF of water in Lake Granby that is produced each year from Windy Gap supplies, for beneficial use without waste in the MPWCD for all beneficial uses, except instream uses and industrial uses
- Subordination of Windy Gap water rights to either Rock Creek or Wolford Mountain projects; Wolford Mountain Reservoir was completed in 1996

The 1980 and 1985 agreements were incorporated as integral parts of the Windy Gap water rights decrees.

2.3 WINDY GAP FIRMING PROJECT

The proposed WGFP would entail construction of a new water storage reservoir that would provide more reliable water deliveries to Front Range and West Slope communities and industry. Due to limitations and constraints with the existing system, the current Windy Gap facilities, which were completed in 1985, are unable to deliver the anticipated firm yield of water. Water deliveries from the West Slope are limited by storage capacity in Lake Granby and by the delivery capacity of the Adams Tunnel, which delivers water from Grand Lake to the East Slope. As a result, a group of the Windy Gap Project unit holders, working through the Subdistrict, have initiated the proposed WGFP which will firm all or a portion of their individual Windy Gap units to meet a portion of existing and future municipal and industrial water requirements. The proposed action is to add water storage and related facilities to the existing Windy Gap operations that would be capable of delivering a firm annual yield of about 30,000 AF to Project Participants.

The intent of the WGFP is to improve the reliability of the Windy Gap Project and the existing Windy Gap water rights by increasing the firm yield from the existing Windy Gap Project water supply. The Subdistrict's Proposed Action is the construction of Chimney Hollow Reservoir to store Windy Gap Project water. To improve yield, the Subdistrict also is requesting integration of the Colorado-Big Thompson Project (C-BT) and Windy Gap Project operations so that C-BT water can be stored in Chimney Hollow Reservoir. The Proposed Action would require new connections to C-BT East Slope facilities and continued use of C-BT storage and conveyance systems and other existing pipelines, canals, and diversions to deliver Windy Gap water to Project Participants.

The Preferred Alternative includes construction of the 90,000-AF Chimney Hollow Reservoir with a surface area of about 740 acres. This alternative includes

prepositioning, which is the storage of C-BT water, as well as Windy Gap water, in the new reservoir. Water would be conveyed to Chimney Hollow Reservoir via a new pipeline connection to existing East Slope C-BT facilities at the upper end of the existing Flatiron Penstocks, where a new buried pipeline would deliver water to Chimney Hollow Reservoir or Carter Lake. Connections between Chimney Hollow Reservoir and Carter Lake would allow delivery of water to Participants using existing infrastructure. Reservoir construction would require relocation of about 3.8 miles of an existing 115-kV transmission line.

The new Chimney Hollow Reservoir would be located on Subdistrict land, and these lands, along with adjacent Larimer County open space lands, would be managed by Larimer County for recreation. Combined Subdistrict and Larimer County lands would provide about 3,400 acres including the reservoir for recreation and fish and wildlife habitat. Anticipated recreation features include a parking area, trails, boat dock and ramps, picnic facilities, and vault toilets. No overnight camping would be allowed.

2.3.1 Relationship of the Original Windy Gap EIS to Current Firming Project EIS

The WGFP EIS evaluates the potential effects of alternatives associated with firming the yield of the water diverted under the terms of the original Windy Gap Project EIS. The proposed WGFP would not exceed the average annual diversion of 56,000 AF evaluated in the 1981 EIS and ROD or any other diversion-related limitations or water rights. Additional reservoir storage capacity is needed in the WGFP because of the limitations in the C-BT system to store Windy Gap water when it is available. The WGFP EIS evaluates the direct, indirect, and cumulative effects of any new physical disturbances or changes in operation needed by the WGFP. As described above, the original EIS included a number of mitigation measures to offset impacts, several of which are ongoing.

3.0 OTHER CONCURRENT OR RELATED ACTIVITIES

3.1 MOFFAT COLLECTION SYSTEM PROJECT

The Moffat Collection System Project is currently proposed by Denver Water (Denver) to develop 18,000 AF/year of new annual yield to the Moffat Treatment Plant to meet future raw water demands on the East Slope. This project is anticipated to result in additional diversions, primarily from the upper Fraser River and Williams Fork River basins. Denver's proposed additional Fraser River diversions would be located upstream of the Windy Gap Project diversion site on the Colorado River and would directly affect the availability of water for the WGFP. The Moffat Collection System Project Draft EIS prepared by the Corps was released for public review in 2009.

Diversions for the WGFP and Moffat Project would result in changes to flows in the Colorado River below the Windy Gap dam. Denver Water and the Subdistrict have

agreed to cooperate with each other and with the Colorado Department of Natural Resources (DNR) and CDOW in concurrent development of the mitigation plans required under CRS 37-60-122.2 for the two projects. They have jointly developed stream temperature monitoring stations as mitigation (refer to Section 5.3.3 of this FWMP). Additionally, Denver Water and the Subdistrict have proposed enhancement with significant resources and funding to improve current conditions in the river. The WGFP Enhancement Plan is being provided to the Wildlife Commission concurrently with this FWMP in a separate document.

3.2 UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Reclamation is preparing an Environmental Assessment (EA) to assess the effects of proposed contracts that would provide for permanent release of 10,825 AF/yr of water to the 15-Mile Reach of the upper Colorado River. As a condition of a 1999 Programmatic Biological Opinion (PBO) (U.S. Fish and Wildlife Service 1999), a group of East and West Slope water users is committed to make releases of "10825 water" in late summer and fall in support of the recovery of endangered fish species in the 15-Mile Reach near Grand Junction. The EA will document whether a Finding of No Significant Impact (FONSI) can be issued for the proposed contracts.

The Proposed Action Alternative would use releases from Ruedi Reservoir and Lake Granby, and to a limited extent, storage in and releases from Green Mountain Reservoir when excess capacity is available, to provide 10,825 AF/yr of water for the 15-Mile Reach.

The Proposed Action Alternative involves release of 5,412.5 AF/year from Lake Granby. Releases from Lake Granby would range from 20 to 50 cfs during the period from July 15 to September 30, depending upon the hydrologic year type. This alternative was not included in the hydrologic analyses for either the WGFP or Moffat Project. Accordingly, the flows in the Colorado River below Lake Granby would be increased over flows shown in the Draft EIS for each project.

3.2.1 Coordination of 10825 Project Releases from Lake Granby

Each year, a total of 5,412.5 AF of water is to be released from Lake Granby. The water will be released to benefit the 15-Mile Reach on a fixed delivery schedule to be agreed upon by the parties in the future, and pursuant to applicable federal and state laws. The parties anticipate that the release pattern will depend on the type of hydrologic year (dry, average, or wet) and will be based on the target stream flow in the Colorado River between Lake Granby and Kremmling during late summer and early fall. Releases from Lake Granby will be pursuant to a municipal-recreation contract with a Grand Valley municipal entity within or downstream of the 15-Mile Reach.

Under some hydrologic conditions, releases from Lake Granby made to meet targeted stream flow in the Colorado River downstream of Lake Granby may not coincide with the FWS requirements for the 10825 water at the 15-Mile Reach. In these instances, water released from Lake Granby will be stored in Green Mountain

Reservoir by exchange or substitution pursuant to a contract with Reclamation (subject to availability of storage capacity and exchange potential). This water will then be released at the request of the Service to benefit the 15-Mile Reach.

An Operations Group will be established, consisting of representatives from the water users, FWS, Reclamation, and the State of Colorado Division 5 Engineer. The Operations Group will meet each spring to develop a plan for releasing the 10,825 AF of water during the coming 12 months, and at other times as necessary to fulfill the purposes of this Project. The Subdistrict will propose that CDOW be added as a member of the Operations Group.

4.0 REGULATORY PROCESS

The WGFP is required to obtain numerous federal and state permits, licenses, and approvals. The primary regulatory processes related to the C.R.S. 37-60-122.2 requirement for fish and wildlife mitigation are described below.

4.1 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REVIEW

The Subdistrict is seeking approval from Reclamation for approval of a physical connection to C-BT Project facilities and for operations of the Chimney Hollow Reservoir in order to implement the project. As the lead federal agency, Reclamation prepared a Draft Environmental Impact Statement (Reclamation 2008) for the proposed project. The U.S. Army Corps of Engineers (Corps), Western Area Power Administration (Western), and Grand County are cooperating agencies. A Final EIS is expected to be published in mid-2011. If impacts to fish and wildlife are identified in the FEIS that were not identified in the DEIS, Reclamation will coordinate with CDOW and other state agencies as required under the Fish and Wildlife Coordination Act and will make adjustments to project mitigation as appropriate.

4.2 SECTION 404 PERMIT

Because the proposed WGFP would involve the discharge of dredged and fill material into wetlands or other waters of the U.S., a permit is required from the Corps under Section 404 of the Clean Water Act. The Subdistrict, acting by and through the Windy Gap Firming Project Water Activity Enterprise, has notified the Corps that it will seek a Section 404 permit for the WGFP. Issuance of a permit would be a Corps federal action.

4.3 COLORADO FISH AND WILDLIFE MITIGATION PLAN

This FWMP is prepared to satisfy the requirements of C.R.S. 37-60-122.2. The first portion of this statute states:

> (1)(a) The general assembly hereby recognizes the responsibility of the state for fish and wildlife resources found in and around state waters which are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities. The general assembly hereby declares that such

> fish and wildlife resources are a matter of state-wide concern and that impacts on such resources should be mitigated by the project applicants in a reasonable manner. It is the intent of the general assembly that fish and wildlife resources that are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities should be mitigated to the extent, and in a manner, that is economically reasonable and maintains a balance between the development of the state's water resources and the protection of the state's fish and wildlife resources.

FWMPs for water projects considered under C.R.S. 37-60-122.2 are to be developed by the project applicant, working in cooperation with CDOW, and submitted to the Colorado Wildlife Commission (CWC). If the CWC and applicant agree on the mitigation plan, the CWC forwards the mitigation plan to the Colorado Water Conservation Board (CWCB) for adoption as the official state position on the mitigation actions required of the applicant.

4.3.1 Mitigation and Enhancement Plans

C.R.S. 37-60-122.2 makes a specific distinction between mitigation of impacts caused by the proposed project, and enhancing fish and wildlife resources over existing conditions. This distinction is further defined in the Procedural Rules for the Wildlife Commission (Chapter 16), and clarified in a memorandum dated December 9, 2010 to the Director of the Colorado Division of Wildlife and the Wildlife Commission from the First Assistant Attorney General, Natural Resources and Environment Section. Accordingly, this FWMP includes mitigation measures to address the direct impacts that have been identified for the proposed project. The Subdistrict has also prepared a separate Enhancement Plan, in accordance with CRS 37-60-122.2 to address issues raised by Colorado Division of Wildlife and other stakeholders regarding the current condition of the aquatic environment on the Colorado River, which includes proposed enhancement measures to enhance fish and wildlife resources over and above levels existing without the WGFP. The Subdistrict, as an applicant for one or more federal permits, or licenses, is required by C.R.S. 37-60-122.2 to submit a proposed mitigation plan, but submittal of an enhancement plan is voluntary.

4.3.2 Consultation, Coordination and Public Input

The Subdistrict consulted with Colorado Division of Wildlife (CDOW) U.S. Fish and Wildlife Service (FWS) representatives during preparation of this Plan. In addition, CDOW and FWS were provided an opportunity to review and comment on the Wildlife Resource Technical Report (ERO 2008) and Aquatic Resource Technical Report (Miller Ecological 2008) prepared as part of the EIS process. Both of these reports provide additional details on the impacts of the alternatives evaluated in the EIS. The CDOW and FWS also were given an opportunity to review and comment on the draft EIS.

CRS 37-60-122.2 requires CDOW and Colorado Water Conservation Board review and input on mitigation for fish and wildlife impacts resulting from a federally

approved water project. The review process is intended to provide a balanced review between fish and wildlife protection and water development.[1] Although the procedures for CRS 37-60-122.2 do not require public review and input, the Subdistrict and CDOW have been involved in extensive efforts to allow for public participation. To date, the Wildlife Commission has provided the following public meetings to solicit input on the potential impacts and mitigation for the Moffat Project:

- Wildlife Commission Workshop, October 7, 2010, Las Animas – CDOW presented the proposed fish and wildlife impacts of the WGFP
- Wildlife Commission Public Meetings ("1313" Meetings), October 13, 2010 in Loveland and October 21, 2010 in Granby – Wildlife Commissioners solicited public comment on the potential impacts of the WGFP
- Stakeholder Workshops, January 24-25, 2011, Winter Park – CDOW solicited input on enhancement options for fixing the upper Colorado River between Windy Gap and the Kemp-Breeze State Wildlife Area to ensure a functioning river that supports fish and wildlife resources given anticipated future flows. (Refer to the *WGFP Enhancement Plan* for details.)
- Public Comment Period on Draft Enhancement and Mitigation Plans, Feb. 10-24, 2011 – CDOW invited public review and comment on the February 9th draft plans. The input will be reviewed by CDOW, Denver Water and the Subdistrict while preparing the final plans.
- Wildlife Commission Meeting, March 10, 2011 – Member of the public provided comments on the February 9th draft plans and review process.
- Wildlife Commission Meeting, May 6, 2011 – Members of the public provided comments on the April 7th plans submitted to the Wildlife Commission.

Input from all of these processes has been used to help prepare this plan.

5.0 PROPOSED FISH AND WILDLIFE MITIGATION PLAN

This section constitutes the Mitigation Plan for fish and wildlife impacts that are expected to be caused by the proposed WGFP. Mitigation measures have been developed to address impacts identified in the Draft EIS. The mitigation measures are also intended to address concerns regarding WGFP impacts that were identified by CDOW staff in a detailed review of the DEIS impacts. The impacts are based on a comparison of the existing conditions scenario to the Preferred Alternative, which consists of a 90,000 AF reservoir at the Chimney Hollow site. A detailed description of existing conditions in the project area and the analysis and identification of project impacts are included in the Draft EIS. The Draft EIS and associated Technical Reports prepared in conjunction with the DEIS are the only studies that

[1] See Testimony of Clyde Martz, Direction of the Department of Natural Resources, Senate Testimony HB 87-1158, April 9, 1987

have been conducted that specifically analyze the incremental impacts of the WGFP.

5.1 WGFP PROJECT AREA

The WGFP would have effects on both the east and west sides of the Continental Divide. The West Slope project area shown on Figure 1 includes the Colorado River below Lake Granby, which is affected by changes in Lake Granby spills and increased Windy Gap diversions at the existing Windy Gap Reservoir. Willow Creek below Willow Creek Reservoir is also included in the project area because of small changes in Willow Creek Feeder Canal diversions. Lake Granby is included because water levels would decrease as a result of storage of a portion of Windy Gap water in Chimney Hollow Reservoir. Shadow Mountain Reservoir and Grand Lake are included in the project area because of potential water quality effects, but there would be no change in lake levels.

The East Slope project area shown in Figure 2 includes the Chimney Hollow Reservoir site located west of Carter Lake, which is also shown on Figure 3. Hydrologic changes would occur in the Big Thompson River below Lake Estes from the import of additional Windy Gap water and from slight increases in flow that would occur below Participant wastewater treatment plants (WWTPs) on the Big Thompson River, St. Vrain Creek, Big Dry Creek, and Coal Creek. Carter Lake and Horsetooth Reservoir would experience a change in reservoir levels with the WGFP.

Proposed mitigation measures for the West Slope (Colorado River) area and the East Slope (South Platte Tributaries and Chimney Hollow Reservoir) are described below in separate sections.

5.2 AVOIDANCE AND MINIMIZATION

The Preferred Alternative for the WGFP was selected to minimize environmental impacts as a result of a detailed alternatives analysis conducted by Reclamation and a Section 404(b)(1) alternatives analysis prepared in coordination with the Corps. The alternatives analysis evaluated over 170 project elements which included both structural and non-structural alternatives. The Preferred Alternative consists of a 90,000 AF reservoir at the Chimney Hollow site and has been designed to minimize direct effects to wetlands and other waters of the U.S.

As part of the federal and state permits and approvals, the Subdistrict will implement a variety of best management practices (BMPs) during design and construction to reduce impacts to the environment, including fish and wildlife. Some of the environmental permits and approvals with BMPs and environmental protection measures include:

- Migratory Bird Treaty Act Compliance
- CDPHE Fugitive Dust Control Plan

- CDPHE Stormwater Management Plan
- CDPHE Section 401 Water Quality Certification

The CDOW has developed BMPs and actions to minimize adverse impacts to wildlife resources. The BMPs were specifically developed for the oil and gas industry; however, they can also be applicable to other major construction projects. These BMPs will be considered by the Subdistrict when preparing final design and construction plans. The Subdistrict will consult with the CDOW to implement the appropriate BMPs to avoid or minimize impacts on fish and wildlife resources.

5.3 PROPOSED MITIGATION MEASURES FOR WEST SLOPE (COLORADO RIVER) IMPACTS

Table 1 summarizes West Slope impacts and the proposed mitigation measures for each identified impact. The table also includes a column that outlines issues and concerns regarding WGFP impacts that were identified by CDOW staff in a detailed review of the DEIS impacts. The mitigation measures identified in the table are described in more detail in this section.

5.3.1. Modified Prepositioning to Maintain Higher Water Levels in Lake Granby

This measure addresses Impact CR-3, as well as CR-16, CR-23, ES-1, ES-2, and ES-29.

In any year when Lake Granby is projected to fall below an elevation of 8,250 feet, modified prepositioning, which reduces the delivery of C-BT water from Lake Granby to Chimney Hollow Reservoir, will be implemented to maintain higher water levels in Lake Granby.

Details of this measure will be developed by the Subdistrict and incorporated into a proposed agreement between Reclamation and the Subdistrict with a concurrence by the Corps. The objective is to minimize the adverse effects of prepositioning on water levels in Lake Granby. This measure will minimize any potential negative effects on aquatic resources and recreation in Lake Granby that may be caused by reduced water levels from prepositioning.

5.3.2 Improvements to Flushing Flows in the Colorado River

This measure addresses Impact CR-6, as well as CR-2, CR-14, CR-15 and CR-17.

The Windy Gap Project is currently required to bypass 450 cfs for 50 hours once in every 3 years, if such flows are naturally available in accordance with the *Memorandum of Understanding Between Municipal Subdistrict, Northern Colorado Water Conservancy District and Division of Wildlife, Colorado Department of Natural Resources, Relating to Minimum Stream Flow in Association with the Windy Gap Diversion Project*, dated June 23, 1980. The Subdistrict will modify project operations as follows:

- The flushing flow provision of the 1980 MOU will be modified to increase the required flushing flow from 450 cfs to 600 cfs.
- In any year when flows below Windy Gap have not exceed 600 cfs for at least 50 consecutive hours in the previous two years, and total Subdistrict water supplies in Chimney Hollow and Granby Reservoirs exceed 60,000 AF on April 1, the Subdistrict will cease all Windy Gap pumping for at least 50 consecutive hours to enhance peak flows below Windy Gap.

The intent of this measure is to enhance peak flows below Windy Gap . The Subdistrict will coordinate with CDOW and other water suppliers, including Denver Water, to maximize benefits of the higher flows and minimize any potential negative impacts to aquatic resources.

5.3.3 Temperature Mitigation

This measure addresses Impact CR-9, as well as CR-11 and CR-24.

- Monitoring Stations. The Subdistrict will work with Denver Water to install, operate and maintain two continuous real-time temperature-monitoring stations on the Colorado River; one at the Windy Gap gage and one upstream of the confluence with the Williams Fork River.

- Temperature Thresholds. For the purposes of this mitigation plan, the threshold temperatures will be the following, as measured at the temperature monitoring stations identified above:

  1. MWAT Chronic Threshold: 18.2^{o}C (64.8^{o} F), based on current Maximum Weekly Average Temperature (MWAT) Chronic Standard
  2. DM Acute Threshold: 23.8^{o}C (74.8^{o} F), based on current Daily Maximum (DM) Acute Standard

- MWAT Chronic Threshold Exceedances - Reduction or Curtailment of WGFP Pumping . For the period after July 15th of each year:

  1. At such times as the Weekly Average Temperature (WAT) exceeds the MWAT Chronic Threshold,, the Subdistrict will reduce or curtail WGFP pumping at the Windy Gap diversion to the extent necessary to maintain temperatures within the MWAT Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold.

2. Pumping for the original Windy Gap Project, now and after the WGFP is in operation, may occur at any time that the Windy Gap water rights are in priority and sufficient space is available in Lake Granby that such water pumped will not be reasonably expected to spill from the reservoir. Therefore, WGFP pumping will be defined as pumping that occurs at such times as the Northern Colorado Water Conservancy District determines, based on its most probable forecasts of inflows to Lake Granby, that a spill of water from Lake Granby is reasonably foreseeable. All other pumping will be considered to be for the original Windy Gap Project.

- DM Acute Threshold Exceedances - Reduction or Curtailment of Pumping for the WGFP and the original Windy Gap Project .

  1. At such times as the Daily Maximum temperature is within 1 ^{o}C of the DM Acute Threshold, the Subdistrict will reduce or curtail pumping for the original Windy Gap Project or the WGFP at the Windy Gap diversion to the extent necessary to maintain temperatures within the DM Threshold. Reduced pumping may not be sufficient to maintain temperatures below the threshold. In the future, the 1 degree buffer may be altered, based on experience, to maintain compliance with the DM Threshold.

- Limitations on Reduction or Curtailment of Windy Gap pumping. The temperature mitigation measures identified above will be suspended in the event that and at such times as there is no material causal relationship between Windy Gap Project or Windy Gap Firming Project operations and any exceedence of the MWAT Chronic threshold or DM Acute threshold at the monitoring stations identified above. For the purposes of this Paragraph a “material causal relationship” is defined as either an actual measureable impact on temperature using readily available monitoring technology or a modeled impact on temperature that is not *de minimus* and is based on a computer model or studies accepted by the Colorado Division of Wildlife. The Subdistrict will cooperate with future studies to determine what factors, other than flow changes, have effects on water temperatures in the Colorado River below Windy Gap.

- Use of the Windy Gap Bypass Valve and Auxiliary Outlet. The Subdistrict will use the Windy Gap Project Bypass Valve and Auxiliary Outlet to the maximum extent practicable, without causing adverse effects to the Windy Gap Project facilities or operations for the bypass of water that is otherwise bypassed from the Windy Gap Project. This measure is intended to make releases of water from these outlets deeper in the reservoir that may be colder than water bypassed over the spillway.

5.3.4 Nutrient Mitigation to Offset Impacts to Grand Lake Water Quality

This measure addresses Impact CR-10, as well as CR-12, CR-13, CR-26, and ES-8.

The Subdistrict will develop a proposed nutrient reduction mitigation plan for Reclamation and Corps approval. The plan includes point source nutrient reductions from WWTP discharges in the Fraser River and nonpoint source nutrient reductions from agricultural land in the Willow Creek watershed. Other nutrient reduction measures would be implemented as necessary to meet the requirement to provide a documented nutrient reduction credit factor of 1:1 to satisfy Reclamation and the Corps mitigation requirements.

5.3.5 Participation in Upper Colorado River Recovery Program

This measure addresses Impact CR-20.

The Subdistrict will complete Section 7 consultation and compliance consistent with the requirements of the Programmatic Biological Opinion (PBO). The Service issued a Biological Opinion on February 12, 2010 for the Preferred Alternative indicating WGFP coverage under the PBO with Participation in Upper Colorado River Recovery Program and payment of a depletion fee for additional depletions attributable to the WGFP.

Documentation of Section 7 consultation will be submitted to the Corps in order to meet requirements for the Fish and Wildlife Coordination Act.

5.3.6 Curtailment of Windy Gap Diversions during Gore Race

This measure addresses Impact CR-22 and CR-25.

WGFP diversions would be suspended during the Gore Race in August if flows drop below preferred range (1,250 cfs).

5.4 PROPOSED MITIGATION MEASURES FOR EAST SLOPE (SOUTH PLATTE TRIBUTARIES AND CHIMNEY HOLLOW RESERVOIR) IMPACTS

Table 2 summarizes East Slope impacts and the proposed mitigation measures for each identified impact. The table also includes a column that outlines issues and concerns regarding WGFP impacts that were identified by CDOW staff in a detailed review of the DEIS impacts. The mitigation measures identified in the table that are relevant to fish and wildlife resources are described in more detail in this section.

5.4.1 Revegatiation and Weed Control on Areas Impacted by Construction

This measure addresses Impact ES-11.

Revegetation and weed control on all disturbed areas in accordance with an erosion control plan to be developed by the Subdistrict and approved by Reclamation and the Corps. Plan will be developed in coordination with CDOW and incorporate CDOW Oil & Gas BMPs where appropriate.

5.4.2 Wetlands Mitigation

This measure addresses Impact ES-13, ES-14, and ES-15.

Avoid, minimize and mitigate wetland impacts as specified in the 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as approved by the Corps. Wetlands would be mitigated by contribution to an approved wetland mitigation bank.

5.4.3 Wildlife Habitat Mitigation at Chimney Hollow Reservoir Site

This measure addresses Impact ES-16 and ES-17.

Subdistrict will develop a plan to replace the values provided by habitat lost or altered by construction of Chimney Hollow Reservoir. Mitigation of impacts to wildlife resources will involve a combination of mitigation strategies and tools, including:

- Restoring habitats temporarily disturbed during reservoir and facility construction
- Working with Larimer County to restore or enhance degraded habitat surrounding Chimney Hollow Reservoir
- Working with CDOW and Larimer County to establish hunting access on the Chimney Hollow property
- Conducting management and education activities to minimize human-wildlife conflicts
- Implementing a migratory bird management plan
- Implementing seasonal restrictions and buffer zones

Details of this plan will include:

Restoration of Temporary Disturbances. The temporary loss of 123 acres of wildlife habitat will be mitigated through reclamation and revegetation of all habitats disturbed during construction and relocation of the transmission line and towers. Temporary loss of vegetation communities due to construction of dams, pipelines, staging, and access roads will be restored with plantings and seed mixes that replicate the vegetation cover types. Vegetation restoration of the transmission line corridor will involve working closely with Western to incorporate strategies for maintenance of stable low-growing vegetative communities that include mechanical cutting, removal of timber, on-site treatment of slash, and planting sustainable, low-growing shrubs and grasses. Plantings and seed mixes will focus on restoring diverse vegetation communities that provide wildlife forage, particularly during fall and winter. A reclamation plan will be developed as part of the construction program and the Stormwater Management Plan.

Habitat Enhancement. Subdistrict will work with Larimer County to develop a land management plan that will include habitat enhancement of vegetation communities surrounding Chimney Hollow Reservoir, which involves planting native species beneficial to wildlife where appropriate. The Subdistrict will provide $50,000 to Larimer County to use in their ongoing habitat management plan. A weed control plan would be developed in cooperation with Larimer County prior to implementing habitat enhancement to improve the quality of lands not specifically within the areas of vegetation enhancement. Weed management will focus on monitoring restored habitats and implementing an integrated weed management approach of mechanical, chemical, and biological control strategies. Integrated weed management strategies also will be used to control existing areas of noxious and invasive species, particularly large patches of thistle and cheatgrass. The weed management plan will be developed prior to construction disturbances and updated periodically through implementation of wildlife enhancement.

Hunting Opportunities. Larimer County will develop a management plan for the Chimney Hollow area. As part of this process, the Subdistrict and Larimer County will work with CDOW and Larimer County to explore opportunities to provide seasonal hunting on portions of the Chimney Hollow Reservoir site and open space to assist with game management and provide additional recreation.

Minimization of Human-Wildlife Conflicts. The displacement of elk and bear into surrounding residential areas as they search for lost food resources will be offset by the habitat enhancement activities and hunting opportunities described above. Additionally, the Subdistrict will work with Larimer County and CDOW to reduce/eliminate wildlife attractants from recreation facilities and establish education/outreach programs and information kiosks/signs informing the public on the dangers of close interactions with wildlife, and methods to avoid and minimize potentially dangerous encounters.

Implementing Migratory Bird Avoidance Plan. The active nesting season for most migratory bird species in Colorado is between April 1 and August 15. Over the past few years, FWS and CDOW have suggested that the best way to avoid a violation of the Migratory Bird Treaty Act (MBTA) is to remove vegetation outside of the active breeding season. The Subdistrict will develop BMPs in accordance with CDOW guidance to avoid disturbing active bird nests at the Chimney Hollow Reservoir site. *Note: Implementing these BMPs demonstrates a good faith effort to avoid incidental violation of the MBTA, but does not guarantee that migratory birds will not still nest in some areas despite these efforts.*

Seasonal Restrictions and Buffer Zones for Raptors. Avoidance and mitigation options for nesting raptors at the Chimney Hollow Reservoir site consists of: 1) conducting nest surveys prior to construction, 2) establishing

reasonable site-specific buffers and seasonal restrictions, 3) implementing seasonal restrictions to avoid and minimize disturbance, and 4) removing inactive nests from the transmission line corridor, construction footprints, reservoir pool area, or other areas of permanent impacts. Currently, there are no expected permanent impacts to existing raptor nests; however, there is the possibility that a new active raptor nest could be established in areas slated for disturbance or inundation. The intent of any mitigation is to encourage individual raptor pairs to nest at selected and more secure locations. BMPs will be developed in accordance with CDOW guidance to avoid, minimize and mitigate potential impacts.

5.4.4 Air Quality Mitigation

This measure addresses Impact ES-23 and ES-24.

Subdistrict will develop a fugitive particulate emissions control plan and BMPs to minimize air quality and noise impacts to wildlife.

5.5 MITIGATION COSTS AND SCHEDULE

Estimated mitigation costs are shown in the following table. Total project costs are estimated to be $273,000,000, which includes construction costs of about $237,000,000. The mitigation schedule will be contingent on the issuance of permits and licenses, construction timetables, project completion, and the ability of the Subdistrict to fill the reservoir. The schedule provided in the following table provides a timetable based on these contingencies.

Mitigation Insurance Policy - The mitigation listed above is based on the Draft EIS for the WGFP that was released for public comment in August of 2008. Since that time and based on comments to the Draft EIS, Reclamation has conducted additional studies related to the preparation of the Final EIS, that in part are designed to further refine the analysis of environmental impacts of the proposed action. If new impacts to fish and wildlife resources are identified in the Final EIS that were not discussed in the Draft EIS and not addressed in this mitigation plan, the Subdistrict will propose mitigation for these new impacts. The additional mitigation will be developed in cooperation with the CDOW prior to submittal to Reclamation for its consideration as a permit condition. The Subdistrict will reserve $600,000 for any new impacts to fish and wildlife resources identified by the Final EIS and required by Reclamation. If Reclamation does not identify new impacts requiring mitigation, the Subdistrict will have no further obligation to reserve this money.

West Slope

Mitigation Measure	Scheduled Start	Scheduled End	Estimated Cost
Modified prepositioning to reduce Lake Granby fluctuations	Concurrent with project start up	Permanent change in WGFP operation	$0 May have minor effect project yield
Improvements to flushing flows in Colorado River	Concurrent with project start up	No end date	May have effects on project yield but cost cannot be estimated.
Temperature mitigation	Temperature monitoring would begin within one year after issuance of permits. Curtailed diversions occur when Chimney Hollow Reservoir is completed and diversions increase	Diversion curtailments per the established criteria would continue as long as the WGFP is in operation	$50,000 for monitoring stations May have effects on project yield but cost cannot be estimated.
Nutrient mitigation to offset impacts to Grand Lake water quality – will also improve water quality in Colorado River below Windy Gap	Monitoring of baseline conditions will begin in 2011 and nutrient removal will begin concurrent with project start up	Monitoring will continue until 1:1 nutrient offset has been verified. Operation of nutrient reduction projects will continue as long as the WGFP is in operation	$4.3 million (estimated)
Participation in Upper Colorado River Recovery Program	Payment upon issuance of permits; expected by 2011	One time upfront fee	$405,000 (estimated)
Curtailed diversions for annual Gore Race, if needed	Concurrent with project start up	Permanent change in WGFP operation	

East Slope

Mitigation Measure	Scheduled Start	Scheduled End	Estimated Cost
Revegetation and weed control on areas impacted by construction	Immediately upon completion of specific habitat-disturbing activity	Three years post-restoration or until success criteria are met	$25,000
Wetland mitigation	Within one year of issuance of permit	One time upfront fee	$115,000
Wildlife habitat mitigation at Chimney Hollow Reservoir site	Concurrent or following construction depending on location	Three years post-construction or until success criteria are met	$50,000 (estimated)
Air quality mitigation	Concurrent or following construction depending on location	Until completion of construction	$0

6.0 CONCLUSIONS

The FWMP presents a broad range of mitigation actions to address the potential fish and wildlife impacts of the WGFP. If accepted by the Colorado Wildlife Commission and CWCB, this mitigation plan will represent the official state position on mitigation for the WGFP. Since the state-adopted FWMP is not enforceable by itself, the Subdistrict anticipates that Reclamation and the Corps will determine these mitigation measures are adequate and will impose them within their regulatory requirements for Reclamation's approvals and the Section 404 Permit, respectively.

REFERENCES

AMEC (AMEC Earth & Environmental, formerly Hydrosphere Resource Consultants). 2008a. Windy Gap Firming Project Lake and Reservoir Water Quality Technical Report. Prepared for U.S. Bureau of Reclamation.

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ERO (ERO Resources Corporation). 2000. Preble's Meadow Jumping Mouse Trapping Survey for Chimney Hollow; Larimer County, Colorado. Prepared for Northern Colorado Water Conservancy District. October 9.

ERO (ERO Resources Corporation). 2003. Preble's Meadow Jumping Mouse Habitat Assessment for the proposed Chimney Hollow Reservoir Site. Prepared for U.S. Bureau of Reclamation and Municipal Subdistrict, Northern Colorado Water Conservancy District.

ERO (ERO Resources Corporation). 2008. Windy Gap Firming Project Wildlife Technical Report. Prepared for U.S. Bureau of Reclamation.

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Reclamation (U.S. Bureau of Reclamation). 2008. Windy Gap Firming Project Draft EIS.

Table 1: WEST SLOPE - Colorado River				
Item No.	**EIS Impacts**	**CDOW Issues**	**Proposed Mitigation**	**Mitigation Agency**
Surface Water Hydrology				
CR-1	Reduced spills from Lake Granby to the Colorado River as a result of fewer Windy Gap spills.	Fewer spills may mean decreased sediment transport in the Colorado River downstream to the Fraser River confluence	None Reclamation minimum flow releases below Lake Granby would be maintained.	
CR-2	Reduced flows in Colorado River below Windy Gap diversion.	Reduced flows impact other resources: -Stream Morphology and Sediment Transport -Surface Water Quality -Aquatic Resources (habitat) -Recreational Fishing -Riparian Health	See Proposed Mitigation for Stream Morphology and Surface Water Quality. Note: Current minimum bypass flows below Windy Gap Reservoir will continue per existing agreements. To assure that water diverted from the Colorado River is used as efficiently as possible, Reclamation will require that all participants in the Windy Gap Firming Project have Water Conservation Plans in accordance with the requirements of CRS 37-60-126 prior to the initial delivery of any water after construction of the WGFP.	Reclamation
CR-3	Lower water levels in Lake Granby as a result of prepositioning.	Lower water levels in Granby (when fisherman access to water is considered) reduce mysid impacts on kokanee growth - a beneficial impact.	In any year when Lake Granby is projected to fall below an elevation of 8,250 feet, modified prepositioning, which reduces the delivery of C-BT water from Lake Granby to Chimney Hollow Reservoir, will be implemented to maintain higher water levels in Lake Granby. Details of this measure will be developed by the Subdistrict and incorporated into a proposed agreement between Reclamation and the Subdistrict with a concurrence by the Corps. The objective is to minimize the adverse effects of prepositioning on water levels in Lake Granby.	Reclamation
Groundwater				
CR-4	Small changes in Colorado River and Willow Creek stream stage would not significantly impact alluvial groundwater levels.	Addressed in terms of stage change as percentage of total flow. Negligible impact on fisheries and riparian zone	None	
CR-5	Small changes in surface water quality in West Slope streams and reservoirs would have minor effect on groundwater quality.	Addressed in terms of stage change as percentage of total flow. Negligible impact on fisheries and riparian zone. Corrected by NPDES permits	None	
Stream Morphology and Floodplain				
CR-6	Decrease in frequency of 2-year peak discharge and in channel maintenance flows in the Colorado River.	Effects of lower flows on stream morphology and sediment transport and potential impacts on aquatic ecosystem, including riparian vegetation, fish and macroinvertebrates.	Note: Mitigation from the original Windy Gap Project would be modified (current flushing flow of 450 cfs below Windy Gap Reservoir for 50 hours from April 1 to June 30 every 3 years would be increased to 600 cfs). At any time when flushing flows have not occurred in previous 2 years, and total Subdistrict water supplies available in Granby and Chimney Hollow Reservoirs exceed 60,000 acre-feet, the Subdistrict will, in coordination with CDOW, cease pumping for 50 hours to enhance peak flows below Windy Gap.	CDOW, Reclamation
CR-7	Small decrease in frequency of 2-year peak discharge and in channel maintenance flows in Willow Creek.		None	CDOW, Reclamation
CR-8	Potential for flooding along the Colorado River and Willow Creek would decrease.		None	

Table 1: WEST SLOPE - Colorado River				
Item No.	**EIS Impacts**	**CDOW Issues**	**Proposed Mitigation**	**Mitigation Agency**
Surface Water Quality				
CR-9	Colorado River temperature between Windy Gap Reservoir and Williams Fork may exceed 18.2 degree centigrade chronic maximum weekly average temperature (MWAT) or 23.8 degree centigrade daily maximum (DM) acute state standard as a result of WGFP diversions that lower flows in the Colorado River. Impact is most likely in the occasional years when WGFP diversions occur after July 15.	Add DM (daily maximum) temperature to the list of monitored statistics. Criteria for use of MWAT and DM; associated decision tree needs to be developed.	1. Install and maintain, for the life of the WGFP, two real time temperature gages in the Colorado River. One will be located downstream of WG Reservoir and one immediately upstream of the Williams Fork at locations agreed to by Reclamation, the Corps, and the Colorado Division of Wildlife. 2. After July 15 if the MWAT temperature threshold (18.2^{o}C, 64.8^{o} F) is exceeded at either station, WGFP pumping will be reduced or curtailed as necessary to maintain temperatures below the threshold. 3. If the DM temperature is within 1°C of the threshold (23.8^{o}C, 74.8^{o} F) at either station, WG and WGFP pumping will be reduced or curtailed as necessary to maintain temperatures below the threshold. 4. The Subdistrict will use the Windy Gap Project Bypass Valve and/or Auxiliary Outlet, to the maximum extent practicable, to release colder water for required project bypasses.	CDOW, Reclamation
CR-10	Additional WGFP pumping would increase nutrient (nitrogen and phosphorus) loading in Lake Granby, Shadow Mountain Reservoir, and Grand Lake, resulting in increased chlorophyll a, and manganese (Mn)		The Subdistrict will develop a proposed nutrient reduction mitigation plan for Reclamation and Corps approval. The plan includes point source nutrient reductions from WWTP discharges in the Fraser River and nonpoint source nutrient reductions from agricultural land in the Willow Creek watershed. Other nutrient reduction measures would be implemented as necessary to meet the requirement to provide a documented nutrient reduction credit factor of 1:1 to satisfy Reclamation and the Corps mitigation requirements.	Reclamation, Corps
CR-11	Decrease in Colorado River DO below Windy Gap Reservoir. DO concentrations predicted to remain above 6.0 mg/L standard. DO could fall below fish spawning standard of 7.0 mg/L between Windy Gap Reservoir and Williams Fork at low flows.		Mitigation for temperature (CR-9) and aquatic resources effects should improve and maintain DO levels above state standard.	CDOW, Reclamation
CR-12	Higher concentration of nutrients in the Colorado River below Windy Gap Reservoir as a result of WGFP pumping that reduces dilution flows.		Nutrient mitigation described in CR-10 in the Windy Gap watershed will reduce nutrient loading to the Colorado River below Windy Gap. The nutrient mitigation plan required by CR-10 must be reviewed and approved by Reclamation and the Corps.	Reclamation, Corps
CR-13	Slight increase in nutrient and metal concentrations in Willow Creek.		Nutrient mitigation described in CR-10 in the Willow Creek watershed will reduce nutrient loading to the creek. The nutrient mitigation plan required by CR-10 must be reviewed and approved by Reclamation and the Corps. Metal concentrations will remain within state standards.	Reclamation, Corps
Aquatic Resources				
CR-14	Decrease in the amount and frequency of available fish habitat in the Colorado River and an increase in stream temperature.	Decrease in habitat during pumping may not be limiting - the decrease is probably related to forgone changes in channel morphology and other factors (upstream development, water quality, other factors in addition to Windy Gap). Concerns about current condition of fishery, including recent trend of lower fish populations, loss of pteronarcys, sculpin, and other aquatic life.	See proposed mitigation for Surface Water Quality (CR-9).	Reclamation, Corps, CDOW
CR-15	Decrease in the amount and frequency of available fish habitat in Willow Creek.		None	
CR-16	Lower water levels in Lake Granby would slightly reduce available fish habitat.	Negligible impact under expected operations.	See proposed mitigation for Surface Water Hydrology (CR-3)	Reclamation

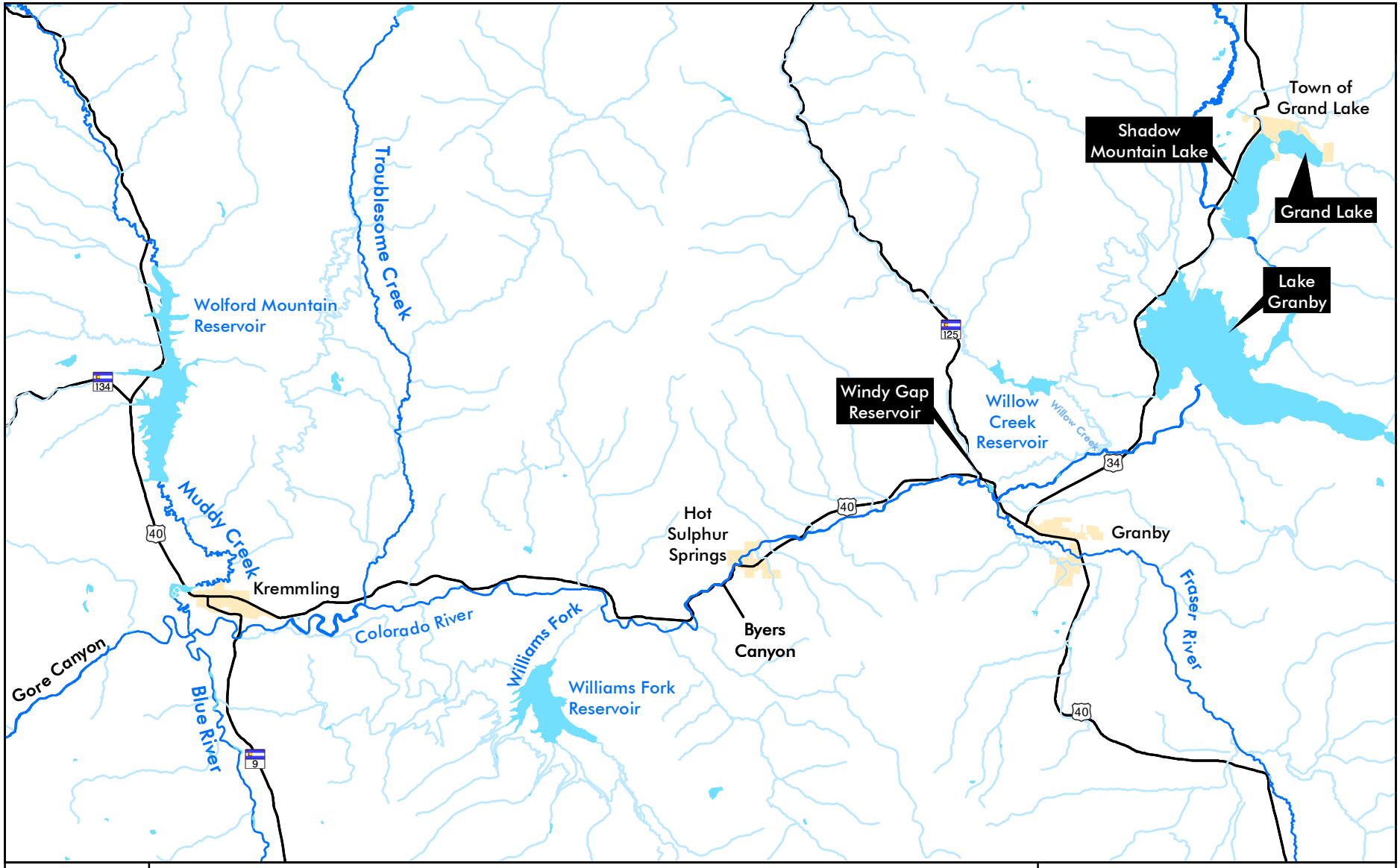
Table 1: WEST SLOPE - Colorado River				
Item No.	**EIS Impacts**	**CDOW Issues**	**Proposed Mitigation**	**Mitigation Agency**
Vegetation				
CR-17	Effects to riparian vegetation along Colorado River from reduced streamflow.		None.	Reclamation, Corps, CDOW
Wetlands				
CR-18	Effects on wetlands adjacent to the Colorado River and downstream of the Windy Gap diversion.		None	
Wildlife				
CR-19	Change in streamflow in the Colorado River and Willow Creek is unlikely to affect terrestrial wildlife resources.		None	
Threatened and Endangered Species				
CR-20	Depletion to Colorado River impacts T&E fish.		Section 7 consultation and compliance consistent with the requirements of the Programmatic Biological Opinion (PBO). The Service issued a Biological Opinion on February 12, 2010 for the Preferred Alternative indicating WGFP coverage under the PBO with participation in Upper Colorado River Recovery Program (UCRRP) and payment of depletion fee for additional depletions attributable to the WGFP. Documentation of Section 7 consultation will be submitted to the Corps in order to meet requirements for the Fish and Wildlife Coordination Act.	Continued participation in the Upper Colorado River Endangered Fish Recovery Program per the USFWS Biological Opinion.
Recreation				
CR-21	Reduction in preferred kayaking flow days in Byers Canyon. In 29 of 47 years in the period of record there would be no change. In other years there would be a slight decrease in average number of days per year with preferred kayaking flows.		None	
CR-22	Preferred rafting and kayaking flows in Big Gore and Pumphouse would decrease. A decrease and increase in the number of days within preferred flow range that averages less than 3 days per year.		None , except WGFP diversions would be suspended during Gore Race in August if flows drop below preferred range (1,250 cfs).	Reclamation
CR-23	Access to Lake Granby boat ramps at Arapaho Bay, Stillwater, and Sunset could diminish in some months.	Proposed change in project operation in dry years will keep Granby higher.	None. Modified prepositioning discussed in CR-3 would maintain higher water levels in Lake Granby during years when the reservoir is anticipated to fall below elevation 8,250 msl thereby improving boat ramp access.	Reclamation
CR-24	Effects on recreational fishing in the Colorado River downstream of the Windy Gap diversion from habitat loss and temperature impacts between Windy Gap and the Blue River.	Includes float fishing.	Proposed mitigation for Surface Water Quality should reduce effects on recreational fishing.	Reclamation, Corps, CDOW

Table 1: WEST SLOPE - Colorado River				
Item No.	**EIS Impacts**	**CDOW Issues**	**Proposed Mitigation**	**Mitigation Agency**
Socioeconomics				
CR-25	Lost recreational boating value in the Colorado River in some years due to lower flows. Although preferred boating flows are not always met, rafting and kayaking opportunities would remain (i.e. flows would rarely drop below minimum flows needed for boating).			
CR-26	Reduction in aesthetic value in Grand Lake if algae concentrations increase.	Additional issues in Shadow Mountain.	Nutrient mitigation measures discussed in CR-10 would offset nutrient loading from increased WGFP pumping.	Reclamation, Corps

Table 2: EAST SLOPE - South Platte Tributaries and Chimney Hollow Reservoir				
Item No.	**EIS Impacts**	**CDOW Issues/Concerns**	**Proposed Mitigation**	**Mitigation Agency**
Surface Water Hydrology				
ES-1	Lower water levels in Carter Lake (~1').	Earlier fill is better for walleye.	None. However, modified prepositioning as discussed in CR-3 would result in smaller changes in water levels (<1' lower).	Reclamation
ES-2	Lower water levels in Horsetooth Reservoir (6' lower on avg.).	Higher nutrients and lower DO may complicate 303D listing status.	None. However, modified prepositioning as discussed in CR-3 would result in smaller changes in water levels (<2' lower).	Reclamation
Groundwater				
ES-3	Small changes in East Slope stream stage that would not significantly impact alluvial groundwater levels.	Addressed in terms of stage change as percentage of total flow. Negligible impact on fisheries and riparian zone.	None	
ES-4	Small changes in surface water quality in East Slope streams and reservoirs would have minor effect on groundwater quality.	Addressed in terms of stage change as percentage of total flow. Negligible impact on fisheries and riparian zone. Corrected by NPDES permits.	None	
Stream Morphology and Floodplain				
ES-5	Increased flows on East Slope streams below WWTPs could have slight effect on channel morphology.		None	
ES-6	Flows in East Slope streams would increase slightly.		None	
Surface Water Quality				
ES-7	Increased ammonia concentrations in St. Vrain Creek, Big Dry Creek, Coal Creek as a result of increased discharges from Participant WWTP's.	Based on standards and NDPES permits. Participants must meet ammonia discharge limitations in accordance with Colorado water quality standards and as part of their NPDES Permit for WWTP discharges.	None	
ES-8	Nutrient increases (TP, TN) resulting in higher chlorophyll *a* concentrations and a decrease in DO in Carter Lake and Horsetooth.		None. In accordance with CR-10, plans to monitor and mitigate nutrient increases in the Three Lakes system should address this issue and the plans must be approved by Reclamation and the Corps.	Reclamation, Corps
Aquatic Resources				
ES-9	Construction of Chimney Hollow Reservoir would create potential flat water fishing opportunities if a fishery is established in Chimney Hollow.	Construction of reservoir will replace terrestrial environment with aquatic environment, displacing terrestrial wildlife and allowing the replacement by aquatic wildlife.	None	
ES-10	Lower water levels in Carter Lake and Horsetooth Reservoir would slightly reduce available fish habitat.	Negligible impact under expected operations.	None. However, modified prepositioning as discussed in CR-3 would result in smaller changes in water levels.	

Table 2: EAST SLOPE - South Platte Tributaries and Chimney Hollow Reservoir				
Item No.	**EIS Impacts**	**CDOW Issues/Concerns**	**Proposed Mitigation**	**Mitigation Agency**
Vegetation				
ES-11	Temporary impact to 123 acres of vegetation during construction of Chimney Hollow Reservoir.	Includes pipeline ROW and contractor staging area. Reveg with wildlife friendly seed mixes. 1298 Final BMPs	Revegetation, and weed control on all disturbed areas in accordance with an erosion control plan to be developed by the Subdistrict and approved by Reclamation and the Corps. Plan will be developed in coordination with CDOW and incorporate CDOW Oil & Gas BMPs where appropriate.	Reclamation, Corps, CDOW
ES-12	Permanent loss of 788 acres of vegetation from inundation and dam at Chimney Hollow.	Hunting Access	None. Larimer County maintains land management plan for Chimney Hollow open space area which includes forestry, vegetation management, and weed control.	CDOW
Wetlands				
ES-13	Temporary disturbance of about 0.2 acres of wetlands during Chimney Hollow Reservoir construction.	Corps issue-compensatory mitigation.	Avoid, minimize and mitigate wetland impacts as specified in the 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as approved by Reclamation and the Corps.	Corps
ES-14	Permanent impact to about 2 acres of wetlands at Chimney Hollow Reservoir.	Corps issue-compensatory mitigation.	Avoid, minimize and mitigate wetland impacts as specified in the 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as approved by the Corps. Wetlands would be mitigated by contribution to an approved wetland mitigation bank.	Corps
ES-15	Permanent impact to about 0.5 acres of waters of the U.S. along Chimney Hollow.	Corps issue-compensatory mitigation.	Avoid, minimize and mitigate wetland impacts as specified in the 33 CFR Part 332 (Mitigation Rule, 10-Apr-08) and as approved by Reclamation and the Corps.	Corps
Wildlife				
ES-16	Loss of 810 acres of elk winter range, mule deer winter range and concentration area, and black bear foraging area at Chimney Hollow.	Access for hunting; improve vegetation to draw elk and/or bears.	Subdistrict will work with CDOW and Larimer County to allow hunting access on property to minimize displacement of game animals to other areas.	
ES-17	General loss of habitat for other terrestrial species, birds, amphibians, reptiles, and butterflies at Chimney Hollow.	Includes reservoir inundation area and pipeline ROW. ≈ 2 mile loss of riparian habitat in inundated stream channel.	Revegetation and weed control on all disturbed areas in accordance with an erosion control plan to be developed by the Subdistrict and approved by Reclamation and the Corps. Plan will be developed in coordination with CDOW and incorporate CDOW Oil & Gas BMPs where appropriate. Implement migratory bird mananagement plan and seasonal restrictions and buffer zones.	
ES-18	Loss of 7 acres of bald eagle winter range at Chimney Hollow. This effect is minor as there is sufficient bald eagle wintering habitat in the area. New reservoir would provide open water foraging habitat for bald eagles.		None	
Threatened and Endangered Species				
ES-19	No impact at Chimney Hollow.		None	
Geology				
ES-20	Potential for uncovering fossils during Chimney Hollow Reservoir construction.		Paleontological survey would be conducted prior to construction and the Denver Museum contacted if important fossils discovered. Paleontological resources will be dealt with in accordance with the programmatic agreement or memorandum of agreement between Reclamation, the State Historic Preservation Officer, the Subdistrict, and possibly the Advisory Council.	Reclamation
Soils				
ES-21	Temporary and permanent loss of soil during Chimney Hollow Reservoir construction.	BMPs for pipelines, dam construction. SWMP (CDPHE) by contractor.	Erosion control and revegetation.	Reclamation
ES-22	Shoreline erosion at Chimney Hollow Reservoir.		None	
Air Quality				
ES-23	Dust and vehicle emissions during Chimney Hollow Reservoir construction.	Adaptive management, blasting for three years.	A fugitive particulate emissions control plan and BMPs would be developed and must be approved by the Corps in order to meet requirements for Colorado Air Quality Control Standards.	Reclamation
ES-24	Increased ambient noise from construction of Chimney Hollow Reservoir.	Displacement of wildlife.	BMPs to minimize noise.	

Table 2: EAST SLOPE - South Platte Tributaries and Chimney Hollow Reservoir				
Item No.	**EIS Impacts**	**CDOW Issues/Concerns**	**Proposed Mitigation**	**Mitigation Agency**
Land Use				
ES-25	A portion of Chimney Hollow would be located on private property or Larimer County property.	Near CH dam - toes of 35 acre parcels on ridge, purchase of horizontal land on edge of CH.	Private land acquisition or the necessary access rights and easements.	Reclamation
ES-26	A portion of Chimney Hollow Reservoir facilities would be located on Reclamation property.	Facilities around Flatiron Reservoir on USBR land - easement w/USBR.	Easements or appropriate permits from Reclamation would be acquired.	Reclamation
ES-27	Sandstone quarry operations could be affected by southern access road to Chimney Hollow Reservoir.	Road uncertain, could be used for hunting access; seasonal closure?	Quarry access would be maintained.	Reclamation
ES-28	Increased construction traffic on CR 18E and CR 31 and impacts to roads during reservoir construction and from recreation access to Chimney Hollow Open Space managed by Larimer County.	Potential for elk/car/truck encounters- add signing.	The Subdistrict would comply with all County road and permitting requirements.	Reclamation
Recreation				
ES-29	Access to the South Bay-South boat ramp in Horsetooth could be impacted.		None. Modified prepositioning discussed in CR-3 would maintain higher water levels in Lake Granby during years when the reservoir is anticipated to fall below elevation 8,250 msl thereby improving boat ramp access.	Reclamation
Cultural Resources				
ES-30	Twenty-four eligible or potential eligible cultural resources could be impacted by construction of Chimney Hollow Reservoir.		Compliance with Section 106 of the National Historic Preservation Act including additional evaluation and mitigation will be conducted in coordination with Reclamation, the Corps of Engineers, and SHPO. Cultural resources will be dealt with in accordance with a Programmatic Agreement or MOA to be developed and signed by Reclamation, the SHPO, and the Subdistrict.	Reclamation, Corps, SHPO
Visual Quality				
ES-31	Temporary impacts from construction of Chimney Hollow Reservoir.	Mostly human, not wildlife.	Revegetation and BMPs.	Reclamation
ES-32	Permanent changes in landscape.		Revegetation, weed control, maintenance.	Reclamation
ES-33	Relocation of transmission line.	115KV line, inline construction, tall poles - raptor protection included in WAPA design standards.	Visual sensitivity analysis conducted in siting relocated transmission line. , Nonspecular, nonreflective wire would be used and possibly nonreflective steel poles. All site disturbances would be revegetated following construction.	Reclamation
Socioeconomics				
ES-34	Property Acquisition.		None Any properties required to be purchased for the project would be purchased for just compensation following an appraisal in accordance with the Water Conservancy Act (CRS 27-45-101 to 153) and other applicable state laws.	



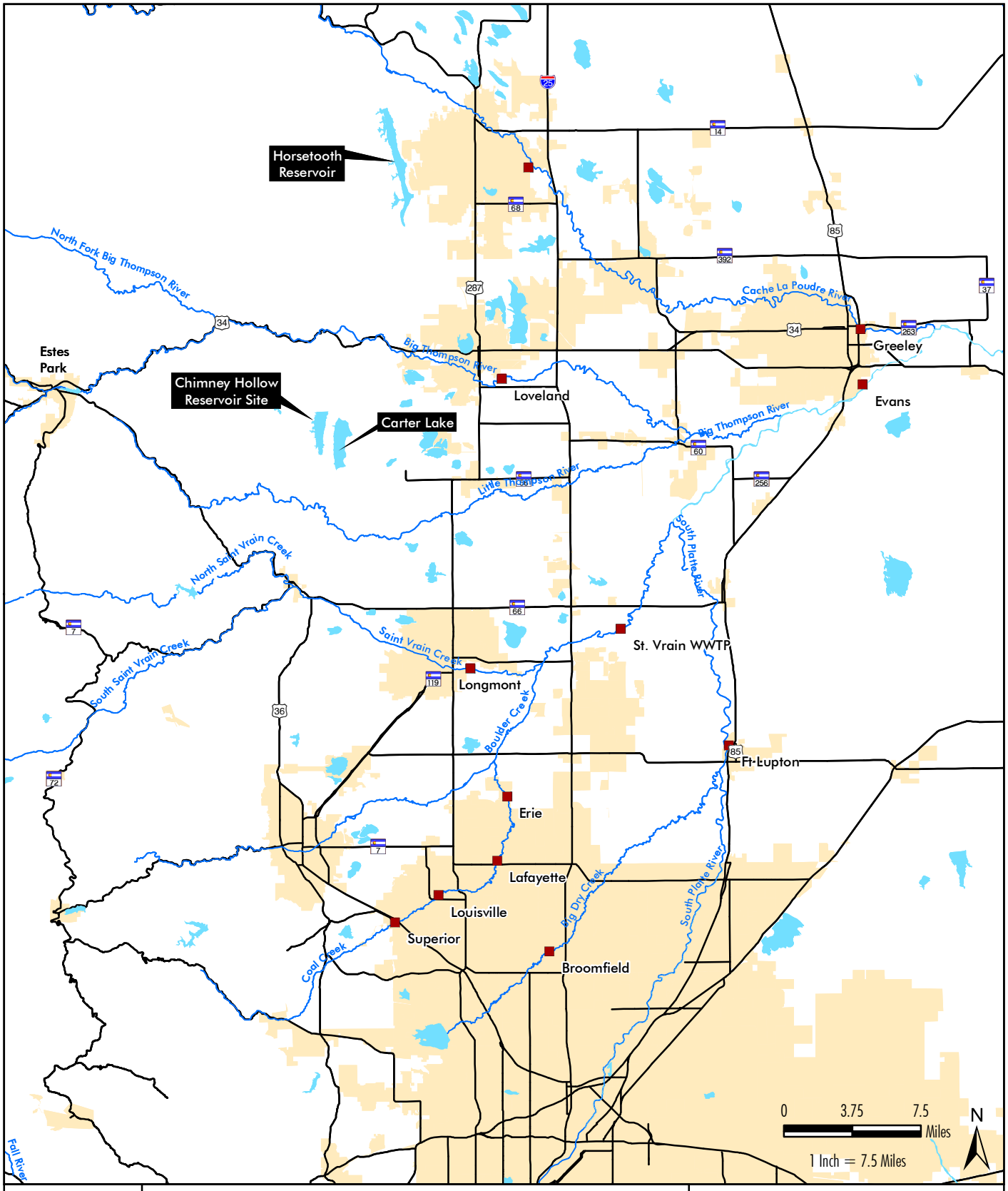
ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: (303) 830-1199

City
Lake or Reservoir
Major Streams
Minor Streams
Highway

0 2 4 Miles
1 Inch = 4 Miles
N

Figure 1
West Slope Project

Prepared for: Windy Gap Firming Project
File: 2390 EIS\WM_WestSlopeWaterResource.mxd (JP)
July 2009

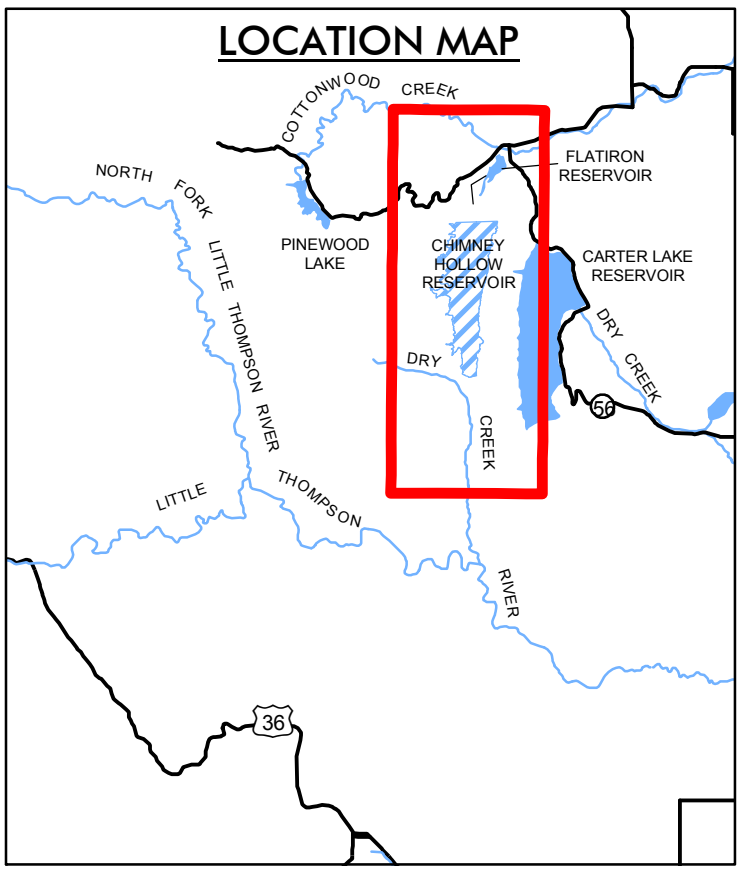


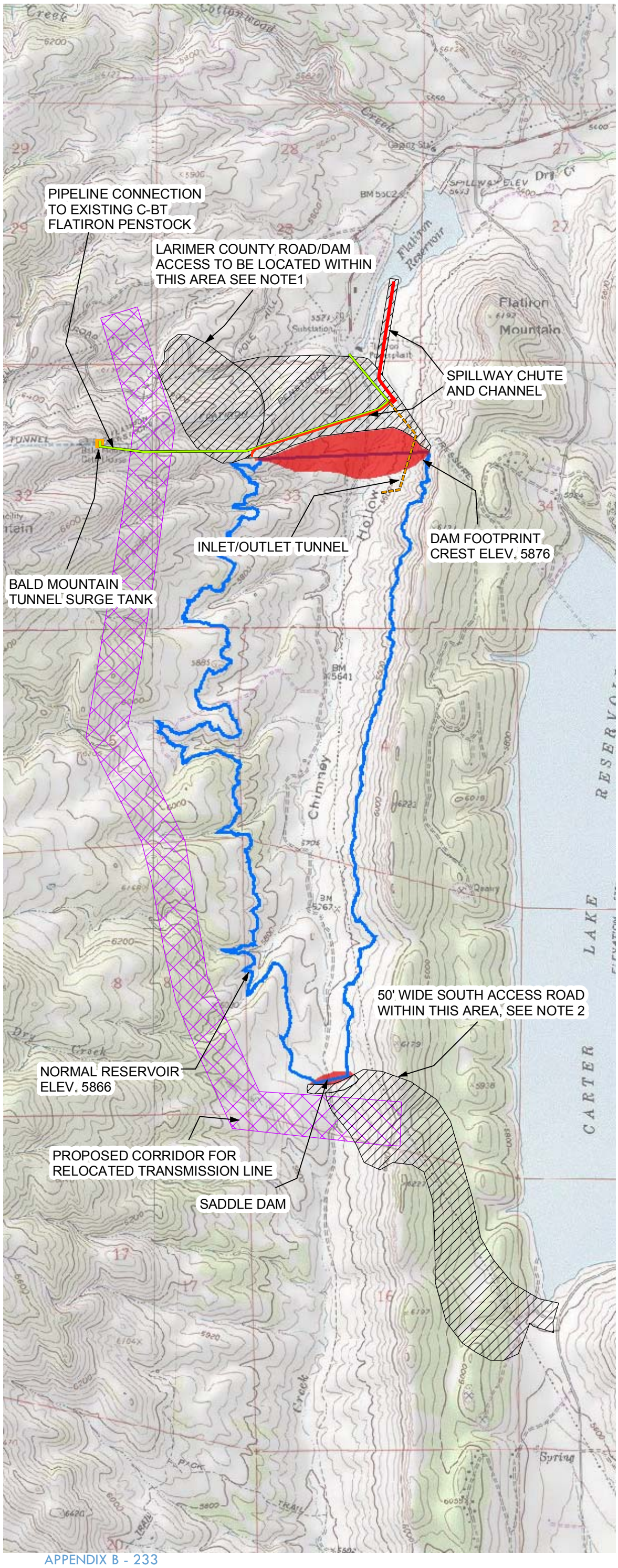
ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: (303) 830-1199

- Waste Water Treatment Plant
- Lake or Reservoir
- Highway
- Major Streams
- City

Figure 2
East Slope Project

Prepared for: Windy Gap Firming Project
File: 2390 EIS\WM_EastSlopeWaterResource.mxd (JP)
June 2009





Inlet - Outlet Tunnel

Spillway and Channel

New Pipeline

Potential Disturbance Area

Transmission Line Corridor

Chimney Hollow Reservoir

Dam

NOTES:

1. FINAL LOCATION OF DAM CREST ACCESS ROAD TO BE DETERMINED THROUGH LARIMER COUNTY PARK PLANNING PROCESS.
2. SOUTH ACCESS ROAD DURING CONSTRUCTION - GATED WITH NO PUBLIC ACCESS FOLLOWING CONSTRUCTION.

0 2,000 4,000 Feet

N

"USGS MAP OF THE CARTER LAKE RESERVOIR QUADRANGLE, BOULDER AND LARIMER COUNTIES, COLORADO"
SITE SPECIFIC TOPOGRAPHY BASED ON AERIAL SURVEY, APRIL 2003

WINDY GAP FIRMING PROJECT

Figure 3
Chimney Hollow Reservoir (90,000 AF)

Windy Gap Firming Project

Windy Gap Firming Project

Fish and Wildlife Enhancement Plan

Prepared for:
The Colorado Wildlife Commission
In accordance with CRS 37-60-122.2

Prepared by:
Municipal Subdistrict,
Northern Colorado Water Conservancy District

In Partnership With:
Denver Water

June 9, 2011

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WINDY GAP FIRMING PROJECT
FISH AND WILDLIFE ENHANCEMENT PLAN

1.0 INTRODUCTION

1.1. Enhancement Project Overview

The Windy Gap Firming Project (WGFP) is a proposed water supply project that would provide more reliable water deliveries to Front Range and West Slope communities and industries. The Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the WGFP Water Activity Enterprise (Subdistrict) is seeking to construct the project on behalf of the 13 WGFP Participants. Project Participants include the City and County of Broomfield; the towns of Erie and Superior; the cities of Evans, Fort Lupton, Greeley, Lafayette, Longmont, Louisville, and Loveland; the Little Thompson Water District; the Central Weld County Water District; and the Platte River Power Authority. The proposed action is to add water storage and related facilities to the existing Windy Gap operations that would be capable of delivering a firm annual yield of about 30,000 AF to Project Participants.

Pursuant to CRS 37-60-122.2(1), Denver Water and the Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the Windy Gap Firming Project (WGFP) Water Activity Enterprise (Subdistrict) have agreed to participate with the Colorado Department of Natural Resources (DNR) and Colorado Division of Wildlife (CDOW) in concurrent development of the Fish and Wildlife Mitigation Plan (FWMP) for the Subdistrict's WGFP and Denver Water's Moffat Project. In addition to the concurrent FWMP's, Denver Water and the Subdistrict have elected to submit to the CDOW enhancement plans to improve existing fish and wildlife resources to the CDOW. These enhancement plans are submitted pursuant to regulations implementing CRS 37-60-122.2(2) and are intended to enhance fish and wildlife resources over and above the levels existing without the Moffat Project and WGFP. Denver Water and the Subdistrict are submitting their Enhancement Plans simultaneously with their FWMP's.

1.2. Fish and Wildlife Enhancement Plan Stakeholders

The Subdistrict has been consulting with a broad range of federal and state agencies, as well as local governments and environmental groups, to solicit input on desired enhancements to existing fish and wildlife resources. These entities include:

- Governmental organizations: CDOW, Denver Water, Grand County, and Town of Hot Sulphur Springs
- Non-governmental organizations: Trout Unlimited, and landowners along the upper Colorado River

Although the CRS 37-60-122.2 procedures do not specify public involvement requirements, Denver Water and the Subdistrict acknowledge the Colorado Wildlife Commission's desire to provide ample opportunity for public participation. To date, the Wildlife Commission has provided the following opportunities for the public to provide mitigation and enhancement suggestions:

- Stakeholder Workshops, January 24-25, 2011, Winter Park – CDOW solicited input on options for fixing the upper Colorado River between Windy Gap and the Kemp-Breeze State Wildlife Area to ensure a functioning river that supports fish and wildlife resources given anticipated future flows.
- Public Comment Period on Draft Enhancement and Mitigation Plans, Feb. 10-24, 2011 – CDOW invited public review and comment on the February 9th draft plans. The input was reviewed by CDOW, Denver Water and the Subdistrict while preparing the April 7th plans.
- Wildlife Commission Meeting, March 10, 2011 – Member of the public provided comments on the February 9th draft plans and review process.
- Wildlife Commission Meeting, May 6, 2011 – Members of the public provided comments on the April 7th plans submitted to the Wildlife Commission on April 7, 2011. Time was also allowed for presentations from several groups on issues regarding the plans.

1.3 Other Concurrent and Related Activities

Moffat Collection System Project

The Moffat Collection System Project is currently proposed by Denver Water (Denver) to develop 18,000 AF/year of new annual yield to the Moffat Treatment Plant to meet future raw water demands on the East Slope. This project is anticipated to result in additional diversions, primarily from the upper Fraser River and Williams Fork River basins. Denver's proposed additional Fraser River diversions would be located upstream of the Windy Gap Project diversion site on the Colorado River and would directly affect the availability of water for the WGFP. The Moffat Collection System Project Draft EIS prepared by the Corps was released for public review in 2009.

Diversions for the WGFP and Moffat Project would result in changes to flows in the Colorado River below the Windy Gap dam. Denver Water and the Subdistrict have agreed to cooperate with each other and with the DNR and CDOW in concurrent development of the mitigation plans required under CRS 37-60-122.2 for the two projects. They have jointly developed stream temperature monitoring stations as mitigation (refer to Section 5.3.3 of this FWMP). Additionally, Denver Water and the Subdistrict have proposed enhancement with significant resources and funding to improve current conditions in the river.

2.0 ENHANCEMENTS

2.1 Upper Colorado River Habitat Project

The Upper Colorado River Habitat Project (Habitat Project) was designed in coordination with the Subdistrict to address concerns raised by CDOW and other stakeholders regarding the current conditions of the aquatic ecosystem in the Colorado River downstream of Windy Gap. CDOW studies have identified a decline in populations of *Pteronarcys californica* (giant stonefly), which, historically, has been a major source of food for trout in the Colorado River as well as other species of stoneflies and mayflies. Populations of the mottled sculpin (*Cottus bairdi*), a native fish that is also an important food source for trout and shares habitat with the *Pteronarcys*, have also declined. CDOW believes that riffle areas below the Windy Gap Reservoir have been altered by changes in flow regime, water depletions, sedimentation, and armoring of the channel bed. Trout populations between Windy Gap and Kremmling have declined. CDOW has expressed a desire to return the river to a more functional system considering current and future hydrology.

The goal of the Habitat Project is to design and implement a stream restoration program to improve the existing aquatic environment from the Windy Gap Diversion to the lower terminus of the Kemp-Breeze State Wildlife Area (Segment). Refer to Figure 1. The intent is for Denver Water and the Subdistrict to join with the CDOW, along with other stakeholders, in a cooperative effort to identify and address desired improvements to the stream environment.

Resources for the Project

A. Funds Provided by Denver Water. To implement the Habitat Project, Denver Water will provide $1.5 million.

B. Funds Provided by Subdistrict. To implement the Habitat Project, the Subdistrict will provide $3.0 million.

C. Possible Funds from CDOW. In addition to designing the Habitat Project, CDOW may contribute $500,000 to implement the Habitat Project.

D. Possible Funds Provided by Learning by Doing. Denver Water and the Subdistrict will participate in the LBD Cooperative Effort, which is described in Section 2.2. In the LBD Cooperative Effort, Denver Water has committed money for habitat improvements, water for environmental flows, and considerable system flexibility to provide flushing flows, all directed towards enhancing the aquatic environment in Grand County (refer to Appendix A for details). Denver Water and the Subdistrict, as two members of the six-member Management Committee, will work with the other members of the committee to dedicate an additional $1 million (from the funds committed to LBD by Denver Water) to the Habitat

Project, in addition to the amounts committed by Denver Water and the Subdistrict in paragraphs A and B above.

E. Possible Matching Funds. Denver Water and Subdistrict have committed $4.5 million for the Habitat Project described in A and B above and, as described below (Use of Funds), preference will be given to land that has public access. However, $1.0 million of this amount is available as matching funds for private landowners to perform additional work in the Colorado River in areas of private land.

F. Other Funding and Resources. If the Habitat Project participants desire additional resources beyond the $6.0 million described above, the project participants will work with other stakeholders and granting agencies to seek other sources of funding (a possible source of funding is matching funds as described in C above). In addition, Denver Water and the Subdistrict will contribute in-kind resources such as labor, equipment, and materials if and when available as determined by Denver Water and the Subdistrict, to help maximize the value of funds described above. Both Denver Water and Northern Water maintain significant workforces and equipment in Grand County as well as a quarry owned by Northern Water. In addition, CDOW has indicated a willingness to provide in-house expertise and resources for stream restoration design.

G. Future Funding. The Subdistrict and Denver Water will contribute $1.0 million and $500,000, respectively, for a total of $1.5 million to a fund to be used for adaptive management and/or maintenance in the Habitat Project segment. Adaptive Management in this case means that the $1.5 million will be available to adjust elements of the stream restoration efforts that are not functioning as designed.

The funding for the Habitat Project is summarized in Table 1.

Table 1. Upper Colorado River Habitat Project Funding

Source of Funding (Habitat Project)	**Amount (millions of $)**	
Denver Water	$1.5	
Subdistrict	$3.0	
CDOW	$0.5	Contingent upon CDOW approval
LBD	$1.0	Contingent upon LBD approval
Subtotal	$6.0	

Source of Funding (Future Funding)		
Denver Water	$0.5	
Subdistrict	$1.0	
Subtotal	$1.5	
Total	$7.5	

Use of Funds. The public funds described above will be used for the Habitat Project to restore the Segment on public land. However, the public stream reaches are interrupted by reaches of private land. The effectiveness of habitat restoration work and overall stream health will be compromised if there is not some degree of stream enhancement continuity for the entire Segment. While, preference will be given to work on public lands, public funds may be used for stream restoration on private land to provide continuity and prevent harm to the Habitat Project as a whole if CDOW determines that such work on private lands will provide benefits to the entire Grand County stream reach, and/or through a program of matching private funds with public funds. Proposed work on private land within the Segment will be developed in cooperation with the project participants and the land owner to ensure maximum benefit to the health of the river.

Any funds remaining after implementation of the Habitat Project will be used for additional projects to improve the aquatic environment on the Colorado River. Additional projects could include maintenance activities, a bypass around Windy Gap Reservoir or continuing stream improvements downstream to the confluence with Troublesome Creek (the lower terminus of the Gold Medal fishery designation). Other projects would be identified and agreed upon by the project participants.

Effective Date. The Habitat Project will commence when the Subdistrict and Denver Water have received acceptable Records of Decision and permits for their respective projects and have begun final design and construction activities. If a permit is appealed, the Habitat Project will commence after final resolution of the appeal and acceptance of the resolution by the Subdistrict and Denver Water.

Project Implementation. The Habitat Project will be implemented in collaboration with the LBD Cooperative Effort to ensure consistency and coordination with the overall stream enhancement efforts in Grand County. Section 2.2 describes the implementation of the Habitat Project and the goals and management structure of LBD.

2.2 Implementing the Habitat Project with the Learning by Doing Cooperative Effort

The Habitat Project will be implemented through an IGA among Denver Water, the Subdistrict, and CDOW. Denver Water and the Subdistrict will convey the committed dollars to CDOW and CDOW will design and implement the project. CDOW will also enter into any agreements, as needed, with private land owners or other funding sources. Additionally, the Habitat Project will be managed by CDOW in collaboration with the Habitat Project Stream Team.

Stream Team: The contributing members of the Habitat Project Steam Team include:

- Denver Water
- Subdistrict
- CDOW
- Grand County
- Other Parties that contribute financial resources to the Habitat Project, including but not limited to landowners

Advisory Team: Interested parties not contributing resources, including Trout Unlimited and landowners.

Implementation of Habitat Project: The Habitat Project will be managed by the Habitat Project Stream Team with advice from the Advisory Team. The Stream Team will make good faith efforts to resolve any conflicts. If the good faith effort does not result in consensus, the Habitat Project Stream Team will refer the issue to the Director of the DNR for resolution. Prior to referral, the unresolved issue will be summarized in writing with an explanation of any "competing views" and efforts to date to resolve the matter.

The Habitat Project will likely consist of several phases:

- *Project Goals* – The Stream Team will begin by setting specific goals for the Habitat Project to promote functionality of the river system. Goals may include specific biological goals related to health of the aquatic ecosystem, including fish and macroinvertebrates (e.g. trout, *Pteronarcys* and sculpin). The Habitat Project goals will be consistent with the LBD Effort and the SMP.
- *Project Design* – The Team will evaluate the most effective and sustainable restoration opportunities for the Segment. Different designs or solutions may be appropriate and implemented for different parts of the Segment. The Team will evaluate restoration opportunities based on site-

specific field evaluations, data from the SMP, and the specific objectives for a given reach.

- *Implementation* – The Team will prioritize proposed habitat improvements, as well as allocation of funding for public and privately-owned stream segments. The Habitat Project will be implemented over time as stream reaches are prioritized and designs are completed. The CDOW will be responsible for the final design, permitting and implementation of the stream restoration activities.
- *Monitoring* – The Team will determine the appropriate monitoring activities to measure outcomes from implementing the Habitat Project taking into consideration monitoring already in place or proposed as part of the LBD Effort. The CDOW will be responsible for the long-term monitoring and maintenance of the stream restoration activities.

Learning by Doing Cooperative Effort

The Habitat Project will be coordinated with the Learning by Doing Cooperative Effort to ensure consistency and coordination with the overall stream enhancement efforts in Grand County.

Denver Water and Grand County have spent over three years working cooperatively to resolve issues related to Denver Water's existing operations in Grand County. Denver Water and Grand County reached a proposed agreement on September 24, 2010 regarding Denver Water's commitments to enhance existing conditions in Grand County. Denver Water and Grand County are currently working with the State to assure that the benefits of Denver Water's commitments can be delivered and protected under Colorado's water rights system. Grand County Commissioners will also conduct a public process to gather input from county residents and other interested parties on the proposed agreement prior to a formal vote by the Commissioners on the agreement. A major component of the proposed agreement is the LBD Cooperative Effort. This is a cooperative, iterative and ongoing process to maintain, and when reasonably possible, restore or enhance the stream environment in the Fraser and Williams Fork river basins, and in the mainstem of the Colorado River from the outflow of Granby Reservoir to its confluence with the Blue River.

The Subdistrict has also been working cooperatively with Grand County and other West Slope stakeholders to develop an IGA regarding additional enhancements to existing conditions in Grand County. The IGA has not been completed, but the Subdistrict has committed to participate in the proposed LBD Cooperative Effort.

The Grand County Stream Management Plan (SMP) is the framework for the overall LBD Cooperative Effort. The SMP will be used as a "living" document that will be revised as additional monitoring data are gathered and as management goals for

each stream reach are agreed upon. Types of restoration opportunities include channel bank revegetation, enhancing fish passage, applying enhancement flows to existing low and/or high flow conditions, and in-stream habitat restoration.

The LBD Effort will be implemented with the following management structure, as shown in Figure 2.

Management Committee – The LBD Cooperative Effort will be managed by representatives of the public entities contributing resources to the various activities and projects undertaken by the group. Resources are defined as funding, water, project design, and/or equipment and manpower to implement a project. The Management Committee will operate by consensus (unanimous vote) under the LBD Cooperative Effort IGA. A copy of the proposed IGA is included in Appendix A of this Enhancement Plan. The Management Committee will include one representative from:

- Denver Water
- Northern Colorado Water Conservancy District, Subdistrict
- Grand County
- Colorado River Water Conservation District
- Middle Park Water Conservancy District
- Trout Unlimited

The Management Committee may elect to invite others to participate as members of the Management Committee based on commitments to long-term contributions of funding or other tangible resources that will further the goals of the LBD Cooperative Effort. It is anticipated that CDOW will be invited to join the Management Committee if the LBD Cooperative Effort is signed by all the parties.

Advisory Committee – The Management Committee may request participation by other parties, such as representatives from environmental, recreational, governmental and agricultural interests, to provide expertise and technical advice. It is anticipated that the U.S. Forest Service and others, would be invited to be advisors.

Responsibilities – The responsibilities of the Management Committee, with input and assistance from the Advisory Committee, include:

- ***Monitoring Plan*** – A long-term monitoring plan will be developed and implemented to identify critical stream reaches and assign priorities for actions; identify changes in the aquatic environment; evaluate effectiveness of actions taken, and modify and refine strategies for achieving the goals of the LBD Cooperative Effort.
- ***Operations Plan*** – As stream reaches are prioritized and projects identified, the Management Committee will develop an annual Operations Plan to maximize the stream environmental benefits with the available resources

such as water commitments, system flexibility and funding. The Management Committee will meet as frequently as necessary to explore opportunities to coordinate operations of all diversion structures and reservoir releases among all water users in Grand County.

- ***Enhancements*** – Denver Water committed in the proposed mediation agreement to provide substantial resources of money, water and system flexibility for the purpose of maintaining, restoring or enhancing the Upper Colorado, Fraser and Upper Williams Fork watersheds. Additional resources can be contributed by other parties to implement the LBD Cooperative Effort.
- ***Annual Review*** – The entire LBD Cooperative Effort, inclusive of coordinated operations, stream reach prioritization, stream improvement projects and monitoring programs, will be reviewed annually by the Management Committee in refining and updating the plans and projects.

STREAM PROJECTS

The Management Committee, with input from the Advisory Committee, will prioritize stream reaches for implementing stream improvement projects.

Stream Team – A specific stream project, as prioritized by the Management Committee, will be managed by a "Stream Team" comprised of organizations or individuals that have committed resources to that specific project. Resources are defined as funding, water, project design, and/or equipment and manpower to implement a specific project. Each Stream Team will consist of representatives of the Management Committee, who will be contributing resources, to ensure consistency and continuity with the LBD Cooperative Effort, plus any other contributing members. Each Stream Team will only develop and implement enhancement projects that support the goals and priorities of the LBD Effort. Private landowners who contribute resources would be invited to participate on the Stream Team for their respective segment of the river. These landowners would approve any projects proposed by the Stream Team on property they own.

Advisory Team – The Stream Team will invite other interested parties such as representatives from environmental, recreational, governmental and agricultural interests, to serve as technical advisors on a particular project.

-

2.3 Funding and Support for Windy Gap Bypass Studies

This measure addresses concerns raised by CDOW and other stakeholders regarding the current condition of the aquatic ecosystem in the Colorado River downstream of Windy Gap Reservoir. West Slope stakeholders and CDOW have expressed concerns that the reservoir has caused changes in water quality and sediment transport below the dam, which may be related to changes in populations of macroinvertebrates (Pteronarcys and other species) and sculpin below the

reservoir. In addition, stakeholders have expressed a desire for structural modifications that would allow free migration of fish around the Windy Gap dam.

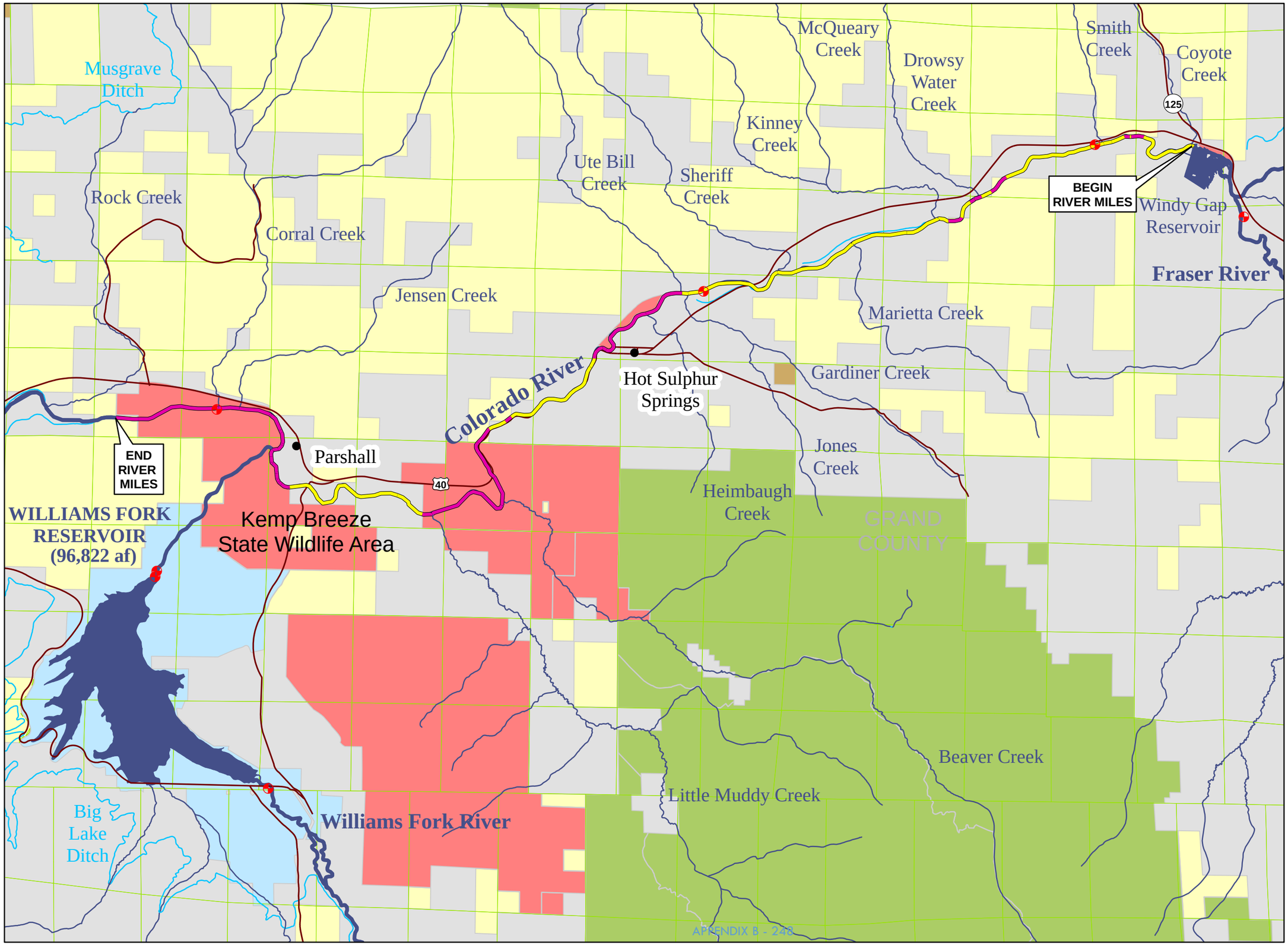
The Subdistrict will provide up to $250,000 to fund detailed studies of methods for bypass of flows, sediment, and/or fish around Windy Gap Reservoir. CDOW would direct these studies to identify potential modifications that would provide tangible benefits to aquatic resources below Windy Gap Reservoir. Issues to be studied include sediment transport, water quality (effects on temperature and/or nutrients) and fish passage. If studies identify significant, measurable benefits and there is stakeholder consensus to pursue the project, the Subdistrict will provide site access, in-kind service for design and construction of any facilities, and long-term operation and maintenance of the facility. All stakeholders will be responsible for investigation of potential sources of funding and procurement of funding for any identified improvements.

3.0 RELATIONSHIP TO PROJECT MITIGATION

Both Denver Water and the Subdistrict will comply with all mitigation measures required in the permits for their respective projects, Moffat Project and WGFP. Compliance with the mitigation measures in permits will be the sole responsibility of the permittee (i.e., Denver Water and the Subdistrict). However, Denver Water and the Subdistrict are members of the Management Committee, and will collaborate, to the extent practicable, to implement the mitigation measures in a manner consistent with the objectives of the Habitat Project, LBD Cooperative Effort and specific Stream Team efforts.

The stream enhancement cooperative efforts, such as the Upper Colorado River Habitat Project and the LBD, are efforts to enhance the existing environment and are not intended to substitute for any mitigation required by the federal agencies for the projects. The goal is to coordinate the application of any required mitigation efforts with the voluntary and collaborative efforts of the stream enhancement projects to assure the maximum benefit for the stream environment.

Denver Water and the Subdistrict will enter into a binding agreement with CDOW for the Habitat Project, as described above. If the Corps or tReclamation requires aquatic mitigation in the Segment, some or all of the committed resources listed above will be enforceable through conditions in the permits. In that case, an IGA would not be needed for those portions of the Habitat Project required by the Corps or Reclamation as aquatic mitigation and included in the permit conditions for the Moffat Project and the WGFP. The Habitat Project will be implemented in a manner that complements any mitigation measures required by the Corps for the Moffat Project or by Reclamation for the WGFP.



Upper Colorado River Vicinity

Windy Gap to Williams Fork River

FIGURE 1

Legend

- Town
- Gaging Station
- Major Stream or River
- Major Canal, Aqueduct or Pipeline
- River access is Private
- River access is Public
- Roads
- Public Land Survey - Section Line
- BLM
- Colorado DOW
- Denver Water
- PRIVATE
- State Land Board
- USFS - Arapahoe Natl. Forest

Total river miles from Windy Gap Reservoir to the West end of Kemp Breeze SWA is 16.70.

Additional adjacent land-use totals:
Private = 9.40
Public = 7.30

N
S

1:65,000

0 0.25 0.5 1 1.5 2
Miles

DRAFT - WORKING COPY

DENVER WATER

Land Ownership compiled by the Natural Resources Ecology Lab (NREL) at Colorado State University, Fort Collins, CO as COMaP v.7.

Theobald, D.M., G. Wilcox, S.E. Linn, N. Peterson, and M. Lineal. 2008. Colorado Ownership, Management, and Protection v7 database. Human Dimensions of Natural Resources and Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO. 15 September. www.nrel.colostate.edu/projects/comap

March 2011
\gis\projects\moffat\maps\UpperColo-DOW-11x17-WG-to-WF.mxd

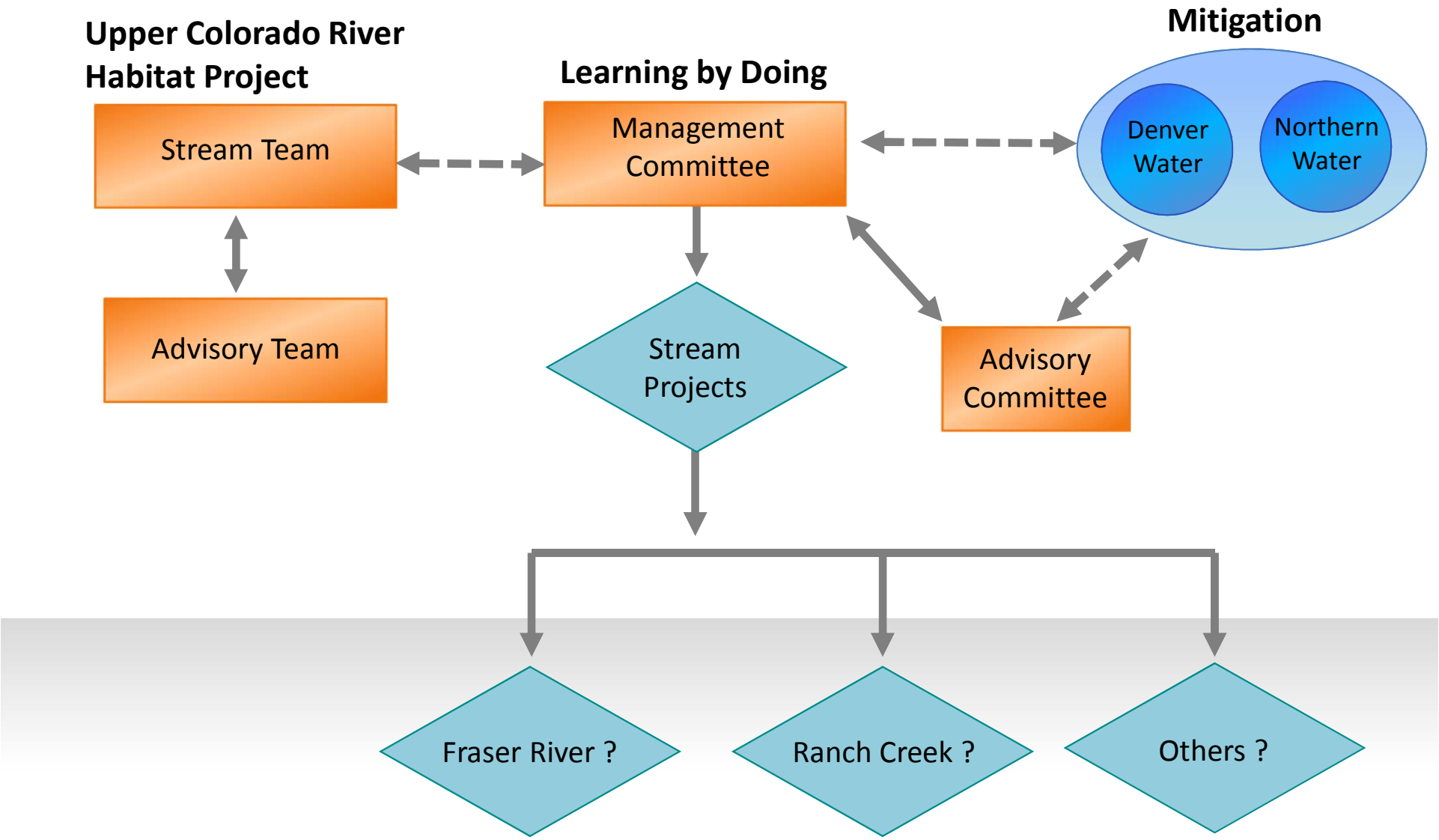


Figure 2. Implementing the Habitat Project with Learning by Doing

DUPLICATE ORIGINAL

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
GREAT PLAINS REGION
EASTERN COLORADO AREA OFFICE

MEMORANDUM OF UNDERSTANDING
MOU NO. 10AG6C0004

Colorado-Big Thompson Project West Slope Collection System Appraisal Study

This Memorandum of Understanding (MOU) between the United States Department of the Interior, Bureau of Reclamation, Eastern Colorado Area Office (Reclamation), Grand County Board of County Commissioners (Grand County) and Northern Colorado Water Conservancy District (Northern Water), identifies the roles, work, and funding responsibilities of the parties for executing a Colorado-Big Thompson West Slope Collection System Appraisal Study. The parties will abide by the terms and provisions expressed or referenced herein.

BUREAU OF RECLAMATION

10/19/2010

Michael P. Collins
Area Manager Eastern Colorado Area Office

Date

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

Eric Wilkinson
General Manager

Date

GRAND COUNTY BOARD OF COUNTY COMMISSIONERS

James L. Newberry
Chair Grand County Board of County Commissioners

Date

I. BACKGROUND, PURPOSE, AND OBJECTIVES

A. Background

Grand Lake is a large natural lake located in Grand County, Colorado surrounded by a small mountain community with the same name. In addition to its use as a recreational amenity for local residents and visitors, it serves as part of the water collection and conveyance system for the Colorado-Big Thompson (C-BT) Project. Shadow Mountain and Granby Reservoirs were constructed as part of the C-BT Project. These three water bodies: Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir are collectively referred to as the "Three Lakes System."

The C-BT Project had its beginnings in the late 1930's and became fully operational about 20 years later. Its main purpose is to collect water from the upper Colorado River Basin and transport it to the eastern slope of Colorado for use by farmers and residents of northeastern Colorado. The C-BT Project is required to be operated in accordance with Senate Document No. 80, 75th Congress, 1st Session, which is the authorizing legislation for the Project. Reclamation owns the C-BT Project and operates it jointly with Northern Water.

While Grand Lake has a depth estimated to exceed 200 feet, Shadow Mountain Reservoir has a mean depth of only 10 feet. Shadow Mountain Reservoir inundated a very large, flat valley that contained wetlands, swampy areas, and dense vegetation common to wetlands and high mountain valleys.

The water quality of Grand Lake has been monitored for many years, including its clarity. A persistent aquatic weed problem in Shadow Mountain Reservoir has been addressed on three different occasions with mixed success.

During recent years the seasonal changes in the clarity of the water column in certain locations in Grand Lake has been a growing concern among a group of residents that live near Grand Lake. In 2006 Grand County, Northern Water, and a group of local residents jointly funded a very small and preliminary reconnaissance level study that conceptually identified several structural alternatives that could change circulation patterns in the Three Lakes System by avoiding use of Grand Lake as part of the C-BT conveyance system. One idea was the construction of a tunnel around Grand Lake. Another was the installation of a submerged flexible pipeline structure in Grand Lake itself. The effect of these proposals on the quality of water in Shadow Mountain or Granby Reservoirs was not considered.

In 2007, Grand County and Northwest Colorado Council of Governments requested that the Colorado Water Quality Control Commission, and the Colorado Department of Public Health and Environment, adopt a water clarity standard for Grand Lake. The Commission adopted a 4-meter Secchi depth numerical clarity standard to be effective by 2015 if a more appropriate standard has not been determined. Reclamation, Grand County, and Northern Water are cooperatively working together on a Grand Lake clarity study to evaluate an appropriate clarity standard. In addition, Reclamation, Grand County and Northern Water are

also involved in an on-going, multi-year nutrient study to determine sources and quantities of nutrients contributing to water quality changes in the "Three Lakes System."

In 2008 and 2009 Reclamation, Grand County, and Northern Water cooperatively altered the normal C-BT Project operations by not pumping water from Granby Reservoir to Shadow Mountain Reservoir for a short period in late summer. This modification to normal operations resulted in the prevention of flow from Shadow Mountain Reservoir into Grand Lake to determine the impact to Grand Lake. Although the "experiment" was planned for a four-week period in 2008, it was cut short to two weeks because of unanticipated east slope C-BT Project reservoir elevation concerns. The 2009 experiment also occurred during a two-week period. There were visible clarity improvements apparent in both stop pump periods.

B. Purpose and Objectives

The purpose of this MOU is to generally describe the following:

1) The process by which Reclamation, Grand County, and Northern Water will complete an Appraisal Study and Report and, if Reclamation issues a notice to proceed, a Feasibility Study Plan with an independent contractor.

2) The funding arrangements between Reclamation, Grand County, and Northern Water.

3) The term of the MOU and required clauses.

4) Identify representatives of Reclamation, Grand County, and Northern Water who will be responsible for monitoring the implementation of the MOU.

II. SCOPE OF WORK

A. Reclamation Responsibilities

Reclamation's responsibilities include the following:

1) Direct, participate and have final authority over all matters related to the completion of the Appraisal Study Report and, if Reclamation issues a notice to proceed, a Feasibility Study Plan.

   a. Designate a point of contact for all matters applicable to the completion of the process.

   b. Assemble a Reclamation Interdisciplinary Study Team and Regional Review Team, which will provide policy and independent reviews throughout the process.

   c. Approve the scope of work, participate in the request for proposal process, be on the selection committee, and have final approval for the selection of the contractor.

d. Provide the contractor with regulations, handbooks and other guidance to be used throughout the process.

e. Approve and participate in all aspects of the public and agency involvement process, including dissemination of materials, approval of invited meeting participants, and determination of how meetings are set up and conducted, in accordance with 40 C.F.R. 1501.7.

f. Approve and file all of the necessary notices throughout the process.

g. Participate in the development of, independently evaluate, and have final approval for the process and all information included in the documents produced.

2) Make the decision to conclude the Appraisal Study if at any point it appears unlikely that the study would produce any alternative plan capable of meeting four tests of viability, including:

a. Acceptability, the workability and viability of the alternatives with regard to acceptance by state and local interests and the public, and compatibility with existing laws, regulations, and public policies.

b. Effectiveness, the extent to which alternatives would contribute to achieving planning objectives.

c. Efficiency, the extent to which alternatives would be the most cost effective means of achieving the objectives.

d. Completeness, the extent to which alternatives would provide and account for all necessary investments or other actions to ensure realization of planning objectives, including actions by other Federal and non-Federal entities.

3) Recommend in the Appraisal Report whether or not to initiate a Feasibility Study based on the following:

a. Reclamation has an interest.

b. An unsatisfied water need exists or could be expected to occur.

c. A means of satisfying (or partially satisfying) that need might be possible by structural or nonstructural alternative plans for development and management of available water and land resources.

d. There appears to be viable alternatives for a project, benefits likely to exceed costs, and there are no "show stoppers."

4) Maintain documentation, including the administrative record, for the above items, 1 through 3.

B. Northern Water and Grand County Responsibilities

Northern Water and Grand County responsibilities include the following:

1) Provide funding in advance to Reclamation for its participation in the completion of the Appraisal Study and Report and, if Reclamation issues a notice to proceed, a Feasibility Study Plan.

2) Help draft the request for proposal and scope of work.

3) Hire and fund the contractor.

4) Designate a point of contact for all matters applicable to the completion of the process.

5) Participate in technical discussions, provide documentation, and cooperate with Reclamation when requested.

6) Cooperate in the selection of the contractor and hire Reclamation's selected contractor.

7) Ensure that the contractor hired by Northern Water and Grand County:

   a. Completes all work as identified in the request for proposal and scope of work.
   b. Follows all regulations, handbooks and other guidance provided by Reclamation.
   c. Develops a schedule to accomplish the tasks identified in this MOU and the request for proposal and scope of work.
   d. Utilizes all available information provided by Reclamation, Northern Water, Grand County, public and agencies, and information collected from other sources by the consultant.
   e. Prepares all materials necessary for interaction with the public and agencies as directed by Reclamation.
   f. Releases information, including but not limited to data, analyses, reports, and evaluations only through or with the approval of Reclamation.

D. Responsibilities common to Reclamation, Grand County, Northern Water, and the contractor.

1) Maintain confidentiality of sensitive information and do not release information to the public without Reclamation approval.

2) Attend meetings as necessary with public, federal, state, regional and local agencies for the purposes of facilitating communication and receiving input, as may be

necessary, desirable, or required by law, and insofar as such meetings are relevant to the subject process.

3) The parties acknowledge and understand that the schedule developed is a target or goal and that there are many influences outside the control of the signatories to this MOU that could affect progress. The parties will work to resolve any issues that could delay the process and will meet periodically to update and revise the schedule as appropriate.

III. FEDERAL FUNDING

There will be no Federal funding associated with the work covered by this MOU.

IV. NON-FEDERAL FUNDING

Northern Water and Grand County will provide funds to Reclamation, in advance, for the work to be performed by Reclamation as described in this MOU. These funds are in addition to any costs associated with the contractor, which are the sole responsibility of Northern Water and Grand County. Prior to commencement of work under this MOU, Northern Water and Grand County will each pay Reclamation the estimated cost to cover work through December 31, 2011 for use in covering Reclamation's costs associated with accomplishing the work items described herein.

V. PAYMENT FOR SERVICES

Reclamation's estimated costs for the MOU through December 31, 2011 is $40,000. Costs include administrative expenses (actual labor costs plus any non-labor expenses such as travel, printing and equipment). The cost per labor hour includes salary, benefits and indirect costs.

Payment for costs incurred by Reclamation under this MOU shall be made in advance as follows:

1) Northern Water and Grand County will advance the amount of $40,000 to cover Reclamation's costs through December 31, 2011. Whenever the balance in the amount advanced is less than $20,000, Reclamation shall notify Northern Water and Grand County and Northern Water and Grand County shall promptly submit an additional advance in the amount of $20,000 each. If Reclamation determines that less than $20,000 is needed to complete work under the MOU, Reclamation will request and Northern Water and Grand County shall provide the lesser amount determined by Reclamation.

2) Within 30 days after June 30 and December 31, while the MOU is in effect, Reclamation will submit to Northern Water and Grand County an accounting of the costs incurred by Reclamation and a summary description of the completed elements for the previous

period. All Reclamation expenses, including administrative costs, will be documented by Reclamation and subject to audit by Northern Water and Grand County.

It is understood that the costs estimated above are preliminary and difficult to estimate, and that actual costs may be lesser or greater than estimated above.

Any funds that have been advanced that are not utilized will be returned to Northern Water and Grand County within 60 days of the completion of work under the MOU or termination of the MOU, along with an accounting of the costs incurred by Reclamation and a summary description of the completed elements.

VI. TERM OF THE MOU

Subject to the termination provisions below, this MOU will remain in effect until December 31, 2011.

This MOU may be terminated upon any of the following conditions:

1) Mutual agreement

2) Thirty (30) day written notice of any party

If the MOU is terminated, any unexpended funds previously advanced to Reclamation will be accounted for and returned to Northern Water and Grand County within sixty (60) days of the termination of this MOU.

This MOU may be extended or amended at any time by written consent of the designated representatives of the parties hereto, provided justification is given to the other party and accepted.

This MOU is renegotiable upon agreement of all parties.

VII. REQUIRED CLAUSES

During the performance of this MOU, the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this MOU or to any benefit arising from it. However, this clause does not apply to this MOU to the extent that this MOU is made with a corporation for the Corporation's general benefit.

Northern Water's and Grand County's obligation to provide funds to Reclamation hereunder is subject to such funds being budgeted and appropriated for such purpose by the Board of Directors of Northern Water and the Board of County Commissioners of Grand County, respectively. If such funds are not so budgeted and appropriated, Northern Water or Grand County may immediately terminate this MOU and all obligations of all parties hereunder shall be terminated, except for the obligation of Reclamation to account for funds previously expended and to return any unused funds to Northern Water and Grand County.

VIII. KEY OR RESPONSIBLE PERSONNEL

The following people will be Reclamation's and Northern Water's representatives for this MOU:

Reclamation's representative for MOU:

Eastern Colorado Area Office
Carlie Ronca, Chief Resources Division
Bureau of Reclamation, Eastern Colorado Area Office
11056 W. County Rd. 18E
Loveland, CO 80537

Northern Water's representative for MOU:

Northern Colorado Water Conservancy District
Don Carlson, Assistant Manager
220 Water Avenue
Berthoud, CO 80513

Grand County's representative for MOU:

Grand County
Lurline Underbrink Curran
Senate Document 80 Representative and Grand County Manager
PO Box 264, 308 Byers Ave
Hot Sulfur Springs, CO 80451

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Region
Eastern Colorado Area Office
11056 West County Road 18E
Loveland, Colorado 80537-9711

IN REPLY REFER TO

EC-1310
ADM 13.00

OCT 19 2010

Don Carlson
Assistant Manager
Northern Colorado Water Conservancy District
220 Water Street
Berthoud, Colorado 80513

Subject: Memorandum of Understanding No. 10AG6C0004 – West Slope Collection System Appraisal Study – Colorado-Big Thompson Project, Colorado

Dear Mr. Carlson:

Enclosed is a fully executed copy of the Memorandum of Understanding (MOU) No. 10AG6C0004 and associated Statement of Work. The MOU between the United States Department of the Interior, Bureau of Reclamation, Eastern Colorado Area Office, Grand County Board of County Commissioners (Grand County) and Northern Colorado Water Conservancy District (Northern Water) identifies the roles, work, and funding responsibilities of the parties for executing a Colorado-Big Thompson West Slope Collection System Appraisal Study.

We are anticipating a meeting with you to discuss next steps in this process by mid-November.

We appreciate your cooperation and assistance on this matter. Should you have any questions, please contact Laura Wheatley at 970-962-4337 or email ltwheatley@usbr.gov.

Sincerely,

Michael P. Collins
Area Manager

Enclosure -1

Identical Letter Sent to:

Lurline Underbrink Curran
County Manager, Grand County
P.O. Box 264
Hot Sulphur Springs, Colorado 80451-0264

BOARD OF COMMISSIONERS

JAMES L. NEWBERRY
District I, Winter Park 80482
NANCY STUART
District II, Granby 80446
GARY BUMGARNER
District III, Kremmling, 80459

Received
NCWCD

OCT - 1 2010

Original File Copy

E-Mail: grndcty1@co.grand.co.us
PHONE: 970/725-3347
Fax: 970/725-0565
LURLINE UNDERBRINK CURRAN
County Manager
ANTHONY J. DICOLA
County Attorney

September 29, 2010

Ms. Carlie Ronca
U.S. Bureau of Reclamation
Eastern Colorado Area Office
11056 West County Road 18E
Loveland, CO 80537-9711

Re: Memorandum of Understanding No. 10AG6C0004 - West Slope Collection System Appraisal Study - Colorado-Big Thompson Project, Colorado

Dear Carlie:

Enclosed please find the signed original and duplicate original of the above referenced Memorandum of Understanding. Both originals have been signed by the Grand County Board of County Commissioners and the Northern Colorado Water Conservancy District.

Once the originals have been signed by the Bureau of Reclamation, please forward us a copy of the fully executed document for our files.

Sincerely,

Lurline

Lurline Underbrink Curran
County Manager

LUC:ke

cc: Eric Wilkinson
Don Carlson

P.O. BOX 264 HOT SULPHUR SPRINGS CO 80451-0264

Corresp

Northern Water
Northern Colorado Water Conservancy District
220 Water Avenue Berthoud, Colorado 80513
Phone 1-800-369-7246 • Fax 1-877-851-0018
www northernwater.org

September 24, 2010

Ms. Lurline Underbrink Curran
Grand County Manager
P.O. Box 264
Hot Sulphur Springs, CO 80451-0264

Re: Memorandum of Understanding No. 10AG6C0004 – West Slope Collection System Appraisal Study – Colorado-Big Thompson Project, Colorado

Dear Lurline:

In accordance with the transmittal letter dated February 19, 2010, from Ms. Carlie Ronca with the U.S. Bureau of Reclamation, enclosed please find the signed original and duplicate original of the above-referenced Memorandum of Understanding. Both originals have been signed on behalf of the Northern Colorado Water Conservancy District by General Manager, Eric W. Wilkinson.

Please have an authorized representative of Grand County sign both originals where indicated. Do not date the documents. Once both originals have been signed, please forward them to Ms. Ronca for final execution. Her address is: U.S. Bureau of Reclamation, Eastern Colorado Area Office, 11056 West County Road 18E, Loveland, Colorado 80537-9711.

Reclamation has requested advance funding from Grand County (upon final execution of the MOU) for work through December 31, 2011, as detailed in the MOU. If you have any questions regarding these documents, please do not hesitate to contact Ms. Laura Wheatley with Reclamation at (970) 962-4337.

Sincerely,

Candys Sinden

Candys Sinden
Administrative Support Specialist

Enclosures
cc: Eric Wilkinson
Don Carlson
Laura Wheatley

Municipal Subdistrict
Northern Colorado Water Conservancy District
220 Water Avenue • Berthoud, CO 80513 • 970-532-7700 • fax 970-532-0942

Corresp

September 23, 2010

Grand County Commissioners
P.O. Box 264
Hot Sulphur Springs, CO 80451-0264

Dear Commissioners:

Northern Water's Board of Directors met via conference call last week on September 15 and on September 17 to discuss the Appraisal Study MOU. It has always been our intention to participate in the effort with Grand County and the U.S. Bureau of Reclamation; however, we had been planning on signing the MOU at the same time we would all sign the Windy Gap Firming Project Agreement.

It is our understanding the County has been under some pressure from some of your constituents to move ahead with the Appraisal Study immediately. Jeff Drager and Don Carlson met with some of the Grand Lake Homeowners in August to better understand their concerns and to communicate to them concerns of the WGFP participants. Although direct face-to-face meetings are generally helpful, the Grand Lake representatives were not interested in any sort of compromise solution. It is our understanding that they fully intend to oppose the Windy Gap Firming Project regardless if the Appraisal Study is delayed or moves ahead.

We also understand that the Grand Lake Homeowners, the Town of Grand Lake, and others filed an Amicus brief relating to the EPA transfer rule and although Grand County was not included in the signatories, it did provide a substantial portion of the funding for legal costs. I hope you understand our disappointment.

Nevertheless, in a gesture of good faith we recommended to the Northern Water Board, and they in turn approved, the signing of the Appraisal Study MOU. Our board was unanimous in their decision.

It is our hope that you would continue to works towards completion of our WGFP negotiations, including an agreement regarding Grand County's 1041 process. We look forward to completing an acceptable "term sheet" in November and completing the agreement details in December.

Sincerely,

Eric Wilkinson
General Manager

cps

BOARD OF COMMISSIONERS

JAMES L. NEWBERRY
District I, Winter Park 80482
NANCY STUART
District II, Granby 80446
GARY BUMGARNER
District III, Kremmling, 80459

E-Mail: grndcty1@co.grand.co.us
PHONE: 970/725-3347
Fax: 970/725-0565
LURLINE UNDERBRINK CURRAN
County Manager
ANTHONY J. DICOLA
County Attorney

February 24, 2010

Carlie A. Ronca
Resources Chief
U.S. Department of the Interior
Bureau of Reclamation
11056 West County Rd 18E
Loveland, CO 80537-9711

Dear Carlie:

Enclosed please find an original and two duplicates of Memorandum of Understanding No. 10AG6C0004 - West Slope Collection System Appraisal Study - Colorado-Big Thompson Project, Colorado and appropriate statement of work. Thank you for all of your efforts and helping to get this document complete. When we receive a fully executed M.O.U., we will provide the $40,000 in funding required to start the process.

Don Carlson and I are still working on language on what I have always termed the "umbrella M.O.U." and hoping that we will be able to move forward on that M.O.U. also.

Again, thank you for your work and assistance.

Sincerely,

Lurline

Lurline Underbrink Curran
County Manager

LUC:ke

enclosures

cc: Don Carlson

OFFICIAL FILE COPY
RECLAMATION
Date MAR 01 2010

Code	Surname	Date
1300		
Ronca		

Copy to

Official File Copy
File Code ADM 13.00
Project 245
Control No. 1013386
Folder I.D. 1006298
AW 3/01/2010

United States Department of the Interior

BUREAU OF RECLAMATION
Eastern Colorado Area Office
11056 West County RD 18E
Loveland, Colorado 80537-9711

IN REPLY
REFER TO
EC-1310
ADM 13.00

FEB 19 2010

Don Carlson
Assistant Manager
Northern Colorado Water Conservancy District
220 Water Street
Berthoud, Colorado 80513

Subject: Memorandum of Understanding No. 10AG6C0004 – West Slope Collection System Appraisal Study – Colorado-Big Thompson Project, Colorado

Dear Mr. Carlson:

Enclosed are an original and two duplicate originals of the subject Memorandum of Understanding (MOU) No. 10AG6C0004 and associated Statement of Work (SOW). If the terms and conditions of the proposed MOU and SOW are acceptable to Northern Colorado Water Conservancy District (Northern), please take the following actions:

- Please arrange for signature of the original and duplicate original MOU documents on behalf of Grand County. Please do not date the documents. We will date the documents when they are returned to us for signature.

- Return all signed MOU documents to this office

One fully-executed MOUwill be returned to Northern upon signature on behalf of Reclamation. Upon execution of the MOU, we ask that Grand County provide funding in advance for work through December 31, 2011, as detailed in the MOU.

If you have any questions, please contact Laura Wheatley at 970-962-4337.

Sincerely,

Carlie A Ronca

Carlie A. Ronca
Resources Chief

Enclosures – 4

Identical Letter Sent To:

Lurline Underbrink Curran
Grand County Manager
P.O. Box 264, 308 Byers Avenue
Hot Sulphur Springs, Colorado 80451-0264

ORIGINAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Colorado-Big Thompson Project
Colorado

SUPPLEMENT OF CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT FOR ADDRESSING COMMITMENTS ASSOCIATED WITH MEETING THE GRAND LAKE CLARITY STANDARD

THIS SUPPLEMENT, entered into this 23rd day of, Oct 2013, pursuant generally to the Act of June 17, 1902 (32 Stat. 388), and subsequent acts supplementary thereto and amendatory thereof collectively known as the Federal Reclamation laws, particularly, but not limited to, the Act of August 9, 1937 (50 Stat. 595) between the UNITED STATES OF AMERICA, hereinafter called the "United States," acting through the Secretary of the Interior, represented by the "Contracting Officer" executing this Supplement, and NORTHERN COLORADO WATER CONSERVANCY DISTRICT, hereinafter referred to as "Northern Water," a quasi-municipal entity and political subdivision of the State of Colorado, organized and existing under and by virtue of the laws of the State of Colorado, with its principal place of business in Berthoud, Colorado. The United States and Northern Water hereinafter are each sometimes individually called "Party," and sometimes collectively called the "Parties".

WITNESSETH THAT:

The following statements are made in explanation:

EXPLANATORY RECITALS

a. WHEREAS, the United States constructed the Colorado-Big Thompson (C-BT) Project in the State of Colorado, pursuant to Federal Reclamation laws; and

b. WHEREAS, the Parties executed Contract No. 9-07-70-W0020, on July 5, 1938; it has subsequently been amended and supplemented. The original contract along with its amendments and supplements are collectively referred to herein as the "1938 Repayment Contract"; and

c. WHEREAS, the Parties have concerns with the clarity of Grand Lake; and

d. WHEREAS, in 2008, the Colorado Water Quality Control Commission adopted a narrative clarity standard and a numerical clarity standard for Grand Lake; and

e. WHEREAS, the Parties wish to meet the applicable water clarity standard.

NOW THEREFORE, in consideration of the mutual and dependent covenants herein contained, it is hereby mutually agreed as follows:

PURPOSE

1. The purpose of this Supplement is to describe the Parties' commitment to identify and evaluate factors that affect clarity in Grand Lake and to develop a plan in accordance with this Supplement to meet the applicable water clarity standards.

RESPONSIBILITIES

2. a. There may be a relationship between the reduced clarity in Grand Lake and the operation of the C-BT Project as well as other factors. The Parties agree that further study and evaluation would be beneficial to better understand this potential relationship.

b. The Parties will: 1) actively participate in the process of identification, development, and evaluation of factors, causes, and actions that affect clarity in Grand Lake; 2) collaborate with each other and other appropriate parties and groups ("Stakeholders") to identify, develop, and evaluate specific proposed actions to meet applicable water clarity standards in a manner that recognizes the relative contributing factors that affect Grand Lake water clarity, in order to allow for, as appropriate, recommendations by the Parties for specific actions to meet applicable water clarity standards at Grand Lake, including participation in further studies designed to identify specific factors affecting clarity; 3) implement the process and actions defined in Article 4 below as appropriate and within legal limitations and funding constraints, with the goal of preserving and maximizing overall C-BT Project benefits while meeting applicable clarity standards at Grand Lake.

c. The United States will have the final authority to approve both the Stakeholders and the process identified in Article 2.b. above, after consultation with Northern Water, other Federal, state, and local authorities, and other entities as the United States deems appropriate.

PAYMENT RESPONSIBILITY

3. The responsibility for payment of the cost of implementing measures to meet applicable water clarity standards shall be determined in accordance with Reclamation law. The Parties acknowledge that congressional and other authorization may be necessary to implement potential solutions.

IMPLEMENTATION

4. a. Pursuant to the foregoing, if specific actions are identified pursuant to Article 2.b. above, the Parties commit to work cooperatively and collaboratively, with each other and with other Stakeholders; to evaluate any such specific actions under applicable local, state, and/or federally required processes, regulations, policies, and statutes; to cooperate with other Stakeholders to identify sources of funding; and to implement any such specific actions to meet the goal identified in Article 2.b. above within legal limitations and funding constraints and in a manner that recognizes the causes and relative contributing factors that affect Grand Lake water clarity. This Supplement does not affect or modify existing authorities, including those regarding the allocation of costs, for operation and maintenance of or capital improvements related to the C-BT Project.

b. The United States may take actions to meet the applicable clarity standard, and the cost of such actions will be allocated in accordance with Reclamation law. The Parties acknowledge that the exact nature and cost of such actions is unknown until the processes outlined in Article 2 are complete. Until a proposed solution is identified, agreed upon, and appropriate authorizations, if necessary, are obtained, the Parties reserve all rights, arguments, and defenses relative to the proposed solution itself and the allocation of costs therein. In the event the Parties are unable to reach agreement concerning the specific actions that should be taken to meet the goal identified in Article 2.b. above and the United States makes a determination to implement specific action(s), the Parties reserve all rights, arguments, and defenses regarding such determination to implement specific actions, and this Supplement does not modify, waive, limit, or relinquish any right of Northern Water to contest the United States' determination to take specific actions in any judicial, administrative, or legislative forum. The execution of this Supplement shall not be used by either Party in any judicial, administrative, or legislative proceeding as an admission to the contrary.

EFFECT ON THE 1938 REPAYMENT CONTRACT

5. This Supplement is in addition to the 1938 Repayment Contract and, except as expressly provided in Articles 2.b. and 4. above, does not modify or amend the 1938 Repayment Contract. This Supplement shall not be a basis for any direct or indirect interpretation or construction of any provision of the 1938 Repayment Contract for any purpose. Prior drafts of this Supplement are not relevant to the interpretation of this Supplement.

STANDARD CONTRACT ARTICLES

6. The standard contract articles applicable to this Supplement are listed below. The full text of these standard articles is attached as Exhibit A and is hereby made a part of this Supplement.

A. Notices
B. Officials Not to Benefit
C. Changes in Contractor's Organization
D. Assignments Limited - Successors and Assigns Obligated
E. Books, Records, and Reports
F. Rules, Regulations, and Determinations
G. Equal Employment Opportunity (Federally Assisted Construction)
H. Compliance with Civil Rights Laws and Regulations

IN WITNESS WHEREOF, The Parties have executed this Supplement the day and year written above and agree to the terms, provisions, special conditions, and standard provisions expressed or referenced herein.

UNITED STATES OF AMERICA

By _____
Michael J. Ryan
Regional Director
Great Plains Region
Bureau of Reclamation

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By _____
Eric W. Wilkinson
General Manager

EXHIBIT A
STANDARD CONTRACT ARTICLES

NOTICES

A. Any notice, demand, or request authorized or required by this Supplement shall be deemed to have been given, on behalf of Northern Water, when mailed, postage prepaid, or delivered to the:

Regional Director
Great Plains Region
Bureau of Reclamation
P.O. Box 36900
Billings, MT 59107

and on behalf of the United States, when mailed, postage prepaid, or delivered to the:

General Manager
Northern Colorado Water
Conservancy District
220 Water Avenue
Berthoud, Colorado 80513

The designation of the addressee or the address may be changed by notice given in the same manner as provided in this Article for other notices.

OFFICIALS NOT TO BENEFIT

B. No Member of or Delegate to the Congress, Resident Commissioner, or official of the Northern Water shall benefit from this Supplement other than as a water user or landowner in the same manner as other water users or landowners.

CHANGES IN CONTRACTOR'S ORGANIZATION

C. While this Supplement is in effect, no change may be made in Northern Water's organization, by inclusion or exclusion of lands or by any other changes which may affect the respective rights, obligations, privileges, and duties of either the United States or Northern Water under this Supplement including, but not limited to, dissolution, consolidation, or merger, except upon the Contracting Officer's written consent.

ASSIGNMENT LIMITED—SUCCESSORS AND ASSIGNS OBLIGATED

D. The provisions of this Supplement shall apply to and bind the successors and assigns of the Parties hereto, but no assignment or transfer of this Supplement or any right or interest therein by either Party shall be valid until approved in writing by the other Party.

BOOKS, RECORDS, AND REPORTS

E. Northern Water shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this Supplement, including Northern Water's financial transactions; water supply data; project operation, maintenance, and replacement logs; project land and rights-of-way use agreements; the water users' land-use (crop census), land-ownership, land-leasing, and water-use data; and other matters that the Contracting Officer may require. Reports shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require. Subject to applicable Federal laws and regulations, each Party to this Supplement shall have the right during office hours to examine and make copies of the other Party's books and records relating to matters covered by this Supplement.

RULES, REGULATIONS, AND DETERMINATIONS

F. 1. The Parties agree that the delivery of water or the use of Federal facilities pursuant to this Supplement is subject to Federal reclamation law, as amended and supplemented, and the rules and regulations promulgated by the Secretary of the Interior under Federal reclamation law.

2. The Contracting Officer shall have the right to make determinations necessary to administer this Supplement that are consistent with its provisions, the laws of the United States and the State of Colorado, and the rules and regulations promulgated by the Secretary of the Interior. Such determinations shall be made in consultation with Northern Water.

EQUAL EMPLOYMENT OPPORTUNITY

G. During the performance of this Supplement, Northern Water agrees as follows:

1. Northern Water will not discriminate against any employee or applicant for employment because of race, color, religion, sex, disability, or national origin. Northern Water will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, disability, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Northern Water agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

2. Northern Water will, in all solicitations or advertisements for employees placed by or on behalf of Northern Water, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, disability, or national origin.

3. Northern Water will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of Northern Water's commitments under section 202 of Executive Order 11246 of September 24, 1965 (EO 11246), and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. Northern Water will comply with all provisions of EO 11246, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. Northern Water will furnish all information and reports required by EO 11246, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the Contracting Agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of Northern Water's noncompliance with the nondiscrimination clauses of this Supplement or with any of such rules, regulations, or orders, this Supplement may be canceled, terminated or suspended in whole or in part and Northern Water may be declared ineligible for further Government contracts in accordance with procedures authorized in EO 11246, and such other sanctions may be imposed and remedies invoked as provided in EO 11246 or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. Northern Water will include the provisions of paragraphs 1 through 7 in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of EO 11246, so that such provisions will be binding upon each subcontractor or vendor. Northern Water will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however,* that in the event Northern Water becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, Northern Water may request that the United States enter into such litigation to protect the interests of the United States.

COMPLIANCE WITH CIVIL RIGHTS LAWS AND REGULATIONS

H. 1. Northern Water shall comply with Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352; 42 U.S.C. § 2000d), the Rehabilitation Act of 1973 (Pub. L. 93-112, Title V, as amended; 29 U.S.C. § 791, et seq.), the Age Discrimination Act of 1975 (Pub. L. 94-135, Title III; 42 U.S.C. § 6101, et seq.), Title III of the Americans with Disabilities Act of 1990 (Pub. L. 101-336; 42 U.S.C. § 12181, et seq.), and any other applicable civil rights laws, and with the applicable implementing regulations and any guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

2. These statutes prohibit any person in the United States from being excluded from participation in, being denied the benefits of, or being otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation on the grounds of race, color, national origin, disability, or age. By executing this Supplement, Northern Water agrees to immediately take any measures necessary to implement this obligation, including permitting officials of the United States to inspect premises, programs, and documents.

3. Northern Water makes this agreement in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts, or other Federal financial assistance extended after the date hereof to Northern Water by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. Northern Water recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this Article and that the United States reserves the right to seek judicial enforcement thereof.

4. Complaints of discrimination against Northern Water shall be investigated by the Contracting Officer's Office of Civil Rights

DUPLICATE ORIGINAL

Contract No. 9-07-W0020
Supplement No. 9

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Colorado-Big Thompson Project
Colorado

SUPPLEMENT OF CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT FOR THE ALLOWANCE OF RELEASE OF PROJECT WATER, THAT HAS BEEN MADE AVAILABLE THROUGH THE RED TOP DITCH, FOR THE EAST SLOPE WATER USERS COMMITMENT UNDER THE PROGRAMMATIC BIOLOGICAL OPINION

THIS SUPPLEMENT, entered into this 23RD day of July, 2013, pursuant generally to the Act of June 17, 1902 (32 Stat. 388), and subsequent acts supplementary thereto and amendatory thereof collectively known as the Federal Reclamation laws, particularly, but not limited to, the Act of August 9, 1937 (50 Stat. 595) between the UNITED STATES OF AMERICA, hereinafter called the "United States," acting through the Secretary of the Interior, represented by the "Contracting Officer" executing this Supplement, and NORTHERN COLORADO WATER CONSERVANCY DISTRICT, hereinafter referred to as the "District" or the "Contractor," a quasi-municipal entity and political subdivision of the State of Colorado, organized and existing under and by virtue of the laws of the State of Colorado, with its principal place of business in Berthoud, Colorado. The United States and the District hereinafter are each sometimes individually called "Party," and sometimes collectively called the "Parties".

WITNESSETH THAT:

The following statements are made in explanation:

EXPLANATORY RECITALS

a. WHEREAS, the United States constructed the Colorado-Big Thompson (C-BT) Project in the State of Colorado, pursuant to Federal Reclamation laws; and

b. WHEREAS, certain releases from Granby Reservoir will be for the purpose of meeting a portion of the Colorado River water users commitment under the *Final Programmatic*

Biological Opinion for Bureau of Reclamation's Operations and Depletions; other Depletions, and Funding and Implementation of recovery Program Actions in the Upper Colorado River above the Confluence of the Gunnison River (PBO); and

c. WHEREAS, the Parties have agreed to supplement the 1938 Repayment Contract.

NOW THEREFORE, in consideration of the mutual and dependent covenants herein contained, it is hereby mutually agreed as follows:

PURPOSE AND SCOPE

1. The sole purpose and scope of this Supplement is to address the disposition of the 5412.5 acre-feet of the increased yield to the C-BT Project resulting from the relinquishment of the District's interest in the New Red Top Valley Ditch Company.

CONCURRENCE OF DELIVERY

2. The District may, with the written concurrence of the Contracting Officer, enter into a contract for the delivery of C-BT Project water to an entity or entities in Mesa County, Colorado for an amount not to exceed 5412.5 acre-feet annually. The United States shall have no obligation under, or liability, for any such contract.

DETERMINATION

3. The United States and the District have determined, through the engineering studies and analyses conducted by the District and the District's consultants which are attached as Exhibit A, which by this reference is made a part of this Supplement, that the average increase in the annual inflow into the C-BT Project resulting from the District's relinquishment of its interest in the New Red Top Valley Ditch is greater than the 5412.5 acre-feet that will be made available through the contract(s) described in Article 2 herein.

CONVEYANCE OF LAND

4. The provisions attached to this Supplement as Exhibit B shall apply to the lands described in Exhibit B, which by this reference is made a made a part of this Supplement and shall be incorporated into any conveyance of such lands as perpetual covenants.

WATER RIGHTS

5. In the event that Colorado state law or water administration changes in the future so that 5412.5 acre-feet of water do not accrue to the C-BT as contemplated in Article 3, the Parties shall meet and confer and seek in good faith to develop new arrangements to accomplish the purposes of this Supplement.

EXISTING CONTRACT

6. This Supplement is in addition to, and shall not otherwise modify or amend, the 1938 Repayment Contract in any respect. This Supplement shall not be a basis for any direct or indirect interpretation or construction of any provision of the 1938 Repayment Contract for any purpose. This Supplement does not establish any factual or legal precedent, concession, or determination by the District or the United States. The United States and the District do not, by virtue of this Supplement, waive or relinquish any legal or factual position.

STANDARD CONTRACT ARTICLES

7. The standard contract articles applicable to this Supplement are listed below. The full text of these standard articles is attached as Exhibit C and is hereby made a part of this Supplement.

a. Notices
b. Officials Not to Benefit
c. Changes in Contractor's Organization
d. Assignments Limited - Successors and Assigns Obligated
e. Books, Records, and Reports
f. Rules, Regulations, and Determinations
g. Equal Employment Opportunity (Federally Assisted Construction)
h. Compliance with Civil Rights Laws and Regulations

IN WITNESS WHEREOF, The Parties have executed this Supplement the day and year written above and agree to the terms, provisions, special conditions, and standard provisions expressed or referenced herein.

UNITED STATES OF AMERICA

By _____
Michael J. Ryan
Regional Director
Great Plains Region
Bureau of Reclamation

NORTHERN COLORADO WATER CONSERVANCY DISTRICT

By _____
Eric W. Wilkinson
General Manager

ATTEST:

_____
Secretary

APPENDIX C - DATABASE DOCUMENTATION AND DATA SUMMARIES

WGFP 401 Certification Database Summary

Overview

The 401 Certification Database contains data to be used in the 401 Certification process. The databse includes both discrete water quality data and continuous water temperature data.

Discrete water quality data

The data in the database meet the following criteria:

- The period of record is 1995-2012
- The sites included are those that were used for modeling for the Windy Gap Firming Project ***and*** are currently in Northern Water's databases. There are some sites that were used for modeling that are not included in the database (listed in the Stations by Model tables).
- The constituents included are those with current or interim standards ***and*** include data for the entire period of record. In addition, TSS and specific conductivity are included in the database.
- Only 'qualified' or good data are in the database. Any suspect data was not included although it may have been used for modeling.
- The database includes data collected through Northern Water and USGS monitoring programs.

Data in the database may differ from the actual data that was used in the WGFP EIS as a result of subsequent QAQC performed on the data. All the data in the database are either USGS data or data generated/funded by Northern Water through its Baseline Monitoring Program. All MDLs in the database come from the lab reports with a few exceptions where MDLs information was not available and assumptions had to be made (some older USGS data). In these instances the MDL was based on the information reported for the RL.

A few sites that are not currently in the Northern Water database and are of no direct interest to Northern Water (such as Muddy Creek), not being within the geographic scope of the CBT and Windy Gap projects are currently not in this WGFP 401 cert database but will be added in a separate table so the data is available. Temperature data will also be added but is not currently in the posted version of the database.

In all data summaries non-detects were treated as equal to the MDL. Jim discussed using a different method that he will provide and that takes into account the number of non-detects in the dataset when computing summary statistics.

Temperature Data

Temperature data covers a period of record from 2005 through 2012 and includes sites from the Northern Water Temperature monitoring program as well data from GCWIN (Grand County Water Information Network), BLM and USGS.

Tables

1. 401 Certification Flowing Sites Data – This is a direct link to Northern's Flowing Sites Database. It includes data for all river/streams and canal sites.
2. 401 Certification Lakes Data – This is a direct link to Northern's Lakes Database. It includes data for all lakes and reservoirs sites.
3. 401 Certification All Data – This table combines the data from the flowing sites and lakes tables.
4. Flags – This table explains the result qualifiers in the data tables.

5. Stations – This table lists all stations (and pertinent station information) included in the database.
6. 2 Hour Averages – This table presents 2-hour running averages of continuous temperature data
7. 7 Day Averages – This table presents 7-day running averages of continuous temperature data
8. Temperature Data – This table compiles 15 min temperature data

The tables can be used as direct inputs for data analysis or to build queries. Additional information can be added if it is available in Northern Water's Lakes and Flowing Sites Databases.

Queries

There are several queries that have been built to organize the data and to help with data analysis:

- Append Queries: There are two queries that are used to make the 'All Data' table; "Append FS Data to All Data" and "Append Lakes Data to All Data". These queries are **only** run if new information is added from Northern Water's in-house databases. Running these queries will result in duplicate records in the 'All Data' table. ***Please do not run these queries when accessing the data!***
- There are three queries named for three of the models. Each of these queries contains all the data specifically for the stations used for that particular model.
- The MDL RL query was built for a report in the database.

Reports

There is one report currently built in the database, the "MDL and RL Summary Report". This summarizes the changes in MDL, RL, laboratories and lab methods per constituent over the period of record.

The database is available on the 401 Certification SharePoint Site.

StationID1	StationDescription	Latitude	Longitude	Three Lakes Model	East Slope Model	Colorado River Model	Temperature Model
AC-GRU	Arapahoe Creek at Monarch Lake outlet, upstream of Lake Granby (USGS #09016500)	40.1128	-105.7497	X			
BT-M70	BTWF site M70 (USGS#06736700). Big Thompson River upstream of Dille Tunnel diversion	40.4150	-105.2500		X		
CL-DAM1	Carter Lake Dam #1 (USGS #06742500)	40.3253	-105.2152		X		
CR-BLD	Colorado River downstream of the Blue River near Kremmling (USGS #9058000)	40.0367	-106.4394				X
CR-BLU	Colorado River above Hwy 9 Bridge at Kremmling CO 2.3 mi upstream of the Blue River	40.0421	-106.3714				X
CR-CON	Colorado River at Public Access East of Con Ritschard Ranch 3 mi downstream of Parshall	40.0656	-106.2321				X
CR-GRD	Colorado River downstream of Lake Granby (USGS #9019000)	40.1444	-105.8672	X		X	X
CR-HRU	Colorado River above Hot Sulphur Springs Resort	40.0738	-106.1099				X
CR-HSU	Colorado River above Hot Sulphur Springs Water Treatment Plant	40.0794	-106.1002				X
CR-KRM	Colorado River near Kremmling (USGS #9058000), upstream of Gore Canyon and downstream of Blue River	40.0367	-106.4394			X	
CR-LB	Colorado River at Lone Buck below CDOW Office 3 mi downstream of Hot Sulphur	40.0472	-106.1427				X
CR-PAD	Colorado River above Kid's Pond below Parshall CO	40.0634	-106.1907				X
CR-SMU	North Fork of Colorado River upstream of Shadow Mountain Reservoir (USGS site #09011000)	40.2190	-105.8577	X			
CR-WFU	Colorado River at South Side of CR3 Bridge near Bar Lazy J Ranch immediately upstream of Williams Fork	40.0504	-106.1729				X
CR-WGD	Colorado River downstream of Windy Gap (USGS #09034250)	40.1082	-106.0037	X		X	X
CR-YGAGE	Colorado River downstream of Lake Granby at YMCA flow Gage	40.1211	-105.9007				X
EI-GLU	East Inlet upstream of Grand Lake (USGS #090135000)	40.2369	-105.8010	X			
FR-WGU	Fraser River upstream of confluence with Colorado River	40.0984	-105.9727	X		X	X
GL-MID	Grand Lake Mid Section 0-2m composite (USGS #09013900)	40.2433	-105.8136	X			
GR-DAM	Lake Granby Dam (USGS #09018500)	40.1497	-105.8614	X			
HFC-C50	BTWF site C-50 in Hansen Feeder Canal (USGS #403020105114700) Approximately same location as HFC-HT	40.5055	-105.1964		X		
HT-SOL	Horsetooth at Soldier Canyon (USGS #06737500)	40.5888	-105.1649		X		
NI-GLU	North Inlet upstream of Grand Lake	40.2507	-105.8148	X			
OLY	Olympus Tunnel at Lake Estes (USGS #06734900 or BTWF site C20)	40.3764	-105.4858		X		
SM-DAM	Shadow Mountain Dam 5m-bottom composite (USGS #09014500)	40.2101	-105.8421	X			
ST-GRU	Stillwater Creek upstream of Lake Granby (USGS #09018000)	40.1829	-105.8892	X			
WC-3	Willow Creek upstream of confluence with Colorado River	40.1235	-105.9128	X		X	
WC-Pump	Willow Creek discharge chute to Lake Granby	40.1430	-105.8888	X			
WC-WCRD	Willow Creek directly downstream of Willow Creek Reservoir Dam	40.1456	-105.9404	X		X	X
WC-WCRU	Willow Creek at USGS Gage above C-Lazy-U Ranch	40.1558	-105.9808			X	
WG-Pump	Windy Gap discharge chute to Lake Granby	40.1429	-105.8888	X			

401 Certification Database
Period of Record Summary

Constituent	AC-GRU Start Date	End Date	BT-M70 Start Date	End Date	CL-DAM1 Start Date	End Date	CR-GRD Start Date	End Date	CR-KRM Start Date	End Date	CR-SMU Start Date	End Date	CR-WGD Start Date	End Date
Ammonia as N, Dissolved	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Arsenic, Dissolved	11/10/2010	11/14/2012	4/16/2002	11/14/2012	1/31/2008	10/8/2012	4/26/1995	11/20/2012	4/12/2005	9/20/2012	11/3/2010	11/7/2012	3/30/1995	11/20/2012
Arsenic, Total	11/14/2012	11/14/2012			8/5/2005	10/8/2012	4/26/1995	11/20/2012	4/12/2005	9/20/2012	11/7/2012	11/7/2012	3/30/1995	11/20/2012
Cadmium, Dissolved	6/19/2009	11/14/2012			6/16/1995	10/8/2012	4/26/1995	11/20/2012	4/13/1995	9/20/2012	4/16/2009	11/7/2012	3/30/1995	11/20/2012
Calcium	11/13/2000	11/14/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	12/27/2012
Chloride	11/13/2000	7/2/2012	4/16/2002	11/14/2012	6/16/1995	6/25/2012	4/26/1995	7/19/2012	4/13/1995	9/20/2012	5/1/1996	7/12/2012	3/30/1995	7/11/2012
Chlorophyll a					6/16/1995	11/15/2012								
Chlorophyll a, Corrected					5/17/2005	11/15/2012								
Copper, Dissolved	6/19/2009	11/14/2012	8/31/2000	11/14/2012	6/16/1995	10/8/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	12/27/2012
Discharge	11/13/2000	12/12/2012	8/31/2000	11/14/2012			5/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	2/7/1995	12/27/2012
Dissolved Oxygen	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Hardness as CaCO3	11/13/2000	11/10/2009	8/31/2000	11/14/2012	6/16/1995	6/23/2009	4/26/1995	8/19/2010	4/13/1995	9/22/2011	5/1/1996	11/10/2009	3/30/1995	8/26/2009
Iron, Dissolved	6/19/2009	11/14/2012	4/16/2002	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	12/27/2012
Iron, Total	1/13/2010	11/14/2012			1/31/2008	10/8/2012	4/26/1995	12/18/2012	4/12/2005	9/20/2012	5/1/1996	11/7/2012	4/26/1995	12/27/2012
Kjeldhal Nitrogen as N, Total	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	11/22/2000	12/18/2012	4/13/1995	9/20/2012	11/14/2000	12/5/2012	3/30/1995	12/27/2012
Lead, Dissolved	6/19/2009	11/14/2012	8/31/2000	11/14/2012	6/16/1995	10/8/2012	4/26/1995	11/20/2012	4/13/1995	9/20/2012	4/16/2009	11/7/2012	3/30/1995	11/20/2012
Magnesium	11/13/2000	11/14/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	12/27/2012
Manganese, Dissolved	6/19/2009	11/14/2012	4/16/2002	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	12/27/2012
Mercury, Dissolved			8/31/2000	12/10/2003			4/26/1995	8/19/2010	6/14/2006	9/20/2012			3/30/1995	6/18/2009
Mercury, Total			6/8/2005	11/14/2012	1/31/2008	10/8/2012	4/26/1995	9/14/1995					3/30/1995	11/14/2003
Nickel, Dissolved	6/19/2009	11/14/2012	4/16/2002	11/14/2012	6/16/1995	10/8/2012	4/26/1995	11/20/2012	4/13/1995	9/20/2012	4/16/2009	11/7/2012	3/30/1995	11/20/2012
Nitrate plus Nitrite as N	1/24/2001	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Nitrogen Total as N	11/4/2003	4/15/2009			5/14/2004	1/31/2008	11/14/2003	2/13/2008	11/19/2003	10/16/2007	11/4/2003	4/16/2009	11/14/2003	1/10/2008
pH	10/22/2002	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Phosphorus, Total	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Secchi Depth					6/16/1995	12/21/2011								
Selenium, Dissolved	6/21/2004	11/14/2012	6/8/2005	11/14/2006	8/5/2005	10/8/2012	4/26/1995	11/20/2012	4/12/2005	9/20/2012	5/13/2004	11/7/2012	3/30/1995	11/20/2012
Silver, Dissolved	6/19/2009	11/14/2012	4/16/2002	11/14/2012	6/16/1995	10/8/2012	4/26/1995	11/20/2012	4/13/1995	9/20/2012	5/1/1996	11/7/2012	3/30/1995	11/20/2012
Specific Conductance	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	2/7/1995	12/27/2012
Sulfate	11/13/2000	7/2/2012	2/13/2001	11/14/2012	6/16/1995	6/25/2012	4/26/1995	7/19/2012	4/13/1995	9/20/2012	5/1/1996	7/12/2012	3/30/1995	7/11/2012
Suspended Solids, Total	6/21/2004	12/12/2012			5/17/2005	11/15/2012	4/26/1995	12/18/2012	4/12/2005	9/20/2012	5/1/1996	12/5/2012	3/30/1995	12/27/2012
Water Temperature	11/13/2000	12/12/2012	8/31/2000	11/14/2012	6/16/1995	11/15/2012	4/26/1995	12/18/2012	4/13/1995	9/20/2012	5/1/1996	12/5/2012	2/7/1995	12/27/2012
Zinc, Dissolved	6/19/2009	11/14/2012			6/16/1995	10/8/2012	5/22/2000	11/20/2012	4/13/1995	9/20/2012	5/22/2000	11/7/2012	3/30/1995	11/20/2012

401 Certification Database
Period of Record Summary

Constituent	EI-GLU Start Date	End Date	GL-MID Start Date	End Date	GR-DAM Start Date	End Date	HFC-C50 Start Date	End Date	HT-SOL Start Date	End Date	NI-GLU Start Date	End Date	OLY Start Date	End Date
Ammonia as N, Dissolved	5/8/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Arsenic, Dissolved	11/3/2010	11/7/2012	11/6/2006	10/23/2012	11/6/2006	10/24/2012	4/18/2002	11/16/2010	3/13/2008	10/9/2012	11/3/2010	11/7/2012	4/15/2002	6/18/2012
Arsenic, Total	11/7/2012	11/7/2012	1/12/2005	10/23/2012	1/11/2005	10/24/2012			8/17/2005	10/9/2012	11/7/2012	11/7/2012	1/10/2006	11/7/2007
Cadmium, Dissolved	6/18/2009	11/7/2012	3/3/2004	10/23/2012	6/1/1995	10/24/2012			6/15/1995	10/9/2012	6/18/2009	11/7/2012	3/28/1995	9/11/2012
Calcium	5/8/1997	11/7/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	11/7/2012	3/28/1995	10/10/2012
Chloride	5/8/1997	9/11/2012	11/21/2000	6/21/2012	6/1/1995	6/20/2012	4/18/2002	11/16/2010	6/15/1995	8/14/2012	5/1/1996	9/4/2012	3/28/1995	9/11/2012
Chlorophyll a			11/21/2000	10/23/2012	6/1/1995	10/24/2012			6/15/1995	11/8/2012				
Chlorophyll a, Corrected			5/18/2005	10/23/2012	5/18/2005	10/24/2012			5/15/2005	11/8/2012				
Copper, Dissolved	5/8/1997	11/7/2012	1/12/2005	10/23/2012	6/1/1995	10/24/2012	9/11/2000	11/16/2010	6/15/1995	10/9/2012	5/1/1996	11/7/2012	3/28/1995	10/10/2012
Discharge	5/8/1997	12/5/2012					8/28/2000	11/16/2010			11/13/2000	12/5/2012	3/28/1995	10/10/2012
Dissolved Oxygen	5/8/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Hardness as CaCO3	5/8/1997	9/11/2012	11/21/2000	6/15/2009	6/1/1995	6/16/2009	8/28/2000	11/16/2010	6/15/1995	6/22/2009	5/1/1996	9/4/2012	3/28/1995	10/13/2011
Iron, Dissolved	5/8/1997	11/7/2012	3/3/2004	10/23/2012	6/1/1995	10/24/2012	4/18/2002	11/16/2010	6/15/1995	11/8/2012	5/1/1996	11/7/2012	3/28/1995	10/10/2012
Iron, Total	5/8/1997	11/7/2012	7/24/2007	10/23/2012	7/24/2007	10/24/2012			3/13/2008	10/9/2012	5/1/1996	11/7/2012	10/10/2012	10/10/2012
Kjeldhal Nitrogen as N, Total	11/13/2000	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	11/13/2000	12/5/2012	3/28/1995	10/10/2012
Lead, Dissolved	6/18/2009	11/7/2012	1/12/2005	1/25/2011	6/1/1995	1/24/2011	8/28/2000	11/16/2010	6/15/1995	10/9/2012	6/18/2009	11/7/2012	3/28/1995	9/11/2012
Magnesium	5/8/1997	11/7/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	11/7/2012	3/28/1995	10/10/2012
Manganese, Dissolved	5/8/1997	11/7/2012	3/3/2004	10/23/2012	6/1/1995	10/24/2012	4/18/2002	11/16/2010	6/15/1995	11/8/2012	5/1/1996	11/7/2012	3/28/1995	10/10/2012
Mercury, Dissolved							8/28/2000	7/14/2009					8/30/2000	6/18/2012
Mercury, Total	4/7/2012	8/7/2012	2/16/2006	10/23/2012	2/15/2006	10/24/2012	11/19/2009	11/16/2010	3/13/2008	10/9/2012				
Nickel, Dissolved	6/18/2009	11/7/2012	1/12/2005	10/23/2012	6/1/1995	10/24/2012	4/18/2002	11/16/2010	6/15/1995	10/9/2012	6/18/2009	11/7/2012	3/28/1995	9/11/2012
Nitrate plus Nitrite as N	5/8/1997	12/5/2012	10/15/2002	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Nitrogen Total as N	11/4/2003	4/16/2009	1/22/2004	9/18/2008	1/21/2004	9/17/2008			5/13/2004	11/15/2007	11/4/2003	4/16/2009	1/10/2006	11/7/2007
pH	5/8/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Phosphorus, Total	6/27/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Secchi Depth			11/21/2000	10/23/2012	6/1/1995	10/24/2012			6/15/1995	12/19/2011				
Selenium, Dissolved	5/13/2004	11/7/2012	1/12/2005	10/23/2012	1/11/2005	10/24/2012	6/9/2005	11/17/2006	8/17/2005	10/9/2012	5/13/2004	11/7/2012	3/8/2005	6/18/2012
Silver, Dissolved	5/8/1997	11/7/2012	1/12/2005	10/23/2012	6/1/1995	10/24/2012	4/18/2002	11/16/2010	6/15/1995	10/9/2012	5/1/1996	11/7/2012	3/28/1995	9/11/2012
Specific Conductance	5/8/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Sulfate	5/8/1997	9/11/2012	11/21/2000	6/21/2012	6/1/1995	6/20/2012	2/14/2001	11/16/2010	6/15/1995	8/14/2012	5/1/1996	9/4/2012	3/28/1995	9/11/2012
Suspended Solids, Total	5/8/1997	12/5/2012	1/12/2005	10/23/2012	1/11/2005	10/24/2012			5/15/2005	11/8/2012	5/1/1996	12/5/2012	1/10/2006	10/10/2012
Water Temperature	5/8/1997	12/5/2012	11/21/2000	10/23/2012	6/1/1995	10/24/2012	8/28/2000	11/16/2010	6/15/1995	11/8/2012	5/1/1996	12/5/2012	3/28/1995	10/10/2012
Zinc, Dissolved	5/22/2000	11/7/2012	1/12/2005	10/23/2012	6/1/1995	10/24/2012			6/15/1995	10/9/2012	5/22/2000	11/7/2012	3/28/1995	9/11/2012

401 Certification Database
Period of Record Summary

Constituent	SM-DAM Start Date	End Date	ST-GRU Start Date	End Date	WC-3 Start Date	End Date	WC-Pump Start Date	End Date	WC-WCRD Start Date	End Date	WC-WCRU Start Date	End Date	WG-Pump Start Date	End Date
Ammonia as N, Dissolved	5/31/1995	10/25/2012	11/14/2000	12/12/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Arsenic, Dissolved	7/24/2007	10/25/2012	11/10/2010	11/14/2012	4/26/1995	9/14/1995	5/26/1995	11/14/2012	4/26/1995	11/28/2012			5/26/1995	6/10/2009
Arsenic, Total	1/11/2005	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/14/1995	5/26/1995	11/14/2012	4/26/1995	11/28/2012			5/26/1995	5/26/1995
Cadmium, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/14/1995	5/26/1995	11/14/2012	4/26/1995	11/28/2012			5/26/1995	6/10/2009
Calcium	5/31/1995	10/25/2012	11/14/2000	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	5/2/2005	5/26/1995	5/2/2012
Chloride	5/31/1995	6/19/2012	11/14/2000	5/10/2011	4/26/1995	9/21/2004	5/26/1995	10/21/2010	4/26/1995	7/25/2012	6/9/1999	5/2/2005	5/26/1995	5/18/2010
Chlorophyll a	5/31/1995	10/25/2012												
Chlorophyll a, Corrected	5/19/2005	10/25/2012												
Copper, Dissolved	5/31/1995	10/25/2012	6/13/2007	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	5/22/2000	5/2/2005	5/26/1995	5/2/2012
Discharge			11/14/2000	12/12/2012			5/26/1995	11/14/2012	4/26/1995	12/18/2012	7/22/2009	11/28/2012	5/26/1995	5/2/2012
Dissolved Oxygen	5/31/1995	10/25/2012	11/14/2000	12/12/2012	4/26/1995	6/7/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Hardness as CaCO3	5/31/1995	6/15/2009	11/14/2000	11/10/2009	4/26/1995	9/24/1998	5/26/1995	5/26/1995	4/26/1995	9/24/1998			5/26/1995	5/26/1995
Iron, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	5/22/2000	5/2/2005	5/26/1995	5/2/2012
Iron, Total	7/24/2007	10/25/2012	1/13/2010	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	5/22/2000	5/2/2005	5/26/1995	5/2/2012
Kjeldhal Nitrogen as N, Total	5/31/1995	10/25/2012	11/14/2000	12/12/2012	5/13/2004	9/21/2004	4/19/2006	11/14/2012	5/13/2004	12/18/2012	5/13/2004	11/28/2012	5/3/2006	5/2/2012
Lead, Dissolved	5/31/1995	1/26/2011	5/17/2007	11/14/2012	4/26/1995	9/14/1995	5/26/1995	11/14/2012	4/26/1995	11/28/2012			5/26/1995	6/10/2009
Magnesium	5/31/1995	10/25/2012	11/14/2000	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	5/2/2005	5/26/1995	5/2/2012
Manganese, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	5/22/2000	5/2/2005	5/26/1995	5/2/2012
Mercury, Dissolved					4/26/1995	9/14/1995	5/26/1995	5/26/1995	4/26/1995	9/14/1995			5/26/1995	5/26/1995
Mercury, Total	4/21/2006	10/25/2012			4/26/1995	9/14/1995	5/26/1995	7/7/2005	4/26/1995	7/7/2005			5/26/1995	6/28/2005
Nickel, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/14/1995	5/26/1995	11/14/2012	4/26/1995	11/28/2012			5/26/1995	6/10/2009
Nitrate plus Nitrite as N	5/31/1995	10/25/2012	5/30/2003	12/12/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Nitrogen Total as N	1/21/2004	9/17/2008	6/22/2004	4/15/2009										
pH	5/31/1995	10/25/2012	5/30/2003	12/12/2012	4/26/1995	6/7/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Phosphorus, Total	5/31/1995	10/25/2012	11/14/2000	12/12/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Secchi Depth	5/31/1995	10/25/2012												
Selenium, Dissolved	1/11/2005	10/25/2012	6/21/2004	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	11/28/2012	5/13/2004	9/21/2004	5/26/1995	6/10/2009
Silver, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	11/28/2012	5/22/2000	9/21/2004	5/26/1995	6/10/2009
Specific Conductance	5/31/1995	10/25/2012	11/14/2000	12/12/2012	4/26/1995	6/7/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Sulfate	5/31/1995	6/19/2012	11/14/2000	5/10/2011	4/26/1995	9/21/2004	5/26/1995	10/21/2010	4/26/1995	7/25/2012	6/9/1999	5/2/2005	5/26/1995	5/18/2010
Suspended Solids, Total	1/11/2005	10/25/2012	6/21/2004	12/12/2012	4/26/1995	9/21/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	5/2/2005	5/26/1995	5/2/2012
Water Temperature	5/31/1995	10/25/2012	11/14/2000	12/12/2012	4/26/1995	6/7/2004	5/26/1995	11/14/2012	4/26/1995	12/18/2012	6/9/1999	11/28/2012	5/26/1995	5/2/2012
Zinc, Dissolved	5/31/1995	10/25/2012	5/17/2007	11/14/2012	5/22/2000	9/21/2004	5/22/2000	11/14/2012	5/22/2000	11/28/2012	5/22/2000	9/21/2004	5/21/2001	6/10/2009

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
AC-GRU	Ammonia as N, Dissolved	33%	6%
	Arsenic, Dissolved		0%
	Arsenic, Total		0%
	Cadmium, Dissolved		100%
	Calcium	0%	0%
	Chloride	1%	0%
	Copper, Dissolved		4%
	Iron, Dissolved		0%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved		0%
	Magnesium	0%	0%
	Manganese, Dissolved		0%
	Nickel, Dissolved		0%
	Nitrate plus Nitrite as N	9%	1%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	2%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved		89%
	Sulfate	0%	0%
	Suspended Solids, Total	67%	31%
	Zinc, Dissolved		10%
BT-M70	Ammonia as N, Dissolved	19%	42%
	Arsenic, Dissolved	18%	0%
	Calcium	0%	0%
	Chloride	0%	0%
	Copper, Dissolved	28%	2%
	Iron, Dissolved	0%	0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved	51%	17%
	Magnesium	0%	0%
	Manganese, Dissolved	0%	0%
	Mercury, Dissolved	100%	
	Mercury, Total	0%	0%
	Nickel, Dissolved	0%	0%
	Nitrate plus Nitrite as N	2%	6%
	Phosphorus, Total	0%	0%
	Selenium, Dissolved	50%	
	Silver, Dissolved	100%	96%
	Sulfate	0%	0%
CL-DAM1	Ammonia as N, Dissolved	53%	3%
	Arsenic, Dissolved		7%
	Arsenic, Total	100%	0%
	Cadmium, Dissolved	88%	86%
	Calcium	0%	0%
	Chloride	0%	0%
	Chlorophyll a	0%	0%
	Chlorophyll a, Corrected	0%	0%
	Copper, Dissolved	55%	7%
	Iron, Dissolved	58%	12%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	29%	0%
	Lead, Dissolved	88%	7%
	Magnesium	0%	0%
	Manganese, Dissolved	45%	14%
	Mercury, Total		12%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
CL-DAM1	Nickel, Dissolved	66%	7%
	Nitrate plus Nitrite as N	53%	2%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	42%	0%
	Selenium, Dissolved	100%	7%
	Silver, Dissolved	100%	97%
	Sulfate	0%	0%
	Suspended Solids, Total	22%	11%
	Zinc, Dissolved	64%	14%
CR-GRD	Ammonia as N, Dissolved	64%	1%
	Arsenic, Dissolved	100%	0%
	Arsenic, Total	83%	0%
	Cadmium, Dissolved	100%	88%
	Calcium	0%	0%
	Chloride	24%	0%
	Copper, Dissolved	48%	0%
	Iron, Dissolved	36%	0%
	Iron, Total	8%	0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved	83%	25%
	Magnesium	0%	0%
	Manganese, Dissolved	48%	0%
	Mercury, Dissolved	100%	0%
	Mercury, Total	100%	
	Nickel, Dissolved	83%	0%
	Nitrate plus Nitrite as N	22%	0%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	14%	0%
	Selenium, Dissolved	80%	0%
	Silver, Dissolved	97%	100%
	Sulfate	11%	0%
	Suspended Solids, Total	71%	11%
	Zinc, Dissolved	41%	6%
CR-KRM	Ammonia as N, Dissolved	44%	0%
	Arsenic, Dissolved	0%	0%
	Arsenic, Total	17%	0%
	Cadmium, Dissolved	75%	9%
	Calcium	0%	0%
	Chloride	0%	0%
	Copper, Dissolved	56%	0%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	18%	0%
	Lead, Dissolved	57%	0%
	Magnesium	0%	0%
	Manganese, Dissolved	0%	0%
	Mercury, Dissolved		0%
	Nickel, Dissolved	59%	0%
	Nitrate plus Nitrite as N	10%	0%
	Nitrogen Total as N	0%	
	Phosphorus, Total	16%	0%
	Selenium, Dissolved	17%	0%
	Silver, Dissolved	95%	94%
	Sulfate	0%	0%
	Suspended Solids, Total	67%	13%
	Zinc, Dissolved	35%	0%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
CR-SMU	Ammonia as N, Dissolved	80%	8%
	Arsenic, Dissolved		0%
	Arsenic, Total		0%
	Cadmium, Dissolved		56%
	Calcium	0%	0%
	Chloride	13%	0%
	Copper, Dissolved	43%	0%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	8%	0%
	Lead, Dissolved		0%
	Magnesium	0%	0%
	Manganese, Dissolved	5%	0%
	Nickel, Dissolved		0%
	Nitrate plus Nitrite as N	42%	5%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	5%	0%
	Selenium, Dissolved	78%	0%
	Silver, Dissolved	95%	75%
	Sulfate	3%	0%
	Suspended Solids, Total	47%	18%
	Zinc, Dissolved	25%	10%
CR-WGD	Ammonia as N, Dissolved	62%	0%
	Arsenic, Dissolved	97%	0%
	Arsenic, Total	95%	0%
	Cadmium, Dissolved	97%	74%
	Calcium	0%	0%
	Chloride	3%	0%
	Copper, Dissolved	48%	0%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	16%	0%
	Lead, Dissolved	69%	9%
	Magnesium	0%	0%
	Manganese, Dissolved	2%	0%
	Mercury, Dissolved	97%	0%
	Mercury, Total	100%	
	Nickel, Dissolved	62%	0%
	Nitrate plus Nitrite as N	47%	0%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	3%	0%
	Selenium, Dissolved	81%	0%
	Silver, Dissolved	98%	91%
	Sulfate	3%	0%
	Suspended Solids, Total	49%	8%
	Zinc, Dissolved	49%	9%
EI-GLU	Ammonia as N, Dissolved	81%	8%
	Arsenic, Dissolved		0%
	Arsenic, Total		0%
	Cadmium, Dissolved		50%
	Calcium	0%	0%
	Chloride	13%	0%
	Copper, Dissolved	44%	0%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	8%	0%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
EI-GLU	Lead, Dissolved		0%
	Magnesium	0%	0%
	Manganese, Dissolved	39%	0%
	Mercury, Total		0%
	Nickel, Dissolved		0%
	Nitrate plus Nitrite as N	5%	0%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	10%	5%
	Selenium, Dissolved	67%	0%
	Silver, Dissolved	94%	63%
	Sulfate	1%	0%
	Suspended Solids, Total	78%	30%
	Zinc, Dissolved	25%	11%
GL-MID	Ammonia as N, Dissolved	84%	4%
	Arsenic, Dissolved		10%
	Arsenic, Total	100%	50%
	Cadmium, Dissolved	57%	87%
	Calcium	0%	0%
	Chloride	0%	7%
	Chlorophyll a	0%	0%
	Chlorophyll a, Corrected	0%	0%
	Copper, Dissolved	0%	10%
	Iron, Dissolved	23%	6%
	Iron, Total		3%
	Kjeldhal Nitrogen as N, Total	2%	0%
	Lead, Dissolved	100%	19%
	Magnesium	0%	0%
	Manganese, Dissolved	21%	10%
	Mercury, Total		0%
	Nickel, Dissolved	100%	10%
	Nitrate plus Nitrite as N	16%	1%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	0%	0%
	Selenium, Dissolved	100%	3%
	Silver, Dissolved	100%	90%
	Sulfate	0%	7%
	Suspended Solids, Total	22%	18%
	Zinc, Dissolved	0%	13%
GR-DAM	Ammonia as N, Dissolved	73%	5%
	Arsenic, Dissolved		6%
	Arsenic, Total	100%	50%
	Cadmium, Dissolved	86%	88%
	Calcium	0%	0%
	Chloride	0%	3%
	Chlorophyll a	0%	0%
	Chlorophyll a, Corrected	0%	0%
	Copper, Dissolved	97%	6%
	Iron, Dissolved	20%	6%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	22%	0%
	Lead, Dissolved	91%	35%
	Magnesium	0%	0%
	Manganese, Dissolved	61%	10%
	Mercury, Total		5%
	Nickel, Dissolved	98%	6%
	Nitrate plus Nitrite as N	43%	2%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
GR-DAM	Nitrogen Total as N	0%	0%
	Phosphorus, Total	28%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved	100%	94%
	Sulfate	0%	0%
	Suspended Solids, Total	22%	20%
	Zinc, Dissolved	75%	12%
HFC-C50	Ammonia as N, Dissolved	28%	68%
	Arsenic, Dissolved	12%	0%
	Calcium	0%	0%
	Chloride	0%	0%
	Copper, Dissolved	16%	0%
	Iron, Dissolved	2%	0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved	58%	6%
	Magnesium	0%	0%
	Manganese, Dissolved	0%	0%
	Mercury, Dissolved	94%	0%
	Mercury, Total		0%
	Nickel, Dissolved	0%	0%
	Nitrate plus Nitrite as N	5%	26%
	Phosphorus, Total	1%	0%
	Selenium, Dissolved	67%	
	Silver, Dissolved	100%	94%
	Sulfate	0%	0%
HT-SOL	Ammonia as N, Dissolved	41%	0%
	Arsenic, Dissolved		6%
	Arsenic, Total	100%	0%
	Cadmium, Dissolved	93%	85%
	Calcium	0%	0%
	Chloride	0%	0%
	Chlorophyll a	0%	1%
	Chlorophyll a, Corrected	0%	2%
	Copper, Dissolved	62%	6%
	Iron, Dissolved	13%	9%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	26%	0%
	Lead, Dissolved	92%	6%
	Magnesium	0%	0%
	Manganese, Dissolved	37%	13%
	Mercury, Total		10%
	Nickel, Dissolved	65%	6%
	Nitrate plus Nitrite as N	38%	1%
	Nitrogen Total as N	0%	
	Phosphorus, Total	45%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved	100%	100%
	Sulfate	0%	0%
	Suspended Solids, Total	22%	16%
	Zinc, Dissolved	60%	9%
NI-GLU	Ammonia as N, Dissolved	75%	6%
	Arsenic, Dissolved		0%
	Arsenic, Total		0%
	Cadmium, Dissolved		75%
	Calcium	0%	0%
	Chloride	14%	6%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
NI-GLU	Copper, Dissolved	50%	0%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	8%	0%
	Lead, Dissolved		0%
	Magnesium	0%	0%
	Manganese, Dissolved	48%	0%
	Nickel, Dissolved		0%
	Nitrate plus Nitrite as N	7%	0%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	10%	3%
	Selenium, Dissolved	60%	0%
	Silver, Dissolved	95%	75%
	Sulfate	5%	0%
	Suspended Solids, Total	80%	36%
	Zinc, Dissolved	23%	22%
OLY	Ammonia as N, Dissolved	20%	0%
	Arsenic, Dissolved	10%	0%
	Cadmium, Dissolved	100%	88%
	Calcium	0%	0%
	Chloride	0%	0%
	Copper, Dissolved	42%	2%
	Iron, Dissolved	0%	0%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	9%	0%
	Lead, Dissolved	66%	26%
	Magnesium	0%	0%
	Manganese, Dissolved	4%	0%
	Mercury, Dissolved	87%	0%
	Nickel, Dissolved	24%	0%
	Nitrate plus Nitrite as N	8%	0%
	Phosphorus, Total	14%	0%
	Selenium, Dissolved	75%	0%
	Silver, Dissolved	99%	91%
	Sulfate	0%	0%
	Suspended Solids, Total		73%
	Zinc, Dissolved	75%	50%
SM-DAM	Ammonia as N, Dissolved	73%	3%
	Arsenic, Dissolved		3%
	Arsenic, Total	100%	50%
	Cadmium, Dissolved	87%	79%
	Calcium	0%	0%
	Chloride	0%	0%
	Chlorophyll a	0%	0%
	Chlorophyll a, Corrected	0%	0%
	Copper, Dissolved	97%	3%
	Iron, Dissolved	0%	0%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	16%	0%
	Lead, Dissolved	95%	26%
	Magnesium	0%	0%
	Manganese, Dissolved	26%	7%
	Mercury, Total		0%
	Nickel, Dissolved	98%	3%
	Nitrate plus Nitrite as N	66%	1%
	Nitrogen Total as N	0%	0%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
SM-DAM	Phosphorus, Total	32%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved	100%	100%
	Sulfate	0%	0%
	Suspended Solids, Total	22%	13%
	Zinc, Dissolved	83%	12%
ST-GRU	Ammonia as N, Dissolved	57%	0%
	Arsenic, Dissolved		0%
	Arsenic, Total		0%
	Cadmium, Dissolved		85%
	Calcium	0%	0%
	Chloride	0%	0%
	Copper, Dissolved		15%
	Iron, Dissolved		0%
	Iron, Total		0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved		31%
	Magnesium	0%	0%
	Manganese, Dissolved		0%
	Nickel, Dissolved		0%
	Nitrate plus Nitrite as N	17%	0%
	Nitrogen Total as N	0%	0%
	Phosphorus, Total	0%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved		92%
	Sulfate	0%	0%
	Suspended Solids, Total	0%	14%
	Zinc, Dissolved		29%
WC-3	Ammonia as N, Dissolved	64%	
	Arsenic, Dissolved	100%	
	Arsenic, Total	100%	
	Cadmium, Dissolved	100%	
	Calcium	0%	
	Chloride	18%	
	Copper, Dissolved	42%	
	Iron, Dissolved	4%	
	Iron, Total	0%	
	Kjeldhal Nitrogen as N, Total	0%	
	Lead, Dissolved	100%	
	Magnesium	0%	
	Manganese, Dissolved	0%	
	Mercury, Dissolved	100%	
	Mercury, Total	100%	
	Nickel, Dissolved	100%	
	Nitrate plus Nitrite as N	24%	
	Phosphorus, Total	4%	
	Selenium, Dissolved	50%	
	Silver, Dissolved	100%	
	Sulfate	4%	
	Suspended Solids, Total	11%	
	Zinc, Dissolved	43%	
WC-Pump	Ammonia as N, Dissolved	92%	0%
	Arsenic, Dissolved	67%	29%
	Arsenic, Total	100%	0%
	Cadmium, Dissolved	100%	100%
	Calcium	0%	0%

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
WC-Pump	Chloride	30%	9%
	Copper, Dissolved	27%	7%
	Iron, Dissolved	0%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total		0%
	Lead, Dissolved	33%	29%
	Magnesium	0%	0%
	Manganese, Dissolved	9%	2%
	Mercury, Dissolved	100%	
	Mercury, Total	100%	
	Nickel, Dissolved	100%	14%
	Nitrate plus Nitrite as N	55%	0%
	Phosphorus, Total	8%	0%
	Selenium, Dissolved	100%	29%
	Silver, Dissolved	100%	100%
	Sulfate	48%	6%
	Suspended Solids, Total	26%	14%
	Zinc, Dissolved	50%	29%
WC-WCRD	Ammonia as N, Dissolved	85%	0%
	Arsenic, Dissolved	100%	15%
	Arsenic, Total	100%	0%
	Cadmium, Dissolved	100%	85%
	Calcium	0%	0%
	Chloride	44%	8%
	Copper, Dissolved	53%	6%
	Iron, Dissolved	7%	4%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total	0%	0%
	Lead, Dissolved	60%	15%
	Magnesium	0%	0%
	Manganese, Dissolved	3%	6%
	Mercury, Dissolved	100%	
	Mercury, Total	100%	
	Nickel, Dissolved	100%	15%
	Nitrate plus Nitrite as N	62%	1%
	Phosphorus, Total	14%	0%
	Selenium, Dissolved	75%	8%
	Silver, Dissolved	93%	77%
	Sulfate	21%	6%
	Suspended Solids, Total	65%	18%
	Zinc, Dissolved	43%	15%
WC-WCRU	Ammonia as N, Dissolved	75%	0%
	Calcium	0%	
	Chloride	6%	
	Copper, Dissolved	36%	
	Iron, Dissolved	7%	
	Iron, Total	0%	
	Kjeldhal Nitrogen as N, Total	0%	0%
	Magnesium	0%	
	Manganese, Dissolved	0%	
	Nitrate plus Nitrite as N	67%	0%
	Phosphorus, Total	7%	0%
	Selenium, Dissolved	0%	
	Silver, Dissolved	100%	
	Sulfate	6%	
	Suspended Solids, Total	50%	

401 Certification Database Non-Detect Summary		Period of Record	
Station	Constituent	1995-2005	2008-2012
WC-WCRU	Zinc, Dissolved	38%	
WG-Pump	Ammonia as N, Dissolved	71%	0%
	Arsenic, Dissolved	100%	50%
	Arsenic, Total	100%	
	Cadmium, Dissolved	100%	100%
	Calcium	0%	0%
	Chloride	4%	0%
	Copper, Dissolved	24%	0%
	Iron, Dissolved	4%	0%
	Iron, Total	0%	0%
	Kjeldhal Nitrogen as N, Total		0%
	Lead, Dissolved	67%	0%
	Magnesium	0%	0%
	Manganese, Dissolved	8%	0%
	Mercury, Dissolved	100%	
	Mercury, Total	100%	
	Nickel, Dissolved	100%	50%
	Nitrate plus Nitrite as N	21%	0%
	Phosphorus, Total	0%	0%
	Selenium, Dissolved	100%	0%
	Silver, Dissolved	81%	100%
	Sulfate	44%	29%
	Suspended Solids, Total	13%	0%
	Zinc, Dissolved	40%	50%

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
AC-GRU	Ammonia as N, Dissolved		1995-2005	0.019	0.009	0.028	0.004	0.142	66
			2008-2012	0.013	0.006	0.019	0.001	0.097	105
	Arsenic, Dissolved		2008-2012	0.067	0.0715	0.013	0.049	0.08	8
	Arsenic, Total		2008-2012	0.100	0.1		0.1	0.1	1
	Cadmium, Dissolved		2008-2012	0.010	0.01	0.000	0.01	0.01	9
	Calcium		1995-2005	4.390	4.09	1.212	2.7	7.09	61
			2008-2012	4.534	4.2	1.352	2.51	7.42	37
	Chloride		1995-2005	0.229	0.17	0.216	0.05	1.2	67
			2008-2012	0.181	0.135	0.099	0.06	0.36	22
	Copper, Dissolved		2008-2012	0.550	0.5	0.194	0.22	0.98	25
	Dissolved Oxygen		1995-2005	8.868	8.9	1.127	7	11.5	63
			2008-2012	9.091	9.295	1.023	7.38	10.82	74
	Iron, Dissolved		2008-2012	200.324	151	141.180	37.4	446	25
	Iron, Total		2008-2012	343.687	220	234.028	83	719	23
	Kjeldhal Nitrogen as N, Total		1995-2005	0.160	0.145	0.079	0.04	0.47	48
			2008-2012	0.143	0.138	0.040	0.055	0.286	96
	Lead, Dissolved		2008-2012	0.035	0.03	0.022	0.013	0.076	9
	Magnesium		1995-2005	0.985	0.928	0.303	0.583	1.72	61
			2008-2012	1.044	0.997	0.330	0.57	1.76	37
	Manganese, Dissolved		2008-2012	11.023	6.99	9.901	1.6	32.1	25
	Nickel, Dissolved		2008-2012	0.193	0.21	0.089	0.08	0.38	10
	Nitrate plus Nitrite as N		1995-2005	0.086	0.079	0.073	0.008	0.423	35
			2008-2012	0.038	0.029	0.034	0.003	0.146	101
	Nitrogen Total as N		1995-2005	0.230	0.24	0.047	0.16	0.34	17
			2008-2012	0.196	0.16	0.100	0.1	0.39	8
	pH		1995-2005	7.779	7.7	0.314	7.35	8.7	15
			2008-2012	7.612	7.535	0.424	6.94	8.9	74
	Phosphorus, Total		1995-2005	0.007	0.006	0.004	0.003	0.021	65
			2008-2012	0.009	0.008	0.002	0.004	0.017	102
	Selenium, Dissolved		1995-2005	0.000	0.0004	0.000	0.0004	0.0004	6
			2008-2012	0.041	0.04	0.010	0.03	0.06	10
	Silver, Dissolved		2008-2012	0.003	0.003	0.000	0.003	0.004	9
	Specific Conductance		1995-2005	35.662	34	10.291	20	57	65
			2008-2012	38.013	36	11.486	19	63	75
	Sulfate		1995-2005	3.220	3.1	0.945	1.8	4.99	61
			2008-2012	2.931	2.61	0.934	1.46	4.44	23
	Suspended Solids, Total		1995-2005	1.000	0.9	0.155	0.9	1.2	6
			2008-2012	3.471	1	4.868	1	15	70
	Water Temperature		1995-2005	8.830	7.95	5.331	0	19.8	64
			2008-2012	8.117	6.89	6.092	0.09	19.9	75
	Zinc, Dissolved		2008-2012	1.060	1.2	0.610	0.2	1.8	10
	Hardness as CaCO3		1995-2005	15.010	14	4.263	9.18	24.6	61
			2008-2012	14.093	13	4.046	9	22	14
BT-M70	Ammonia as N, Dissolved		1995-2005	0.019	0.008	0.030	0.002	0.142	81
			2008-2012	0.019	0.011	0.028	0.005	0.15	67
	Arsenic, Dissolved		1995-2005	0.167	0.2	0.061	0.1	0.3	57
			2008-2012	0.166	0.16	0.031	0.08	0.27	52
	Calcium		1995-2005	5.795	5.79	1.918	2.79	13.1	81
			2008-2012	5.738	6.19	1.966	2.03	9.34	52
	Chloride		1995-2005	3.169	2.62	2.241	1.04	13.8	57
			2008-2012	2.687	2.17	1.572	0.77	8.52	52
	Copper, Dissolved		1995-2005	0.961	0.9	0.379	0.5	3.1	79
			2008-2012	2.032	1.5	2.172	0.5	15.3	52
	Dissolved Oxygen		1995-2005	10.104	9.7	1.686	7.5	13.9	79
			2008-2012	9.691	9.55	1.393	7.7	12.8	68
	Iron, Dissolved		1995-2005	56.653	53.3	20.033	19.7	104	57
			2008-2012	59.850	48.45	44.020	21.9	301	52
	Kjeldhal Nitrogen as N, Total		1995-2005	0.286	0.26	0.089	0.12	0.54	80
			2008-2012	0.278	0.25	0.093	0.16	0.7	67
	Lead, Dissolved		1995-2005	0.199	0.07	0.202	0.04	0.5	81
			2008-2012	0.052	0.0395	0.036	0.013	0.2	52

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
BT-M70	Magnesium		1995-2005	1.289	1.26	0.462	0.61	3.17	81
			2008-2012	1.227	1.295	0.401	0.503	2.02	52
	Manganese, Dissolved		1995-2005	3.853	3.41	1.857	1.62	10.4	57
			2008-2012	3.704	3.31	1.496	2.06	11.3	52
	Mercury, Dissolved		1995-2005	0.031	0.009	0.027	0.006	0.1	51
	Mercury, Total		1995-2005	3.950	3.95	3.041	1.8	6.1	2
			2008-2012	1.831	1.32	1.828	0.5	11.6	43
	Nickel, Dissolved		1995-2005	0.380	0.34	0.216	0.1	1.26	56
			2008-2012	0.303	0.27	0.127	0.11	0.74	52
	Nitrate plus Nitrite as N		1995-2005	0.261	0.233	0.233	0.009	1.77	81
			2008-2012	0.198	0.139	0.163	0.008	0.684	67
	pH		1995-2005	7.793	7.8	0.401	7.1	8.8	81
			2008-2012	7.738	7.7	0.339	7.2	9.5	68
	Phosphorus, Total		1995-2005	0.054	0.048	0.027	0.011	0.155	81
			2008-2012	0.056	0.047	0.028	0.021	0.153	67
	Selenium, Dissolved		1995-2005	0.250	0.25	0.071	0.2	0.3	2
	Silver, Dissolved		1995-2005	0.242	0.1	0.331	0.1	1	57
			2008-2012	0.013	0.004	0.019	0.003	0.058	52
	Specific Conductance		1995-2005	57.173	55	21.405	27	151	81
			2008-2012	53.647	53	19.417	21	98	68
	Sulfate		1995-2005	3.659	3.315	1.672	1.78	12	74
			2008-2012	3.376	3.32	1.169	1.12	6.58	52
	Water Temperature		1995-2005	8.648	9	6.067	0	20	81
			2008-2012	10.263	10.15	5.852	0	19.8	68
	Hardness as CaCO3		1995-2005	19.775	19.2	6.633	9.57	45.7	81
			2008-2012	19.380	21	6.539	7.13	31.6	52
CL-DAM1	Ammonia as N, Dissolved	0	1995-2005	0.016	0.02	0.015	0.002	0.08	31
		1	2008-2012	0.003	0.002	0.002	0.001	0.011	60
		bottom	1995-2005	0.014	0.0125	0.010	0.004	0.048	15.5
			2008-2012	0.005	0.002	0.007	0.001	0.0285	36
	Arsenic, Dissolved	1	2008-2012	0.262	0.232	0.076	0.189	0.5	15
		bottom	2008-2012	0.239	0.22375	0.074	0.173	0.3835	7
	Arsenic, Total	0	1995-2005	0.800	0.8		0.8	0.8	1
		1	2008-2012	0.294	0.294	0.008	0.288	0.3	2
		bottom	1995-2005	0.800	0.8		0.8	0.8	1
			2008-2012	0.276	0.2755		0.2755	0.2755	1
	Cadmium, Dissolved	0	1995-2005	1.064	0.11	2.010	0.02	8	30
		1	2008-2012	0.017	0.01	0.023	0.005	0.1	15
		bottom	1995-2005	0.580	0.2875	1.030	0.02	4.01	15
			2008-2012	0.016	0.0125	0.017	0.0075	0.06	7
	Calcium	0	1995-2005	9.369	9.57	0.938	7.68	11	29
		1	2008-2012	9.333	9.39	0.854	7.58	10.8	32
		bottom	1995-2005	8.316	8.1975	0.993	7.37	9.135	14.5
			2008-2012	8.125	8.12	0.801	6.93	9.66	17
	Chloride	0	1995-2005	0.725	0.71	0.222	0.1	1.23	27
		1	2008-2012	1.250	1.19	0.223	1	1.95	14
		bottom	1995-2005	0.997	0.975	0.179	0.77	1.18	13.5
			2008-2012	1.098	1.08	0.158	0.995	1.25	6.5
	Chlorophyll a	0	1995-2005	1.329	1.3	0.597	0.3	2.5	28
		0-5	1995-2005	1.867	1.55	0.859	1.1	3.4	6
			2008-2012	2.575	2.21	2.014	0.38	8.38	45
		1	1995-2005	1.900	1.5	1.103	0.9	3.8	6
			2008-2012	2.003	1.59	1.607	0.49	6.01	9
	Chlorophyll a, Corrected	0-5	1995-2005	2.000	1.8	0.846	1.3	3.6	6
			2008-2012	2.375	2.14	1.881	0.36	7.89	45
		1	1995-2005	2.160	1.7	1.328	1.2	4.5	5
			2008-2012	1.818	1.39	1.520	0.37	5.61	9
	Copper, Dissolved	0	1995-2005	6.300	10	4.186	1	10	29
		1	2008-2012	2.213	1.82	2.259	0.2	10	15
		bottom	1995-2005	5.013	6.75	4.100	2.4	6.75	14.5
			2008-2012	1.793	1.57	1.231	0.625	5.53	7
	Dissolved Oxygen	0-2	1995-2005	8.085	8	1.054	6.5	11.81	113
			2008-2012	8.605	7.97	1.342	6.6	12.6	128

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
CL-DAM1	Iron, Dissolved	0	1995-2005	6.060	5	4.816	3	28	30
		1	2008-2012	17.862	17.8	12.308	1.7	57.4	47
		bottom	1995-2005	14.125	13	6.559	5	28	18.5
			2008-2012	20.291	20.45	7.920	10.72	49.55	24
	Iron, Total	1	2008-2012	46.827	45.6	19.513	13.8	83.2	15
		bottom	2008-2012	77.004	78.175	18.059	54.4	103.95	7
	Kjeldhal Nitrogen as N, Total	0	1995-2005	0.198	0.2	0.027	0.13	0.25	26
		1	2008-2012	0.222	0.216	0.035	0.154	0.334	61
		bottom	1995-2005	0.187	0.195	0.024	0.13	0.24	26
			2008-2012	0.217	0.2145	0.035	0.176	0.3625	31
	Lead, Dissolved	0	1995-2005	15.227	10	20.421	0.04	50	29
		1	2008-2012	0.037	0.0325	0.030	0.006	0.1	14
		bottom	1995-2005	8.217	5.155	20.568	0.175	25.155	14.5
			2008-2012	0.026	0.019	0.013	0.014	0.06	6.5
	Magnesium	0	1995-2005	1.294	1.3	0.087	1.18	1.53	29
		1	2008-2012	1.502	1.57	0.136	1.27	1.8	33
		bottom	1995-2005	1.294	1.28	0.107	1.18	1.405	14.5
			2008-2012	1.377	1.3775	0.092	1.22	1.535	17.5
	Manganese, Dissolved	0	1995-2005	1.013	1	0.899	0.1	4	30
		1	2008-2012	2.023	1.1	1.973	0.33	8	47
		bottom	1995-2005	5.654	5.65	4.838	0.55	19.3	18.5
			2008-2012	3.997	3.0025	3.889	0.585	13.85	24
	Mercury, Total	1	2008-2012	0.830	0.635	0.427	0.5	1.52	8
		bottom	2008-2012	0.774	0.7375	0.247	0.505	1.05	4.5
	Nickel, Dissolved	0	1995-2005	8.104	10	8.015	0.03	20	29
		1	2008-2012	0.343	0.27	0.177	0.2	0.73	15
		bottom	1995-2005	4.683	5.5	8.034	0.515	10.5	14.5
			2008-2012	0.329	0.2975	0.179	0.195	0.565	7
	Nitrate plus Nitrite as N	0	1995-2005	0.031	0.05	0.021	0.005	0.05	31
		1	2008-2012	0.009	0.003	0.013	0.001	0.048	56
		bottom	1995-2005	0.070	0.078	0.045	0.0125	0.1245	15.5
			2008-2012	0.047	0.043	0.026	0.0095	0.1	35
	Nitrogen Total as N	0	1995-2005	0.196	0.19	0.015	0.18	0.22	5
		1	2008-2012	0.190	0.19		0.19	0.19	1
		bottom	1995-2005	0.263	0.2675	0.048	0.22	0.3	2.5
			2008-2012	0.200	0.2		0.2	0.2	1
	pH	0-2	1995-2005	7.921	7.99	0.441	7	8.9	104
			2008-2012	7.975	7.93	0.288	7.09	9.05	126
	Phosphorus, Total	0	1995-2005	0.014	0.01	0.010	0.004	0.04	31
		1	2008-2012	0.012	0.012	0.004	0.006	0.02	60
		bottom	1995-2005	0.014	0.0125	0.005	0.0085	0.023	15.5
			2008-2012	0.014	0.0135	0.003	0.0095	0.0225	34
	Secchi Depth		1995-2005	2.940	2.775	0.666	1.6	5.05	40
			2008-2012	3.786	3.48	1.436	1.69	8.69	50
	Selenium, Dissolved	0	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	0.064	0.07	0.020	0.01	0.1	15
		bottom	1995-2005	0.200	0.2		0.2	0.2	1
			2008-2012	0.063	0.0625	0.010	0.055	0.08	7
	Silver, Dissolved	0	1995-2005	0.158	0.2	0.054	0.06	0.2	29
		1	2008-2012	0.010	0.003	0.016	0.003	0.05	15
		bottom	1995-2005	0.130	0.15	0.054	0.08	0.15	14.5
			2008-2012	0.007	0.003	0.009	0.003	0.0265	7
	Specific Conductance	0-2	1995-2005	67.269	66	9.602	55	101	113
			2008-2012	70.642	70	6.709	59	83	137
	Sulfate	0	1995-2005	2.729	2.68	0.445	1.65	3.99	27
		1	2008-2012	3.539	3.635	0.415	2.69	4	14
		bottom	1995-2005	3.168	3.1675	0.381	2.65	3.49	13.5
			2008-2012	3.141	3.215	0.515	2.415	3.385	6.5
	Suspended Solids, Total	0	1995-2005	36.000	36		36	36	1
		1	1995-2005	5.571	2	9.519	1	27	7
			2008-2012	2.846	2	3.158	1	15	26
		bottom	1995-2005	19.000	19		19	19	1
			2008-2012	2.737	2	2.299	1	9.5	13.5

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
CL-DAM1	Water Temperature	0-2	1995-2005	16.205	15	4.121	8.9	22.9	113
			2008-2012	13.879	15	6.139	3.1	22.9	137
	Zinc, Dissolved	0	1995-2005	4.900	3	4.594	0.3	16	29
		1	2008-2012	2.947	0.9	4.035	0.3	11.6	15
		bottom	1995-2005	7.121	6.325	5.501	2.65	15.15	15
			2008-2012	1.480	1.0775	1.695	0.6	5.9	7
	Hardness as CaCO3	0	1995-2005	28.690	29	2.593	24	33	29
		1	2008-2012	28.667	30	4.163	24	32	3
		bottom	1995-2005	25.911	25.5	2.868	23	28	14.5
			2008-2012	30.000	32	5.292	24	34	3
CR-GRD	Ammonia as N, Dissolved		1995-2005	0.021	0.011	0.024	0.004	0.1	61
			2008-2012	0.003	0.002	0.002	0.001	0.01	67
	Arsenic, Dissolved		1995-2005	5.000	5	0.000	5	5	3
			2008-2012	0.205	0.203	0.028	0.159	0.262	14
	Arsenic, Total		1995-2005	2.797	2.9	2.424	0.18	5	6
			2008-2012	0.300	0.3		0.3	0.3	1
	Cadmium, Dissolved		1995-2005	0.110	0.11	0.099	0.02	0.2	6
			2008-2012	0.011	0.01	0.005	0.005	0.02	16
	Calcium		1995-2005	7.691	7.54	0.855	6.5	10.4	57
			2008-2012	7.587	7.59	0.842	6.13	8.94	37
	Chloride		1995-2005	1.014	0.91	0.627	0.31	3	63
			2008-2012	0.854	0.85	0.124	0.68	1.12	21
	Copper, Dissolved		1995-2005	1.347	1	1.108	0.43	5	29
			2008-2012	0.750	0.71	0.151	0.55	1.2	37
	Dissolved Oxygen		1995-2005	9.430	9.2	1.467	6.5	14.52	85
			2008-2012	9.976	9.93	0.749	7.76	11.6	47
	Iron, Dissolved		1995-2005	32.464	20	31.093	10	100	28
			2008-2012	15.896	15.9	6.511	6.7	30.3	37
	Iron, Total		1995-2005	109.920	80	81.169	13	380	25
			2008-2012	50.445	44.2	19.448	19.1	96.2	29
	Kjeldhal Nitrogen as N, Total		1995-2005	0.242	0.2	0.130	0.14	0.7	25
			2008-2012	0.194	0.1875	0.031	0.15	0.258	62
	Lead, Dissolved		1995-2005	0.523	0.53	0.522	0.04	1	6
			2008-2012	0.017	0.0125	0.013	0.004	0.04	16
	Magnesium		1995-2005	1.391	1.33	0.167	1.18	2.01	57
			2008-2012	1.433	1.43	0.143	1.19	1.64	37
	Manganese, Dissolved		1995-2005	9.071	5	14.664	0.97	81	29
			2008-2012	1.909	1.6	1.204	0.63	6.14	37
	Mercury, Dissolved		1995-2005	0.100	0.1	0.000	0.1	0.1	3
			2008-2012	0.807	0.81	0.318	0.47	1.26	6
	Mercury, Total		1995-2005	0.100	0.1	0.000	0.1	0.1	3
	Nickel, Dissolved		1995-2005	10.500	10.5	10.407	1	20	6
			2008-2012	0.284	0.24	0.109	0.18	0.62	16
	Nitrate plus Nitrite as N		1995-2005	0.069	0.05	0.061	0.003	0.31	54
			2008-2012	0.021	0.0205	0.015	0.002	0.051	68
	Nitrogen Total as N		1995-2005	0.222	0.21	0.032	0.18	0.28	13
			2008-2012	0.200	0.2		0.2	0.2	1
	pH		1995-2005	7.620	7.68	0.551	6.5	8.6	87
			2008-2012	7.716	7.755	0.310	6.98	8.2	46
	Phosphorus, Total		1995-2005	0.027	0.0175	0.041	0.006	0.285	64
			2008-2012	0.014	0.013	0.003	0.008	0.02	72
	Selenium, Dissolved		1995-2005	1.056	0.07	2.043	0.0004	5	15
			2008-2012	0.070	0.07	0.012	0.05	0.1	16
	Silver, Dissolved		1995-2005	0.106	0.1	0.073	0.016	0.2	29
			2008-2012	0.009	0.003	0.016	0.003	0.05	16
	Specific Conductance		1995-2005	53.914	53	15.139	11.2	113	91
			2008-2012	64.383	65	9.444	49	96	47
	Sulfate		1995-2005	3.642	3.31	0.827	2	5.32	57
			2008-2012	3.783	3.84	0.270	3.13	4.12	21
	Suspended Solids, Total		1995-2005	4.516	5	2.967	0.9	11	38
			2008-2012	3.027	1	4.173	1	17	37
	Water Temperature		1995-2005	7.774	8	2.839	3	14.5	91
			2008-2012	5.874	5.05	2.719	2.5	16.45	47

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
CR-GRD	Zinc, Dissolved		1995-2005	8.635	5	13.491	0.3	55	17
			2008-2012	1.006	1	0.634	0.1	2.5	16
	Hardness as CaCO3		1995-2005	24.949	25	2.625	21	34	39
			2008-2012	27.925	28	0.534	27.2	29	8
CR-KRM	Ammonia as N, Dissolved		1995-2005	0.021	0.015	0.021	0.003	0.11	63
			2008-2012	0.005	0.004	0.004	0.001	0.016	46
	Arsenic, Dissolved		1995-2005	0.590	0.65	0.138	0.4	0.7	6
			2008-2012	0.529	0.52	0.103	0.38	0.858	32
	Arsenic, Total		1995-2005	0.797	0.9	0.250	0.47	1	6
			2008-2012	0.782	0.755	0.214	0.48	1.27	32
	Cadmium, Dissolved		1995-2005	1.383	1	2.085	0.02	8	60
			2008-2012	0.022	0.02	0.015	0.009	0.07	32
	Calcium		1995-2005	29.457	28.3	6.745	16.6	55.5	63
			2008-2012	28.663	28.5	4.593	18.1	41	32
	Chloride		1995-2005	3.684	3.45	1.371	1.56	7.25	63
			2008-2012	5.243	5.2	1.538	2.25	8.22	31
	Copper, Dissolved		1995-2005	5.913	10	4.470	0.8	10	63
			2008-2012	1.713	1.42	0.948	0.59	4.36	32
	Dissolved Oxygen		1995-2005	8.134	8	0.924	6.6	9.9	64
			2008-2012	8.714	8.4	1.023	7.4	10.5	29
	Iron, Dissolved		1995-2005	62.651	52	43.019	10	195	63
			2008-2012	79.434	77.25	31.897	27.9	148	32
	Iron, Total		1995-2005	890.000	515	939.843	233	2680	6
			2008-2012	609.563	436.5	408.308	192	1680	32
	Kjeldhal Nitrogen as N, Total		1995-2005	0.305	0.3	0.169	0.05	1	51
			2008-2012	0.283	0.259	0.080	0.157	0.487	45
	Lead, Dissolved		1995-2005	15.443	10	20.191	0.04	50	63
			2008-2012	0.057	0.058	0.022	0.02	0.098	32
	Magnesium		1995-2005	5.975	5.36	2.636	2.94	20.2	63
			2008-2012	5.781	5.78	1.406	3.44	10.5	32
	Manganese, Dissolved		1995-2005	40.492	27	33.418	10.8	143	63
			2008-2012	36.413	31.9	16.393	15.6	81.9	32
	Mercury, Dissolved		2008-2012	1.419	1.48	0.412	0.71	2.04	8
	Nickel, Dissolved		1995-2005	8.218	10	7.704	0.03	20	63
			2008-2012	0.741	0.605	0.294	0.342	1.5	32
	Nitrate plus Nitrite as N		1995-2005	0.084	0.07	0.053	0.008	0.236	63
			2008-2012	0.069	0.063	0.031	0.012	0.138	50
	Nitrogen Total as N		1995-2005	0.417	0.375	0.195	0.18	0.92	12
	pH		1995-2005	8.222	8.2	0.156	7.8	8.6	63
			2008-2012	8.160	8.2	0.161	7.8	8.5	25
	Phosphorus, Total		1995-2005	0.045	0.03	0.045	0.01	0.27	63
			2008-2012	0.038	0.0355	0.017	0.013	0.097	50
	Selenium, Dissolved		1995-2005	0.352	0.35	0.150	0.2	0.6	6
			2008-2012	0.304	0.295	0.082	0.21	0.58	32
	Silver, Dissolved		1995-2005	1.116	1	0.950	0.1	3.5	63
			2008-2012	0.010	0.003	0.017	0.002	0.05	32
	Specific Conductance		1995-2005	238.385	223	51.137	139	420	65
			2008-2012	231.103	233	42.507	142	349	29
	Sulfate		1995-2005	39.584	34.5	19.415	11.6	148	63
			2008-2012	36.988	33.8	12.911	19.2	87.8	31
	Suspended Solids, Total		1995-2005	25.167	10	30.805	10	87	6
			2008-2012	26.250	13	36.238	7	164	32
	Water Temperature		1995-2005	10.194	10.5	4.285	1.2	19	67
			2008-2012	9.038	10.9	5.012	0	16.2	29
	Zinc, Dissolved		1995-2005	5.103	3	3.637	0.5	13	63
			2008-2012	2.356	1.9	1.379	0.8	6.1	32
	Hardness as CaCO3		1995-2005	98.159	93	26.862	54	220	63
			2008-2012	91.581	97.2	15.764	60.2	110	21
CR-SMU	Ammonia as N, Dissolved		1995-2005	0.012	0.005	0.016	0.003	0.1	87
			2008-2012	0.003	0.002	0.003	0.001	0.01	87
	Arsenic, Dissolved		2008-2012	0.207	0.187	0.055	0.15	0.281	7
	Arsenic, Total		2008-2012	0.200	0.2		0.2	0.2	1
	Cadmium, Dissolved		2008-2012	0.011	0.01	0.003	0.01	0.02	9

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
CR-SMU	Calcium		1995-2005	8.739	8.535	2.798	4.17	16.1	86
			2008-2012	8.952	9.4	2.341	4.58	14.8	33
	Chloride		1995-2005	0.508	0.37	0.356	0.13	1.4	93
			2008-2012	0.420	0.375	0.220	0.17	0.99	20
	Copper, Dissolved		1995-2005	1.228	1	0.974	0.43	5	21
			2008-2012	0.670	0.615	0.296	0.2	1.3	22
	Dissolved Oxygen		1995-2005	9.119	8.9	1.283	6.6	12.6	85
			2008-2012	9.602	9.6	1.127	7.45	11.52	73
	Iron, Dissolved		1995-2005	190.476	140	135.480	50	680	21
			2008-2012	212.468	160	158.526	68.8	643	22
	Iron, Total		1995-2005	531.571	460	362.375	43	1700	21
			2008-2012	424.737	303	317.206	110	1100	19
	Kjeldhal Nitrogen as N, Total		1995-2005	0.207	0.16	0.169	0.04	1	53
			2008-2012	0.179	0.1505	0.100	0.047	0.505	96
	Lead, Dissolved		2008-2012	0.052	0.04	0.046	0.006	0.15	9
	Magnesium		1995-2005	1.972	2.065	0.499	1.06	2.8	86
			2008-2012	2.104	2.2	0.460	1.2	2.79	33
	Manganese, Dissolved		1995-2005	12.457	10	8.496	4.3	35	21
			2008-2012	16.420	14.5	9.850	7.19	42.6	22
	Nickel, Dissolved		2008-2012	0.327	0.29	0.206	0.12	0.84	10
	Nitrate plus Nitrite as N		1995-2005	0.052	0.05	0.058	0.005	0.317	57
			2008-2012	0.015	0.0065	0.021	0.001	0.105	86
	Nitrogen Total as N		1995-2005	0.222	0.18	0.132	0.08	0.57	17
			2008-2012	0.280	0.14	0.264	0.08	0.74	8
	pH		1995-2005	7.745	7.9	0.508	6.78	8.58	37
			2008-2012	7.955	7.95	0.332	7.2	9.08	72
	Phosphorus, Total		1995-2005	0.022	0.0155	0.025	0.003	0.21	88
			2008-2012	0.022	0.0145	0.024	0.006	0.199	96
	Selenium, Dissolved		1995-2005	0.036	0.0004	0.073	0.0004	0.2	9
			2008-2012	0.059	0.045	0.023	0.04	0.09	10
	Silver, Dissolved		1995-2005	0.095	0.1	0.076	0.016	0.2	21
			2008-2012	0.004	0.003	0.003	0.003	0.011	8
	Specific Conductance		1995-2005	69.539	71	22.688	28	125	89
			2008-2012	75.945	78	20.062	32	129	73
	Sulfate		1995-2005	5.813	5.47	2.566	3	24	87
			2008-2012	5.545	5.66	1.586	3.29	7.9	21
	Suspended Solids, Total		1995-2005	6.907	5	7.274	0.9	32	30
			2008-2012	9.955	4	14.460	1	77	66
	Water Temperature		1995-2005	7.898	7.5	5.030	0	21.8	92
			2008-2012	6.669	6.47	5.107	0	17.01	73
	Zinc, Dissolved		1995-2005	6.983	5	4.974	2.1	20	12
			2008-2012	2.490	0.9	4.155	0.3	14	10
	Hardness as CaCO3		1995-2005	30.168	30	8.816	14.8	51	71
			2008-2012	28.800	31	7.069	17	37.2	14
CR-WGD	Ammonia as N, Dissolved		1995-2005	0.033	0.02	0.030	0.005	0.14	61
			2008-2012	0.018	0.003	0.030	0.001	0.128	70
	Arsenic, Dissolved		1995-2005	1.345	1	1.199	0.4	5	32
			2008-2012	0.372	0.336	0.119	0.23	0.719	18
	Arsenic, Total		1995-2005	1.279	1	1.123	0.32	5	38
			2008-2012	0.500	0.5		0.5	0.5	1
	Cadmium, Dissolved		1995-2005	0.450	0.11	0.467	0.02	1	39
			2008-2012	0.012	0.01	0.005	0.005	0.02	23
	Calcium		1995-2005	15.613	16.35	3.082	8.2	21.2	64
			2008-2012	16.369	17	3.173	8.45	20.8	59
	Chloride		1995-2005	2.876	2.585	1.344	1	8.1	64
			2008-2012	4.244	4.06	1.808	0.89	8.49	40
	Copper, Dissolved		1995-2005	1.129	1	0.740	0.57	5	63
			2008-2012	0.876	0.76	0.487	0.5	4.14	59
	Dissolved Oxygen		1995-2005	9.513	9.34	1.439	6.2	13.69	63
			2008-2012	9.883	9.83	0.992	8	11.98	57
	Iron, Dissolved		1995-2005	171.186	170	76.474	40	480	59
			2008-2012	180.946	178	68.447	83.8	386	59
	Iron, Total		1995-2005	544.800	500	192.378	300	1300	25
			2008-2012	542.532	518	325.815	256	2330	47

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
CR-WGD	Kjeldhal Nitrogen as N, Total		1995-2005	0.349	0.29	0.307	0.12	1.9	31
			2008-2012	0.311	0.286	0.126	0.116	0.895	77
	Lead, Dissolved		1995-2005	0.562	1	0.465	0.04	1	39
			2008-2012	0.063	0.052	0.047	0.018	0.24	23
	Magnesium		1995-2005	2.685	2.765	0.521	1.5	3.93	64
			2008-2012	2.966	3.06	0.580	1.56	4	59
	Manganese, Dissolved		1995-2005	40.507	36	19.757	5	92	61
			2008-2012	49.968	44.1	21.815	22.8	114	59
	Mercury, Dissolved		1995-2005	0.074	0.1	0.042	0.006	0.1	32
			2008-2012	2.391	2.2	2.047	0.59	5.89	7
	Mercury, Total		1995-2005	0.077	0.1	0.047	0.006	0.15	32
	Nickel, Dissolved		1995-2005	2.359	1	5.174	0.03	20	39
			2008-2012	0.531	0.42	0.257	0.26	1.2	23
	Nitrate plus Nitrite as N		1995-2005	0.080	0.05	0.092	0.008	0.54	64
			2008-2012	0.104	0.015	0.145	0.001	0.453	73
	Nitrogen Total as N		1995-2005	0.373	0.35	0.152	0.19	0.67	8
			2008-2012	0.670	0.67		0.67	0.67	1
	pH		1995-2005	8.150	8.3	0.700	6.51	9.5	63
			2008-2012	8.098	7.99	0.456	7.34	9.3	56
	Phosphorus, Total		1995-2005	0.049	0.05	0.019	0.01	0.1	63
			2008-2012	0.054	0.052	0.021	0.024	0.128	80
	Selenium, Dissolved		1995-2005	0.871	0.7	1.212	0.02	5	43
			2008-2012	0.091	0.08	0.033	0.05	0.17	23
	Silver, Dissolved		1995-2005	0.467	0.2	0.444	0.016	1	62
			2008-2012	0.013	0.003	0.020	0.003	0.05	23
	Specific Conductance		1995-2005	121.674	128	30.702	55	277	132
			2008-2012	133.930	142	27.558	62	179	57
	Sulfate		1995-2005	5.050	4.58	1.817	2.63	12	64
			2008-2012	5.928	5.835	1.955	2.79	10.8	40
	Suspended Solids, Total		1995-2005	7.732	8	5.005	1	26	65
			2008-2012	9.254	7	8.727	2	46	59
	Water Temperature		1995-2005	8.934	9	5.562	0	19.5	133
			2008-2012	6.535	6.94	5.727	0	20.27	57
	Zinc, Dissolved		1995-2005	5.045	3	6.937	0.5	48.2	51
			2008-2012	1.716	1.2	1.123	0.8	5.7	23
	Hardness as CaCO3		1995-2005	49.681	53	10.149	27	69	47
			2008-2012	52.200	55.5	12.090	33	65	10
EI-GLU	Ammonia as N, Dissolved		1995-2005	0.013	0.005	0.018	0.003	0.1	84
			2008-2012	0.003	0.002	0.003	0.001	0.01	91
	Arsenic, Dissolved		2008-2012	0.088	0.094	0.023	0.052	0.114	7
	Arsenic, Total		2008-2012	0.100	0.1		0.1	0.1	1
	Cadmium, Dissolved		2008-2012	0.010	0.01	0.000	0.01	0.01	8
	Calcium		1995-2005	2.030	2	0.414	1.35	3	83
			2008-2012	2.071	1.95	0.595	1.2	4.15	79
	Chloride		1995-2005	0.338	0.17	0.364	0.04	1.2	89
			2008-2012	0.177	0.14	0.092	0.07	0.44	64
	Copper, Dissolved		1995-2005	1.198	1	1.106	0.46	5	18
			2008-2012	0.785	0.62	0.394	0.44	1.82	22
	Dissolved Oxygen		1995-2005	9.620	10	1.350	6.79	13.3	91
			2008-2012	9.730	10.195	1.125	7.65	11.15	72
	Iron, Dissolved		1995-2005	72.000	60	47.021	28	210	18
			2008-2012	115.527	54.9	142.306	33.5	585	22
	Iron, Total		1995-2005	114.444	89	60.949	47	280	18
			2008-2012	164.440	103.55	158.056	59.2	646	20
	Kjeldhal Nitrogen as N, Total		1995-2005	0.143	0.12	0.100	0.04	0.54	52
			2008-2012	0.155	0.122	0.070	0.056	0.351	89
	Lead, Dissolved		2008-2012	0.036	0.0315	0.022	0.015	0.085	8
	Magnesium		1995-2005	0.319	0.307	0.079	0.188	0.5	83
			2008-2012	0.348	0.316	0.133	0.187	0.73	79
	Manganese, Dissolved		1995-2005	4.056	4.5	2.151	1	9.6	18
			2008-2012	3.127	2.82	1.492	1.2	6.8	22
	Mercury, Total		2008-2012	2.649	2.815	1.055	1.03	4.48	14
	Nickel, Dissolved		2008-2012	0.190	0.17	0.068	0.12	0.33	9

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
EI-GLU	Nitrate plus Nitrite as N		1995-2005	0.092	0.077	0.064	0.025	0.484	57
			2008-2012	0.058	0.043	0.041	0.006	0.165	94
	Nitrogen Total as N		1995-2005	0.246	0.23	0.096	0.13	0.46	17
			2008-2012	0.224	0.17	0.105	0.13	0.39	7
	pH		1995-2005	7.472	7.385	0.610	6.5	9	32
			2008-2012	7.228	7.21	0.352	6.31	8.76	70
	Phosphorus, Total		1995-2005	0.011	0.006	0.028	0.0019	0.26	86
			2008-2012	0.009	0.007	0.005	0.002	0.028	136
	Selenium, Dissolved		1995-2005	0.033	0.0004	0.066	0.0004	0.2	9
			2008-2012	0.052	0.05	0.016	0.04	0.09	9
	Silver, Dissolved		1995-2005	0.098	0.1	0.104	0.016	0.4	17
			2008-2012	0.004	0.0035	0.001	0.003	0.006	8
	Specific Conductance		1995-2005	17.706	16	14.898	4	146	85
			2008-2012	18.679	18	5.707	10	41	140
	Sulfate		1995-2005	1.739	1.74	0.587	1	5	83
			2008-2012	1.411	1.29	0.404	0.78	2.44	65
	Suspended Solids, Total		1995-2005	3.548	2	3.380	0.9	16	27
			2008-2012	3.636	1	4.882	1	15	66
	Water Temperature		1995-2005	5.532	4.5	4.598	0	16	95
			2008-2012	6.025	5.2	4.989	0	16.4	141
	Zinc, Dissolved		1995-2005	5.467	5	2.567	2	11	12
			2008-2012	1.000	1	0.602	0.4	2.3	9
	Hardness as CaCO3		1995-2005	6.411	6.515	1.340	4.14	9.16	68
			2008-2012	6.498	6	1.991	3.82	13.4	59
GL-MID	Ammonia as N, Dissolved	0	1995-2005	0.009	0.007	0.005	0.005	0.015	5
		0-5	1995-2005	0.006	0.004	0.004	0.004	0.024	36
		1	1995-2005	0.005	0.005	0.000	0.005	0.005	2
			2008-2012	0.004	0.002	0.004	0.001	0.021	66
		bottom	1995-2005	0.005	0.0045	0.002	0.0045	0.009	21
			2008-2012	0.002	0.002	0.002	0.001	0.0065	37
	Arsenic, Dissolved	1	2008-2012	0.227	0.191	0.114	0.138	0.5	15
		bottom	2008-2012	0.180	0.167325	0.052	0.1455	0.33215	7
	Arsenic, Total	0	1995-2005	0.800	0.8		0.8	0.8	1
		1	2008-2012	0.250	0.25	0.071	0.2	0.3	2
		bottom	1995-2005	0.800	0.8		0.8	0.8	1
			2008-2012	0.250	0.25		0.25	0.25	1
	Cadmium, Dissolved	0	1995-2005	0.020	0.02	0.000	0.02	0.02	2
		0-5	1995-2005	0.020	0.02		0.02	0.02	1
		1	2008-2012	0.022	0.01	0.031	0.005	0.1	16
		bottom	1995-2005	0.043	0.0425	0.004	0.04	0.045	2
			2008-2012	0.014	0.01	0.013	0.0075	0.055	7.5
	Calcium	0	1995-2005	5.920	5.92	2.164	4.39	7.45	2
		0-5	1995-2005	5.831	5.88	0.789	4.8	7.23	7
		1	2008-2012	5.667	5.66	1.830	1.68	8.91	39
		bottom	1995-2005	6.400	6.3725	0.535	5.805	7	4.5
			2008-2012	6.624	6.575	0.540	5.095	7.485	18
	Chloride	0	1995-2005	0.490	0.49	0.240	0.32	0.66	2
		0-5	1995-2005	0.365	0.375	0.043	0.24	0.41	18
		1	2008-2012	0.687	0.71	0.213	0.35	1	15
		bottom	1995-2005	0.549	0.55	0.042	0.485	0.6	10
			2008-2012	0.779	0.79	0.117	0.685	0.895	7
	Chlorophyll a	0	1995-2005	2.750	2.75	1.626	1.6	3.9	2
		0-2	2008-2012	5.066	4.1	3.025	0.62	14.63	39
		0-5	1995-2005	4.636	4.3	3.371	0.7	14.3	14
			2008-2012	4.535	3.48	2.833	0.74	13	49
		1	1995-2005	6.200	5.1	2.630	4.4	10.8	5
			2008-2012	4.847	5	2.072	1.47	7.97	11
	Chlorophyll a, Corrected	0-2	2008-2012	4.690	3.8	2.776	0.59	13.35	39
		0-5	1995-2005	7.325	5.85	3.762	4.7	12.9	4
			2008-2012	4.189	3.24	2.621	0.69	11.96	49
		1	1995-2005	4.950	4.9	0.597	4.3	5.7	4
			2008-2012	4.359	4.06	2.152	1.28	7.48	9

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
GL-MID	Copper, Dissolved	0	1995-2005	0.600	0.6		0.6	0.6	1
		1	2008-2012	2.048	0.87	3.120	0.64	10	16
		bottom	1995-2005	0.700	0.7		0.7	0.7	1
			2008-2012	1.293	0.96	1.357	0.695	5.49	7.5
	Dissolved Oxygen	0-2	1995-2005	7.986	7.83	0.732	7.1	10.8	145
			2008-2012	8.329	8.2	0.799	7	12.55	237
	Iron, Dissolved	0	1995-2005	23.500	23.5	7.778	18	29	2
		0-5	1995-2005	43.000	43		43	43	1
		1	2008-2012	36.034	28.9	23.670	9.88	143	55
		bottom	1995-2005	24.278	20.5	15.232	16	40.5	5
			2008-2012	31.019	25	13.328	17.1	65.25	25
	Iron, Total	1	2008-2012	64.687	62.5	26.792	30	117	15
		bottom	2008-2012	77.004	79.45	27.850	42.5	111.5	7
	Kjeldhal Nitrogen as N, Total	0-5	1995-2005	0.198	0.19	0.064	0.06	0.35	33
		1	2008-2012	0.257	0.227	0.085	0.14	0.499	69
		bottom	1995-2005	0.132	0.13	0.034	0.085	0.18	16.5
			2008-2012	0.211	0.2055	0.049	0.151	0.3215	33.5
	Lead, Dissolved	0	1995-2005	0.040	0.04		0.04	0.04	1
		1	2008-2012	0.058	0.04	0.069	0.006	0.24	11
		bottom	1995-2005	0.040	0.04		0.04	0.04	1
			2008-2012	0.046	0.036	0.042	0.004	0.13	10
	Magnesium	0	1995-2005	1.088	1.0875	0.385	0.815	1.36	2
		0-5	1995-2005	1.061	1.05	0.142	0.879	1.32	7
		1	2008-2012	1.110	1.12	0.354	0.292	1.69	39
		bottom	1995-2005	1.179	1.17	0.081	1.0695	1.265	4.5
			2008-2012	1.295	1.295	0.093	1.012	1.41	18
	Manganese, Dissolved	0	1995-2005	0.600	0.6	0.141	0.5	0.7	2
		0-5	1995-2005	0.900	0.9		0.9	0.9	1
		1	2008-2012	2.691	1.95	2.008	0.2	9.18	55
		bottom	1995-2005	105.328	29.75	197.686	5.3	579.2	5.5
			2008-2012	44.500	3.21	88.470	1.05	317.7	25
	Mercury, Total	1	2008-2012	1.178	1	0.696	0.6	2.87	9
		bottom	2008-2012	1.306	1.305	0.108	1.16	1.45	5
	Nickel, Dissolved	0	1995-2005	1.000	1		1	1	1
		1	2008-2012	0.297	0.24	0.154	0.13	0.6	16
		bottom	1995-2005	1.000	1		1	1	1
			2008-2012	0.269	0.255	0.098	0.185	0.445	7.5
	Nitrate plus Nitrite as N	0	1995-2005	0.053	0.041	0.053	0.008	0.138	5
		0-5	1995-2005	0.038	0.032	0.027	0.011	0.081	12
		1	1995-2005	0.008	0.008	0.000	0.008	0.008	2
			2008-2012	0.022	0.005	0.031	0.001	0.153	66
		bottom	1995-2005	0.102	0.10575	0.036	0.044	0.1465	9.5
			2008-2012	0.094	0.095	0.022	0.049	0.1315	37.5
	Nitrogen Total as N	0	1995-2005	0.260	0.22	0.071	0.21	0.38	5
		0-5	1995-2005	0.255	0.25	0.037	0.22	0.3	4
		1	1995-2005	0.190	0.19	0.057	0.15	0.23	2
			2008-2012	0.230	0.23	0.020	0.21	0.25	3
		bottom	1995-2005	0.282	0.28	0.026	0.245	0.32	5.5
			2008-2012	0.257	0.26	0.015	0.24	0.27	3
	pH	0-2	1995-2005	7.389	7.3	0.642	6.4	9	129
			2008-2012	7.748	7.655	0.532	6.5	9.2	236
	Phosphorus, Total	0	1995-2005	0.010	0.01	0.003	0.007	0.015	5
		0-5	1995-2005	0.009	0.009	0.002	0.006	0.014	36
		1	1995-2005	0.008	0.0075	0.004	0.005	0.01	2
			2008-2012	0.013	0.012	0.003	0.005	0.021	68
		bottom	1995-2005	0.010	0.00775	0.005	0.0045	0.0225	21.5
			2008-2012	0.014	0.01275	0.003	0.0105	0.02	33.5
	Secchi Depth		1995-2005	3.465	3.55	1.036	1.75	5.7	42
			2008-2012	3.591	3.415	1.080	1.6	7.19	420
	Selenium, Dissolved	0	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	0.074	0.07	0.023	0.05	0.14	16
		bottom	1995-2005	0.200	0.2		0.2	0.2	1
			2008-2012	0.072	0.07	0.018	0.06	0.13	7.5

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
GL-MID	Silver, Dissolved	0	1995-2005	0.100	0.1		0.1	0.1	1
		1	2008-2012	0.015	0.003	0.021	0.003	0.05	16
		bottom	1995-2005	0.100	0.1		0.1	0.1	1
			2008-2012	0.009	0.003	0.010	0.003	0.0265	7.5
	Specific Conductance	0-2	1995-2005	42.750	44	13.754	13	96	148
			2008-2012	45.595	48	14.965	1	87	237
	Sulfate	0	1995-2005	3.095	3.095	1.025	2.37	3.82	2
		0-5	1995-2005	2.791	2.77	0.227	2.38	3.2	18
		1	2008-2012	2.728	2.61	0.960	1	4.09	15
		bottom	1995-2005	3.219	3.2575	0.115	3.015	3.36	10
			2008-2012	3.215	3.255	0.357	2.945	3.42	7
	Suspended Solids, Total	0	1995-2005	10.000	10		10	10	1
		1	1995-2005	3.143	3	1.773	2	7	7
			2008-2012	3.548	3	3.118	1	15	31
		bottom	1995-2005	10.000	10		10	10	1
			2008-2012	2.419	1	2.529	1	9.5	14.5
	Water Temperature	0-2	1995-2005	10.128	11.4	5.770	0.1	18.8	148
			2008-2012	10.911	12.785	5.306	0.1	17.9	238
	Zinc, Dissolved	0	1995-2005	1.200	1.2		1.2	1.2	1
		1	2008-2012	2.075	0.85	3.137	0.3	10	16
		bottom	1995-2005	2.850	2.85	3.041	0.7	5	2
			2008-2012	1.450	0.9	1.721	0.45	5.85	7.5
	Hardness as CaCO3	0	1995-2005	19.000	19	7.071	14	24	2
		0-5	1995-2005	18.714	19	2.360	16	23	7
		1	2008-2012	21.500	23	6.807	12	28	4
		bottom	1995-2005	20.643	20.5	1.922	18.5	22.5	4.5
			2008-2012	25.500	25.5	0.577	25	26	4
GR-DAM	Ammonia as N, Dissolved	0	1995-2005	0.015	0.015	0.006	0.003	0.03	34
		0-5	1995-2005	0.006	0.004	0.004	0.004	0.024	35
		1	1995-2005	0.005	0.005	0.000	0.005	0.005	2
			2008-2012	0.003	0.002	0.002	0.001	0.01	60
		bottom	1995-2005	0.011	0.0095	0.009	0.0035	0.044	35.5
			2008-2012	0.003	0.0015	0.004	0.001	0.015	34
	Arsenic, Dissolved	1	2008-2012	0.237	0.219	0.073	0.182	0.5	16
		bottom	2008-2012	0.233	0.2235	0.066	0.1805	0.378	7.5
	Arsenic, Total	0	1995-2005	0.800	0.8		0.8	0.8	1
		1	2008-2012	0.250	0.25	0.071	0.2	0.3	2
		bottom	1995-2005	0.800	0.8		0.8	0.8	1
			2008-2012	0.250	0.25		0.25	0.25	1
	Cadmium, Dissolved	0	1995-2005	1.609	1	2.247	0.02	8	30
		0-5	1995-2005	0.070	0.07		0.07	0.07	1
		1	2008-2012	0.017	0.01	0.022	0.005	0.1	17
		bottom	1995-2005	0.815	0.51	1.123	0.02	4.01	16
			2008-2012	0.013	0.01	0.012	0.0075	0.055	8
	Calcium	0	1995-2005	6.587	6.45	0.808	5.61	9.19	31
		0-5	1995-2005	7.134	7	0.401	6.62	7.68	7
		1	2008-2012	7.578	7.465	1.214	5.62	10.3	38
		bottom	1995-2005	7.494	7.435	0.294	7.165	8.23	18.5
			2008-2012	7.531	7.555	0.523	6.545	8.6	18.5
	Chloride	0	1995-2005	0.427	0.4	0.140	0.28	0.87	31
		0-5	1995-2005	0.439	0.45	0.031	0.38	0.5	17
		1	2008-2012	0.866	0.865	0.157	0.6	1.1	16
		bottom	1995-2005	0.637	0.63	0.099	0.46	0.81	24
			2008-2012	0.795	0.825	0.119	0.655	0.86	8
	Chlorophyll a	0	1995-2005	2.861	1.6	2.908	0.4	14.1	31
		0-5	1995-2005	4.121	3.75	2.591	1	8.9	14
			2008-2012	3.384	3.08	1.724	0.59	8.14	50
		1	1995-2005	4.180	3.4	1.401	2.9	5.8	5
			2008-2012	3.760	3	3.022	0.11	10.48	11
	Chlorophyll a, Corrected	0-5	1995-2005	5.220	4.1	2.411	2.7	7.9	5
			2008-2012	3.108	2.775	1.604	0.52	7.48	50
		1	1995-2005	4.175	4.1	1.539	2.8	5.7	4
			2008-2012	3.769	2.99	3.103	0.05	9.83	9

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
GR-DAM	Copper, Dissolved	0	1995-2005	9.100	10	2.746	1	10	30
		1	2008-2012	1.512	0.85	2.241	0.62	10	17
		bottom	1995-2005	5.079	5.4	2.360	0.9	5.4	14.5
			2008-2012	1.110	0.7875	1.301	0.6	5.415	8
	Dissolved Oxygen	0-2	1995-2005	7.839	7.35	1.473	5	14.2	242
			2008-2012	8.063	7.5	1.213	6.8	12.8	210
	Iron, Dissolved	0	1995-2005	10.903	6	10.041	3	41	31
		0-5	1995-2005	21.000	21		21	21	1
		1	2008-2012	19.989	18.3	12.140	4.8	66	52
		bottom	1995-2005	25.272	22.5	10.302	11	51	19
			2008-2012	25.682	23.65	9.805	15.95	68.85	26
	Iron, Total	1	2008-2012	50.163	37.45	36.732	16	130	16
		bottom	2008-2012	113.496	102.35	76.034	50.6	202	7.5
	Kjeldhal Nitrogen as N, Total	0	1995-2005	0.211	0.2	0.048	0.12	0.32	29
		0-5	1995-2005	0.203	0.19	0.063	0.08	0.48	32
		1	2008-2012	0.227	0.225	0.028	0.173	0.309	61
		bottom	1995-2005	0.179	0.18	0.038	0.07	0.3	60
			2008-2012	0.197	0.19475	0.035	0.154	0.328	32.5
	Lead, Dissolved	0	1995-2005	21.450	10	19.694	0.04	50	29
		1	2008-2012	0.042	0.036	0.031	0.004	0.1	12
		bottom	1995-2005	11.353	5.02	19.836	0.52	25.02	14
			2008-2012	0.026	0.014	0.028	0.005	0.1	11
	Magnesium	0	1995-2005	1.191	1.17	0.141	0.972	1.67	31
		0-5	1995-2005	1.236	1.24	0.057	1.16	1.31	7
		1	2008-2012	1.434	1.45	0.205	1.1	1.83	38
		bottom	1995-2005	1.362	1.3475	0.037	1.29	1.45	18.5
			2008-2012	1.433	1.4475	0.082	1.26	1.575	18.5
	Manganese, Dissolved	0	1995-2005	1.271	1	0.772	0.2	4	31
		0-5	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	2.034	1.295	2.120	0.1	11	52
		bottom	1995-2005	21.142	5.75	32.949	4.25	117.5	19
			2008-2012	14.227	2.425	32.248	0.65	102.85	26
	Mercury, Total	1	2008-2012	1.065	0.81	0.869	0.49	3.5	11
		bottom	2008-2012	1.012	1.005	0.243	0.715	1.295	5.5
	Nickel, Dissolved	0	1995-2005	12.100	10	5.904	1	20	30
		1	2008-2012	0.396	0.3	0.218	0.22	0.87	17
		bottom	1995-2005	6.804	5.5	5.685	1	10.5	14.5
			2008-2012	0.334	0.2775	0.142	0.225	0.69	8
	Nitrate plus Nitrite as N	0	1995-2005	0.044	0.05	0.020	0.005	0.09	34
		0-5	1995-2005	0.024	0.0155	0.019	0.008	0.068	12
		1	1995-2005	0.008	0.008	0.000	0.008	0.008	2
			2008-2012	0.006	0.003	0.010	0.001	0.052	55
		bottom	1995-2005	0.102	0.1	0.028	0.0555	0.1735	23.5
			2008-2012	0.053	0.0515	0.023	0.0165	0.102	37
	Nitrogen Total as N	0	1995-2005	0.202	0.2	0.008	0.19	0.21	5
		0-5	1995-2005	0.275	0.27	0.037	0.24	0.32	4
		1	1995-2005	0.180	0.18	0.000	0.18	0.18	2
			2008-2012	0.210	0.21	0.030	0.18	0.24	3
		bottom	1995-2005	0.283	0.28	0.019	0.26	0.31	5.5
			2008-2012	0.237	0.23	0.040	0.2	0.28	3
	pH	0-2	1995-2005	7.688	7.7	0.515	6.5	9	233
			2008-2012	7.811	7.8	0.314	6.4	8.53	212
	Phosphorus, Total	0	1995-2005	0.015	0.01	0.011	0.005	0.05	34
		0-5	1995-2005	0.012	0.012	0.005	0.003	0.031	37
		1	1995-2005	0.009	0.009	0.000	0.009	0.009	2
			2008-2012	0.014	0.013	0.005	0.009	0.031	56
		bottom	1995-2005	0.023	0.0205	0.006	0.0145	0.0425	36
			2008-2012	0.020	0.01925	0.005	0.013	0.0335	36.5
	Secchi Depth		1995-2005	3.818	3.7	1.120	1.6	7.95	71
			2008-2012	4.555	4.395	1.313	2.2	8.1	80
	Selenium, Dissolved	0	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	0.094	0.07	0.080	0.05	0.4	17
		bottom	1995-2005	0.200	0.2		0.2	0.2	1
			2008-2012	0.072	0.0675	0.021	0.06	0.13	8

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
GR-DAM	Silver, Dissolved	0	1995-2005	0.197	0.2	0.018	0.1	0.2	30
		1	2008-2012	0.012	0.003	0.018	0.003	0.05	17
		bottom	1995-2005	0.150	0.15	0.000	0.15	0.15	14.5
			2008-2012	0.006	0.003	0.008	0.003	0.0265	8
	Specific Conductance	0-2	1995-2005	54.897	53	13.033	29	117	239
			2008-2012	61.043	62	7.866	46	81	209
	Sulfate	0	1995-2005	2.601	2.51	0.546	1.68	4.53	31
		0-5	1995-2005	3.152	3.17	0.137	2.89	3.48	17
		1	2008-2012	3.672	3.835	0.647	2	4.59	16
		bottom	1995-2005	3.462	3.5025	0.210	3.02	3.715	24
			2008-2012	3.515	3.57	0.399	3.12	3.785	8
	Suspended Solids, Total	0	1995-2005	10.000	10		10	10	1
		1	1995-2005	3.429	4	1.134	2	5	7
			2008-2012	3.032	1	3.979	1	15	31
		bottom	1995-2005	10.000	10		10	10	1
			2008-2012	3.167	2	2.798	1	9.5	15
	Water Temperature	0-2	1995-2005	12.329	13.6	5.668	0.1	19.9	242
			2008-2012	12.270	14.55	6.063	0.1	20.6	212
	Zinc, Dissolved	0	1995-2005	5.363	3	3.413	1	10	30
		1	2008-2012	2.106	0.9	3.019	0.2	10	17
		bottom	1995-2005	4.293	3.1	2.912	1.2	7.5	15
			2008-2012	1.318	0.95	1.769	0.3	5.95	8
	Hardness as CaCO3	0	1995-2005	21.387	21	2.565	18	30	31
		0-5	1995-2005	23.000	23	1.414	21	25	7
		1	2008-2012	28.600	28	2.702	26	33	5
		bottom	1995-2005	24.350	24.25	1.027	23	26.5	18.5
			2008-2012	28.500	28.5	0.577	28	29	4
HFC-C50	Ammonia as N, Dissolved		1995-2005	0.015	0.01	0.015	0.002	0.09	74
			2008-2012	0.011	0.01	0.004	0.005	0.026	31
	Arsenic, Dissolved		1995-2005	0.177	0.2	0.060	0.09	0.4	52
			2008-2012	0.180	0.18	0.034	0.11	0.25	30
	Calcium		1995-2005	5.782	5.945	1.878	2.41	10.1	74
			2008-2012	6.248	7.1	2.201	2.14	8.92	31
	Chloride		1995-2005	1.656	1.19	1.475	0.42	9.5	52
			2008-2012	1.591	1.4	0.927	0.63	5.04	31
	Copper, Dissolved		1995-2005	3.460	2.5	2.742	0.5	11	62
			2008-2012	3.098	2.5	2.093	0.94	8.2	31
	Dissolved Oxygen		1995-2005	9.942	9.65	1.663	7	13.8	74
			2008-2012	10.319	10.2	1.436	7.5	13.5	31
	Iron, Dissolved		1995-2005	46.606	43.95	25.016	5	111	52
			2008-2012	49.374	36.4	37.030	19.7	198	31
	Kjeldhal Nitrogen as N, Total		1995-2005	0.242	0.23	0.061	0.12	0.43	74
			2008-2012	0.234	0.23	0.043	0.18	0.37	31
	Lead, Dissolved		1995-2005	0.201	0.071	0.206	0.04	0.522	74
			2008-2012	0.048	0.04	0.022	0.016	0.096	31
	Magnesium		1995-2005	1.157	1.2	0.349	0.475	2.28	74
			2008-2012	1.248	1.43	0.400	0.47	1.76	31
	Manganese, Dissolved		1995-2005	2.762	1.875	2.362	0.69	11.8	52
			2008-2012	2.872	2.7	1.672	0.7	7.14	31
	Mercury, Dissolved		1995-2005	0.163	0.0295	0.797	0.006	5.5	48
			2008-2012	1.588	1.76	0.649	0.81	2.31	5
	Mercury, Total		2008-2012	2.525	1.72	2.070	1.07	5.59	4
	Nickel, Dissolved		1995-2005	0.315	0.33	0.119	0.08	0.64	52
			2008-2012	0.302	0.28	0.133	0.07	0.68	31
	Nitrate plus Nitrite as N		1995-2005	0.078	0.0555	0.082	0.005	0.607	74
			2008-2012	0.042	0.035	0.034	0.004	0.129	31
	pH		1995-2005	7.870	7.8	0.373	7.1	9	73
			2008-2012	7.871	7.9	0.391	7.1	8.7	31
	Phosphorus, Total		1995-2005	0.019	0.018	0.009	0.004	0.059	74
			2008-2012	0.021	0.017	0.009	0.01	0.041	31
	Selenium, Dissolved		1995-2005	0.150	0.2	0.087	0.05	0.2	3
	Silver, Dissolved		1995-2005	0.256	0.1	0.344	0.1	1	52
			2008-2012	0.018	0.005	0.021	0.003	0.05	31

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
HFC-C50	Specific Conductance		1995-2005	49.187	50	15.276	21	100	75
			2008-2012	56.065	61	17.363	23	81	31
	Sulfate		1995-2005	2.934	2.745	0.962	1.42	6.65	68
			2008-2012	3.246	3.54	0.980	1.48	4.88	31
	Water Temperature		1995-2005	10.207	10.5	6.245	0	21.5	75
			2008-2012	9.084	8.6	5.607	1.7	20.2	31
	Hardness as CaCO3		1995-2005	19.191	20	6.081	7.96	32.1	74
			2008-2012	20.777	24	7.132	7	29	31
HT-SOL	Ammonia as N, Dissolved	0	1995-2005	0.020	0.02	0.016	0.002	0.08	28
		1	2008-2012	0.004	0.002	0.003	0.001	0.012	60
		bottom	1995-2005	0.016	0.0125	0.011	0.0035	0.043	14
			2008-2012	0.008	0.006	0.010	0.001	0.0345	35.5
	Arsenic, Dissolved	1	2008-2012	0.315	0.284	0.097	0.244	0.609	17
		bottom	2008-2012	0.346	0.30125	0.127	0.247	0.577	8
	Arsenic, Total	0	1995-2005	0.800	0.8		0.8	0.8	1
		1	2008-2012	0.640	0.64		0.64	0.64	1
		bottom	1995-2005	0.800	0.8		0.8	0.8	1
			2008-2012	0.660	0.66		0.66	0.66	1
	Cadmium, Dissolved	0	1995-2005	1.213	1	2.097	0.02	8	27
		1	2008-2012	0.016	0.01	0.022	0.005	0.1	17
		bottom	1995-2005	0.624	0.51	1.072	0.02	4.01	13.5
			2008-2012	0.014	0.01	0.013	0.0075	0.055	8
	Calcium	0	1995-2005	8.327	8.3	1.253	6.1	11.1	26
		1	2008-2012	8.606	8.91	0.806	7.13	9.7	33
		bottom	1995-2005	8.924	8.875	0.921	8.265	10.285	13
			2008-2012	8.577	8.5445	0.628	7.465	9.42	16
	Chloride	0	1995-2005	1.070	0.955	0.332	0.7	1.87	24
		1	2008-2012	1.696	1.56	0.453	1	2.8	16
		bottom	1995-2005	1.254	1.2	0.284	1.05	1.62	12
			2008-2012	1.575	1.555	0.232	1.25	2.06	7.5
	Chlorophyll a	0	1995-2005	1.979	1.85	1.385	0.2	5.8	24
		0-5	1995-2005	3.633	3.7	1.481	1.3	5.6	6
			2008-2012	3.288	2.56	2.370	0.51	12.96	52
		1	1995-2005	3.600	3.95	1.543	1.2	5.3	6
			2008-2012	2.609	2.75	1.174	1.01	4.34	9
	Chlorophyll a, Corrected	0-5	1995-2005	3.683	3.55	1.379	1.7	5.9	6
			2008-2012	3.049	2.43	2.236	0.48	12.15	52
		1	1995-2005	3.800	3.95	1.307	1.7	5.2	6
			2008-2012	2.378	2.46	1.101	0.83	4.01	9
	Copper, Dissolved	0	1995-2005	7.296	10	3.455	2.1	10	25
		1	2008-2012	2.159	1.645	2.184	0.26	10	16
		bottom	1995-2005	7.532	10	3.384	2.2	10	25
			2008-2012	2.000	1.725	1.369	0.69	5.825	7.5
	Dissolved Oxygen	0-2	1995-2005	7.911	7.67	0.966	6.1	9.9	104
			2008-2012	8.355	8.07	1.298	6.5	15.02	146
	Iron, Dissolved	0	1995-2005	15.852	10	20.255	4	110	27
		1	2008-2012	34.892	21.2	26.869	6.51	103	47
		bottom	1995-2005	25.560	27	13.381	7.5	58	17
			2008-2012	49.477	49.3	28.272	14.1	118.95	23
	Iron, Total	1	2008-2012	88.553	83	39.271	32.2	176	17
		bottom	2008-2012	134.804	128.5	43.875	76.65	219	8
	Kjeldhal Nitrogen as N, Total	0	1995-2005	0.222	0.21	0.041	0.15	0.32	23
		1	2008-2012	0.212	0.2115	0.035	0.143	0.337	64
		bottom	1995-2005	0.233	0.2	0.110	0.15	0.7	23
			2008-2012	0.221	0.2135	0.051	0.165	0.3355	34
	Lead, Dissolved	0	1995-2005	16.980	10	20.885	0.04	50	26
		1	2008-2012	0.043	0.0365	0.028	0.011	0.1	16
		bottom	1995-2005	8.937	5.11	21.026	0.13	25.11	13
			2008-2012	0.039	0.041	0.015	0.019	0.0655	7.5
	Magnesium	0	1995-2005	1.390	1.395	0.205	1	1.96	26
		1	2008-2012	1.538	1.55	0.157	1.25	1.81	33
		bottom	1995-2005	1.502	1.49	0.180	1.38	1.775	13
			2008-2012	1.543	1.55	0.101	1.34	1.665	16

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
HT-SOL	Manganese, Dissolved	0	1995-2005	2.500	1.5	2.140	0.3	9	27
		1	2008-2012	2.737	2.58	2.098	0.17	10	46
		bottom	1995-2005	9.765	5.875	9.738	1.45	33.95	16.5
			2008-2012	16.840	8.635	19.914	1.305	62.25	23
	Mercury, Total	1	2008-2012	0.714	0.645	0.205	0.48	1.02	12
		bottom	2008-2012	0.909	0.8225	0.489	0.515	1.735	4.5
	Nickel, Dissolved	0	1995-2005	9.034	10	7.953	0.21	20	26
		1	2008-2012	0.353	0.29	0.161	0.23	0.87	17
		bottom	1995-2005	5.180	5.5	7.936	0.595	10.5	13
			2008-2012	0.380	0.3525	0.085	0.295	0.58	8
	Nitrate plus Nitrite as N	0	1995-2005	0.049	0.05	0.026	0.008	0.122	28
		1	2008-2012	0.015	0.006	0.018	0.001	0.083	56
		bottom	1995-2005	0.129	0.1165	0.051	0.0675	0.208	14
			2008-2012	0.061	0.0655	0.040	0.0055	0.1365	38
	Nitrogen Total as N	0	1995-2005	0.252	0.23	0.061	0.2	0.35	5
		bottom	1995-2005	0.298	0.2875	0.028	0.28	0.325	2.5
	pH	0-2	1995-2005	7.729	7.7	0.321	7.3	8.63	97
			2008-2012	7.797	7.8	0.200	7.26	8.28	143
	Phosphorus, Total	0	1995-2005	0.016	0.011	0.010	0.004	0.05	28
		1	2008-2012	0.012	0.012	0.003	0.006	0.019	59
		bottom	1995-2005	0.017	0.0155	0.008	0.008	0.032	14
			2008-2012	0.018	0.01675	0.006	0.0095	0.0305	35
	Secchi Depth		1995-2005	2.614	2.4	0.877	1.1	4.5	37
			2008-2012	3.376	3.19	0.814	2.22	5.69	59
	Selenium, Dissolved	0	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	0.079	0.08	0.021	0.03	0.12	17
		bottom	1995-2005	0.200	0.2		0.2	0.2	1
			2008-2012	0.079	0.075	0.022	0.05	0.135	8
	Silver, Dissolved	0	1995-2005	0.167	0.2	0.048	0.06	0.2	26
		1	2008-2012	0.009	0.003	0.016	0.003	0.05	17
		bottom	1995-2005	0.135	0.15	0.046	0.08	0.15	13
			2008-2012	0.007	0.003	0.009	0.003	0.0265	8
	Specific Conductance	0-2	1995-2005	64.207	63	11.488	46	95	107
			2008-2012	67.356	67	5.042	57	78	149
	Sulfate	0	1995-2005	3.266	3.27	0.837	2.22	5.32	24
		1	2008-2012	3.571	3.49	0.600	2.85	4.41	16
		bottom	1995-2005	3.576	3.54	0.758	3.015	4.575	12
			2008-2012	3.381	3.4625	0.268	2.905	3.7	7.5
	Suspended Solids, Total	0	1995-2005	10.000	10		10	10	1
		1	1995-2005	2.571	2	0.787	2	4	7
			2008-2012	3.231	3	3.050	1	15	26
		bottom	1995-2005	10.000	10		10	10	1
			2008-2012	2.698	2.5	2.330	1	9	12.5
	Water Temperature	0-2	1995-2005	16.639	15.39	4.057	10.3	23.04	106
			2008-2012	14.972	16.27	6.155	3.2	23.97	149
	Zinc, Dissolved	0	1995-2005	4.981	3	3.800	0.3	10	26
		1	2008-2012	1.953	0.8	2.513	0.4	10	17
		bottom	1995-2005	5.430	4.5	2.782	2.65	9.5	13.5
			2008-2012	1.413	0.875	1.376	0.55	5.5	8
	Hardness as CaCO3	0	1995-2005	26.577	27	4.022	19	36	26
		1	2008-2012	28.000	29	1.732	26	29	3
		bottom	1995-2005	28.380	28	2.990	26.5	33	13
			2008-2012	28.667	29	1.528	27	30	3
NI-GLU	Ammonia as N, Dissolved		1995-2005	0.014	0.005	0.019	0.002	0.1	88
			2008-2012	0.003	0.002	0.002	0.001	0.01	93
	Arsenic, Dissolved		2008-2012	0.085	0.086	0.024	0.046	0.124	7
	Arsenic, Total		2008-2012	0.100	0.1		0.1	0.1	1
	Cadmium, Dissolved		2008-2012	0.010	0.01	0.000	0.01	0.01	8
	Calcium		1995-2005	2.122	2	0.578	1.3	5.3	87
			2008-2012	2.162	2.15	0.634	1.01	3.74	50
	Chloride		1995-2005	0.396	0.21	0.367	0.06	1.3	93
			2008-2012	0.206	0.17	0.123	0.018	0.53	36
	Copper, Dissolved		1995-2005	1.139	1	0.921	0.48	5	22
			2008-2012	0.920	0.86	0.313	0.55	1.73	21

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
NI-GLU	Dissolved Oxygen		1995-2005	9.496	9.5	1.229	6.36	12.1	85
			2008-2012	9.811	10.08	1.057	7.67	11.38	73
	Iron, Dissolved		1995-2005	89.143	63	56.129	40	240	21
			2008-2012	122.848	75.6	139.076	34.8	545	21
	Iron, Total		1995-2005	179.095	120	152.018	64	710	21
			2008-2012	188.963	128	162.673	79.9	706	19
	Kjeldhal Nitrogen as N, Total		1995-2005	0.178	0.11	0.246	0.04	1.8	53
			2008-2012	0.157	0.133	0.072	0.057	0.333	93
	Lead, Dissolved		2008-2012	0.042	0.0285	0.040	0.014	0.137	8
	Magnesium		1995-2005	0.396	0.374	0.116	0.227	0.69	87
			2008-2012	0.445	0.4055	0.173	0.217	0.861	50
	Manganese, Dissolved		1995-2005	4.143	5	1.663	1	7.9	21
			2008-2012	4.366	4.7	1.596	1.1	6.8	21
	Nickel, Dissolved		2008-2012	0.247	0.25	0.071	0.13	0.35	9
	Nitrate plus Nitrite as N		1995-2005	0.107	0.093	0.057	0.042	0.385	60
			2008-2012	0.060	0.041	0.045	0.006	0.161	90
	Nitrogen Total as N		1995-2005	0.259	0.26	0.079	0.16	0.43	17
			2008-2012	0.263	0.21	0.133	0.13	0.47	7
	pH		1995-2005	7.474	7.295	0.548	6.67	8.8	32
			2008-2012	7.296	7.3	0.276	6.65	8.7	72
	Phosphorus, Total		1995-2005	0.012	0.008	0.015	0.002	0.13	88
			2008-2012	0.011	0.008	0.010	0.002	0.085	101
	Selenium, Dissolved		1995-2005	0.024	0.0004	0.035	0.0004	0.083	10
			2008-2012	0.060	0.06	0.015	0.04	0.09	9
	Silver, Dissolved		1995-2005	0.096	0.1	0.075	0.016	0.2	21
			2008-2012	0.004	0.003	0.003	0.003	0.011	8
	Specific Conductance		1995-2005	19.449	19	7.226	8	55	88
			2008-2012	21.306	21	6.310	10	39	108
	Sulfate		1995-2005	1.884	1.75	1.248	1	11	87
			2008-2012	1.394	1.4	0.400	0.77	2.26	37
	Suspended Solids, Total		1995-2005	3.890	4.9	3.226	0.9	14	30
			2008-2012	3.879	1	5.205	1	20	66
	Water Temperature		1995-2005	5.871	4.95	4.551	0	18.9	90
			2008-2012	5.429	4.8	4.670	0	15.4	108
	Zinc, Dissolved		1995-2005	5.677	4.4	6.248	1.4	26	13
			2008-2012	1.267	1.2	0.458	0.7	1.9	9
	Hardness as CaCO3		1995-2005	6.780	6.475	1.598	4.37	10.1	72
			2008-2012	7.056	7	2.146	4	12	31
OLY	Ammonia as N, Dissolved		1995-2005	0.019	0.0145	0.015	0.002	0.07	90
			2008-2012	0.008	0.004	0.008	0.001	0.034	83
	Arsenic, Dissolved		1995-2005	0.174	0.2	0.055	0.1	0.3	52
			2008-2012	0.180	0.18	0.036	0.1	0.25	31
	Cadmium, Dissolved		1995-2005	2.500	1	2.338	1	8	16
			2008-2012	0.015	0.01	0.019	0.008	0.131	40
	Calcium		1995-2005	5.275	5.23	1.941	1.9	9.92	90
			2008-2012	5.544	6.05	2.197	1.84	9.08	48
	Chloride		1995-2005	1.401	0.945	1.705	0.3	10.4	68
			2008-2012	1.120	1.01	0.587	0.49	4.05	47
	Copper, Dissolved		1995-2005	2.454	0.8	3.543	0.5	10	90
			2008-2012	1.648	1.15	1.002	0.5	4.3	48
	Dissolved Oxygen		1995-2005	9.198	9.3	1.512	6.4	13.5	89
			2008-2012	8.911	9	1.016	7.1	10.7	46
	Iron, Dissolved		1995-2005	62.721	59.5	33.100	11	149	68
			2008-2012	55.635	49.5	28.892	21	154	48
	Iron, Total		2008-2012	134.000	134		134	134	1
	Kjeldhal Nitrogen as N, Total		1995-2005	0.228	0.21	0.073	0.04	0.48	90
			2008-2012	0.233	0.225	0.055	0.135	0.421	73
	Lead, Dissolved		1995-2005	6.522	0.05	15.214	0.04	50	68
			2008-2012	0.040	0.03	0.045	0.008	0.32	47
	Magnesium		1995-2005	1.077	1.1	0.377	0.4	2.6	90
			2008-2012	1.131	1.21	0.393	0.411	1.68	48
	Manganese, Dissolved		1995-2005	4.350	3	4.382	0.2	28.6	68
			2008-2012	3.560	2.88	2.746	0.4	11.1	48

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
OLY	Mercury, Dissolved		1995-2005	0.233	0.05	0.785	0.006	5.4	54
			2008-2012	3.443	3.4	2.383	0.99	8.02	7
	Nickel, Dissolved		1995-2005	3.606	0.32	6.489	0.03	20	68
			2008-2012	0.271	0.26	0.091	0.13	0.52	47
	Nitrate plus Nitrite as N		1995-2005	0.070	0.0585	0.050	0.005	0.288	90
			2008-2012	0.036	0.038	0.019	0.006	0.092	76
	pH		1995-2005	7.809	7.8	0.392	7	9.1	89
			2008-2012	7.594	7.6	0.253	7.1	8.5	47
	Phosphorus, Total		1995-2005	0.017	0.015	0.009	0.0019	0.06	90
			2008-2012	0.019	0.018	0.008	0.011	0.062	75
	Selenium, Dissolved		1995-2005	0.165	0.2	0.070	0.06	0.2	4
			2008-2012	0.068	0.075	0.019	0.04	0.09	6
	Silver, Dissolved		1995-2005	0.600	0.1	0.835	0.1	3.5	68
			2008-2012	0.014	0.005	0.018	0.003	0.05	47
	Specific Conductance		1995-2005	44.800	44	16.259	18	107	90
			2008-2012	49.404	52	17.017	19	71	47
	Sulfate		1995-2005	2.633	2.405	0.998	0.9	6.65	84
			2008-2012	2.881	3.1	0.941	1.03	4.11	47
	Suspended Solids, Total		2008-2012	11.366	15	5.113	2	19	41
	Water Temperature		1995-2005	8.458	7.95	5.629	0	19	90
			2008-2012	8.043	7.2	5.301	1.1	17.1	47
	Zinc, Dissolved		1995-2005	6.375	5.5	3.442	3	10	16
			2008-2012	1.148	1.1	0.491	0.4	2.8	40
	Hardness as CaCO3		1995-2005	17.600	18	6.337	6	35	90
			2008-2012	18.851	21.75	7.704	6	30	38
SM-DAM	Ammonia as N, Dissolved	0	1995-2005	0.019	0.015	0.018	0.002	0.09	35
		0-bottom	1995-2005	0.005	0.004	0.002	0.004	0.012	34
		1	2008-2012	0.003	0.002	0.003	0.001	0.016	62
		bottom	1995-2005	0.013	0.0125	0.006	0.0035	0.0355	17
			2008-2012	0.004	0.002	0.006	0.001	0.034	38
	Arsenic, Dissolved	1	2008-2012	0.237	0.2165	0.074	0.177	0.5	16
		bottom	2008-2012	0.210	0.207825	0.013	0.1965	0.226	8
	Arsenic, Total	0	1995-2005	0.800	0.8		0.8	0.8	1
		1	2008-2012	0.250	0.25	0.071	0.2	0.3	2
		bottom	1995-2005	0.800	0.8		0.8	0.8	1
			2008-2012	0.250	0.25		0.25	0.25	1
	Cadmium, Dissolved	0	1995-2005	1.621	1	2.211	0.02	8	31
		0-bottom	1995-2005	0.070	0.07		0.07	0.07	1
		1	2008-2012	0.016	0.01	0.022	0.005	0.1	17
		bottom	1995-2005	0.896	0.5125	1.140	0.02	4.015	15.5
			2008-2012	0.010	0.01	0.002	0.0075	0.015	8.5
	Calcium	0	1995-2005	6.143	6.39	1.155	3.6	8.46	30
		0-bottom	1995-2005	7.275	7.24	0.354	6.82	7.7	6
		1	2008-2012	7.128	7.03	1.386	4.17	9.07	38
		bottom	1995-2005	7.189	7.3	0.629	6.065	7.965	15
			2008-2012	7.110	7.155	0.753	5.66	8.2	20.5
	Chloride	0	1995-2005	0.381	0.35	0.155	0.2	0.87	29
		0-bottom	1995-2005	0.439	0.44	0.035	0.35	0.52	17
		1	2008-2012	0.809	0.845	0.211	0.43	1.1	16
		bottom	1995-2005	0.578	0.5875	0.074	0.44	0.665	14.5
			2008-2012	0.742	0.765	0.122	0.56	0.88	8
	Chlorophyll a	0	1995-2005	4.007	2.7	4.241	0.2	17.6	30
		0-5	1995-2005	10.660	5.9	9.838	3.9	27.8	5
			2008-2012	4.179	3.54	2.369	0.96	10.82	49
		0-bottom	1995-2005	3.340	2.9	2.248	0.8	8.6	25
		1	1995-2005	12.460	7.1	13.316	3.9	36	5
			2008-2012	3.829	3.35	1.701	1.74	6.82	11
	Chlorophyll a, Corrected	0-5	1995-2005	10.240	5.6	9.532	4.3	26.9	5
			2008-2012	3.872	3.31	2.191	0.91	10.01	49
		1	1995-2005	12.020	6.6	13.178	4.2	35.4	5
			2008-2012	3.601	3.1	1.797	1.5	6.3	9
	Copper, Dissolved	0	1995-2005	9.369	10	2.360	0.7	10	29
		1	2008-2012	1.524	0.98	2.212	0.56	10	17
		bottom	1995-2005	4.979	5.3	2.360	0.8	5.3	14.5
			2008-2012	0.989	1.035	0.334	0.625	1.67	8.5

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
SM-DAM	Dissolved Oxygen	0-2	1995-2005	7.714	7.8	1.053	4.7	12.2	237
			2008-2012	7.622	7.81	1.027	5.04	9.64	408
	Iron, Dissolved	0	1995-2005	62.226	45	47.100	13	190	31
		0-bottom	1995-2005	28.000	28		28	28	1
		1	2008-2012	55.046	32.55	52.790	8	246	52
		bottom	1995-2005	76.944	46.25	69.143	14.5	240	18.5
			2008-2012	47.385	33.65	40.588	14.45	194.1	27.5
	Iron, Total	1	2008-2012	148.638	88.55	163.967	33.2	636	16
		bottom	2008-2012	125.238	89.6	87.321	65.55	356	8
	Kjeldhal Nitrogen as N, Total	0	1995-2005	0.229	0.2	0.062	0.14	0.4	29
		0-bottom	1995-2005	0.213	0.21	0.046	0.12	0.31	32
		1	2008-2012	0.273	0.246	0.089	0.168	0.522	63
		bottom	1995-2005	0.235	0.2	0.058	0.16	0.42	28
			2008-2012	0.249	0.2415	0.052	0.17	0.377	35
	Lead, Dissolved	0	1995-2005	21.068	10	19.464	0.04	50	30
		1	2008-2012	0.044	0.0425	0.032	0.004	0.1	12
		bottom	1995-2005	11.127	5.02	19.612	0.52	25.02	14.5
			2008-2012	0.032	0.04	0.018	0.004	0.064	11
	Magnesium	0	1995-2005	1.223	1.255	0.199	0.71	1.53	30
		0-bottom	1995-2005	1.298	1.305	0.077	1.2	1.39	6
		1	2008-2012	1.408	1.36	0.216	0.94	1.72	38
		bottom	1995-2005	1.365	1.3625	0.096	1.175	1.515	15
			2008-2012	1.391	1.44	0.117	1.16	1.545	20.5
	Manganese, Dissolved	0	1995-2005	2.910	1.7	3.857	0.5	21.7	31
		0-bottom	1995-2005	1.500	1.5		1.5	1.5	1
		1	2008-2012	5.073	3.525	5.255	0.2	25.9	52
		bottom	1995-2005	20.812	6.95	39.677	0.85	136.65	19
			2008-2012	4.145	3.3325	3.398	0.65	14.885	27.5
	Mercury, Total	1	2008-2012	1.422	0.99	1.024	0.57	4.01	11
		bottom	2008-2012	1.296	1.215	0.677	0.59	2.4	6
	Nickel, Dissolved	0	1995-2005	12.100	10	5.904	1	20	30
		1	2008-2012	0.399	0.32	0.216	0.21	0.94	17
		bottom	1995-2005	6.786	5.5	5.699	1	10.5	14.5
			2008-2012	0.318	0.275	0.119	0.21	0.58	8.5
	Nitrate plus Nitrite as N	0	1995-2005	0.047	0.05	0.019	0.005	0.1	35
		0-bottom	1995-2005	0.028	0.011	0.038	0.006	0.133	13
		1	2008-2012	0.013	0.0075	0.014	0.001	0.052	62
		bottom	1995-2005	0.040	0.041	0.016	0.0065	0.0665	17
			2008-2012	0.013	0.011	0.011	0.001	0.0385	39.5
	Nitrogen Total as N	0	1995-2005	0.267	0.25	0.072	0.19	0.39	6
		0-bottom	1995-2005	0.460	0.27	0.285	0.24	0.82	5
		1	2008-2012	0.213	0.21	0.006	0.21	0.22	3
		bottom	1995-2005	0.268	0.265	0.035	0.245	0.29	3
			2008-2012	0.210	0.21	0.000	0.21	0.21	3
	pH	0-2	1995-2005	7.519	7.5	0.515	6.5	9.3	225
			2008-2012	7.761	7.67	0.576	6.8	9.38	407
	Phosphorus, Total	0	1995-2005	0.017	0.01	0.011	0.01	0.05	35
		0-bottom	1995-2005	0.015	0.0145	0.005	0.008	0.028	36
		1	2008-2012	0.017	0.016	0.005	0.01	0.036	65
		bottom	1995-2005	0.018	0.015	0.008	0.0115	0.0355	17
			2008-2012	0.019	0.0175	0.004	0.0125	0.0295	38.5
	Secchi Depth		1995-2005	2.316	2.3	0.605	1	4	73
			2008-2012	2.652	2.62	0.781	0.6	5.9	501
	Selenium, Dissolved	0	1995-2005	0.200	0.2		0.2	0.2	1
		1	2008-2012	0.075	0.07	0.029	0.05	0.17	17
		bottom	1995-2005	0.200	0.2		0.2	0.2	1
			2008-2012	0.068	0.06	0.019	0.055	0.125	8.5
	Silver, Dissolved	0	1995-2005	0.197	0.2	0.018	0.1	0.2	30
		1	2008-2012	0.011	0.003	0.018	0.003	0.05	17
		bottom	1995-2005	0.150	0.15	0.000	0.15	0.15	14.5
			2008-2012	0.006	0.003	0.009	0.003	0.0265	8.5
	Specific Conductance	0-2	1995-2005	51.382	51	11.790	21	101	234
			2008-2012	57.163	58	11.937	32	73	406

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
SM-DAM	Sulfate	0	1995-2005	2.786	2.73	0.510	1.8	4.12	29
		0-bottom	1995-2005	3.228	3.2	0.095	3.05	3.39	17
		1	2008-2012	3.649	3.73	0.447	2.87	4.27	15
		bottom	1995-2005	3.396	3.38	0.214	3.07	3.82	14.5
			2008-2012	3.490	3.5175	0.263	3.01	3.82	8
	Suspended Solids, Total	0	1995-2005	10.000	10		10	10	1
		1	1995-2005	5.857	4	3.532	3	13	7
			2008-2012	4.367	3	3.917	1	15	30
		bottom	1995-2005	10.000	10		10	10	1
			2008-2012	3.582	3	2.343	1.5	9.5	17
	Water Temperature	0-2	1995-2005	10.976	10.8	4.699	1	19.7	237
			2008-2012	12.317	12.45	4.715	0.8	19.87	410
	Zinc, Dissolved	0	1995-2005	4.903	3	3.444	1	10	30
		1	2008-2012	2.912	1.2	3.791	0.3	11.8	17
		bottom	1995-2005	4.436	3.15	2.973	1.3	8	15
			2008-2012	1.263	1	1.234	0.25	3.9	8.5
	Hardness as CaCO3	0	1995-2005	20.333	21	3.689	12	27	30
		0-bottom	1995-2005	23.667	24	1.366	22	25	6
		1	2008-2012	25.800	28	4.970	17	29	5
		bottom	1995-2005	23.446	23.75	1.907	20	26	15
			2008-2012	26.000	28	5.050	17	29	5
ST-GRU	Ammonia as N, Dissolved		1995-2005	0.008	0.005	0.005	0.004	0.022	21
			2008-2012	0.005	0.004	0.005	0.001	0.025	77
	Arsenic, Dissolved		2008-2012	0.843	0.774	0.183	0.704	1.05	3
	Arsenic, Total		2008-2012	1.200	1.2		1.2	1.2	1
	Cadmium, Dissolved		2008-2012	0.015	0.01	0.007	0.01	0.03	13
	Calcium		1995-2005	25.549	24.3	10.154	6.16	42.4	15
			2008-2012	19.558	18.05	8.515	7.1	35.7	20
	Chloride		1995-2005	0.658	0.49	0.382	0.07	1.6	21
			2008-2012	0.892	0.88	0.377	0.5	1.73	13
	Copper, Dissolved		2008-2012	0.741	0.76	0.289	0.3	1.3	20
	Dissolved Oxygen		1995-2005	8.116	8.1	1.359	6	11.6	19
			2008-2012	9.315	9.31	1.178	7.2	11.84	52
	Iron, Dissolved		2008-2012	478.250	502	281.833	68	980	20
	Iron, Total		2008-2012	1502.667	1230	780.140	869	3180	9
	Kjeldhal Nitrogen as N, Total		1995-2005	0.425	0.39	0.184	0.2	0.99	17
			2008-2012	0.483	0.414	0.428	0.186	2.874	75
	Lead, Dissolved		2008-2012	0.061	0.04	0.038	0.017	0.154	13
	Magnesium		1995-2005	2.240	2.25	0.664	0.816	3.39	15
			2008-2012	1.891	1.83	0.572	0.939	2.84	20
	Manganese, Dissolved		2008-2012	51.605	30.45	54.294	13.4	228	20
	Nickel, Dissolved		2008-2012	0.493	0.495	0.148	0.22	0.86	14
	Nitrate plus Nitrite as N		1995-2005	0.031	0.0135	0.046	0.009	0.173	12
			2008-2012	0.016	0.008	0.016	0.001	0.063	67
	Nitrogen Total as N		1995-2005	0.260	0.24	0.081	0.19	0.37	4
			2008-2012	2.430	2.43		2.43	2.43	1
	pH		1995-2005	8.041	8.1	0.446	7	8.6	10
			2008-2012	7.944	8.005	0.321	7.34	8.7	52
	Phosphorus, Total		1995-2005	0.104	0.103	0.022	0.074	0.163	21
			2008-2012	0.145	0.118	0.130	0.073	0.911	68
	Selenium, Dissolved		1995-2005	0.000	0.0004	0.000	0.0004	0.0004	6
			2008-2012	0.091	0.085	0.024	0.06	0.14	14
	Silver, Dissolved		2008-2012	0.019	0.004	0.023	0.003	0.05	12
	Specific Conductance		1995-2005	167.750	159.5	55.449	47	261	20
			2008-2012	137.635	134	46.394	59	242	52
	Sulfate		1995-2005	4.565	4.08	1.612	3.06	8.28	15
			2008-2012	4.561	4.06	1.462	2.98	7.23	14
	Suspended Solids, Total		1995-2005	26.314	20	21.938	7.2	74	7
			2008-2012	30.905	15	77.604	2	508	42
	Water Temperature		1995-2005	11.940	12.45	5.930	0.1	19.5	20
			2008-2012	8.326	7.64	6.519	0.01	21	52
	Zinc, Dissolved		2008-2012	1.643	1.35	0.922	0.4	3.8	14
	Hardness as CaCO3		1995-2005	73.000	69.5	28.064	18.7	120	15
			2008-2012	58.427	55	23.561	22	91	11

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
WC-3	Ammonia as N, Dissolved		1995-2005	0.056	0.04	0.053	0.02	0.25	25
	Arsenic, Dissolved		1995-2005	5.000	5	0.000	5	5	3
	Arsenic, Total		1995-2005	5.000	5	0.000	5	5	3
	Cadmium, Dissolved		1995-2005	0.200	0.2	0.000	0.2	0.2	3
	Calcium		1995-2005	25.250	26	7.472	13	45	28
	Chloride		1995-2005	2.614	2.1	1.814	0.8	7.4	28
	Copper, Dissolved		1995-2005	1.406	1	0.903	0.64	5	26
	Dissolved Oxygen		1995-2005	9.181	8.8	1.968	6.1	15.57	25
	Iron, Dissolved		1995-2005	100.885	100	32.339	30	180	26
	Iron, Total		1995-2005	752.385	710	337.893	62	1600	26
	Kjeldhal Nitrogen as N, Total		1995-2005	0.507	0.52	0.150	0.35	0.65	3
	Lead, Dissolved		1995-2005	1.000	1	0.000	1	1	3
	Magnesium		1995-2005	3.046	3.1	0.579	2.1	4.6	28
	Manganese, Dissolved		1995-2005	76.192	64	43.197	6	180	26
	Mercury, Dissolved		1995-2005	0.100	0.1	0.000	0.1	0.1	3
	Mercury, Total		1995-2005	0.100	0.1	0.000	0.1	0.1	3
	Nickel, Dissolved		1995-2005	20.000	20	0.000	20	20	3
	Nitrate plus Nitrite as N		1995-2005	0.221	0.09	0.248	0.025	0.85	25
	pH		1995-2005	7.670	7.81	0.539	6.59	8.81	27
	Phosphorus, Total		1995-2005	0.152	0.13	0.111	0.02	0.45	27
	Selenium, Dissolved		1995-2005	2.567	2.66	2.667	0.03	5	6
	Silver, Dissolved		1995-2005	0.107	0.1	0.077	0.016	0.2	26
	Specific Conductance		1995-2005	141.821	138	35.194	99	240	28
	Sulfate		1995-2005	7.293	6.6	2.899	3.3	13	28
	Suspended Solids, Total		1995-2005	19.314	18	11.913	5	46	28
	Water Temperature		1995-2005	10.141	10.9	3.570	1	17.9	29
	Zinc, Dissolved		1995-2005	7.871	5	8.896	1.4	36	14
	Hardness as CaCO3		1995-2005	65.750	62	16.305	44	94	12
WC-Pump	Ammonia as N, Dissolved		1995-2005	0.044	0.029	0.027	0.02	0.1	12
			2008-2012	0.003	0.002	0.003	0.001	0.014	52
	Arsenic, Dissolved		1995-2005	2.100	0.8	2.516	0.5	5	3
			2008-2012	0.399	0.445	0.118	0.22	0.5	7
	Arsenic, Total		1995-2005	5.000	5		5	5	1
			2008-2012	0.500	0.5	0.000	0.5	0.5	2
	Cadmium, Dissolved		1995-2005	0.133	0.1	0.058	0.1	0.2	3
			2008-2012	0.034	0.01	0.045	0.005	0.1	7
	Calcium		1995-2005	10.691	10.45	2.497	6.7	16	22
			2008-2012	12.476	12	2.886	8.39	17.5	44
	Chloride		1995-2005	1.360	1	0.724	0.5	3	23
			2008-2012	1.098	1	0.462	0.45	2	35
	Copper, Dissolved		1995-2005	1.469	0.965	2.134	0.5	10.8	22
			2008-2012	0.755	0.675	0.438	0.34	3.2	44
	Dissolved Oxygen		1995-2005	8.442	8.285	1.480	6.13	12.11	22
			2008-2012	9.104	9.125	0.662	7.87	10.33	44
	Iron, Dissolved		1995-2005	153.182	110	130.215	50	680	22
			2008-2012	99.327	90	52.106	13.9	327	44
	Iron, Total		1995-2005	506.818	455	203.151	170	900	22
			2008-2012	421.761	370	272.374	49.2	1300	44
	Kjeldhal Nitrogen as N, Total		2008-2012	0.199	0.1985	0.054	0.082	0.374	58
	Lead, Dissolved		1995-2005	0.500	0.4	0.458	0.1	1	3
			2008-2012	0.052	0.038	0.034	0.021	0.1	7
	Magnesium		1995-2005	2.259	2	0.544	1.4	3.6	22
			2008-2012	2.656	2.54	0.647	1.7	3.82	44
	Manganese, Dissolved		1995-2005	20.632	15	14.344	5	49	22
			2008-2012	20.561	12.35	22.839	1.93	89.9	44
	Mercury, Dissolved		1995-2005	0.100	0.1		0.1	0.1	1
	Mercury, Total		1995-2005	0.130	0.15	0.087	0.021	0.2	4
	Nickel, Dissolved		1995-2005	13.333	10	5.774	10	20	3
			2008-2012	8.841	0.45	18.501	0.25	50	7
	Nitrate plus Nitrite as N		1995-2005	0.067	0.034	0.108	0.021	0.39	11
			2008-2012	0.014	0.0065	0.015	0.001	0.05	54
	pH		1995-2005	7.503	7.34	0.549	6.78	8.77	22
			2008-2012	7.771	7.79	0.442	6.16	8.71	43
	Phosphorus, Total		1995-2005	0.033	0.032	0.012	0.019	0.055	12
			2008-2012	0.032	0.029	0.014	0.015	0.069	54

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
WC-Pump	Selenium, Dissolved		1995-2005	2.333	1	2.309	1	5	3
			2008-2012	0.110	0.11	0.014	0.09	0.13	7
	Silver, Dissolved		1995-2005	0.055	0.016	0.056	0.016	0.2	13
			2008-2012	0.016	0.003	0.023	0.003	0.05	7
	Specific Conductance		1995-2005	84.042	85.5	29.387	23	138	24
			2008-2012	104.659	99.5	25.031	70	146	44
	Sulfate		1995-2005	8.413	10	2.515	4	13	23
			2008-2012	7.143	5.65	4.043	1	20	35
	Suspended Solids, Total		1995-2005	8.917	6	8.914	0.9	46	23
			2008-2012	5.091	5	2.794	1	16	44
	Water Temperature		1995-2005	9.972	9.3	3.750	4.9	18.08	31
			2008-2012	8.192	8.185	4.346	1.08	17.82	44
	Zinc, Dissolved		1995-2005	7.450	6.1	4.342	1.4	17	12
			2008-2012	3.614	1.7	4.391	0.4	10	7
	Hardness as CaCO3		1995-2005	41.000	41		41	41	1
WC-WCRD	Ammonia as N, Dissolved		1995-2005	0.037	0.029	0.026	0.003	0.1	26
			2008-2012	0.022	0.003	0.057	0.001	0.261	104
	Arsenic, Dissolved		1995-2005	3.200	5	2.465	0.5	5	5
			2008-2012	0.333	0.308	0.108	0.196	0.5	13
	Arsenic, Total		1995-2005	5.000	5	0.000	5	5	3
			2008-2012	0.600	0.6		0.6	0.6	1
	Cadmium, Dissolved		1995-2005	0.160	0.2	0.055	0.1	0.2	5
			2008-2012	0.023	0.01	0.034	0.005	0.1	13
	Calcium		1995-2005	12.224	12	2.659	8	17	34
			2008-2012	13.227	14.1	2.885	6.57	17.7	51
	Chloride		1995-2005	1.306	1	0.743	0.5	3	34
			2008-2012	1.093	1	0.506	0.4	2.66	36
	Copper, Dissolved		1995-2005	1.177	1	0.907	0.4	5	30
			2008-2012	0.628	0.59	0.249	0.33	1.63	51
	Dissolved Oxygen		1995-2005	9.800	9.5	2.292	6	17.04	31
			2008-2012	9.771	9.71	0.780	7.59	11.34	78
	Iron, Dissolved		1995-2005	99.467	90	51.132	19	260	30
			2008-2012	100.265	77.1	110.979	12.5	576	51
	Iron, Total		1995-2005	287.833	255	153.138	25	750	30
			2008-2012	409.206	164	726.684	39.5	4200	51
	Kjeldhal Nitrogen as N, Total		1995-2005	0.533	0.71	0.387	0.09	0.8	3
			2008-2012	0.214	0.1755	0.146	0.105	1.346	114
	Lead, Dissolved		1995-2005	0.680	1	0.438	0.2	1	5
			2008-2012	0.085	0.073	0.072	0.008	0.246	13
	Magnesium		1995-2005	2.618	2.55	0.580	1.7	3.8	34
			2008-2012	2.852	3.08	0.631	1.49	4.07	51
	Manganese, Dissolved		1995-2005	34.700	16.5	49.497	5	270	30
			2008-2012	37.654	11.5	67.520	1.18	314	51
	Mercury, Dissolved		1995-2005	0.100	0.1	0.000	0.1	0.1	3
	Mercury, Total		1995-2005	0.125	0.1	0.050	0.1	0.2	4
	Nickel, Dissolved		1995-2005	16.000	20	5.477	10	20	5
			2008-2012	1.814	0.33	3.634	0.26	10	13
	Nitrate plus Nitrite as N		1995-2005	0.071	0.05	0.078	0.008	0.372	29
			2008-2012	0.016	0.013	0.013	0.001	0.059	105
	pH		1995-2005	7.616	7.545	0.575	6.81	9.09	30
			2008-2012	7.825	7.855	0.288	6.96	8.39	76
	Phosphorus, Total		1995-2005	0.042	0.023	0.059	0.013	0.25	29
			2008-2012	0.042	0.023	0.067	0.005	0.426	100
	Selenium, Dissolved		1995-2005	2.153	1	2.389	0.0004	5	8
			2008-2012	0.119	0.1	0.036	0.09	0.2	13
	Silver, Dissolved		1995-2005	0.107	0.1	0.079	0.016	0.2	27
			2008-2012	0.010	0.003	0.018	0.003	0.05	13
	Specific Conductance		1995-2005	94.758	90	31.820	45	223	33
			2008-2012	106.221	106	23.721	56	150	77
	Sulfate		1995-2005	7.997	8.2	2.468	4	13	34
			2008-2012	7.196	7.405	2.804	2	12.5	36
	Suspended Solids, Total		1995-2005	4.706	5	2.000	1.2	10	34
			2008-2012	5.451	3	12.271	1	85	51
	Water Temperature		1995-2005	9.439	9.4	3.229	3.24	15.5	35
			2008-2012	6.840	7.425	3.681	1.41	15.07	78

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
WC-WCRD	Zinc, Dissolved		1995-2005	6.950	5	8.502	1.4	35	14
			2008-2012	2.431	1.1	3.455	0.2	10	13
	Hardness as CaCO3		1995-2005	42.750	42	9.498	30	54	12
WC-WCRU	Ammonia as N, Dissolved		1995-2005	0.045	0.0345	0.030	0.003	0.1	12
			2008-2012	0.003	0.002	0.002	0.001	0.009	53
	Calcium		1995-2005	12.900	13	3.489	7.9	19	16
	Chloride		1995-2005	1.369	1.35	0.721	0.5	3.3	16
	Copper, Dissolved		1995-2005	0.850	0.615	0.620	0.32	2.4	14
	Dissolved Oxygen		1995-2005	8.857	8.8	1.863	6.8	13.8	13
			2008-2012	9.345	9.35	0.914	7.54	10.94	44
	Iron, Dissolved		1995-2005	174.214	165	88.974	50	310	14
	Iron, Total		1995-2005	466.429	370	284.702	180	1200	14
	Kjeldhal Nitrogen as N, Total		1995-2005	0.260	0.26	0.170	0.09	0.43	3
			2008-2012	0.190	0.182	0.073	0.066	0.4	71
	Magnesium		1995-2005	2.850	2.7	0.795	1.5	4.4	16
	Manganese, Dissolved		1995-2005	26.929	21.5	16.065	10	71	14
	Nitrate plus Nitrite as N		1995-2005	0.035	0.021	0.022	0.008	0.086	15
			2008-2012	0.006	0.003	0.008	0.001	0.048	55
	pH		1995-2005	7.575	7.5	0.354	6.89	8.16	13
			2008-2012	7.932	7.87	0.307	7.31	8.79	44
	Phosphorus, Total		1995-2005	0.032	0.03	0.015	0.01	0.069	15
			2008-2012	0.035	0.0275	0.023	0.01	0.117	54
	Selenium, Dissolved		1995-2005	0.100	0.056	0.105	0.025	0.22	3
	Silver, Dissolved		1995-2005	0.044	0.026	0.039	0.016	0.1	13
	Specific Conductance		1995-2005	84.656	87	29.763	39	135	16
			2008-2012	101.451	105	29.847	11.4	162	43
	Sulfate		1995-2005	7.963	7.55	2.149	4	12	16
	Suspended Solids, Total		1995-2005	6.944	5	7.517	0.9	33	16
	Water Temperature		1995-2005	9.906	9.35	4.388	2.4	18.2	16
			2008-2012	8.107	7.61	5.453	0.01	17.39	44
	Zinc, Dissolved		1995-2005	4.862	5	2.182	1.4	9.5	13
WG-Pump	Ammonia as N, Dissolved		1995-2005	0.049	0.029	0.030	0.02	0.1	14
			2008-2012	0.005	0.004	0.005	0.001	0.021	31
	Arsenic, Dissolved		1995-2005	2.000	0.5	2.598	0.5	5	3
			2008-2012	0.423	0.423	0.109	0.346	0.5	2
	Arsenic, Total		1995-2005	5.000	5		5	5	1
	Cadmium, Dissolved		1995-2005	0.133	0.1	0.058	0.1	0.2	3
			2008-2012	0.053	0.0525	0.067	0.005	0.1	2
	Calcium		1995-2005	14.275	13.9	3.085	9.6	20	24
			2008-2012	14.220	14.4	2.270	10.7	18.5	25
	Chloride		1995-2005	3.104	3	1.339	1	6	25
			2008-2012	3.158	2.38	1.537	1.62	7	21
	Copper, Dissolved		1995-2005	1.275	1	0.718	0.5	3.3	25
			2008-2012	1.108	1	0.360	0.75	2.5	25
	Dissolved Oxygen		1995-2005	8.406	8.32	1.327	6.32	11.8	25
			2008-2012	8.551	8.59	0.564	7.02	9.4	23
	Iron, Dissolved		1995-2005	239.600	190	193.336	100	1100	25
			2008-2012	182.320	174	41.691	119	294	25
	Iron, Total		1995-2005	815.000	715	352.087	210	2000	24
			2008-2012	1038.880	802	663.908	438	3090	25
	Kjeldhal Nitrogen as N, Total		2008-2012	0.487	0.381	0.278	0.134	1.59	33
	Lead, Dissolved		1995-2005	0.500	0.4	0.458	0.1	1	3
			2008-2012	0.071	0.071	0.041	0.042	0.1	2
	Magnesium		1995-2005	2.479	2.4	0.502	1.7	3.7	24
			2008-2012	2.464	2.51	0.430	1.89	3.3	25
	Manganese, Dissolved		1995-2005	53.000	51	29.357	5	126	25
			2008-2012	43.494	36.5	22.502	6.25	117	25
	Mercury, Dissolved		1995-2005	0.100	0.1		0.1	0.1	1
	Mercury, Total		1995-2005	0.167	0.2	0.058	0.1	0.2	3
	Nickel, Dissolved		1995-2005	13.333	10	5.774	10	20	3
			2008-2012	5.265	5.265	6.696	0.53	10	2
	Nitrate plus Nitrite as N		1995-2005	0.104	0.05	0.142	0.024	0.56	14
			2008-2012	0.022	0.011	0.031	0.002	0.126	31
	pH		1995-2005	7.339	7.3	0.487	6.6	8.44	21
			2008-2012	7.721	7.725	0.305	7.08	8.37	22

Station	Constituent	Depth (m)	POR	Mean	Median	Std Dev	Minimum	Maximum	Count
WG-Pump	Phosphorus, Total		1995-2005	0.067	0.0615	0.022	0.046	0.13	14
			2008-2012	0.069	0.0605	0.029	0.037	0.127	28
	Selenium, Dissolved		1995-2005	2.333	1	2.309	1	5	3
			2008-2012	0.145	0.145	0.078	0.09	0.2	2
	Silver, Dissolved		1995-2005	0.110	0.036	0.174	0.016	0.69	16
			2008-2012	0.027	0.0265	0.033	0.003	0.05	2
	Specific Conductance		1995-2005	104.712	103	28.827	57	160.7	25
			2008-2012	116.217	113	22.823	86	174	23
	Sulfate		1995-2005	7.352	8	2.844	3.6	11	25
			2008-2012	4.950	4	4.321	1	20	21
	Suspended Solids, Total		1995-2005	13.600	11	11.124	5	60	24
			2008-2012	11.200	10	5.686	5	25	25
	Water Temperature		1995-2005	9.349	9.04	2.316	5	14.5	33
			2008-2012	7.877	9.21	2.902	2.49	14.3	23
	Zinc, Dissolved		1995-2005	6.140	5	3.112	1.4	10	15
			2008-2012	6.250	6.25	5.303	2.5	10	2
	Hardness as CaCO3		1995-2005	46.000	46		46	46	1

Method Detection and Reporting Limits Summary Report

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Ammonia as N, Dissolved	Acculabs	EPA 350.1	9/24/1998	9/24/1998		0.05	4
			9/24/1998	9/24/1998		0.1	3
		EPA 350.3	4/26/1995	10/6/1997		0.02	62
			4/30/1998	9/25/2000		0.04	25
			6/4/1998	9/22/1999		0.05	33
			6/29/2000	6/27/2001		0.1	25
	High Sierra Water Lab	EPA 350.1	1/8/2008	12/27/2012	0.00049	0.001	1705
	National Water Quality Lab	I-2522-90	3/28/1995	10/17/1997	0.015	0.015	106
			4/7/1995	4/7/1995	0.015	0.15	1
			6/15/1995	8/23/2000	0.02	0.02	133
			10/12/2000	8/20/2003	0.021	0.041	9
		I-2525-89	3/26/1998	9/13/2001	0.002	0.002	83
			10/2/2003	5/26/2006	0.005	0.01	336
			10/4/2001	9/25/2003	0.008	0.015	168
		I-2525-89, I-2522-90	6/5/2006	11/14/2012	0.005	0.01	90
			10/3/2006	9/16/2010	0.01	0.02	269
		NH4 as N low-level	11/13/2000	3/12/2003	0.004	0.007	289
	Severn Trent Laboratories	EPA 350.1	9/24/2002	9/24/2002	0.015	0.04	1
			4/30/2003	10/9/2003	0.029	0.04	40
			5/5/2004	5/5/2004	0.029	0.1	2
	USBR Boise		4/19/2006	11/14/2007	0.003		221
	USBR Denver		5/13/2004	9/21/2004	0.003		63
Arsenic, Dissolved	Acculabs	EPA 206.2	4/26/1995	9/14/1995		5	17
	ACZ	EPA 200.8	4/17/2007	7/9/2008	0.5	1	20
			11/18/2008	11/18/2008	0.5	2	1
			4/24/2005	7/17/2006	0.5	3	13
	Huffman Laboratories	I-4492-97	1/26/2009	11/28/2012	0.005	0.06	234
	National Water Quality Lab	I-2020-05	10/18/2010	9/13/2011	0.011	0.022	12
			10/12/2011	9/11/2012	0.015	0.03	10
			10/10/2012	11/14/2012	0.02	0.04	2

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Arsenic, Dissolved	National Water Quality Lab	I-2020-05	10/5/2009	9/16/2010	0.022	0.044	29
			10/16/2007	9/17/2009	0.03	0.06	103
			9/19/2005	9/14/2007	0.06	0.12	88
		I-2062-85	3/30/1995	8/13/1998	1	1	13
		I-2063-98	4/17/2002	8/1/2002	0.9	1.8	2
			10/8/2002	8/20/2003	0.95	1.9	3
			10/15/1998	8/12/1999	1	1	3
			10/12/1999	10/5/2001	1	2	7
		I-2477-92	4/15/2002	9/13/2002	0.09	0.18	27
			10/21/2003	8/30/2005	0.1	0.2	90
			10/9/2002	9/11/2003	0.13	0.26	42
	USBR Boise	SM3114B	11/6/2006	10/22/2007	2		13
Arsenic, Total	Acculabs	EPA 206.2	4/26/1995	9/14/1995		5	17
	Huffman Laboratories	I-4492-97	3/31/2009	9/20/2012	0.005	0.2	27
			10/8/2012	11/28/2012	0.1	0.2	21
	National Water Quality Lab	I-4020-05	8/30/2005	9/26/2006	0.06	0.12	37
			10/3/2006	3/31/2009	0.1	0.2	49
			10/16/2007	9/18/2008	0.3	0.6	23
		I-4062-85	3/30/1995	8/13/1998	1	1	12
		I-4063-98	4/17/2002	8/17/2005	0.8	1.9	28
			10/15/1998	8/12/1999	1	1	3
			10/12/2000	10/5/2001	1	2	4
			10/12/1999	8/23/2000	1.5	3	3
	USBR Boise	SM3114B	11/6/2006	10/22/2007	2		13
Cadmium, Dissolved	Acculabs	EPA 213.2	4/26/1995	9/14/1995		0.2	17
	ACZ	EPA 200.8	4/24/2005	11/18/2008	0.1	0.5	34
	Huffman Laboratories	I-4492-97	3/31/2009	12/21/2009	0.005	0.02	44
			1/26/2009	11/28/2012	0.01	0.02	200
	National Water Quality Lab	I-1472-87	3/28/1995	11/25/1997	1	1	133
			10/14/1998	5/8/2000	3	8	17
			3/26/1998	10/21/1998	8	8	30
		I-2138-89	10/12/1999	10/5/2001	0.05	0.1	52

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Cadmium, Dissolved	National Water Quality Lab	I-2138-89	10/10/2001	8/21/2002	0.06	0.12	14
			10/7/2002	10/7/2003	0.11	0.22	21
			3/30/1995	9/15/1999	1	1	36
		I-2477-92	1/12/2011	10/13/2011	0.008	0.016	9
			10/21/2008	8/9/2010	0.01	0.02	47
			11/14/2003	9/18/2008	0.02	0.04	188
	USBR Boise	EPA 213.2	11/6/2006	10/22/2007	1		13
Calcium	Acculabs	EPA 200.7	5/21/2001	9/19/2001		0.05	16
			4/26/1995	9/25/2000		0.1	141
	ACZ		4/24/2005	1/21/2009	0.2	1	150
	Huffman Laboratories	I-4491-97	1/26/2009	12/27/2012	0.003	0.02	672
	National Water Quality Lab	I-1472-87	10/18/2001	9/28/2004	0.005	0.01	127
			10/5/2000	9/25/2003	0.005	0.011	234
			10/4/2001	4/14/2003	0.006	0.012	161
			10/14/1998	9/17/2009	0.01	0.02	479
			3/28/1995	9/30/1998	0.02	0.02	174
			10/16/2007	9/21/2008	0.02	0.04	102
			10/5/2009	11/14/2012	0.022	0.044	132
	Severn Trent Laboratories	EPA 200.7	5/23/2002	9/26/2002	0.031	0.1	27
			5/13/2004	9/21/2004	0.076	0.1	27
			4/30/2003	10/9/2003	0.095	0.1	42
	USBR Boise	EPA 215.1	11/6/2006	10/22/2007	0.2		15
Chloride	Acculabs	EPA 300.0	5/22/2000	9/19/2001		0.5	44
		EPA 325.2	9/24/1998	9/22/1999		0.5	34
			5/1/1996	6/4/1998		1	62
			4/26/1995	9/14/1995		3	17
	ACZ		4/24/2005	5/2/2007	1	5	72
		EPA 325.2/SM4500-Cl E	5/9/2007	6/12/2008	1	5	46
		SM 4500-Cl E	5/7/2008	1/21/2009	1	5	32
	Huffman Laboratories	I-2057-85	1/26/2009	9/20/2012	0.03	0.12	322
	National Water Quality Lab	I-2057-90	10/22/2002	10/22/2002	0.01	0.01	2
			10/18/2010	11/14/2012	0.03	0.06	33

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Chloride	National Water Quality Lab	I-2057-90	4/10/2001	8/30/2001	0.04	0.08	12
			10/3/2006	9/16/2010	0.06	0.12	317
			3/28/1995	9/15/1999	0.1	0.1	204
			10/7/2002	9/26/2006	0.1	0.2	274
			10/12/1999	10/18/2000	0.14	0.29	45
			10/4/2001	9/13/2002	0.17	0.33	43
		I-2058-85	11/13/2000	11/21/2005	0.01	0.01	387
			10/1/2010	9/11/2012	0.018	0.035	62
	Severn Trent Laboratories	EPA 300.0	5/23/2002	9/26/2002	0.1	0.5	27
			4/30/2003	9/21/2004	0.2	0.5	107
	USBR Boise		11/6/2006	10/22/2007	0.4		15
Chlorophyll a	National Water Quality Lab	B-6530-85	5/31/1995	10/16/2003	0.1	0.1	127
			5/13/2004	8/6/2004	0.2	0.2	4
		EPA 445	11/20/2000	9/18/2008	0.1	0.1	48
	USBR Denver	SM 10200 H.2	5/15/2005	11/15/2012	0.1	0.1	819
Chlorophyll a, Corrected			5/15/2005	11/15/2012	0.1	0.1	782
Copper, Dissolved	Acculabs	EPA 200.7	5/8/1997	9/24/1998		1	48
		EPA 200.8	5/22/2000	6/27/2001		1	43
		EPA 220.2	4/26/1995	9/19/1996		1	38
	ACZ	EPA 200.7	5/15/2006	6/12/2008	10	50	14
		EPA 200.8	4/24/2005	1/21/2009	0.5	3	136
			6/6/2005	5/2/2007	1	5	4
	Huffman Laboratories	I-4492-97	1/26/2009	12/27/2012	0.03	1	472
	National Water Quality Lab	I-1472-87	8/30/2000	5/21/2001	0.5	1	25
			6/12/2001	3/19/2002	1	2	29
			3/28/1995	6/7/2000	10	10	220
		I-2020-05	9/20/2005	9/27/2007	0.2	0.4	84
			10/18/2010	9/14/2011	0.3	0.5	20
			10/12/2011	11/14/2012	0.4	0.8	13
			10/16/2007	9/16/2010	0.5	1	170
		I-2274-89	10/12/1999	4/12/2000	0.6	1.3	2
			3/30/1995	8/12/1999	1	1	16

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Copper, Dissolved	National Water Quality Lab	I-2477-92	10/12/2000	9/11/2003	0.12	0.23	119
			10/2/2003	7/12/2006	0.2	0.4	172
			8/15/2000	9/28/2000	1	1	13
	Severn Trent Laboratories	EPA 200.8	4/30/2003	9/21/2004	0.095	1	73
			5/23/2002	9/24/2002	0.25	1	27
	USBR Boise	EPA 220.2	11/6/2006	10/22/2007	2		13
Iron, Dissolved	Acculabs	EPA 200.7	4/26/1995	9/25/2000		10	112
			5/21/2001	6/27/2001		100	15
	ACZ		4/24/2005	6/28/2005	10	50	25
			7/7/2005	1/21/2009	20	50	190
	Huffman Laboratories	I-4492-97	1/26/2009	12/27/2012	0.04	4	741
	National Water Quality Lab	I-1472-87	10/18/2010	9/11/2012	1.6	3.2	31
			10/15/2008	11/14/2012	2	4	69
			3/28/1995	11/25/1997	3	3	145
			10/4/2004	9/16/2010	3	6	255
			7/25/2005	7/25/2005	3	18	1
			10/2/2003	9/17/2004	3.2	6.4	67
			5/5/2003	9/11/2003	3.8	8	34
			10/16/2007	9/18/2008	4	8	84
			10/14/1998	4/16/2003	5	10	164
			3/26/1998	9/30/1998	10	10	30
	Severn Trent Laboratories	EPA 200.7	5/23/2002	9/24/2002	13	100	25
			4/30/2003	9/21/2004	19	100	71
	USBR Boise	EPA 236.1	5/15/2005	10/22/2007	20		114
Iron, Total	Acculabs	EPA 200.7	4/26/1995	9/25/2000		10	113
			5/21/2001	6/27/2001		100	15
	ACZ		4/28/2005	6/28/2005	10	50	24
			7/7/2005	1/21/2009	20	50	123
			5/29/2008	5/29/2008	100	300	1
			6/6/2007	6/6/2007	100	500	1
	Huffman Laboratories	I-4492-97	1/26/2009	12/27/2012	0.04	14	455
	National Water Quality Lab	I-4471-97	4/12/2005	9/10/2008	3	6	37

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Iron, Total	National Water Quality Lab	I-4471-97	10/21/2008	3/31/2009	7	14	16
	Severn Trent Laboratories	EPA 200.7	5/23/2002	9/24/2002	13	100	25
			4/30/2003	9/21/2004	19	100	71
	USBR Boise	EPA 236.1	7/24/2007	10/22/2007	20		9
Kjeldhal Nitrogen as N, Total	High Sierra Water Lab	EPA 351.2	1/8/2008	12/27/2012	0.0235	0.035	1761
	National Water Quality Lab	I-4515-91	10/18/2010	9/13/2011	0.025	0.05	15
			10/12/2011	11/14/2012	0.035	0.07	15
			10/5/2000	9/27/2001	0.04	0.08	211
			10/14/1998	9/16/2010	0.05	0.1	632
			10/16/2007	9/10/2008	0.07	0.14	29
			11/21/1997	9/30/1998	0.1	0.1	33
			3/28/1995	10/22/1997	0.2	0.2	143
	USBR Boise	EPA 351.2	4/19/2006	11/14/2007	0.03		221
	USBR Denver		5/13/2004	9/21/2004	0.05		63
Lead, Dissolved	Acculabs	EPA 239.2	4/26/1995	9/14/1995		1	17
	ACZ	EPA 200.8	4/24/2005	11/18/2008	0.1	0.5	34
	Huffman Laboratories	I-4492-97	3/31/2009	11/28/2012	0.004	0.06	199
			1/26/2009	1/27/2010	0.006	0.06	10
	National Water Quality Lab	I-1472-87	3/28/1995	11/25/1997	10	10	132
			3/26/1998	6/7/2000	50	100	86
		I-2403-89	10/12/1999	3/21/2002	0.5	1	48
			3/30/1995	8/12/1999	1	1	16
		I-2477-92	10/18/2010	9/14/2011	0.008	0.015	20
			10/12/2011	11/14/2012	0.013	0.025	13
			10/5/2009	9/16/2010	0.015	0.03	30
			10/15/2008	9/17/2009	0.03	0.06	63
			10/12/2000	9/18/2008	0.04	0.08	395
			10/3/2006	9/27/2007	0.06	0.12	73
			8/15/2000	9/28/2000	1	1	14
	USBR Boise	EPA 239.2	11/6/2006	10/22/2007	2		13
Magnesium	Acculabs	EPA 200.7	4/26/1995	9/19/2001		0.05	157
	ACZ		4/24/2005	1/21/2009	0.2	1	150

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Magnesium	Huffman Laboratories	I-4491-97	1/26/2009	12/27/2012	0.001	0.012	674
	National Water Quality Lab	I-1472-87	10/14/1998	9/15/1999	0.002	0.004	34
			5/1/2003	9/25/2003	0.003	0.008	53
			3/26/1998	9/30/1998	0.004	0.004	30
			10/18/2000	9/26/2006	0.004	0.008	673
			10/15/2008	9/17/2009	0.006	0.012	86
			10/26/1998	9/27/2007	0.007	0.014	155
			10/5/2009	9/23/2011	0.008	0.016	88
			3/28/1995	11/25/1997	0.01	0.01	144
			10/16/2007	9/21/2008	0.01	0.02	102
			10/12/2011	11/14/2012	0.011	0.022	44
	Severn Trent Laboratories	EPA 200.7	5/23/2002	9/26/2002	0.024	0.05	27
			4/30/2003	9/21/2004	0.027	0.05	69
	USBR Boise	EPA 242.1	11/6/2006	10/22/2007	0.1		14
Manganese, Dissolved	Acculabs	EPA 200.7	4/26/1995	9/24/1998		5	85
		EPA 200.8	9/25/2000	9/25/2000		1	8
			5/22/2000	6/27/2001		5	35
	ACZ	EPA 200.7	4/24/2005	1/21/2009	5	30	215
	Huffman Laboratories	I-4492-97	1/26/2009	12/27/2012	0.02	0.2	728
			1/27/2010	7/7/2011	0.02	0.4	10
			4/22/2009	4/22/2009	0.02	2	1
			3/29/2010	3/29/2010	0.02	4	1
	National Water Quality Lab	I-1472-87	8/20/2003	11/15/2007	0.2	0.4	3
			10/5/2001	3/12/2003	0.8	1.6	5
			3/28/1995	11/25/1997	1	1	144
			10/12/1999	10/12/2000	1.1	2.2	27
			9/30/1998	9/15/1999	1.5	3	44
			4/11/2001	8/30/2001	1.6	3.2	2
			3/26/1998	9/21/1998	4	4	26
		I-2477-92	10/18/2010	9/11/2012	0.007	0.13	30
			10/13/2011	11/14/2012	0.008	0.15	3
			10/12/2000	9/13/2002	0.05	0.1	55

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Manganese, Dissolved	National Water Quality Lab	I-2477-92	10/7/2002	9/11/2003	0.09	0.18	54
			10/2/2003	9/17/2009	0.1	0.2	440
			10/5/2009	9/16/2010	0.13	0.26	35
			8/15/2000	9/28/2000	1	1	13
	Severn Trent Laboratories	EPA 200.7	5/23/2002	9/24/2002	0.49	1	27
			4/30/2003	9/21/2004	0.54	1	72
	USBR Boise	EPA 243.1	5/15/2005	10/22/2007	10		113
Mercury, Dissolved	Acculabs	EPA 245.1	4/26/1995	9/14/1995		0.1	17
	Accutest	EPA 1631E	6/18/2012	9/20/2012	0.5	0.5	4
	National Water Quality Lab	1-4464-01	12/12/2005	9/12/2006	0.1	0.2	8
			1/3/2005	2/20/2008	0.2	0.4	24
		EPA 1631E	5/8/2008	7/20/2011	0.04	0.04	27
		I-2462-85	10/24/2000	3/21/2002	0.05	0.1	61
			3/30/1995	10/12/1999	0.1	0.1	17
			4/12/2000	10/12/2000	0.1	0.2	10
		I-2464-01	10/5/2001	9/13/2002	0.006	0.011	30
			10/8/2002	9/11/2003	0.009	0.018	45
			10/21/2003	12/12/2003	0.009	0.02	8
			4/11/2001	8/30/2001	0.01	0.01	2
Mercury, Total	Acculabs	EPA 245.1	4/26/1995	9/14/1995		0.1	17
	Accutest	EPA 1631E	12/19/2011	10/25/2012	0.5	0.5	34
	ACZ		11/14/2011	11/14/2011	0.4	1	1
			11/14/2011	11/15/2011	1	3	3
		EPA 245.1	4/24/2005	7/7/2005	0.2	1	6
	National Water Quality Lab	1-4464-01	4/7/2012	8/7/2012	0.04	0.04	14
			2/15/2006	9/26/2006	0.1	0.2	10
			5/24/2006	9/13/2006	0.1	0.2	2
			10/12/2006	3/13/2008	0.2	0.4	23
			6/8/2005	4/15/2008	0.2	0.4	8
		EPA 1631E	9/17/2008	6/9/2010	0.04	0.04	54
			5/7/2008	11/14/2012	0.04	0.04	43
		I-3462-85	10/12/2000	10/12/2000	0.05	0.1	1

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Mercury, Total	National Water Quality Lab	I-3462-85	3/30/1995	8/12/1999	0.1	0.1	16
			10/12/1999	8/23/2000	0.15	0.3	3
		I-4464-01	4/17/2002	8/1/2002	0.006	0.011	2
			10/8/2002	11/14/2003	0.009	0.018	4
			4/11/2001	10/5/2001	0.01	0.01	3
	Severn Trent Laboratories	EPA 353.2	5/5/2004	5/5/2004	0.021	0.05	1
Nickel, Dissolved	Acculabs	EPA 200.7	4/26/1995	9/14/1995		20	17
	ACZ		4/24/2005	11/18/2008	10	50	23
			7/1/2008	7/1/2008	50	300	1
		EPA 200.8	6/10/2008	6/12/2008	0.6	3	10
	Huffman Laboratories	I-4492-97	1/26/2009	11/28/2012	0.02	0.12	244
	National Water Quality Lab	I-1472-87	11/15/2004	11/10/2005	1	2	26
			3/28/1995	11/25/1997	10	10	134
			3/26/1998	6/7/2000	20	40	86
		I-2020-05	10/20/2005	9/27/2007	0.03	0.06	100
			10/18/2010	11/14/2012	0.05	0.09	33
			10/15/2008	9/16/2010	0.06	0.12	98
			10/16/2007	9/18/2008	0.1	0.2	76
		I-2477-92	10/12/2000	7/12/2006	0.03	0.06	265
			8/15/2000	9/28/2000	1	1	14
		I-2503-89	10/12/1999	4/12/2000	0.7	1.4	2
			3/30/1995	8/12/1999	1	1	16
Nitrate plus Nitrite as N	Acculabs	EPA 353.2	4/26/1995	9/19/2001		0.05	153
	High Sierra Water Lab	EPA 353.1	1/8/2008	12/27/2012	0.00044	0.002	1685
	National Water Quality Lab	I-2545-90	10/12/2000	8/1/2002	0.023	0.047	6
			10/8/2002	8/20/2003	0.03	0.06	3
			3/28/1995	8/23/2000	0.05	0.05	242
		I-2546-91	10/18/2010	10/12/2011	0.004	0.008	16
			8/15/2000	9/13/2001	0.005	0.005	93
			10/2/2003	9/16/2010	0.008	0.016	682
			10/4/2001	9/13/2002	0.009	0.013	56
			10/7/2002	9/25/2003	0.011	0.022	130

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Nitrate plus Nitrite as N	National Water Quality Lab	I-2548-11	11/15/2011	11/14/2012	0.005	0.01	14
	Severn Trent Laboratories	EPA 353.2	5/23/2002	9/26/2002	0.012	0.05	26
			4/30/2003	5/5/2004	0.021	0.05	43
	USBR Boise		4/19/2006	11/14/2007	0.003		221
	USBR Denver		5/13/2004	9/21/2004	0.003		61
Nitrogen Total as N	National Water Quality Lab	I-4650-03	11/4/2003	9/28/2004	0.03	0.03	77
			10/20/2004	9/21/2008	0.03	0.06	334
			11/13/2008	4/16/2009	0.05	0.1	9
			5/13/2004	8/6/2004	0.06	0.03	8
Phosphorus, Total	Acculabs	EPA 365.2	4/30/1998	9/19/2001		0.01	90
			4/26/1995	10/7/1997		0.02	56
	High Sierra Water Lab	EPA 365.3	1/8/2008	12/27/2012	0.00062	0.002	1694
	National Water Quality Lab	EPA 365.1	10/5/2000	9/25/2003	0.0019	0.0037	480
			10/2/2003	11/14/2012	0.002	0.004	484
			9/27/2007	9/27/2007	0.004	0.004	2
			5/4/2000	9/16/2010	0.004	0.008	298
			11/13/2000	9/16/2003	0.019	0.0037	44
		I-4607-90	3/26/1998	9/21/1998	0.01	0.01	2
		I-4610-91	3/28/1995	9/8/1998	0.01	0.01	170
			10/8/2002	6/9/2004	0.02	0.04	4
			10/14/1998	8/23/2000	0.03	0.05	56
			10/12/2000	8/1/2002	0.03	0.06	6
			9/30/1998	9/30/1998	0.05	0.05	4
		I-4650-03	11/14/2003	4/15/2009	0.01	0.02	3
	Severn Trent Laboratories	EPA 365.3	5/23/2002	9/24/2002	0.013	0.05	25
			4/30/2003	5/5/2004	0.019	0.05	44
	USBR Boise	EPA 365.1	4/19/2006	11/14/2007	0.003		206
			4/19/2006	7/24/2007	0.01		15
	USBR Denver		5/13/2004	9/21/2004	0.003		63
Selenium, Dissolved	Acculabs	EPA 270.2	4/26/1995	9/14/1995		5	17
	ACZ	EPA 200.8	4/19/2006	11/18/2008	0.1	0.5	26
			4/24/2005	9/12/2005	1	5	8

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Selenium, Dissolved	Huffman Laboratories	I-4492-97	1/26/2009	11/28/2012	0.02	0.06	237
	National Water Quality Lab	I-2020-05	10/16/2007	6/8/2010	0.02	0.04	51
			10/21/2008	9/17/2009	0.03	0.06	33
			9/19/2005	9/27/2007	0.04	0.08	89
		I-2477-92	10/12/2000	10/5/2001	0.15	0.3	4
			4/17/2002	8/1/2002	0.15	0.33	2
			11/14/2003	8/30/2005	0.2	0.4	31
			10/8/2002	8/20/2003	0.3	0.5	3
			8/23/2000	8/23/2000	0.7	0.7	1
		I-2667-85	3/30/1995	8/13/1998	1	1	13
		I-2668-98	10/15/1998	8/12/1999	1	1	3
			10/12/1999	4/12/2000	1	2	2
	Severn Trent Laboratories	EPA 200.8	5/13/2004	9/21/2004	0.0004	5	65
	USBR Boise	SM3114B	11/6/2006	10/22/2007	2		10
Silver, Dissolved	Acculabs	EPA 200.8	5/22/2000	6/27/2001		0.1	43
		EPA 272.2	4/30/1998	9/24/1998		0.1	23
			4/26/1995	10/6/1997		0.2	62
	ACZ	EPA 200.8	6/28/2005	11/18/2008	0.05	0.3	33
			4/24/2005	4/24/2005	0.3	1	1
	Huffman Laboratories	I-4492-97	1/26/2009	11/28/2012	0.003	0.008	244
	National Water Quality Lab	I-1472-87	3/28/1995	11/25/1997	1	1	28
			3/26/1998	8/11/1999	2	4	14
			9/8/1999	6/7/2000	3.5	7	8
		I-2477-92	10/18/2010	11/14/2012	0.003	0.005	33
			10/15/2008	9/17/2009	0.004	0.008	61
			10/5/2009	9/16/2010	0.005	0.01	30
			10/3/2006	9/18/2008	0.05	0.1	147
			9/27/2007	9/27/2007	0.05	0.2	2
			10/7/2002	9/26/2006	0.1	0.2	246
			8/23/2000	9/13/2002	1	1	45
		I-2724-89	10/10/2001	8/21/2002	0.06	0.12	8
			10/17/2000	8/28/2001	0.1	0.2	10

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Silver, Dissolved	National Water Quality Lab	I-2724-89	11/7/2002	10/7/2003	0.13	0.26	12
			3/30/1995	4/12/2000	1	1	18
		I-2725-93	5/31/1995	9/28/2000	0.2	0.2	182
	Severn Trent Laboratories	EPA 200.8	4/30/2003	9/21/2004	0.016	0.1	71
			5/23/2002	9/24/2002	0.026	0.1	27
Sulfate	Acculabs	EPA 300.0	5/8/1997	9/25/2000		1	103
		EPA 300.1	5/21/2001	9/19/2001		1	16
		EPA 375.2	4/26/1995	9/19/1996		5	38
	ACZ	EPA 375.3	4/24/2005	11/22/2005	10	50	33
		EPA 375.4	5/14/2008	1/21/2009	1	5	38
		SM 4500-SO4 D	2/2/2006	5/7/2008	10	50	78
	Huffman Laboratories	I-2057-85	1/26/2009	9/11/2012	0.03	0.18	307
			4/22/2010	7/19/2012	0.03	0.3	5
			12/1/2009	9/20/2012	0.03	0.6	9
			3/31/2009	3/31/2009	0.03	1.8	1
	National Water Quality Lab	I-2057-90	10/18/2010	11/14/2012	0.045	0.09	33
			10/18/2000	9/13/2002	0.05	0.11	106
			10/7/2002	9/16/2010	0.09	0.18	593
			3/28/1995	9/15/1999	0.1	0.1	204
			10/12/1999	10/17/2000	0.15	0.31	43
		I-2058-85	11/13/2000	11/21/2005	0.01	0.01	353
			7/12/2001	9/15/2004	0.01	0.02	39
			10/1/2010	9/11/2012	0.02	0.04	62
	Severn Trent Laboratories	EPA 300.0	5/23/2002	9/21/2004	0.2	1	98
	USBR Boise		11/6/2006	10/22/2007	0.5		15
Suspended Solids, Total	Acculabs	EPA 160.2	4/26/1995	9/19/2001		5	156
	ACZ	EPA 160.1/SM2540C	5/9/2007	6/27/2007	5	20	23
		EPA 160.2	4/28/2005	5/2/2007	5	20	71
		EPA 160.2/SM2540D	7/24/2007	6/12/2008	5	20	21
			4/2/2008	4/2/2008	10	40	1
		SM 2540 D	5/7/2008	1/21/2009	5	20	32
	Huffman Laboratories	I-3765-85	1/26/2009	12/27/2012	1	10	706

Constituent	Laboratory	Analytical Method	Start Date	End Date	MDL	RL	# of Samples
Suspended Solids, Total	Huffman Laboratories	I-3765-85	11/5/2010	11/5/2010	1	20	1
			3/31/2009	7/8/2009	2	10	49
	National Water Quality Lab		3/30/1995	10/12/1999	1	1	17
			4/12/2000	9/21/2008	10	10	244
			10/21/2008	10/13/2011	15	15	84
	Severn Trent Laboratories	EPA 160.2	4/30/2003	9/21/2004	0.9	4	108
			5/23/2002	9/26/2002	1.8	4	27
	USBR Boise		5/8/2006	10/22/2007	1	4	82
	USBR Denver		5/15/2005	10/27/2005	1	4	35
Zinc, Dissolved	Acculabs	EPA 200.8	5/22/2000	6/27/2001		5	43
	ACZ	EPA 200.7	4/24/2005	11/18/2008	10	50	34
	Huffman Laboratories	I-4492-97	1/26/2009	11/28/2012	0.2	2	244
	National Water Quality Lab	I-1472-87	3/28/1995	11/25/1997	3	3	143
			3/26/1998	6/7/2000	10	20	93
		I-1900-85	10/26/1995	1/11/1996	10	10	2
		I-2020-05	7/12/2006	9/27/2007	0.3	0.6	60
			1/12/2011	10/13/2011	0.7	1.4	9
			10/16/2007	9/18/2008	0.9	1.8	50
			10/21/2008	9/17/2009	1	2	39
			11/9/2009	8/9/2010	1.4	2.8	13
		I-2477-92	10/2/2003	7/10/2006	0.3	0.6	64
			8/15/2000	8/27/2003	1	1	64
	Severn Trent Laboratories	EPA 200.8	5/23/2002	9/21/2004	1.4	5	99
	USBR Boise	EPA 289.1	5/15/2005	10/22/2007	5		18

TABLE 1.3 - LABORATORIES, LAB METHODS, MDL's and RL's: 2005 - 2011 LAKE & RESERVOIRS BASELINE MONITORING PROGRAM

			2005		2006		2007		2008		2009		2010		2011	
Constituent	**Lab Name**	**Lab Method**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**
GENERAL PARAMETERS																
Alkalinity, Total Dissolved (mg/L)	ACZ	SM 2320 B							2	20						
	Huffman Laboratories	I-2030-89									1	5	1	5	1	5
	National WQ Lab Denver	NFM 6.6.4.C				0.05		0.05		0.05		0.05				
	National WQ Lab Denver	I-2030-85				5										
Chlorophyll a (mg/m3)	National WQ Lab Denver	EPA 445	0.05	0.1	0.05	0.1	0.05	0.1	0.05	0.1						
	USBR Denver	SM 10200 H2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Chlorophyll b (mg/m3)	USBR Denver	SM 10200 H2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Chlorophyll c (mg/m3)	USBR Denver	SM 10200 H2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Dis. Organic Carbon (mg/L)	Huffman Laboratories	O-3100-83											0.02	0.6	0.02	0.6
Total Organic Carbon (mg/L)	ACZ	EPA 415.1/ SM 5310B							1	5						
	Huffman Laboratories	O-3100-83									0.02	0.6	0.02	0.6	0.02	0.6
	National WQ Lab Denver	O-3100-83							0.1	0.4, 0.6	0.1	0.6				
	USBR Boise	EPA 415.1	0.2		0.2		0.2									
Total Suspended Solids (mg/L)	ACZ	EPA 160.2							5	20						
	Huffman Laboratories	I-3765-85									1, 2	10	1	10	1	10
	National WQ Lab Denver	I-3765-85							5	10, 15	5	15				
	USBR Boise	EPA 160.2			1	4	1	4								
	USBR Denver	EPA 160.2	1	4												
NUTRIENTS																
Ammonia as N, Dissolved (mg/L)	High Sierra Water Lab	EPA 350.1							0.00049	0.001	0.00049	0.001	0.00049	0.001	0.00049	0.001
	National WQ Lab Denver	I-2525-89	0.002	0.01	0.002	0.01										
		I-2522-90			0.002	0.01	0.002	0.02	0.002	0.02						
	USBR Boise	EPA 350.1			0.003		0.003									
	USBR Boulder	EPA 350.1	0.003													
Kjeldhal Nitrogen as N, Total (mg/L)	High Sierra Water Lab	EPA 351.2							0.0235	0.035	0.0235	0.035	0.0235	0.035	0.0235	0.035
	USBR Boise	EPA 351.2			0.03		0.03									
	USBR Boulder	EPA 351.2	0.005													
Nitrate plus Nitrite as N (mg/L)	High Sierra Water Lab	EPA 353.1							0.00044	0.002	0.00044	0.002	0.00044	0.002	0.00044	0.002
	National WQ Lab Denver	I-2546-91	0.005	0.016	0.005	0.016	0.005	0.016	0.005	0.016						
	USBR Boise	EPA 353.2			0.003		0.003									
Ortho Phosphate as P (mg/L)	High Sierra Water Lab	SM 4500-P E							0.0004	0.001	0.0004	0.001	0.0004	0.001	0.0004	0.001
	National WQ Lab Denver	I-2525-89, I-2522-90	0.001	0.006	0.001	0.006	0.001	0.006	0.001	0.006	0.001	0.008				
	USBR Boise	EPA 365.1			0.001		0.001									
	USBR Boulder	EPA 365.1	0.001													
Phosphorus, Total (mg/L)	High Sierra Water Lab	EPA 365.3							0.00062	0.002	0.00062	0.002	0.00062	0.002	0.00062	0.002
	National WQ Lab Denver	EPA 365.1	0.002	0.004	0.002	0.008	0.002	0.008	0.002	0.008	0.002	0.008				
	USBR Boise	EPA 365.1			0.003		0.003									
	USBR Boulder	EPA 365.1	0.003													

TABLE 1.3 - LABORATORIES, LAB METHODS, MDL's and RL's: 2005 - 2011 LAKE & RESERVOIRS BASELINE MONITORING PROGRAM (continued)

			2005		2006		2007		2008		2009		2010		2011	
Constituent	**Lab Name**	**Lab Method**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**
MAJOR IONS																
Calcium (mg/L)	ACZ	EPA 200.7							0.2	1						
	Huffman Laboratories	I-4491-97									0.003	0.02	0.003	0.02	0.003	0.02
	National WQ Lab Denver	I-1472-87							0.02	0.04	0.02	0.02				
	USBR Boise	EPA 215.1			0.2		0.2									
Magnesium (mg/L)	ACZ	EPA 200.7							0.2	1						
	Huffman Laboratories	I-4491-97									0.001	0.012	0.001	0.012	0.001	0.012
	National WQ Lab Denver	I-1472-87							0.004	0.012, 0.02	0.004	0.012				
	USBR Boise	EPA 242.1			0.1		0.1									
Potassium (mg/L)	ACZ	EPA 200.7							0.3	2						
	Huffman Laboratories	I-4491-97									0.03	0.06	0.03	0.06	0.03	0.06
	National WQ Lab Denver	SM3120B							0.01	0.02, 0.06	0.01	0.06				
	USBR Boise	EPA 258.1			0.2		0.2									
Sodium (mg/L)	ACZ	EPA 200.7							0.3	2						
	Huffman Laboratories	I-4491-97									0.01	0.12	0.01	0.12	0.01	0.12
	National WQ Lab Denver	I-1472-87							0.06	0.12	0.06	0.12				
	USBR Boise	EPA 273.1			0.2		0.2									
Chloride (mg/L)	ACZ	EPA 325.2							1	5						
	Huffman Laboratories	I-2057-85									0.03	0.12	0.03	0.12	0.03	0.12
	National WQ Lab Denver	I-2057-90							0.06	0.12	0.06	0.12				
	USBR Boise	EPA 300.0			0.4		0.4									
Sulfate (mg/L)	ACZ	EPA 375.4							1	5						
	Huffman Laboratories	I-2057-85									0.03	0.18	0.03	0.18	0.03	0.18
	National WQ Lab Denver	I-2057-90							0.18	0.18	0.18	0.18				
	USBR Boise	EPA 300.0			0.5		0.5									

BIOLOGICAL		**Method**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Phytoplankton, Density (cells/mL) & Biovolume (um3/mL)	Aquatic Analysts	SM100200D.2,F.2c Sedgwick-Rafter	X	X	X	X	X		
	BSA Environmental	Membrane Filtration (McNabb 1960)					X	X	X
	Timberline Aquatics	Utermohl Chamber Method (no biovolume)					X		
Zooplankton (#/L)	BSA Environmental	Utermohl Chamber Method	X	X	X	X	X	X	X
	Timberline Aquatics	Utermohl Chamber Method					X		

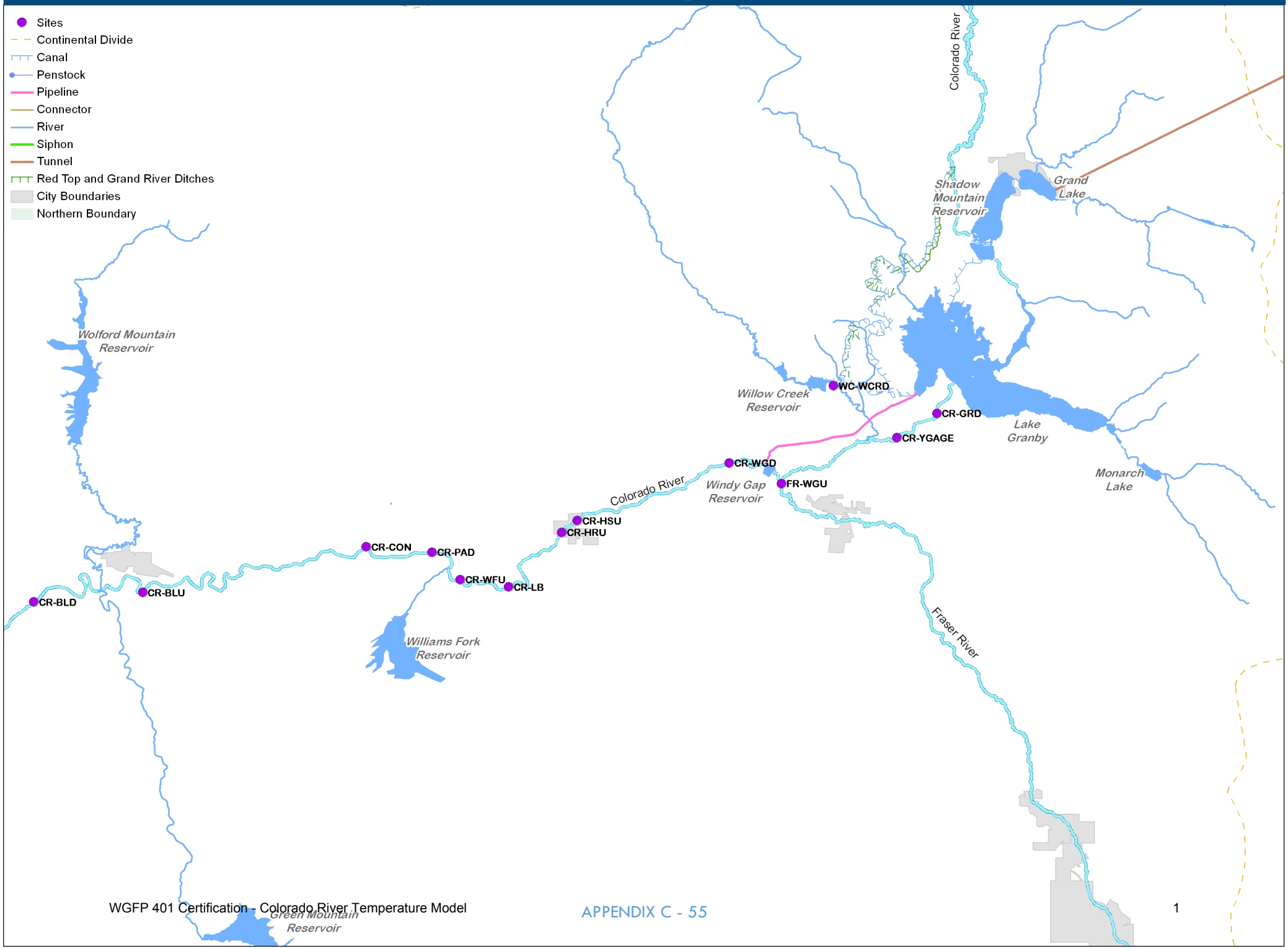
TABLE 1.3 - LABORATORIES, LAB METHODS, MDL's and RL's: 2005 - 2011 LAKE & RESERVOIRS BASELINE MONITORING PROGRAM (continued)

			2005		2006		2007		2008		2009		2010		2011	
Constituent	**Lab Name**	**Lab Method**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**	**MDL**	**RL**
METALS																
Arsenic, Dissolved (ug/L)	ACZ	EPA 200.8							0.5	1						
	Huffman Laboratories	I-4492-97									0.005	0.06	0.005	0.06	0.005	0.06
	National WQ Lab Denver	I-2020-05							0.06	0.06	0.06	0.06				
	USBR Boise	SM3114B			2	2	2	2								
Cadmium, Dissolved (ug/L)	ACZ	EPA 200.8							0.1	0.5						
	Huffman Laboratories	I-4492-97									0.005, 0.01	0.02	0.01	0.02	0.01	0.02
	National WQ Lab Denver	I-2477-92							0.01	0.04	0.01	0.02				
	USBR Boise	EPA 213.2					1									
Copper, Dissolved (ug/L)	ACZ	EPA 200.7							10	50						
	Huffman Laboratories	I-4492-97									0.03	1	0.03	1	0.03	1
	National WQ Lab Denver	I-2020-05							0.04	1	0.04	1				
	USBR Boise	EPA 220.2			2		2									
Iron, Dissolved (ug/L)	ACZ	EPA 200.7							20	50						
	Huffman Laboratories	I-4492-97									0.04	4	0.04	4	0.04	4
	National WQ Lab Denver	I-1472-87							3	8	3	4				
	USBR Boise	EPA 236.1	20		20		20									
Iron, Total Rec (ug/L)	ACZ	EPA 200.7							20	50						
	Huffman Laboratories	I-4492-97									0.04	14	0.04	14	0.04	14
	National WQ Lab Denver	I-4471-97							6	14	6	14				
	USBR Boise	EPA 236.1					20									
Lead, Dissolved (ug/L)	ACZ	EPA 200.8							0.1	0.5						
	Huffman Laboratories	I-4492-97									0.004	0.06	0.004	0.06	0.004	0.06
	National WQ Lab Denver	I-2477-92							0.03	0.06, 0.08	0.03	0.06				
	USBR Boise	EPA 239.2			2		2									
Manganese, Dissolved (ug/L)	ACZ	EPA 200.7							5	30						
	Huffman Laboratories	I-4492-97									0.02	0.2	0.02	0.2	0.02	0.2
	National WQ Lab Denver	I-2477-92							0.2	0.2	0.2	0.2				
	USBR Boise	EPA 243.1	10		10		10									
Mercury, Total Rec (nanograms/L)	National WQ Lab Denver	I-4464-01							0.04	0.4						
		EPA 1631E							0.04	0.04	0.04	0.04	0.04	0.04		
	Test America	EPA 1631E											0.14	0.5	0.12, 0.14	0.5
	USBR Boise	EPA 245.1			0.2 ug/L		0.2 ug/L									
Nickel, Dissolved (ug/L)	ACZ	EPA 200.8							0.6	3						
	Huffman Laboratories	I-4492-97									0.02	0.12	0.02	0.12	0.02	0.12
	National WQ Lab Denver	I-2020-05							0.05	0.12, 0.2	0.05	0.12				
Selenium, Dissolved (ug/L)	ACZ	EPA 200.8							0.1	0.5						
	Huffman Laboratories	I-4492-97									0.02	0.06	0.02	0.06	0.02	0.06
	National WQ Lab Denver	1-2020-05							0.04	0.06	0.04	0.06				
	USBR Boise	SM3114B			2		2									
Silver, Dissolved (ug/L)	ACZ	EPA 200.8							0.05	0.3						
	Huffman Laboratories	I-4492-97									0.003	0.008	0.003	0.008	0.003	0.008
	National WQ Lab Denver	I-2477-92							0.004	0.1	0.004	0.008				
Zinc, Dissolved (ug/L)	ACZ	EPA 200.7							10	50						
	Huffman Laboratories	I-4492-97									0.2	2	0.2	2	0.2	2
	National WQ Lab Denver	1-2020-05							0.04	1.8, 2	0.04	2				
	USBR Boise	EPA 289.1	5		5		5									

Temperature Sites and Data Inventory

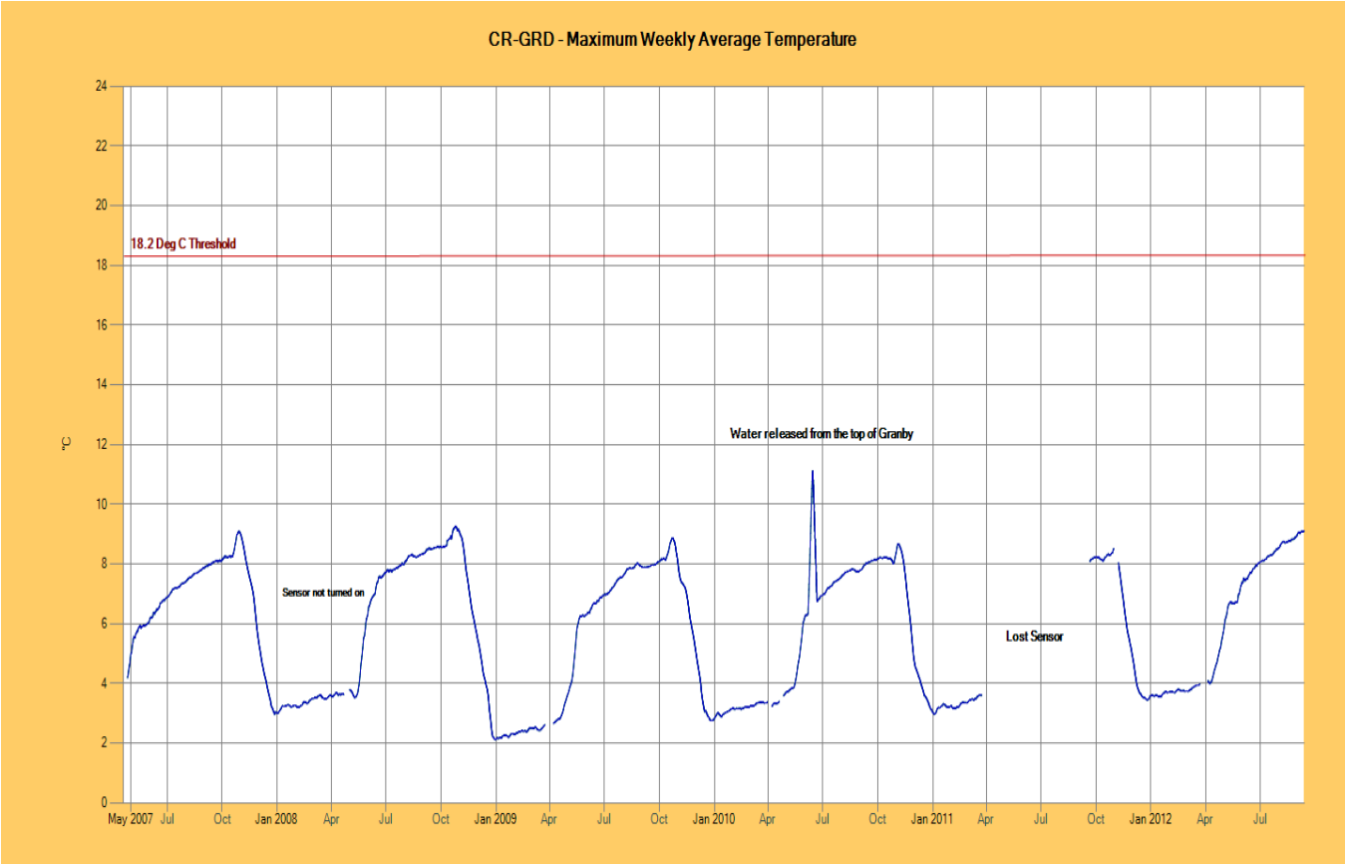
Station ID	Description	Start Date	End Date	Entity	Watershed	Lat	Long
CR-BLD	Colorado River downstream of the Blue River near Kremmling	4/1/2007	9/30/2012	USGS	Lower Colorado River	40.0367	-106.4394
CR-BLU	Colorado River above Hwy 9 Bridge at Kremmling CO 2.3 mi upstream of the Blu	7/30/2006	9/4/2012	BLM	Middle Colorado River	40.0421	-106.3714
CR-CON	Colorado River at Public Access East of Con Ritschard Ranch 3 mi downstream c	7/2/2007	9/8/2012	GCWIN	Middle Colorado River	40.0656	-106.2318
CR-GRD	Colorado River downstream of Lake Granby at Flume	4/19/2007	9/14/2012	Northern	Upper Colorado	40.1440	-105.8670
CR-HRU	Colorado River above Hot Sulphur Springs Resort	5/4/2008	9/8/2012	GCWIN	Middle Colorado River	40.0739	-106.1103
CR-HSU	Colorado River above Hot Sulphur Springs Water Treatment Plant	7/2/2007	9/8/2012	GCWIN	Middle Colorado River	40.0794	-106.1004
CR-LB	Colorado River at Lone Buck below CDOW Office 3 mi downstream of Hot Sulp	7/2/2007	9/8/2012	GCWIN	Middle Colorado River	40.0470	-106.1426
CR-PAD	Colorado River above Kid's Pond below Parshall CO	7/26/2005	9/8/2012	GCWIN	Middle Colorado River	40.0634	-106.1903
CR-WFU	Colorado River at South Side of CR3 Bridge near Bar Lazy J Ranch immediately up	7/13/2007	9/8/2012	GCWIN	Middle Colorado River	40.0503	-106.1725
CR-WGD	Colorado River 1 mi downstream of Windy Gap at USGS flow gage	4/17/2007	9/13/2012	Northern	Colorado Windy Gap	40.1080	-106.0060
CR-YGAGE	Colorado River downstream of Lake Granby at YMCA flow Gage	4/17/2007	9/14/2012	Northern	Upper Colorado	40.1210	-105.9010
FR-WGU	Fraser River upstream of Windy Gap	4/17/2007	9/14/2012	Northern	Fraser River	40.0980	-105.9730
WC-WCRD	Willow Creek downstream of Willlow Creek Reservoir	4/17/2007	9/20/2012	Northern	Upper Colorado	40.1460	-105.9410

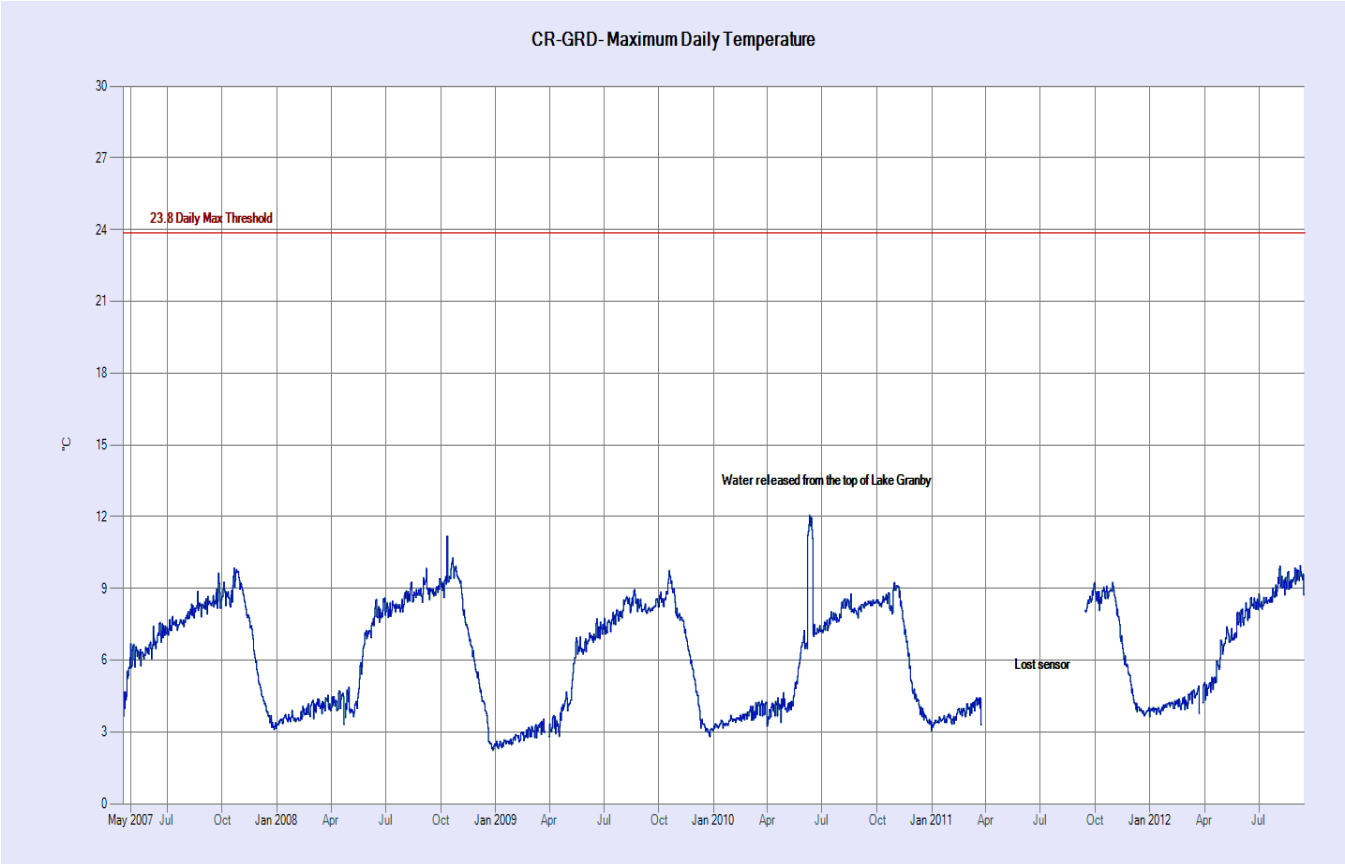
Colorado River Temperature Model

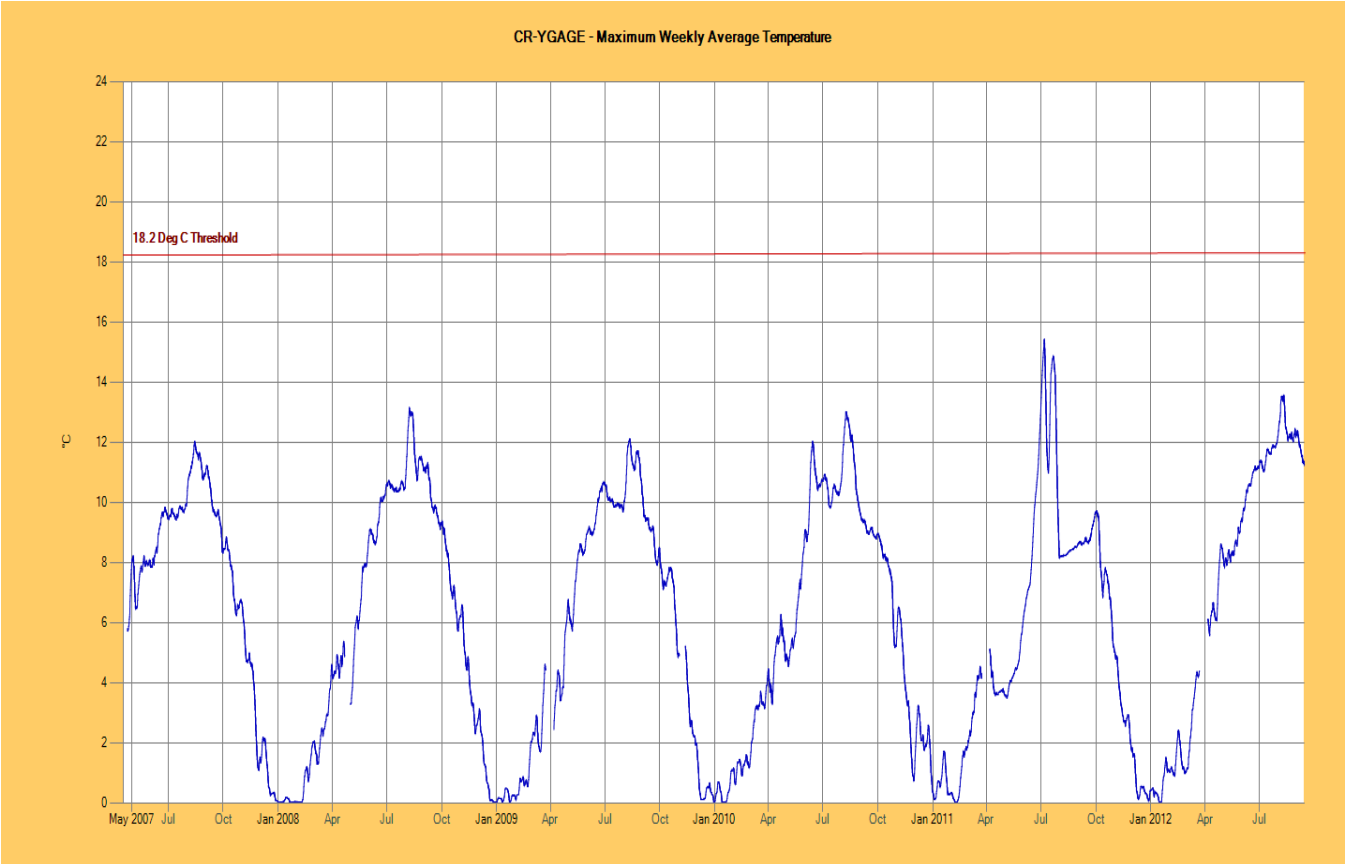


Temperature Site and Data Inventory

Station ID	Start Date	End Date	Entity
CR-GRD	4/19/2007	9/14/2012	Northern
CR-YGAGE	4/17/2007	9/14/2012	Northern
WC-WCRD	4/17/2007	9/20/2012	Northern
FR-WGU	4/17/2007	9/14/2012	Northern
CR-WGD	4/17/2007	9/13/2012	Northern
CR-HSU	7/2/2007	9/8/2012	GCWIN
CR-HRU	5/4/2008	9/8/2012	GCWIN
CR-LB	7/2/2007	9/8/2012	GCWIN
CR-WFU	7/13/2007	9/8/2012	GCWIN
CR-PAD	7/26/2005	9/8/2012	GCWIN
CR-CON	7/2/2007	9/8/2012	GCWIN
CR-BLU	7/30/2006	9/4/2012	BLM
CR-BLD	4/1/2007	9/30/2012	USGS


CR-GRD - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Water released from the top of Granby
Sensor not turned on
Lost Sensor
°C
24
22
20
18
16
14
12
10
8
6
4
2
0
May 2007
Jul
Oct
Jan 2008
Apr
Jul
Oct
Jan 2009
Apr
Jul
Oct
Jan 2010
Apr
Jul
Oct
Jan 2011
Apr
Jul
Oct
Jan 2012
Apr
Jul


CR-GRD- Maximum Daily Temperature
23.8 Daily Max Threshold
Water released from the top of Lake Granby
Lost sensor
°C
30
27
24
21
18
15
12
9
6
3
0
May 2007
Jul
Oct
Jan 2008
Apr
Jul
Oct
Jan 2009
Apr
Jul
Oct
Jan 2010
Apr
Jul
Oct
Jan 2011
Apr
Jul
Oct
Jan 2012
Apr
Jul


CR-YGAGE - Maximum Weekly Average Temperature
18.2 Deg C Threshold
°C
24
22
20
18
16
14
12
10
8
6
4
2
0
May 2007
Jul
Oct
Jan 2008
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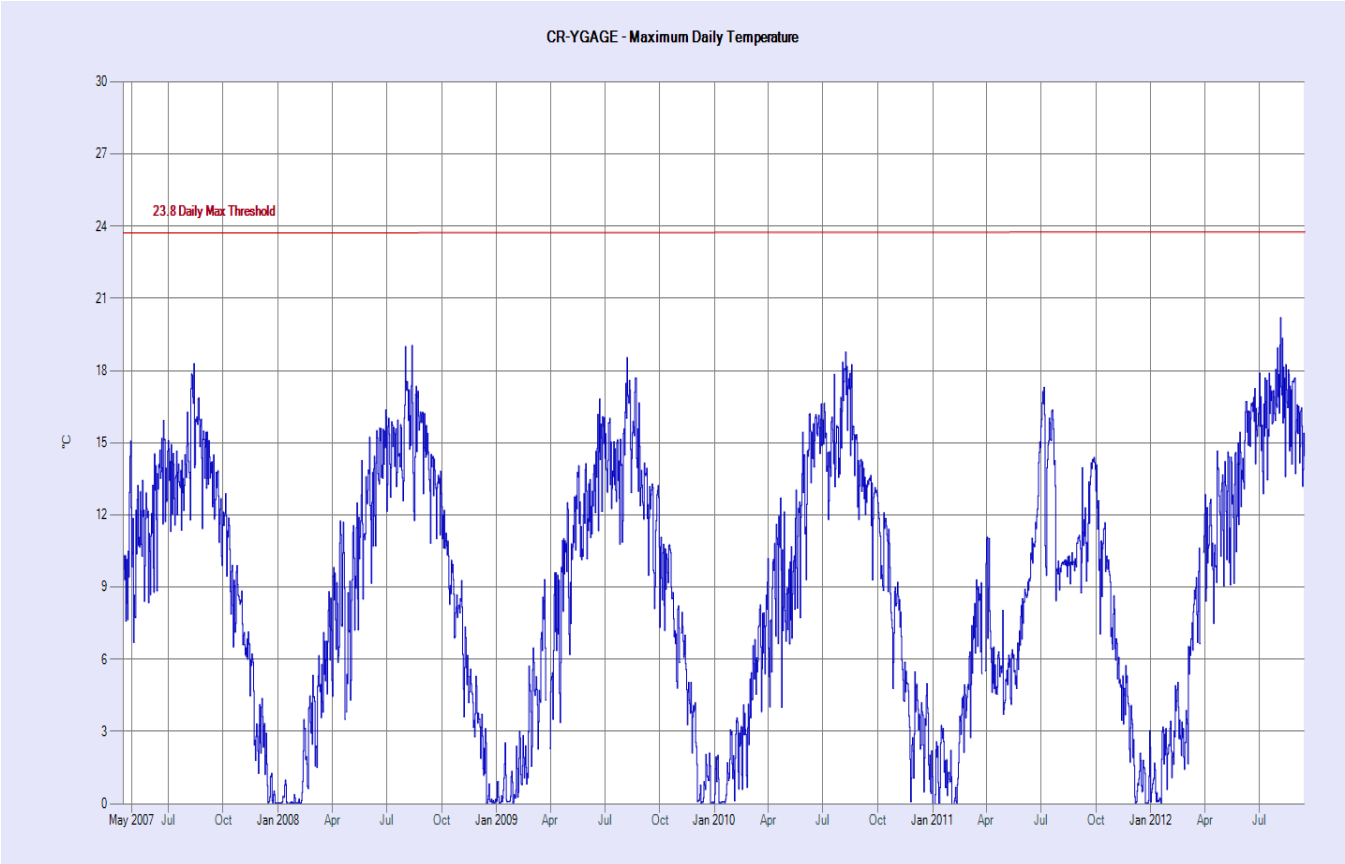
Jan 2012
Apr
Jul


CR-YGAGE - Maximum Daily Temperature
23.8 Daily Max Threshold
°C
30
27
24
21
18
15
12
9
6
3
0
May 2007
Jul
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Jan 2008
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Jan 2009
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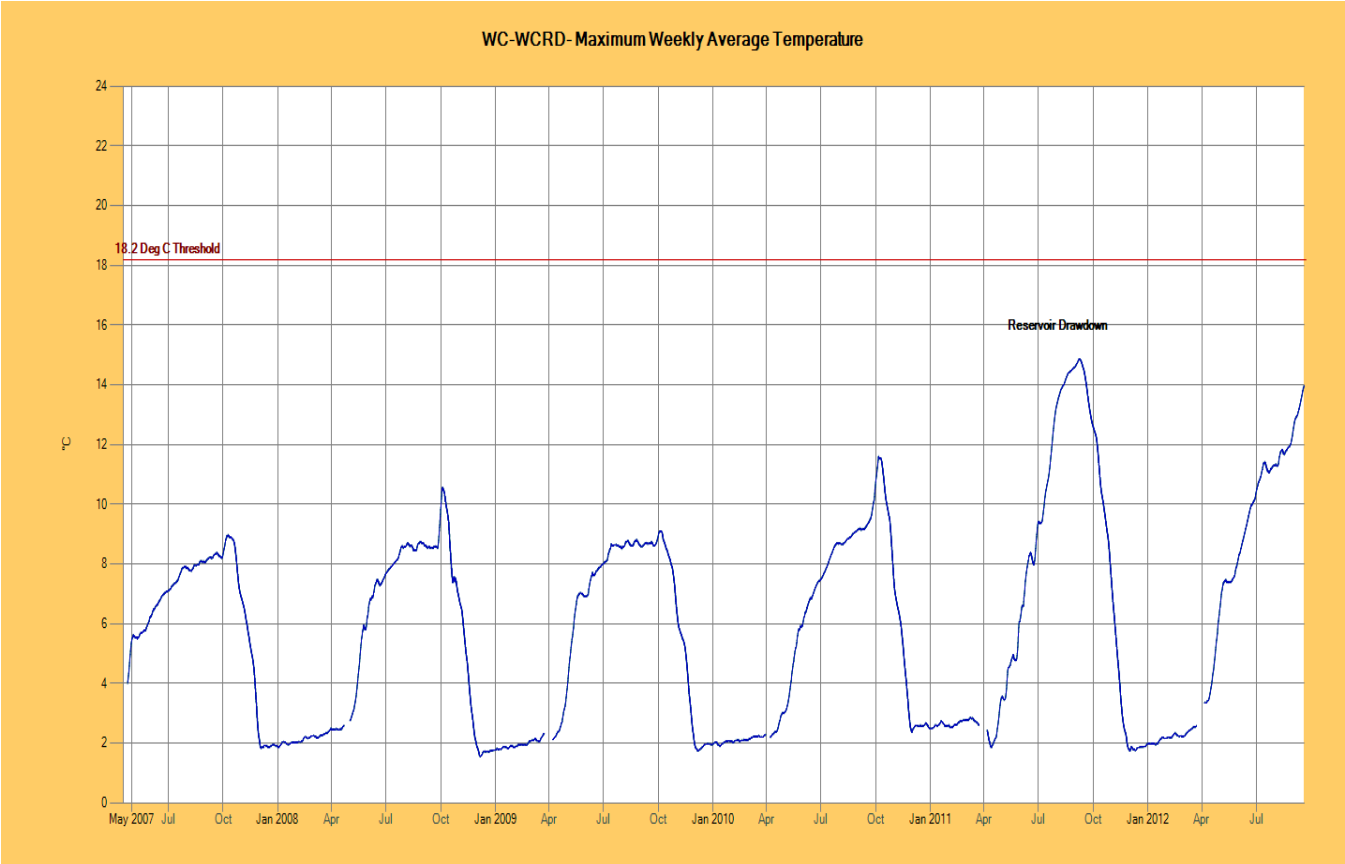
Jan 2011
Apr
Jul
Oct
Jan 2012
Apr
Jul


WC-WCRD- Maximum Weekly Average Temperature
18.2 Deg C Threshold
Reservoir Drawdown
°C
24
22
20
18
16
14
12
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6
4
2
0
May 2007
Jul
Oct
Jan 2008
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Jan 2011
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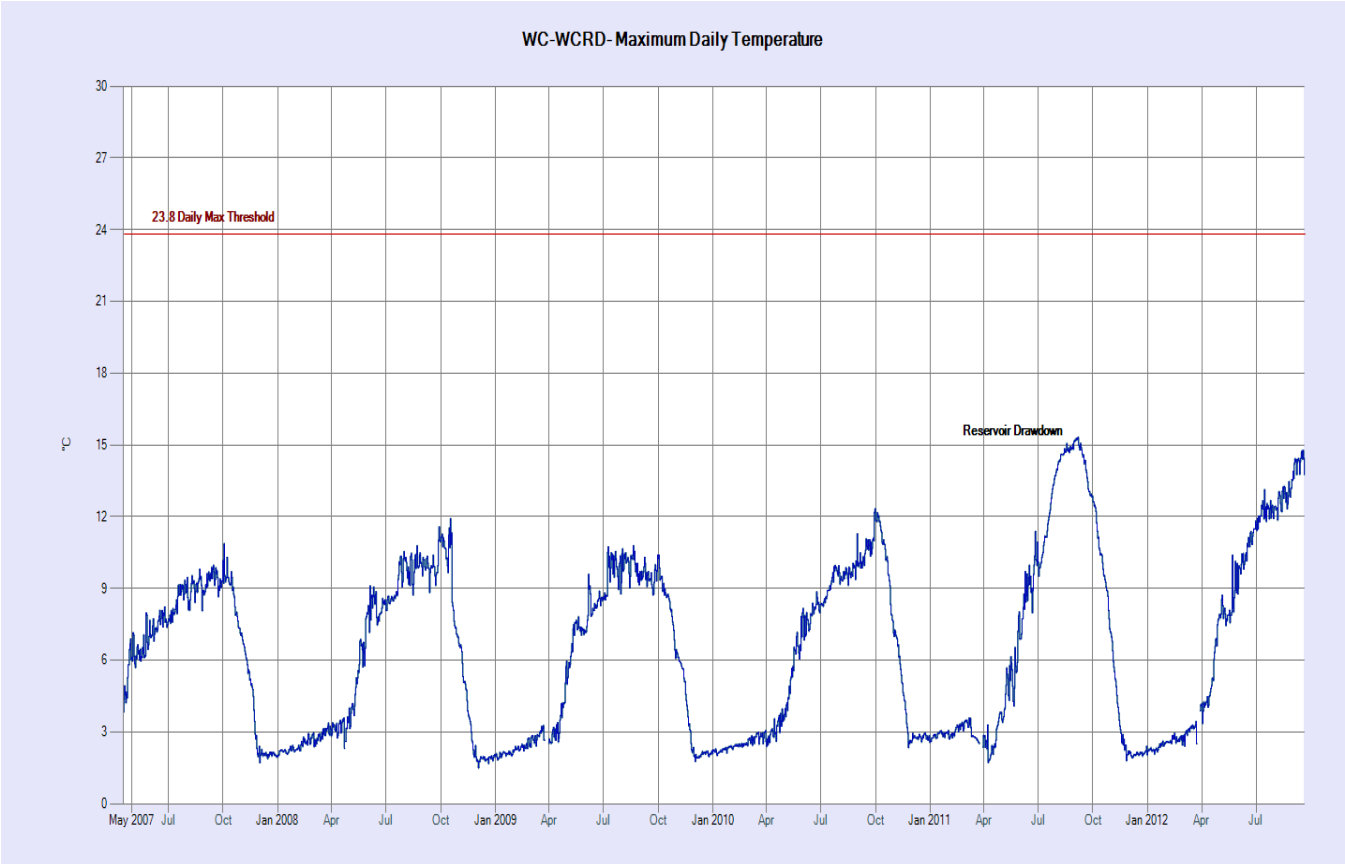
Jan 2012
Apr
Jul


WC-WCRD- Maximum Daily Temperature
23.8 Daily Max Threshold
Reservoir Drawdown
°C
30
27
24
21
18
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12
9
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May 2007
Jul
Oct
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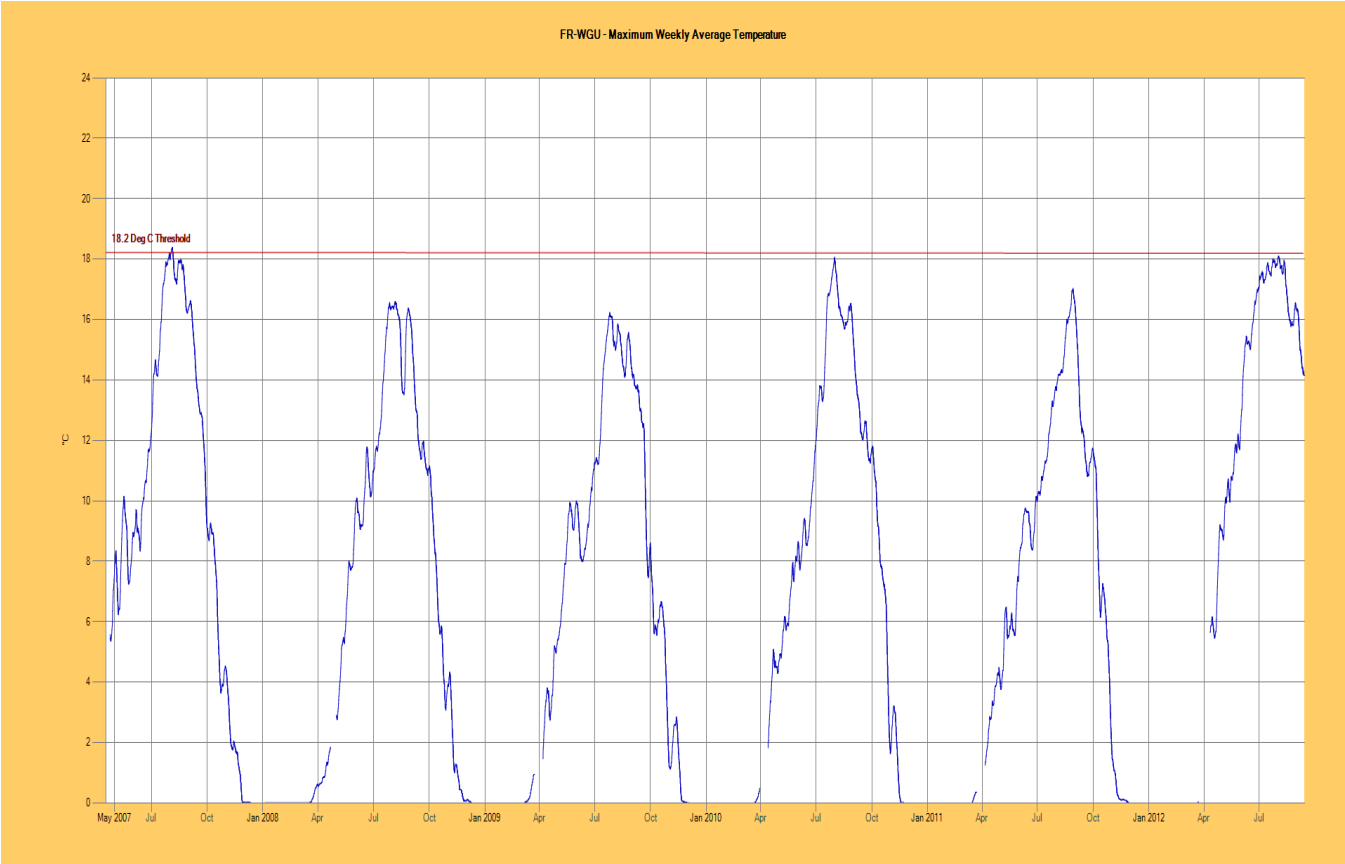
Jul
Oct
Jan 2012
Apr
Jul


FR-WGU - Maximum Weekly Average Temperature
18.2 Deg C Threshold
°C
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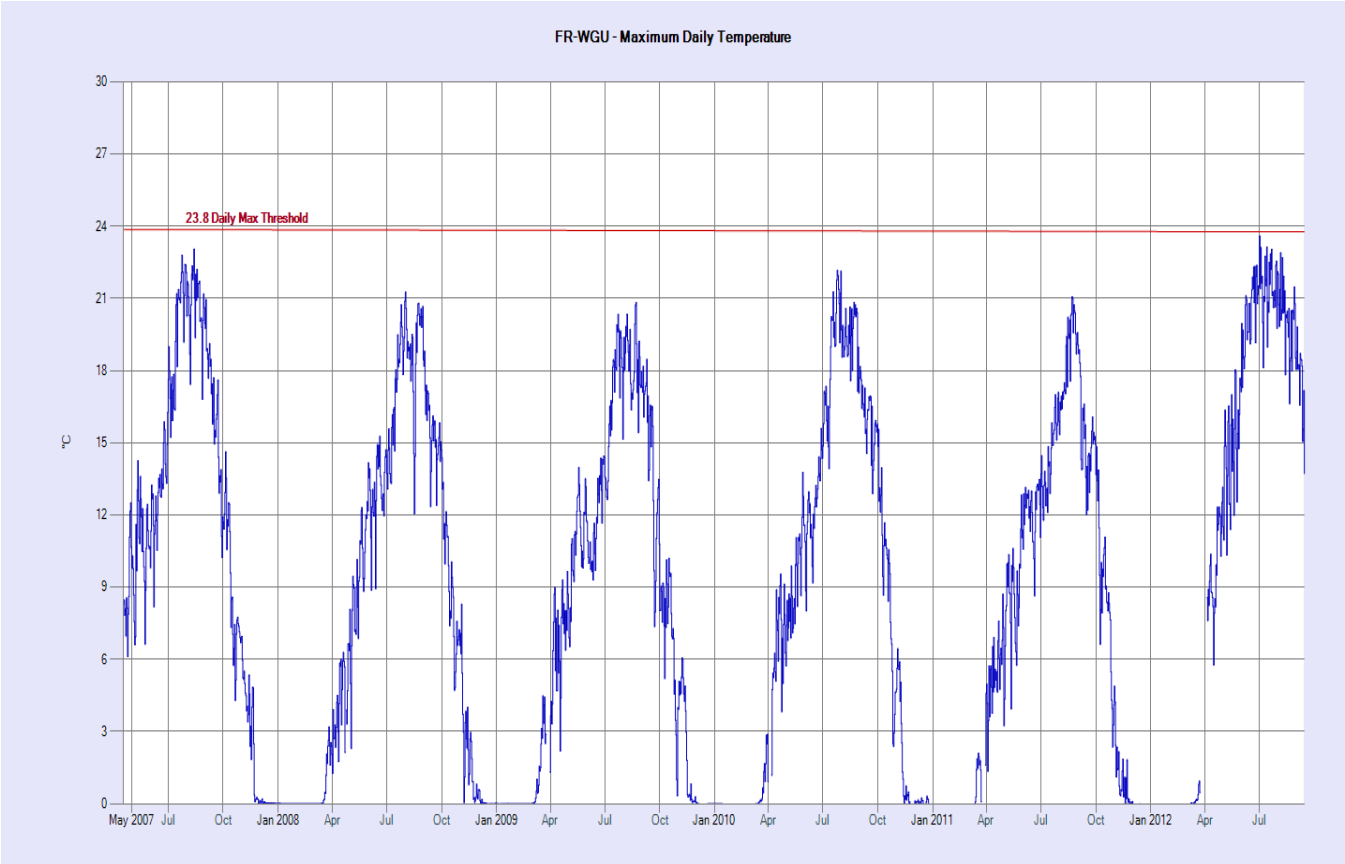
FR-WGU - Maximum Daily Temperature
23.8 Daily Max Threshold
°C
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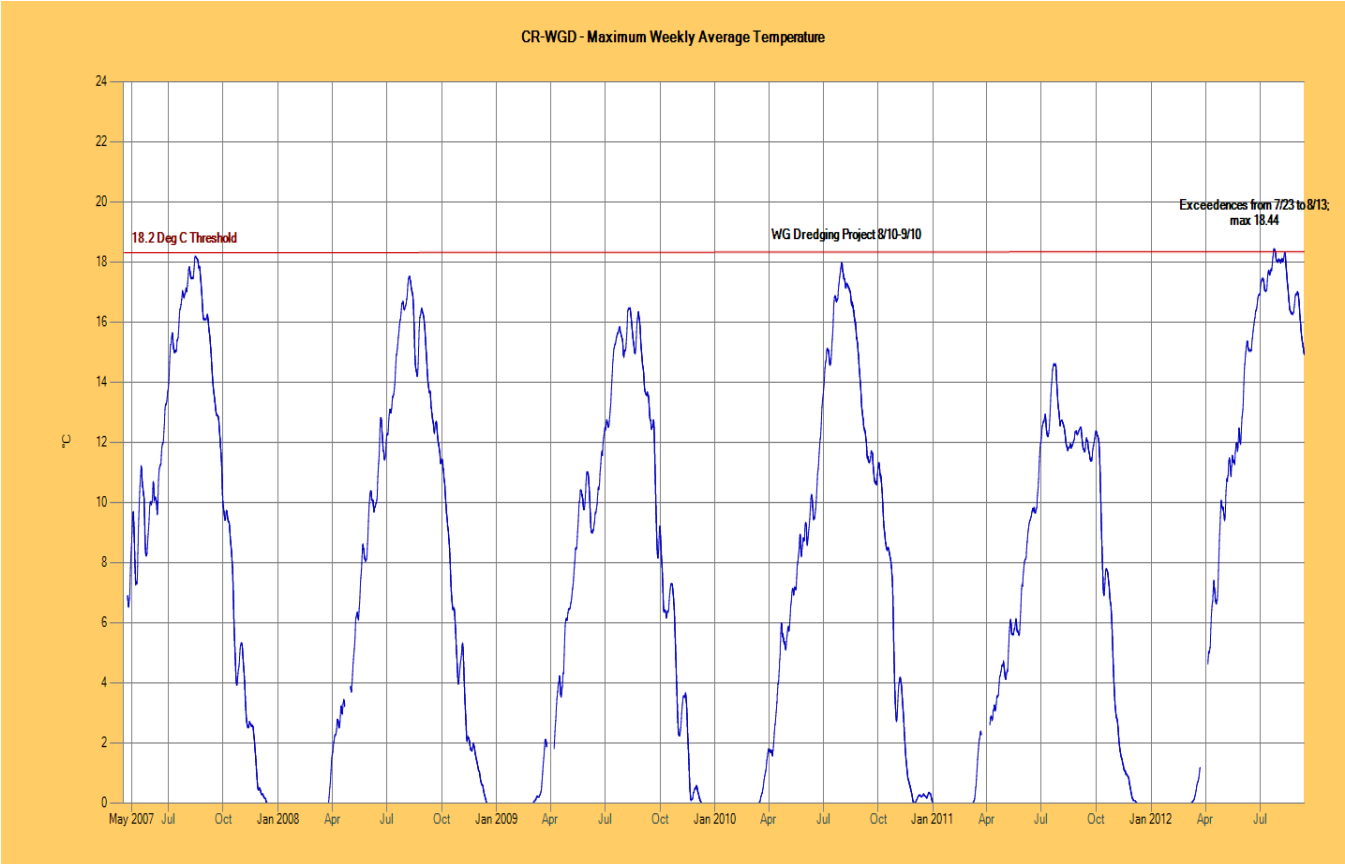
CR-WGD - Maximum Weekly Average Temperature
18.2 Deg C Threshold
WG Dredging Project 8/10-9/10
Exceedences from 7/23 to 8/13; max 18.44
°C
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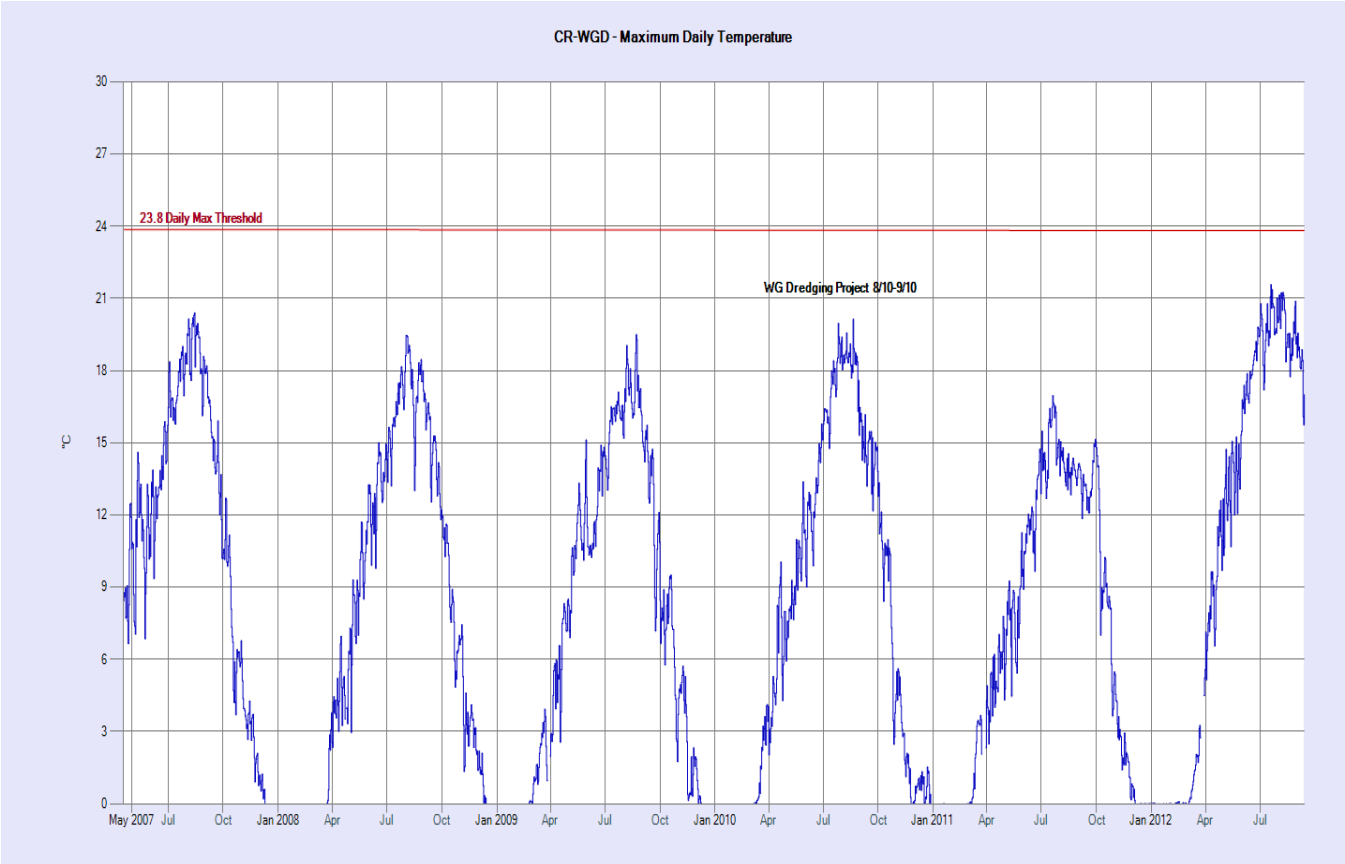
CR-WGD - Maximum Daily Temperature
23.8 Daily Max Threshold
WG Dredging Project 8/10-9/10
°C
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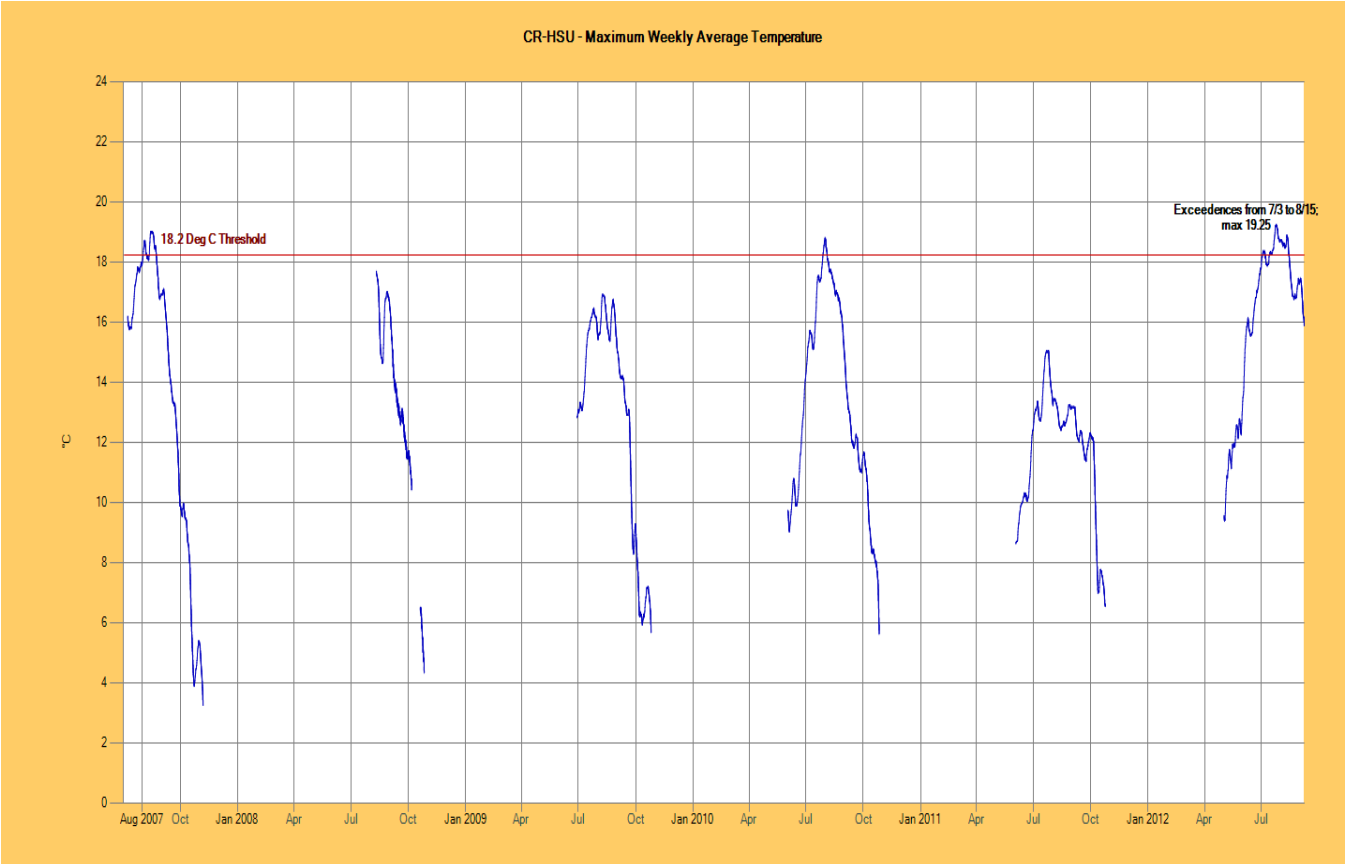
CR-HSU - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Exceedences from 7/3 to 8/15; max 19.25
°C
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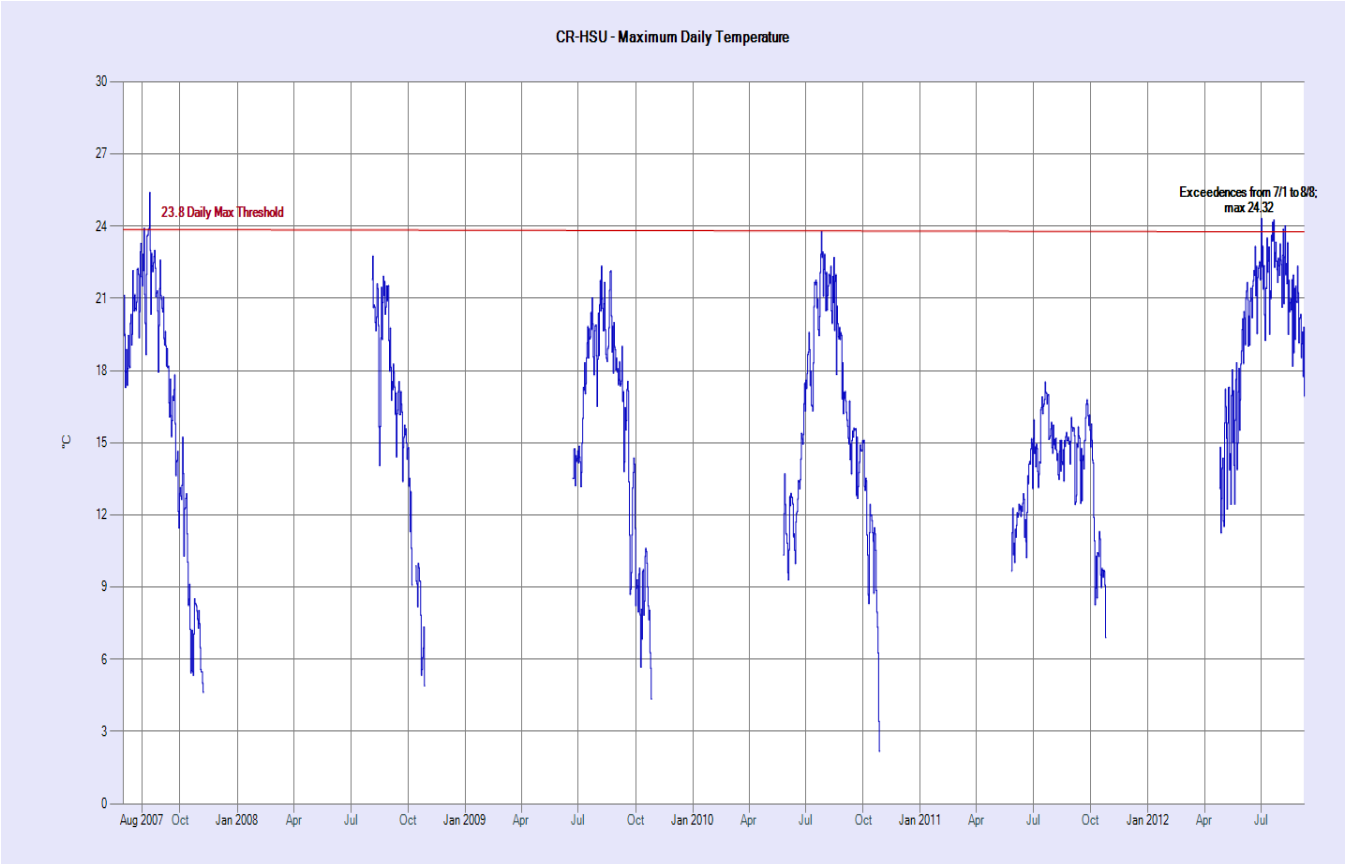
CR-HSU - Maximum Daily Temperature
23.8 Daily Max Threshold
Exceedences from 7/1 to 8/8; max 24.32
°C
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18
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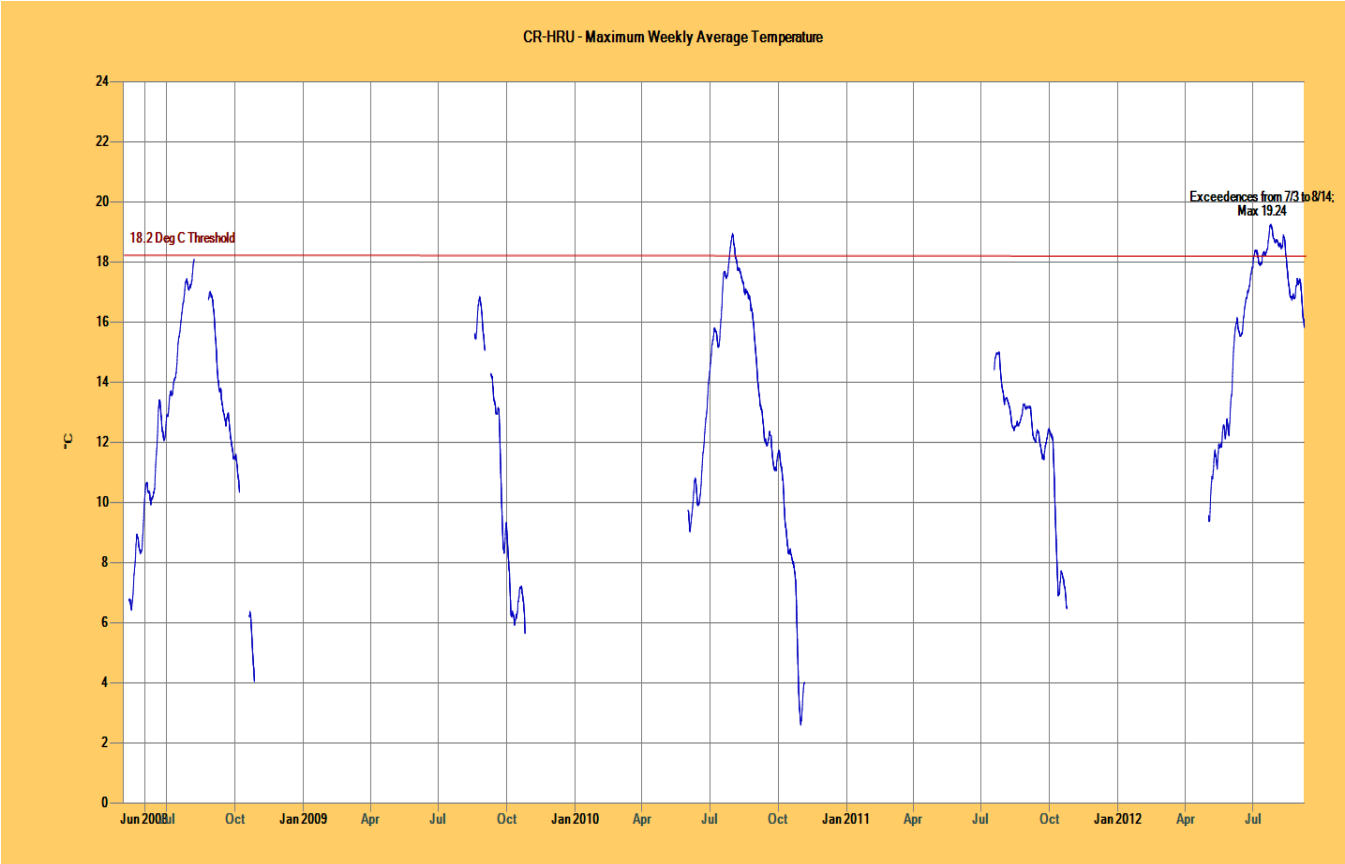
CR-HRU - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Exceedences from 7/3 to 8/14;
Max 19.24
°C
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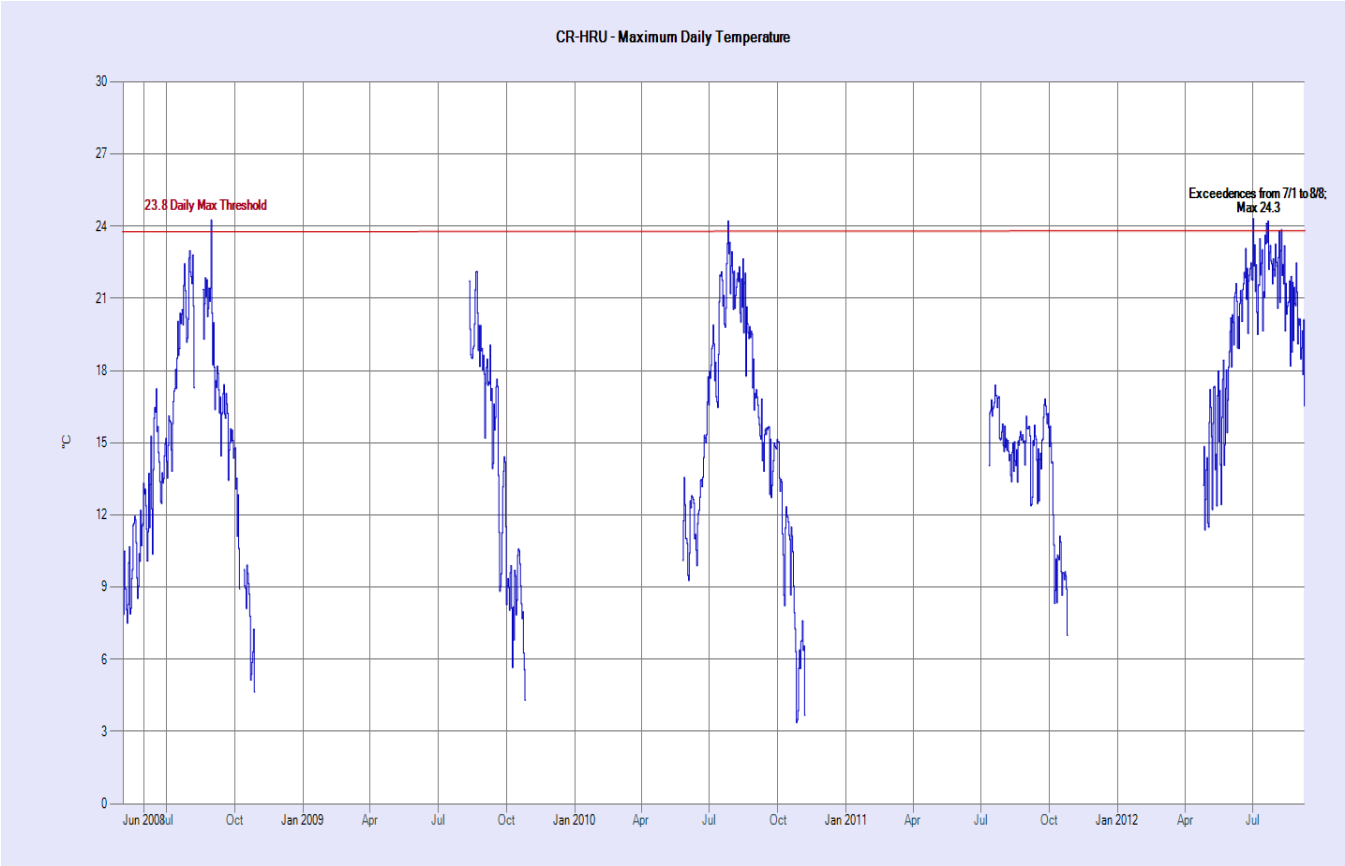
CR-HRU - Maximum Daily Temperature
23.8 Daily Max Threshold
Exceedences from 7/1 to 8/8;
Max 24.3
°C
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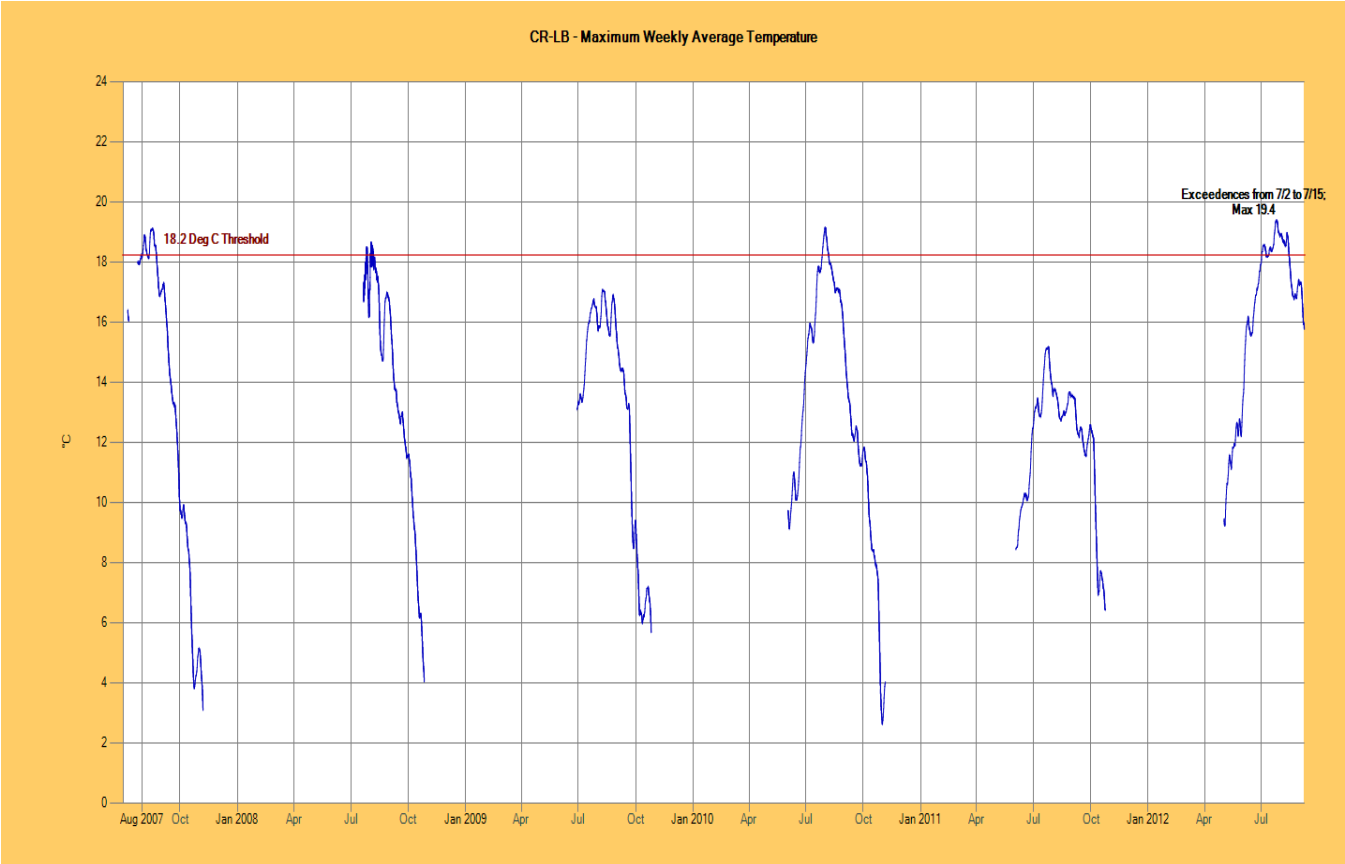
CR-LB - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Exceedences from 7/2 to 7/15;
Max 19.4
°C
24
22
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14
12
10
8
6
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Aug 2007
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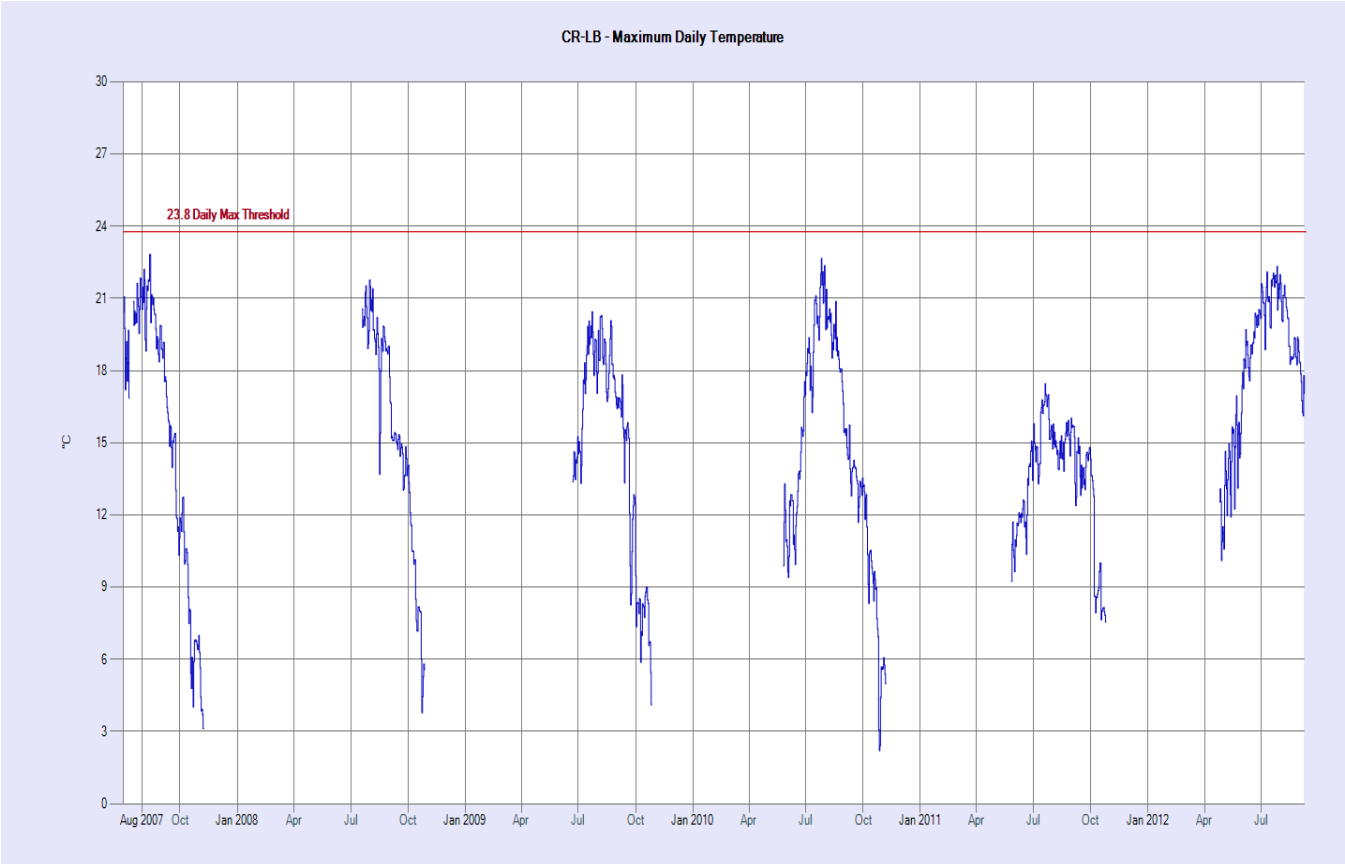
CR-LB - Maximum Daily Temperature
23.8 Daily Max Threshold
°C
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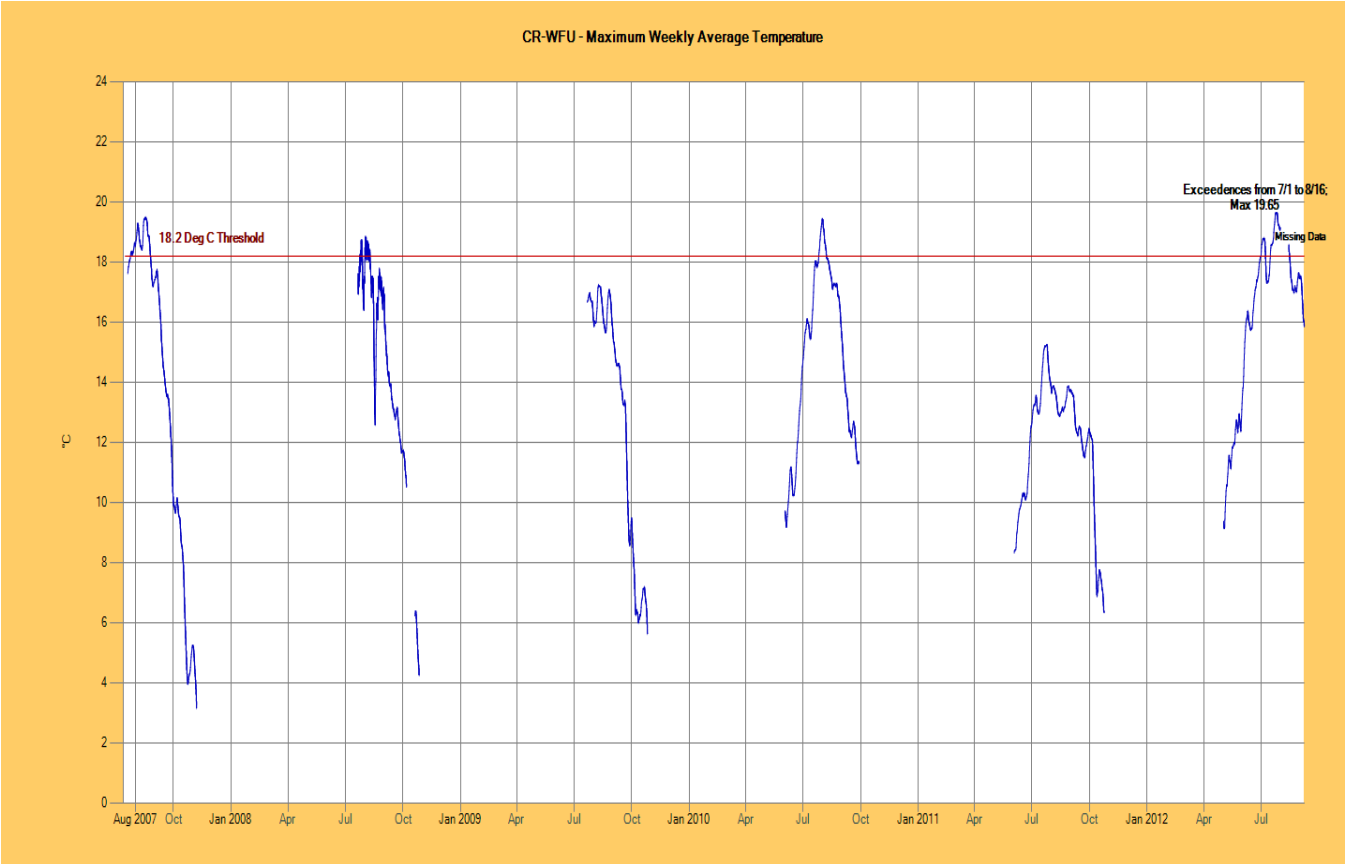
CR-WFU - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Exceedences from 7/1 to 8/16;
Max 19.65
Missing Data
°C
24
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Aug 2007
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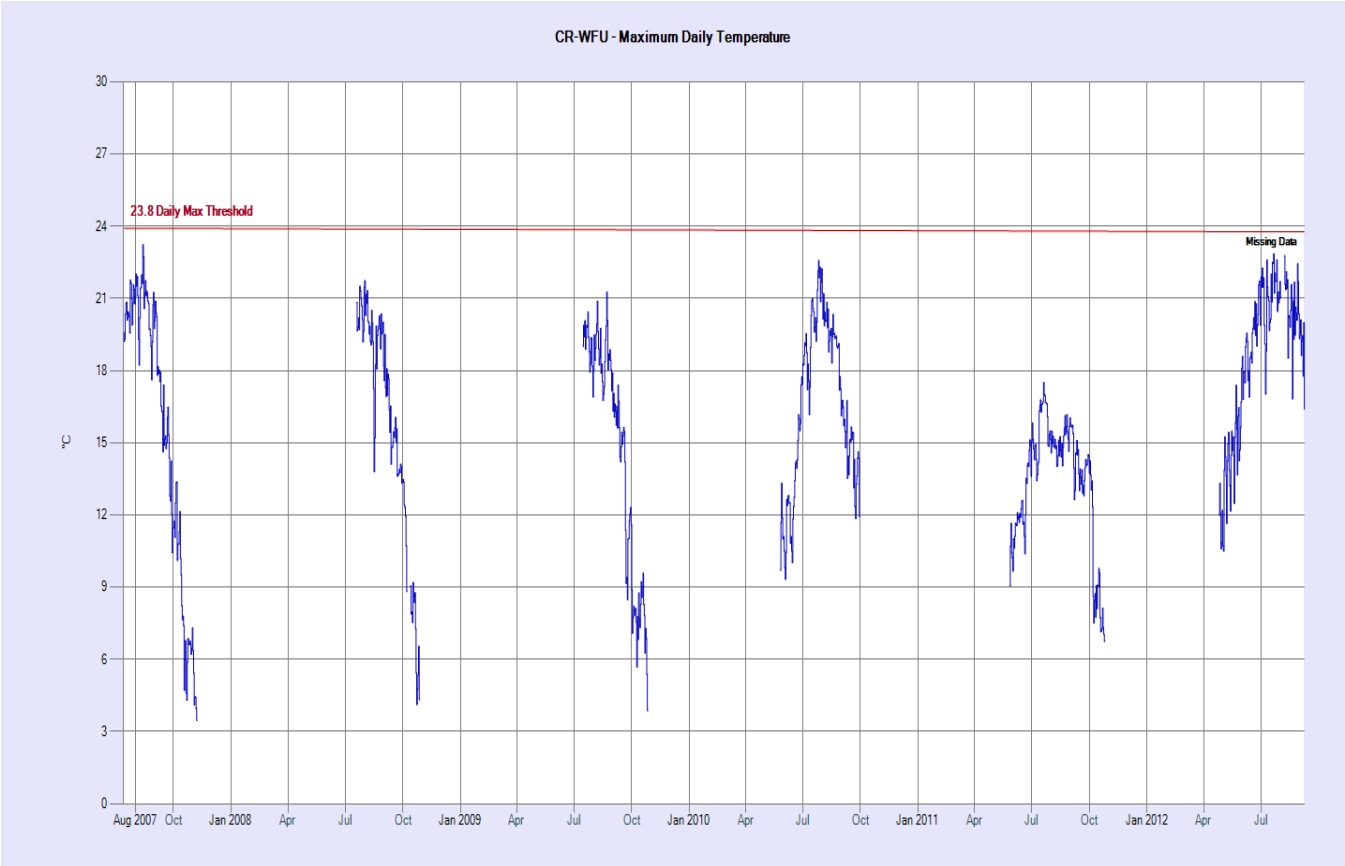
CR-WFU - Maximum Daily Temperature
23.8 Daily Max Threshold
Missing Data
°C
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Aug 2007
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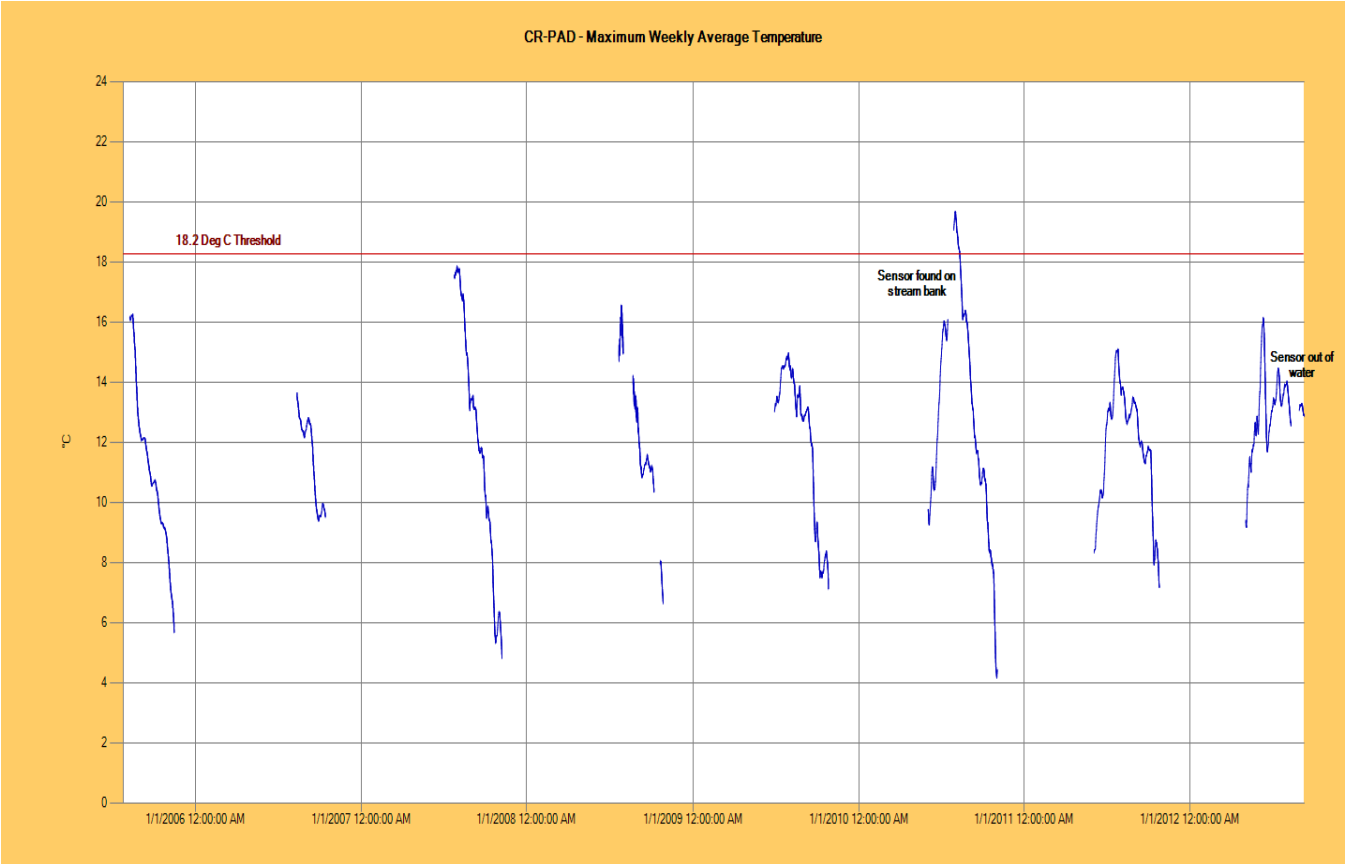
CR-PAD - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Sensor found on stream bank
Sensor out of water
°C
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1/1/2006 12:00:00 AM
1/1/2007 12:00:00 AM
1/1/2008 12:00:00 AM
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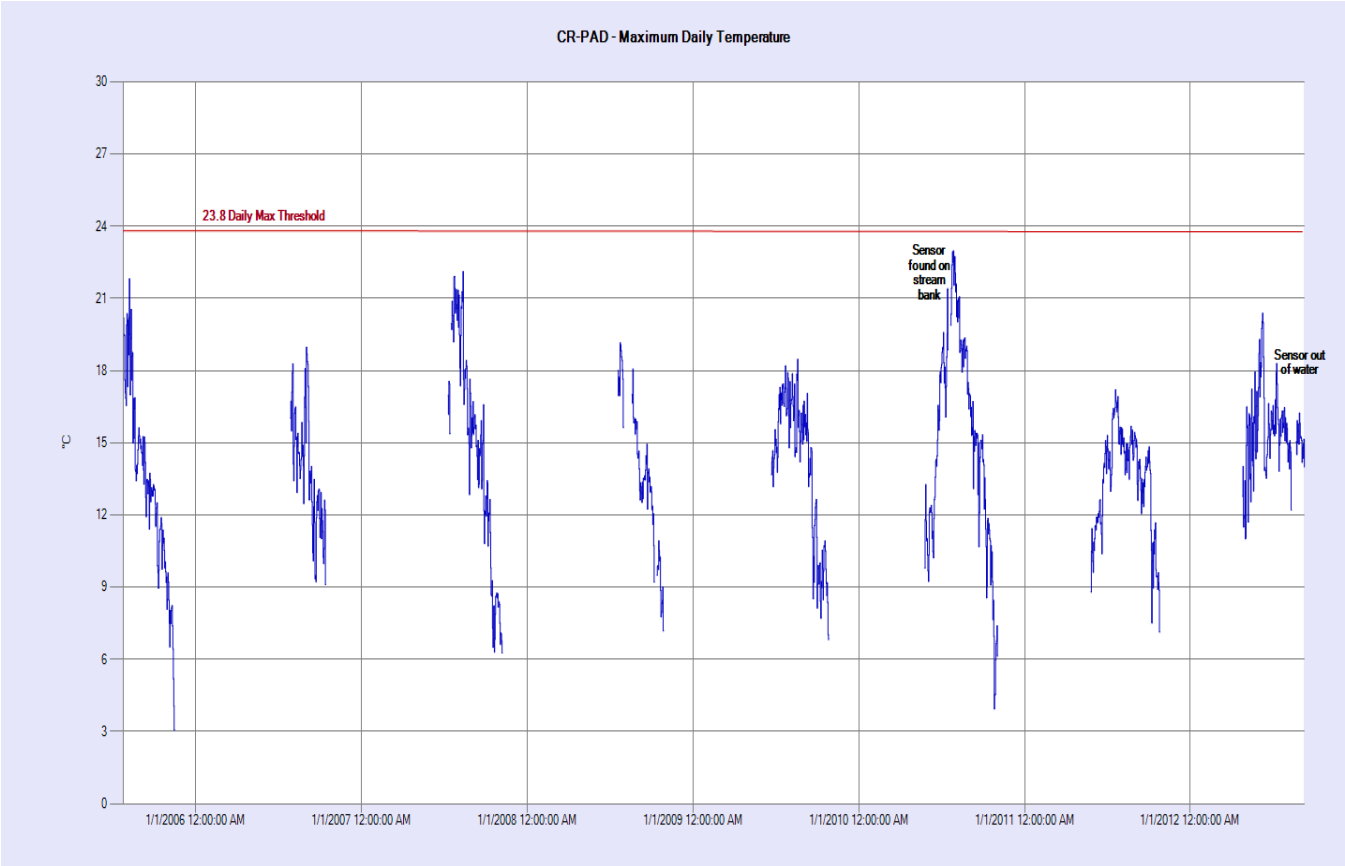
1/1/2012 12:00:00 AM


CR-PAD - Maximum Daily Temperature
23.8 Daily Max Threshold
Sensor found on stream bank
Sensor out of water
°C
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1/1/2006 12:00:00 AM
1/1/2007 12:00:00 AM
1/1/2008 12:00:00 AM
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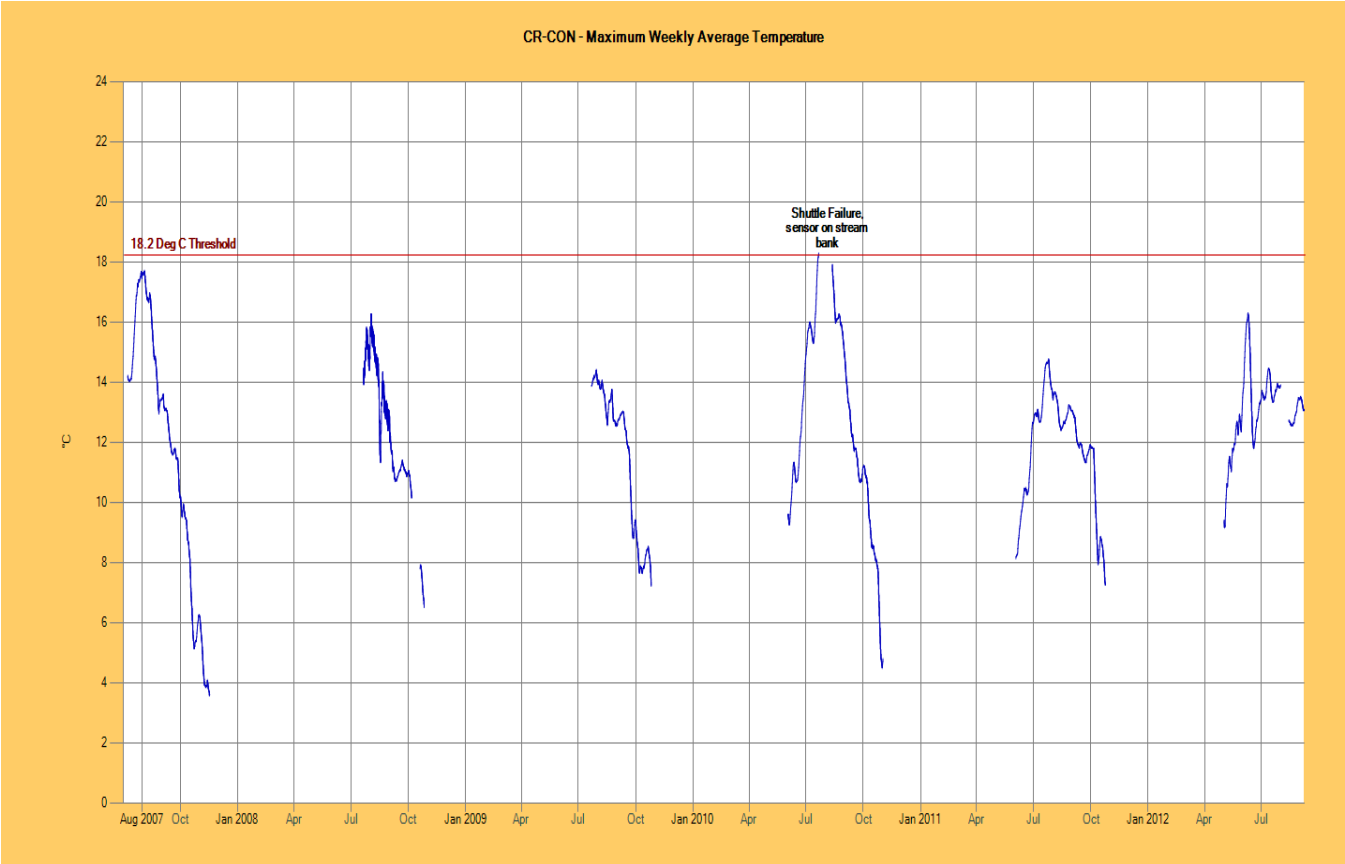
1/1/2011 12:00:00 AM
1/1/2012 12:00:00 AM


CR-CON - Maximum Weekly Average Temperature
18.2 Deg C Threshold
Shuttle Failure, sensor on stream bank
°C
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6
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Aug 2007
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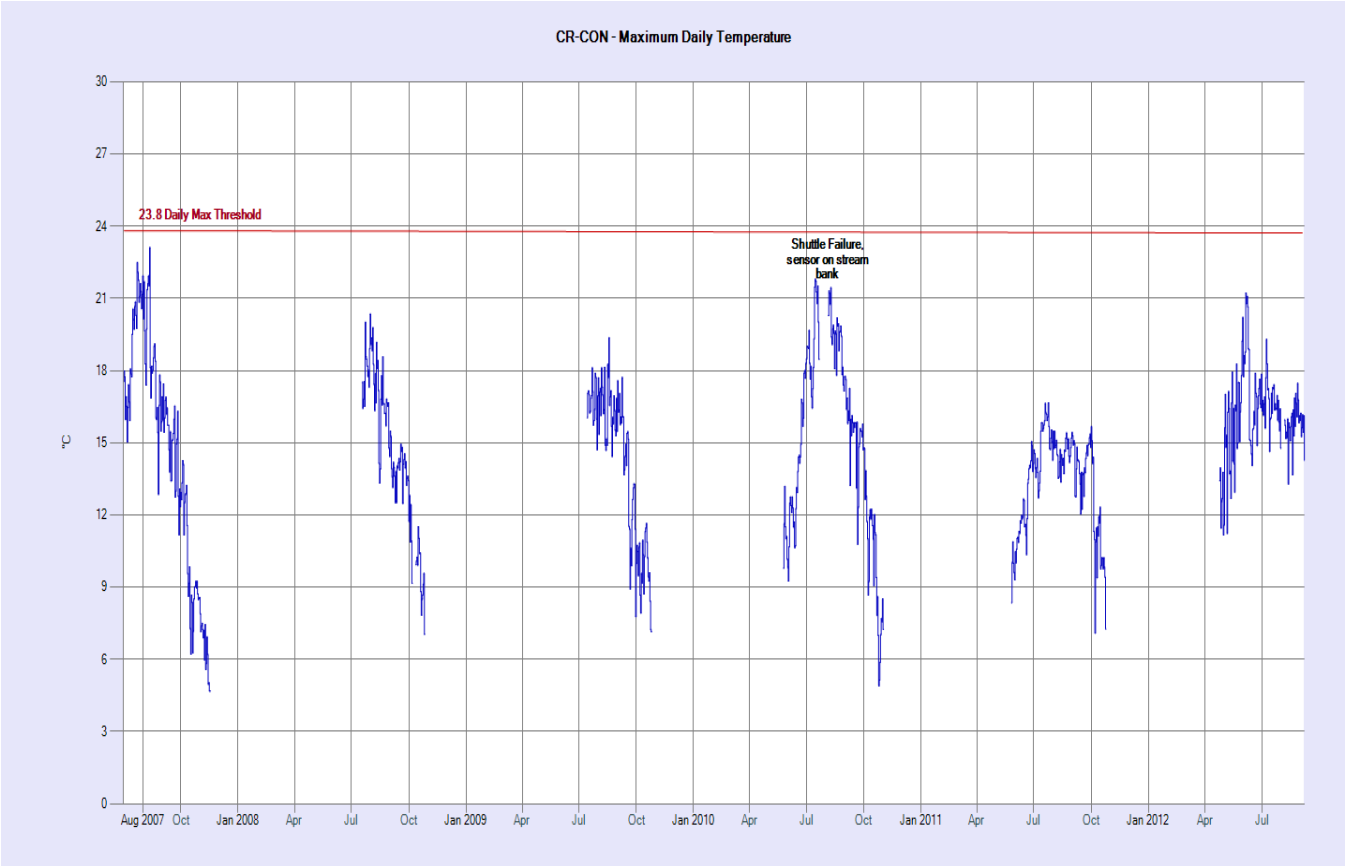
CR-CON - Maximum Daily Temperature
23.8 Daily Max Threshold
Shuttle Failure, sensor on stream bank
°C
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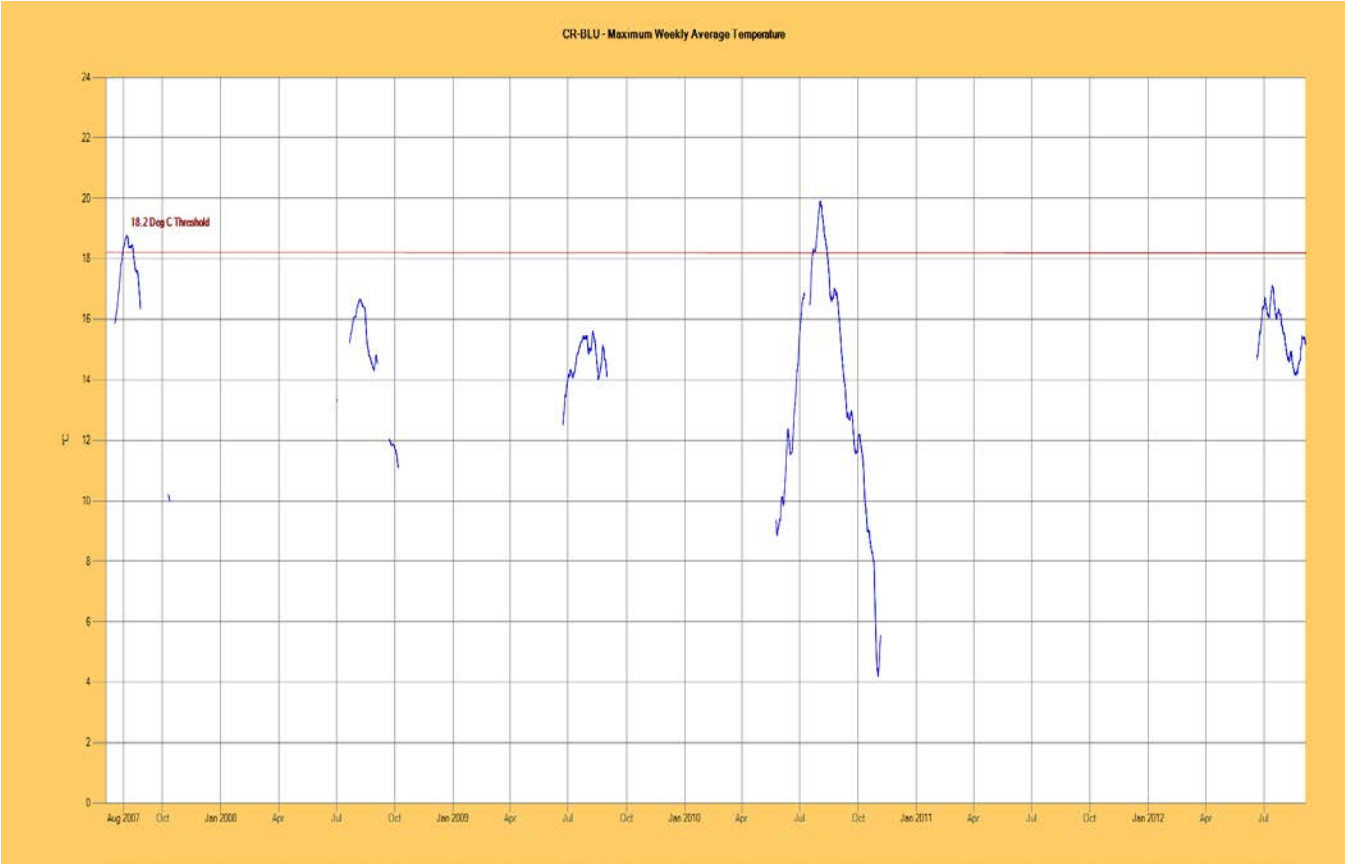
CR-BLU - Maximum Weekly Average Temperature
18.2 Deg C Threshold
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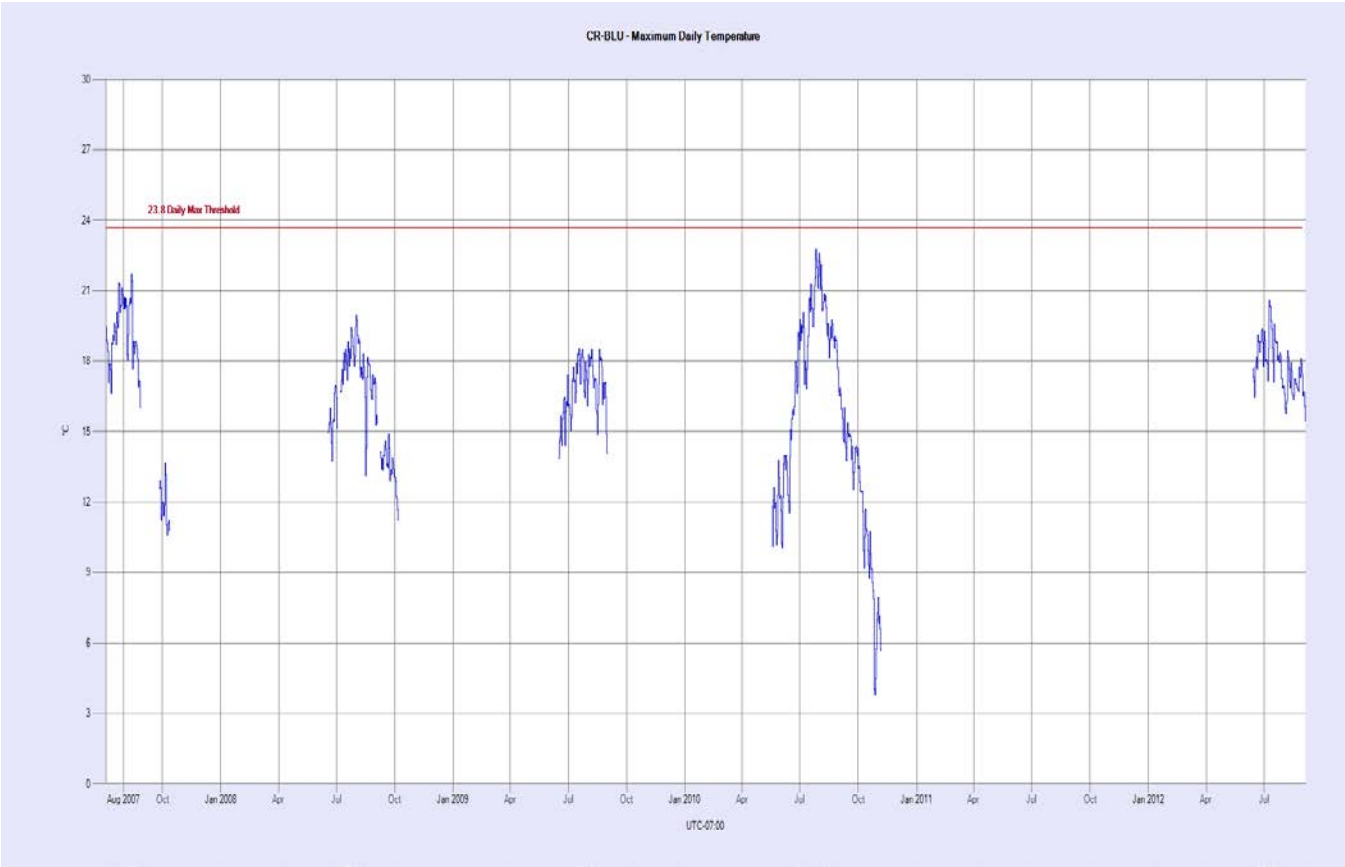
CR-BLU - Maximum Daily Temperature
23.8 Daily Max Threshold
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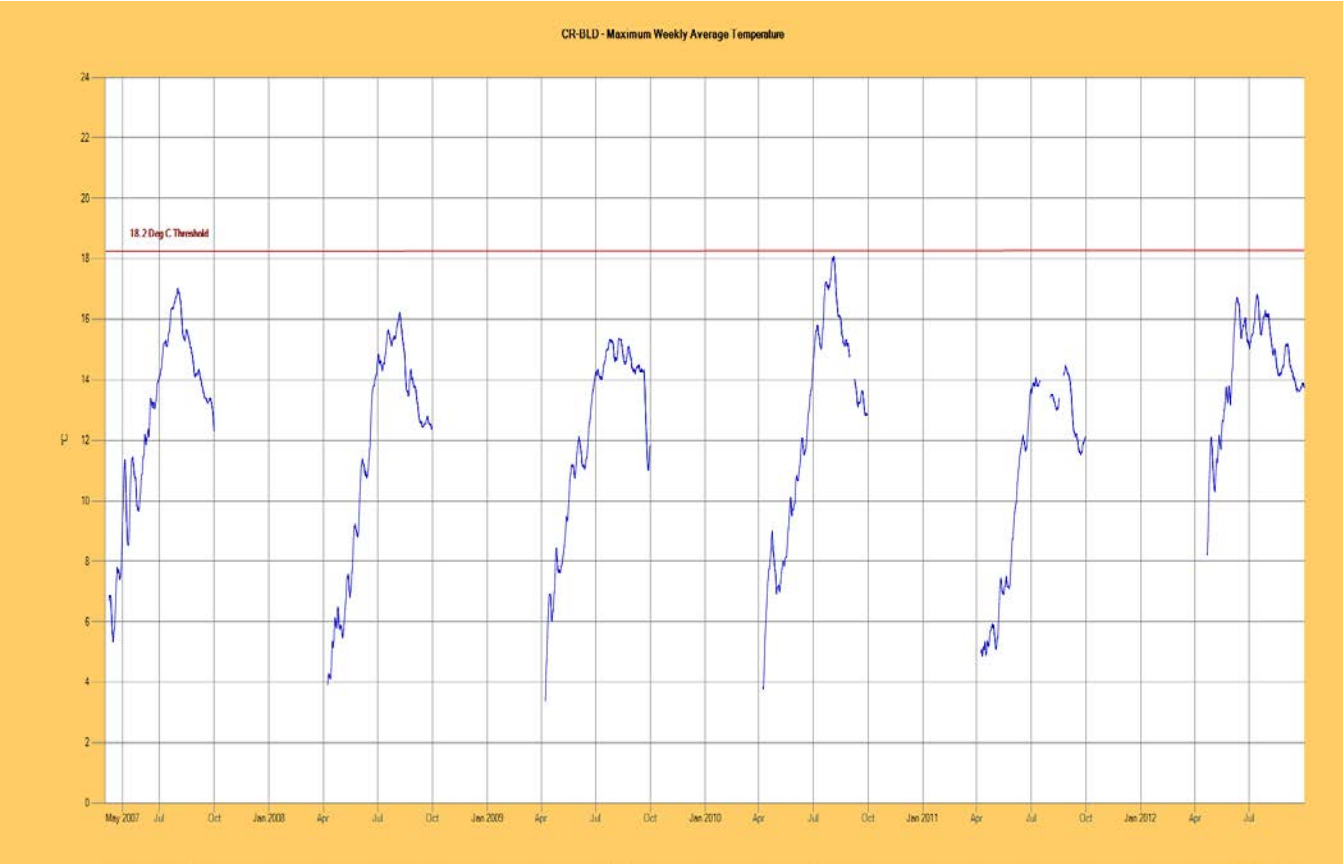
CR-BLD - Maximum Weekly Average Temperature
18.2 Deg C Threshold
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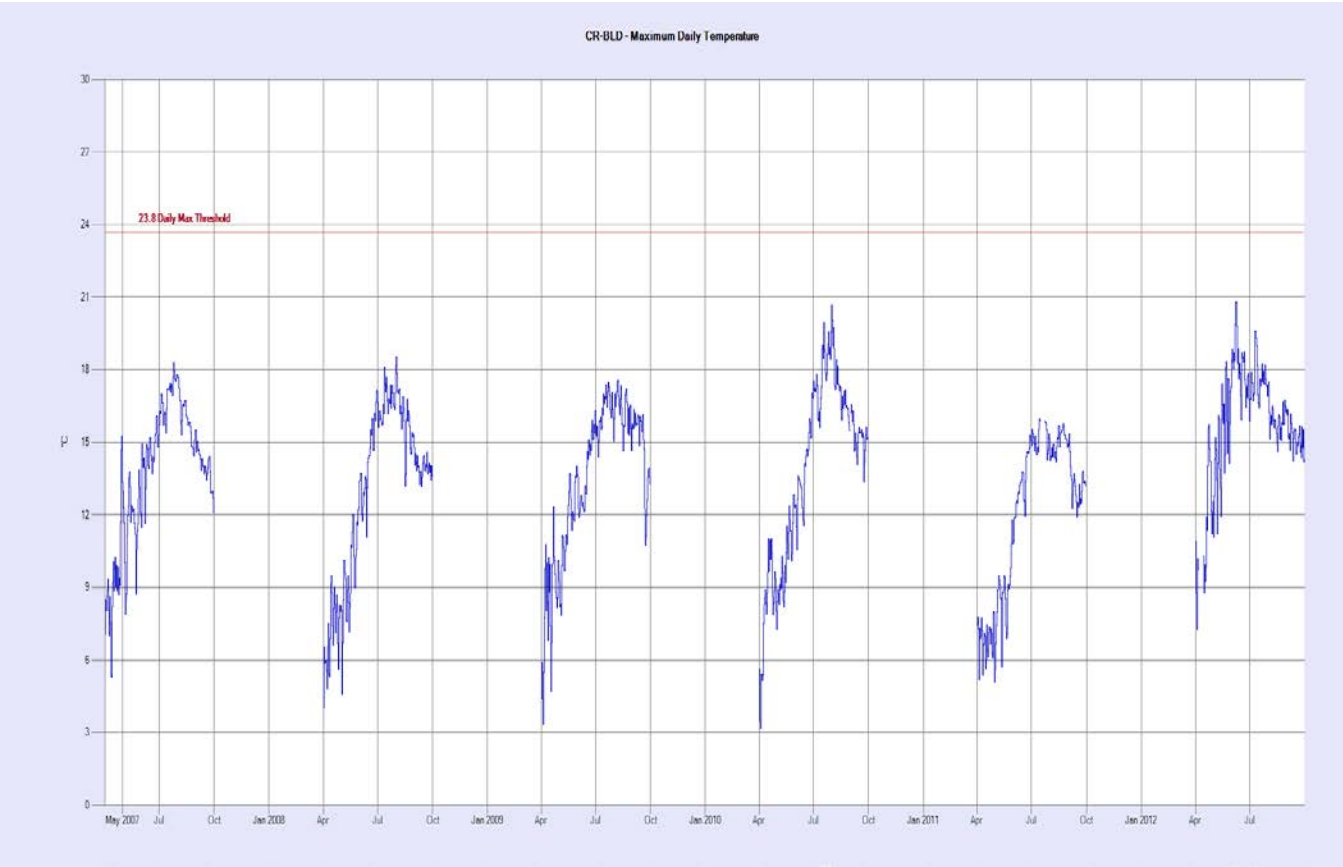
CR-BLD - Maximum Daily Temperature
23.8 Daily Max Threshold
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Nutrient Study – Data Review

The Nutrient Study was a three year study that was conducted from 2005-2007. During this time, sampling on the lakes and reservoirs was done by Davine Lieberman with the US Bureau of Reclamation and sampling on the rivers and streams was done by the USGS, Harlan and Associates and Northern Water. Laboratory analysis was done at various labs including the National Water Quality Lab, three different USBR Laboratories (Boulder, Boise and Denver), Aquatic Analysts and BSA. At the end of the three year period, the data were compiled into a database and were analyzed. A report entitled "Physical, Chemical, and Biological Attributes of Western and Eastern Slope Reservoir, Lake, and Flowing Water Sites on the C-BT Project, 2005-2007: Lake Granby, Grand Lake, Shadow Mountain Reservoir, Horsetooth Reservoir, Carter Lake" (Report) was prepared by Davine Lieberman, USBR.

There were many problems discovered with the data both during the course of the study and after the study and Report were complete. There were inconsistencies with sampling dates, suspect data received from the laboratories, suspect profile data for the lakes, and calibration/equipment concerns. There was a separate database that contained all the data collected for the Nutrient Study and used in the Report. Some of the data was 'cleaned-up' during the study and these changes were made directly in the nutrient database. Most of these changes were related to inconsistencies with sampling dates. After the study and Report were complete, the data from the Nutrient Database was rolled into Northern's Flowing Sites and Lakes Databases. This occurred in the early part of 2009 and was complete in May 2009. During this process, there was a significant amount of additional QAQC done on the data, primarily in regard to suspect data. After this was complete the data was used in the Flowing Sites and Lakes and Reservoirs Reports which led to the discovery of more suspect data. The data was flagged and censored in Northern's Flowing Sites and Lakes and Reservoirs Databases accordingly.

This purpose of this document is to provide detail on what data was censored or marked as suspect in Northern Water's databases, explain why the data was censored and to outline inconsistencies between the Report and the databases.

Chlorophyll a

Note: The report uses the "corrected chlorophyll a" value. This analysis was done at the USBR Denver Lab.

Current Data Status, Known Data Issues and Actions Taken

- All of the flowing sites data received from the lab are in both the database and the Report.
- For the lakes and reservoirs, there are two lab reports that contain suspect data. Both reports are from October 2005. These data were disqualified in the Lakes Database in March 2009.
    - The first report has a majority of the values reported as non-detects. The values that were reported have higher values for corrected chlorophyll a than for (not corrected) chlorophyll a.
      Action Taken: All of the data from this lab report were disqualified; 130 records total.
    - The second report had values reported as "0".
      Action Taken: The zero values were disqualified; 38 records total.

Note: There was no October 2005 chlorophyll data included in the Report. There are no chlorophyll a data in either the report or the database for the samples collected on the West Slope on September 21, 2005; this data is missing. In the Report, in the chlorophyll section under Lake Granby, it was stated that two data points were not included in the Report due to error in analysis; September and October 2005. This corresponds to the missing September data and the suspect October data that has been disqualified in the database.

New Found Issues and Action Taken

- Regarding the comment in the Report about the data that was not included due to error in analysis in September and October 2005; most of this data has been censored from the database but not all of it was. There are still data in the database from the lab report that includes the "0" values.

  Action Taken: Disqualified all the data from the lab reports that were not included in the Report. This includes the remainder of the data from the report "Chl_10-2005_HT", 22 records from the Lakes database. These data were disqualified on 1/7/2013.

- There are three other issues that occur with the 2005-2007 chlorophyll data:

  1. Often, the corrected chlorophyll a is greater than the (not corrected) chlorophyll a concentration, primarily in lab reports from 2005. The chlorophyll a value accounts for the "living chlorophyll". It should be equal to the corrected chlorophyll a added to the Pheophytin a (degradation byproduct). An email was been sent to the lab (USBR Denver) to try to resolve this issue and possibly see if the correct data can be resubmitted. The lab stated they no longer have the original data for 2005 (email correspondence Chlorophyll_2005 Data_Email MSimonavice.pdf). Review of the data showed no pattern in regards to how the corrected chlorophyll a was calculated when calculated in error; however there was often an error in the calculation used occurred when the pheophytin was reported as a non-detect, <0.1. In all these instances, the corrected chlorophyll a was 0.1 (ug/L) greater than the chlorophyll a. Instances where the corrected chlorophyll a is greater than chlorophyll a occurs 207 times in the lakes database and 14 times in the flowing sites database.

  2. There are several instances when the pheophytin a concentration is significantly greater than the chlorophyll a concentration; 11 times in the lakes database and 23 times in the flowing sites database. This occurred primarily in May and June of 2007. Correspondence with Chris Holdren, Manager, Environmental Applications and Research Group, USBR, indicates that when this occurs, the data are suspect (Chlorophyll_2007 Pheophytin a concentration_Email CHoldren.pdf). The lab reports that contain this data also have data where this does not occur but in these instances, the calculation for corrected chlorophyll is not equal to chlorophyll a minus the pheophytin a.

  3. Most of the chlorophyll lab reports from 2005-2007 contain instances where the calculation for corrected chlorophyll a is not correct according to the chlorophyll a and pheophytin a concentrations. This occurs 113 times in the lakes database and 50 times in the flowing sites database, not including the data recommended for disqualification above. It occurs over the entire period of record and is not localized to any specific timeframe. In addition, the error in the calculated value is not apparent or consistent when looking at the data.

  A meeting was held between Northern Water and Chris Holdren, who was and is currently the manager of the USBR Denver Lab, on January 3, 2013 to discuss the chlorophyll data issues. He stated that due to the variability in the chlorophyll analysis, all three of the above issues can occur to some degree. The extent of each occurrence is dependent on concentration each instance should be compared to a set percentile in order to determine whether the data are suspect or not. The guidelines he provided were:

  - If the pheophytin is 50% greater than the corrected chlorophyll a the data may be suspect. In these cases, it is likely that the chlorophyll a value is correct as it is derived from a separate analysis and may be used.
  - If the analytically derived chlorophyll a value is 20% different than the value derived from adding the pheophytin a and the corrected chlorophyll a, this data may be suspect.

In all instances where there are suspect data, knowledge of the system and expected conditions can help determine what data are useable and what data are truly suspect.

Action Taken: All chlorophyll lab reports from 2005-2007 that contain suspect data were reviewed by Chris Holdren. He provided recommendations as to what values to use, what values to mark as suspect and what values to disqualify in the databases. In most cases, either the corrected chlorophyll a value or the chlorophyll a value were valid and remain in the database without being flagged as suspect or disqualified. Below is a summary of what action(s) were taken on the chlorophyll a (corrected) and chlorophyll a suspect data.

	Lakes		Flowing Sites	
Action	Chlorophyll a (Corrected)	Chlorophyll a	Chlorophyll a (Corrected)	Chlorophyll a
Disqualified	57	1	82	0
Flagged as Suspect	13	103	0	23
No Action	99	65	1	60

Nutrients

For the samples collected by USBR, Harlan and Northern, the nutrient analysis was done at the USBR Boulder Lab (4/2005-2/2006) and the USBR Boise Lab (4/2006-11/2007). Samples collected by the USGS were analyzed at the NWQL. Beginning in 2008, High Sierra Water Lab was used for (most) all nutrient analysis; the NWQL was still used at select sites. In both figures, values reported as a non-detect were set equal to the reporting limit

Figure 1 and Figure 2 show how the data compare for each different laboratory for 2005-2010. Figure 1 is data for the flowing sites; Figure 2 is data for the lakes and reservoirs. The data is grouped by sites with similar water quality. The flowing sites figure includes data for sites not in the Report. In both figures, values reported as a non-detect were set equal to the reporting limit.

Figure 1 - Nutrient Data by Laboratory – Flowing Sites

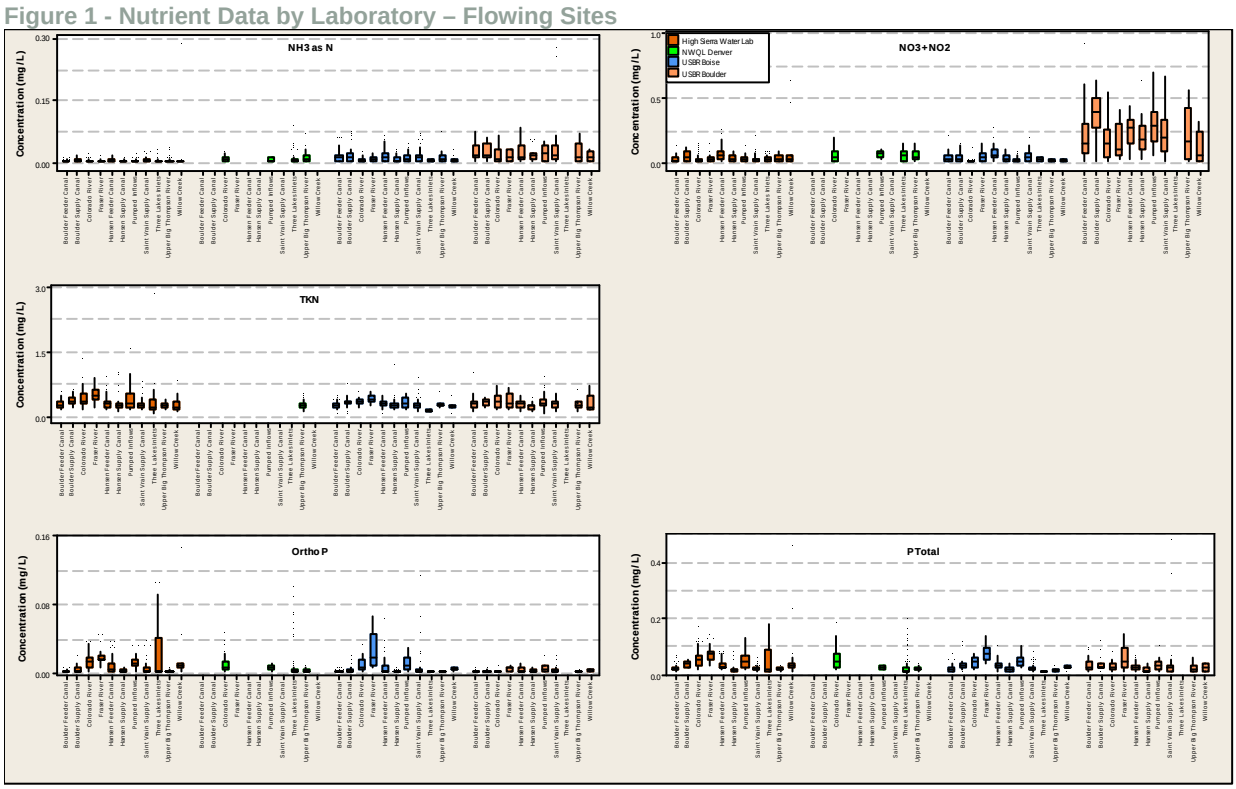
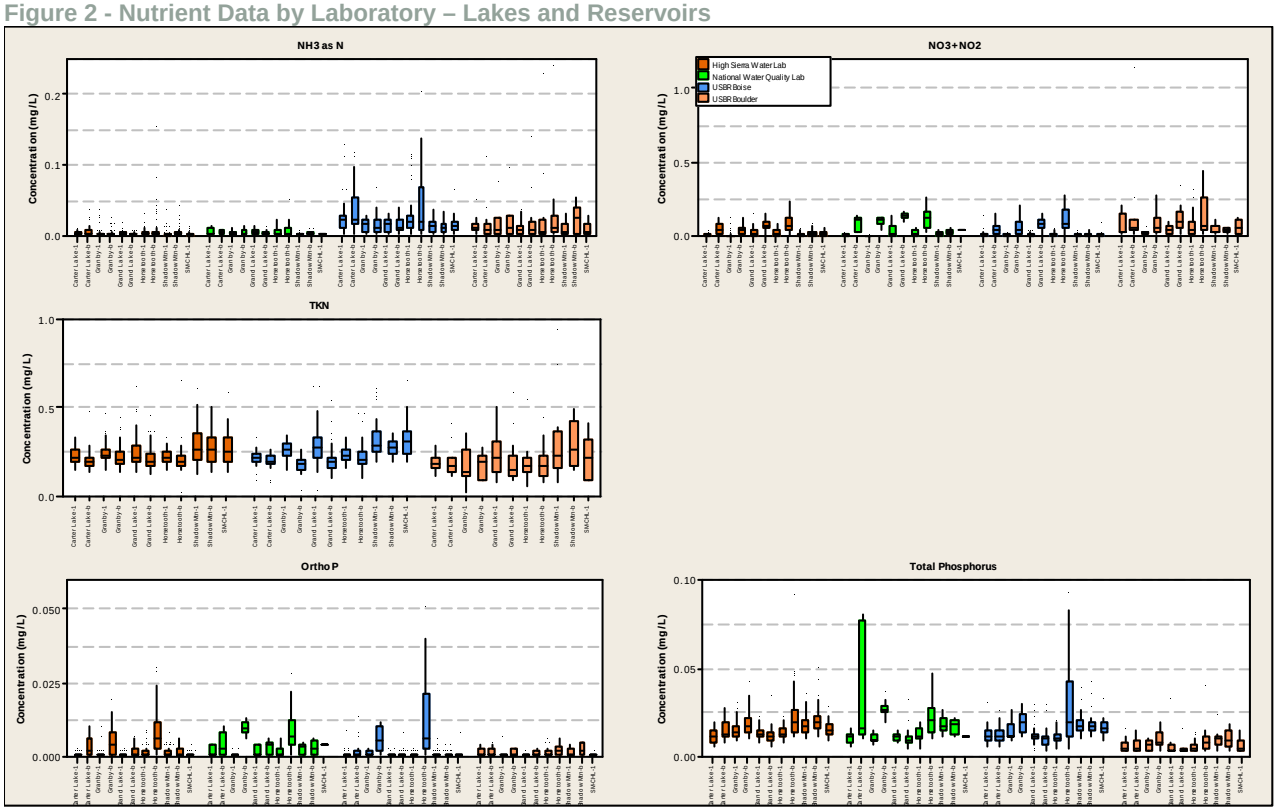


Figure 2 - Nutrient Data by Laboratory – Lakes and Reservoirs



CURRENT DATA STATUS, KNOWN DATA ISSUES AND ACTIONS TAKEN

- As shown in Figure 1 and Figure 2, NH3 and NO3+NO2 results from the USBR Boulder Lab generally have higher values that are inconsistent with data from High Sierra, NWQL and USBR Boise. There are also elevated concentrations for NH3 for the lakes data from USBR Boise. This will be discussed in more detail later in this document. The NH3 and NO3+NO2 data from USBR Boulder are considered suspect and have been disqualified in the database. These data were disqualified on 5/13/2010.

  - Flowing sites, for data included in the Report
    Action Taken: There were 69 records disqualified for NH3 and 69 records disqualified for NO3+NO2 for a total of 138 records.
  - Lakes, for data included in the Report
    Action Taken: There were 138 records disqualified for NH3 and 138 records disqualified for NO3+NO2 for a total of 276 records.
  - The USBR Boulder Lab also did analysis on flowing sites in Northern's Baseline Monitoring Program that were not included in the Report. These data were also censored accordingly.
    Action Taken: There were 118 records disqualified for NH3 and 118 records disqualified for NO3+NO2 for a total of 236 records.

  Note: Discussion with Chris Holdren supports the disqualification of these data. He stated that there were problems with nutrient analysis at the USBR Boulder Lab in 2005 due to implementation of the low-level method and/or problems with the instrumentation.

- General housekeeping: The lab reports from USBR Boulder (2005) had NO3 listed as a constituent, not NO3+NO2. All 2005 NO3+NO2 data was changed in the databases to NO3 according to the lab reports on 5/13/2010. While compiling information for this document, there was a note from Esther Vincent from

2/2006 "I found out that the Nitrate data that we receive from the USBR is actually Nitrates + Nitrites even though it was marked as Nitrate. Needs to be replaced in database by N02+NO3. 2004 data is marked as NO3+NO2 already" in the document: \Database Log 3-2005 to 10-2007.xls. All 2005 NO3 data was changed back to NO3+NO2 in the databases on 11/28/2012.

New Found Issues and Action Taken

- Figure 1 and Figure 2 show some lower average concentrations for total P for data analyzed at the USBR Boulder Lab. This is especially apparent when looking at the lakes data in Figure 2. The lakes data that were analyzed at USBR Boulder have 24 out of 138 values that were reported as a non-detect (<0.003 mg/L); these are the only non-detects recorded in the lakes database since low-level analysis began in 2005. For comparison, the High Sierra data displayed in Figure 2 (2008 – 2010 data) have 0 out of 678 non-detect values. The average value for the USBR Boulder data is 0.007(mg/L) compared to an average of 0.017(mg/L) for the High Sierra data. Review of the lab reports confirms that the data in the database matches what was reported.

  Action Taken: Disqualified all the total P data analyzed at the USBR Boulder Lab. This results in 69 records for the flowing sites that were included in the Report, 118 records for the flowing sites not in the Report and 138 records for the lakes and reservoirs. Discussion with Chris Holdren supports the disqualification of these data. He stated that there were problems with nutrient analysis at the USBR Boulder Lab in 2005 due to implementation of the low-level method and/or problems with the instrumentation. These data were disqualified 1/7/2013.

- **NO3+NO2 vs. TKN** - There are many instances where NO3+NO2 is greater than TKN. This is not a common occurrence in the study area; it is generally an indication of WWTP effluent which has little impact at the sites monitored for the Report. This occurred in 27 out of 176 records for the flowing sites (all USBR Boulder data) and in 29 out of 463 records for the lakes sites. For comparison, data analyzed at High Sierra Water Lab (2008-2011), and for the sites included in the Report, this has occurred in 0 out of 397 records for the flowing sites and in 2 out of 920 records for the lake sites (both instances occurred in 2008 on Horsetooth at the bottom depth, one may have been reported incorrectly).

  - This also occurred several times at the flowing sites that were monitored but not included in the Report. Most all the data was analyzed at the USBR Boulder Lab.
  - Review of the lab reports confirms that the data in the database matches what was reported.
  - Review of the lab reports show some extremely elevated TKN concentrations in the data from the USBR Boulder Lab.
  - There have been instances at the flowing sites in more recent data (HSWL and NWQL) where NO3+NO2 was greater than TKN. This did not occur at any sites included in the Report. It occurred at sites where there is greater influence from WWTP effluent (Windy Gap and Big Thompson sites) or at the Three Lake Inlets, where there are known elevated NO3+NO2. All of these instances occurred during low flow, either in the winter or early fall.

Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8 and Figure 9 show how TKN compares to NO3+NO2 on a yearly basis from 2005-2011 for the lakes sites. 2005, 2006 and 2007 show inconsistencies in patterns that are apparent in 2008, 2009, 2010 and 2011. In general, it is apparent that the 2009, 2010 and 2011 data are cleaner; this corresponds with the time that the sampling was conducted by either USGS or Northern Water, the laboratories were reviewed and USGS certified on an annual basis and there was QAQC done on all data received in a timeframe that allowed for "re-run" analysis of any data that was suspect. When available the USGS/NWQL NO3+NO2 data are also included for comparison (they did not do analysis for TKN).

Figure 3 - TKN vs. NO3+NO2 for 2005, Lakes

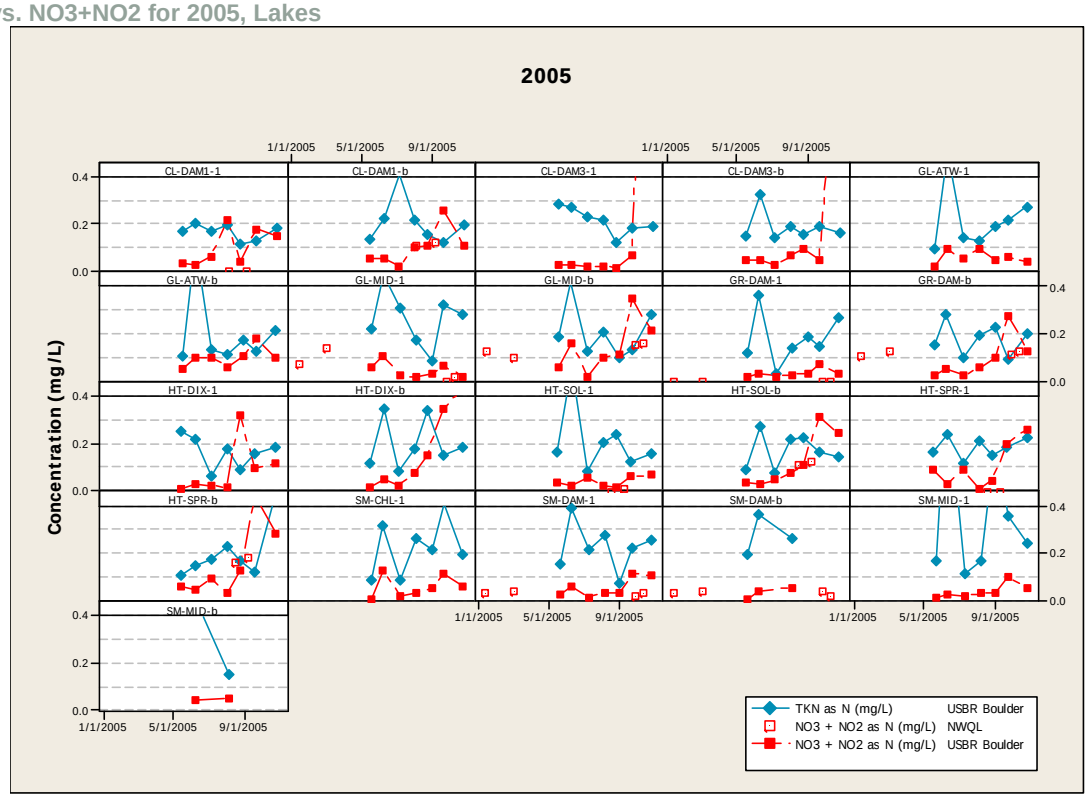


Figure 4 - TKN vs. NO3+NO2 for 2006, Lakes

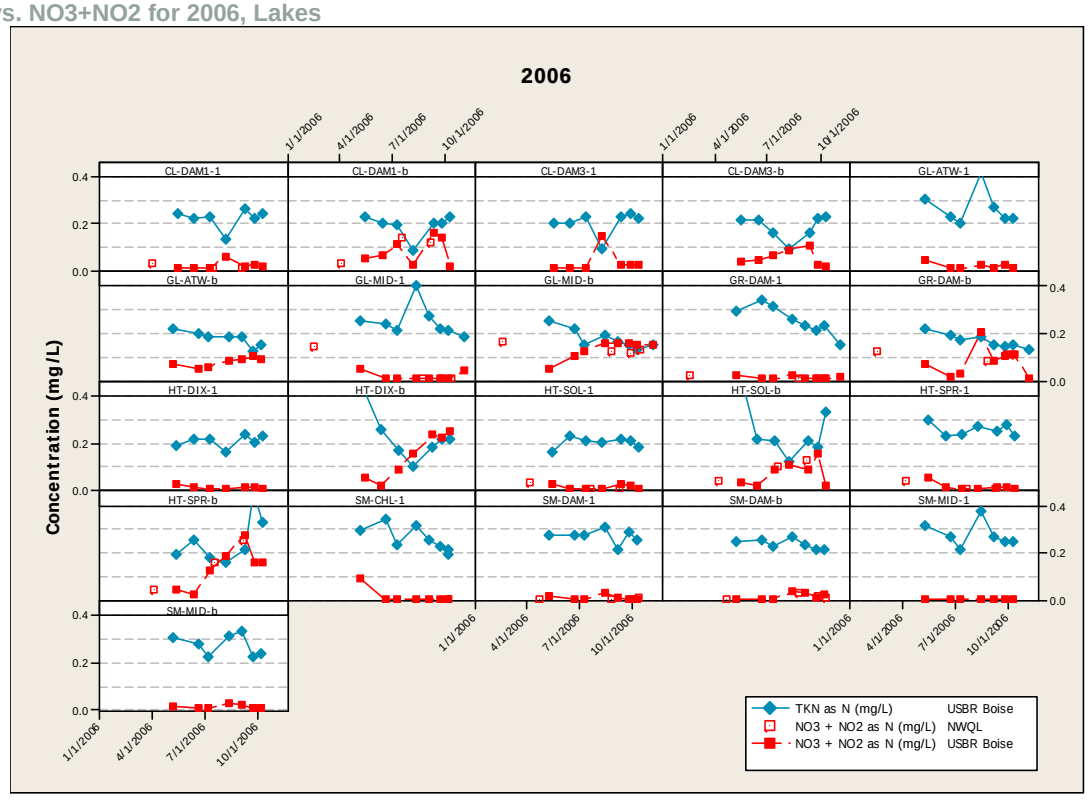


Figure 5 - TKN vs. NO3+NO2 for 2007, Lakes

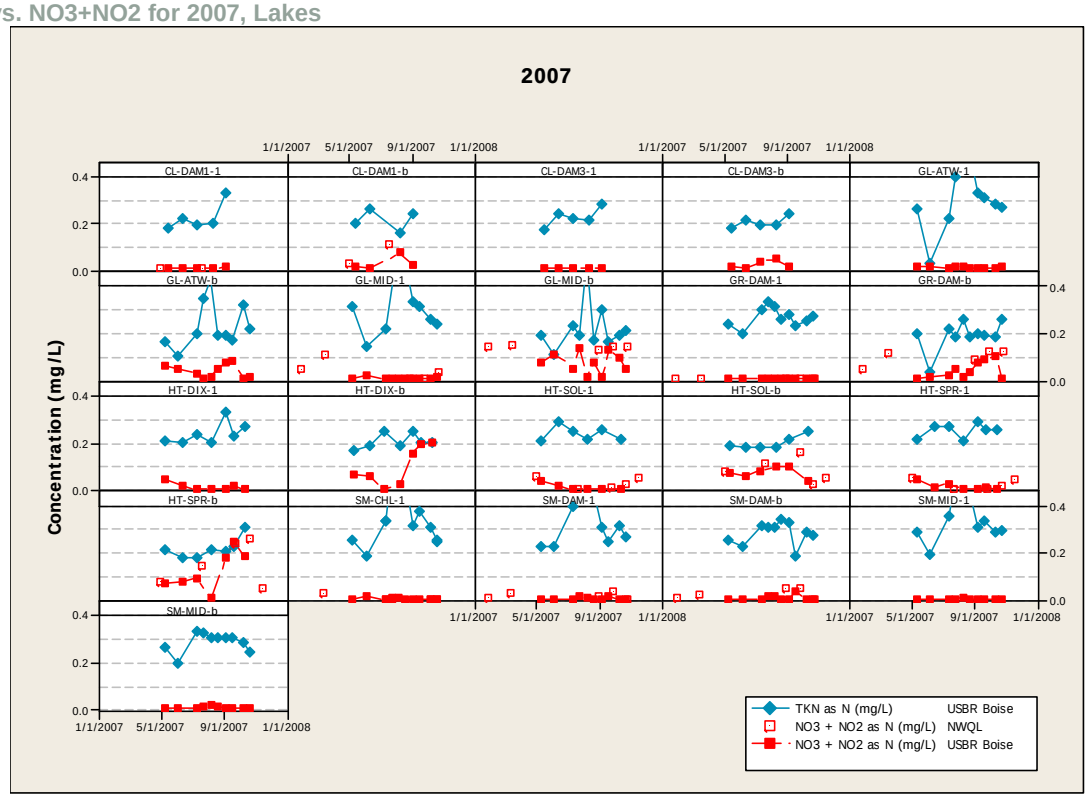


Figure 6 - TKN vs. NO3+NO2 for 2008, Lakes

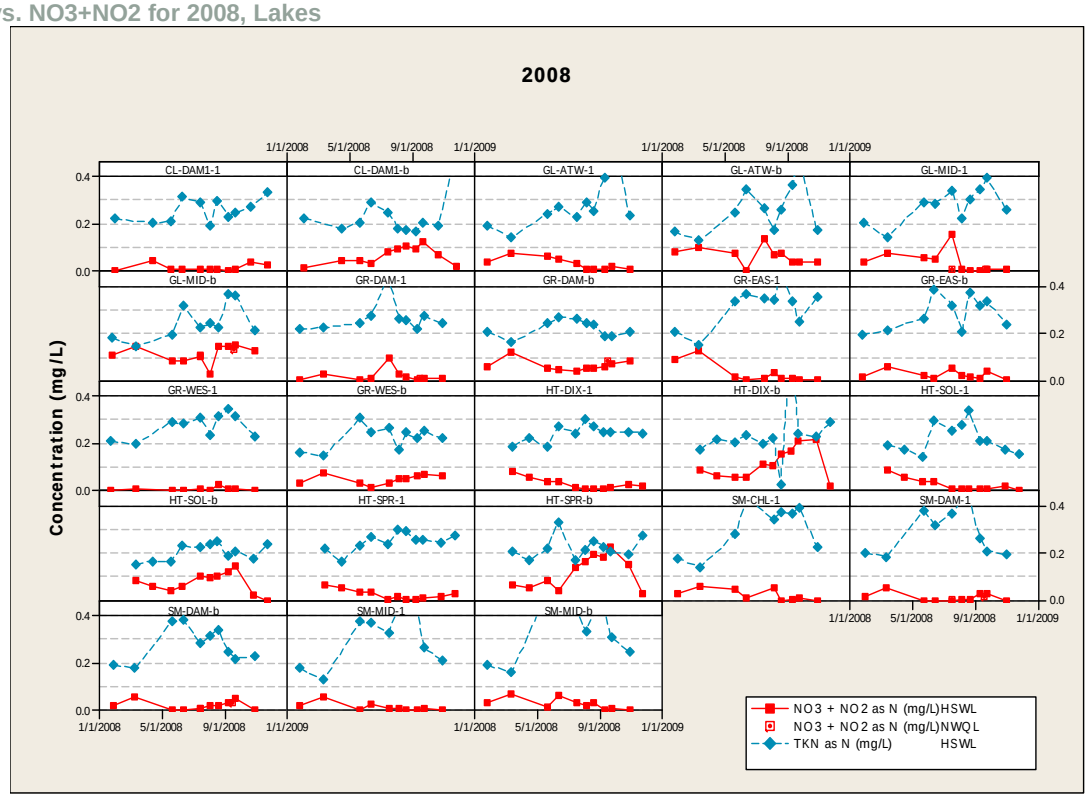


Figure 7 - TKN vs. NO3+NO2 for 2009, Lakes

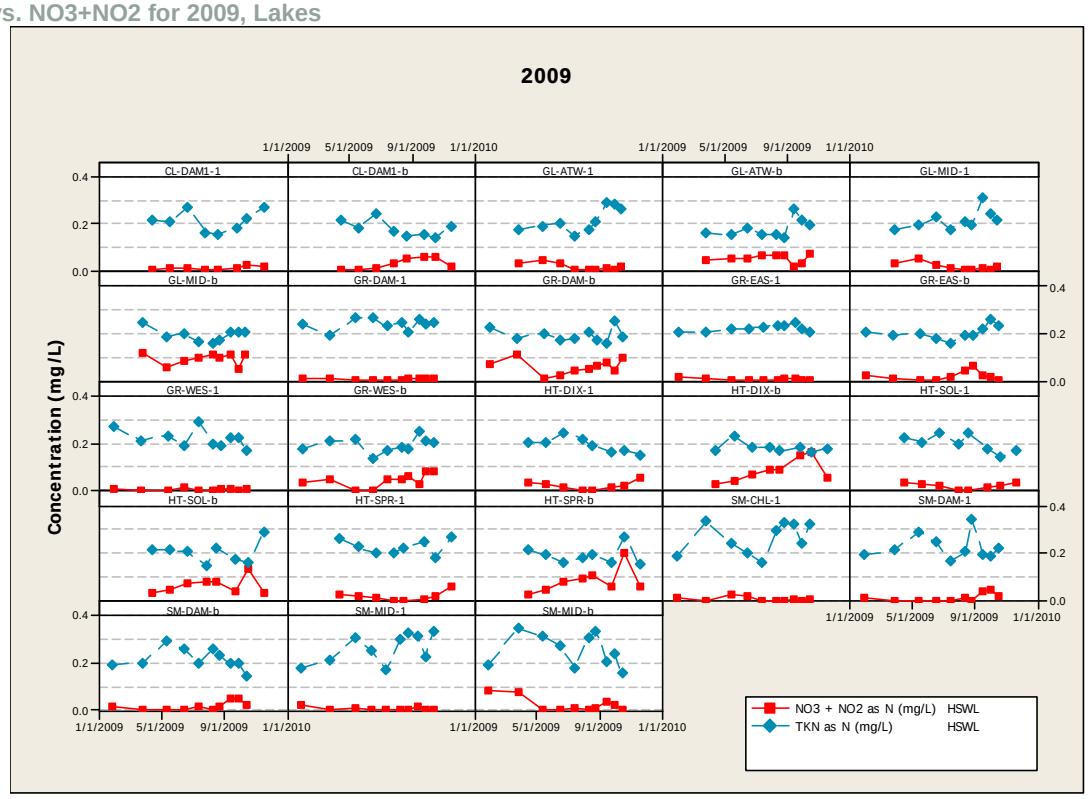


Figure 8 - TKN vs. NO3+NO2 for 2010, Lakes

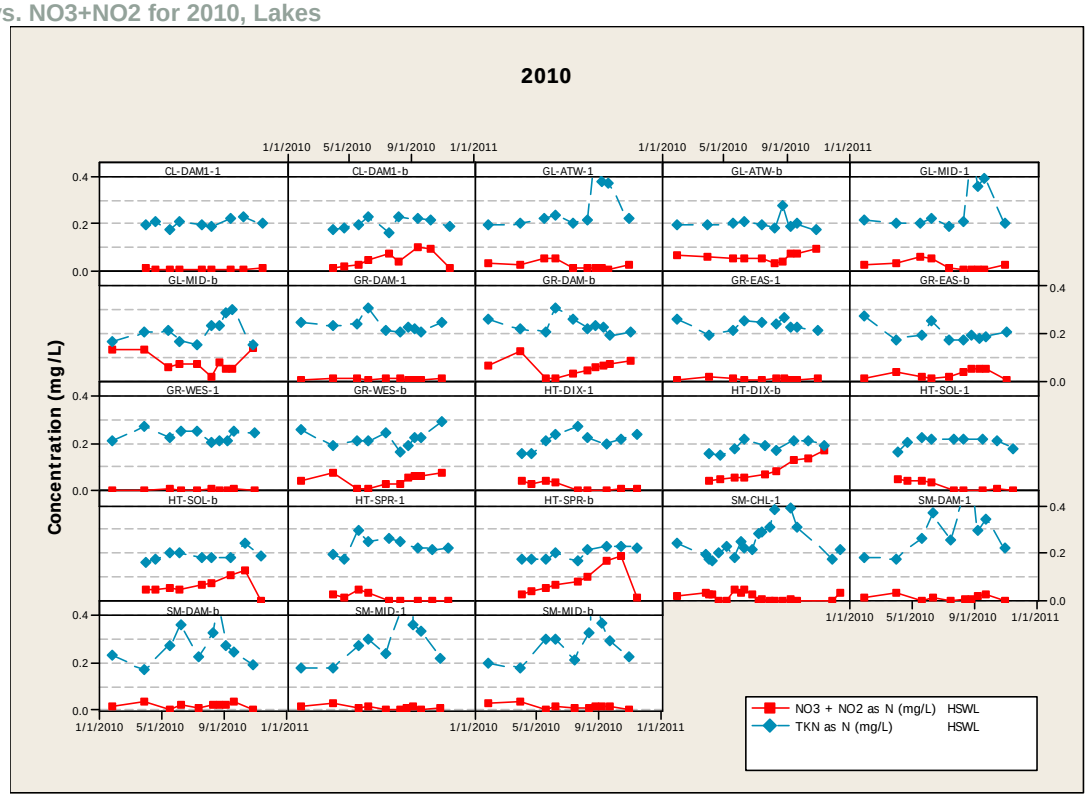
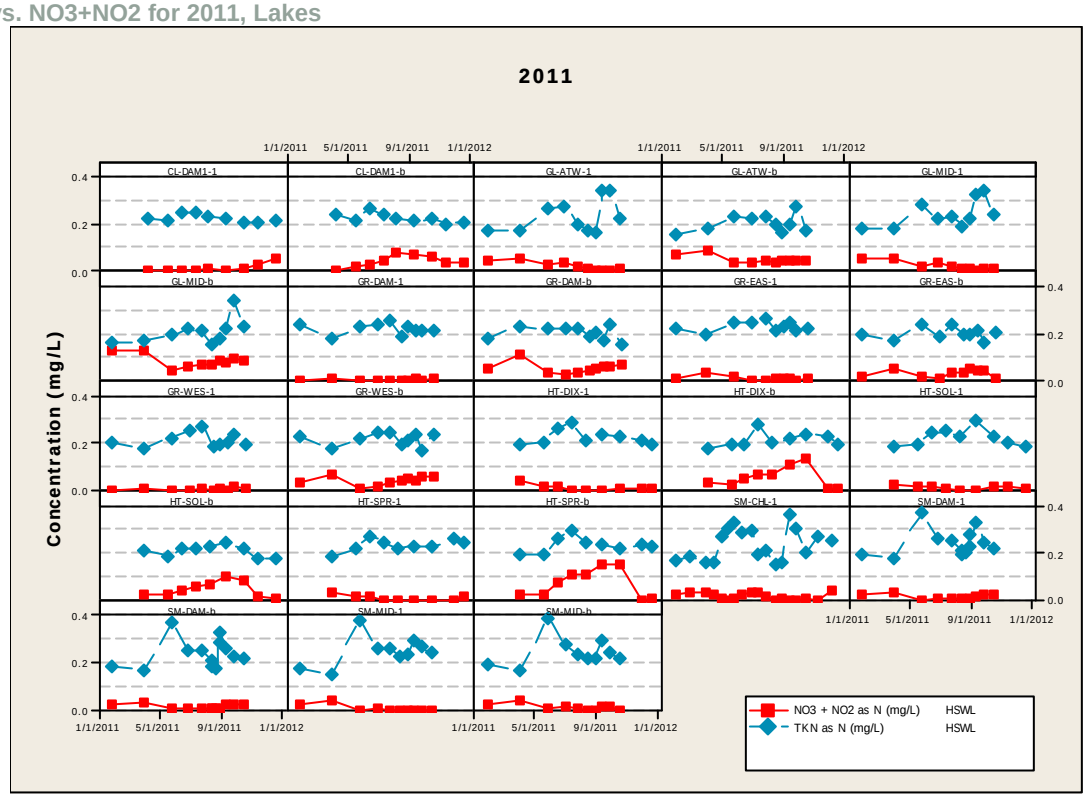


Figure 9 - TKN vs. NO3+NO2 for 2011, Lakes



Action Taken: The majority of these occurrences is in data analyzed at the USBR Boulder Lab therefore; all TKN data analyzed at the USBR Boulder Lab was disqualified. This results in 69 records for the flowing sites that were included in the Report, 118 records for the flowing sites not in the Report and 138 records for the lakes and reservoirs. Discussion with Chris Holdren supports the disqualification of these data. He stated that there were problems with nutrient analysis at the USBR Boulder Lab in 2005 due to implementation of the low-level method and/or problems with the instrumentation. These data were disqualified 1/7/2013.

After the USBR Boulder data is disqualified, there are 12 instances where the TKN is less than the NO3+NO2, all occurring at the lakes sites, and in all cases there was not that big a of difference between the concentrations (all less than 0.055 mg/L). In these instances, both TKN and NO3+NO2 data was flagged as suspect in the database on 1/7/2013.

- Four out the five nutrients analyzed at the USBR Boulder lab have been or are recommended to be disqualified from the database; ortho P is the only nutrient that remains in the database for analysis done at the USBR Boulder lab.

Action Taken: Disqualified all ortho P data analyzed at the USBR Boulder lab. Since all the other data was considered suspect for the reasons stated above, the ortho P data should be considered suspect as well. It is apparent that the methodology and/or instrumentation and/or QAQC were not accurate at this lab. This results in 69 records for the flowing sites that were included in the Report, 118 records for the flowing sites not in the Report and 138 records for the lakes and reservoirs. Discussion with Chris Holdren supports the disqualification of these data. He stated that there were problems with nutrient analysis at the USBR Boulder Lab in 2005 due to implementation of the low-level method and/or problems with the instrumentation. These data were disqualified 1/7/2013.

- **NH3 vs. NO3+NO2** - There are many instances where NH3 is greater than NO3+NO2. This is something that can occur on occasion at the sites included in the Report, but generally when it does occur the concentrations are very close to one another and the NO3+NO2 is usually very low. Since 2005 NH3 and NO3+NO2 data has already been censored in the database, this discussion will focus on the 2006 and 2007 data.

  Flowing Sites - For the flowing sites included in the Report there were only a few instances where the NH3 was considerably higher than the NO3+NO2. The most obvious occur in May 2006, August 2006 (for sites in the Report) and in May 2006, October 2006 and September 2007 (for sites not included in the Report). There were several instances in August 2006 where the NH3 concentration was significantly greater than the NO3+NO2 concentration on the Hansen Feeder Canal Sites (HFC) (Figure 10). These occurrences were validated as the pattern was consistent as the water moved through the system and samples collected by the USGS at OLY in the early part of September displayed the same pattern. The remainder of the occurrences had concentrations that were not significantly different and/or followed patterns at other sites sampled of the same water that day and/or followed patterns similar to those in other years. There were more occurrences over a broader date range at flowing sites that were not included in the Report compared to the sites that were in the Report.

  Figure 10, Figure 11, Figure 12, Figure 13, Figure 14 and Figure 15 show how NH3 compares to NO3+NO2 on a yearly basis from 2006-2011 for the flowing sites included in the Report. When available, USGS data were included for comparison. NH3 vs. NO3+NO2 graphs for all the flowing sites can be found in the document entitled Nutrients_All FS Data Review 2005-2011.rtf.

Figure 10 - NH3 vs.NO3+NO2 for 2006, Flowing Sites

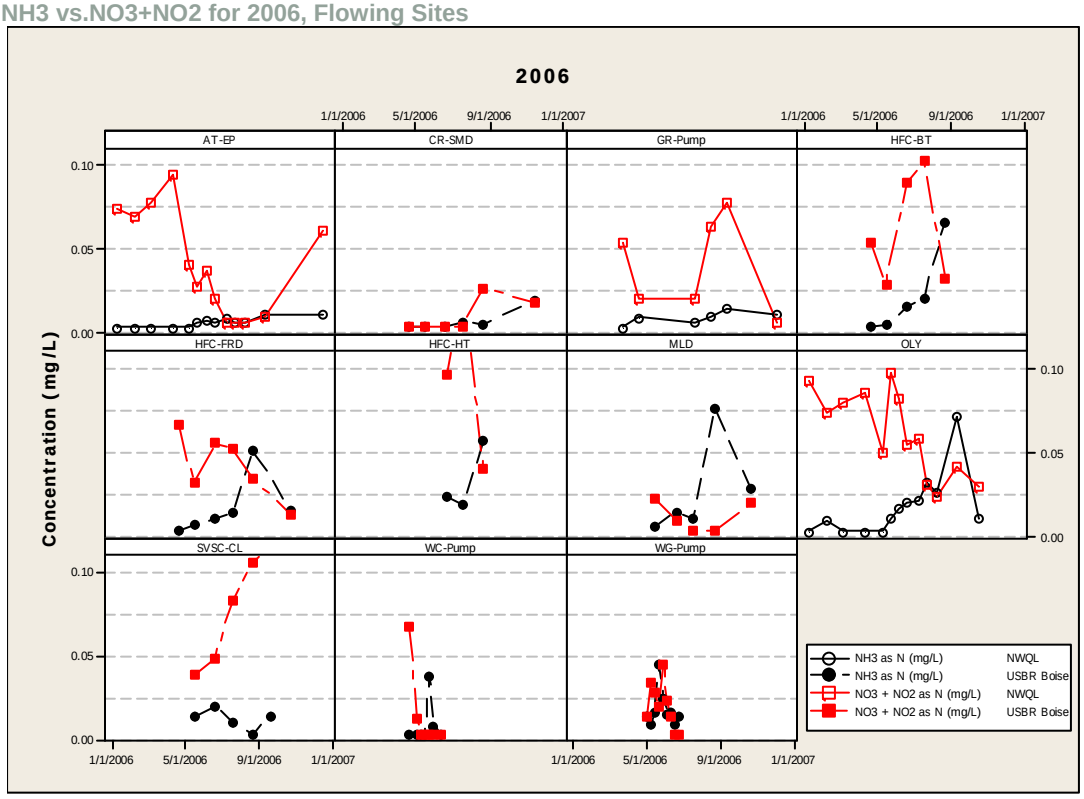


Figure 11 - NH3 vs.NO3+NO2 for 2007, Flowing Sites

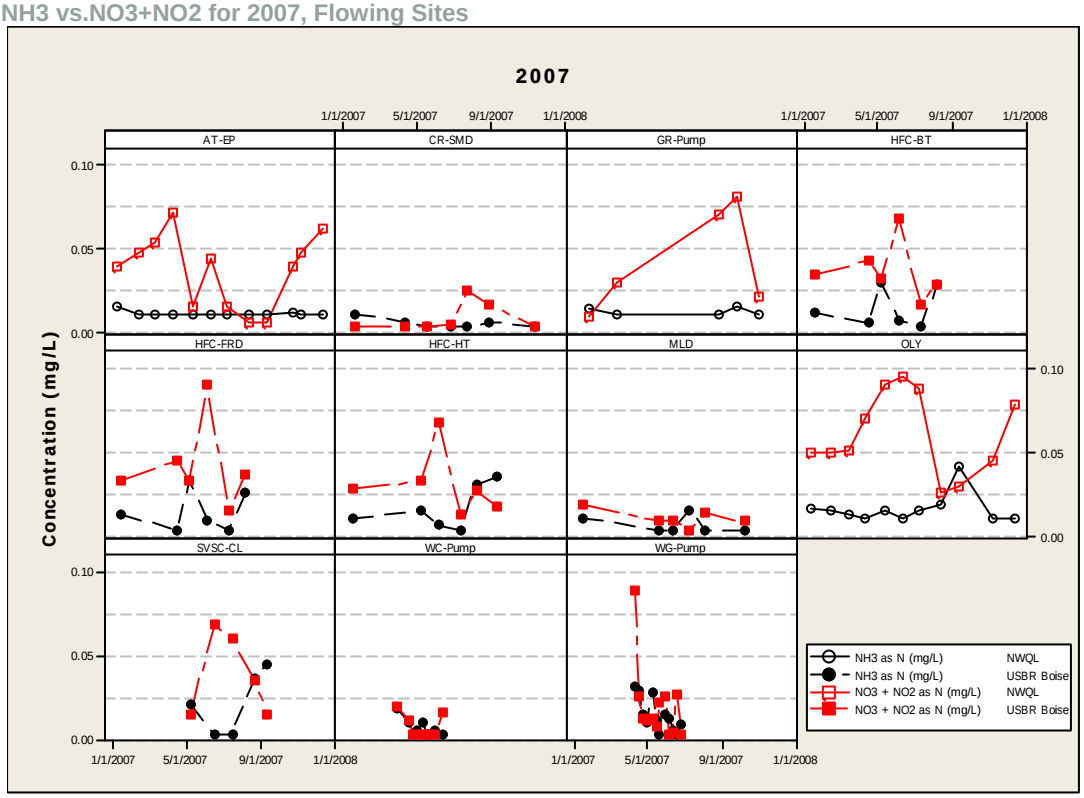


Figure 12 - NH3 vs.NO3+NO2 for 2008, Flowing Sites

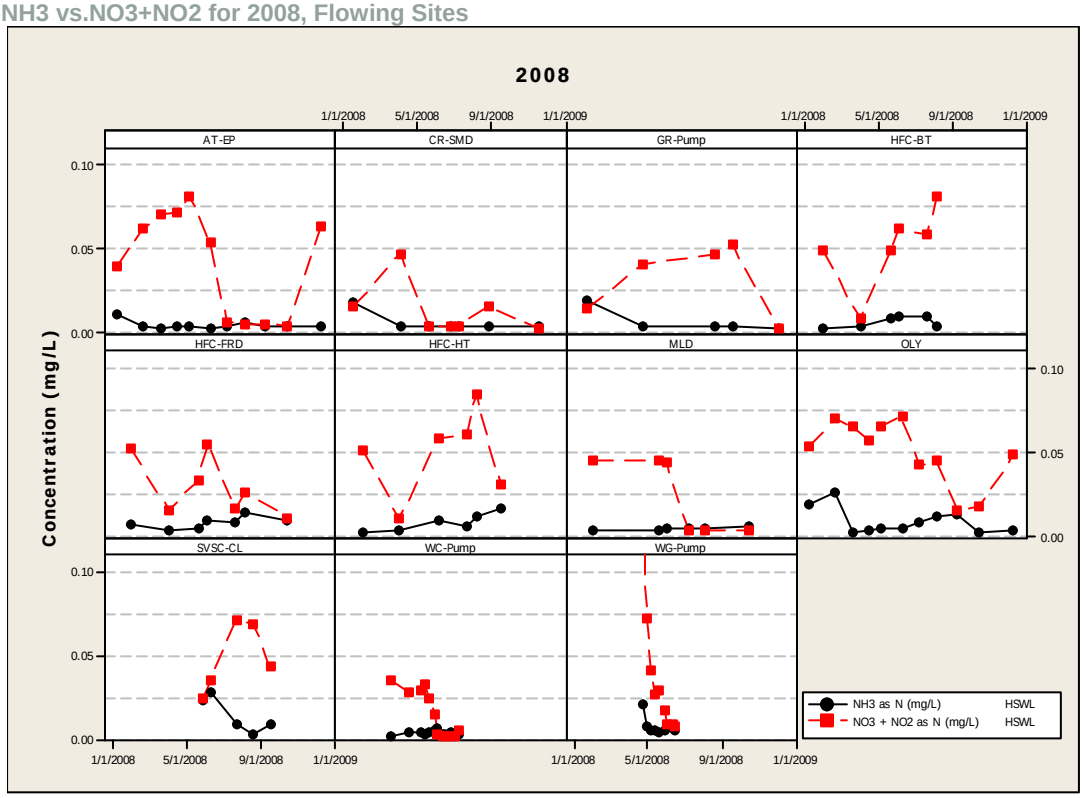


Figure 13 - NH3 vs.NO3+NO2 for 2009, Flowing Sites

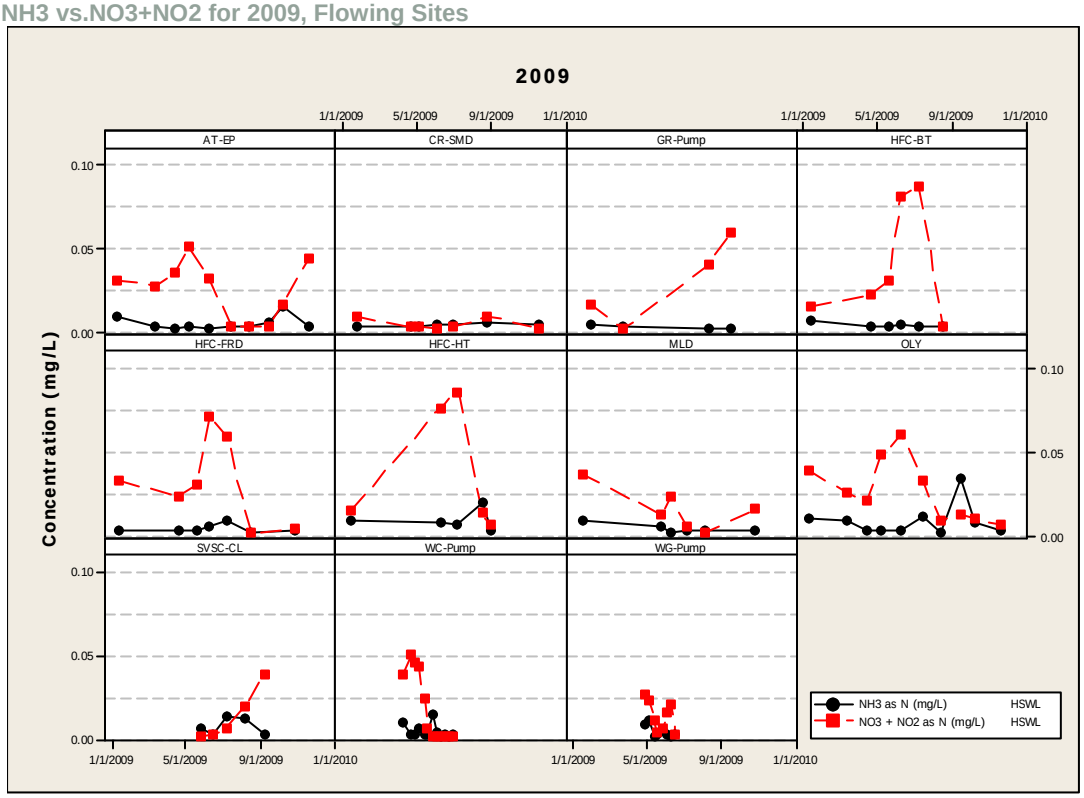


Figure 14 - NH3 vs.NO3+NO2 for 2010, Flowing Sites

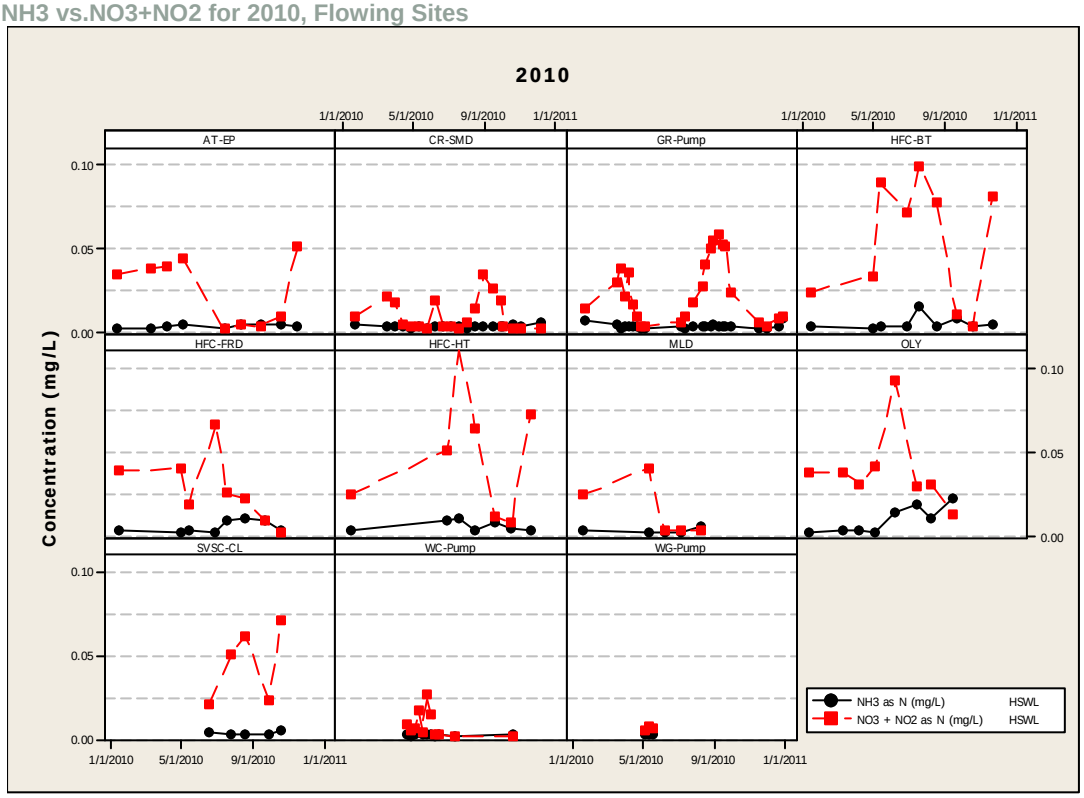
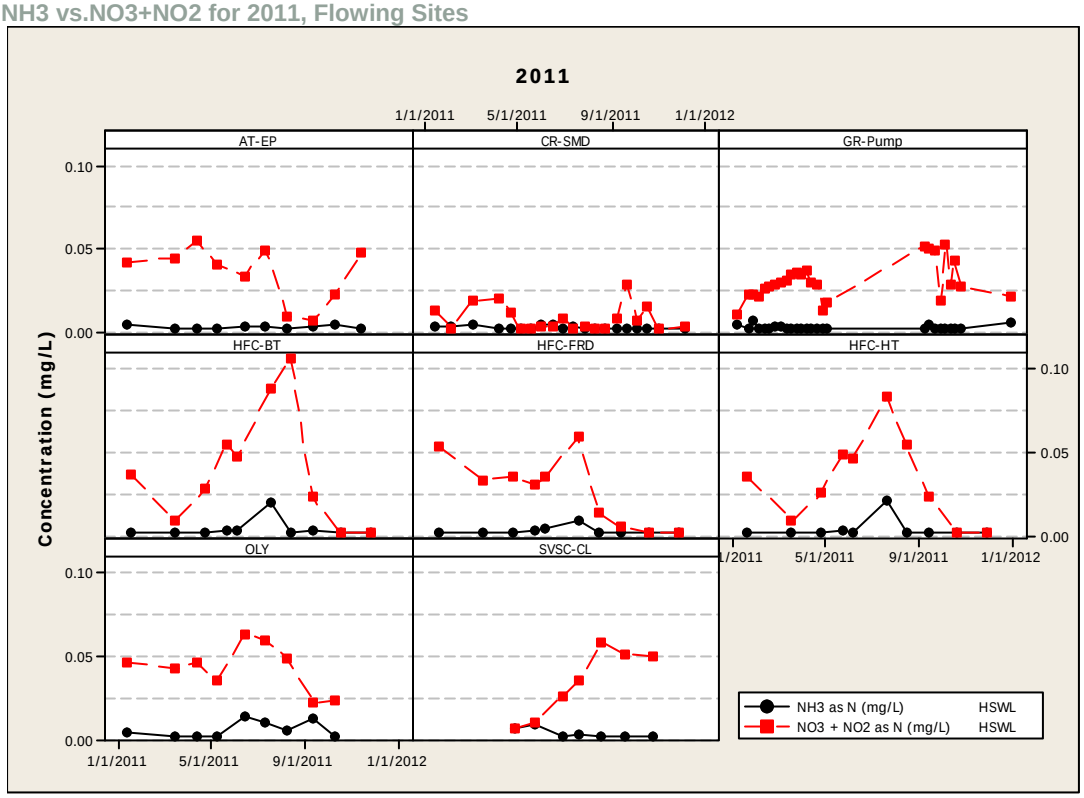


Figure 15 - NH3 vs.NO3+NO2 for 2011, Flowing Sites



Action Taken: Flagged both NH3 and NO3+NO2 as suspect in the Flowing Sites database in any instances where NH3 was significantly greater than NO3+NO2 that could not be validated by typical patterns or concentrations at surrounding sites sampled the same day. The majority of these records occurred on one lab report from May 2006; this may have been a reporting error where the NH3 and NO3+NO2 values were transposed. The remainder occurred in October 2006 and September 2007. This results in 22 NH3 records and 22 NO3+NO2 records being flagged as suspect in the flowing sites database; only 3 of the records are included in the Report. These data were flagged as suspect on 1/15/2013.

Lake Sites - For the lakes sites there are more suspect data points than the flowing sites. The data are especially suspect when this occurs in the samples collected at the top of the waterbody because ammonia is rapidly used as a food source at this depth or converted to NO2 through nitrification. This happens over the entire period of record but the occurrences seem to be linked to specific lab reports so it could be a reporting issue.

Figure 16, Figure 17, Figure 18, Figure 19, Figure 20 and Figure 21show how NH3 compares to NO3+NO2 on a yearly basis from 2006-2011 for the lakes sites. As with the figures that show TKN compared to NO3+NO2, 2006 and 2007 show inconsistencies in patterns that are apparent in 2008, 2009, 2010 and 2011 and 2009, 2010 and 2011 data are cleaner. When available the USGS/NWQL data are also included for comparison.

Action Taken: The data were carefully reviewed and all instances where NH3 is significantly greater than NO3+NO2 and that could not be validated by typical patterns or concentrations at surrounding sites sampled the same day were flagged as suspect in the lakes database. The majority of the records that were marked as suspect were at the top depth where NH3 is typically low. This results in 150 NH3 and 150 NO3+NO2 records being flagged as suspect in the lakes database on 1/17/2013.

Figure 16 - NH3 vs.NO3+NO2 for 2006, Lakes

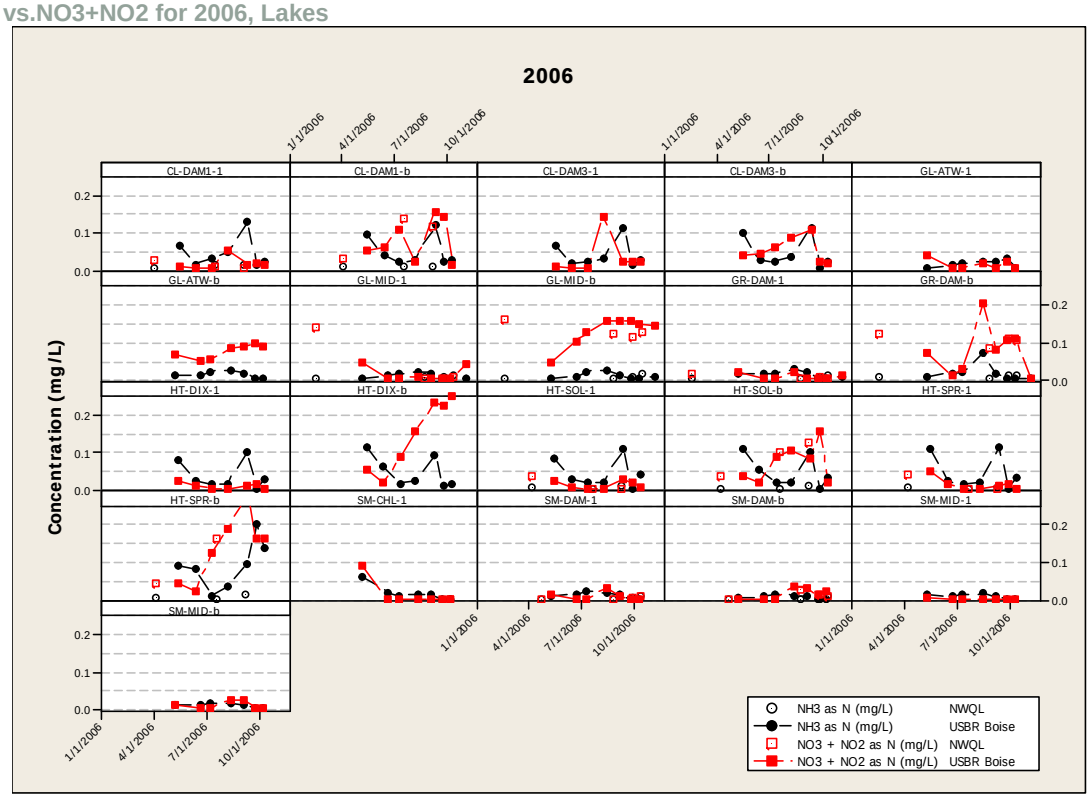


Figure 17 - NH3 vs.NO3+NO2 for 2006, Lakes

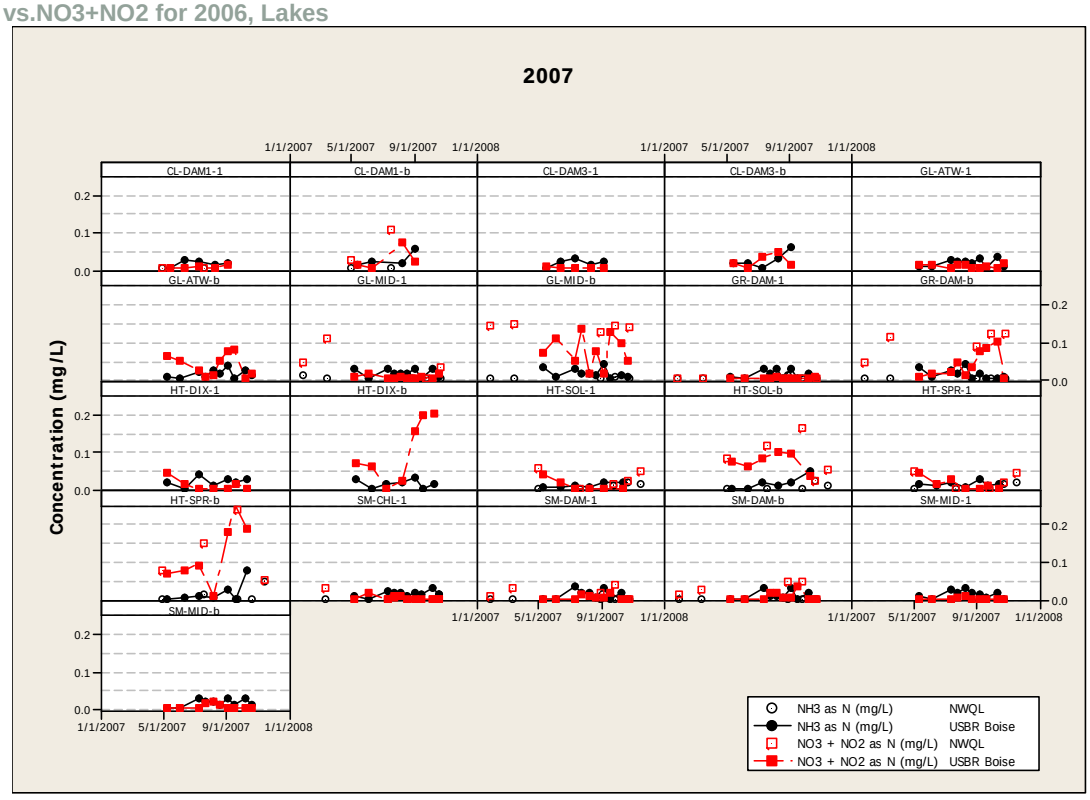


Figure 18 - NH3 vs.NO3+NO2 for 2008, Lakes

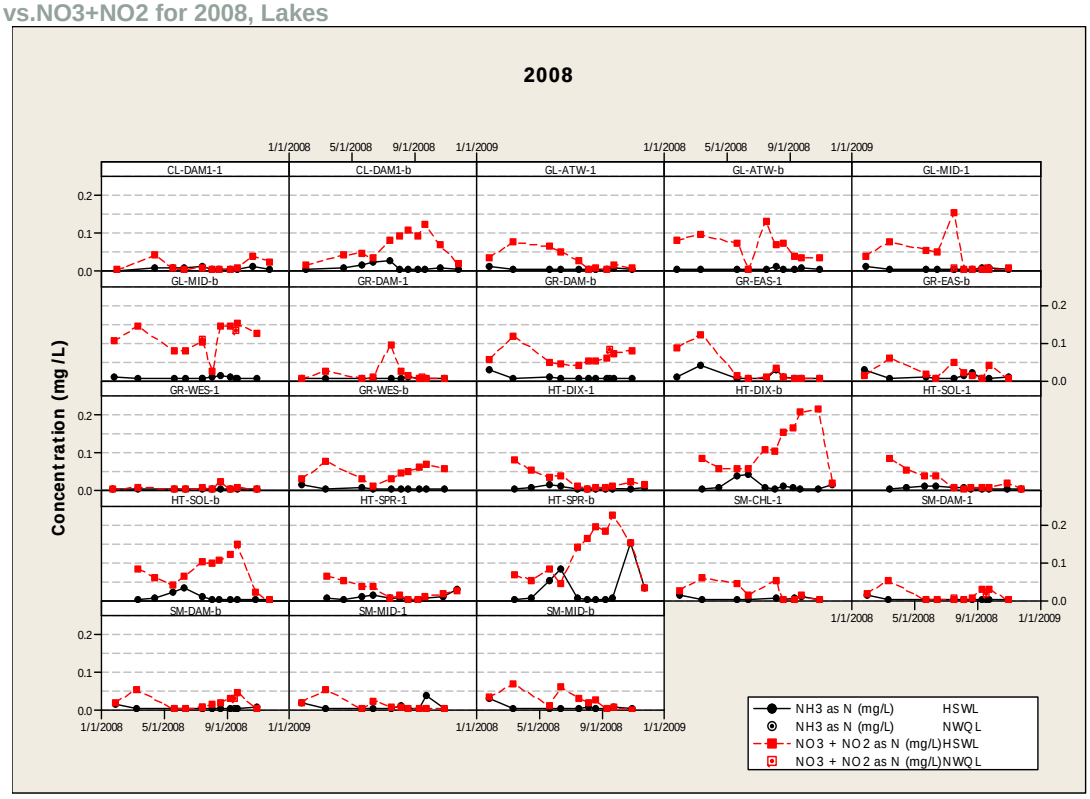


Figure 19 - NH3 vs.NO3+NO2 for 2009, Lake

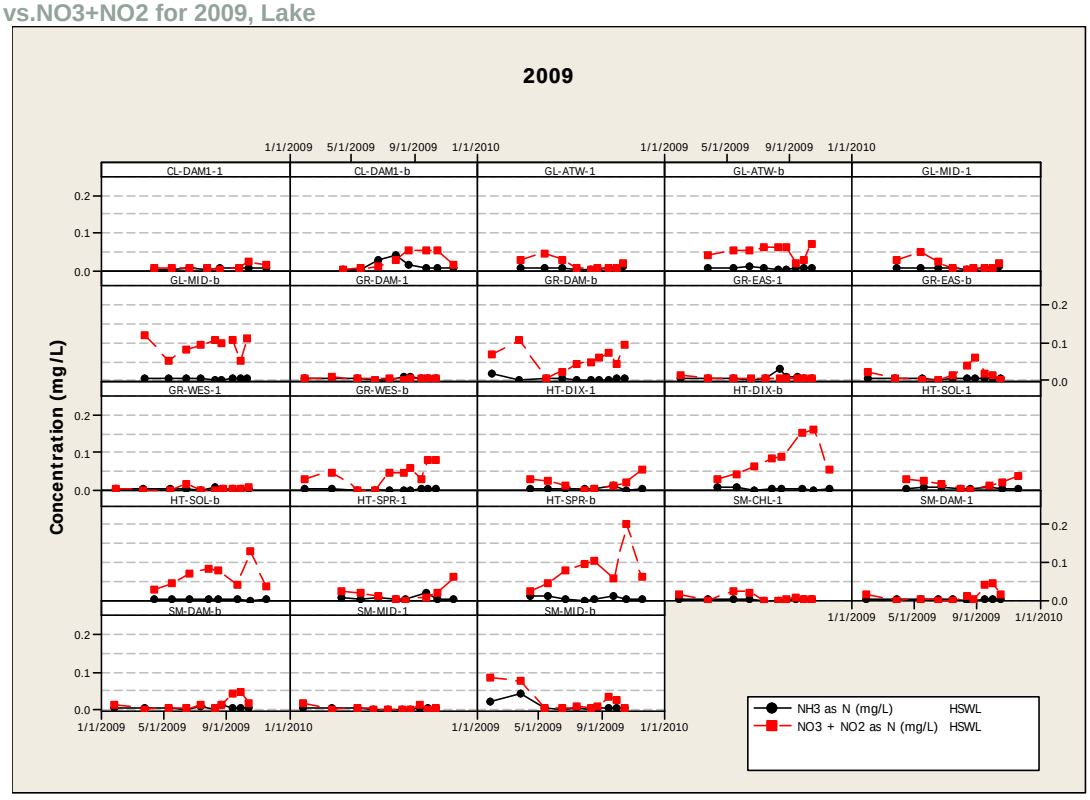


Figure 20 - NH3 vs.NO3+NO2 for 2010, Lakes

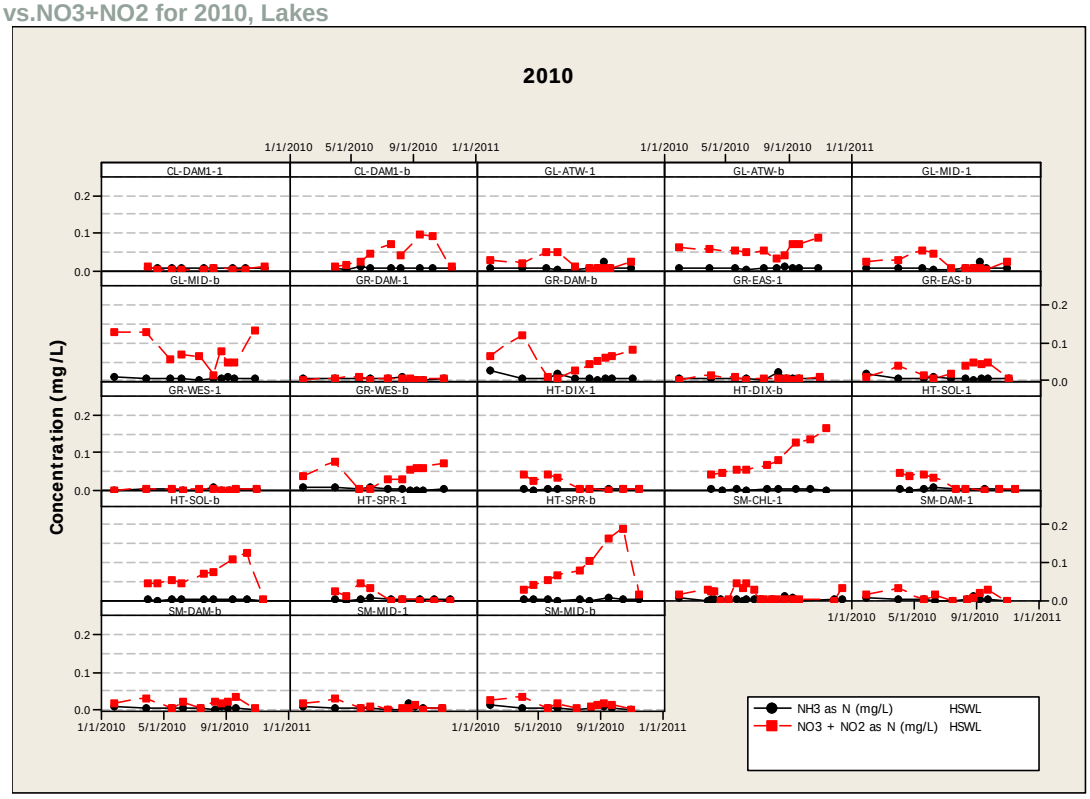
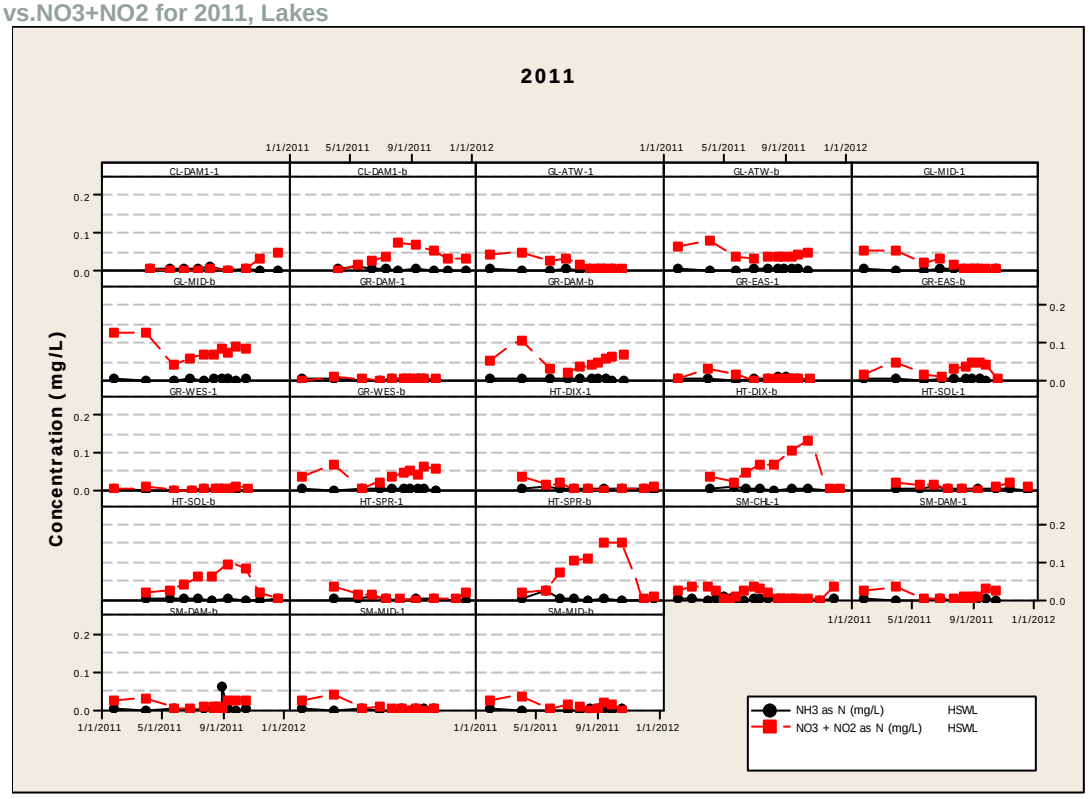


Figure 21 - NH3 vs.NO3+NO2 for 2011, Lakes



INCONSISTENCIES BETWEEN REPORT AND DATA

While reviewing the nutrient data for this memo and while doing the data analysis for the Lakes and Reservoirs Report, it was discovered that there are many graphs in the Report that display different data than what are in the database. It would be a very time consuming and trivial task to replicate all the graphs in the report in order to document all of these occurrences. This section of the memo is meant to acknowledge and document that there may be differences between the graphical displays in the Report and the data that are in the database. For the known instances when this occurs, the data that are in the database match the data that is on the raw data file from the laboratory. Figure 22 and Figure 23 provide an example differences between the Report graphics and the concentrations recorded on the lab reports and in the database.

Figure 22 - 2006 NO3 + NO2 at GR-DAM as recorded in the database

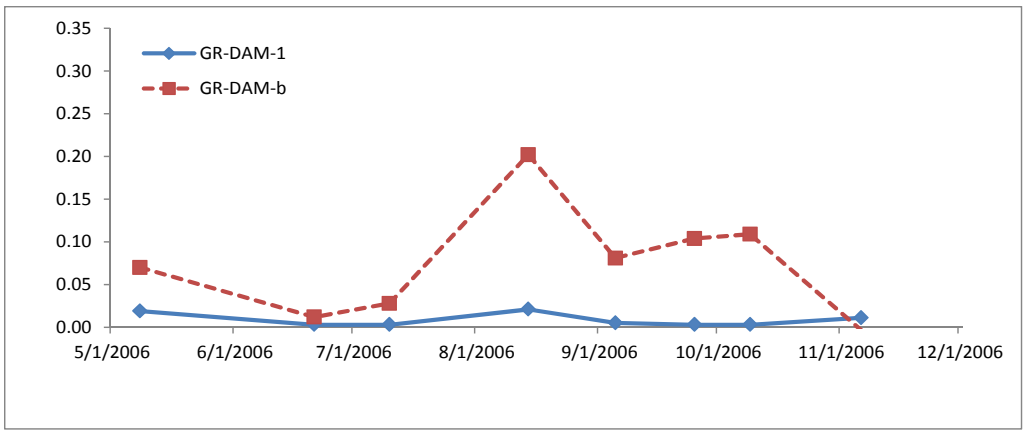
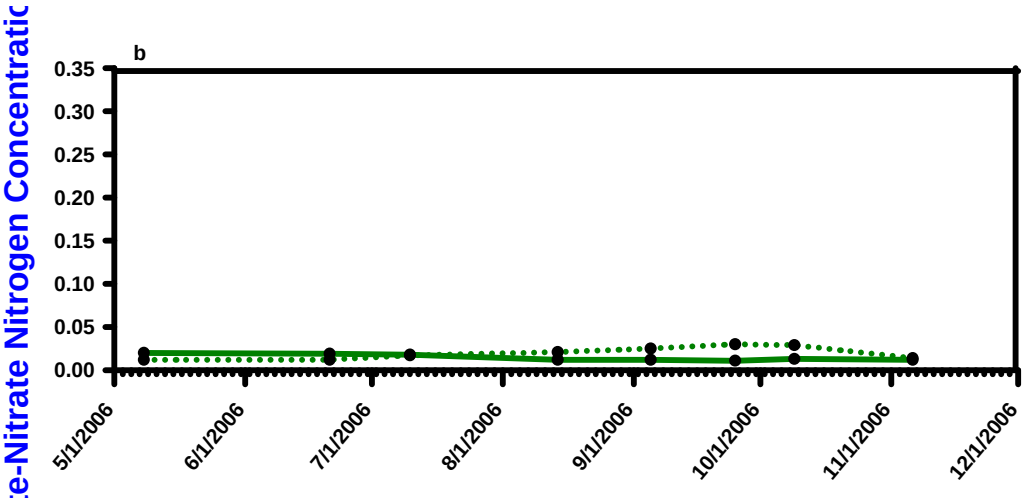


Figure 23 - NO3 + NO2 at GR-DAM as displayed in the Report (GR-DAM-1 is solid line, GR-DAM-b is dotted line)



Physical Data

Physical data at the flowing sites was collected by Harlan in 2005 and 2006. In 2007, Northern Water began collecting all the physical data at the flowing sites following a more stringent protocol for calibration and data collection. All physical data for the lakes (2005-2007) was collected by Davine Lieberman with the USBR.

CURRENT DATA STATUS, KNOWN DATA ISSUES AND ACTIONS TAKEN

Flowing Sites

pH – The Report documented several occurrences of suspect pH values for data collected in 2005-2006, generally unusually low values. The reason provided in the Report for the suspect data was the possibility of a faulty probe. The Report makes several comparisons of 2005-2006 data vs. 2007 data stating that low pH values did not occur in 2007 after Northern made changes to the sampling protocols. In summary these include:

- WC-Pump and WG-Pump – In the text of the Report, there is discussion on low values in 2005-2006, specifically referencing the minimum values of 3.18 and 3.03 respectively, collected in May of 2005.
  Action Taken – All pH values less than 6.5 collected during 2005-2006 were disqualified from the database. This resulted in 12 values at these two sites for data collected in April, May and June 2005 and 2006. The data range from 3.03 to 6.42. These data were disqualified during the early part of 2009.

- CR-SMD – In the text of the Report, it is noted that the minimum pH value of 4.77 was most "likely in error possibly due to a faulty probe", and that 2007 pH data "appear to be accurate and consistent".

  Action Taken – All pH values less than 6.5 collected during 2005-2006 were disqualified from the database. This resulted in 2 values at CR-SMD, 4.77 and 5.10 collected in May 2005 and April 2006 respectively. These data were disqualified during the early part of 2009.

- MLD – In the text of the Report it is noted that the 2005 and 2006 pH data "tend to be lower than in 2007 and are most likely in error" and "2007 data appear to be accurate".
  Action Taken – All pH values less than 6.5 collected during 2005-2006 were disqualified from the database. This resulted in 4 values at MLD ranging from 5.79-6.31. These data were disqualified during the early part of 2009.

- SVSC-CL – In the text of the Report it is noted that the low pH values in 2005 and 2006 are "most likely in error" and such low pH does not occur here in 2007. The minimum value of 4.51 is specifically referred to.
  Action Taken – All pH values less than 6.5 collected during 2005-2006 were disqualified from the database. This resulted in 4 values at SVSC-CL ranging from 4.51-6.27. These data were disqualified during the early part of 2009.

The minimum pH values discussed above were all noted in the text of the Report as being "likely in error". Despite this, the data was still included in the summary statistics table in the Report and most likely included as part of the statistical analysis done at these sites.

Dissolved Oxygen – The Report documented a few occurrences of suspect DO values for data collected in 2005-2006, generally unusually low values. In summary these include:

- WC-PUMP and WG-PUMP – In the text of the Report, there is discussion on low DO levels of 5.15 and 4.34 (mg/L) respectively, for data collected in June 2006. The report states that DO at these sites are generally above 6.0 (mg/L) and this should be further investigated to see if these measurements are accurate or in error.
  Action Taken – More recent data (2007-2010) show that DO concentrations at these two sites do not fall below 6 (mg/L) and are generally above 8 (mg/L). All DO values less than 6 collected during 2005-2006 were disqualified from the database. This resulted in 1 value at WC-PUMP and 3 values at WG-PUMP ranging from 4.34-5.15. These data were disqualified during the early part of 2009.

- MLD – In the text of the Report low DO concentrations that occurred during the summer of 2006 are discussed; specifically the minimum concentration of 5.14 (mg/L). The low DO is not apparent at sites upstream (AT-EP) or downstream (OLY) and should be further investigated to see if these measurements are accurate or in error.
  Action Taken - All DO values less than 6 collected during 2005-2006 were disqualified from the database. This resulted in 2 values at MLD. These data were disqualified during the early part of 2009.

The minimum DO values discussed above were all noted in the text of the Report as being somewhat suspect. Despite this, the data was still included in the summary statistics table in the Report and most likely included as part of the statistical analysis done at these sites.

- CR-SMD - There is discussion in the text of the Report about the minimum DO concentration of 5.34 (mg/L) that occurs in 2006 at CR-SMD, but there is no reference to this data being suspect. More recent data (2007-2011) show that the DO at this site does not fall below 6 (mg/L) with an average DO concentration of 9.1 (mg/L).
  Action Taken - All DO values less than 6 collected during 2005-2006 were disqualified from the database. This resulted in 2 values at CR-SMD, 5.15 and 5.28 both collected in 2006. These data were disqualified during the early part of 2009.

In summary, 30 values were disqualified from the flowing sites database that were included in the Report.

Lakes and Reservoirs

pH – The Report mentions several instances where the pH data are suspect, especially in regards to outlying values. Many of these have been accounted for in the lakes database by disqualifying data for the dates discussed in the Report. In summary these are:

- Granby - In the text of the Report there is reference to suspect data at GR-DAM stating "most likely in error are pH outliers present in May and July 2005, and in Nov. 2006". The minimum and maximum pH observed occurred during these events; 6.2 in November 2006 and 9.29 in May 2005.
  Action Taken – All pH data at GR-DAM were disqualified in the lakes database for July 7, 2005 and November 6, 2006. These data were disqualified during the early part of 2009.

- Shadow Mountain – In the text of the Report suspect data at Shadow Mountain is noted as "Greatest pH levels that exceed pH 9.0 (i.e. pH 10.47, June 2005 at station SM-CHL) or less than pH 7.0 in 2005 are likely in error". The minimum pH at all three Shadow Mountain locations are less than seven and all occur in July 2005.
  Action Taken – All pH data at SM-DAM, SM-MID and SM-CHL were disqualified in the lakes database for June 8, 2005 and July 8, 2005. These data were disqualified during the early part of 2009.

- Grand Lake – There is no discussion in the text of the Report regarding suspect pH data in Grand Lake. However, pH data has been disqualified from the lakes database. Data in Grand Lake was collected on the same days as the suspect pH data in Shadow Mountain and Granby, June 8, 2005 and July 7, 2005. The Grand Lake data show the same atypical patterns as the Shadow Mountain data; unusually high values in June and low values in July. This may have been a probe calibration issue so the suspect data is not limited to Shadow Mountain.
  Action Taken – All pH data at GL-MID and GL-ATW were disqualified in the lakes database for June 8, 2005 and July 7, 2005. These data were disqualified during the early part of 2009.

- Horsetooth Reservoir – In the text of the Report suspect pH data at Horsetooth is noted in 2005; "In 2005, there are some pH profiles that are inconsistent with other water quality conditions in the reservoir (i.e. May and July 2005) and may indicate likely errors in the recorded levels".
  Action Taken – All pH data at HT-SPR, HT-DIX and HT-SOL were disqualified in the lakes database for May 15, 2005 and July 5, 2005. These data were disqualified during the early part of 2009.

- Carter Lake – In the text of the report, an unusually high pH of 9.98 recorded in May of 2005 was stated to be "most likely in error". All of the pH data collected in May of 2005 have unusually high pH values. This may be a probe issue as the pH data at Horsetooth collected this day were also suspect.
  Action Taken – All pH data at CL-DAM1 and CL-DAM3 were disqualified in the lakes database for May 15, 2005. These data were disqualified during the early part of 2009.

Except for Grand Lake, the dates where there was suspect data discussed in the Report contain both the minimum and maximum pH values. Despite this, the data was still included in the summary statistics table in the Report and most likely included as part of the statistical analysis done at these sites.

Dissolved Oxygen – The Report does not document suspect DO data for the lake sites. However, there were known issues with some of the DO profiles, specifically for Horsetooth Reservoir. Some of these data have been disqualified from the lakes database.

- Horsetooth Reservoir – There were some usually low DO profiles collected in August 2005 at HT-DIX and HT-SOL. These profiles were found to be suspect by Hydros Consulting during calibration of the Horsetooth Model. This is documented in an email correspondence between Christine Hawley with Hydros and Northern Water (Physical_Suspect DO profiles at HT_Email Hawley.rtf).

  Action Taken – All DO data at HT-SPR, HT-DIX and HT-SOL were disqualified in the lakes database for August 2, 2005. These data were disqualified in February 2012.

New Found Issues and Action Taken

Flowing Sites

There are no known outstanding issues with the physical data at the flowing sites.

Lakes and Reservoirs

The pH and DO data were reviewed in two different ways; comparison to USGS data collected during the same month and year and comparison to data collected by Northern and the USGS from 2009-2011. The first comparison shows accuracy of the data collected by the USBR. The second compares monthly patterns.

pH – In general, that pH data collected by the USBR shows more spread when compared to the Northern/USGS data from 2009-2011. This pattern is clear in all waterbodies except for Shadow Mountain. When compared to the USGS data collected during the same month and year, the USBR pH value is generally higher than the USGS pH value (but not always) and there are no instances when the data line up well with one another. In comparison, data collected by Northern and USGS during the same month and year compare well with one another (Horsetooth August and September 2009 is a good example). Note: there are some notable differences when comparing Northern to the USGS at the SM-CHL site; this is due to a slightly different sampling location. The USGS samples in Grand Lake northeast of the footbridge and Northern samples off of the footbridge.

Figure 24 - Figure 44 show the pH data review for each sampling site included in the Report. The data discussed above that has already been disqualified from the database is shown on the figures in hallowed out symbols.

Figure 24 - pH at GR-DAM 2005-2007

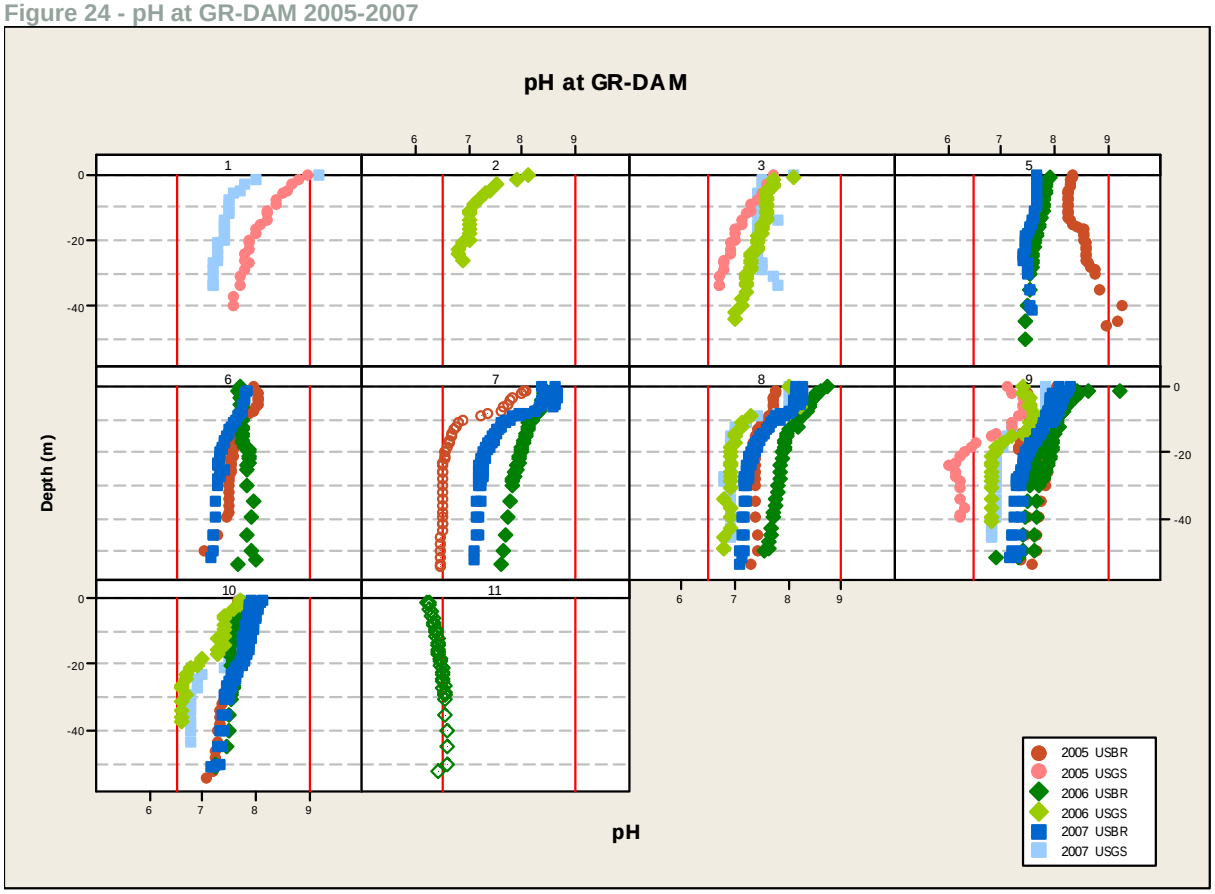


Figure 25 - pH at GR-DAM 2009-2011

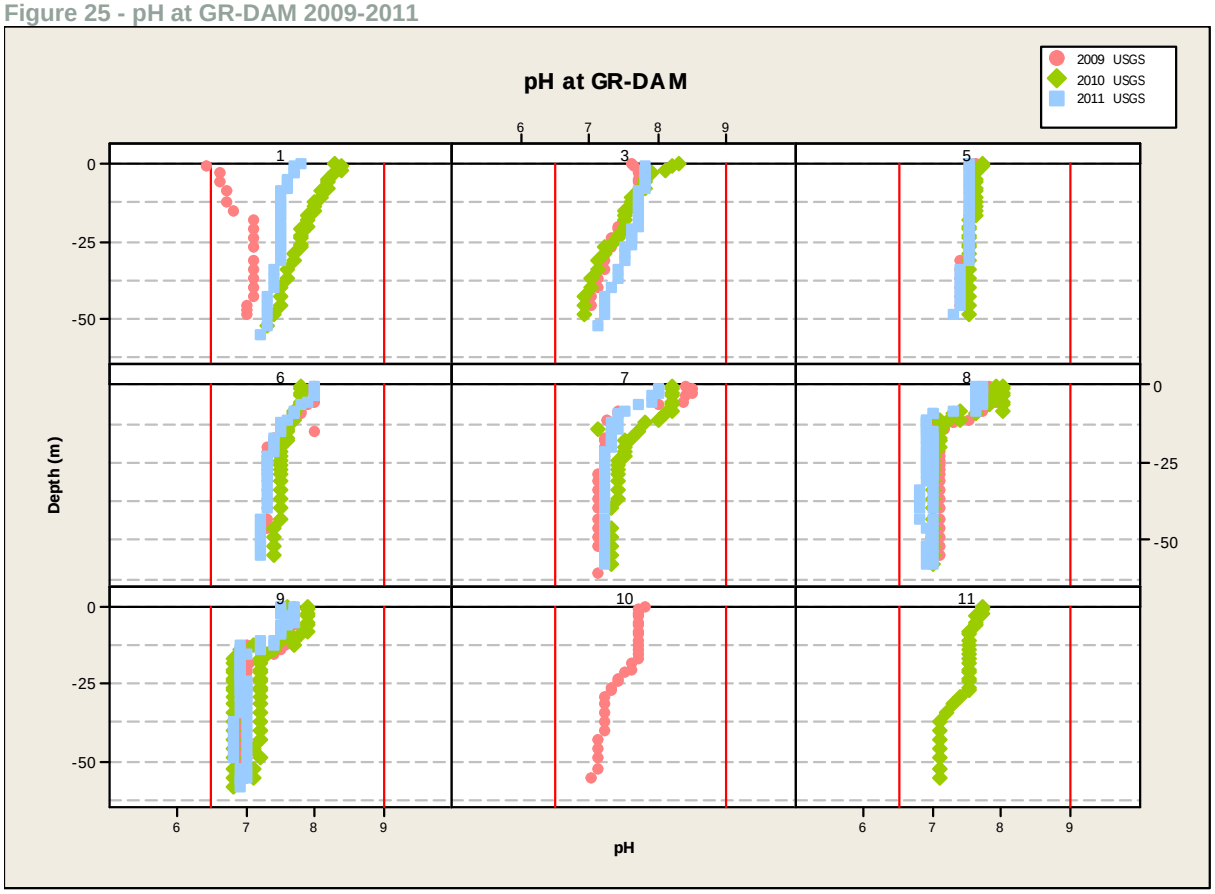


Figure 26 - pH at SM-DAM 2005-2007

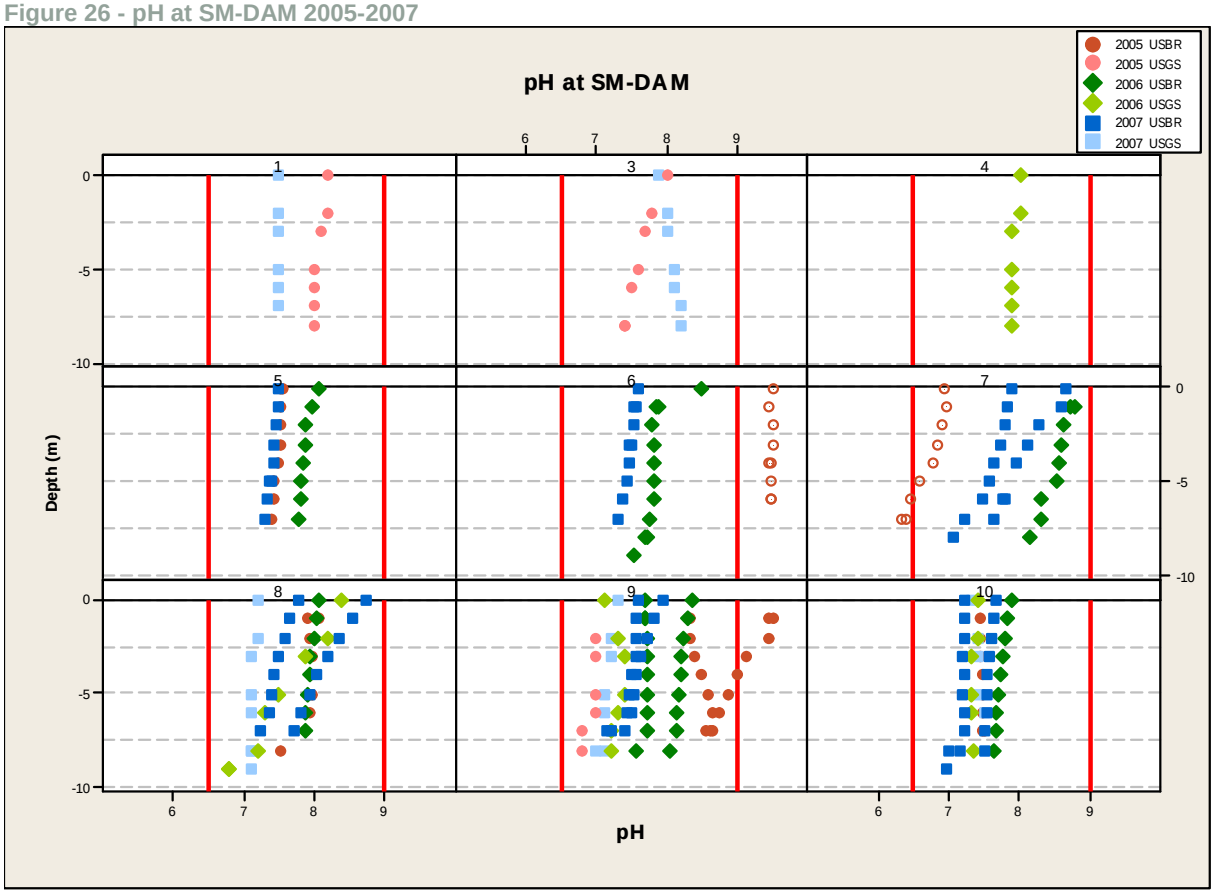


Figure 27 - pH at SM-DAM 2009-2011

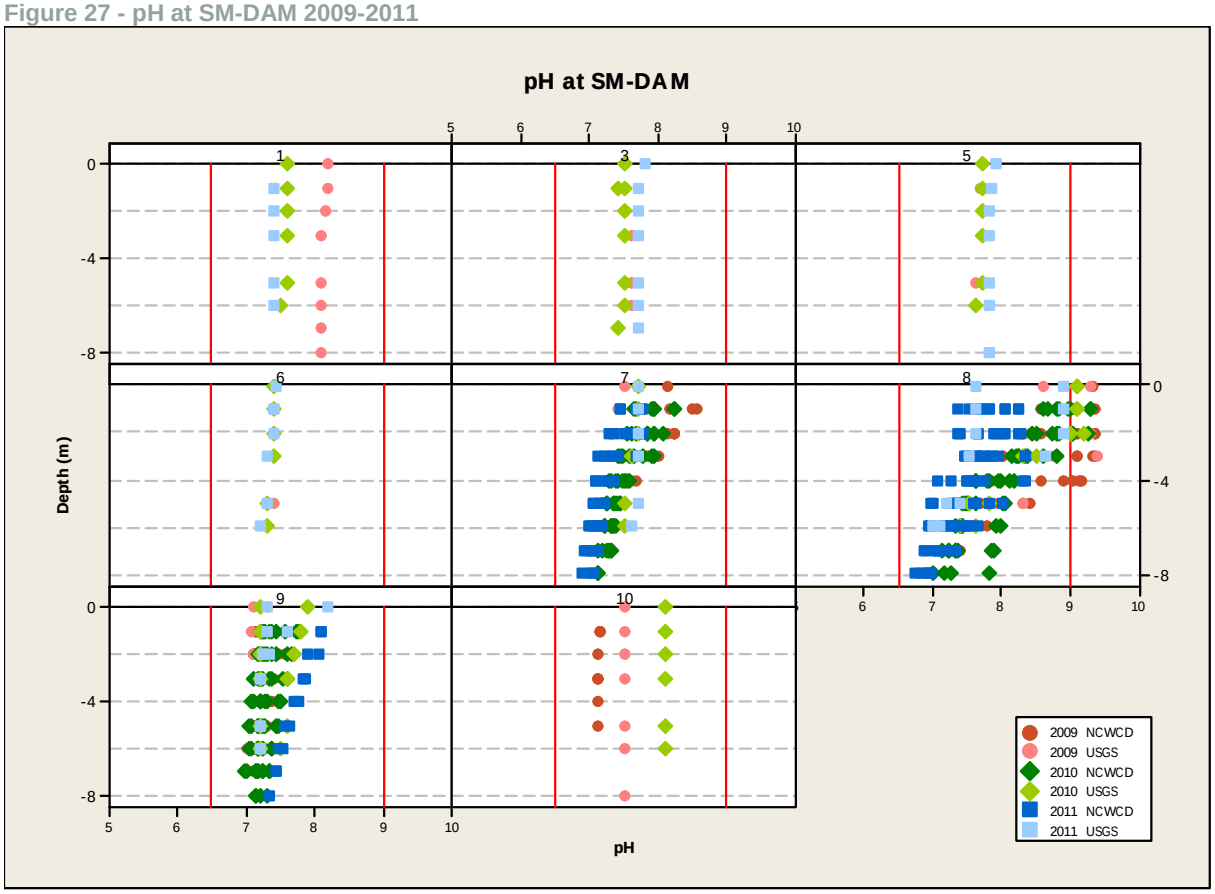


Figure 28 - pH at SM-MID 2005-2007

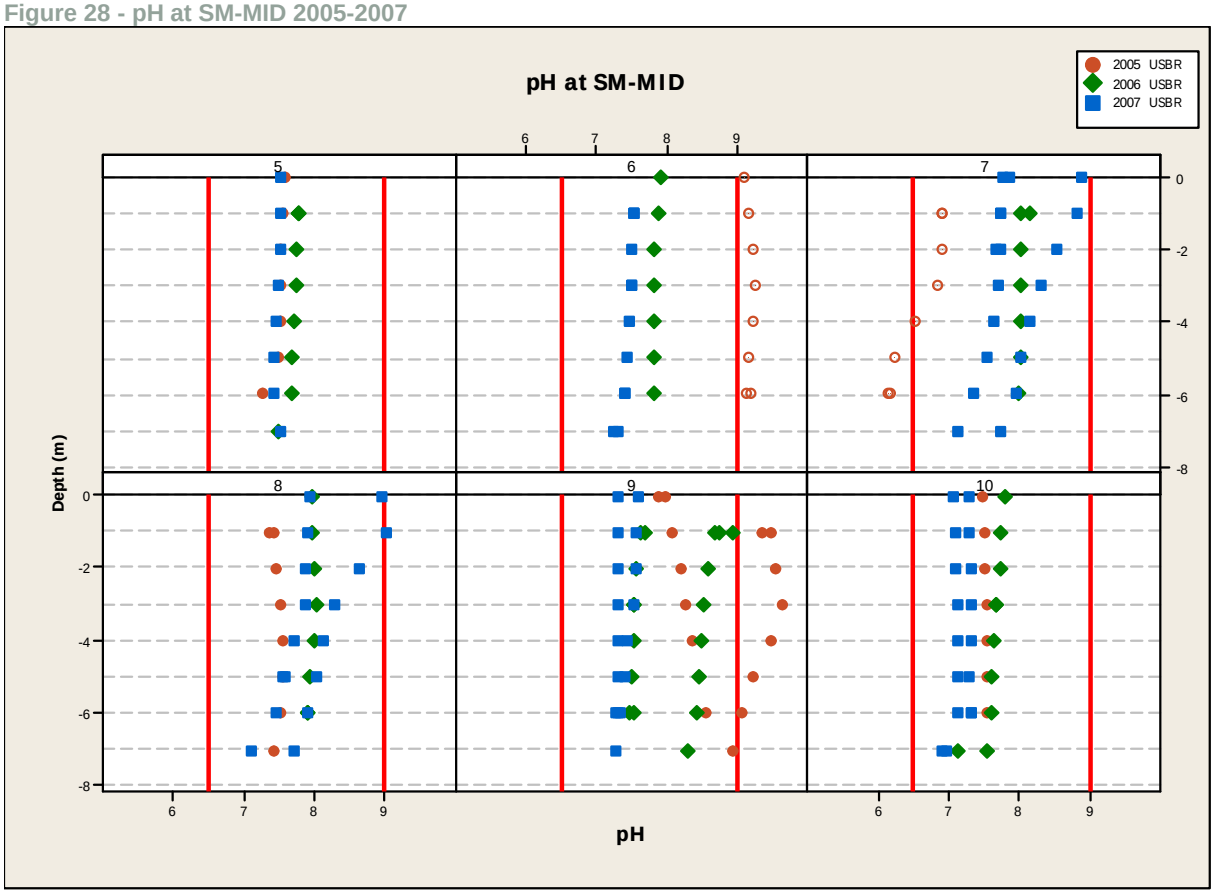


Figure 29 - pH at SM-MID 2009-2011

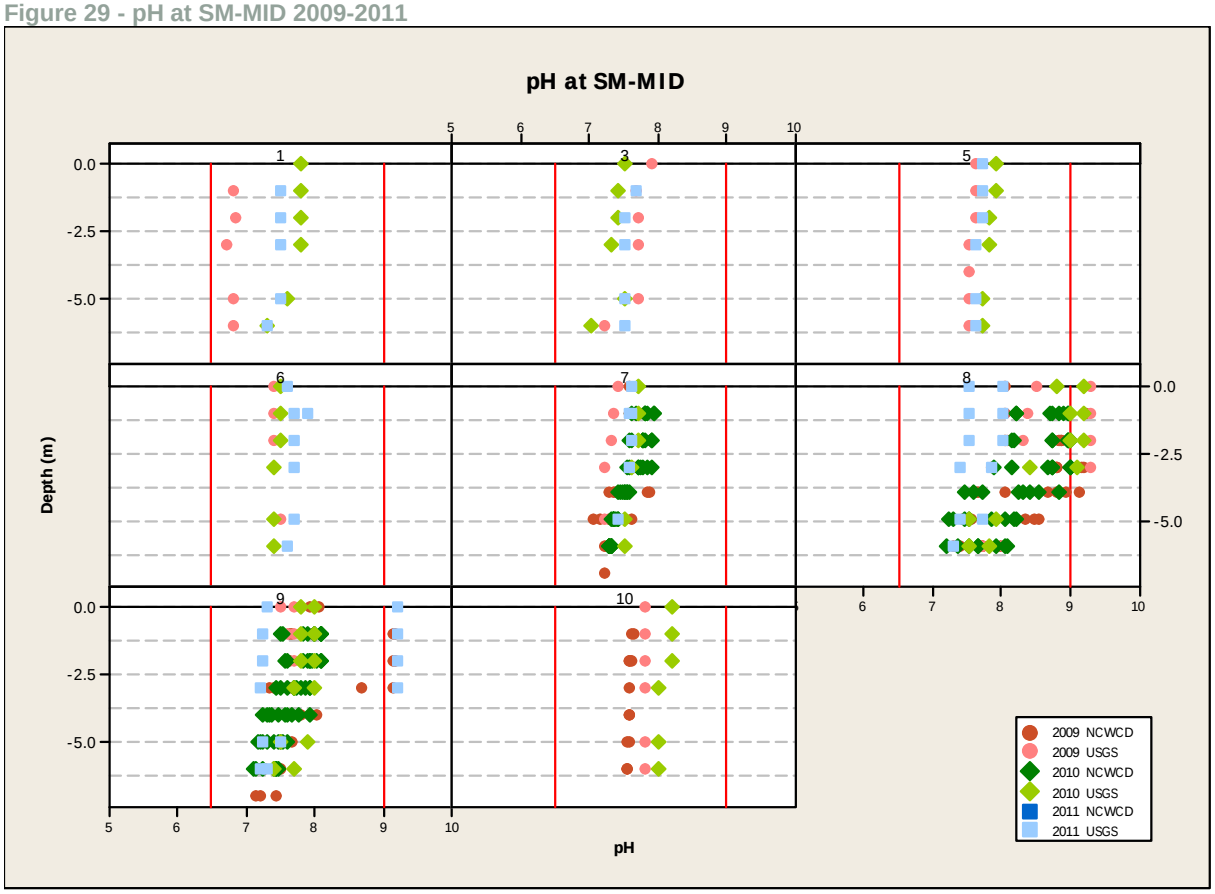


Figure 30 - pH at SM-CHL 2005-2007

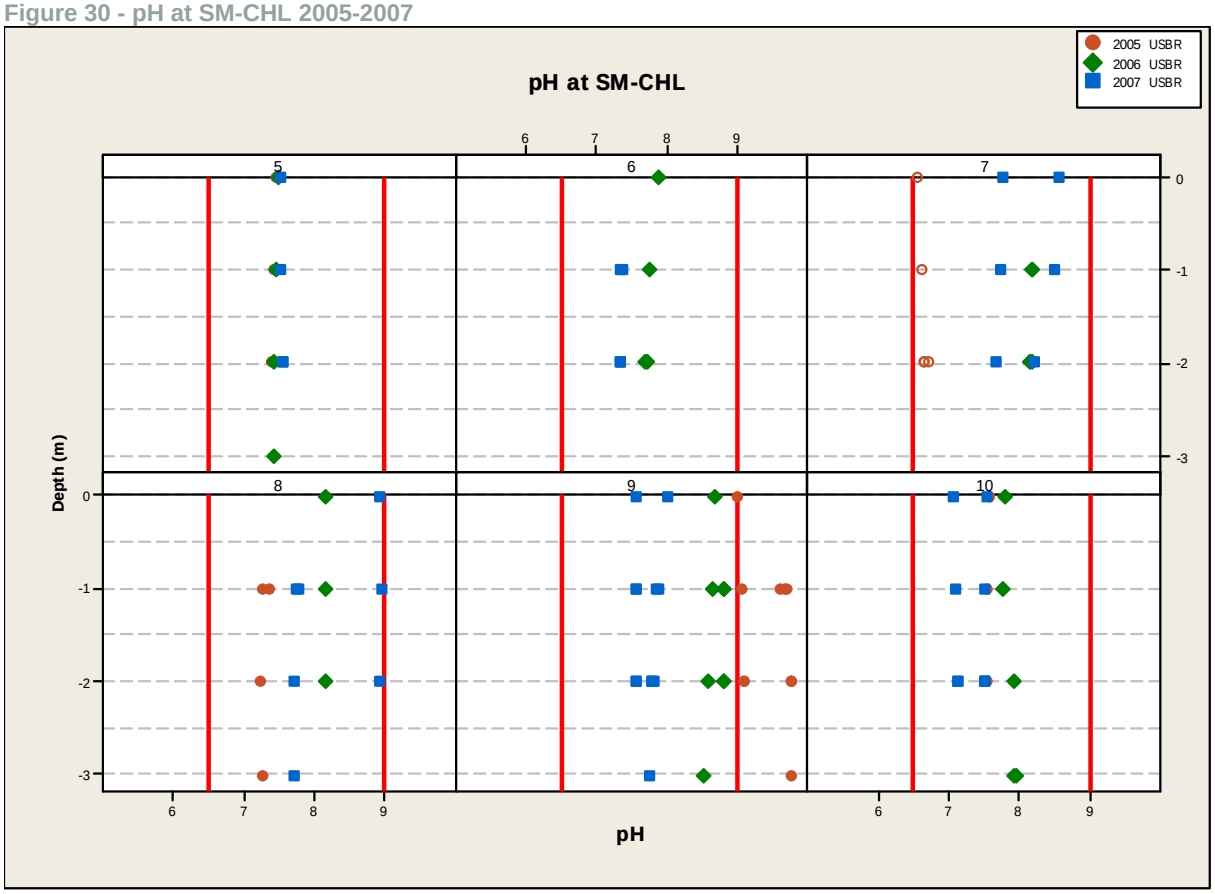


Figure 31 - pH at SM-CHL 2009-2011

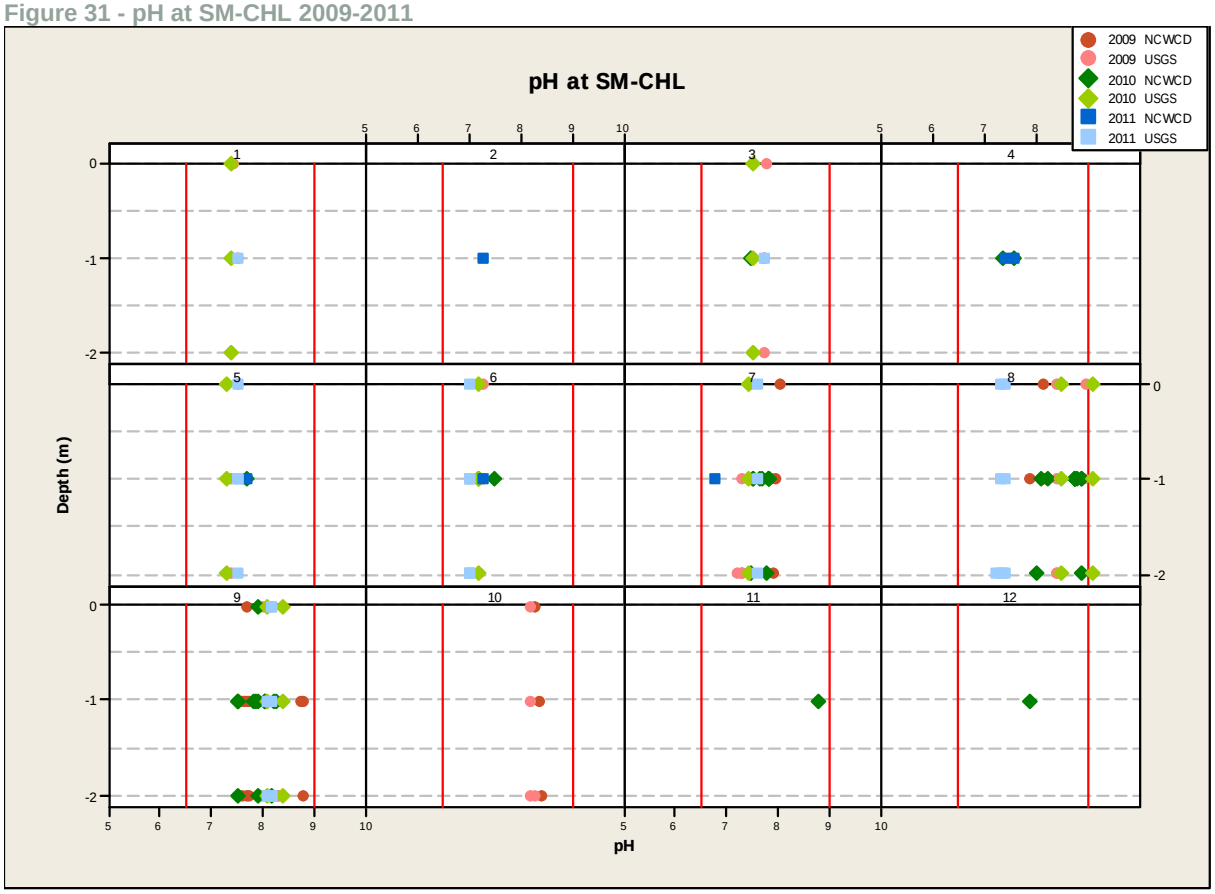


Figure 32 - pH at GL-MID 2005-2007

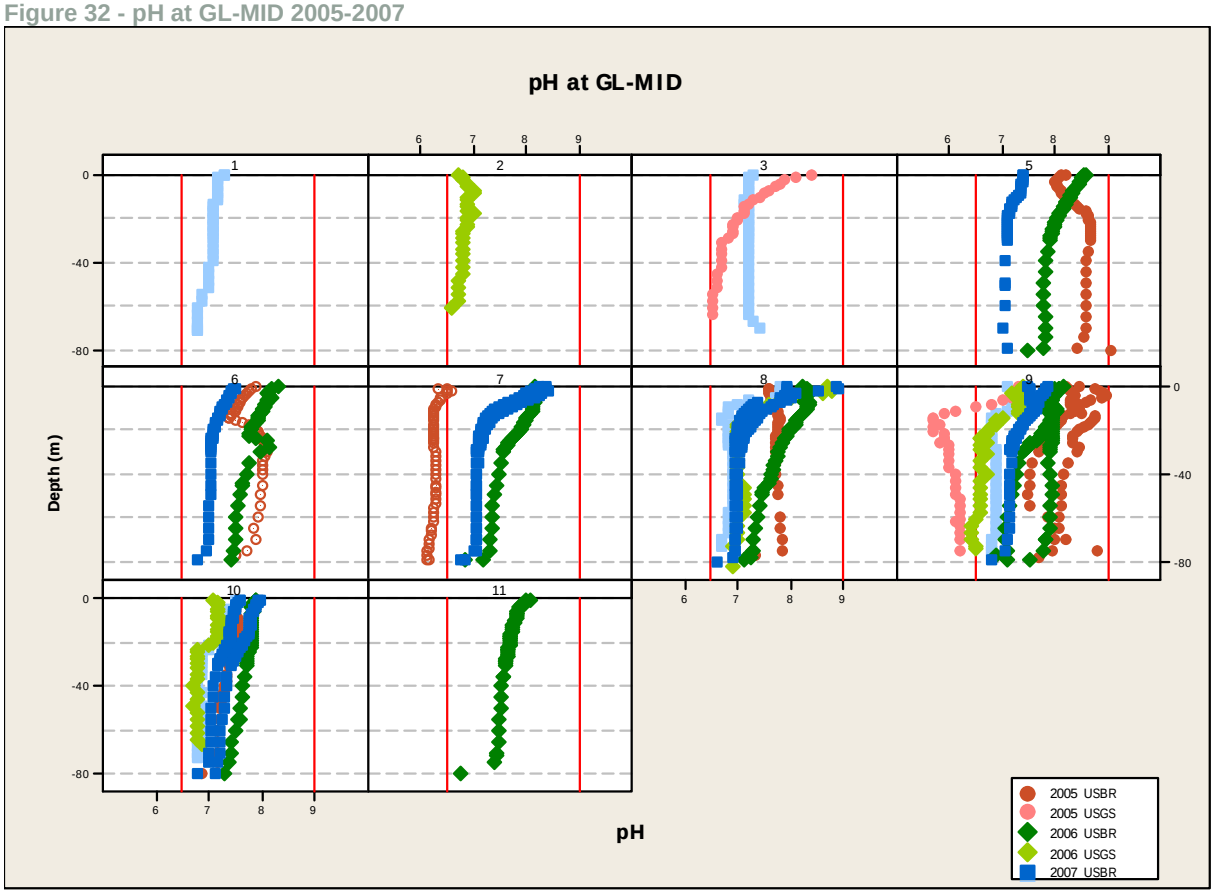


Figure 33 - pH at GL-MID 2009-2011

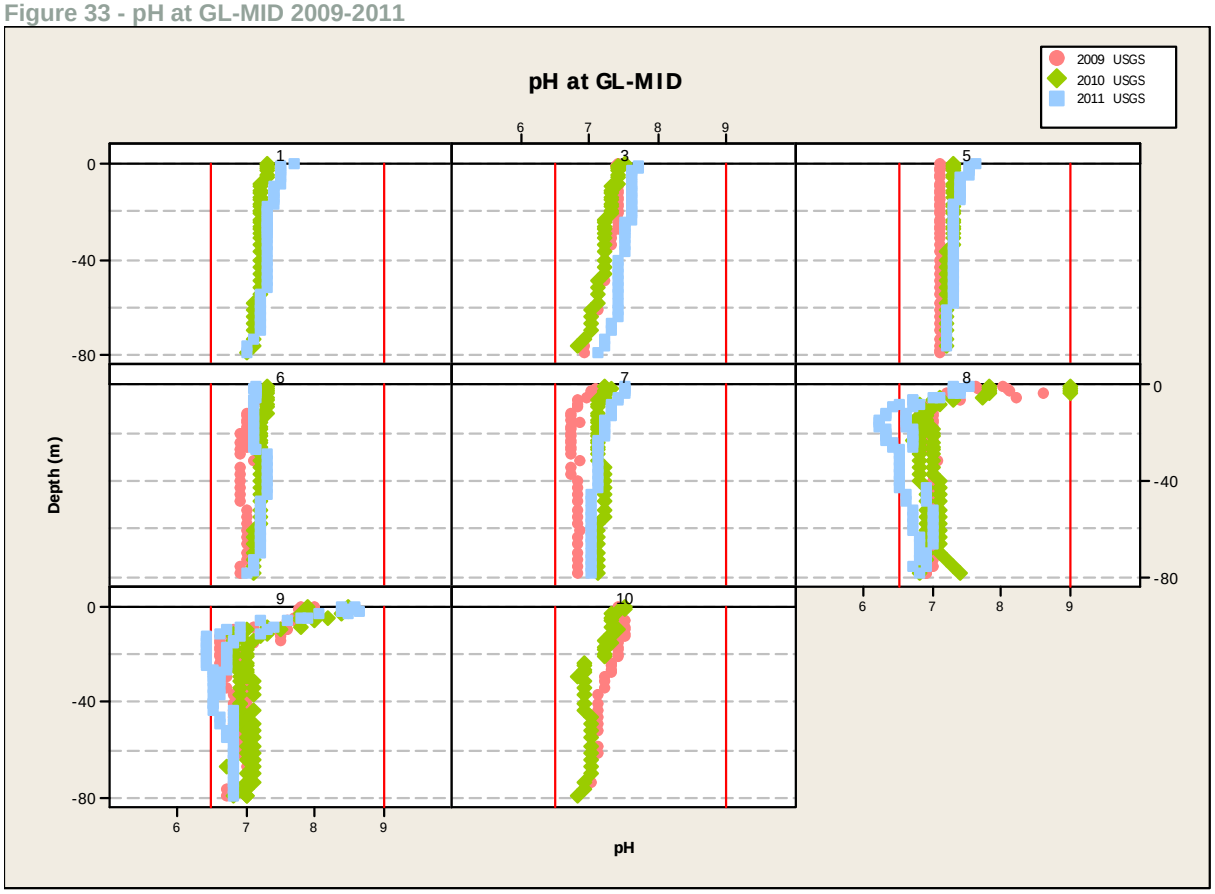


Figure 34 - pH at GL-ATW 2005-2007

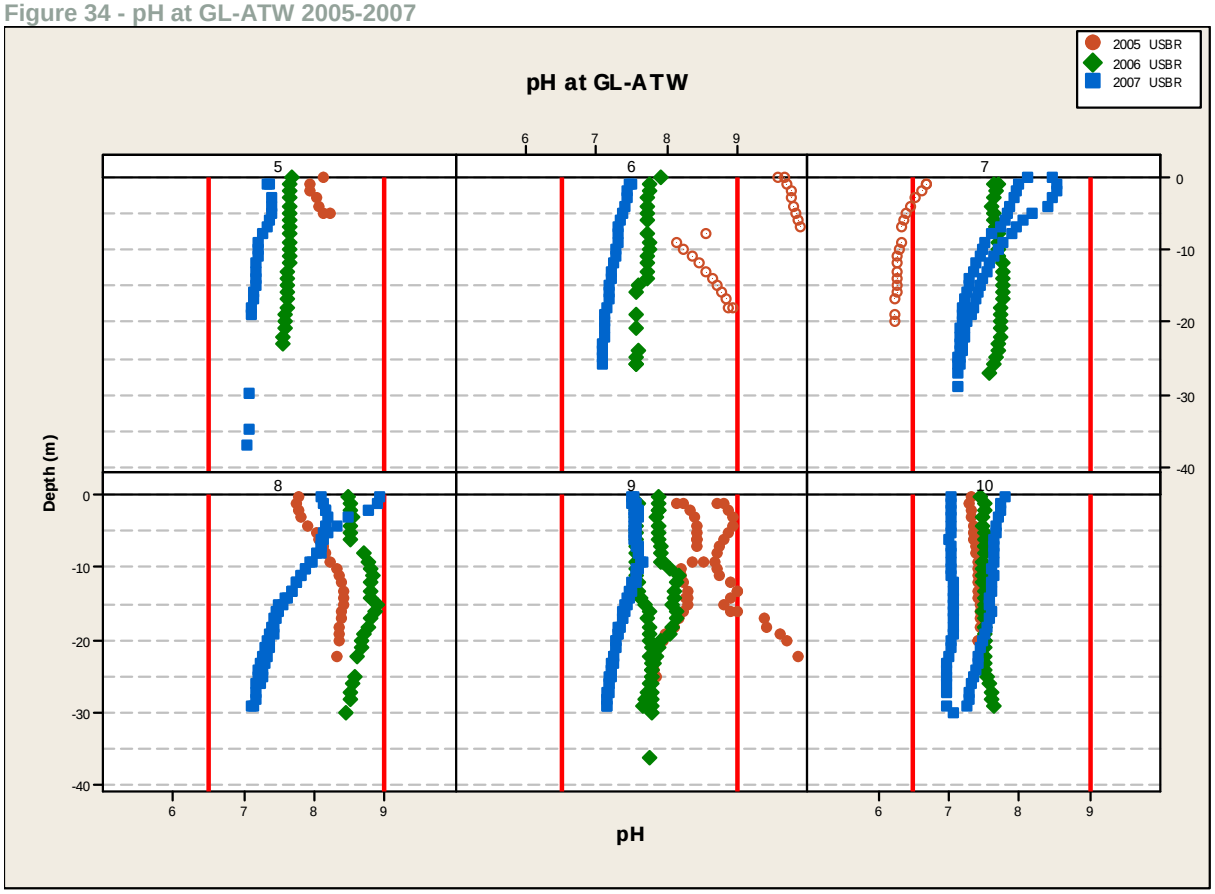


Figure 35 - pH at GL-ATW 2009-2011

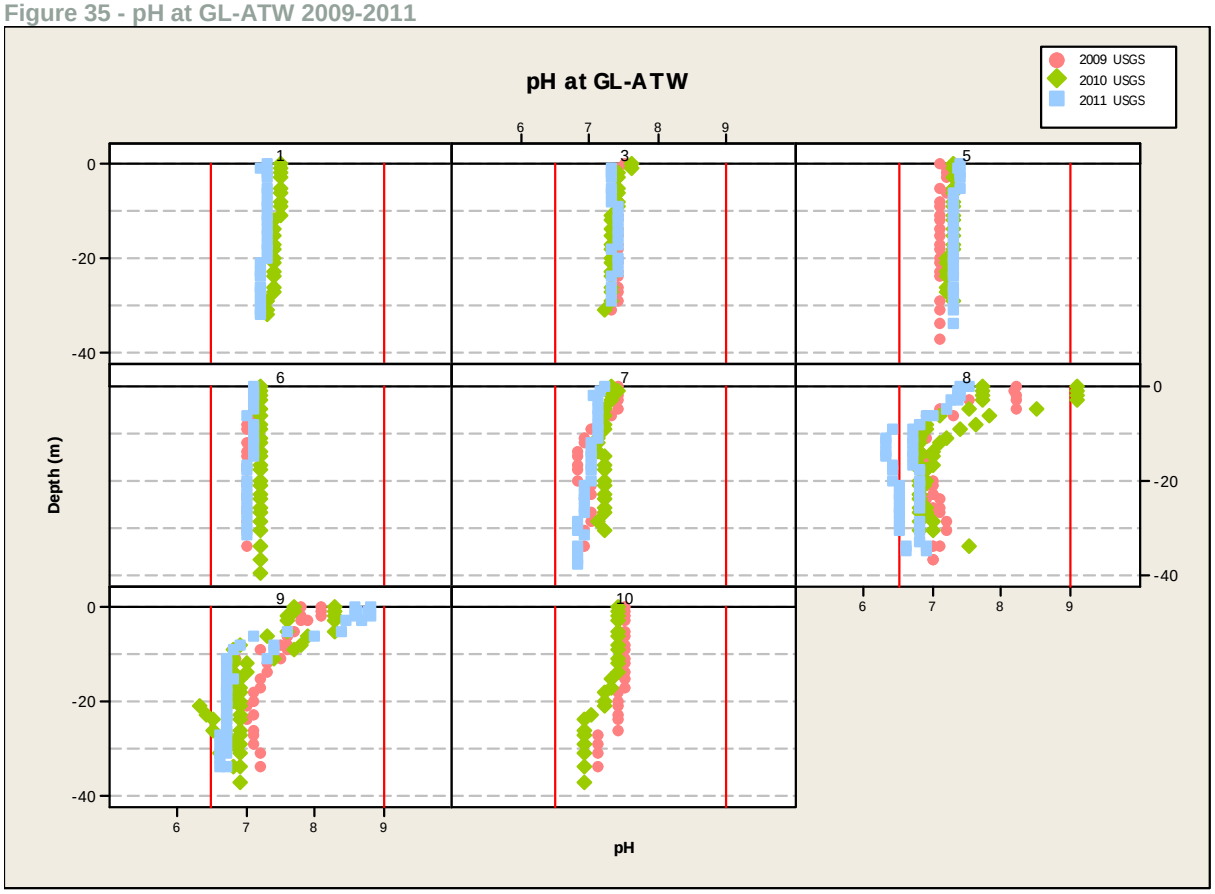


Figure 36 - pH at HT-SPR 2005-2007

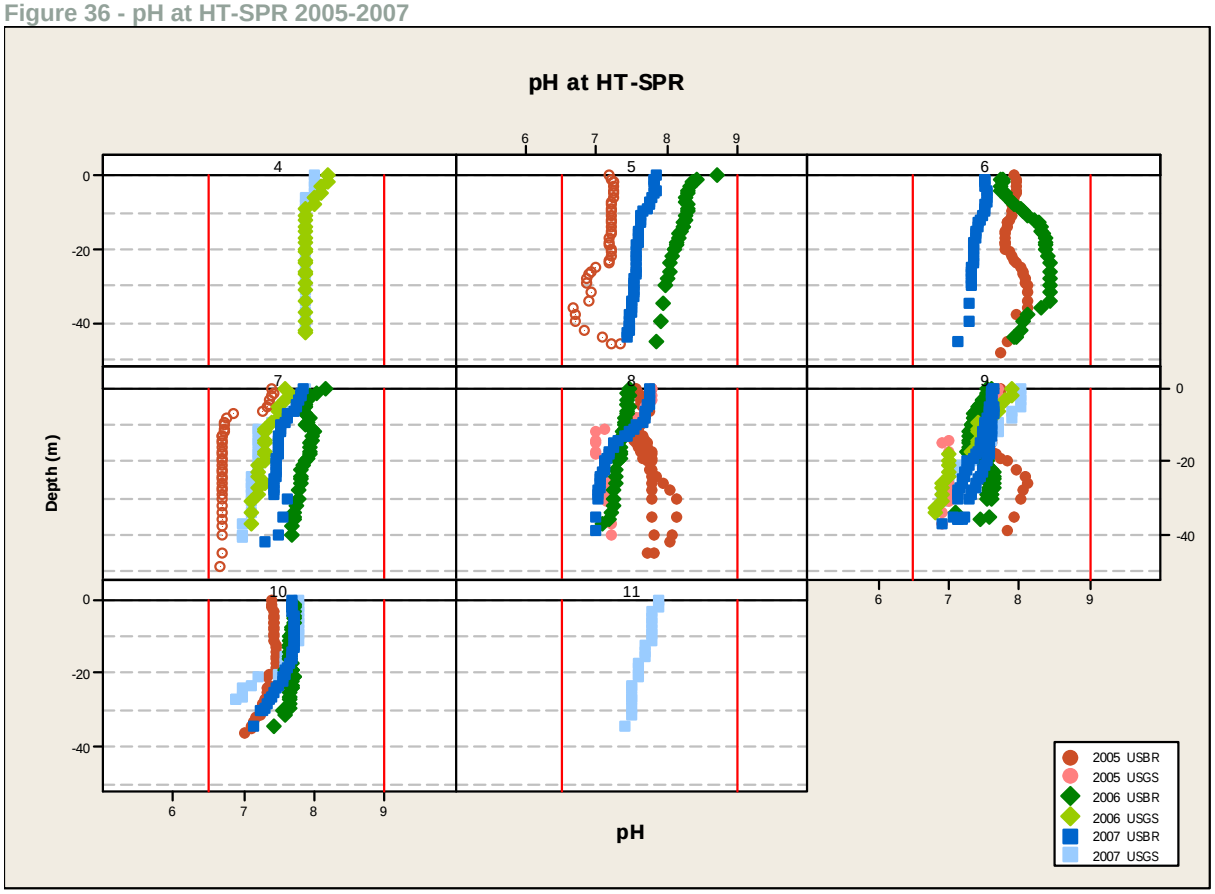


Figure 37 - pH at HT-SPR 2009-2011

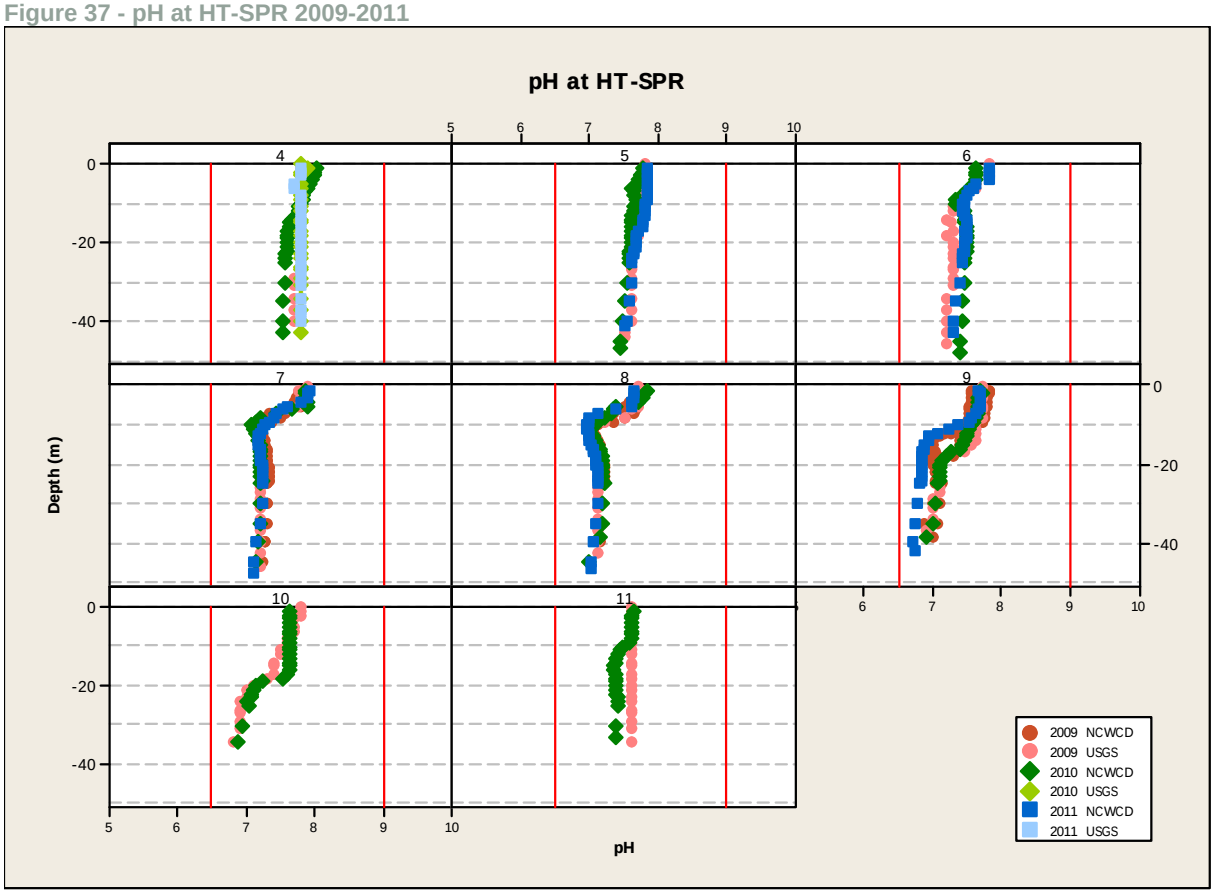


Figure 38 - pH at HT-DIX 2005-2007

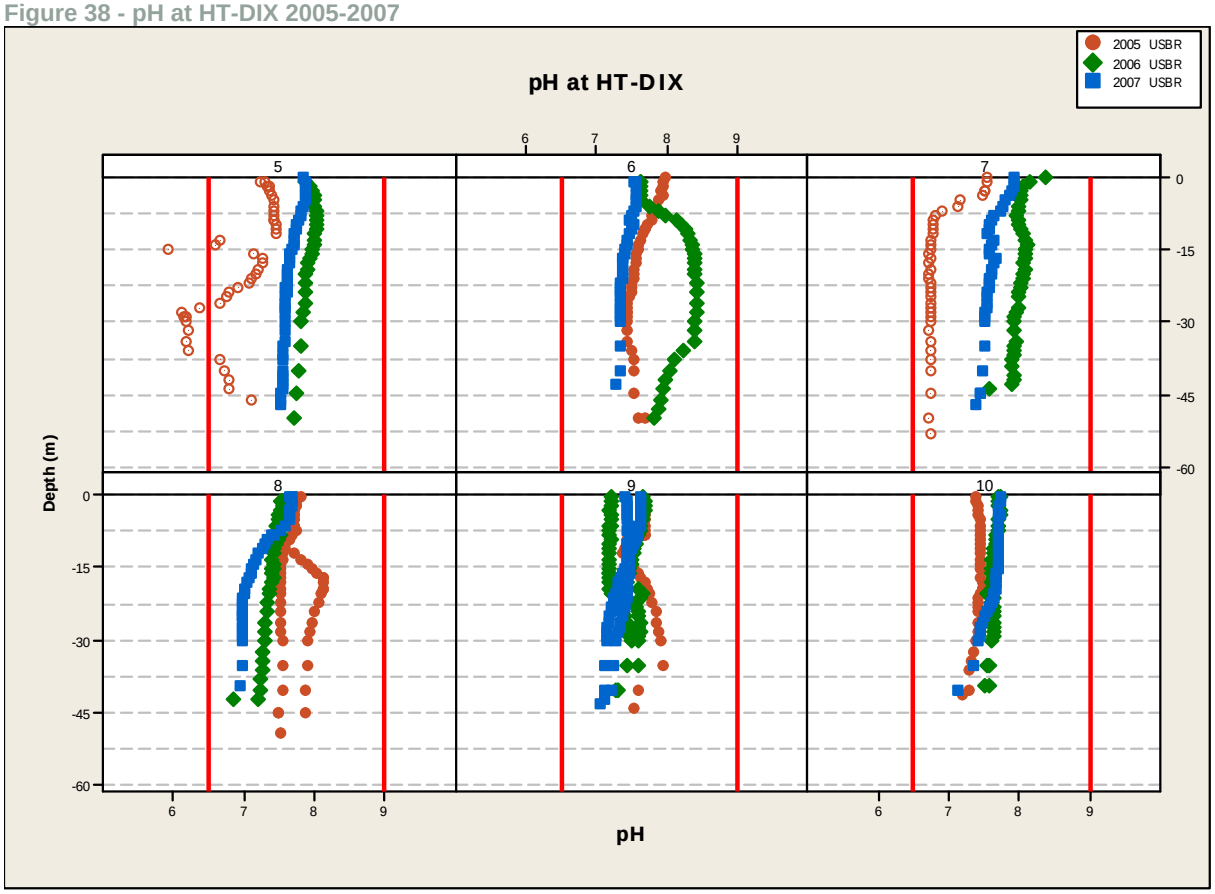


Figure 39 - pH at HT-DIX 2009-2011

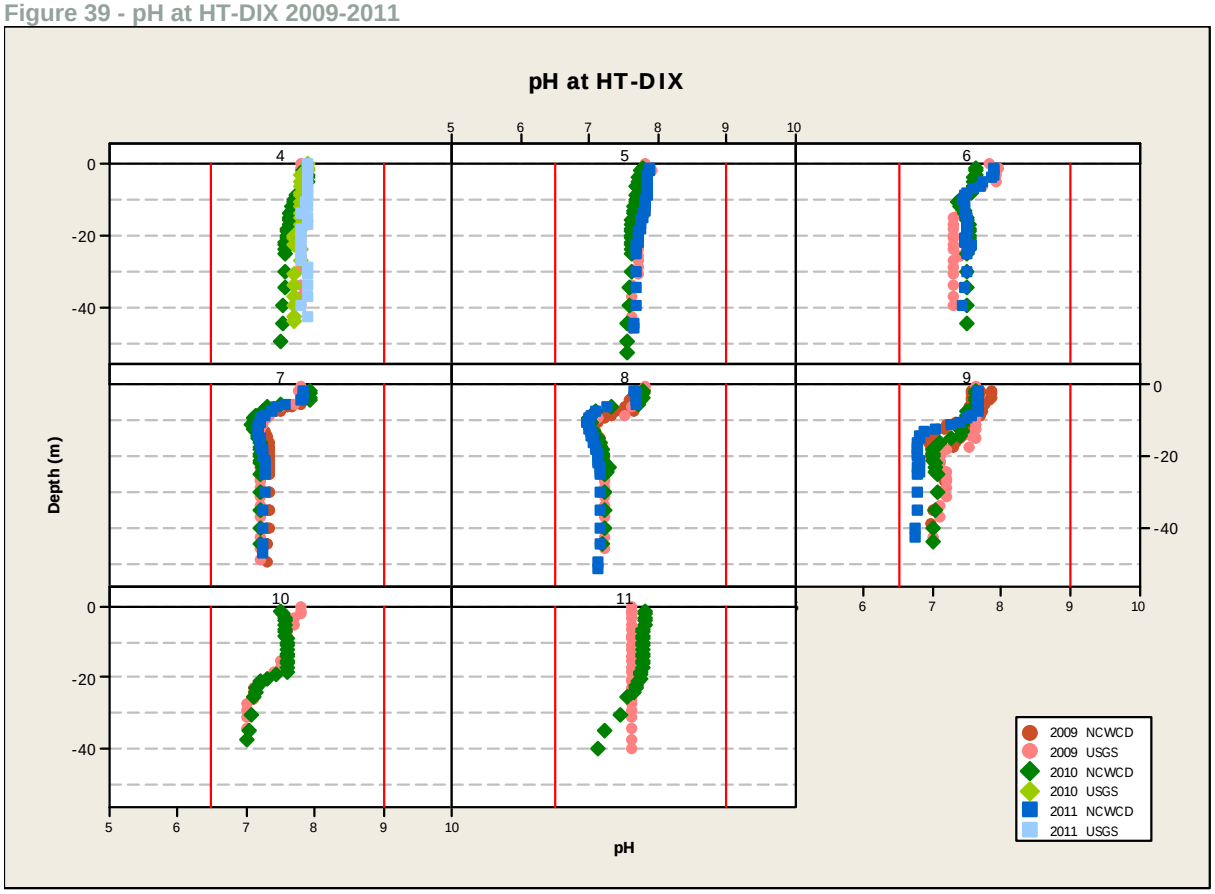


Figure 40 - pH at HT-SOL 2005-2007

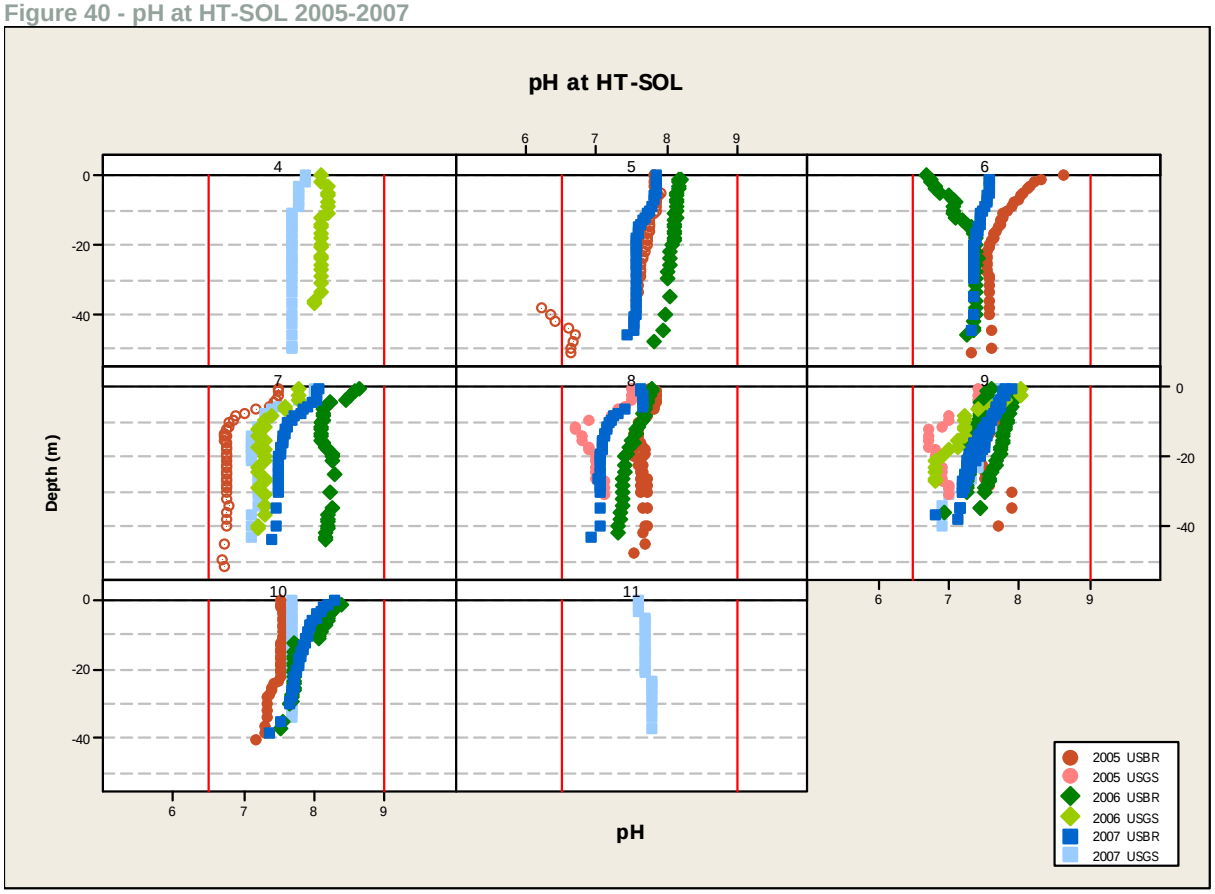


Figure 41 - pH at HT-SOL 2009-2011

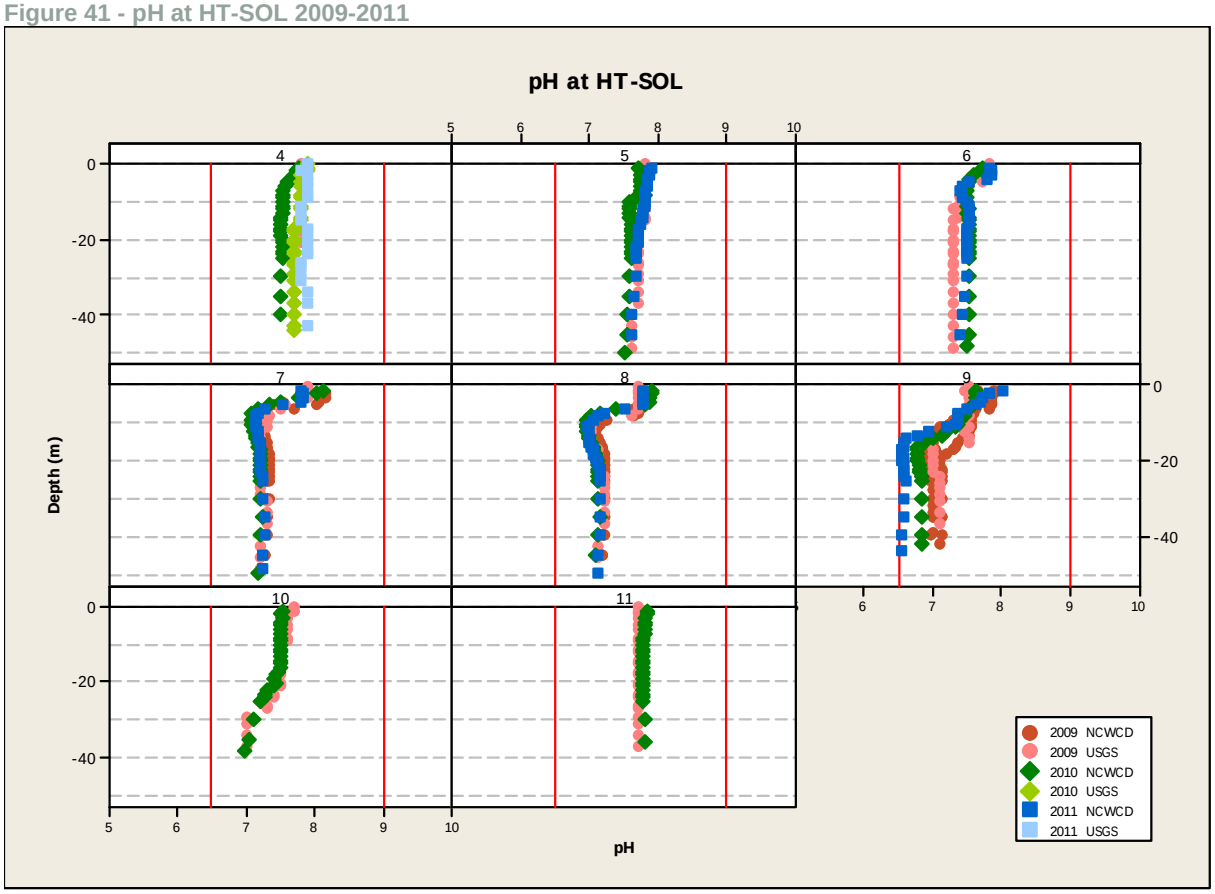


Figure 42 - pH at CL-DAM1 2005-2007

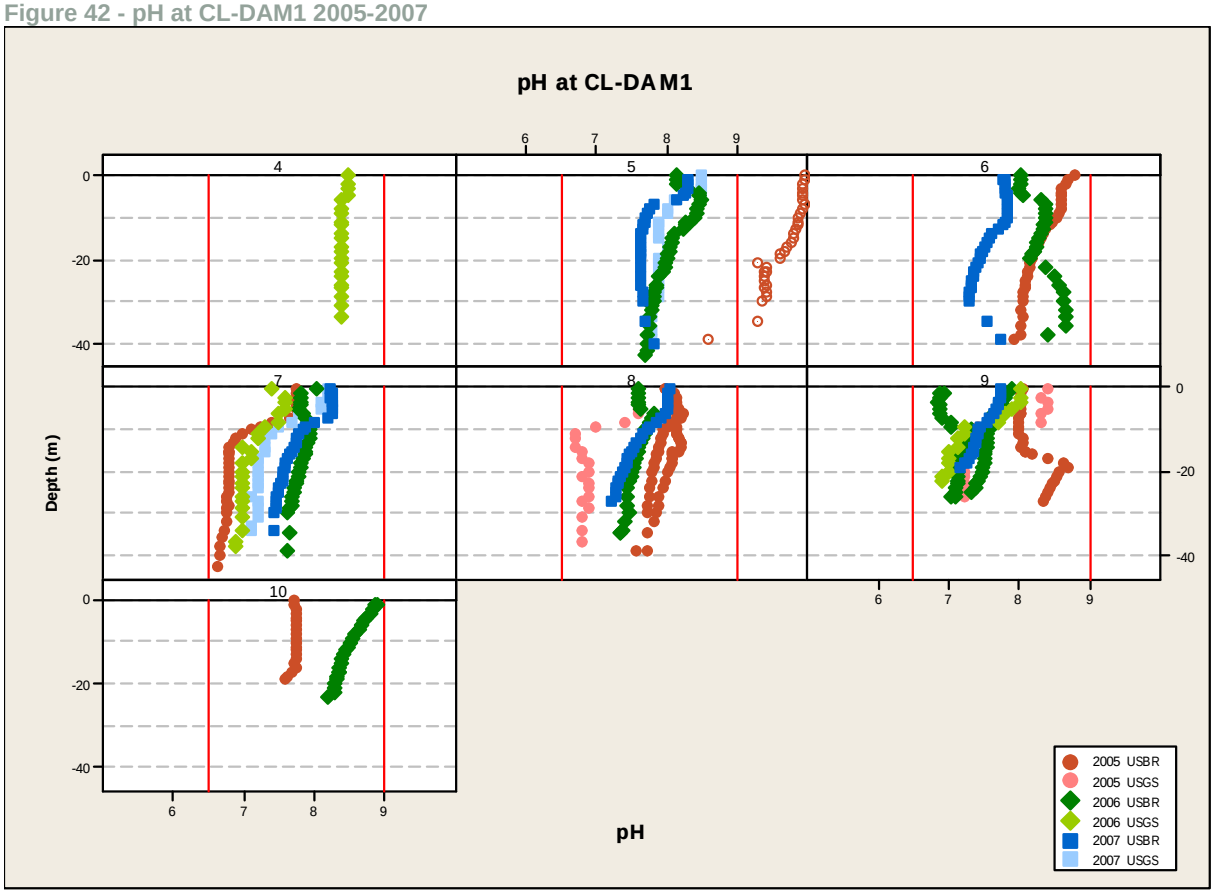


Figure 43 - pH at CL-DAM1 2009-2011

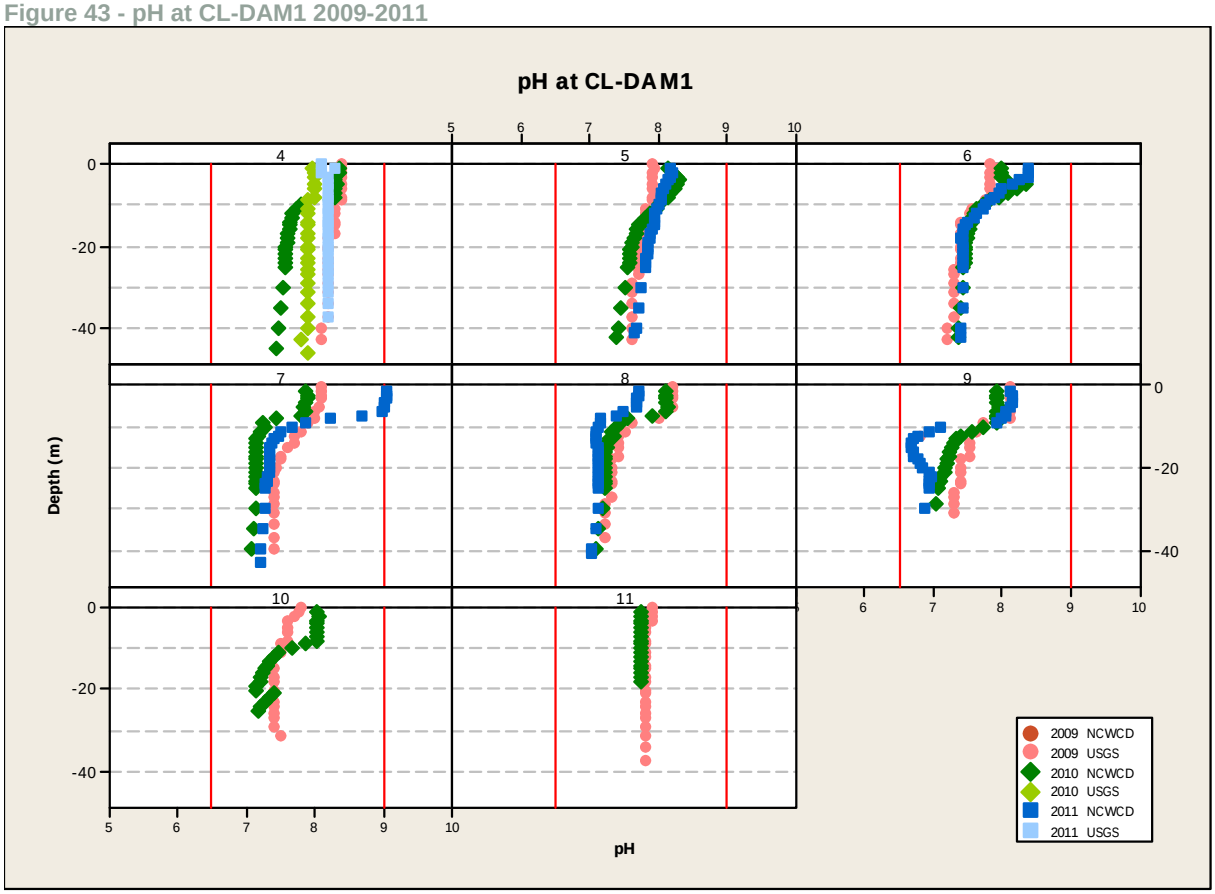
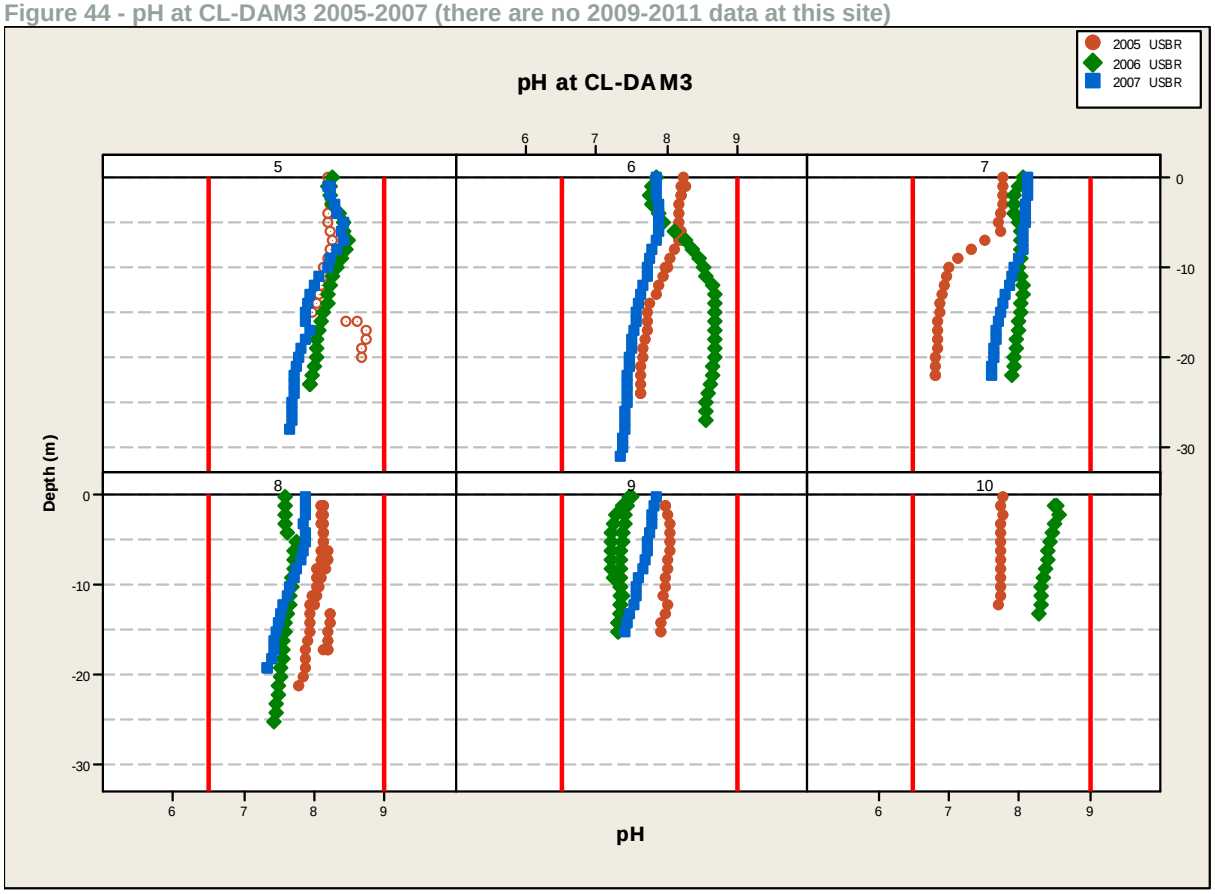


Figure 44 - pH at CL-DAM3 2005-2007 (there are no 2009-2011 data at this site)



- Granby - In the text of the Report there is reference to suspect data at GR-DAM stating "most likely in error are pH outliers present in May and July 2005, and in Nov. 2006". As discussed in the known data issues section, all pH data at GR-DAM has been disqualified in the lakes database for July 7, 2005 and November 6, 2006. The May data has not been disqualified to date. It is apparent in Figure 24 that these data are suspect.

  <u>Action Taken</u> – Disqualified all pH data at GR-DAM from 5/18/2005. There were also pH profiles taken at GL-MID and GL-ATW on 5/18/2005; these data also look suspect. In addition, the profile collected at GL-ATW is incomplete, only reaching a depth of 5 meters. The pH data from 5/18/2005 at GL-MID and GL-ATW were also disqualified. These data were disqualified on 1/15/2013.

- The pH data from 2005-2007 are messy and there are no clear patterns to the pH profiles. After meeting with Chris Holdren it was discovered that there were possible issues with the pH probe; the probe used was manufactured by YSI and has a relatively short (1-2 year) lifespan. He agreed that much of the data looked suspect and should be carefully reviewed and censored accordingly.

  <u>Action Taken</u> – All of the profiles from 2005-2007 were thoroughly reviewed. Any profiles that looked suspect when compared to typical seasonal patterns, patterns for that particular year, or, when applicable, are not comparable to other data collected during the same month and year were disqualified from the database. The data that were found to be suspect were:

  - *CL-DAM1 and CL-DAM3 collected on 7/6/2005. These data were low and were omitted from Figure 42 in the Report.*

- *GL-ATW, GL-MID, SM-CHL, SM-DAM and SM-MID on 9/1/2005. These data were high, especially in Grand Lake at the bottom. Further, the data displayed for the 17 – 22 meter depths at GL-ATW in Figure 38 of the Report are not the same as the pH data reported and in the database. There is also a pH profile at GR-DAM on 9/1/2005. The data collected at GR-DAM do not look suspect; this was the first profile collected that day and there could have been problems with the probe that occurred at the subsequent sites.*

- *GL-ATW from 10/9/2006. Data in this profile was not collected in sequential order. 1-13 meter depths were collected first and sequentially, than data was collected from the bottom up for the 28-13 meter depths. The data did not compare well where it met at the 13 meter depth.*

These data were disqualified in the lakes database on 1/15/2013.

Dissolved Oxygen – In general, the DO data collected by the USBR does not display clear patterns and shows more spread when compared to the Northern/USGS data from 2009-2011. This is especially clear when looking at the Grand Lake sites where in August and September two profiles are collected at these sites. In the 2005-2007 data collected by the USBR, there is a noticeable difference in DO between the two events in each of these months. In the 2009-2011 data collected by the USGS, the DO profiles overlay one another, appearing almost as one profile. When looking at the data at the Horsetooth sites, the August and September profiles collected by the USBR are very spread out compared to the 2009-2011 data.

When compared to the USGS data collected during the same month and year, the USBR DO values are often higher than the USGS DO values (but not always) and there are only a few instances when the data line up well with one another (SM-DAM 2007). In comparison, data collected by Northern and USGS during the same month and year compare well with one another (Horsetooth August and September 2009 is a good example). Note: there are some notable differences when comparing Northern to the USGS at the SM-CHL site; this is due to a slightly different sampling location. The USGS samples in Grand Lake northeast of the footbridge and Northern samples off of the footbridge.

Figure 45 - Figure 65 show the DO data review for each sampling site included in the Report. The data discussed above that has already been disqualified from the database is shown on the figures in hallowed out symbols.

Figure 45 - Dissolved Oxygen at GR-DAM 2005-2007

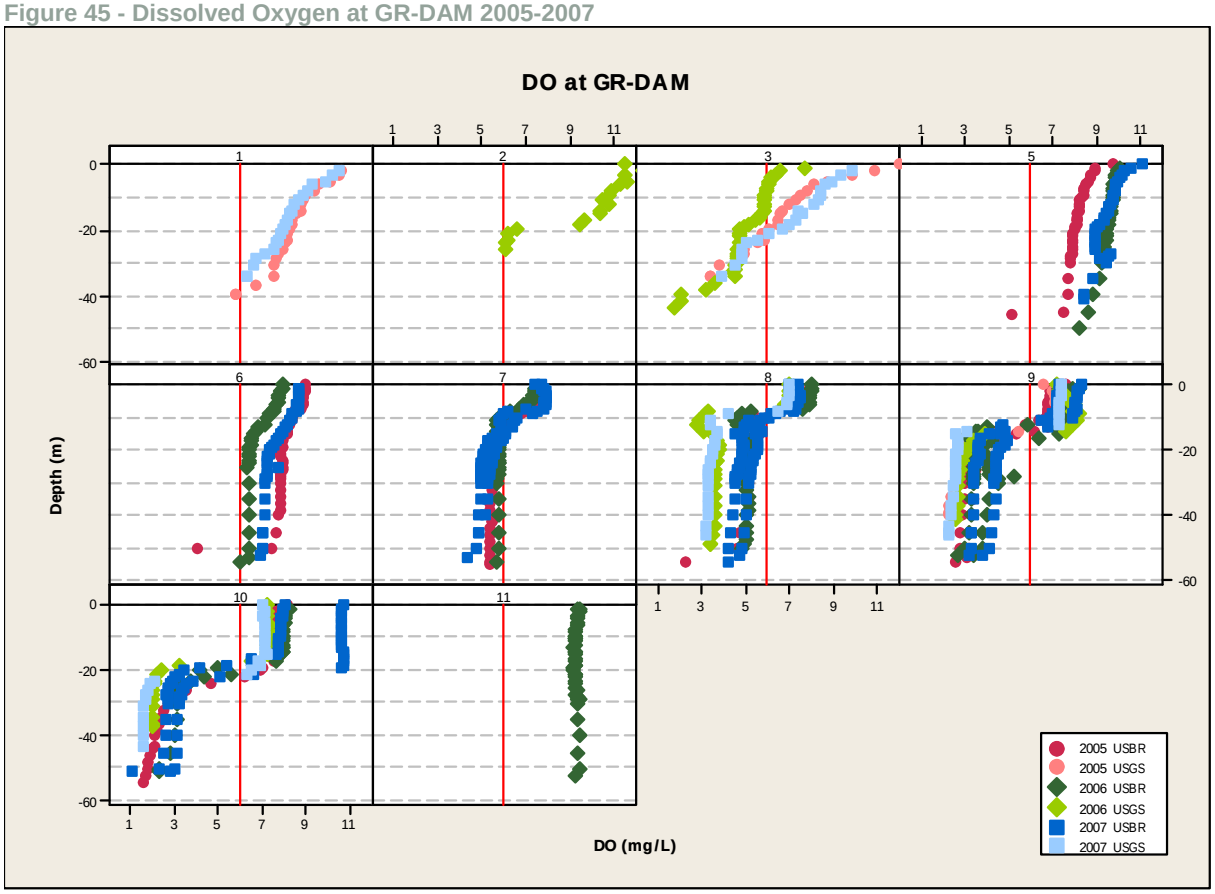


Figure 46 - Dissolved Oxygen at GR-DAM 2009-2011

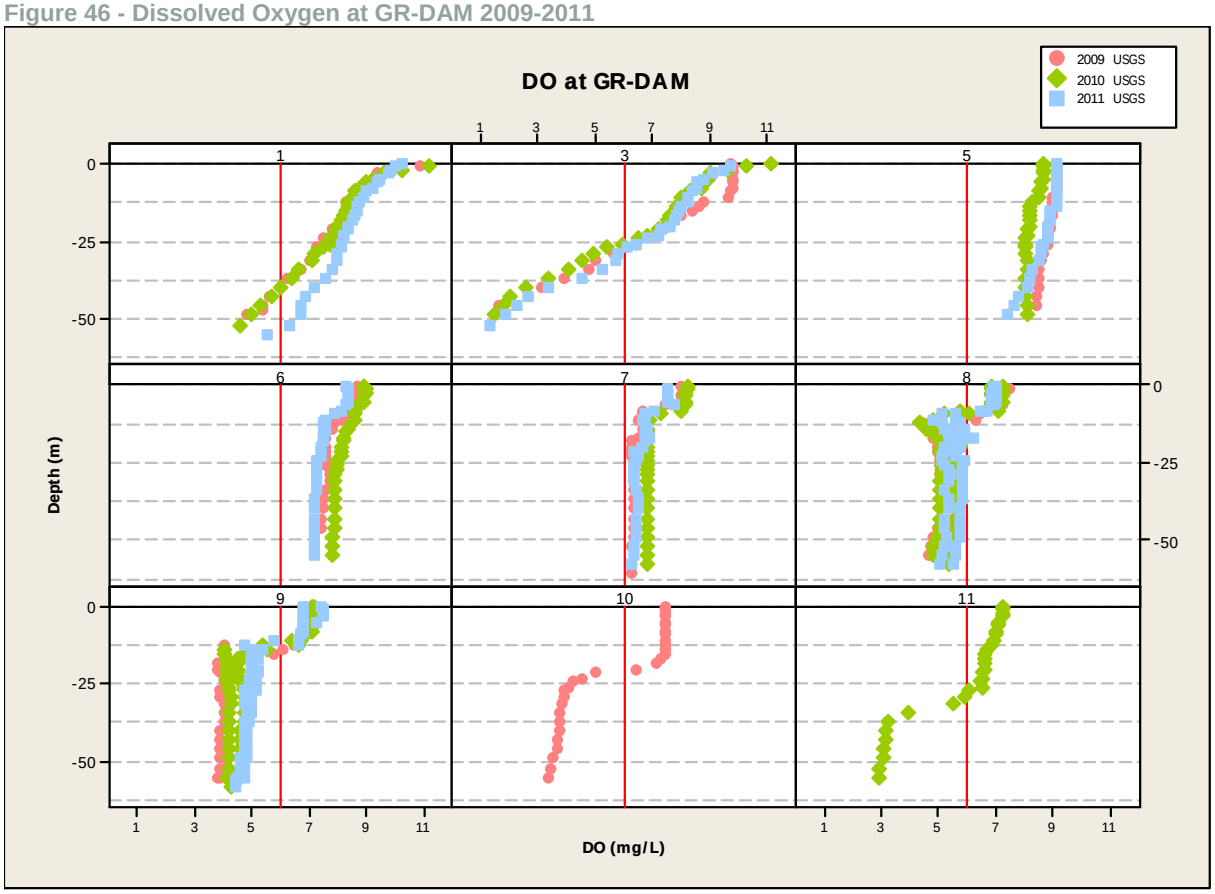


Figure 47 - Dissolved Oxygen at SM-DAM 2005-2007

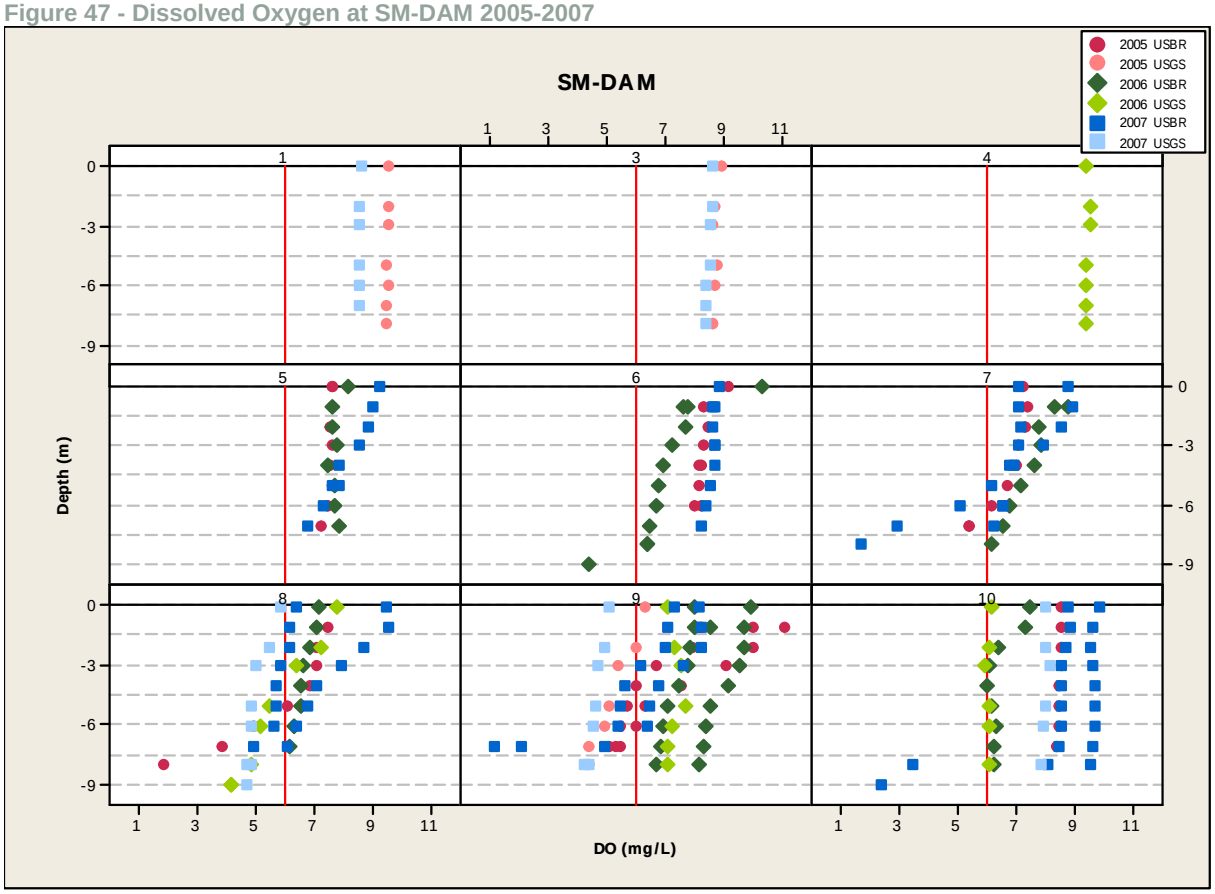


Figure 48 - Dissolved Oxygen at SM-DAM 2009-2011

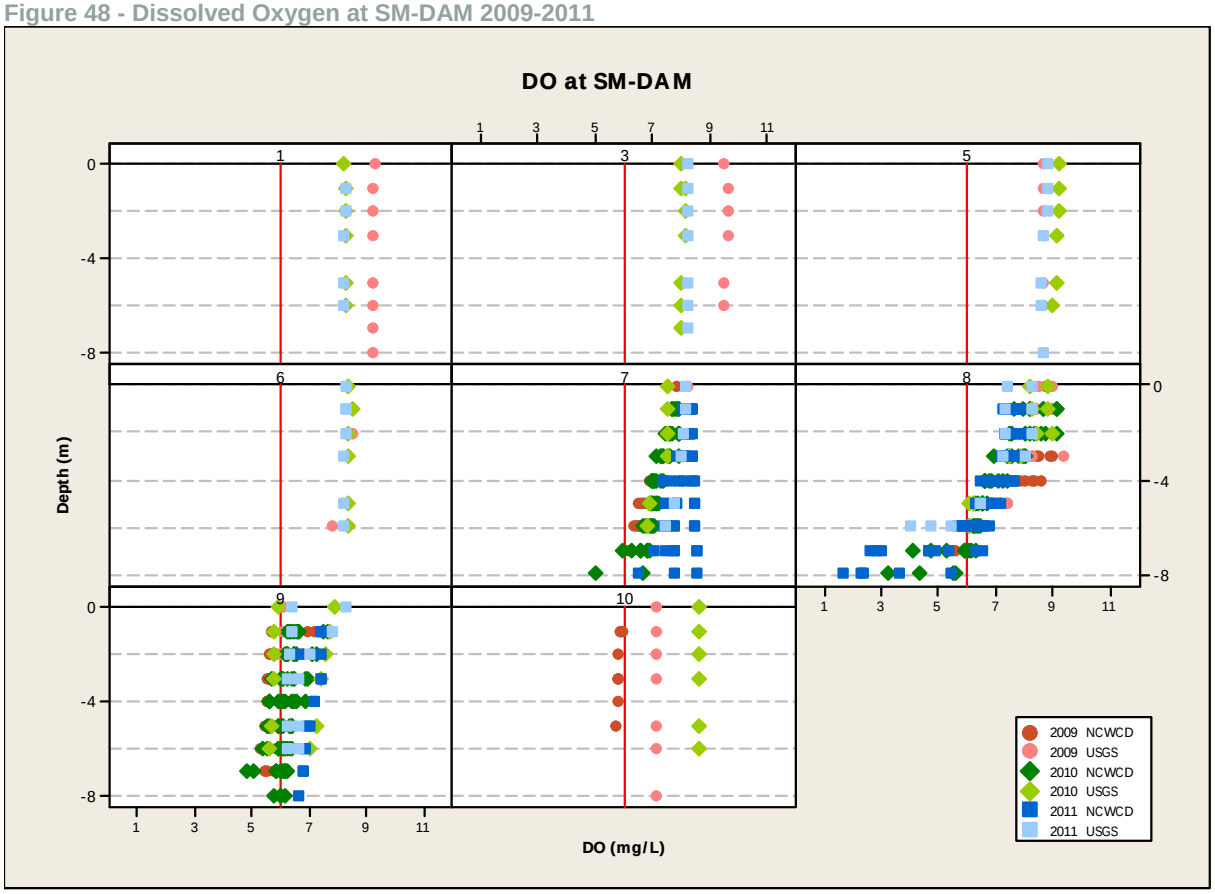


Figure 49 - Dissolved Oxygen at SM-MID 2005-2007

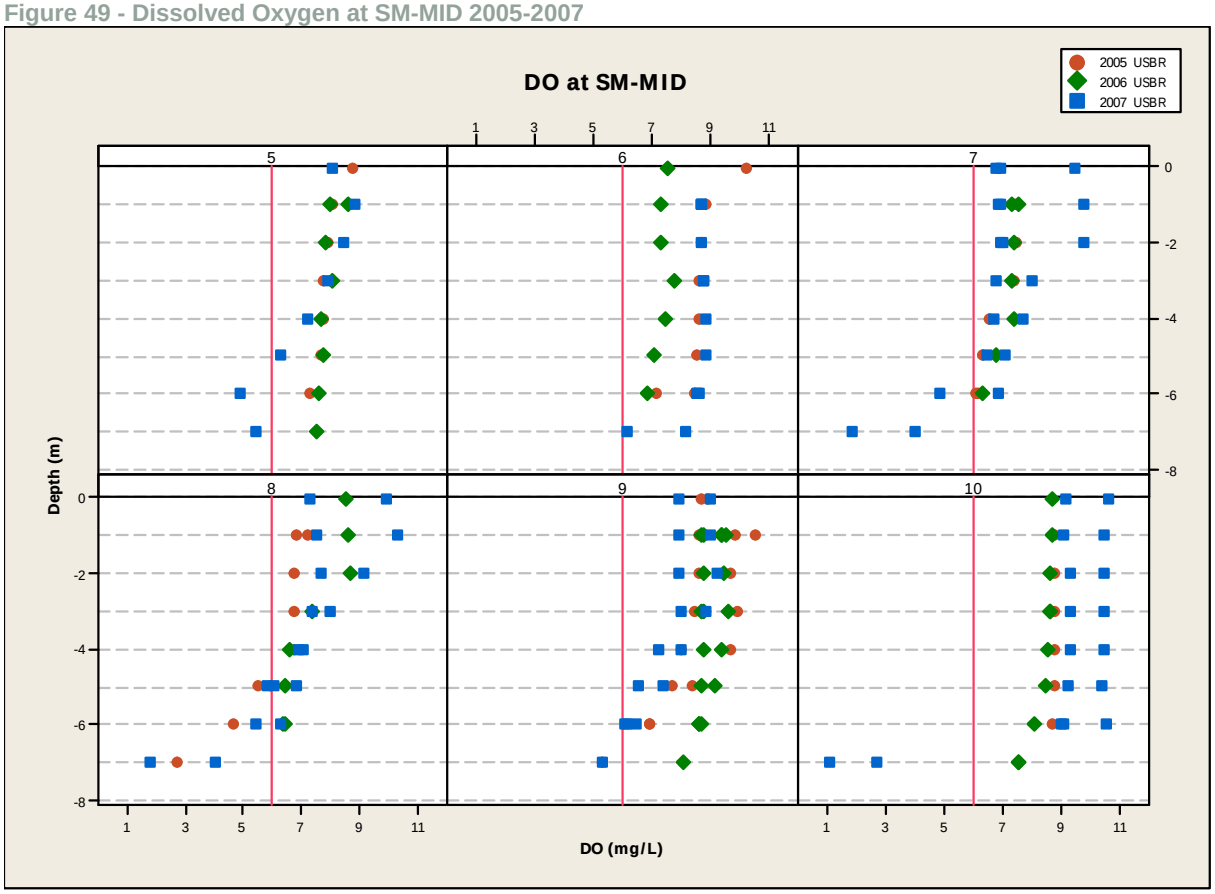


Figure 50 - Dissolved Oxygen at SM-MID 2009-2011

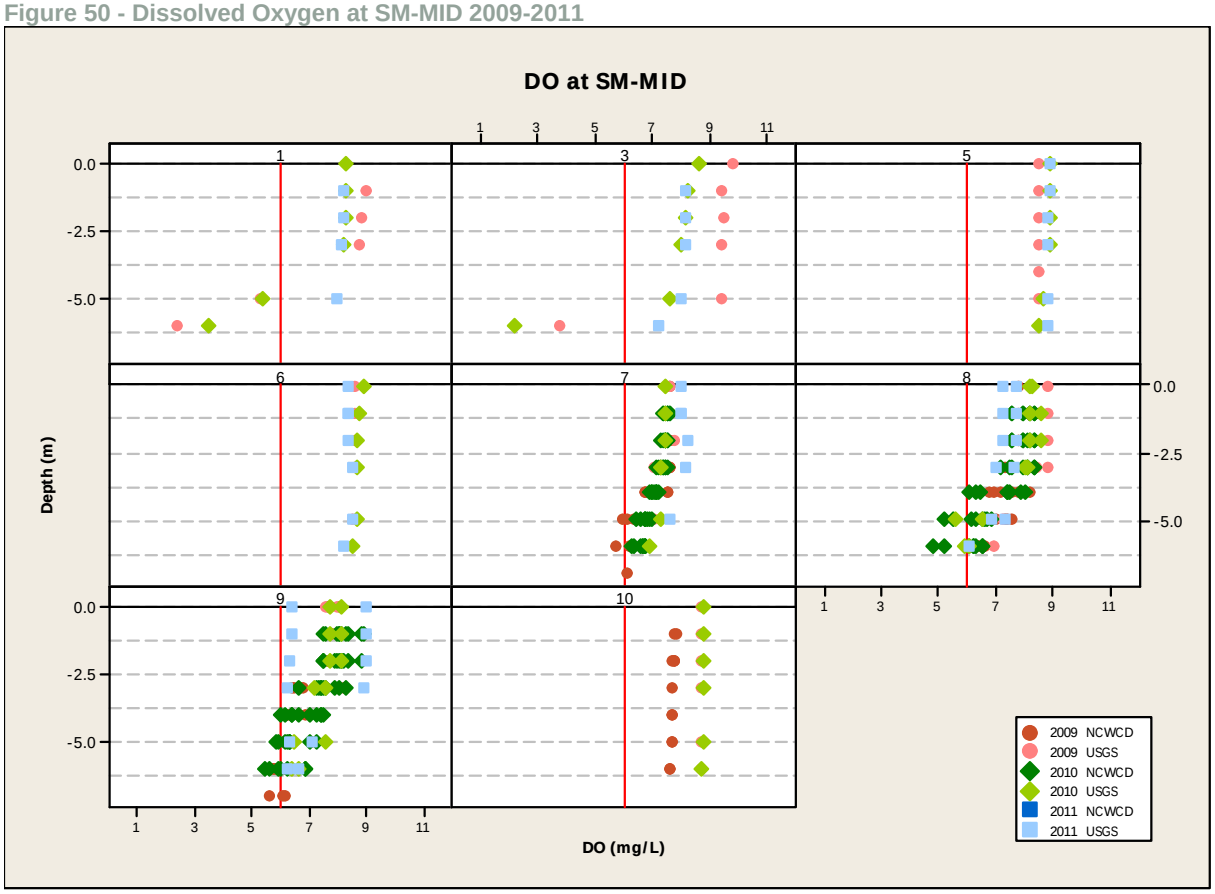


Figure 51 - Dissolved Oxygen at SM-CHL 2005-2007

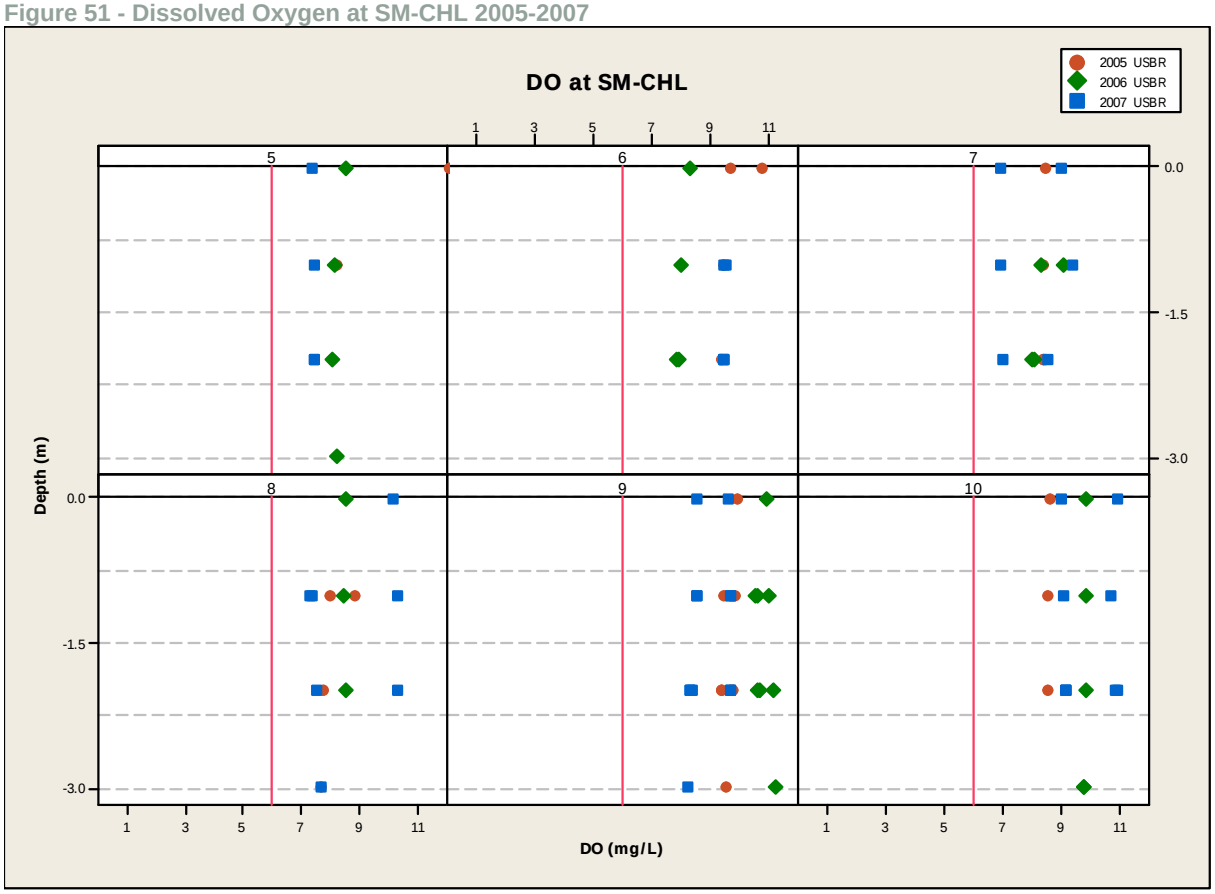


Figure 52 - Dissolved Oxygen at SM-CHL 2009-2011

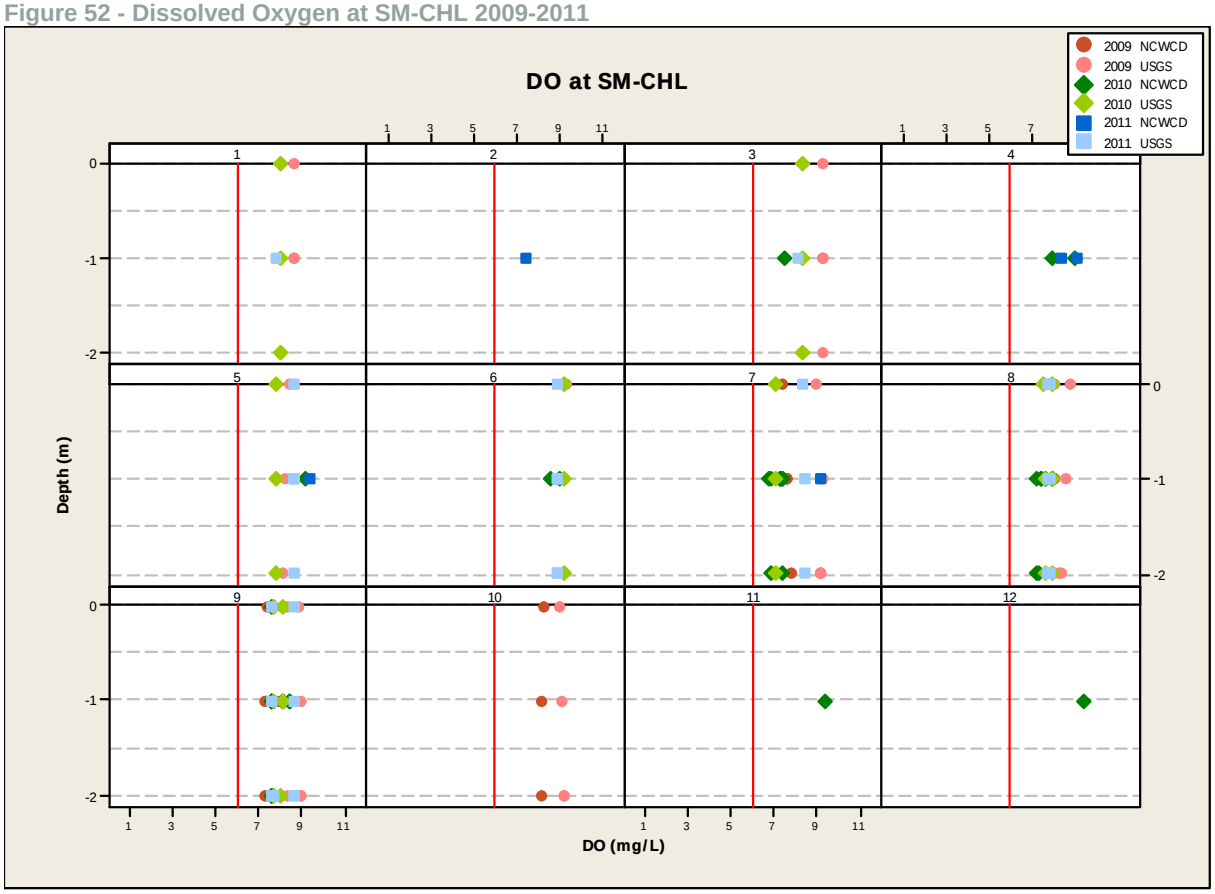


Figure 53 - Dissolved Oxygen at GL-MID 2005-2007

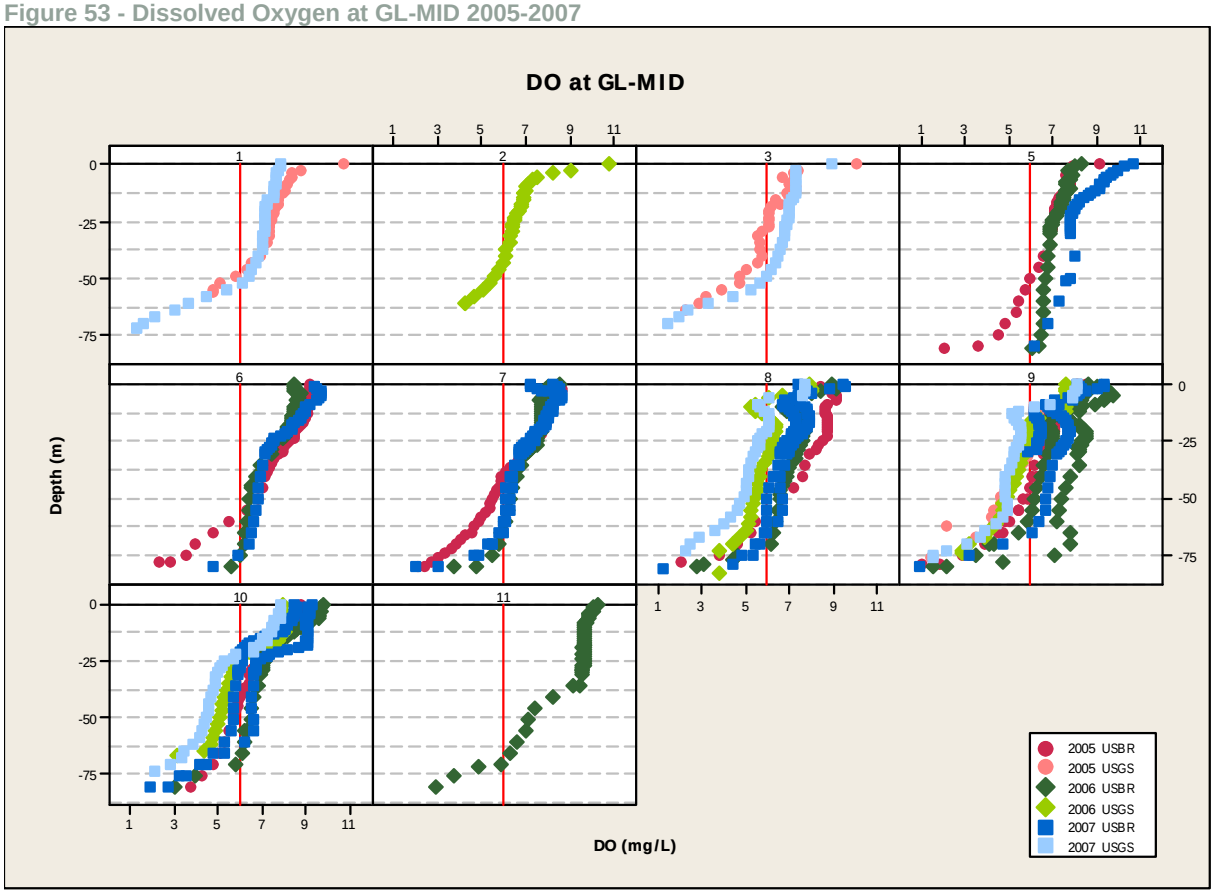


Figure 54 - Dissolved Oxygen at GL-MID 2009-2011

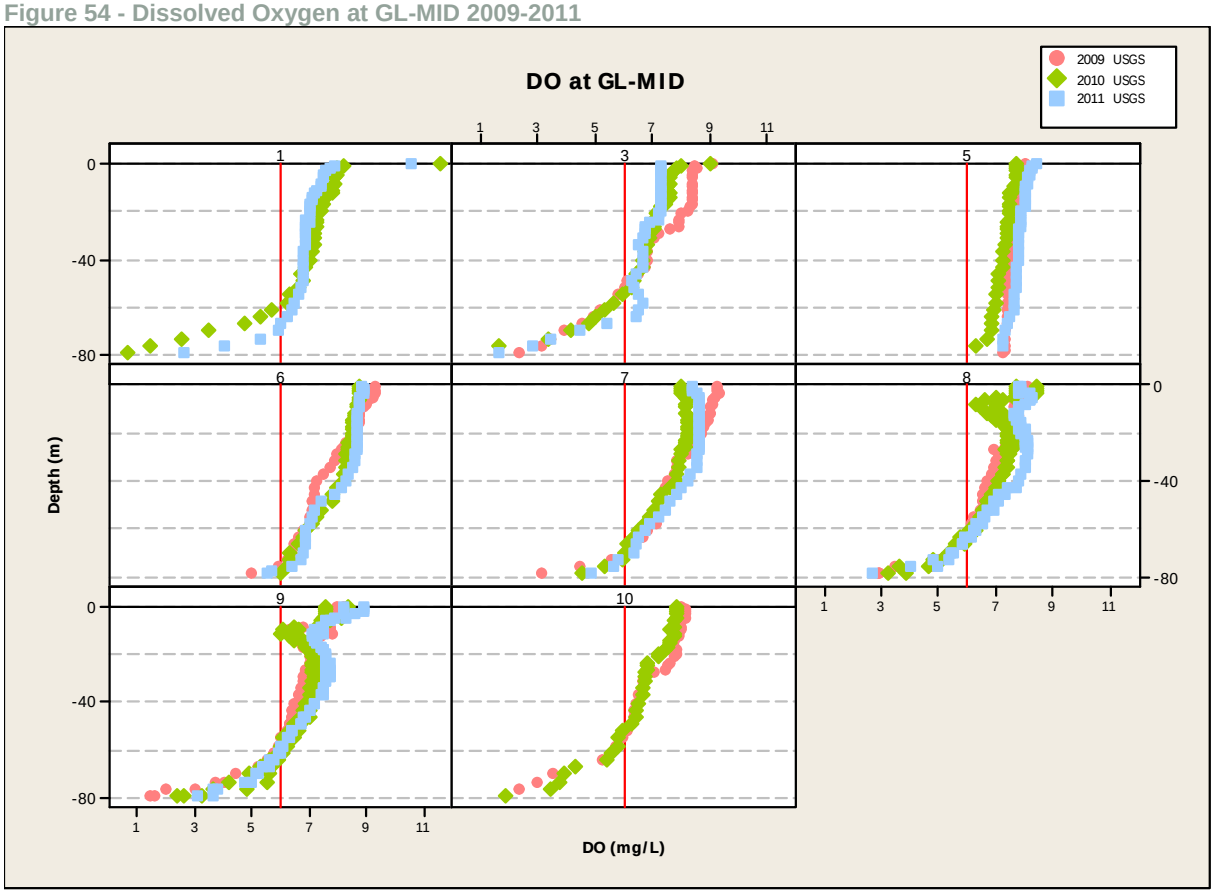


Figure 55 - Dissolved Oxygen at GL-ATW 2005-2007

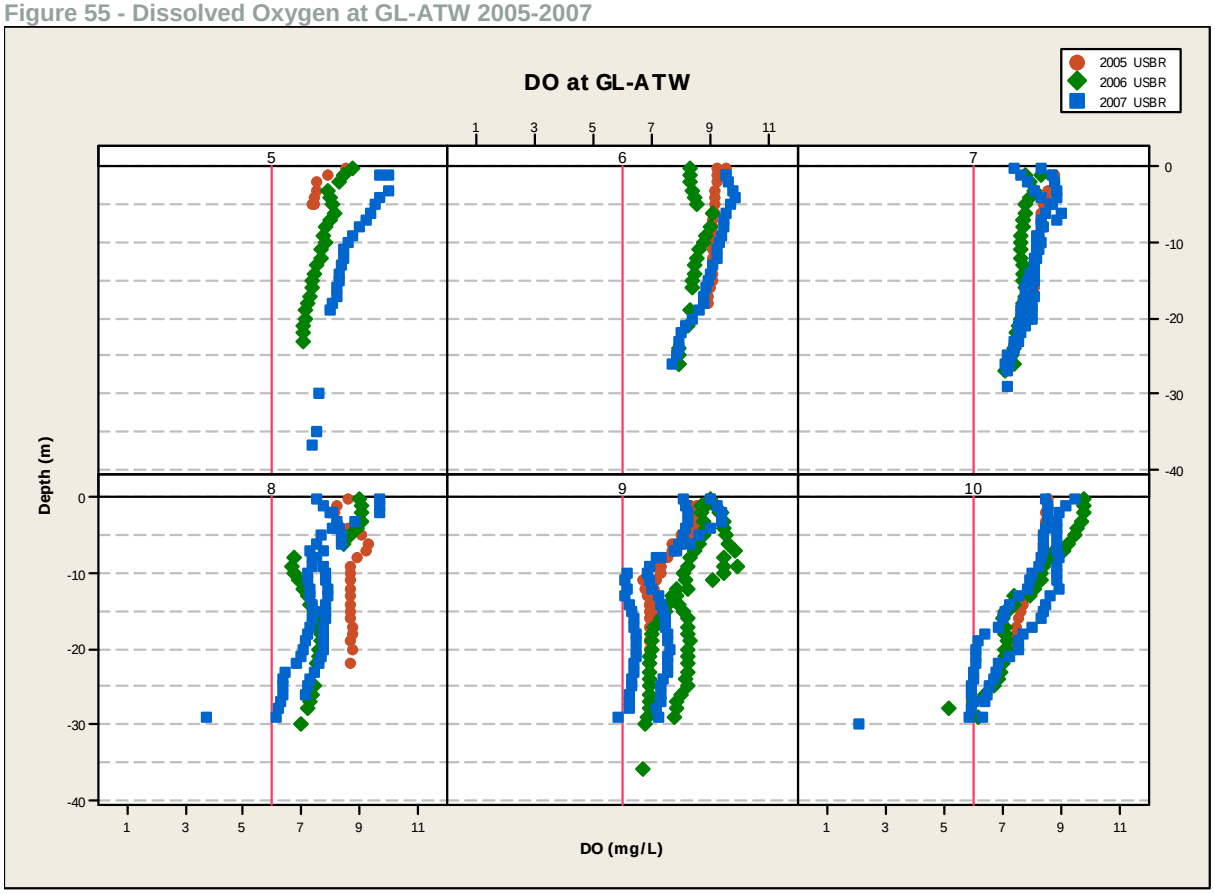


Figure 56 - Dissolved Oxygen at GL-ATW 2009-2011

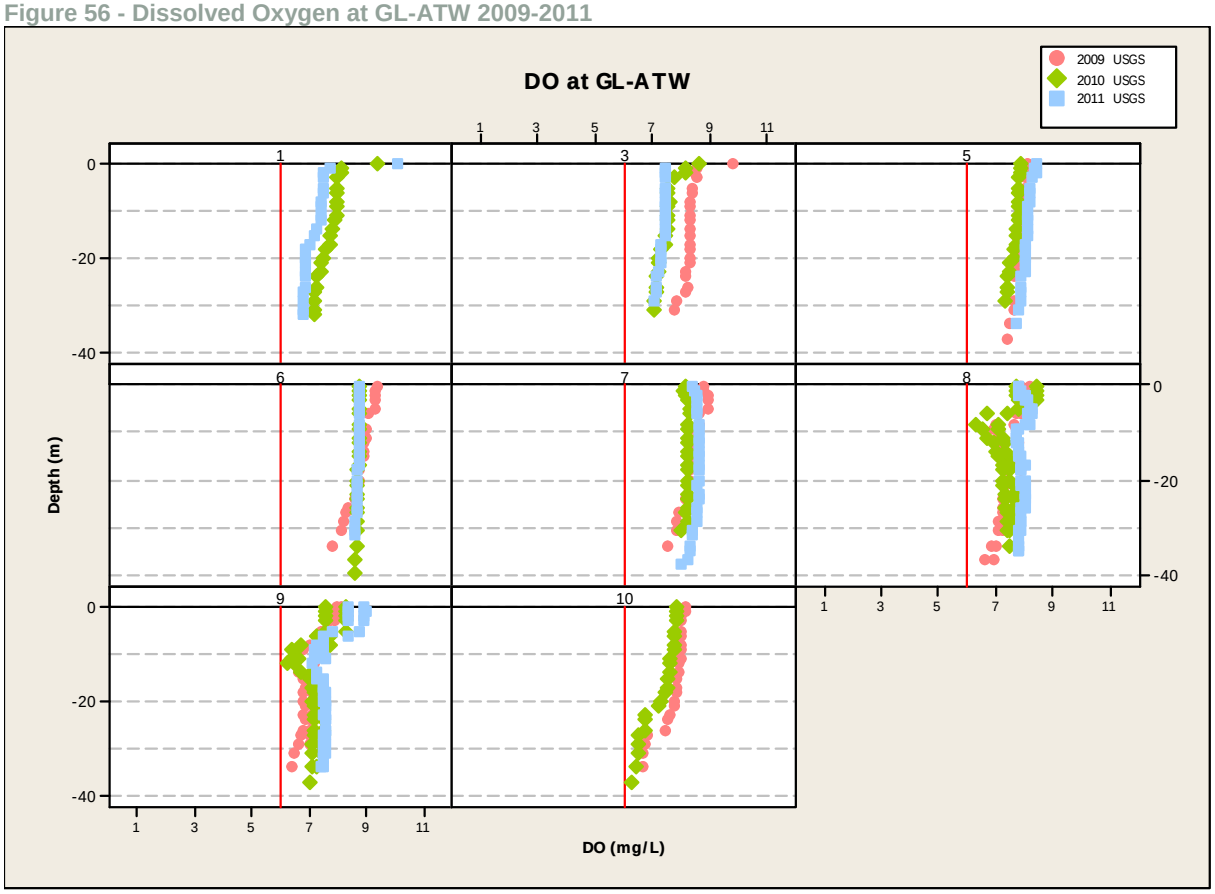


Figure 57 - Dissolved Oxygen at HT-SPR 2005-2007

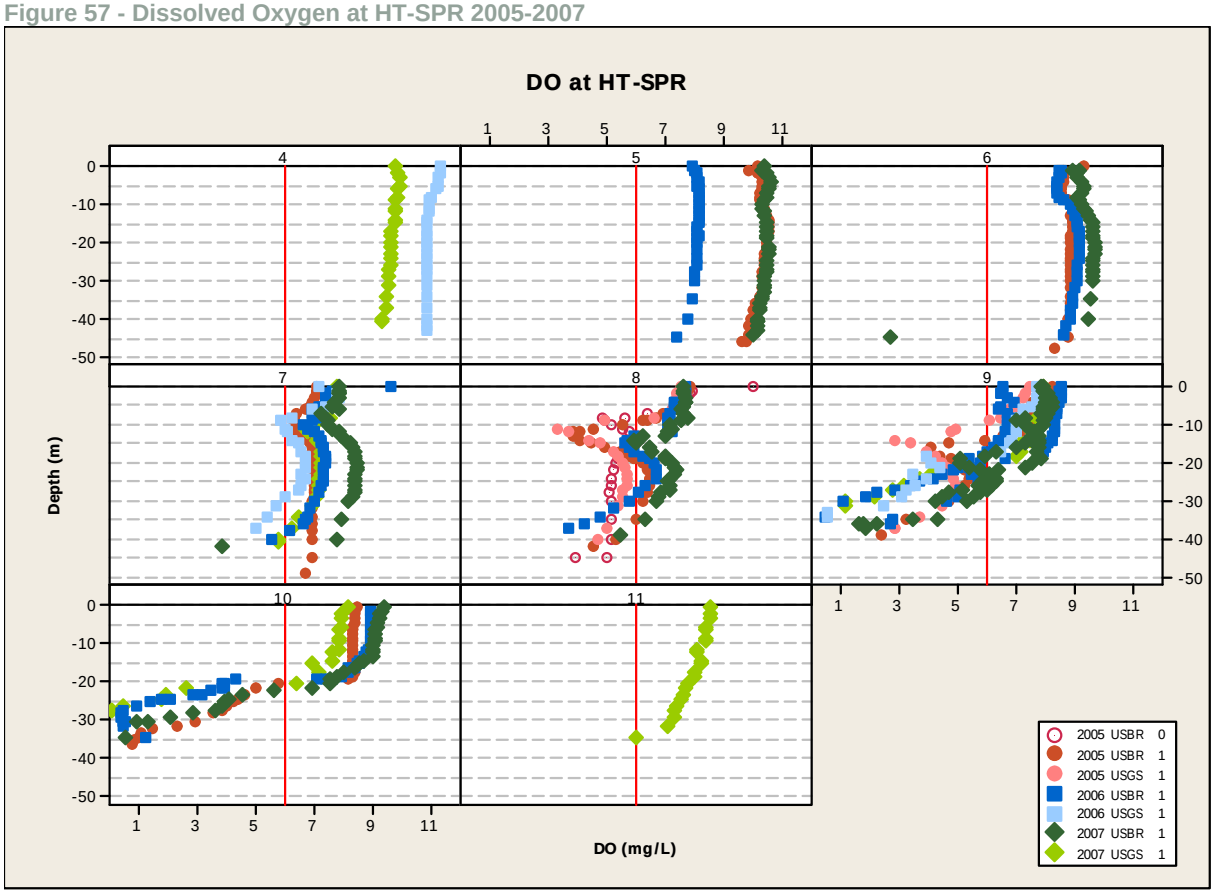


Figure 58 - Dissolved Oxygen at HT-SPR 2009-2011

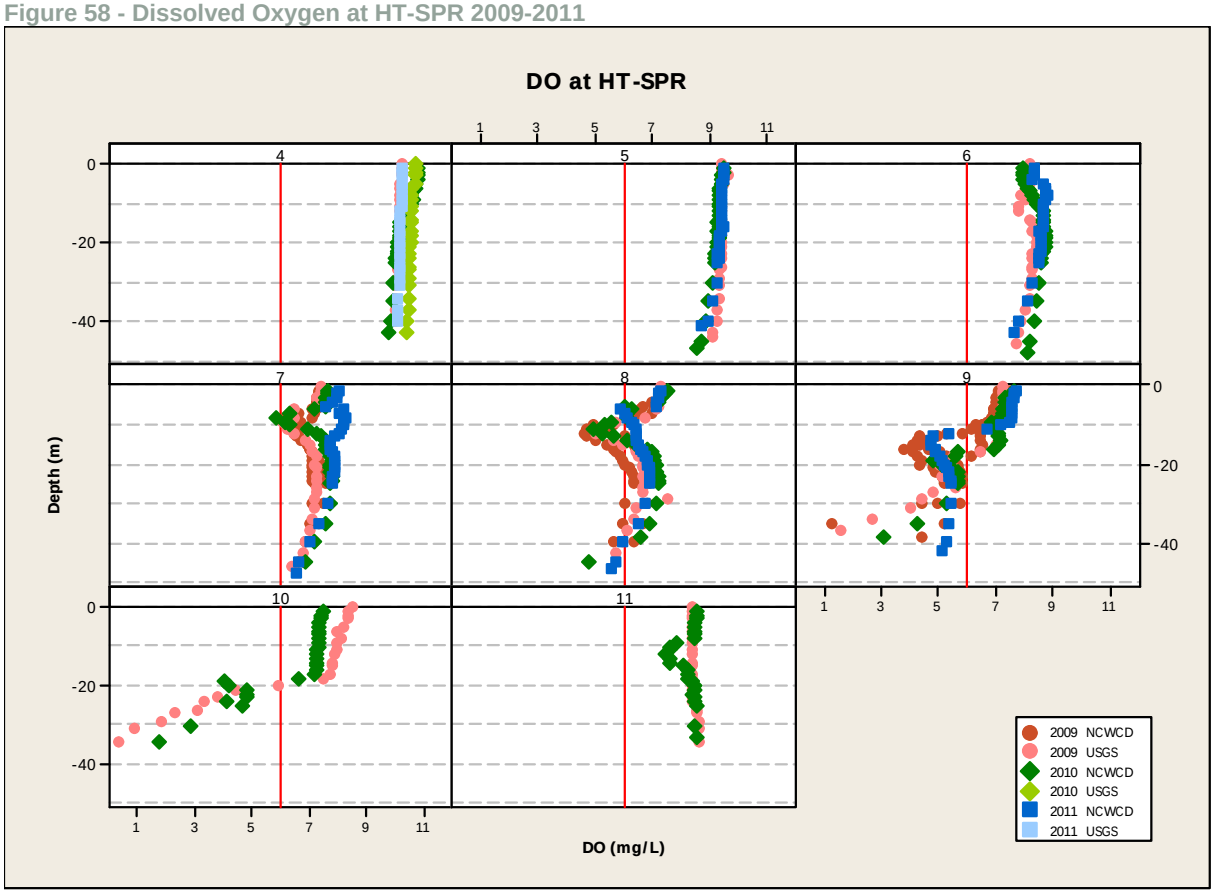


Figure 59 - Dissolved Oxygen at HT-DIX 2005-2007

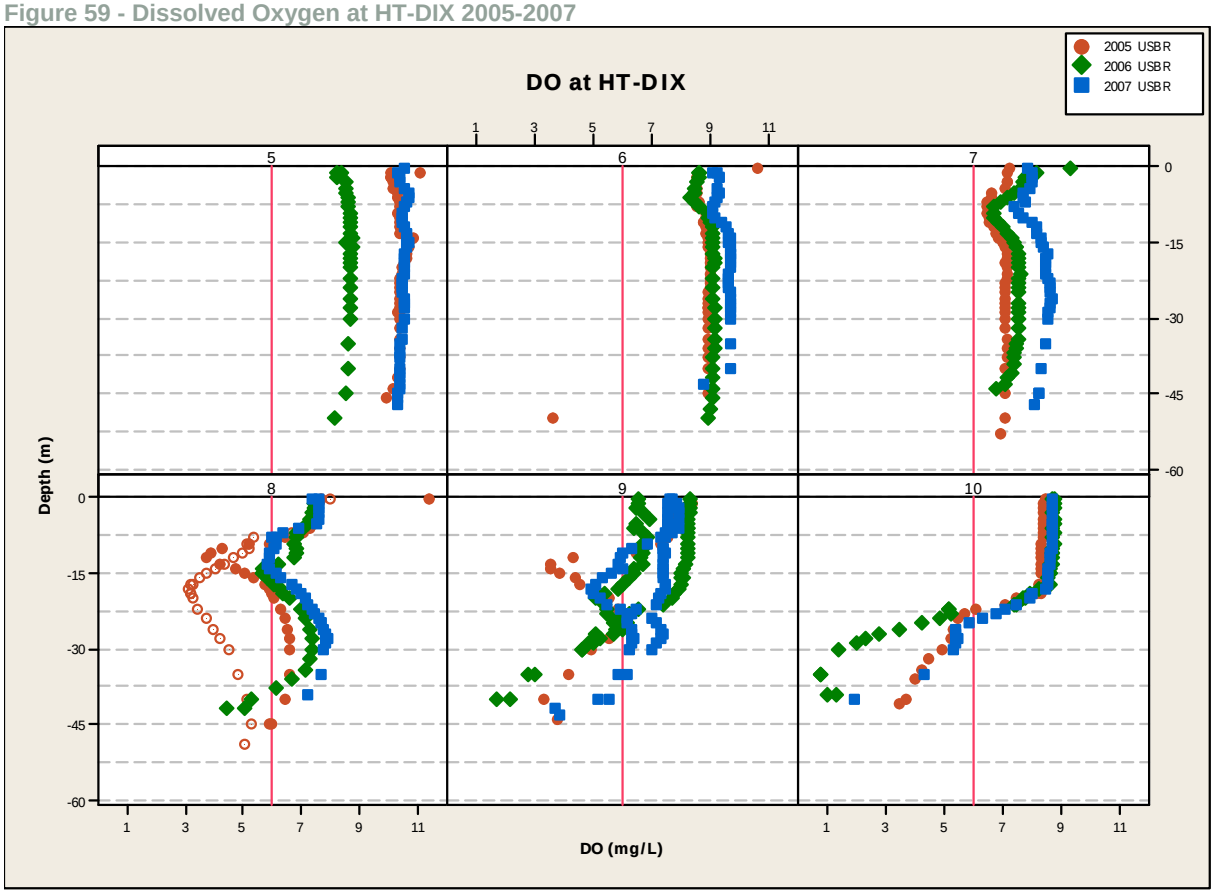


Figure 60 - Dissolved Oxygen at HT-DIX 2009-2011

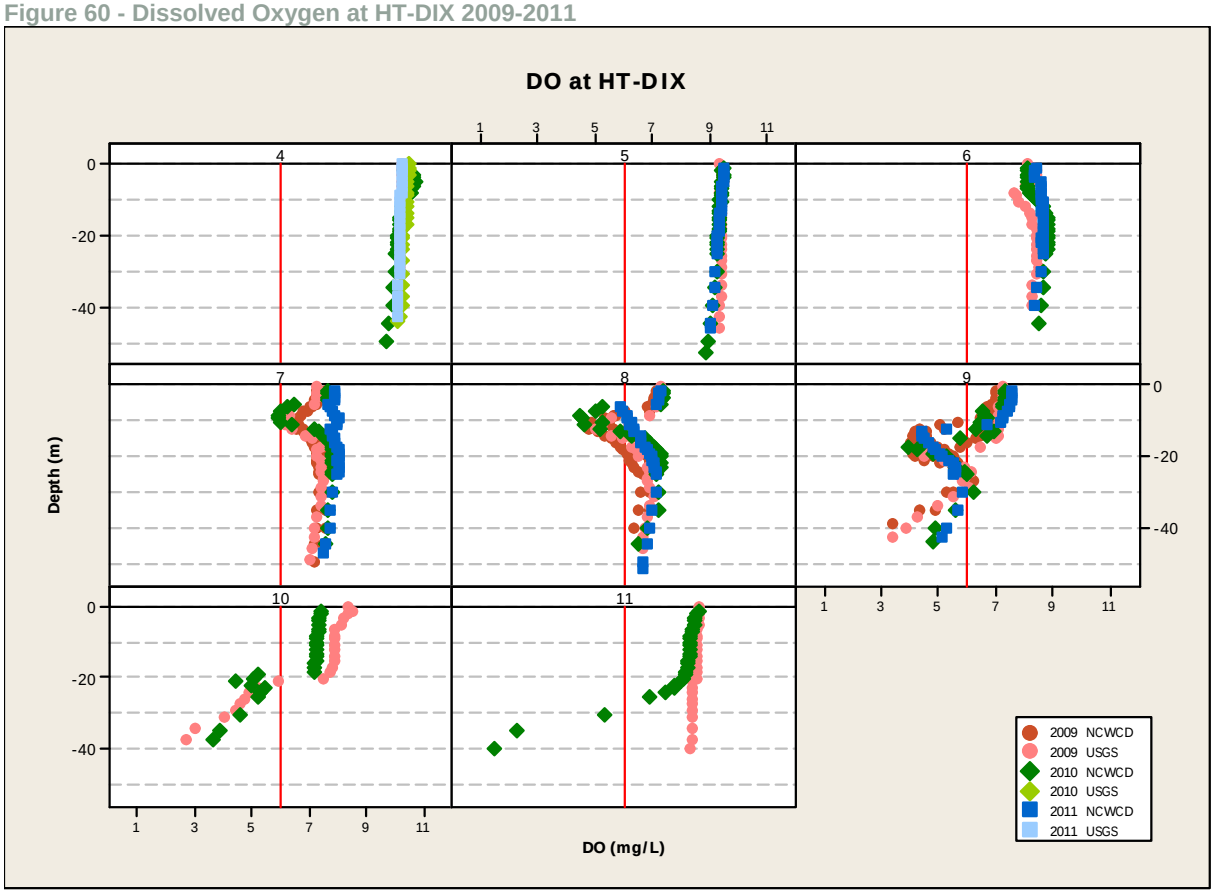


Figure 61 - Dissolved Oxygen at HT-SOL 2005-2007

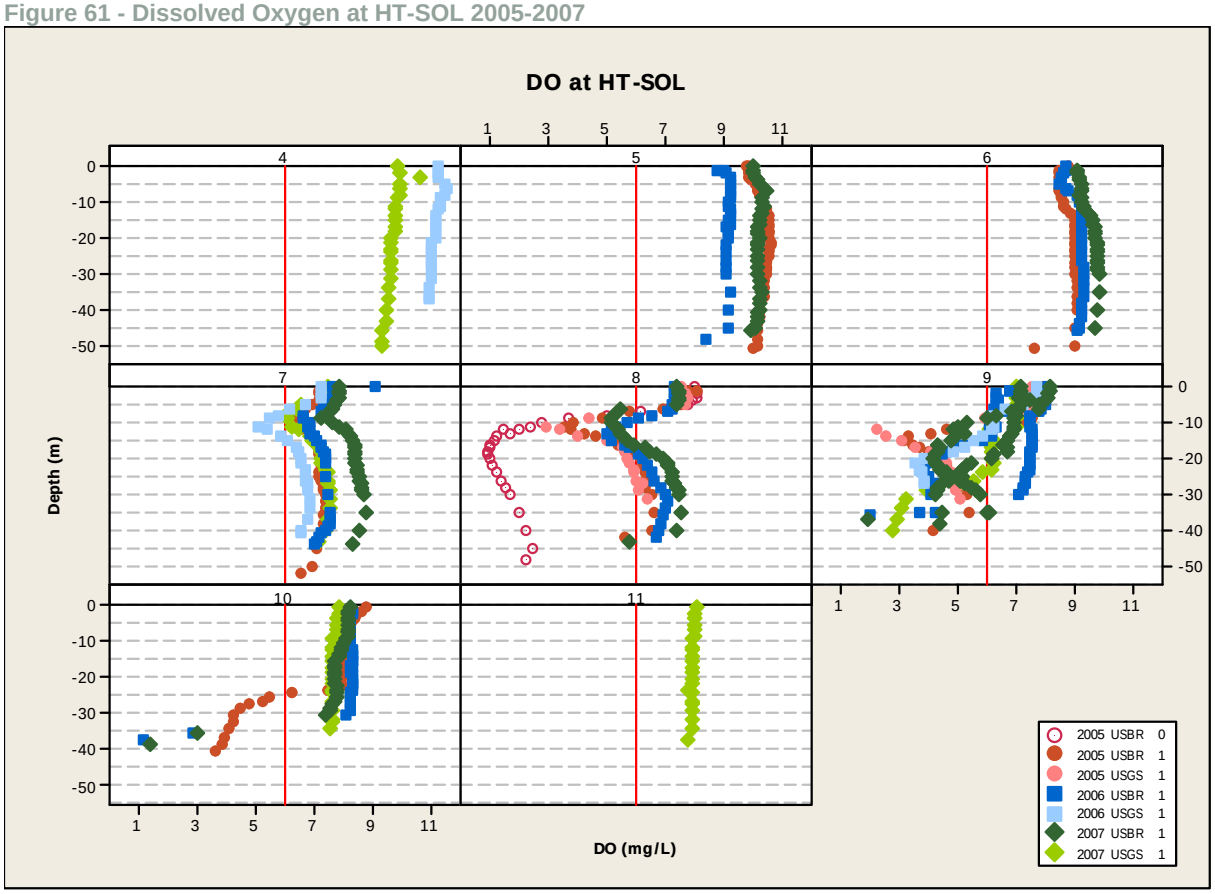


Figure 62 - Dissolved Oxygen at HT-SOL 2009-2011

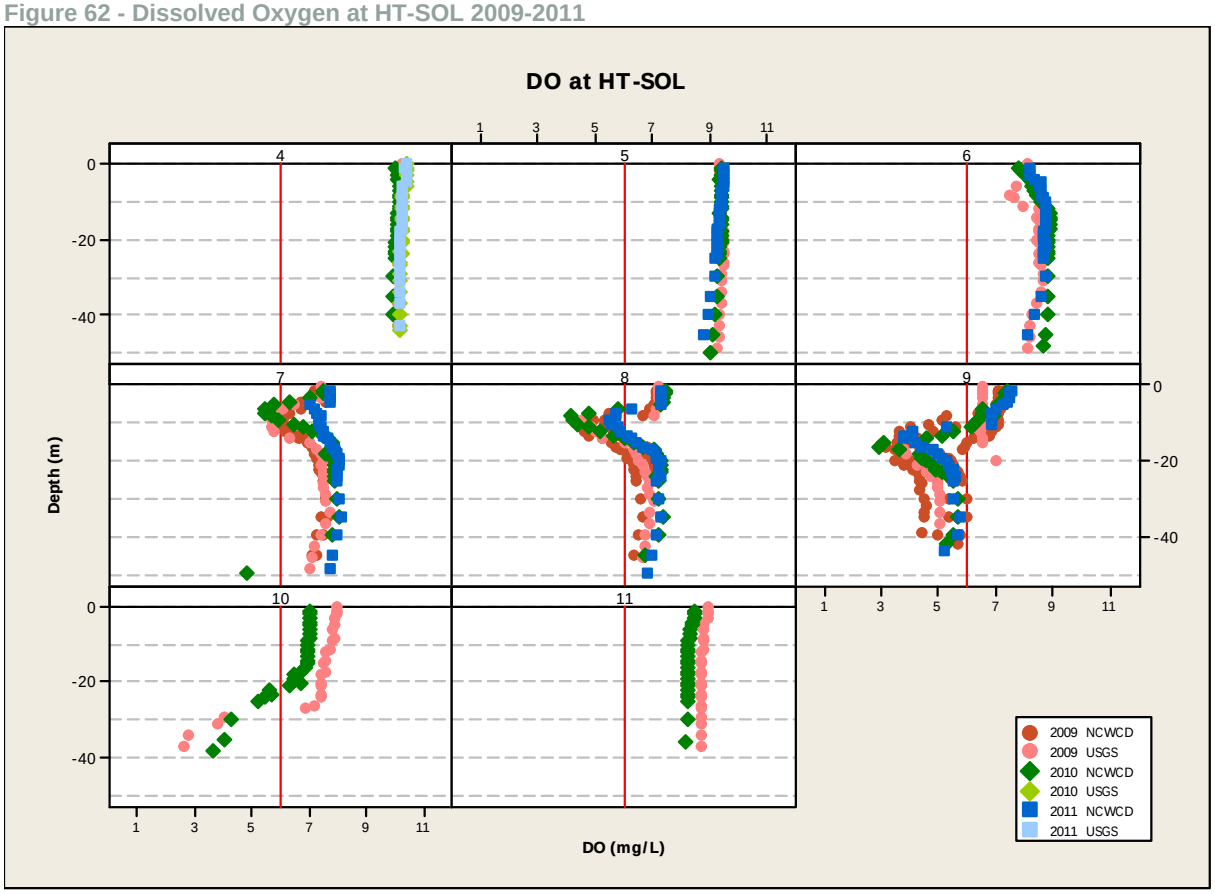


Figure 63 - Dissolved Oxygen at CL-DAM1 2005-2007

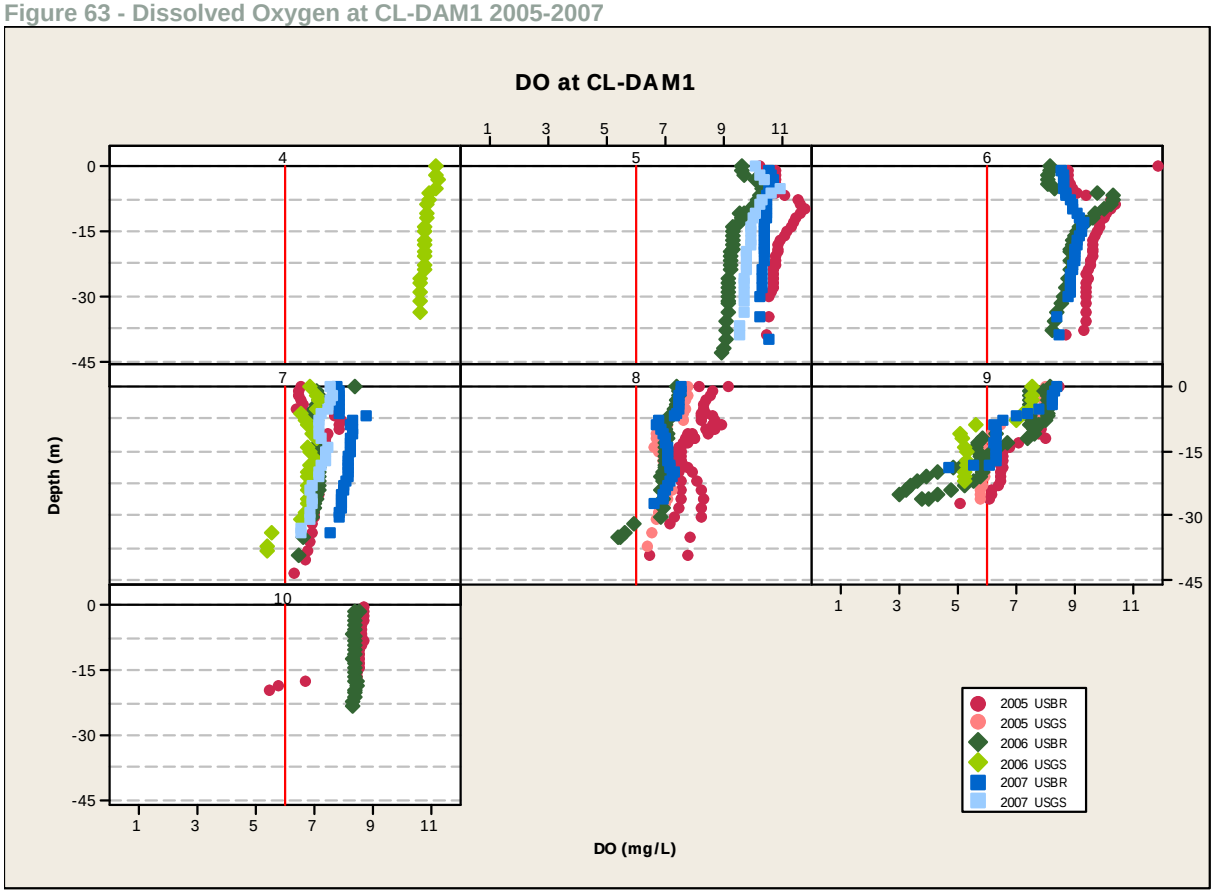


Figure 64 - Dissolved Oxygen at CL-DAM1 2009-2011

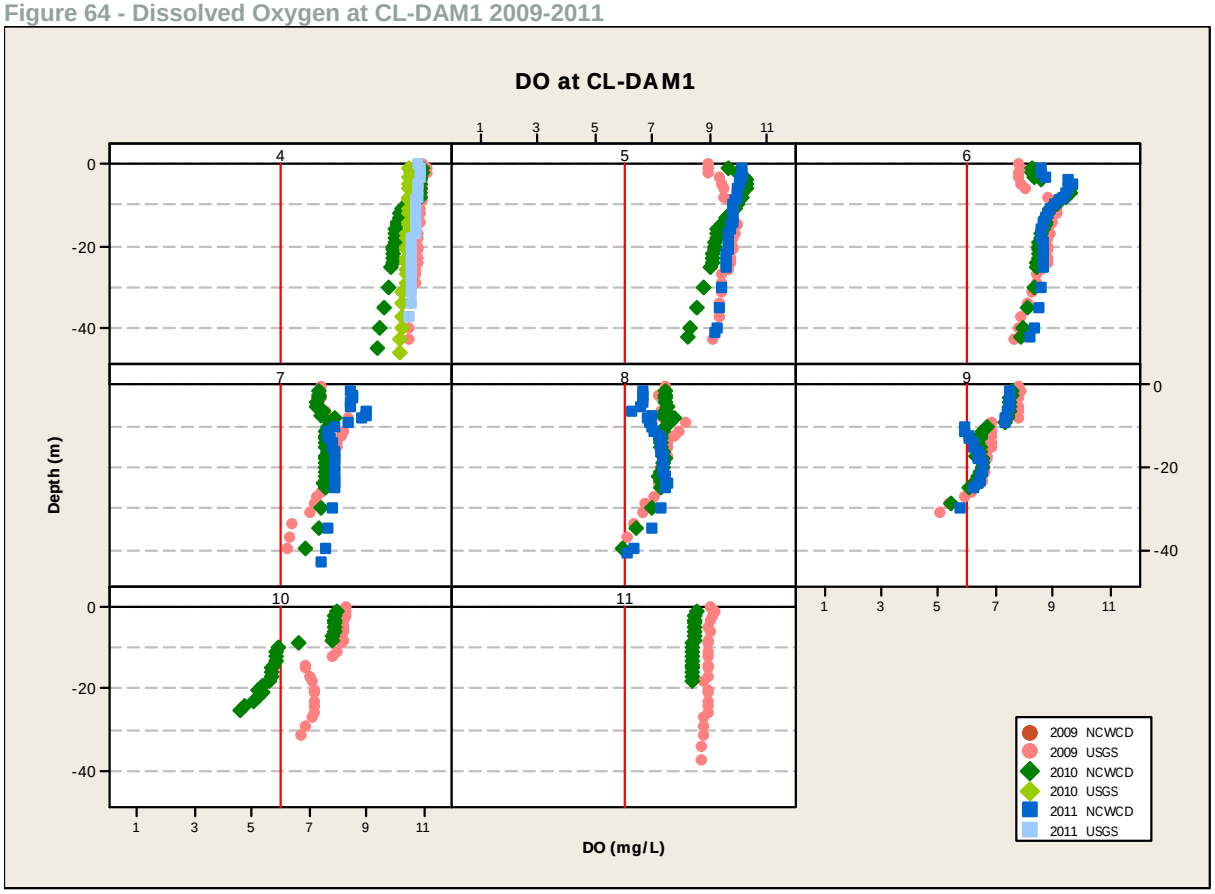
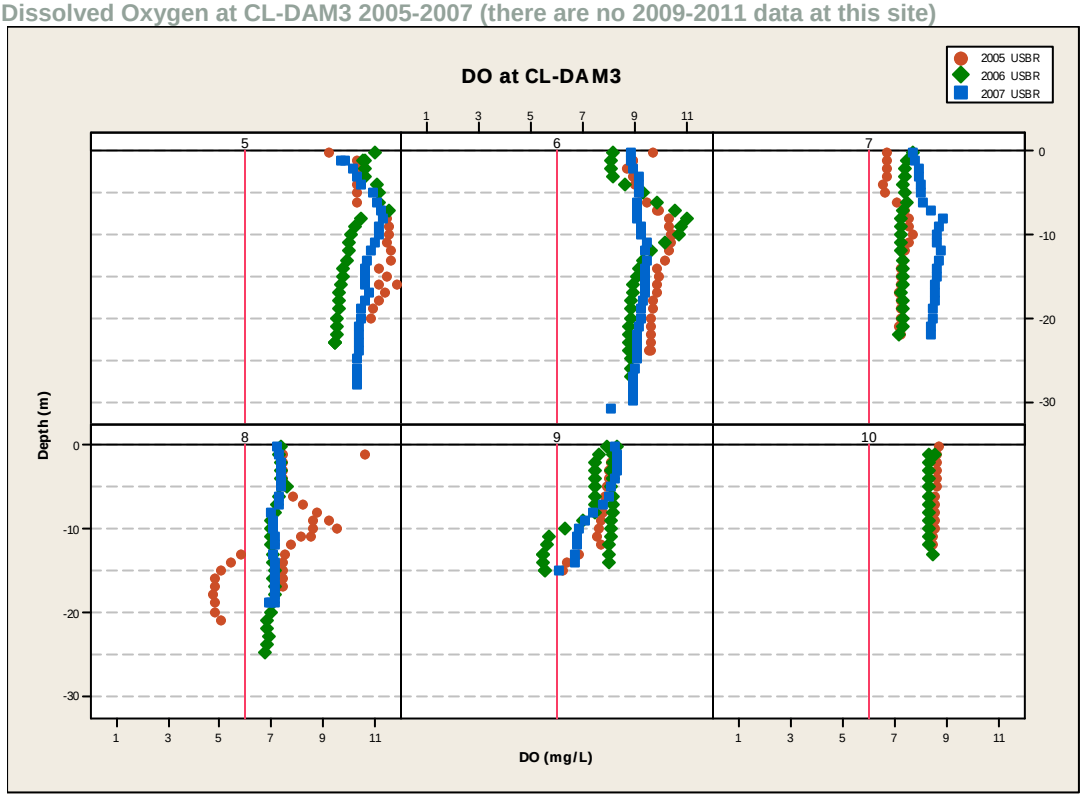


Figure 65 - Dissolved Oxygen at CL-DAM3 2005-2007 (there are no 2009-2011 data at this site)



- As with the pH data, the DO profiles from 2005-2007 are messy with no apparent patterns. After meeting with Chris Holdren it was agreed that much of the data looked suspect and should be carefully reviewed and censored accordingly.

  <u>Action Taken</u> – All of the DO profiles from 2005-2007 were thoroughly reviewed. Any profiles that looked suspect when compared to typical seasonal patterns, patterns for that particular year, or, when applicable, are not comparable to other data collected during the same month and year were disqualified from the database. There were two types of data that were found to be suspect, entire profiles and single points that were not in line with the rest of the data in the profile. The entire profile data that were disqualified were:

  - *GL-ATW from 5/18/2005. The profile from this date was not complete; it only goes to a depth of 5 meters. This is also what was displayed in the figure in the Report.*

  - *GL-MID and GL-ATW from 8/4/2005. These profiles were high compared to the other profiles collected in 2005 and compared to USGS data. There was a profile taken at GR-DAM on this date that does not look suspect. This profile was taken before the profiles at GL-MID and GL-DAM, there could have been a calibration problem that occurred after the profile was collected at GR-DAM.*

  - *GL-MID and GL-ATW from 9/5/2006. These profiles were high compared to the other profiles collected in 2006 and compared to USGS data. There was a profile taken at GR-DAM on this date that does not look suspect. This profile was taken before the profiles at GL-MID and GL-DAM, there could have been a calibration problem that occurred after the profile was collected at GR-DAM.*

~ *GL-ATW from 10/9/2006. Data in this profile was not collected in sequential order. 1-13 meter depths were collected first and sequentially, than data was collected from the bottom up for the 28-13 meter depths. The data did not compare well where it met at the 13 meter depth.*

These data were disqualified from the database on 1/16/2013.

In addition, there was one profile that was flagged as suspect. GR-DAM from 8/6/2007. This data does not follow the progression of the other profiles collected that year; the DO concentrations are too high. There was not enough evidence at other sites that were sampled that day to justify disqualifying this profile.

There were many outlying low values that generally occurred at the bottom depth(s) of the profile. This is often due to the probe hitting the bottom of the waterbody. Much of the data that were found to be suspect during this review of the data were also censored in the figures in the Report. There were also several instances where duplicate data was collected at very similar bottom depths and the values for the samples collected at the later timestamp were significantly lower than the first sample collected at that depth. This resulted in 17 records being disqualified from the database on 1/16/2013.

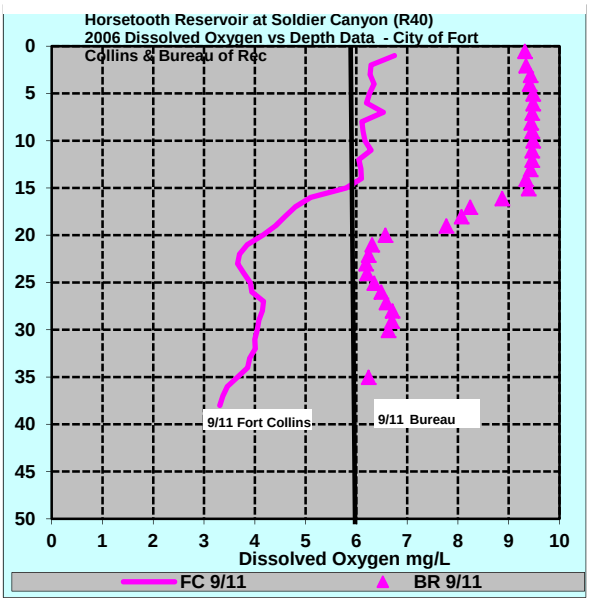
Temperature and Specific Conductivity – There were no known issues with the temperature and specific conductance data therefore they were not subject to a thorough review. During the course of the review of the DO and pH data, there were two instances where temperature and specific conductance data were found to be suspect and disqualified.

Action Taken: The following profiles were disqualified from the database on 1/16/2013:

~ *GL-ATW from 5/18/2005. The profile from this date was not complete; it only goes to a depth of 5 meters. This is also what was displayed in the figure in the Report.*

~ *GL-ATW from 10/9/2006. Data in this profile was not collected in sequential order. 1-13 meter depths were collected first and sequentially, than data was collected from the bottom up for the 28-13 meter depths. The data did not compare well where it met at the 13 meter depth.*

Figure 66 - FTC vs USBR Data



INCONSISTENCIES BETWEEN REPORT AND DATA

As with the nutrient data, some inconsistencies were discovered in the physical data between the graphs in the Report and the data that was reported and recorded in the database; specifically for the profile data. One example of this occurring was on September 11, 2006 when both the City of Fort Collins and the USBR collected data on Horsetooth Reservoir at the HT-SOL site. When the data were compared, there were significant differences in the DO concentration. The USBR data were suspect as it did not follow typical decrease in DO that occurs in Horsetooth over the summer months when compared to August; the USBR data showed an increase in DO compared to August. **Error! Reference source not found.** show how the two data sets compare. Judy Billica provided Davine Lieberman documentation of the difference in the data sets (Physical_FTC Horsetooth D.O.

Profile data to Bureau & NCWCD.doc) and the City of Fort Collins data for this day. In the Report, the City of Fort Collins data for September 11, 2006 were used for the figures, not the suspect USBR data. Also, according to the field data sheet provided to Northern by Davine Lieberman, the City of Fort Collins Data these are the data that were reported to Northern, not the suspect USBR data. There was no reference to this in the Report and this was not disclosed to Northern with the report DO data.

TOC, TSS, Manganese and Iron

The Report only included TOC, TSS, manganese and iron data for the lakes sites; these data were not included for the flowing sites. Analysis of TOC, manganese and iron were done at the USBR Boise Lab for the entire study period (2005-2007). TSS analysis was done at the USBR Denver Lab in 2005 and the USBR Boise Lab in 2006 and 2007. During the study period samples that were collected by the USGS were analyzed at the NWQL; these data are not included in the Report but are a good reference for QAQC purposes.

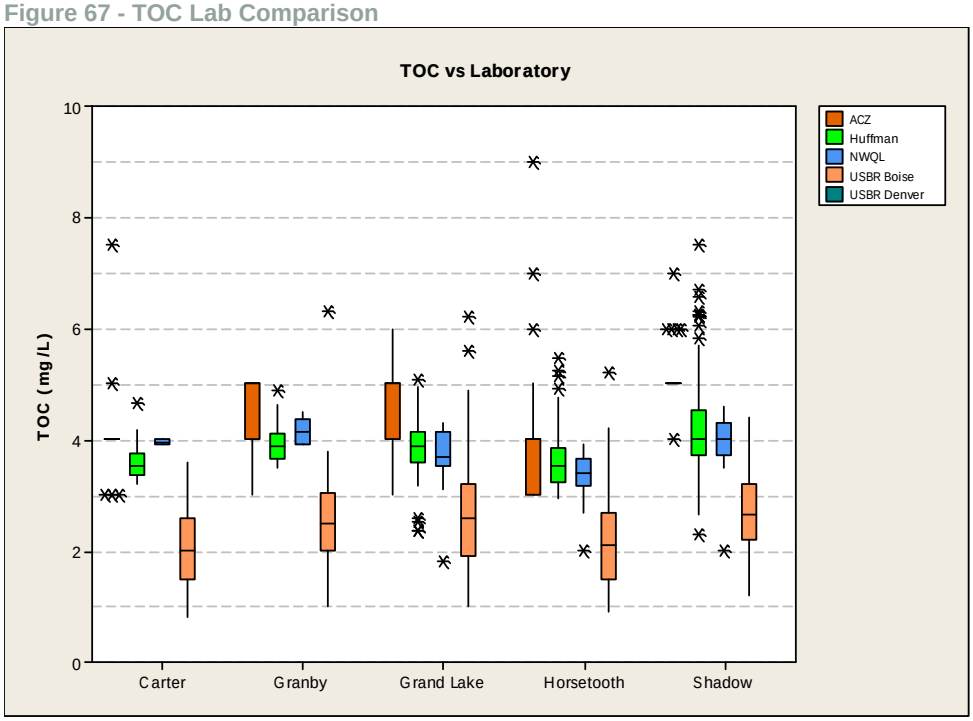
Current Data Status, Known Data Issues and Actions Taken

Although there are known difference in the TOC analysis done at different laboratories, no action has been taken on any of these data. No TOC, TSS, Mn (dissolved) or Fe (dissolved) data have been disqualified from the lakes database to date.

New Found Issues and Action Taken

TOC – Since 2007, analysis for TOC at the lake sites has been done at two other laboratories; ACZ in 2008 and Huffman from 2009-2011. The NWQL only has TOC data for January 2009, at which time a spilt sample was submitted to compare values between Huffman and the NWQL in order for Huffman to obtain USGS certification. In general, TOC concentrations for the analysis done at the USBR Boise Lab have lower values when compared to the other laboratories that did the analysis done from 2005-2011. Figure 67 compares the TOC data at each waterbody for each different lab.

Figure 67 - TOC Lab Comparison



In addition, while preparing Northern's Lakes and Reservoirs Report, Judy Billica realized this pattern and investigated the matter further. The following is an excerpt from the Lakes and Reservoirs Draft Report and the corresponding figure (**Error! Reference source not found.**):

"In order to explore this further, the TOC data collected at the Horsetooth Reservoir Soldier Canyon Dam site (HT-SOL) were compared to TOC data collected at this location by the City of Fort Collins (sampling site R-40) with analysis conducted by the City of Fort Collins Water Quality Lab (Figure 6.5). The City of Fort Collins Water Quality Lab has been using the same method (Standard Method 5310C: UV/persulfate oxidation) since 2002 to analyze their TOC samples. Results from their consistent analytical method do not show the jump in values between the 2005-2007 data and the 2009-2011 data, or the high values observed in 2008 with the Northern Water data. The City of Fort Collins Water Treatment Facility keeps a very close watch on the TOC concentrations because they have a direct impact on the treatment process. If the increases in TOC exhibited by the Northern Water data in Figure 6.5 were real, it is likely that they would have been observed in the Fort Collins data as well, and would have had an impact on the treatment process. Figure 6.5 shows that the 2009 through 2011 TOC data collected for the Northern Water Baseline Program compare favorably to the TOC data from the City of Fort Collins. However, it appears that the 2005 through 2007 Northern Water data are likely lower than actual, while some of the 2008 data are significantly higher than actual. It is assumed that this conclusion uniformly applies to the TOC data collected at Granby Reservoir, Shadow Mountain Reservoir, Grand Lake, and Carter Lake."

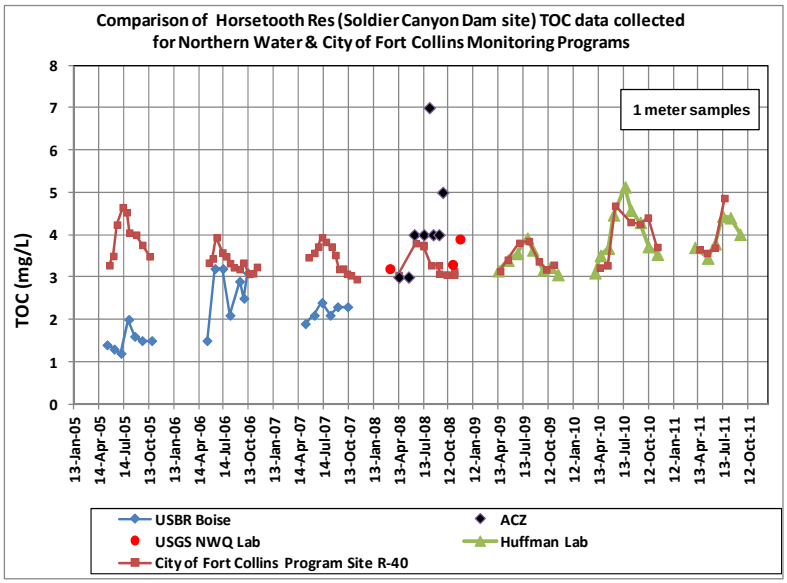


Figure 68 Figure 68 - COMPARISON OF TOC DATA COLLECTED FOR NORTHERN WATER AND CITY OF FORT COLLINS MONITORING PROGRAMS

Action Taken: Disqualified all TOC data in the lakes database that was analyzed at the USBR Boise lab. Chris Holdren agreed with this action stating that he had some issues with TOC analysis in the past at the USBR Boise Lab. They were used to doing analysis on water samples with a much higher TOC concentration. If the data were reviewed promptly and the lab was notified of the suspect values, the issue may have been resolved. This resulted in disqualification of 458 records on 1/16/2013.

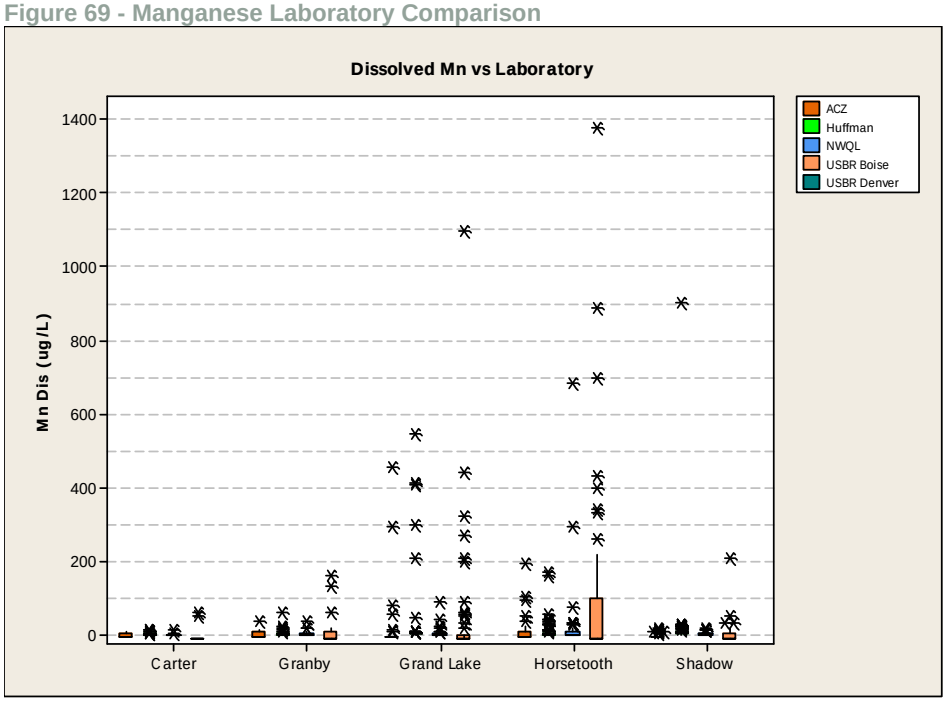
TSS – Generally, the TSS data analyzed from 2005-2007 at both the USBR Denver and Boise labs are in agreement with the data analyzed at other laboratories from 2008-2011. In the text of the Report, a maximum value of 29.6 collected at GL-ATW in October 2005 is stated as being "an outlier and most likely a lab error since it is greater than any other TSS level present during the entire sampling period". Although this data point is discussed as being suspect, it is still included as the maximum value in the appendix of the Report.

Action Taken: Disqualified the TSS value of 29.6 (mg/L) collected at GL-ATW in October 2005 from the lakes database on 1/16/2013.

Manganese (dissolved) – The Mn data from the USBR Boise lab had a fairly high detection limit (10 ug/L). This is higher than any other detection limit for analysis done from 2008-2011 and higher than the NWQL for data collected from 2005-2007. For the sites included in the Report, and unless there are instances of low DO specifically at the bottom depths, Mn concentrations are generally less than 10 (ug/L) or the USBR Boise detection limit. 177 of the 246 Mn records included in the Report were reported as non-detects, or as an unknown value less than 10 (ug/L).

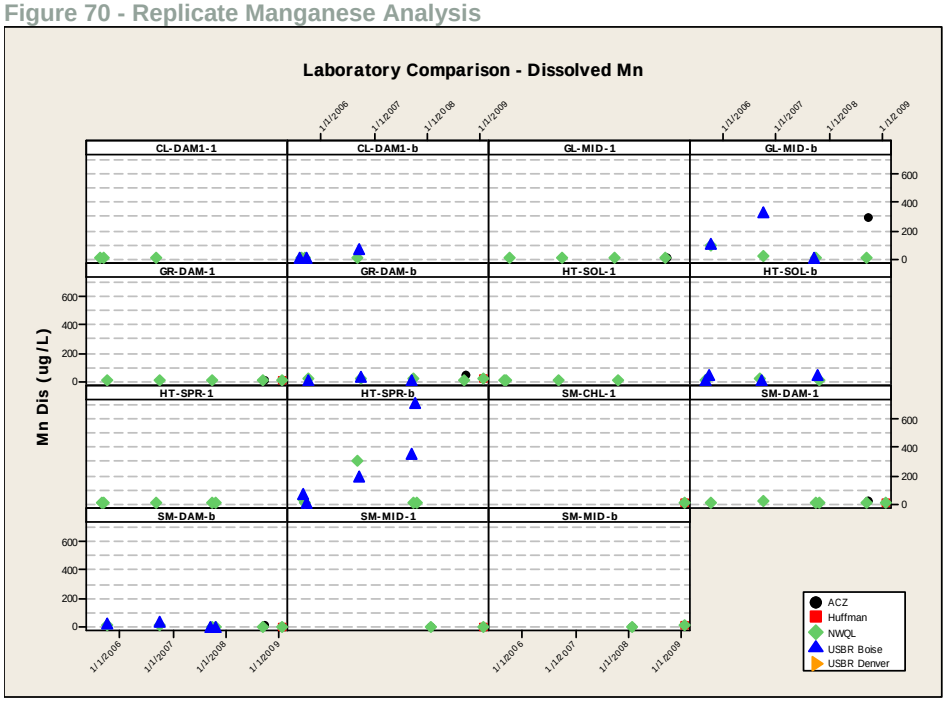
In addition to having the highest detection limit and number of reported non-detect values, the Mn data from the USBR Boise lab also contains the highest values and most outliers for the 2005-2011 period of record. Figure 69 show how the Mn data compare by laboratory and by waterbody. The figure shows that at Carter, Granby, Grand Lake and Horsetooth the highest Mn value on record from 2005-2011 was analyzed at the USBR Boise lab.

Figure 69 - Manganese Laboratory Comparison



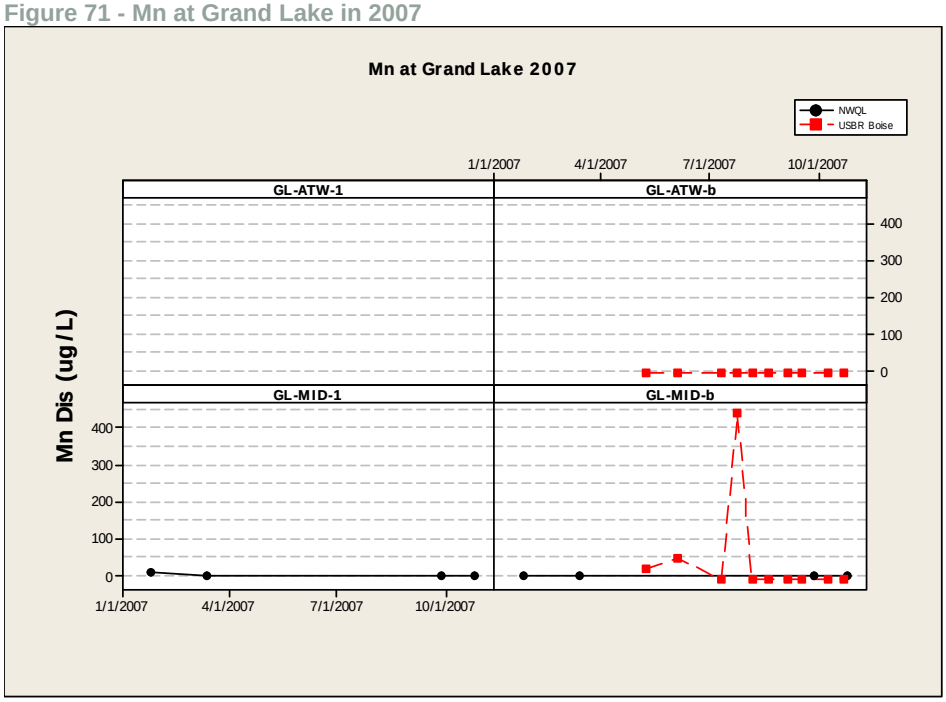
There are also several instances where data collected in the same month at the same site by the USBR and the USGS do not compare well. In **Error! Not a valid bookmark self-reference.**, this is apparent at GL-MID-b in September 2006 and at HT-SPR-b in September and October 2007. In all three cases, the Mn concentration from the NWQL is significantly lower than what was reported by the USBR Boise lab.

Figure 70 - Replicate Manganese Analysis



Review of the Mn data was done focusing primarily on the extreme outliers in data from the USBR lab and the differences between the NWQL and the USBR lab. It was determined that although the concentrations of the outliers may be elevated in the analysis at the USBR Boise Lab compared to the actual concentrations, these occurrences were at bottom depths during times of low DO when Mn was very likely elevated and concurrent sampling events support increase in concentration. This was also the case in the three instances where the data between the NWQL and the USBR Boise lab did not agree. In these cases, the exact location, time and depth of the sample can have an influence on the Mn concentration detected. For these reasons, only one data point will be disqualified from the Lakes database.

Figure 71 - Mn at Grand Lake in 2007



Action Taken – Mn data at GL-MID-b from 7/24/2007 with a concentration of 440 (ug/L) was disqualified from the database on 1/17/2013. This concentration did not coincide with a low DO event nor were there higher concentrations leading up to or following this occurrence as shown in Figure 71.

Iron (dissolved) – Generally, the Fe data analyzed from 2005-2007 at the Boise lab are in agreement with the data analyzed at other laboratories from 2008-2011. The comparison of USBR data to NWQL data also compare well for the most part.

Action Taken: None

Three Lakes Water Quality Model

Agency	Station ID	Database Station ID	Data in Database?	2000 Data?
NCWCD	GL-MID	GL-MID	Y	Y
NCWCD	SM-DAM	SM-DAM	Y	Y
NCWCD	GR-DAM	GR-DAM	Y	Y
NCWCD	WC-Pump	WC-Pump	Y	Y
NCWCD	WG-Pump	WG-Pump	Y	N
NCWCD	CR3A	CR-WGD	Y	N
NCWCD	CR3B	CR-WGD	Y	N
NCWCD	CR-WGD	CR-WGD	Y	N
NCWCD	WC-CWRD	WC-CWRD	Y	Y
NCWCD	SW-1	ST-GRU	Y	N
NCWCD	AC-1	AC-GRU	Y	N
NCWCD	NI-GLU	NI-GLU	Y	Y
NCWCD	EI-GLU	EI-GLU	Y	Y
NCWCD	NF-GLU	CR-SMU	Y	Y
NCWCD	CR-GRD	CR-GRD	Y	Y
NCWCD	FR-WGU	FR-WGU	Y	Y
NCWCD	WC-3	WC-3	Y	Y
USGS	09016500 ARAPAHO CREEK AT MONARCH LAKE OUTLET, CO.	AC-GRU	Y	Y
USGS	09011000 COLORADO RIVER NEAR GRAND LAKE, CO.	CR-SMU	Y	Y
USGS	09013500 EAST INLET NEAR GRAND LAKE, CO.	EI-GLU	Y	Y
USGS	09012500 NORTH INLET AT GRAND LAKE, CO.	NI-GLU	Y	Y
USGS	09018000 STILLWATER CREEK AB LK GRANBY, NR GRAND LK, CO.	ST-GRU	Y	Y
USGS	09034250 COLORADO RIVER AT WINDY GAP, NEAR GRANBY, CO.	CR-WGD	Y	Y
USGS	400833105532000 LAKE GRANBY INFLOW FROM WINDY GAP TUNNEL	WG-PUMP	Y	N
USGS	09021000 WILLOW CREEK BELOW WILLOW CREEK RESERVOIR, CO.	WC-WCRD	Y	N

East Slope Reservoir Water Quality Model

Agency	Station ID	Database Station ID	Data in Database?	2000 Data?
BTWF	C20	OLY	Y	Y
BTWF	C50	HFC-C50	Y	Y
BTWF	M70	BT-M70	Y	Y
NCWCD	CL-DAM1	CL-DAM1	Y	N
NCWCD	HT-SOL	HT-SOL	Y	N
USGS	06737500 HORSETOOTH RESERVOIR NEAR FORT COLLINS, CO.	HT-SOL	Y	Y
USGS	06742500 CARTER LAKE NEAR BERTHOUD, CO.	CL-DAM1	Y	Y
USGS	06721500 NORTH ST. VRAIN CREEK NEAR ALLENS PARK, CO.	N/A	N	N

Colorado River Water Quality Model

Agency	Station ID	Database Station ID	Data in Database?	2000 data?
USGS	9019000 Colorado River downstream of Lake Granby	CR-GRD	Y	Y
USGS	9019500 Colorado River near Lake Granby	CR-YGAGE	Y	Y
USGS	9034250 Colorado River at Windy Gap	CR-WGD	Y	Y
USGS	9034500 Colorado River at Hot Sulphur Springs	N/A	N	N
USGS	9058000 Colorado River near Kremmling	CR-KRM	Y	Y
USGS	9021000 Willow Creek below Willow Creek Reservoir	WC-WCRD	Y	N
USGS	400453105554200 Fraser at Highway 40	N/A	N	Y
USGS	400550105581800 Fraser at mouth	FR-WGU	Y	N
USGS	9038500 Williams Fork below Williams Fork Reservoir	N/A	N	Y
USGS	9249750 Williams Fork at mouth	N/A	N	Y
USGS	9039000 Troublesome near Pearmont	N/A	N	N
USGS	9041400 Muddy Creek below Wolford Mt. Reservoir	N/A	N	Y
USGS	9041500 Muddy Creek at Kremmling	N/A	N	N
USGS	9057500 Blue River below Green Mountain Reservoir	N/A	N	Y
USGS	9057700 Blue River at mouth	N/A	N	N
NCWCD	WC-WCRD	WC-WCRD	Y	Y
NCWCD	WC-2	WC-2	Y	N
NCWCD	WC-3	WC-3	Y	Y
NCWCD	WC-WCRU	WC-WCRU	Y	Y
NCWCD	FR-3	FR-3	Y	N
NCWCD	FR-4A	FR-WGU	Y	Y
NCWCD	FR-4B	FR-WGU	Y	Y
NCWCD	FR-WGU	FR-WGU	Y	Y

West Slope Temperature Model

Agency	Station ID	Database Station ID	Data in Database?	2000 data?
NCWCD	CR-GRD	CR-GRD	Y	N
GCWIN	FR-WGU	FR-WGU	Y	N
NCWCD	CR-YGAGE	CR-YGAGE	Y	N
NCWCD	WC-WCRD	WC-WCRD	Y	N
NCWCD	CR-WGD	CR-WGD	Y	N
GCWIN	CR-HSU	CR-HSU	Y	N
GCWIN	CR-HRU	CR-HRU	Y	N
GCWIN	CR-LB	CR-LB	Y	N
NCWCD	CR-WFU	CR-WFU	Y	N
GCWIN	CR-PAD	CR-PAD	Y	N
GCWIN	CR-CON	CR-CON	Y	N
GCWIN	CR-BLU	CR-BLU	Y	N
USGS	CR-BLD	CR-BLD	Y	N

APPENDIX D - DATASET USED IN SCT COMPUTATIONS FOR THE THREE LAKES

SEE EXCEL FILES

Table 48- Baseline Water Quality – Jul-Sep Average Total Phosphorus (ug/L)

Station	2008	2009	2010	2011	2012	BWQ (2008-2012 Median)	Water Quality Standard	Assimilative Capacity	15% of Assimilative Capacity	SCT
GR-DAM	17.3	14.3	11.0	12.4	12.2	12.4	25.0	12.6	1.9	14.3
SM-DAM	19.3	14.7	17.0	14.7	16.8	16.8	25.0	8.2	1.2	18.0
GL-MID	13.6	10.6	11.3	11.0	13.3	11.3	25.0	13.7	2.1	13.4

Table 49 - Baseline Water Quality - Jul-Sep Average Total Nitrogen (ug/L)

Station	2008	2009	2010	2011	2012	BWQ (2008-2012 Median)	Water Quality Standard	Assimilative Capacity	15% of Assimilative Capacity	SCT
GR-DAM	233	237	426	271	192	237	426	189	28	265
SM-DAM	318	242	765	257	261	261	426	165	25	286
GL-MID	276	303	859	332	371	332	426	94	14	346

Table 50 - Baseline Water Quality – Jul-Sep Average Chlorophyll a (ug/L)

Station	2008	2009	2010	2011	2012	BWQ (2008-2012 Median)	Water Quality Standard	Assimilative Capacity	15% of Assimilative Capacity	SCT
GR-DAM	2.4	3.6	3.1	2.6	1.1	2.6	8	5.4	0.81	3.4
SM-DAM	3.9	5.6	6.7	5.0	3.7	5.0	8	3.0	0.45	5.5
GL-MID	5.4	5.2	6.4	4.8	8.2	5.4	8	2.6	0.40	5.8

Table 51- Model Outputs, Jul-Sep Average Total Phosphorus (ug/L)

Station	Year	TP (ug/L) Existing Conditions	TP (ug/L) Alternative 2 Cumulative Effects
GL-MID	1975	6.6	6.6
	1976	9.4	9.6
	1977	10.3	10.9
	1978	7.2	12.5
	1979	6.9	7.3
	1980	7.4	8.0
	1981	10.7	10.8
	1982	5.7	6.0
	1983	5.2	5.8
	1984	5.0	5.2
	1985	6.8	8.3
	1986	5.3	5.9
	1987	8.6	9.1
	1988	9.4	10.6
	1989	11.0	11.3
GR-DAM	1975	10.5	11.1
	1976	9.4	9.2
	1977	9.1	9.4
	1978	18.6	18.0
	1979	16.0	16.9
	1980	12.1	12.1
	1981	9.9	9.6
	1982	15.9	15.3
	1983	11.6	13.3
	1984	9.6	11.1
	1985	10.2	10.8
	1986	10.6	10.9
	1987	9.9	9.8
	1988	10.6	12.1
	1989	10.1	9.8
SM-DAM	1975	9.5	9.5
	1976	12.7	12.7
	1977	13.7	14.2
	1978	12.1	16.9
	1979	10.9	11.3
	1980	11.2	12.0
	1981	14.1	14.0
	1982	9.7	10.3
	1983	8.5	9.2
	1984	8.0	8.5
	1985	11.0	13.0
	1986	8.7	9.4

Station	Year	TP (ug/L) Existing Conditions	TP (ug/L) Alternative 2 Cumulative Effects
	1987	13.3	13.3
	1988	13.7	14.7
	1989	14.4	14.4

Table 52 - Model Outputs, Jul-Sep Average Total Nitrogen (ug/L)

Station	Year	TN (ug/L) Existing Conditions	TN (ug/L) Alternative 2 Cumulative Effects
GL-MID	1975	214.5	214.6
	1976	267.2	273.3
	1977	288.3	292.8
	1978	209.3	254.8
	1979	206.9	213.9
	1980	219.3	233.6
	1981	292.2	299.8
	1982	209.6	212.4
	1983	190.6	202.6
	1984	188.9	190.9
	1985	226.6	251.1
	1986	200.3	210.8
	1987	283.3	298.7
	1988	274.6	296.0
	1989	310.3	321.1
SM-DAM	1975	231.6	233.8
	1976	281.5	286.2
	1977	293.8	297.5
	1978	232.0	277.4
	1979	226.7	235.5
	1980	238.8	254.0
	1981	300.4	307.1
	1982	239.0	245.4
	1983	205.3	215.0
	1984	206.5	210.3
	1985	256.0	283.3
	1986	220.0	231.2
	1987	296.6	309.4
	1988	291.2	313.0
	1989	317.1	327.0

Station	Year	TN (ug/L) Existing Conditions	TN (ug/L) Alternative 2 Cumulative Effects
GL-MID	1975	214.5	214.6
	1976	267.2	273.3
	1977	288.3	292.8
	1978	209.3	254.8
	1979	206.9	213.9
	1980	219.3	233.6
	1981	292.2	299.8
	1982	209.6	212.4
	1983	190.6	202.6
	1984	188.9	190.9
	1985	226.6	251.1
	1986	200.3	210.8
	1987	283.3	298.7
	1988	274.6	296.0
	1989	310.3	321.1

Table 53 - Model Outputs, Jul-Sep Average Chlorophyll a (ug/L)

Station	Year	Chl a (ug/L) Existing Conditions	Chl a (ug/L) Alternative 2 Cumulative Effects
GL-MID	1975	4.6	4.6
	1976	5.6	5.4
	1977	5.5	5.4
	1978	5.3	5.1
	1979	5.5	5.6
	1980	5.8	6.2
	1981	5.4	4.9
	1982	4.5	4.6
	1983	3.7	3.9
	1984	3.6	3.8
	1985	5.4	6.0
	1986	4.0	4.4
	1987	6.4	6.4
	1988	6.3	6.6
	1989	5.5	5.2

Station	Year	Chl a (ug/L) Existing Conditions	Chl a (ug/L) Alternative 2 Cumulative Effects
GR-DAM	1975	5.1	5.2
	1976	4.2	4.3
	1977	4.0	4.1
	1978	5.1	5.1
	1979	4.4	4.5
	1980	4.1	4.1
	1981	3.9	3.9
	1982	4.3	4.4
	1983	4.3	4.5
	1984	4.4	4.3
	1985	4.5	4.4
	1986	4.7	4.7
	1987	4.1	4.1
	1988	4.3	4.5
	1989	4.0	4.0
SM-DAM	1975	4.7	4.7
	1976	5.4	5.2
	1977	4.9	4.8
	1978	5.3	4.6
	1979	6.0	6.0
	1980	5.9	6.4
	1981	4.3	3.9
	1982	5.5	5.6
	1983	3.1	3.1
	1984	3.4	3.5
	1985	6.3	6.2
	1986	4.1	4.3
	1987	6.0	5.8
	1988	5.8	5.8
	1989	4.6	4.2

APPENDIX E - REPRESENTATIVE BASELINE DEVELOPMENT STATISTICS SUMMARY – THREE LAKES

Table 53 - Mann-Whitney Results for Arapaho Creek

Constituent	1996-2004							2008-2012							P-Value
	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	
Ca (mg/L)	7	3.76	5.0	5.2	0	0.005	0.006	5	4.03	4.585	4.71	0	0.003	0.02	96.91%
DOC (mg/L)	6	1.65	2.175	3.18	0	0.16	0.16	8	1.58	1.935	2.29	0	0.02	0.2	92.22%
Mg (mg/L)	7	0.86	1.14	1.17	0	0.003	0.004	5	0.90	1.03	1.04	0	0.001	0.01	85.44%
NH3 as N (mg/L)	7	0.01	0.018	0.05	0	0.004	0.008	20	0.00	0.005	0.02	1	0.00049	0.01	97.52%
P Total (mg/L)	6	0.01	0.00675	0.016	0	0.0019	0.002	18	0.01	0.00875	0.01	0	0.00062	0.004	8.59%
SpCond (uS/cm)	7	34.00	41.5	42	0	0	0	14	31.00	38	54	0	0	0	90.42%
TKN as N (mg/L)	5	0.13	0.14	0.3	0	0.04	0.05	19	0.11	0.14	0.23	0	0.0235	0.0235	76.14%

Table 54 - Mann-Whitney Results for North Fork

Constituent	1996-2004							2008-2012							P-Value
	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	
Ca (mg/L)	13	8.60	10	11	0	0.005	0.095	4	9.40	9.74	11	0	0.003	0.02	47.74%
DOC (mg/L)	5	1.54	1.63	2.2	0	0.16	0.16	7	1.67	1.8	3.54	0	0.02	0.2	7.40%
Mg (mg/L)	13	2.00	2.2	2.52	0	0.004	0.027	4	2.14	2.245	2.55	0	0.001	0.01	21.40%
P Total (mg/L)	13	0.01	0.01	0.063	3	0.0019	0.019	14	0.01	0.01175	0.03	0	0.00062	0.004	51.94%
pH	8	6.78	7.59	8.45	0	0	0	13	7.50	7.94	8.56	0	0	0	7.38%
SpCond (uS/cm)	13	52.00	79	108	0	0	0	13	66.00	84	101	0	0	0	3.84%
TKN as N (mg/L)	5	0.07	0.08	1	0	0.04	0.05	13	0.06	0.12	0.21	0	0.0235	0.0235	26.09%
TOC (mg/L)	8	1.50	2	4	0	0.3	0.5	5	1.72	1.81	3.51	0	0.02	0.02	50.00%

Table 55 - Mann-Whitney Results for East Inlet

Constituent	1996-2004							2008-2012							P-Value
	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	
Ca (mg/L)	13	1.83	2.2	2.5	0	0.005	0.095	10	1.80	2.065	2.55	0	0.003	0.022	94.31%
Cl (mg/L)	13	0.10	0.17	1.1	6	0.01	0.2	8	0.09	0.135	0.37	0	0.018	0.06	61.40%
DOC (mg/L)	5	1.41	1.9	2.04	0	0.16	0.16	13	1.64	1.9	3.8	0	0.02	0.2	44.12%
Hardness (mg/L)	8	5.76	6.795	7.39	0	0	0	8	5.56	6.425	7.89	0	0	0	82.77%
K (mg/L)	13	0.16	0.19	0.3	6	0.004	0.49	8	0.12	0.19	0.23	0	0.01	0.035	50.00%
Mg (mg/L)	13	0.28	0.32	0.38	0	0.003	0.027	10	0.26	0.3215	0.36	0	0.001	0.011	58.59%
Na (mg/L)	13	0.70	0.9	1.5	1	0.03	1.1	8	0.73	0.895	1.31	0	0.03	0.06	54.33%
NO3+NO2 (mg/L)	9	0.06	0.081	0.13	2	0.003	0.021	17	0.01	0.042	0.08	0	0.00044	0.008	99.18%
P Total (mg/L)	12	0.00	0.0095	0.26	2	0.0019	0.019	23	0.01	0.006	0.01	2	0.00062	0.004	78.79%
pH	6	6.78	7.595	7.81	0	0	0	15	6.80	7.34	7.61	0	0	0	93.55%
SiO2 Dis (mg/L)	5	2.93	3.54	4.08	0	0.01	0.1	7	2.46	3.6	4.94	0	0.009	0.1	23.25%
SO4 (mg/L)	13	1.00	1.885	2.4	1	0.01	0.2	8	1.12	1.42	1.83	0	0.02	0.09	96.49%
SpCond (uS/cm)	12	11.00	18	28	0	0	0	28	14.00	19	35	0	0	0	6.24%
TKN as N (mg/L)	5	0.09	0.13	0.54	1	0.04	0.05	19	0.08	0.1045	0.2	0	0.0235	0.0235	66.51%
TOC (mg/L)	7	1.90	2	3.2	0	0.3	0.5	5	1.65	1.8	2.41	0	0.02	0.02	96.91%

Table 56 - Mann-Whitney Results for North Inlet

Constituent	1996-2004							2008-2012							P-Value
	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	N	Min	Median	Max	# Censored	Lowest DL	Highest DL	
Ca (mg/L)	14	1.96	2.085	5.3	0	0.005	0.095	7	1.84	2.19	2.37	0	0.003	0.022	63.15%
Cl (mg/L)	14	0.12	0.19	1.2	5	0.01	0.2	5	0.13	0.18	0.22	0	0.018	0.06	59.15%
DOC (mg/L)	5	1.41	1.8	2	0	0.06	0.06	11	1.51	1.9	2.85	0	0.02	0.2	10.64%
Hardness (mg/L)	9	5.00	6.62	7.95	0	0	0	5	6.01	7	7.54	0	0	0	19.31%
K (mg/L)	13	0.21	0.23	0.6	6	0.004	0.49	5	0.16	0.25	0.26	0	0.01	0.035	59.73%
Mg (mg/L)	14	0.34	0.3845	0.454	0	0.003	0.027	7	0.34	0.397	0.48	0	0.001	0.011	18.53%
Na (mg/L)	14	0.90	1.18	4.3	1	0.03	1.1	5	1.03	1.25	1.81	0	0.035	0.06	22.95%
NO3+NO2 (mg/L)	10	0.07	0.112	0.385	1	0.003	0.021	20	0.01	0.0305	0.13	0	0.00044	0.008	99.35%
P Total (mg/L)	12	0.00	0.006	0.13	3	0.002	0.019	20	0.00	0.006	0.02	0	0.00062	0.004	56.95%
pH	7	6.86	7.21	8.26	0	0	0	14	7.04	7.37	7.64	0	0	0	47.03%
SiO2 Dis (mg/L)	5	4.51	5	5.95	0	0.01	0.1	4	4.20	4.835	5.63	0	0.009	0.1	68.79%
SO4 (mg/L)	14	1.00	1.815	2.3	2	0.01	0.2	5	1.03	1.4	1.67	0	0.02	0.09	50.00%
SpCond (uS/cm)	13	12.00	20	55	0	0	0	20	17.00	22	39	0	0	0	28.40%
TKN as N (mg/L)	5	0.07	0.1	0.57	1	0.04	0.05	19	0.06	0.102	0.16	0	0.0235	0.0235	40.18%
TOC (mg/L)	8	1.00	2	3	0	0.3	0.5	6	1.60	1.935	2.66	0	0.02	0.02	74.07%

APPENDIX F - TEMPERATURE ANTIDEGRADATION TECHNICAL MEMORANDUM

Technical Memorandum

TO: Esther Vincent, Northern Water
FROM: Christine Hawley and Jean Marie Boyer, PhD, PE, Hydros Consulting Inc.
SUBJECT: Review of Cumulative Effects Temperature Results in the Colorado River for Windy Gap Firming Project 401 Certification Process
DATE: August 26, 2014

To support the 401 Certification Process for the Windy Gap Firming Project (WGFP), a quantitative analysis of observed and simulated water temperature data on the upper Colorado River was conducted. The goal of the analysis was to provide information to support antidegradation assessment for stream temperature. The approach presented and applied in this technical memorandum is based directly on discussions with and guidance provided by Colorado Department of Public Health and Environment (CDPHE, 2013a, 2014a, and 2014b) as well as follow up communications with Dr. James Saunders of the Colorado Water Quality Control Division (personal communication from J. Saunders, 2014a and 2014b).

This technical memorandum presents:

1. **Approach:** A description of the spatial and temporal focus of the analysis, data sources, and calculation steps;
2. **Results and Discussions**
   a) **Summary of Calculation Results**: Tables and figures summarizing results;
   b) **Assessment Discussion - Granby Reservoir to the Fraser River**: A presentation of results for this non-303(d)-listed[1] portion of the focus reach;
   c) **Assessment Discussion - Fraser River to Just above Williams Fork**: A presentation of results for this reach containing the 303(d)-listed portion of the focus reach above Williams Fork Reservoir;
   d) **Assessment Discussion - below Williams Fork**: A presentation of results for the one modeled location below Williams fork (CR-PAD);
3. **Findings**: An overview of the conclusions; and
4. **References**.

Additionally, two attachments are provided with supporting information. Attachment A details the approach taken to define baseline conditions based on observed data for use in assessment of the adequacy of modeled baselines. Attachment B presents a complete set of detailed figures presenting baseline time series and assessment plots.

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[1] The 303(d) List is a list of those waters for which technology-based effluent limitations and other required controls are not stringent enough to implement water quality standards. The list is prepared by CDPHE and submitted to the U.S. Environmental Protection Agency, fulfilling requirements of section 303(d) of the federal Clean Water Act.

1 Approach

The WGFP is one of the first major water projects in the state of Colorado to perform an antidegradation assessment of stream temperature for 401 Certification. Antidegradation analysis of stream temperature requires a more complicated approach than most typical contaminant concentration antidegradation assessments. The challenges associated with stream temperature include the need for a temporally-varying baseline, recognizing the important effects of meteorological and hydrological conditions. Antidegradation assessment for stream temperature for this project also requires the appropriate use of simulated temperature results.

The approach taken to assess antidegradation of the stream temperature on the upper Colorado River for the WGFP is based on the steps described by CDPHE in a technical memorandum developed by the Water Quality Control Division (CDPHE, 2014b). The approach is quantitative and focuses on antidegradation assessment of the numerical chronic (weekly average temperature [WAT]) and acute (daily maximum [DM]) standards. The narrative temperature standard is not specifically addressed by this approach.

The general principles of antidegradation review, described in Regulation 31 (CDPHE, 2013c), are honored in this approach, applying further guidance from CDPHE (2014b) recognizing the challenges specific to assessment of stream temperature. The assessment requires several types of information:

- **Observed hourly stream temperature data (conditions representative September 30, 2000):** Observed hourly (or finer resolution) stream temperature data are needed for multiple years through the season(s) of focus at key locations in the assessment reach. These observations do not need to include data from September 30, 2000, but they should exclude any data for which stream geometry, relative heat loading from various sources, and operations (e.g., demands and routing) were significantly different from those in place on September, 30, 2000.
- **A conceptual understanding of the reach and the project:** A conceptual understanding of stream temperature patterns and response drivers in the project response area is needed to support appropriate selection of spatial and temporal focus for the analysis and for critical review of results.
- **A calibrated dynamic temperature model:** A calibrated dynamic temperature model is needed for the reach of focus capable of generating output supporting calculation of DMs and WATs.
- **Simulation results for baseline (conditions representative September 30, 2000):** Simulation results are needed from the dynamic temperature model for conditions representative of low-flow, high air-temperature conditions for the system as of September 30, 2000. This requires simulation results for conditions of stream geometry, relative heat loading from various sources, and operations (e.g., demands and routing) that existed at the time of the target baseline date of September, 30, 2000. This does not mean that specific flows and meteorological conditions from September 30, 2000 need to be simulated. In fact, flow and meteorological conditions should reflect temperature stress conditions of low-flow and high air temperatures to best honor the intent of the

antidegradation review principles. This may include multiple simulation years to capture a range of conditions over the season of focus.

- **Simulation results for cumulative effects with the proposed project:** Simulation results are needed from the dynamic temperature model that estimate the effects of the preferred alternative of the proposed project and cumulative effects (any reasonably foreseeable future actions[RFFAs]) relative to simulated baseline effects.

Applying this information, antidegradation can be assessed at each calibration target location where simulated and observed DM and WAT results are available. Calculations follow a four step process:

Step 1. Determine observed baselines: First, time-varying temperature baselines for DMs and WATs are developed from observed data for each location.

Step 2. Compare modeled and observed baselines: Second, modeled baselines are compared to baselines developed from observed data. The purpose of this comparison is to assess appropriateness of the modeled baseline conditions. Modeled baseline stream temperatures should be comparable to or warmer than the observed baseline at each location. Significantly cooler model baseline temperatures, relative to observed baseline, could indicate that the simulated baseline hydrology and meteorology do not reflect low flow/ high air-temperature conditions targeted for the assessment. There may be reasons for this, but it would require explanation.

Step 3. Determine the assimilative capacity/ baseline available increment: Third, each modeled baseline is then compared to the applicable numerical standard for calculation of time-varying assimilative capacity, i.e., the baseline available increment (BAI).

Step 4. Assess simulated effects: Fourth, simulated cumulative-effects changes (simulated differences) to DM and WAT values at each location are compared to the respective calculated BAI time-series.

A decision was made to apply modeled baselines to determine assimilative capacity instead of observed baselines based on findings from early attempts to focus on observed baseline. Specifically, it is recognized that assimilative capacity varies from day-to-day as a function of flow rate and meteorological conditions. A single baseline developed from observed data fails to represent baseline for all years, even if both correspond to low-flow, high air temperature seasons. Consequently, early attempts to assess antidegradation with observed baselines compared to modeled effects resulted in cases of both underestimation and overestimation of antidegradation concerns for particular hydrologic years. The existence of a model provides an opportunity to define realistic baseline conditions specific to each simulation year for the given meteorological conditions. As such, it was decided (CDPHE, 2014b) to use the modeled baseline conditions, where appropriate, to assess antidegradation for stream temperature.

The following subsections describe the basis for defining the spatial and temporal focus of this analysis, the sources of data used, and the calculations performed to assess antidegradation for 401 Certification.

1.1 Spatial and Temporal Focus

The focus area for this analysis is the upper Colorado River from the Granby Reservoir Dam to just above the inflow location from Williams Fork (below Williams Fork Reservoir; Figure 1). This corresponds to the reach of the Colorado River for which a dynamic temperature model was developed for the WGFP EIS (Hydros, 2011). As described in Hydros (2011), this reach will experience changes in flow rates as a result of the EIS preferred alternative for the Windy Gap Firming Project (Alt2). The downstream limit on the reach for modeling was set based on the cooling effects of inflows from Williams Fork Reservoir. As such, this reach was identified as the most vulnerable reach on the Colorado River, in terms of potential temperature increases due to the WGFP (Hydros, 2011). One location downstream of Williams Fork Reservoir inflow, CR-PAD is also included in the analysis.

Currently, the reach of the Colorado River from 578 Road Bridge (located ~1 mile downstream of Windy Gap Reservoir) to just above the confluence with the Blue River is on the 303(d) List for temperature (CDPHE, 2012; Figure 1). The portion of the modeled reach upstream of the 578 Road Bridge to Granby Reservoir is not on the 303(d) list of impaired waters for temperature. Per CDPHE (2014a), both 303(d)-listed and non-listed reaches are subject to the antidegradation review for water temperature for 401 Certification. The purpose of inclusion of 303(d)-listed locations in the antidegradation review is to quantify any exacerbation of impairment within a reach (spatially and/or temporally).

Within this area of focus on the Colorado River, the quantitative antidegradation analysis focuses primarily on the temperature observation locations that were calibration targets in the dynamic temperature model. While temperature simulation results can be extracted from the dynamic temperature model at locations that were not calibration targets, greater uncertainty is associated with such locations (as discussed further in Section 2.2). Qualitative analysis is provided at one location on this reach that was not a calibration target. The locations included in the assessment are listed here (and shown on Figure 1):

Quantitative Antidegradation Assessment Locations:

- CR-YGAGE –Northern Colorado Water Conservancy District (NCWCD) gage, location: Colorado River downstream of YMCA flow gage
- CR-WGD – NCWCD gage, location: Colorado River 1 mi downstream of Windy Gap at USGS flow gage
- CR-HSU – GCWIN (aka COR-abvHSS) gage, location: Colorado River above Hot Sulphur Springs Water Treatment Plant
- CR-HRU – GCWIN (aka COR-abvHSR) gage, location: Colorado River above Hot Sulphur Springs Resort
- CR-LB – GCWIN (aka COR-LoneBuck) gage, location: Colorado River at Lone Buck below Colorado Division of Wildlife (CDOW) Office
- CR-WFU – NCWCD gage, location: Colorado River upstream of confluence with Williams Fork
- CR-PAD – GCWIN (aka COR-abvKidPond) gage, location: Colorado River above Kids Pond below Parshall CO

Qualitative Antidegradation Assessment Locations:

- CR-WGU – NCWCD gage, location: Colorado River just upstream of Fraser River inflow

As noted above, model simulation results are required to quantify anticipated temperature effects relevant to the 401 Certification for the Windy Gap Firming Project. The WGFP dynamic temperature model of the Colorado River simulates the period of June through September for the years of simulated hydrology. This period was selected to include the months of the warmest observed temperatures (July and August), as well as one month before and one month after these critical months. Thus, the portion of the year simulated in each model run is June 1 – September 30. June through September is expected to include the most critical period of months for the applicable summer standard (Cold Stream, Tier II; April – October; 18.3°C WAT and 23.9°C DM), which also would experience changes in flow rates due to the Windy Gap Firming Project. Based on this, the antidegradation analysis presented here focuses on the months of June through September.

The dynamic temperature model years of simulated hydrology are 1975, 1979, 1986, 1987, and 1988. These years were selected from the WGFP Hydrologic Model-simulated 15-year period of daily records developed for water-quality analyses[2]. These five years represent the only years in the 15-year simulated daily hydrology that were expected to exhibit possible river temperature increases due to the proposed alternative. Other years in the fifteen year period either exhibit no differences in pumping from Windy Gap or have very high flow rates during critical months and would not be expected to have temperature concerns.

For each model run, meteorological data from 2007 is applied. The 2007 meteorology was selected because it was the hottest July and August pairing of the 62-year period of record (1948-2010 data reviewed in Hydros, 2011)[3]. Additionally, it was a year for which a complete hourly meteorological input dataset could be developed.

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[2] The 15-year period (WY1975 – WY1989) was selected as a focus period for WGFP water quality assessments from the overall study period of 47 years (1950-1996). These 15 years contain dry, wet, and average conditions. The shorter period was selected because it coincides with a period during which more historic gage data are available for disaggregating monthly data to daily data, resulting in more accurate disaggregation. The period was selected to reflect the range of conditions observed over the full record.

[3] The Grand Lake Weather station, GL 6SSW, was used for this analysis because it had the most complete long-term records in the vicinity. The station is located just north of Granby Reservoir, between Shadow Mountain Reservoir and Granby Reservoir. Data from the Grand Lake Weather Station track well with data from the Kremmling airport, with an R^2 value 0.94 in a linear correlation. As such, patterns in this data set are expected to be applicable to the focus area from Windy Gap to Williams Fork.

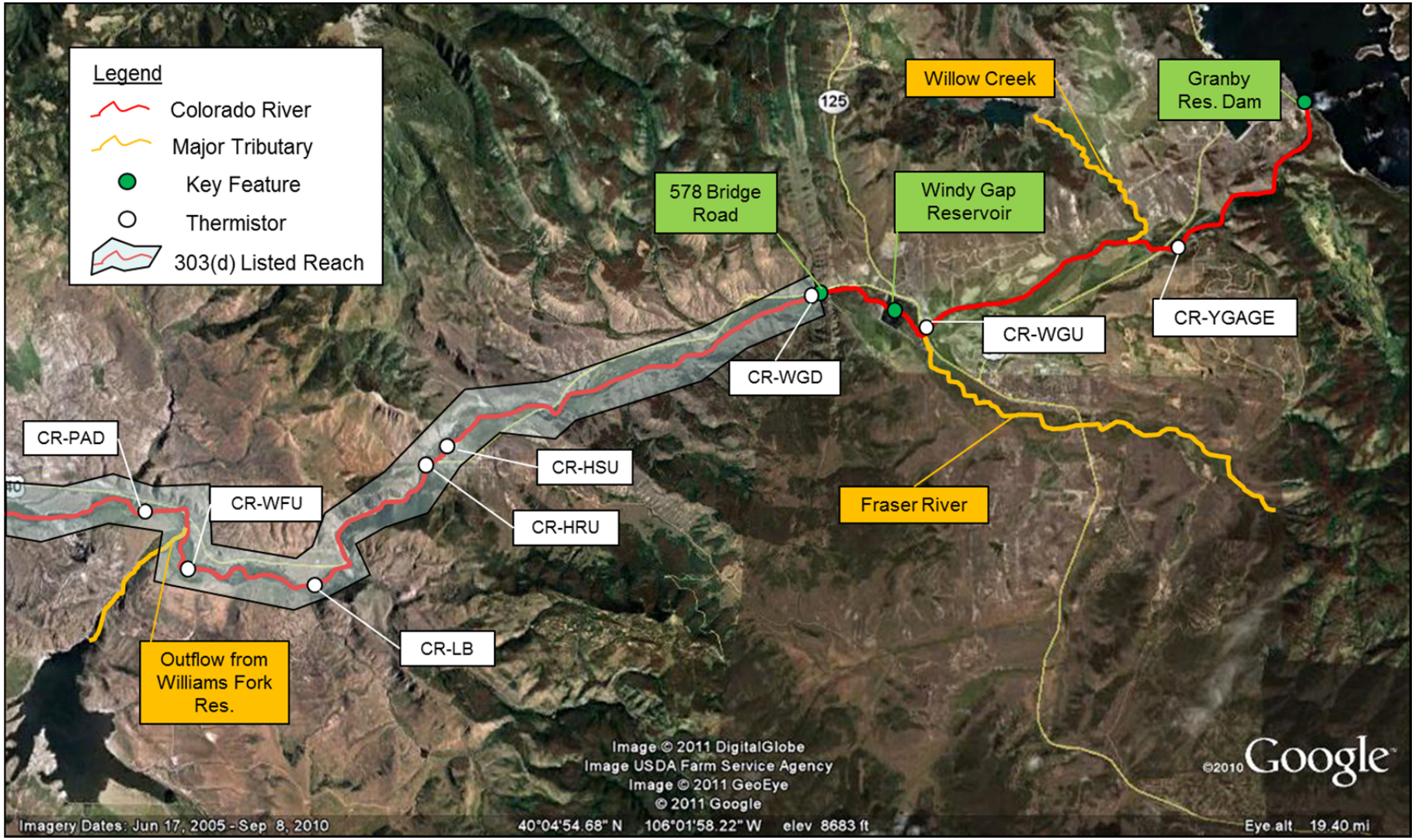

Figure 1. Upper Colorado River Focus Reach, 303(d) Temperature Listing, Major Tributaries, and Target Temperature Gages

Based on this, the quantitative antidegredation analysis is based on simulated hydrology existing conditions and cumulative effects for June through September for 1975, 1979, 1986, 1987, and 1988, applying 2007 meteorology. The existing-conditions simulation results correspond to the antidegradation baseline conditions representative of September 30, 2000, in terms of stream geometry, relative heat loading from various sources, and operations (e.g., demands and routing). The WGFP modeled hydrology for existing conditions on the upper Colorado River assumed demands based on actual demands for 1998-2003 (USBR, 2011 and ERO, 2005).

1.2 Data Sources

Observed water-temperature data used in this antidegradation evaluation were compiled from Northern Water (personal communication from J. Stephenson, 2014) and Grand County Water Information Network (GCWIN; personal communication from J. Tollett, 2014), from data requests in March of 2014 for all readily-available data at the locations listed in Section 1. The resulting dataset included continuous temperature data with at least some hourly (or higher resolution) data for the years listed in Table 1.

Table 1. Temperature Gage Periods of Observed Record Compiled for Antidegradation Analysis

Temperature Gage Location	Years of Record*
CR-YGAGE	2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-WGU	2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-WGD	2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-HSU	2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-HRU	2008, 2009, 2010, 2011, 2012, 2013
CR-LB	2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-WFU	2007, 2008, 2009, 2010, 2011, 2012, 2013
CR-PAD	2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013

*Most years contain periods of missing data in the June through September period.

Simulated hourly water temperatures were taken from calibration target locations in the existing upper Colorado River Dynamic Temperature Model (Hydros, 2011). Data sources used in development and application of that model are described in detail in the model report (Hydros, 2011). Hourly modeled temperature output was compiled from the following dynamic temperature model runs:

- 1975 hydrology (2007 meteorology)
  - Existing-Conditions Simulation
  - Proposed Action (Alt2), including Cumulative Effects

    - Proposed Action (Alt2), including Cumulative Effects – with a July 15 start data for 10825 releases from Granby Reservoir
- 1979 hydrology (2007 meteorology)
    - Existing-Conditions Simulation
    - Proposed Action (Alt2), including Cumulative Effects
- 1986 hydrology (2007 meteorology)
    - Existing-Conditions Simulation
    - Proposed Action (Alt2), including Cumulative Effects
- 1987 hydrology (2007 meteorology)
    - Existing-Conditions Simulation
    - Proposed Action (Alt2), including Cumulative Effects
- 1988 hydrology (2007 meteorology)
    - Existing-Conditions Simulation
    - Proposed Action (Alt2), including Cumulative Effects

Additionally, simulated Willow Creek and Granby Reservoir daily flow records for WY1975 – WY1989 (development described in Thompson, 2011), were evaluated in the qualitative assessment completed for CR-WGU.

1.3 Analysis Steps

The analysis to support stream temperature antidegradation assessment for 401 Certification for the WGFP was conducted in four distinct steps. First observed baseline conditions were calculated from observed data. Second, the observed baselines were compared to modeled existing condition baselines to assess appropriateness of the modeled hydrologic and meteorological conditions. Third, time-varying assimilative capacity was calculated by comparison of modeled baselines to the relevant standard. Fourth, the model-simulated cumulative effects (with the proposed project) on stream temperature were compiled and compared to the calculated available increment.

Calculations were performed for DMs and WATs at each location for all simulated hydrologic years. The following subsections describe each step in greater detail, using examples from the analysis to more clearly illustrate the products. A complete set of results from each step are presented in Attachment A (Steps 1 and 2) and Attachment B (Steps 3 and 4).

1.3.1 Step 1: Determining Observed Baseline

The first step in the stream temperature antidegradation analysis for the WGFP was to develop a baseline from observed data at each gage. Because stream temperatures naturally vary temporarily and spatially, a time-varying baseline is needed for each gaging station. Baselines based on observed data are needed to support assessment of the appropriateness of modeled baselines for the antidegradation assessment. For this project, the baselines based on observed data are not used directly to determine available increment (for the reasons described above in Section 1). The approach to development of observed-data baselines followed CDPHE guidance (CDPHE, 2013a), with a few minor modifications. A detailed description of the steps taken,

including the complete set of figures and discussions of any modifications made to original related guidance, is presented in Attachment A.

All resulting June through September observed-data baseline time series for DMs and WATs are presented in Figure 2 and Figure 3, respectively[4]. Relevant standards are also shown on these plots for perspective. Differences between the observed-data baseline values and the relevant standards are relatively small in some cases (e.g., peak DMs and CR-HSU and WATs at CR-WGD and CR-HRU). 15% of these differences are less than 0.2 °C at times, which, for perspective, is the noted accuracy of the thermistors used in the reach (Personal Communication with Jane Tollett, GCWIN, 2/21/2011).

Figure 2 and Figure 3reflect the conceptual understanding of warming patterns in the upper Colorado River. First, Figure 2 shows increasing baseline temperatures moving downstream from CR-YGAGE until CR-HSU, which exhibits the highest DM baseline values. Downstream from CR-HSU is Byers Canyon, where shading effectively reduces DM values. The DM baseline values decrease further below Williams Fork Reservoir, as shown by CR-PAD, due to releases from Williams Fork. Similar patterns are apparent for WATs (Figure 3), though the cooling effect of shading through Byer's Canyon results in little change in baseline WATs downstream of CR-HSU, unlike the cooling effect observed for DMs. This agreement with the conceptual system understanding is reassuring in terms of application of the calculated baseline values for use in comparison to modeled baselines.

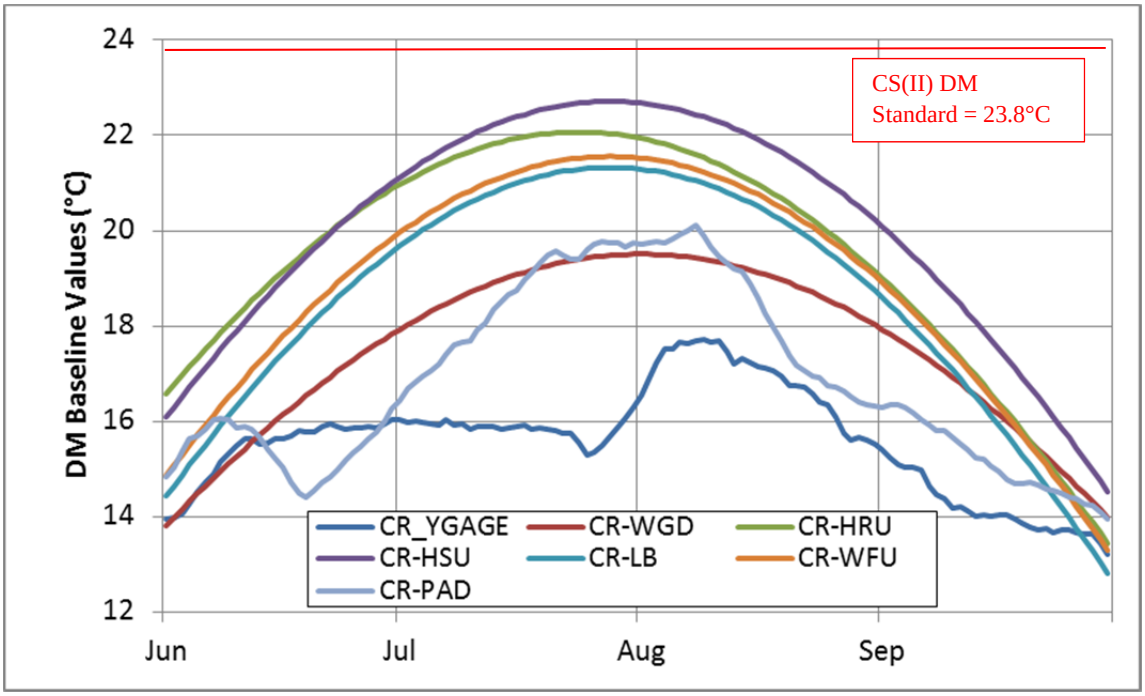

Figure 2. Baseline DM Time Series for Quantitative Analysis of Antidegradation

[4] The different pattern-type apparent for CR-YGAGE and CR-PAD is due to their location below major reservoir releases. The reasoning behind this is discussed in Attachment A.

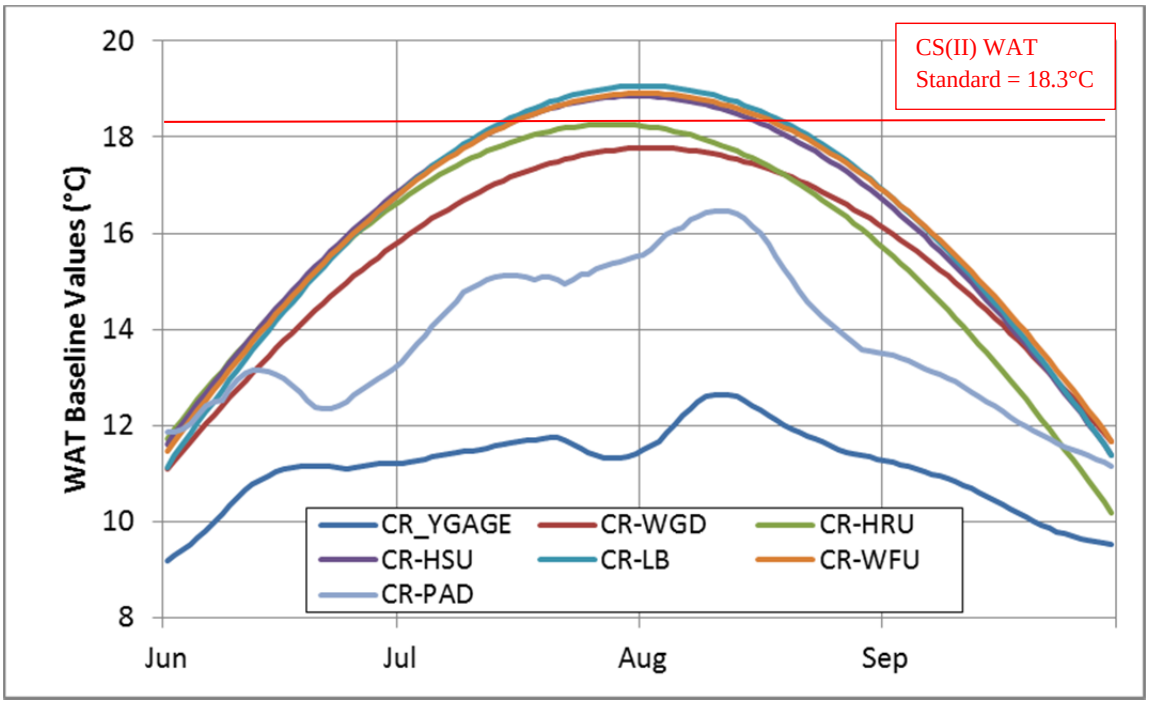

Figure 3. Baseline WAT Time Series for Quantitative Analysis of Antidegradation

1.3.2 Step 2: Comparison of Observed and Modeled Baselines

Following their development, observed baselines were compared to modeled baselines. Modeled baselines for the WGFP consist of existing-conditions simulation results at each calibration-target gage location for each simulated year. The purpose of this comparison is to assess appropriateness of the modeled baseline conditions. Specifically, this comparison supports determination of whether the simulated baseline conditions represent low-flow, high air-temperature conditions targeted for antidegradation assessment. Modeled baselines should include years that are comparable to or warmer than the observed-data baseline at each location. Significantly cooler modeled baselines, relative to observed baseline, could indicate that the simulated baseline hydrology and meteorology do not reflect low flow/ high air-temperature conditions targeted for the assessment. There may be reasons for this, but it would require explanation. Modeled baselines that are significantly warmer than observed-data baselines could also reflect inadequate data for development of observed baselines (i.e., lack of observed data for low-flow, high air-temperature conditions).

As described in the previous subsection, one observed-data baseline was developed for each gage location for DMs and for WATs. Modeled baselines for the WGFP consist of existing-conditions simulation results at each gage location for each simulated year. Five hydrologic years were simulated (1975, 1979, 1986, 1987, and 1988). These years were selected to exhibit maximum anticipated temperature effects due to the proposed project. Available meteorological data from these years were inadequate for model input development, so meteorological conditions from 2007 were simulated in each of the years. The 2007 meteorology was selected because it was the hottest July and August pairing of the 62-year period of record (1948-2010 data reviewed in Hydros, 2011).

Observed-data baselines for DMs and WATs are compared to simulated baselines at each gage in figures presented in Attachment A (Section III). Overall observed and modeled baselines compare well. As an example, baseline comparisons for DMs and WATs at CR-HSU are shown in Figure 4 and Figure 5. The modeled baselines have temperatures similar to and warmer than the observed-data baseline throughout the focus period of June through September. The coolest modeled baseline is consistently from 1986, which was a much wetter year than the other four years. Even in the 1986 baseline, however, results in late August and September are close to or above the observed data baseline.

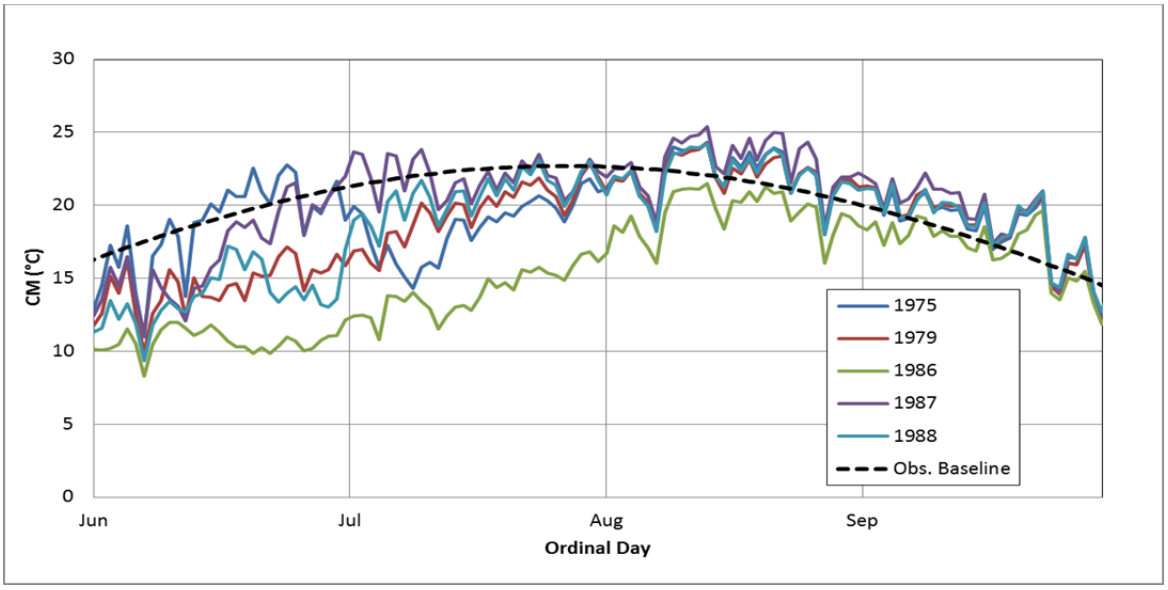

Figure 4. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HSU

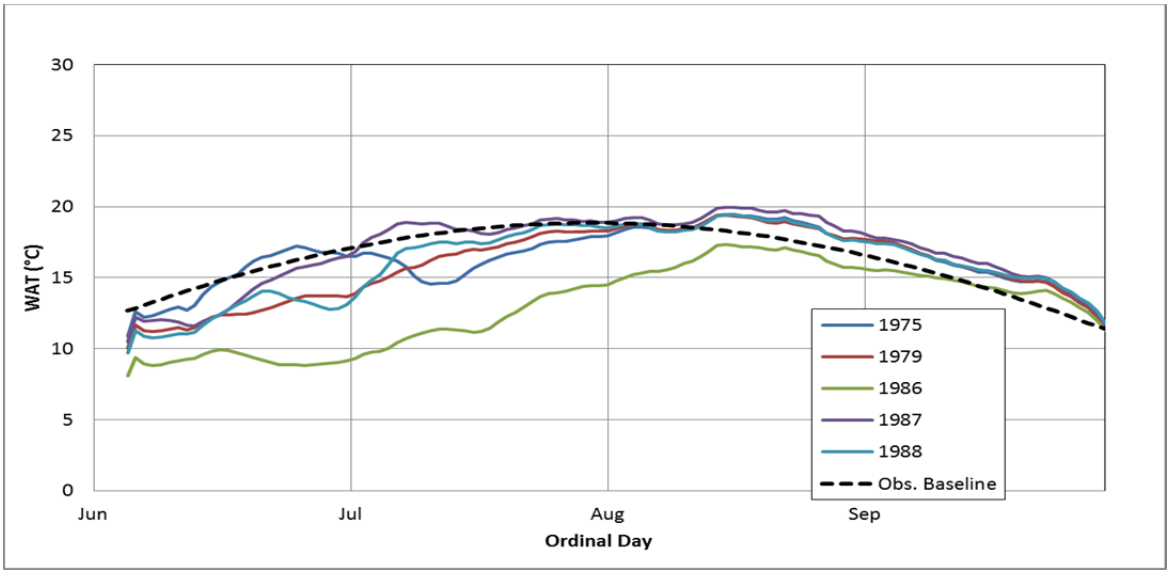

Figure 5. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HSU

Other gage comparison results are similar to those presented above for CR-HSU. Only CR-YGAGE exhibits consistent simulated baseline values that are consistently lower than the observed-data baseline. Comparison plots for CR-YGAGE for DMs and WATs are presented in Figure 6 and Figure 7, respectively. Differences from June through August are on the order of roughly 2°C, suggesting that modeled baseline conditions at this location may not be representative of low-flow, high air-temperature conditions represented in the observed data baseline. This is not considered a major limitation since CR-YGAGE is one of the least sensitive locations in the analysis, due to the reach (lowest temperatures of the reach, upstream of Windy Gap pumping effects, and results are well below relevant standards). In spite of the anticipated limited sensitivity at YGAGE, potential underrepresentation of baseline conditions by modeled baselines will be addressed in the discussion of the results (Section 2.2.1) by consideration of both modeled and observed-data baselines. For all other locations, comparison of observed-data baselines and simulated baselines suggests that the modeled baselines are adequate for direct use in the antidegradation assessment.

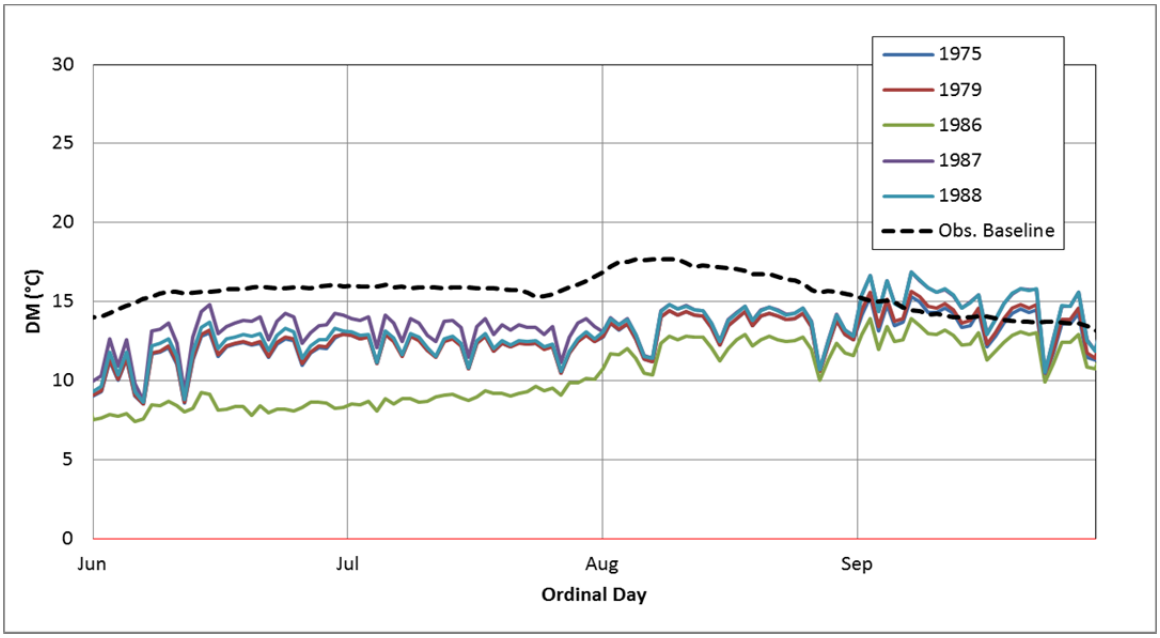

Figure 6. June-Sept DM Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-YGAGE

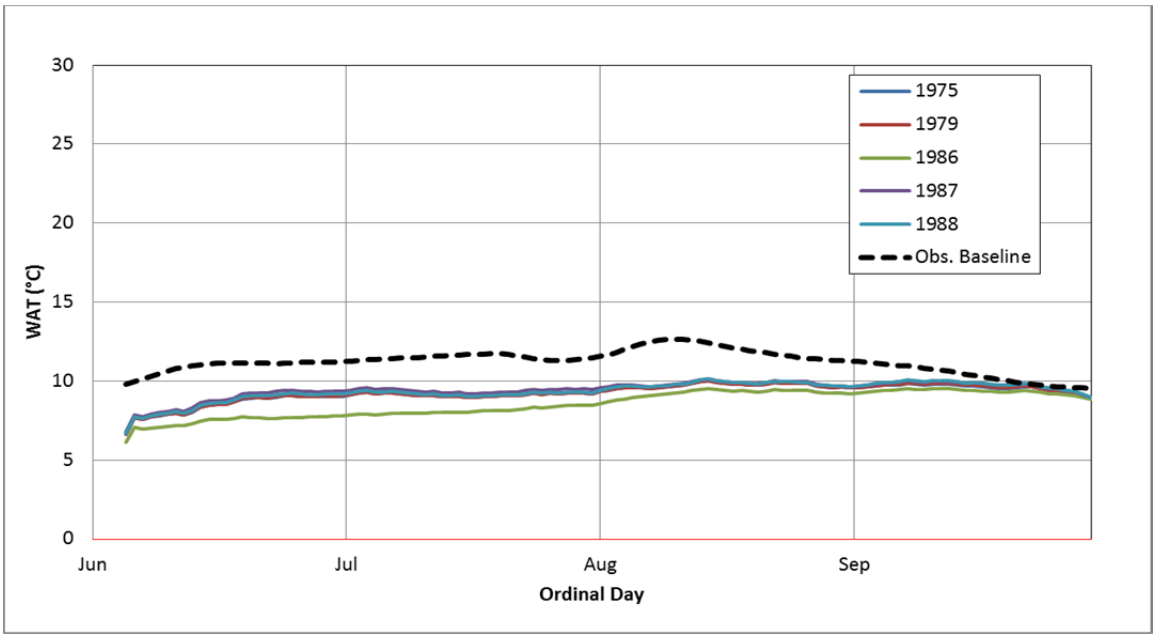

Figure 7. June-Sept WAT Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-YGAGE

1.3.3 Step 3: Calculation of Assimilative Capacity (the Baseline Available Increment)

In the third step of the analysis, modeled baseline time series for DMs and WATs were used to calculate assimilative capacity (aka baseline available increment [BAI]) for each simulated year at each location. This was accomplished by subtracting each value in the baseline time series from the relevant standard[5] to generate a BAI time series. One BAI time series for DMs and one BAI time series for WATs were generated for each simulation year at each location. BAI values were multiplied by 0.15 to obtain the 15% BAI time series for direct comparison with simulated effects in the antidegradation assessment. The full set of resulting 15% BAI time series is presented in Attachment B grouped by location (Attachment B, Section II) and by simulation year (Attachment B, Section II).

As an example, the DM and WAT time series for CR-HSU are presented in Figure 8 and Figure 9. These results reflect a scaled, reversed pattern of the existing conditions baseline simulation results presented in Figure 4 and Figure 5. Figure 8 and Figure 9 show that at CR-HSU, 15% of the available increment is small at times. Further, the relative year-to-year pattern shown in Figure 8 and Figure 9 is also apparent in results from the other locations upstream of Williams Fork. Specifically, the smallest available increment occurs in 1987, though in part to all of June, the increment in 1975 is smaller. Results from the wet year, 1986, consistently exhibit the largest available increment, as would be expected. The pattern changes at CR-PAD, which is below the

[5] The relevant standards for the focus period of June through September for these locations on the upper Colorado River are Cold Stream, Tier II chronic and acute values for April through October (18.3°C WAT and 23.9°C DM).

confluence with Williams Fork, reflecting dominant control of this response by Williams Fork releases, as opposed to Windy Gap pumping.

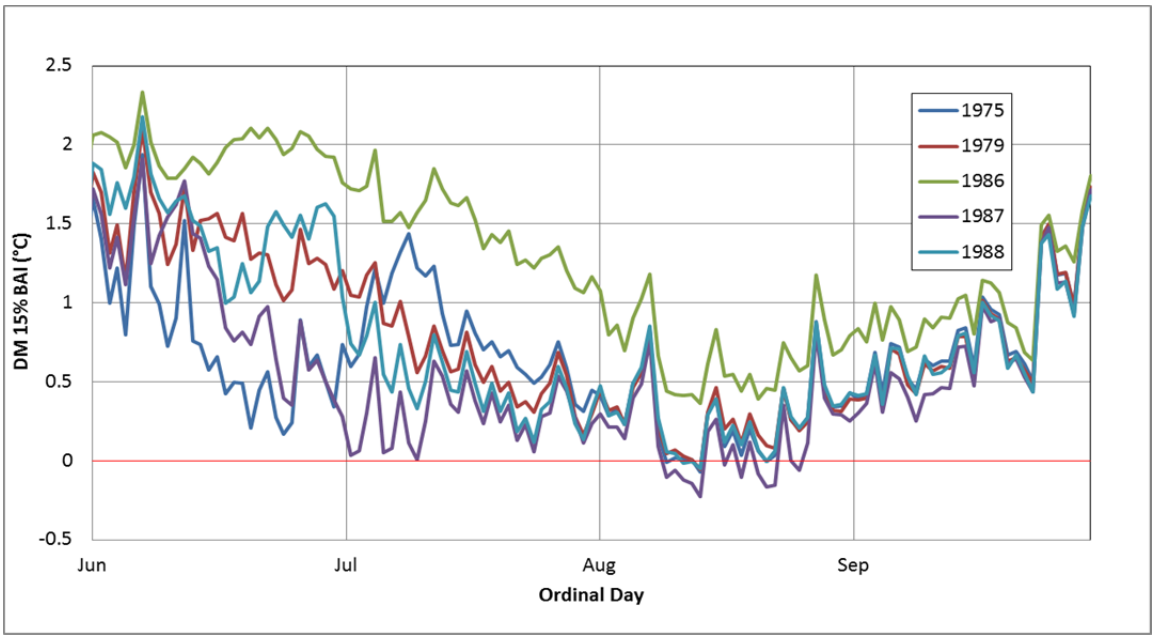

Figure 8. CR-HSU DM 15% BAI

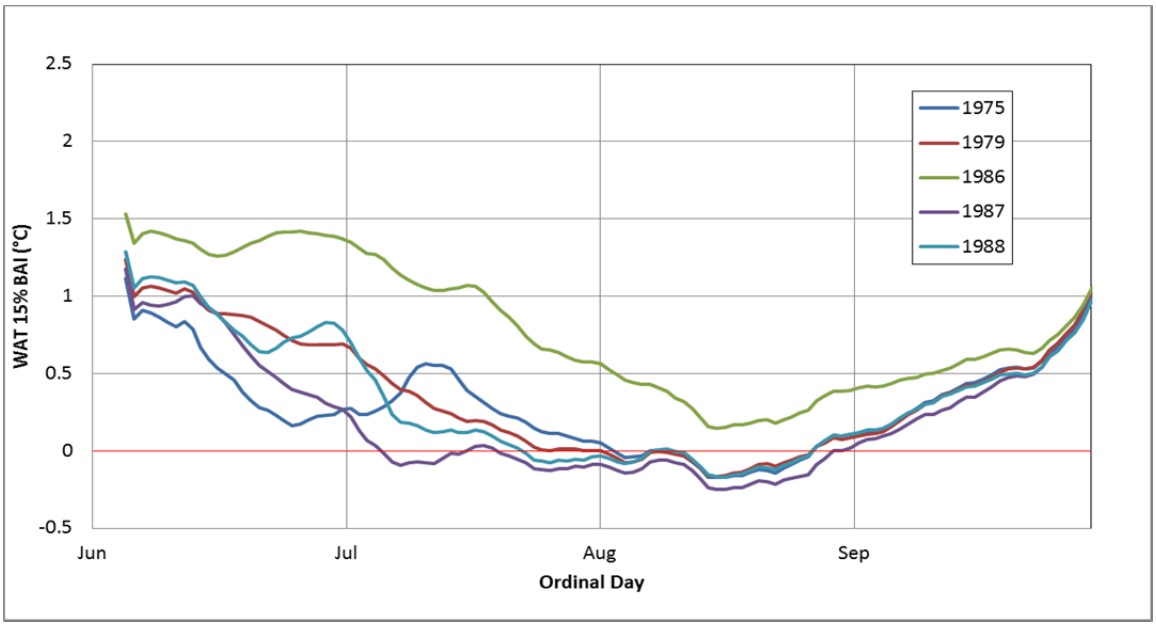

Figure 9. CR-HSU WAT 15% BAI

As noted above, the 15% BAI time series were also plotted by year to support review of spatial patterns within a given simulation year. As an example, the set of 15% BAI time series for 1987 are presented in Figure 10 and Figure 11. These plots reflect the conceptual understanding of warming patterns in the upper Colorado River. First, Figure 10 shows decreasing available increments moving downstream from CR-YGAGE until CR-HSU, which tends to exhibit the highest DM baseline values. Downstream from CR-HSU is Byers Canyon, where shading can

reduce DM values. The DM available increment values increase below Williams Fork Reservoir, as shown by CR-PAD, due to releases from Williams Fork. Similar patterns are apparent for WATs (Figure 3), though the cooling effect of shading through Byer's Canyon results in little change in baseline WATs downstream of CR-HSU. All years exhibit this general agreement with the conceptual system understanding, which adds confidence to use of simulation results for the antidegradation analysis.

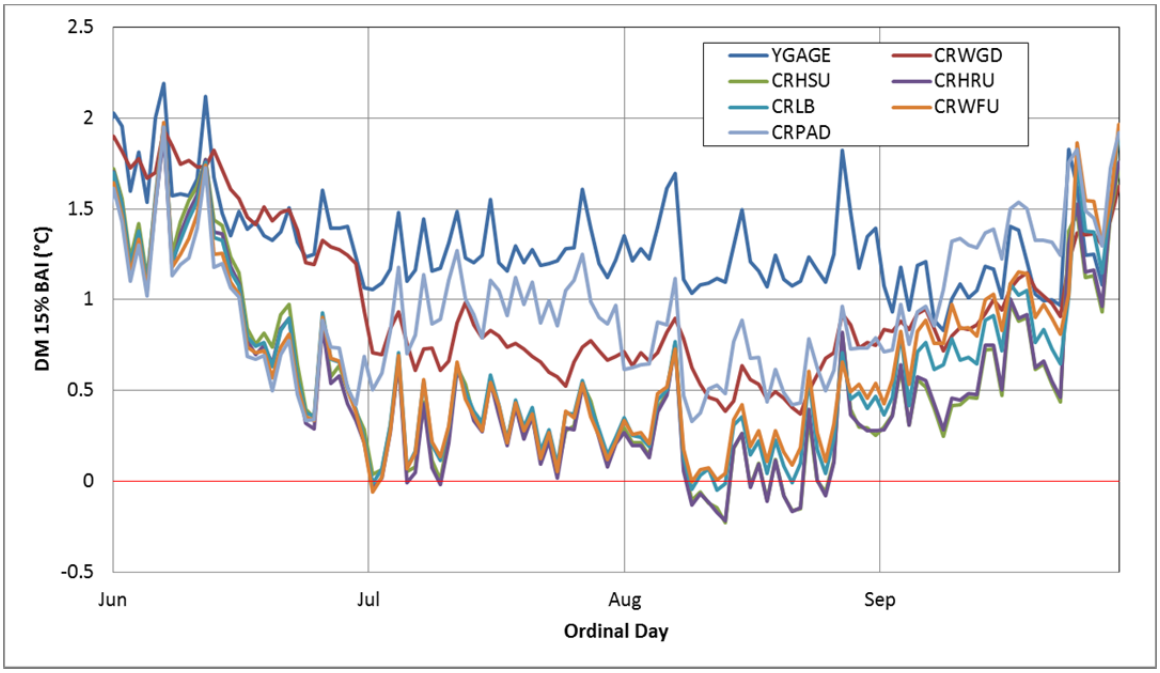

Figure 10. 1987 DM 15% BAI

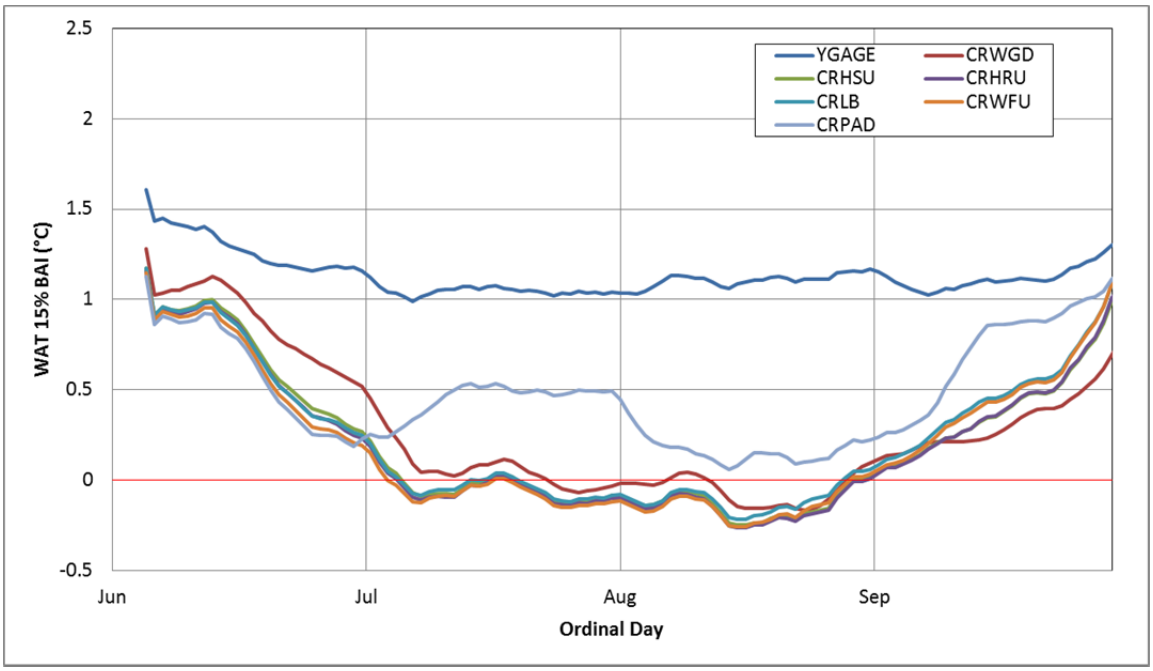

Figure 11. 1987 WAT 15% BAI

Additionally, as shown in Figure 8 through Figure 11, there are times when the available increment is negative, indicating that the simulated baseline exceeded the relevant standard, leaving no available increment. Negative BAI values were anticipated in the development stages of this analysis because a portion of the focus reach is on the 303d list for temperature. Overall, there are periods of time with no available increment for either DMs or WATs at all gages between Windy Gap Reservoir and the confluence with Williams Fork. CR-YGAGE and CR-PAD do not exhibit negative available increments for DMs or WATs for any of the simulation years. Table 2 and Table 3 summarize the days with no available increment at each location for DMs and WATs, respectively. Zero-values are shaded to support visualization of spatial and temporal patterns.

Table 2. Count of Days with No Baseline Available Increment for DM (Baseline Condition Excursions)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	0	3	5	0	0	0
1979	0	0	1	2	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	11	14	5	2	0
1988	0	0	4	4	0	0	0

Table 3. Count of Days with No Baseline Available Increment for WAT (Baseline Condition Excursions)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	14	23	24	22	25	0
1979	0	6	25	33	29	34	0
1986	0	0	0	0	0	0	0
1987	0	31	53	53	48	54	0
1988	0	11	33	35	31	36	0

1.3.4 Step 4: Assessing Antidegradation with Model Results

As the fourth step in the analysis, model results for cumulative-effects simulations were compiled for development of temperature effects time series. Simulated hourly results at all focus locations were extracted from the model, and DM and WAT values were calculated using the same WQCD tool used on the observed data. Existing-conditions (baseline) temperature time series for each year at each location were subtracted from cumulative-effects time series. The product is the set of DM and WAT time series defining the modeled temperature effects attributable to the proposed project and RFFAs at each location. These time series are compared directly to BAI and 15% BAI time series to support the antidegradation assessment.

A total of six cumulative-effects simulations were conducted as part of the WGFP dynamic temperature modeling. As discussed in Section 1.1, the simulated years were the five years of the 15 years of daily hydrologic modeled flows that were identified as having the potential for exhibiting project-caused temperature increases (1975, 1979, 1986, 1987, and 1988).

Additionally, 1975 hydrology is also simulated under a different cumulative effects assumption (a July 15 [two week earlier] start to 5412 Releases from Granby Reservoir), for a total of six simulation years. For all cumulative effects simulations, 2007 meteorological conditions were applied, making flow the only variable between the paired existing-conditions and cumulative-effects runs.

A full set of graphical comparisons 15% BAI and simulated temperature effects is presented in Attachment B. For each location and simulation year, plots were compiled showing the simulated temperature effects as a difference, the BAI, and 15% of the BAI. Plots are presented for DMs and WATs. As an example, results from CR-HSU for DMs and WATs for 1975 are shown in Figure 12 and Figure 13. Notice that plots for 1975 simulation results include one run with an August 1 start data for 5412 Releases from Granby Reservoir and one run with a July 15 start date for those releases. All other years were only simulated with an August 1 start date.

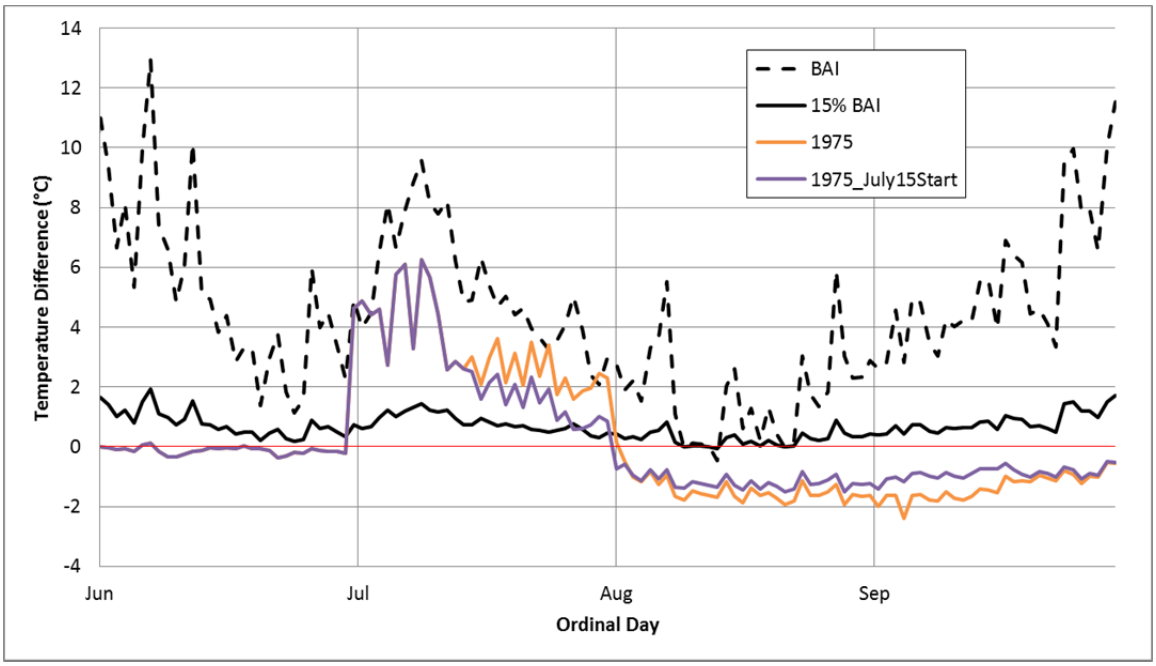

Figure 12. Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

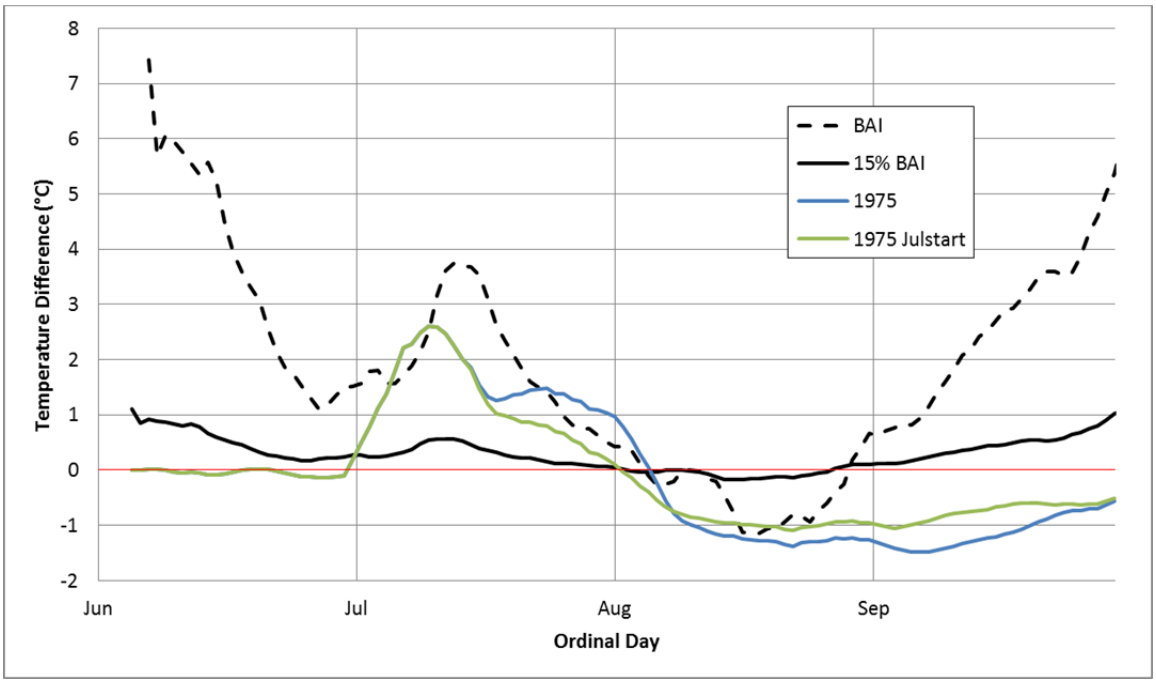

Figure 13. Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

Several measures of these comparisons were generated, recognizing the complexity of information needs for the antidegradation analysis. First, in accordance with guidance from CDPHE (2014b), counts of excursions (simulated exceedances of standards) were generated for each location and each simulation. Excursion counts were compiled and compared for existing conditions and cumulative effects. Second, also in accordance with guidance from CDPHE (2014b), counts of days with predicted temperature increases in excess of the 15% BAI were compiled for each simulation. Third, counts were also compiled for days on which temperature decreases are simulated for cumulative effects. The intended purpose of this count is to support discussion of potentially offsetting beneficial effects. All summary information was prepared for DM and WAT metrics.

2 Results and Discussions

In this section, summary results from the analysis of all gage locations are presented, followed by discussions of antidegradation. The discussions are broken up spatially based on similar patterns in findings due to common major influences on simulated temperature results. These discussions do not comprise an official assessment of antidegradation, but instead are provided to support CDPHE in their analysis of antidegradation of stream temperature for the 401 Certification of the Windy Gap Firming Project.

2.1 Summary of Calculation Results

As described in Section 1.3.4, summary measures of the comparisons between simulated temperature effects and baseline available increments were compiled to support the

antidegradation assessment. Several measures of these comparisons were generated, recognizing the complexity of information needs for the antidegradation analysis. The following subsections present these compilations, and results are referenced in the subsequent assessment discussions by reach.

2.1.1 Counts of Simulated Temperature Excursions

Counts of excursions for existing-conditions and cumulative-effects simulations were generated from modeled results for DMs and WATs. Tabular results for existing conditions are presented in Table 2 and Table 3 in Section 1.3.3. Counts of days with excursions for cumulative-effects simulations are presented below in the same format in Table 4 and Table 5.

Table 4. Count of Days with DM Temperature Excursions for Cumulative-Effects Simulations

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	0	3	5	1	1	0
1975_Jul15_5412*	0	0	1	3	1	1	0
1979	0	0	3	4	0	2	0
1986	0	0	0	0	0	0	0
1987	0	0	3	6	1	2	0
1988	0	0	0	0	0	0	0

*This run refers to the simulation of an earlier start date (July 15) for cumulative effects 5412 Releases from Granby Reservoir compared to August 1 for other runs.

Table 5. Count of Days with WAT Temperature Excursions for Cumulative-Effects Simulations

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	0	16	21	19	28	0
1975_Jul15_5412*	0	0	6	16	9	30	0
1979	0	11	18	24	20	34	0
1986	0	0	0	0	0	0	0
1987	0	11	31	37	33	40	0
1988	0	0	12	14	13	15	0

*This run refers to the simulation of an earlier start date (July 15) for cumulative effects 5412 Releases from Granby Reservoir compared to August 1 for other runs.

For easier assessment of simulated effects of the proposed WGFP plus RFFAs on the number of days of temperature excursions, difference tables for cumulative effects minus existing conditions are presented in Table 6 and Table 7, and those results are presented graphically in Figure 14 and Figure 15. These tables and figures show that the cumulative effects are simulated to increase the number of days of excursions for DMs and WATs at some locations in some years, but the overall effect is a net reduction in excursions. Specifically, the average reduction in the number of excursion-days (sum of all stations) across the reach for the years with simulated excursions (1975, 1979, 1987, and 1988), is 56 fewer exceedances per year for WATs and 5 fewer exceedances per year for DMs. These simulated decreases in exceedances are attributable to the

5412 Releases. With an earlier start to 5412 Releases (as simulated for the July 15 start in 1975) there is an even greater reduction in exceedances of both DMs and WATs.

Table 6. Simulated Change in the Count of Days with DM Temperature Excursions (Cumulative Effects Minus Existing Conditions)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	0	0	0	**1**	**1**	0
1975_Jul15_5412*	0	0	-2	-2	**1**	**1**	0
1979	0	0	**2**	**2**	0	**2**	0
1986	0	0	0	0	0	0	0
1987	0	0	-8	-8	-4	0	0
1988	0	0	-4	-4	0	0	0

*This run refers to the simulation of an earlier start date (July 15) for cumulative effects 5412 Releases from Granby Reservoir compared to August 1 for other runs.

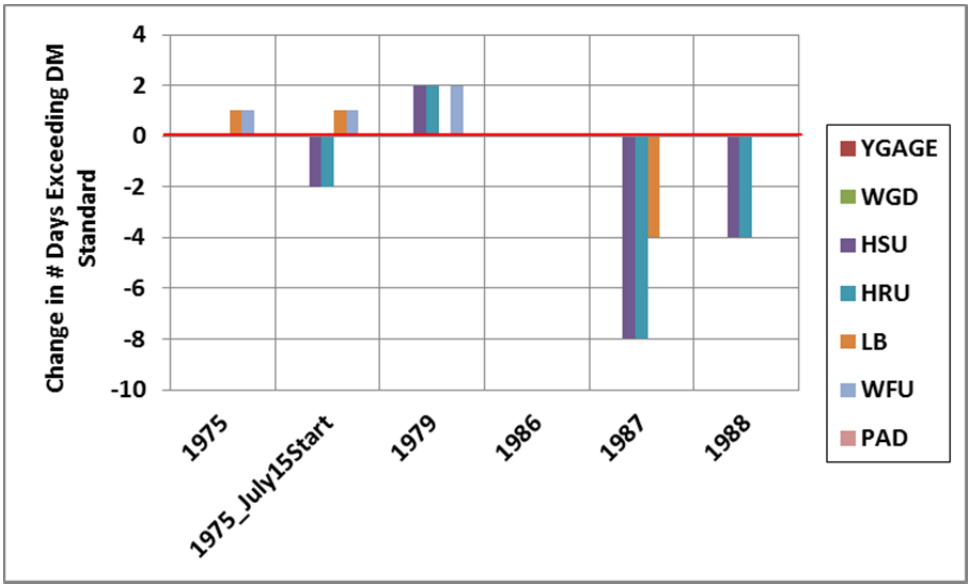

Figure 14. Simulated Change in Count of Days of DM Standard Exceedances (Cumulative Effects Minus Existing Conditions)

Table 7. Simulated Change in the Count of Days with WAT Temperature Excursions (Cumulative Effects Minus Existing Conditions)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	-14	-7	-3	-3	**3**	0
1975_Jul15_5412*	0	-14	-17	-8	-13	**5**	0
1979	0	**5**	-7	-9	-9	0	0
1986	0	0	0	0	0	0	0
1987	0	-20	-22	-16	-15	-14	0
1988	0	-11	-21	-21	-18	-21	0

*This run refers to the simulation of an earlier start date (July 15) for cumulative effects 5412 Releases from Granby Reservoir compared to August 1 for other runs.

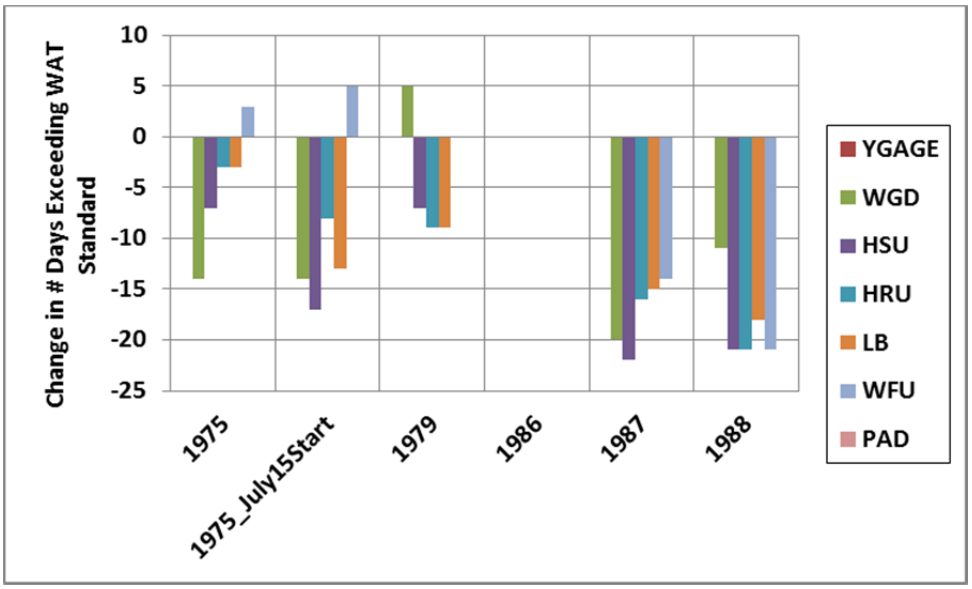

Figure 15. Simulated Change in Count of Days of WAT Standard Exceedances (Cumulative Effects Minus Existing Conditions)

2.1.2 Counts of Days with Warming Greater than 15% BAI

Counts were compiled of the number of days for which there was a simulated increase in temperature for cumulative effects that was greater than the corresponding 15% BAI. Where the BAI was less than zero (i.e., where baseline indicates no available increment), any day with simulated cumulative effects warming of at least 0.05°C was counted. The purpose of this second set is to identify any exacerbation of baseline condition excursions. Results for counts of days with simulated cumulative effects warming greater than 15% of the BAI are presented in tabular form in Table 8 and Table 9 and in graphical form in Figure 16 and Figure 17.

Table 8. Count of Days with Simulated Cumulative Effects DM Temperature Increases Greater than 15% BAI

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	26	31	31	31	32	1
1975_July15Start	0	10	30	30	29	28	0
1979	0	52	57	58	58	57	8
1986	0	0	0	0	0	0	0
1987	0	0	36	39	33	33	28
1988	0	4	28	29	26	27	41

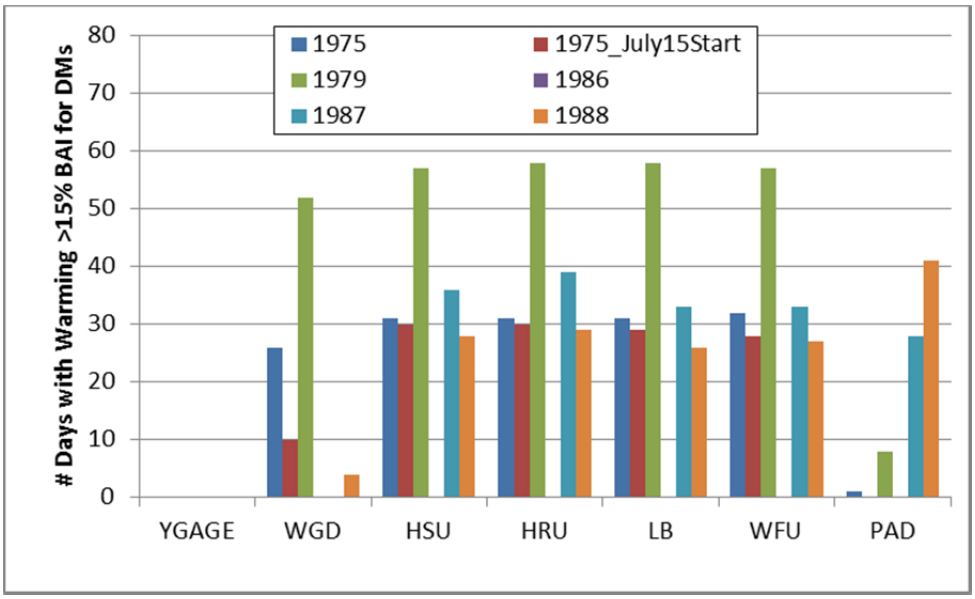

Figure 16. Count of Days with Simulated Cumulative Effects DM Temperature Increases Greater than 15% BAI – Graphical

Table 9. Count of Days with Simulated Cumulative Effects WAT Temperature Increases Greater than 15% BAI

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	33	35	35	35	35	11
1975_July15Start	0	25	31	32	32	32	15
1979	0	58	57	57	57	57	9
1986	0	0	0	0	0	0	0
1987	0	27	50	50	50	50	31
1988	0	14	25	25	24	25	75

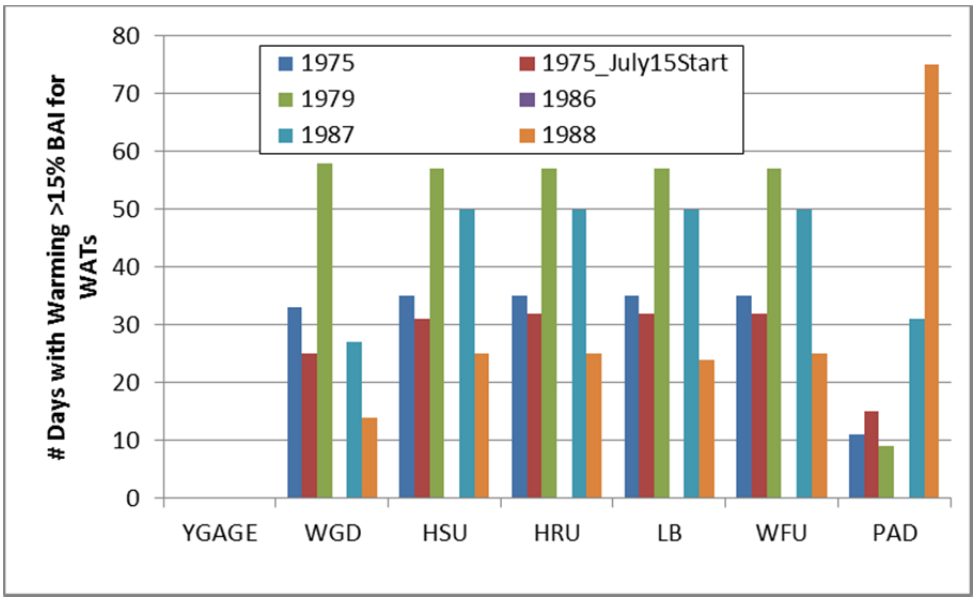

Figure 17. Count of Days with Simulated Cumulative Effects WAT Temperature Increases Greater than 15% BAI – Graphical

The number of days simulated to have stream temperature increases greater than 15% of the BAI range from 0 to 58 for DMs (out of the 122 days between June 1 through September 30), and 0 to 75for WATs, depending on year and location. Results for the 1979 hydrology consistently produced the greatest counts for DMs and WATs between Windy Gap Reservoir and Williams Fork. The pattern changes at CR-PAD, downstream of Williams Fork, with 1988 being the year of the greatest number of days of increases greater than the 15% BAI. This difference is due directly to simulated operational changes for Williams Fork Reservoir between existing conditions and cumulative effects.

Of the counts of warming, 16% of the WAT count days correspond to warming on days with no available increment (the baseline was already above the relevant standard). In other words, these were days of exacerbation of standard exceedances. For DMs, less than 1% of the counts correspond to warming on days where the baseline already exceeded the standard.

Only CR-YGAGE (located upstream of Windy Gap Reservoir and the Fraser River) consistently exhibited no simulated days of DM or WAT warming greater than 15% of the BAI. Additionally, the high flow year (1986) exhibited no days with cumulative effects greater than 15% of the BAI at any location in the reach. This is an indication that there are no temperature antidegradation issues with the project for the higher flow years, and the modeling focus on dry-to-average years with project effects was appropriate.

2.1.3 Count of Days with Cooling

To consider potentially beneficial cumulative effects, a third measure of the comparison was generated. Specifically, for each location and each simulated hydrologic year, a count of the number of days between June and September with simulated cooling for cumulative effects, compared to existing conditions, was compiled for DMs and WATs. To make these counts directly comparable to counts assessed for warming effects, days of cooling were only counted if

the magnitude of the cooling was greater than 15% of the BAI for that day at the given location. On days with no available BAI, a minimum cooling effect of 0.05°C was set for inclusion as a counted day of cooling. These results are presented in tabular form in Table 10 and Table 11 and in graphical form in Figure 18 and Figure 19.

Table 10. Count of Days with Simulated Cumulative Effects DM Temperature Decreases (Cooling)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	36	52	55	54	44	38	29
1975_July15Start	10	41	49	49	34	31	27
1979	41	53	53	50	46	37	14
1986	10	32	40	39	35	26	6
1987	48	57	54	52	46	35	33
1988	49	53	56	56	50	40	5

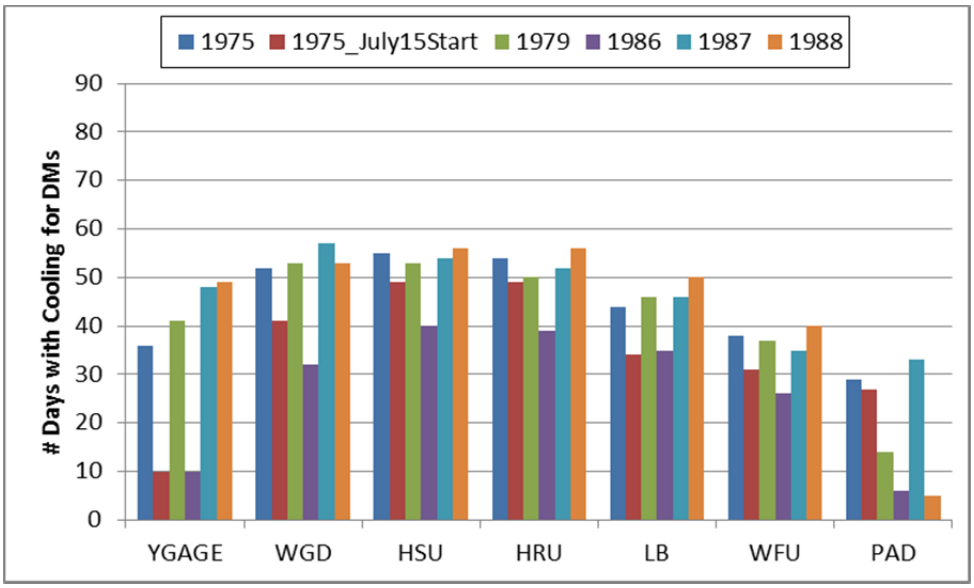

Figure 18. Count of Days with Simulated Cumulative Effects DM Temperature Decreases (Cooling) – Graphical

Table 11. Count of Days with Simulated Cumulative Effects WAT Temperature Decreases (Cooling)

Simulation Year	YGAGE	WGD	HSU	HRU	LB	WFU	PAD
1975	0	55	51	50	48	54	42
1975_July15Start	0	59	52	52	45	50	42
1979	0	55	50	49	47	47	37
1986	0	49	47	47	45	45	28
1987	0	58	54	54	52	51	41
1988	0	59	66	65	64	66	11

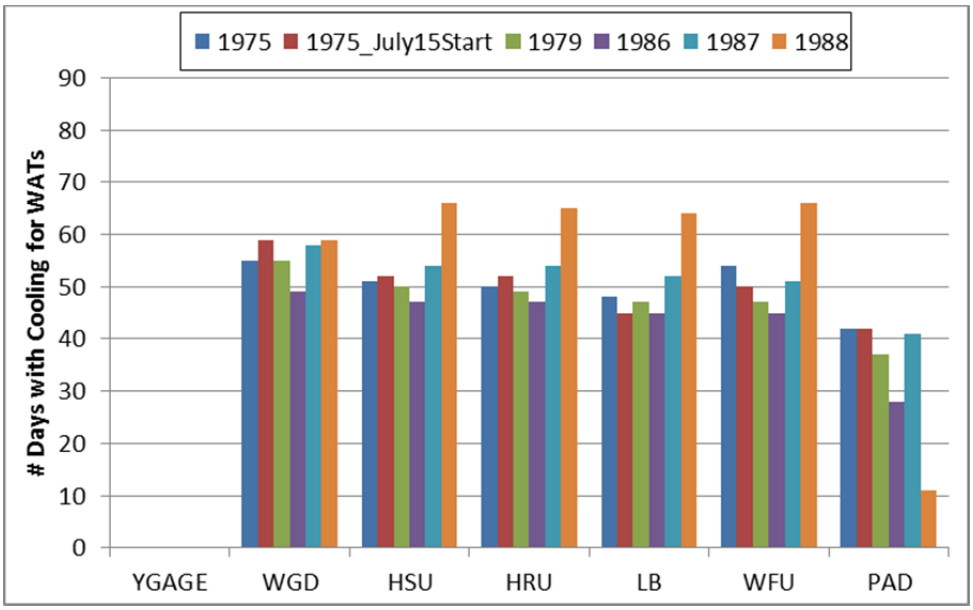

Figure 19. Count of Days with Simulated Cumulative Effects WAT Temperature Decreases (Cooling) - Graphical

The majority of cooling simulated for cumulative effects is the result of 5412 Releases from Granby Reservoir, increasing flow rates in the Colorado River beginning on August 1 (beginning on July 15 for the "1975_July15Start" simulation). Interestingly, the early start to 5412 releases results in lower counts of cooling days as compared to the August 1 start; however, this is a results of limiting the counted days of cooling to those days with cooling greater than 15% of the BAI. Water temperatures are lower on more days with the July 15 start, but the magnitude of the temperature decrease is greater for the August 1 start due to higher flow rates.

By direct count of days, cooling effects outnumber days with warming in excess of 15% of the BAI for DMs and WATs at all stations. This helps explain the reduction in exceedances simulated for cumulative effects, as described in Section 2.1.1. Because of the timing of the 5412 Releases, this cooling occurs in August and September. The number of days of simulated cooling in summer months for the six simulations are compared to counts of days of warming for DMs and WATs in Figure 20 and Figure 21, respectively. These figures also present the subset of counted cooling and warming days that occur on days of current conditions standards excursions. There are more days of cooling on days of standards excursions than days of warming on days of standard excursions.

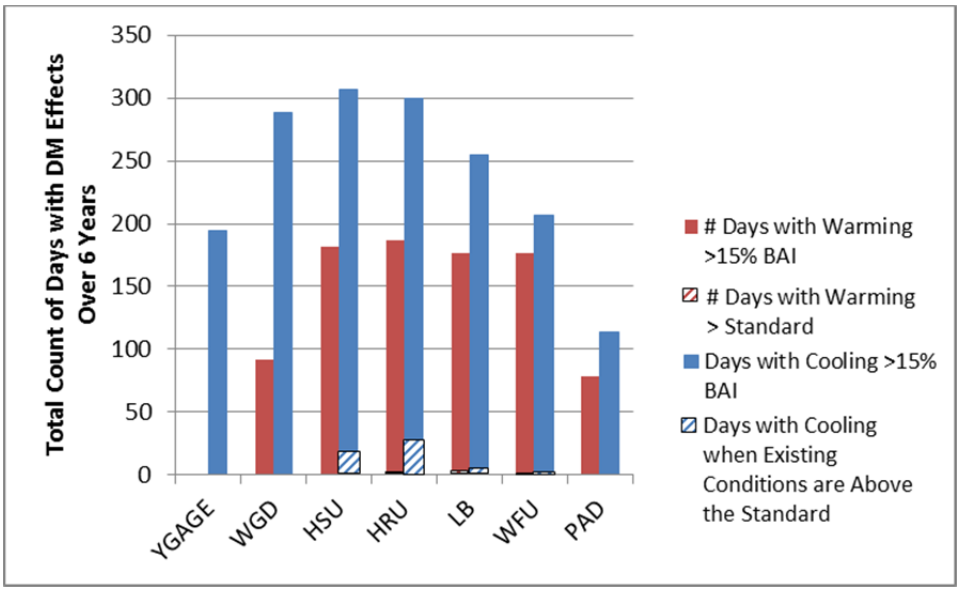

Figure 20. Comparison of Measures of Simulated Summer Cooling and Warming Effects for DMs

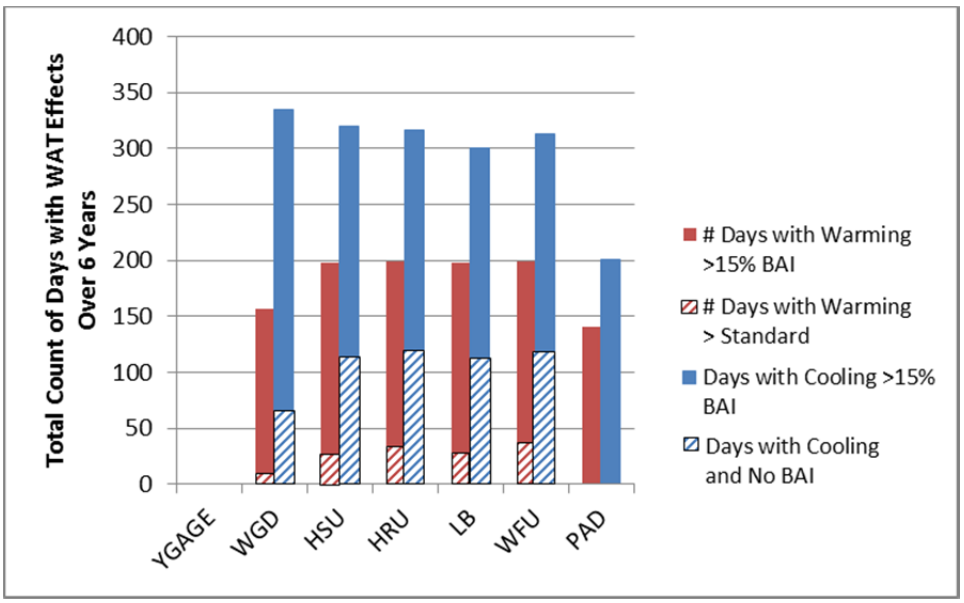

Figure 21. Comparison of Measures of Simulated Summer Cooling and Warming Effects for WATs

2.2 Assessment Discussion - Granby Reservoir to Fraser River Confluence

The reach of the upper Colorado River from Granby Reservoir to the Fraser River confluence is not currently 303d-listed for stream temperature. Water temperatures on this reach are primarily influenced by flows from Granby Reservoir and Willow Creek. There are two continuous temperature gages in this reach, CR-YGAGE and CR-WGU. Discussions of anticipated

cumulative effects with the WGFP at each of these stations are presented in the following subsections.

2.2.1 CR-YGAGE

CR-YGAGE is located downstream of the Granby Reservoir Dam and upstream of Willow Creek (Figure 1). Temperature at this location is primarily influenced by releases from Granby Reservoir. As presented in Section 2.1.2, there are no simulated cumulative effects with the project that will result in increased temperatures greater than 15% of the BAI for DM or WATs at this location. This assessment was based on the modeled baseline conditions.

As noted in Section 1.3.2, for this one location, modeled baselines at CR-YGAGE tended to be consistently lower than observed-data baselines for WATs and DMs. At all other locations, modeled baselines exhibited consistently similar or higher temperatures than the observed-data baselines. Therefore, for additional perspective on the assessment results for CR-YGAGE, simulated temperature differences were also compared to observed-data baselines at this one location. These results are shown graphically in Figure 22 and Figure 23, presenting the BAI, the 15% BAI, and simulated temperature differences at CR-YGAGE for DMs and WATs, respectively. Even with use of the warmer observed-data baselines, no warming in excess of the 15% BAI is simulated at CR-YGAGE.

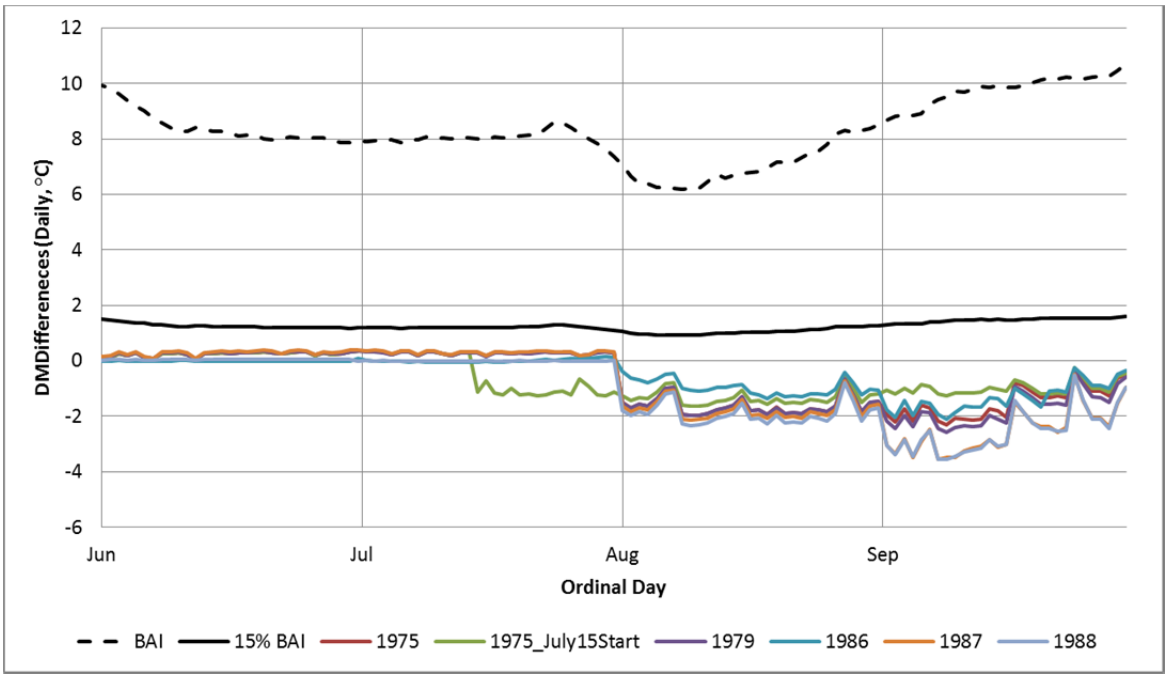

Figure 22. Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

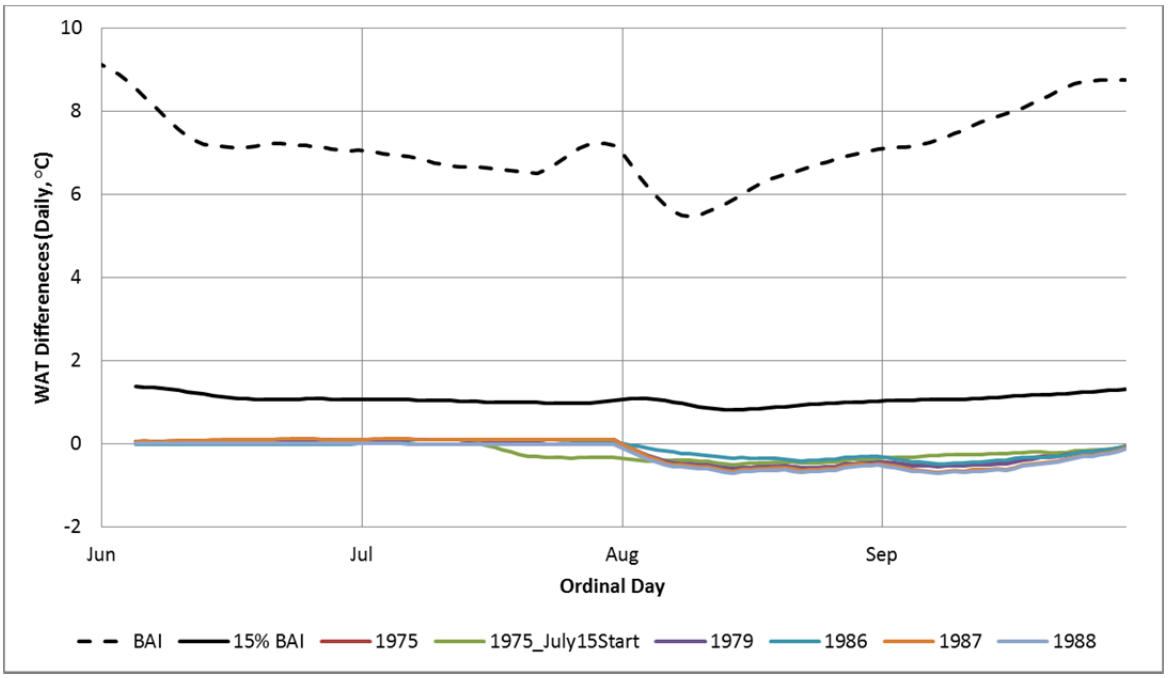

Figure 23. Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

Additionally, due to 5412 Releases, cumulative effects temperatures are anticipated to be cooler for two to two and a half months of each summer (the range is a function of the start date of these additional releases). Based on this, it is expected that there are no antidegradation concerns for water temperature at CR-YGAGE from the proposed WGFP with cumulative effects.

2.2.2 CR-WGU

The CR-WGU temperature gage is located just upstream of the confluence with the Fraser River (Figure 1). As such, temperature at this gage is primarily influenced by any changes to flow from Granby Reservoir or Willow Creek. CR-WGU is considered important for consideration in the antidegradation analysis because it is located at the end of the reach above the Fraser River and the upper Colorado River. As such, it would be expected to exhibit the greatest effects of decreased flow rates from Granby Reservoir and Willow Creek. At the time of EIS model development, the temperature antidegradation approach had not yet been developed by CDPHE; and this location was not designated as a calibration target.

Review of results from CR-WGU reveal inadequate model resolution for use in the antidegradation analysis. Specifically, this location is within a modeled reach between Y-GAGE and Windy Gap Reservoir that includes significant gains which vary in magnitude between existing-conditions and cumulative-effects simulations. Assessment at CR-WGU with modeling results would require reopening of the model for calibration at this location, refining the inflow locations of gains. Unfortunately, there are no data to support such refinements beyond the observed thermal response, and the predictions based on such a refinement would retain uncertainty. Alternatively, because temperature effects on this portion of the upper Colorado River (above Windy Gap and the Fraser River) can be reasonably anticipated through analysis of

anticipated changes in flow from Granby Reservoir, it was decided that a qualitative approach to assessment could be taken at this location.

Because results from the analysis at CR-YGAGE (Section 2.2.1) indicate there are likely no antidegradation concerns at that gage, a closer look at changes in anticipated flows from Willow Creek were evaluated (Figure 24) to assess CR-WGU. As shown in Figure 24, there are few anticipated changes to flows from Willow Creek, except during higher flow years. Additionally, Willow Creek flows comprise a relatively small portion of the total flow reaching CR-WGU.

The combined flows from Willow Creek and Granby Reservoir, for existing conditions and cumulative effects with the project, were also reviewed since these together comprise the majority of flow reaching CR-WGU. Focusing on June through September, the maximum daily decrease in flow rate (and corresponding percentage of existing-conditions flow) was calculated for these combined flows for each year. These results (Figure 25) show that the maximum decrease in flow rate at CR-WGU in dry or average years is expected to be less than 4% (a 3.9% reduction occurs in July of 1975, corresponding to a decrease in flow rate of 3.2 cfs on a day when flow rates are relatively high at 79 cfs[6]). Most low flow years exhibit no summer days with decreases in these combined flow rates. Instead, decreases are focused on wet years of 1980, 1983, 1984, 1985, and 1986. Because of planned operations and 5412 releases, these anticipated decreases in flow rates occur in June and July.

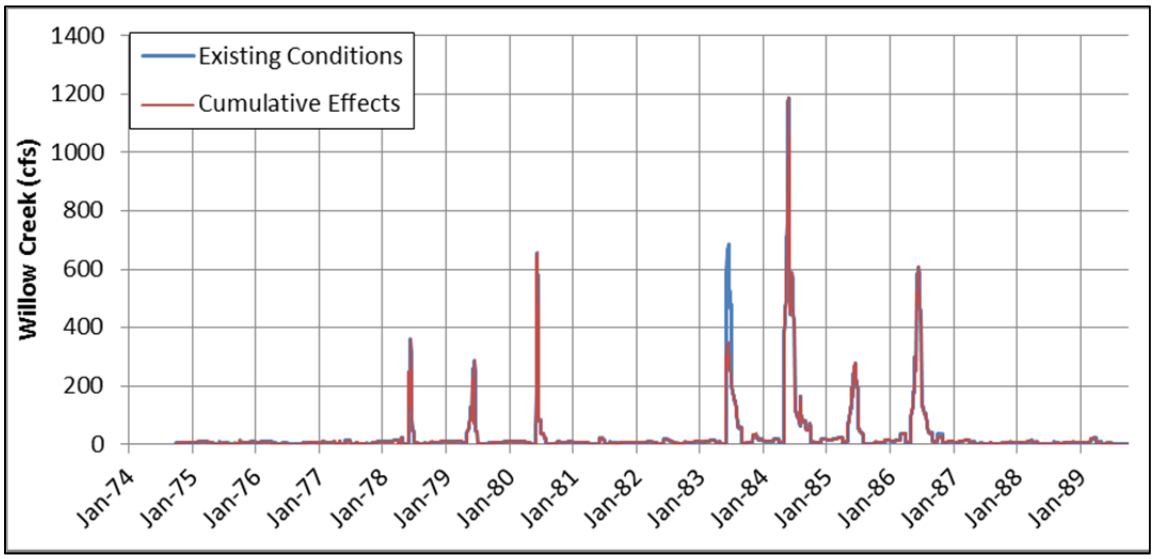

Figure 24. Hydrologic Model Daily Flow Results for Willow Creek Flows into the Upper Colorado River

[6] For perspective, seasonal-low combined flow rates from Willow Creek and Granby Reservoir releases in summer months typically occur in September for existing conditions, and range from 20 to 25 cfs.

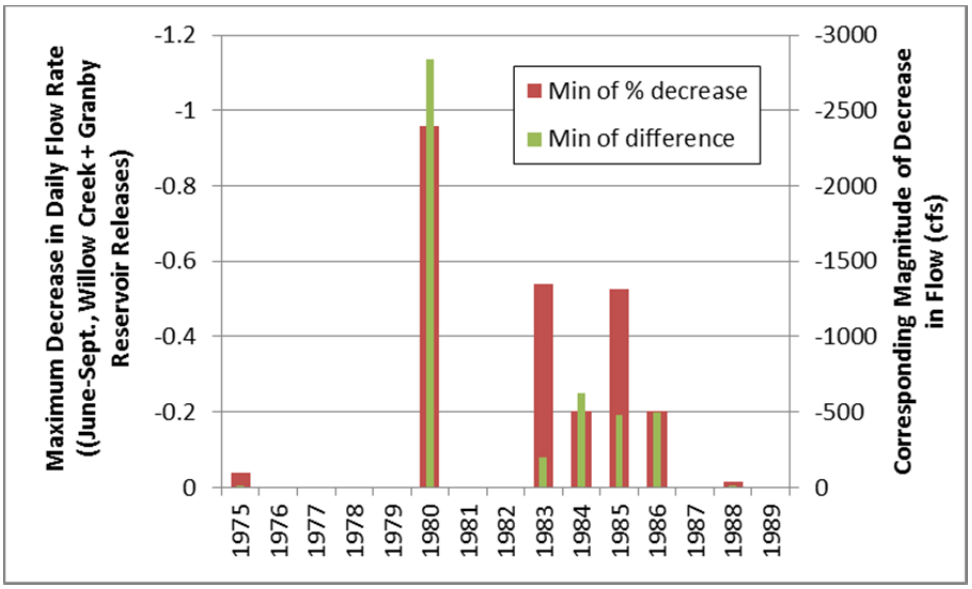

Figure 25. Summary of Maximum Daily (June-September) Decreases in Combined Flows from Granby Reservoir and Willow Creek; Comparing Existing Conditions to Cumulative Effects with Project

This qualitative analysis is less definitive than the quantitative analysis presented for CR-YGAGE; however, the evaluation of flow changes provides a reasonable basis for assessment. Decreases in flow rate are not anticipated during the periods of lowest flows (typically September). Instead, 5412 Release will result in increased flow rates during that time. Anticipated decreases in flow rates occur in June and July and are limited to wetter years. Based on this, no temperature antidegradation-related concerns are anticipated at CR-WGU.

2.3 Assessment Discussion – Fraser River Confluence to Just above Williams Fork

The upper Colorado River from the Fraser River Confluence to just above Williams Fork is the key reach for assessment of temperature antidegradation cumulative effects with the Windy Gap Firming Project. This reach includes inflows from the Fraser River, which exhibits decreased flow rates and increased water temperatures under cumulative effects. The reach also includes Windy Gap Reservoir, from which additional diversions are the primary direct effect of the WGFP on the Colorado River. A portion of this reach (beginning below Windy Gap Reservoir, as shown on Figure 1) is currently on the 303d list for temperature.

There are five long-term continuous temperature gages in this reach that were also included as calibration targets in the dynamic temperature model (Figure 1), CR-WGD, CR-HSU, CR-HRU, CR-LB, and CR-WFU. Measures of anticipated cumulative effects with the WGFP at these stations are summarized in Section 2.1, and those results are discussed here.

The five calibration-target temperature gages between Windy Gap Reservoir and Williams Fork are all subject to the same major drivers for temperature changes under cumulative effects with the project. The major adverse changes are increased diversions from Windy Gap Reservoir and decreased flow rates at higher temperatures from the Fraser River. Also included in cumulative

effects are the 5412 Releases from Granby Reservoir, which result in increased flow rates at times and cooler water temperatures throughout this reach.

The results presented in Section 2.1 and Attachment B show very similar patterns in predicted temperature response for these five gages below Windy Gap Reservoir. All five gages exhibit simulated DM and WAT temperature increases with the cumulative effects simulations in June and July for the simulated years. The cooling effects of the 5412 Releases are also apparent across this reach in August and September. While the magnitude of effect and BAI vary somewhat from station to station, the general pattern of simulated warming and cooling is consistent for all five gages. DM and WAT results from the downstream-most gage, CR-WFU, for the year with the greatest simulated adverse effects, 1979, are presented in Figure 26 and Figure 27 as an example.

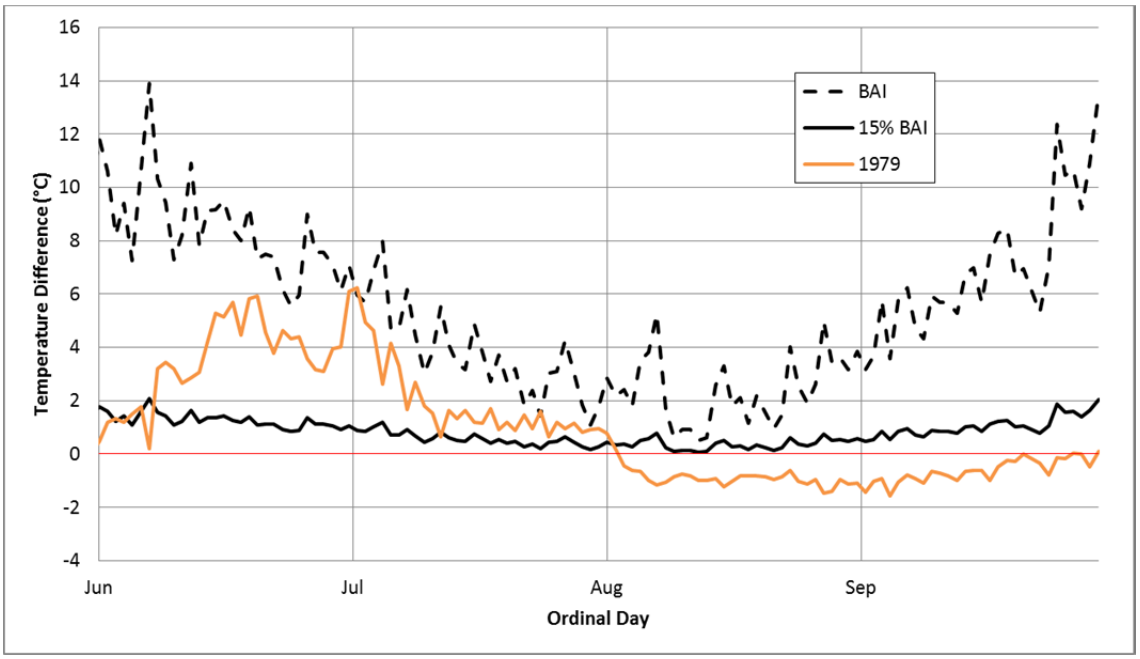

Figure 26. 1979 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

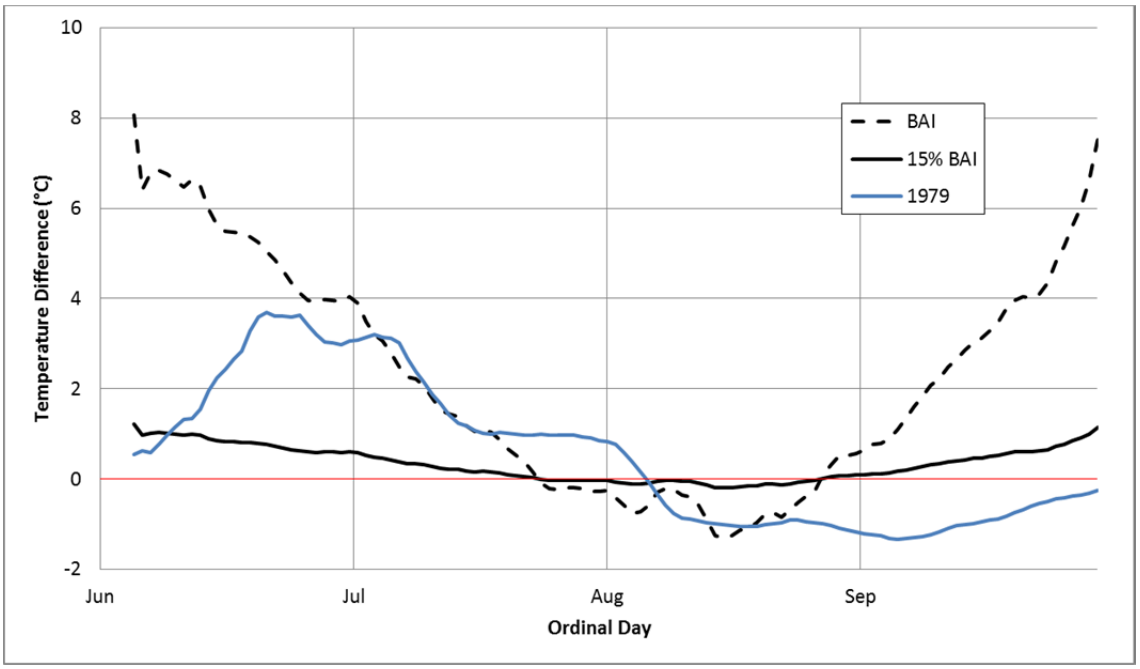

Figure 27. 1979 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

As presented in Table 8 and Table 9, there are simulated temperature increases in excess of 15% of the BAI for DMs and/or WATs at each gage in in this reach in every year except the wet year, 1986. The spatial patterns in the compilation of counts of days with increases greater than 15% of the BAI are very consistent over this reach, particularly from CR-HSU to CR-WFU. Counts range up to 58 days for DMs and WATs.

As described in Section 2.1.1, cumulative-effects results show a net decrease in DM and WAT excursions in these simulated dry-to-average years over this reach. This is the net result of proposed project effects (without mitigation) causing some increases in exceedances, and 5412 Releases causing reductions in exceedances. This result is in agreement with the counts of days of cooling relative to warming in excess of 15% of the BAI.

In summary, the modeling results show increases of water temperatures in this reach in excess of the 15% BAI. The effects are limited to four of the simulated years (no antidegradation concerns noted for the wet year, 1986). These years were selected among the 15 years of daily hydrologic simulation records to include *all* of the dry-to-average years with increased Windy Gap diversions (as well as one of the wet years). There were no dry years (designated based on annual flows) simulated for temperature effects because the WGFP would not be in priority to allow for additional diversions. Figure 28 shows a plot of June through September virgin flow volumes below Granby Reservoir for the temperature model-simulated years, the 15 years of daily simulated hydrology from which the simulated years were selected, and the full 46 years simulated on a monthly basis for the WGFP. The 15 years of daily simulated hydrology cover a wide range of the conditions from the 46-year period, as do the years selected for the dynamic temperature modeling.

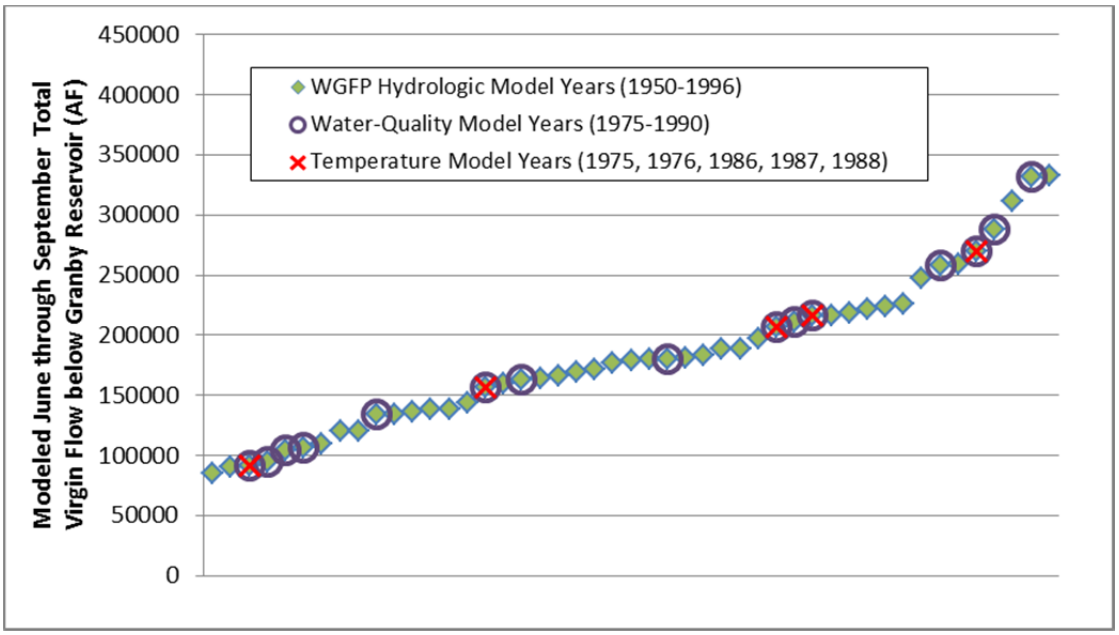

Figure 28. June-September Virgin Flow Totals Below Granby Reservoir for WGFP- Simulated 46-Year Period of Record (1950-1996), 15-Year Daily Simulation Years; and Temperature Simulation Years

Based on this, it is reasonable to extend the analysis to state that the results indicate that temperature increases are anticipated in excess of the 15% BAI for DMs and/or WATs in four out of 15 years at CR-WGD, CR-HSU, CR-HRU, CR-LB, and CR-WFU. In addition, the analysis shows cooling effects in excess of the 15% BAI (due to 5412 Releases) on more days than the warming in excess of the 15% BAI. A net reduction in DM and WAT temperature exceedances is also simulated across this reach, due to 5412 Releases. Cooling effects of 5412 Releases would occur in all years, not just in years with additional WGFP diversion.

2.4 Assessment Discussion - Below Williams Fork (CR-PAD)

Based on the conceptual understanding of river temperatures in the upper Colorado River, dynamic temperature modeling focused on the reach extending from Granby Reservoir to Williams Fork. This was based on patterns in observed data indicating a change in the temperature regime starting at Williams Fork in response to releases from Williams Fork Reservoir (Hydros, 2011). Specifically, there is a change in flow patterns below Williams Fork; and, there is a corresponding change in temperature patterns below Williams Fork, including a break in observed temperature excursions. In other words, temperatures on the Colorado River below Williams Fork tend to be more controlled more by releases from Williams Fork than conditions upstream of the Williams Fork confluence. While effects upstream would have some effect downstream of Williams Fork, the influence of upstream effects is expected to decrease at this point. As such, this was identified as a reasonable boundary for the extent of modeling (Hydros, 2011).

The dynamic temperature model included one gage below the Williams Fork confluence (CR-PAD). Observed and simulated results from that location were compiled to conduct the

antidegradation analysis. Results of that analysis support the conceptual model. Specifically, the consistent patterns of warming below Windy Gap Reservoir change sharply below the Williams Fork confluence at CR-PAD. This is apparent in Figure 16 and Figure 17 in year-to-year patterns. It is also apparent in visual comparison of simulated DM and WAT temperature difference plots from CR-PAD to those from the upstream reach. As an example, simulated temperature difference results from 1975 at CR-PAD are presented in Figure 29 with results from other stations downstream of Windy Gap Reservoir. Review of this figure indicates a consistent pattern in warming/cooling effects from Windy Gap Reservoir (WGD) to upstream of Williams Fork (WFU), and a sharp break in that pattern at CR-PAD (with warming at times of cooling upstream and vice versa), confirming the conceptual understanding noted above.

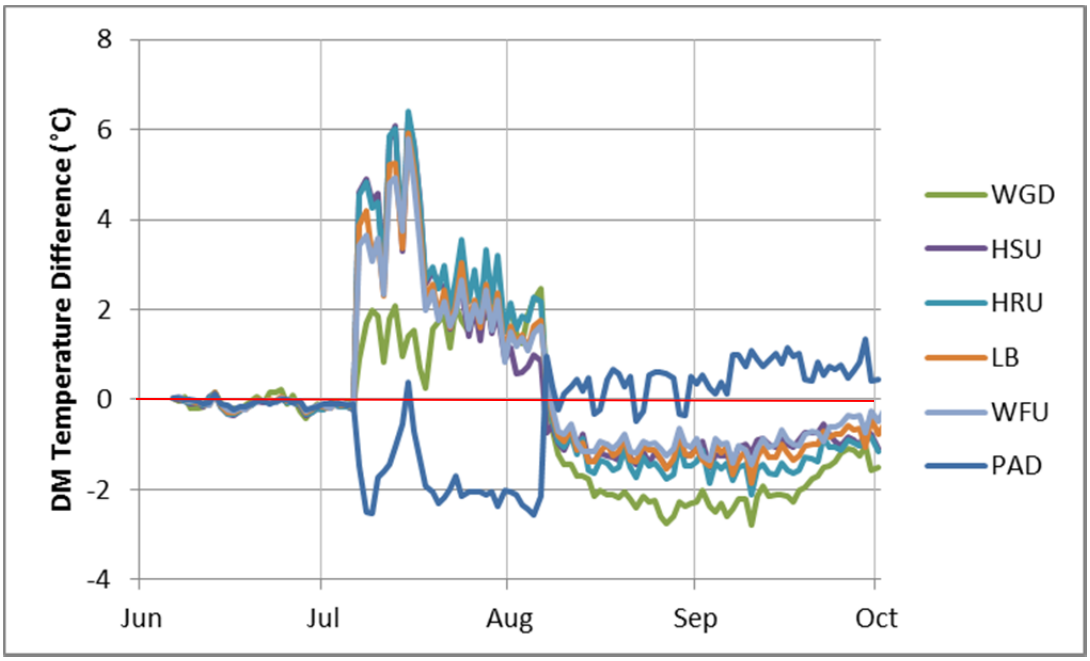

Figure 29. 1975 Model-Simulated DM Differences Downstream of Windy Gap Reservoir

Because Williams Fork operations are unrelated to the Windy Gap Firming Project, relative effects by year also differ at CR-PAD as compared to upstream stations. For example, at CR-PAD, the 1988 simulation results show some of the largest DM and WAT increases simulated at that location for cumulative effects. Further, these largest increase occur in August during 5412 Releases from Granby Reservoir, when upstream gages exhibit cooling. This is due to a sharp decrease in releases from Williams Fork at this time in 1988 for cumulative effects compared to existing conditions. In short, while warming and cooling effects upstream affect conditions at CR-PAD somewhat, these effects seem to be obscured/overwhelmed by the controlling influence of Williams Fork operations.

A review of the antidegradation results shows that there are no existing-conditions or cumulative-effects temperature excursions, though there are days of cumulative effects warming in excess of 15% of the BAI at CR-PAD. This level of warming is simulated in all years except the simulated wet year, 1986. Unfortunately, the frequency of these effects at CR-PAD cannot be scaled to the 15 years of record from which the simulation years were selected, as was done for upstream

gages[7]. Generally, with some exceptions, there was a simulated decrease in number of days of warming exceeding 15% of the BAI for DMs and WATs, comparing CR-PAD to the next upstream location, CR-WFU. Also, in total, there were more simulated of days of cooling through the summer months at CR-PAD than warming above the 15% BAI. This is true on a year-by-year basis for all simulated years except 1988, due to simulated Williams Fork cumulative effects operational changes that year.

3 Findings Summary

To support the 401 Certification antidegradation assessment of stream temperature for the Windy Gap Firming Project, a quantitative analysis of observed and simulated water temperature data on the upper Colorado River was conducted. This document does not comprise an official assessment of antidegradation, but instead is presented to support CDPHE in their analysis of antidegradation of stream temperature for the 401 Certification of the Windy Gap Firming Project. This is one of the first attempts to conduct an analysis of this type in Colorado. The analysis largely followed the guidance provided by Colorado Department of Public Health and Environment (CDPHE, 2013a, 2014a, and 2014b). The following summarizes cautions and considerations for interpretation of results, as well as findings from the analysis:

Cautions/Considerations for Interpretation

- Project-Specific - The approach and interpretation steps are considered to be project-specific, and may not be appropriate for application to antidegradation assessment of stream temperature on other projects.
- Focus on Model Calibration Target Locations – The assessment focused on model calibration target locations within the dynamic temperature model, though simulation results could be extracted at other locations. This decision recognizes the nature of varying resolution within the model, particularly in terms of distributions of gains and localized channel geometry uncertainty.
- Informed Interpretation of Results – Interpretation of results from the analysis requires a conceptual understanding of the focus reach. For this application, this includes a need to understand the range and general influence of major cumulative effects included in the simulation. Additionally, while the ultimate focus of antidegradation analysis is appropriately on cumulative effects, it canalso be important to understand direct project effects for complicated systems[8].

[7] This is because the years were not selected in an attempt to target effects of operational changes at Williams Fork, so it is not clear whether other years might also exhibit effects at this location. Any other years with effects at this location would be attributable to Williams Fork operations, as opposed to the Windy Gap firming Project.

[8] For example, there may be cases where there are no direct project effects on temperature at a certain time or location. In such cases, non-project cumulative effects alone may result in exceedances of 15% of the BAI, which could lead to an inappropriate assessment indicating the project failed to meet antidegradation criteria.

- *Mitigation* – As a reminder, mitigation, in the form of real-time monitoring with operational response are being developed for this reach as part of the Windy Gap Firming Project, but beneficial effects of such mitigation activities are not included in the modeling results assessed here.

Results of Analysis

- Granby Reservoir to Fraser River – Results of the quantitative assessment at CR-YGAGE and qualitative assessment at CR-WGU do not indicate any river temperature antidegradation concerns in this reach upstream of the Fraser River.
- Fraser River to Williams Fork – Competing effects of warming and cooling need to be assessed.
    - *Warming > 15% BAI* - The analysis indicates that there are days at most locations in most years with simulated cumulative effects water temperature increases in excess of 15% of the BAI in summer months (DMs and WATs). In other words, cumulative effects do result in an exacerbation of the adverse temperature conditions across the listed reach at times.
    - *Limited to 4 of 15 Years* - These simulated temperature increases in excess of 15% of the BAI occur in four out of 15 years. This corresponds to the approximate anticipated frequency of additional diversions from Windy Gap in dry and average years for the proposed Windy Gap Firming Project. Other years in the 15-year period exhibited either no additional diversions for Windy Gap Firming or were wet years like 1986, for which no antidegradation concerns are anticipated.
    - *More Cooling Days than Warming* - The analysis revealed extensive summertime cooling effects across this reach due to the 5412 Releases from Granby Reservoir included in the cumulative effects simulations. By direct count of days, cooling effects in excess of 15% of the BAI outnumber days with warming in excess of 15% of the BAI for both DMs and WATs at all locations.
    - *Reduction in Number of Excursions* - The analysis also revealed a net reduction in the number of summertime exceedances of both DM and WAT standards for the cumulative effects simulation, due to the 5412 Releases.
    - *Mitigation* – As a reminder, mitigation, in the form of real-time monitoring and operational response are planned for this reach, but mitigation effects are not included in the results assessed here.
- Below Williams Fork
    - *Different Regime* - Temperatures on the Colorado River below Williams Fork are controlled more by releases from Williams Fork than conditions upstream of Williams Fork. This is part of the conceptual understanding upon which the extent of the original modeled reach was based. It is also apparent in the sharp break in the simulated warming and cooling patterns at CR-PAD as compared to upstream gages. Therefore simulated cumulative effects should be evaluated at this location with recognition that the effects are primarily a response to differences in cumulative effects operations at Williams Fork Reservoir, whose operations are unrelated to the Windy Gap Firming Project.

- *Warming and Cooling at CR-PAD* - Cumulative effects results show that there are summer days of warming in excess of 15% of the BAI for DMs and WATs at this location in all but the simulated wet year, 1986. Also, in total, there were more simulated of days of cooling through the summer months at CR-PAD than warming. This is true on a year-by-year basis for all simulated years except 1988, due to Williams Fork cumulative effects operational changes that year. No temperature excursions are simulated at CR-PAD for any simulations.

In summary, simulated effects on water temperatures in the upper Colorado River associated with the WGFP and RFFAs are mixed. Summer days of increased WAT and DM water temperatures in excess of 15% of the BAI are anticipated in four out of 15 years. The extent of the upper Colorado River over which these simulated effects are, at least in part, clearly attributable to the proposed WGFP is from Windy Gap Reservoir to Williams Fork Reservoir. Over this reach, summer days with anticipated cooling, due to 5412 Releases, exceed anticipated days of warming. Also attributable to 5412 Releases, the net number of DM and WAT temperature exceedances in this reach is simulated to decrease. Additionally, cooling effects of 5412 Releases will occur in all years, not just in years with additional WGFP diversion.

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Attachment A: Approach Details for Development of Observed-Data Baselines and Comparisons to Modeled Baselines

This attachment presents a detailed description of the approach taken to develop stream temperature baselines from observed data for the upper Colorado River. Graphic and tabular summaries of baseline development steps and results are included. Additionally, figures comparing observed baselines to modeled baselines (existing conditions simulations) are provided. This information supports discussions in the main technical memorandum.

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I. Approach for Development of Observed Baselines

The first step in the stream temperature antidegradation analysis for the Windy Gap Firming Project was to develop a baseline from observed data at each gage. This section presents the steps taken to develop those baselines, and discusses any modifications made to original related guidance from the Colorado Department of Public Health and Environment (CDPHE, 2013a). Baselines based on observed data are needed to support assessment of the appropriateness of modeled baselines for the antidegradation assessment. For this project, the baselines based on observed data are not used directly to determine available increment for the reasons described in Section 1 of the main Technical Memorandum.

Because stream temperatures naturally vary temporarily and spatially, a time-varying baseline is needed for each gaging station. Regulation 31 (CDPHE, 2013c) establishes September 30, 2000 as the nominal closing date for defining baseline conditions for antidegradation analysis. However, the earliest available stream temperature datasets that support development of baseline conditions on the focus reach begin in 2005. CDPHE (2013a) indicated that use of this more recent data may satisfy the intent of the baseline date, since hydrologic and meteorological conditions driving the temperature response have not changes markedly since September 2000.

A. Compilation of Observed Data

In accordance with CDPHE guidance (CDPHE, 2013a), all available continuous stream temperature data were first compiled for each gage. The data (hourly or sub-hourly) were processed into daily values of DMs and WATs, applying the Water Quality Control Division's (WQCD) Excel-based temperature standard tool (personal communication from R. Hillegas, 2014). The DMs and WATs were then assigned ordinal day values and plotted on a single graph for each station[1]. As an example, the values generated for CR-WGD are presented in Figure 1 and Figure 2, and the full set of these plots is presented in Attachment A.

[1] Per CDPHE (2013a), DM and MWAT values from leap years (2008 and 2012) were shifted backwards one day to produce clean alignment of dates for the majority of the year (March 1 through December 31).

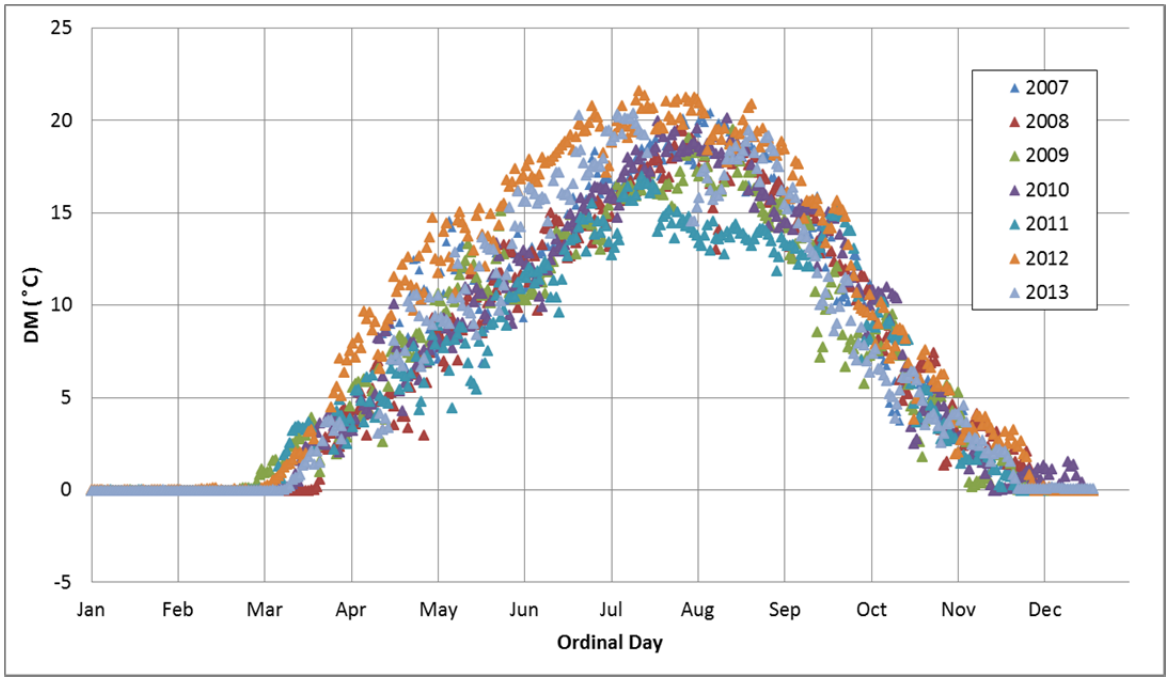

Figure 1. Observed DM Values from CR-WGD

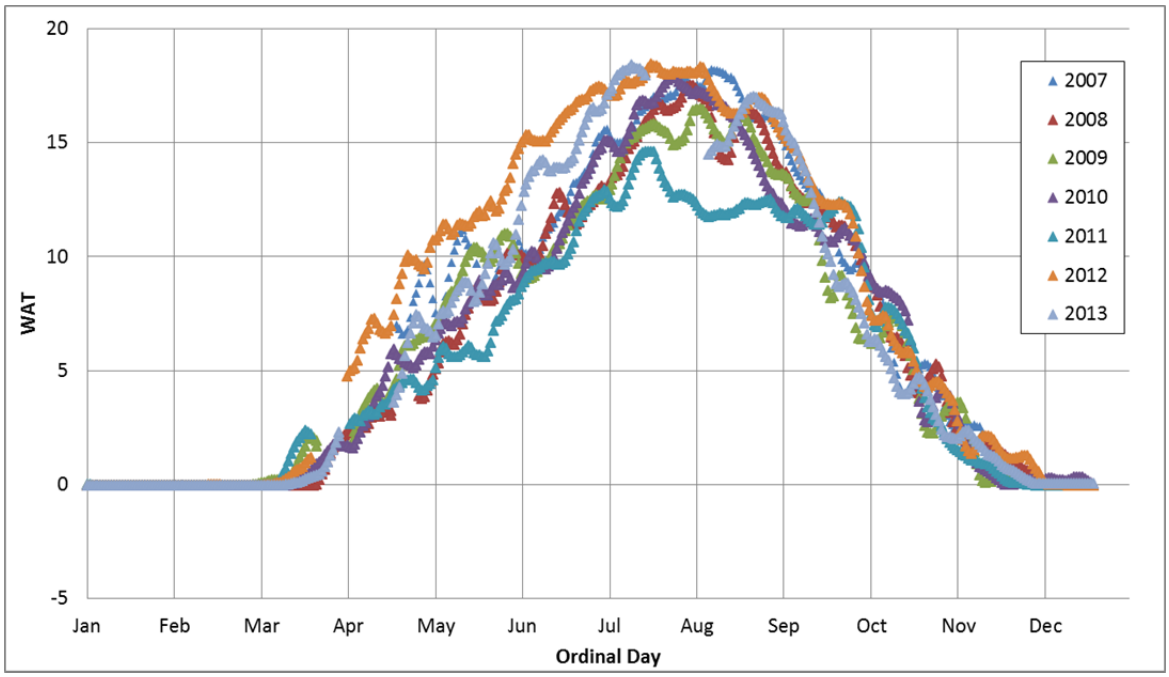

Figure 2. Observed WAT Values from CR-WGD

B. Selection of Subset of Observed Data

From these plots, the second highest value for DM or WAT on each date was selected for each location to generate a new time series for development of a baseline. In cases where there were fewer than three years of available record on a given ordinal date, the highest value on each date

was selected instead of the second highest, per CDPHE (2014a). The values generated for CR-WGD are presented in Figure 3 and Figure 4 as an example, and the full set of these plots is presented in Attachment A. The resulting time series plots for DMs and WATs include values from six to nine different years, depending on the location. In other words, the method of selection of representative values did not tend to limit the analysis to a single-year time series for the locations considered in this analysis.

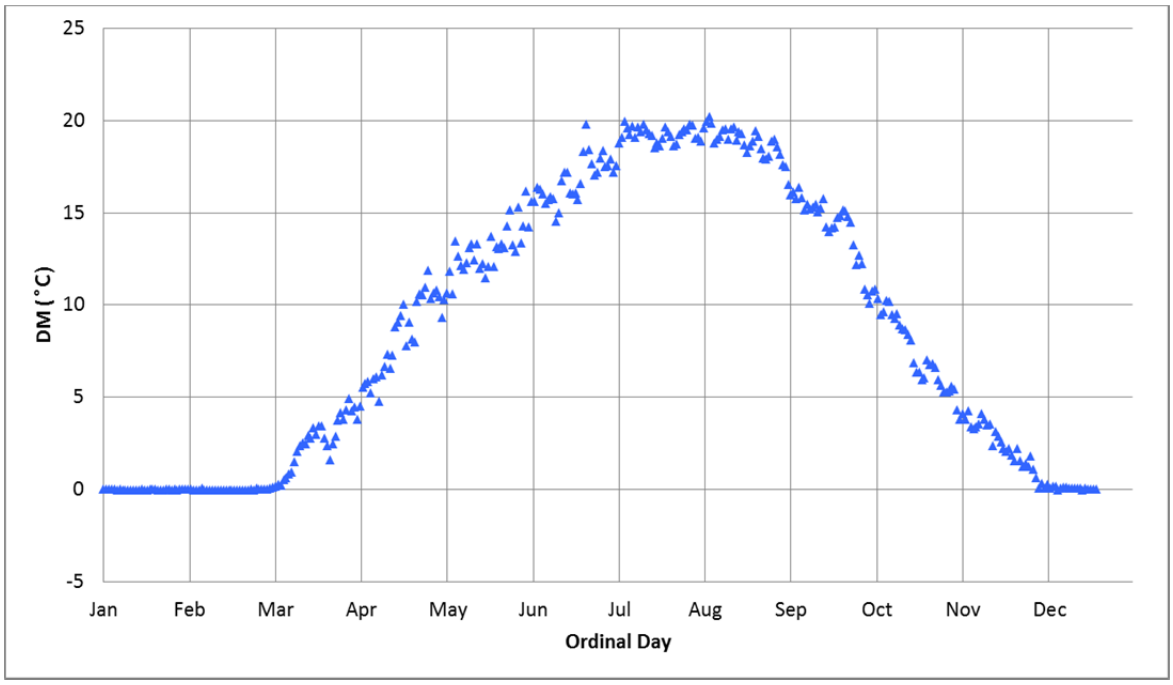

Figure 3. Selected Observed DM Values for Baseline Development for CR-WGD

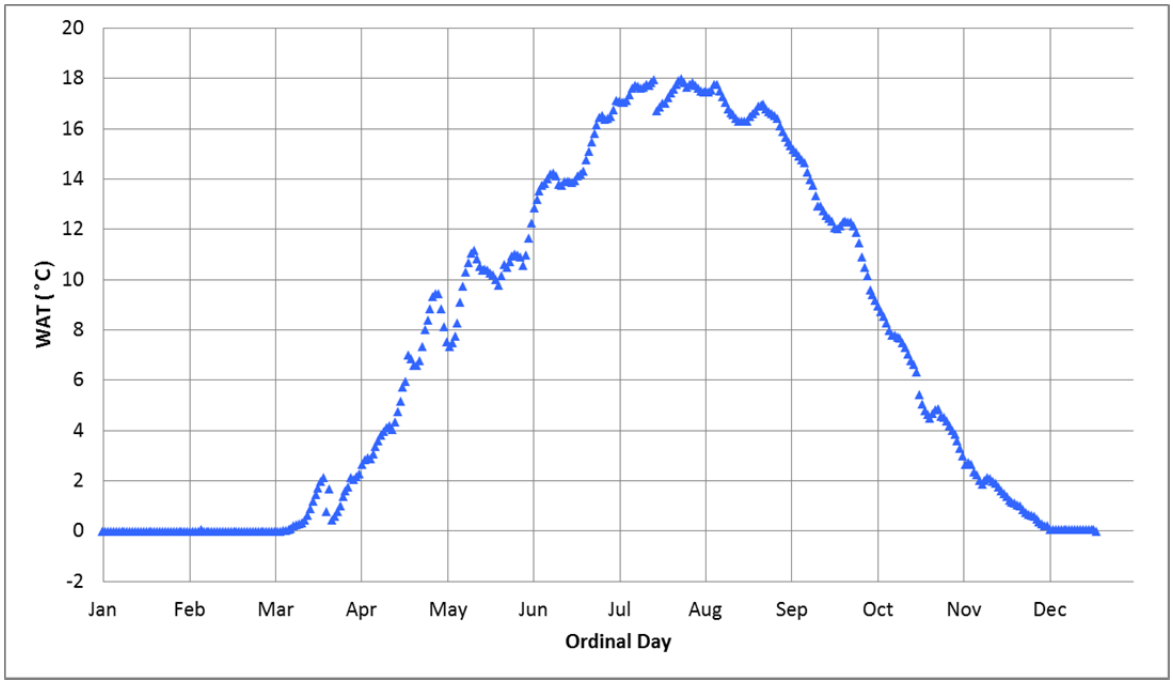

Figure 4. Selected Observed WAT Values for Baseline Development for CR-WGD

C. Calculation of Smoothed Baseline

CDPHE (2013a) indicated a preference for a smoothed baseline, rather than simply assigning the baseline as the selected set of DM or WAT values. The purpose of the smoothing is to reduce day-to-day variation in the selected values and avoid unrealistic day-to-day variation in the calculated BAI, all while maintaining the seasonal pattern. CDPHE (2013a) suggested use of a simple harmonic function curve fitting approach, following the equation provided by Tasker and Burns (1974):

$$T_d = M + A * \cos\left[\frac{2\pi}{365}(d - d_{max})\right]$$

Where,

- T_d = The smoothed baseline daily DM or WAT value;
- d = The ordinal day;
- d_{max} = The ordinal day of the year when the stream temperature reaches its maximum in the smoothed baseline (determined using the Excel solver tool to achieve the best fit); and
- M and A are the intercept and slope, respectively, of the linear fit between observed DM or WAT values and the cosine function.

Applying this approach to the upper Colorado River temperature data produced reasonable fits at many locations; however, some concerns were noted. These concerns prompted recommendation for two modifications to the CDPHE-drafted approach: (1) a modification to the focus period for most locations, and (2) use of a different smoothing approach at two locations. These proposed approach modifications are considered project-specific, and may not be appropriate for application to antidegradation assessment of stream temperature on other projects.

The first approach modification is recommended to address observations that the shape of the simple harmonic curve-fit was influenced, in some cases, by potentially less representative data. Specifically, the curve-fit was found to be adversely influenced by periods of ice record (e.g., CR-WGD; see Figure 3) or periods with limited numbers of years of observations. Periods of water temperature records with limited numbers of years of observations tend to occur in the earlier and latter months of the respective measurement season at each location. Because there are often fewer years of results during these periods, the baseline selected values are often based on one or two years of data, resulting in portions of the baseline value set that do not fit in well (in terms of seasonal pattern) with the rest of the selected values. The DM data, the selected baseline values, and the resulting curve fit for CR-LB are presented in Figure 5 as an example of this issue.

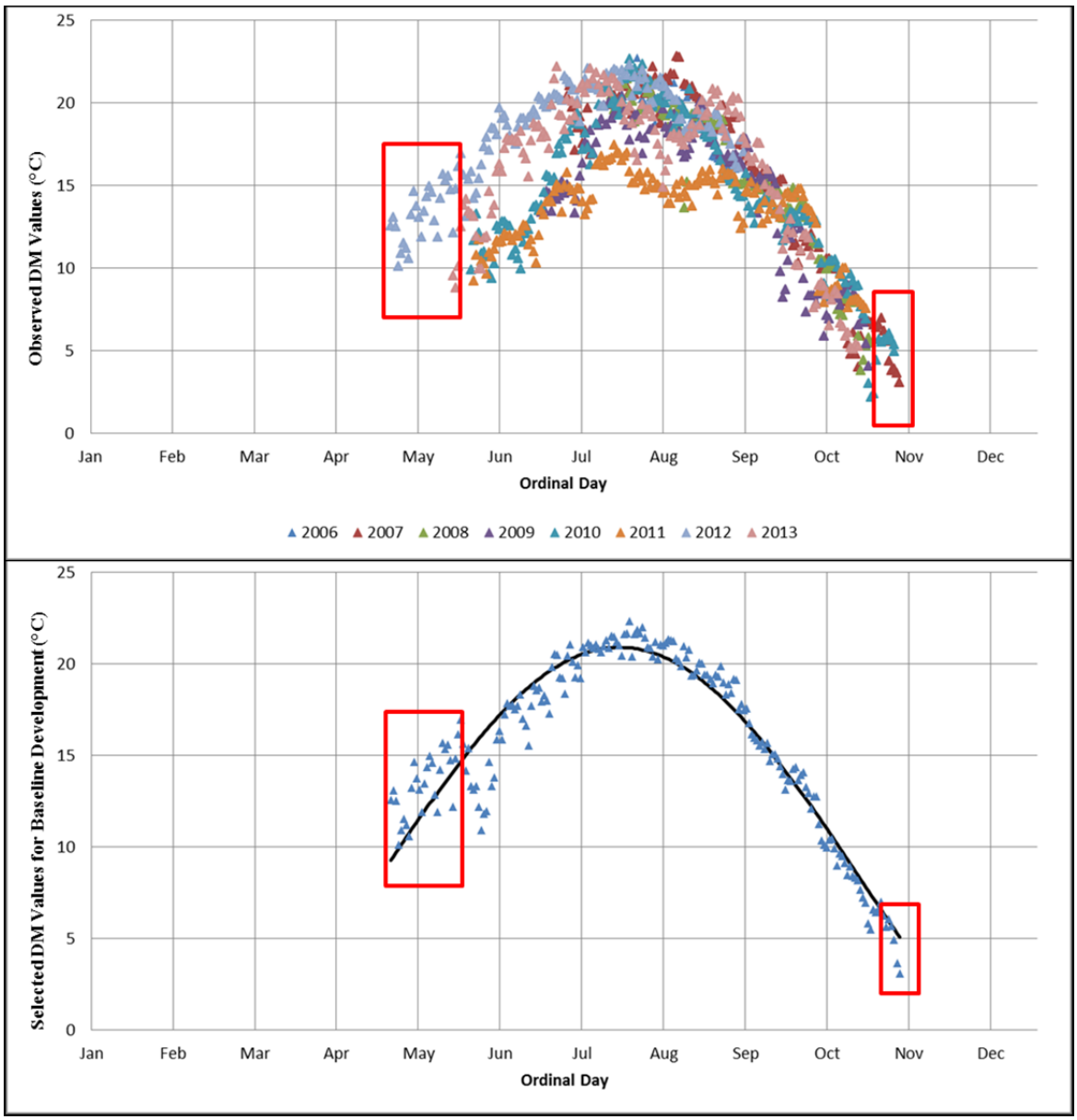

Figure 5. CR-LB Baseline Development Plots to Illustrate Issues of Limited Data in "Tail" Months

Because the period of focus for this particular analysis is limited to June through September (limitation determined by the period for which modeling results exist), the approach was modified to fit the simple harmonic function only to the baseline values between June 1 and September 30. This approach was applied to all the gages, for consistency, and improved the correlation-measured fit during these focus months in all cases. This approach removed the influence of limited early/late season data and periods of apparent ice in the records. The resulting smoothed June through September fit for CR-LB is shown in red in Figure 6 along with the full-period fit (in black) for comparison.

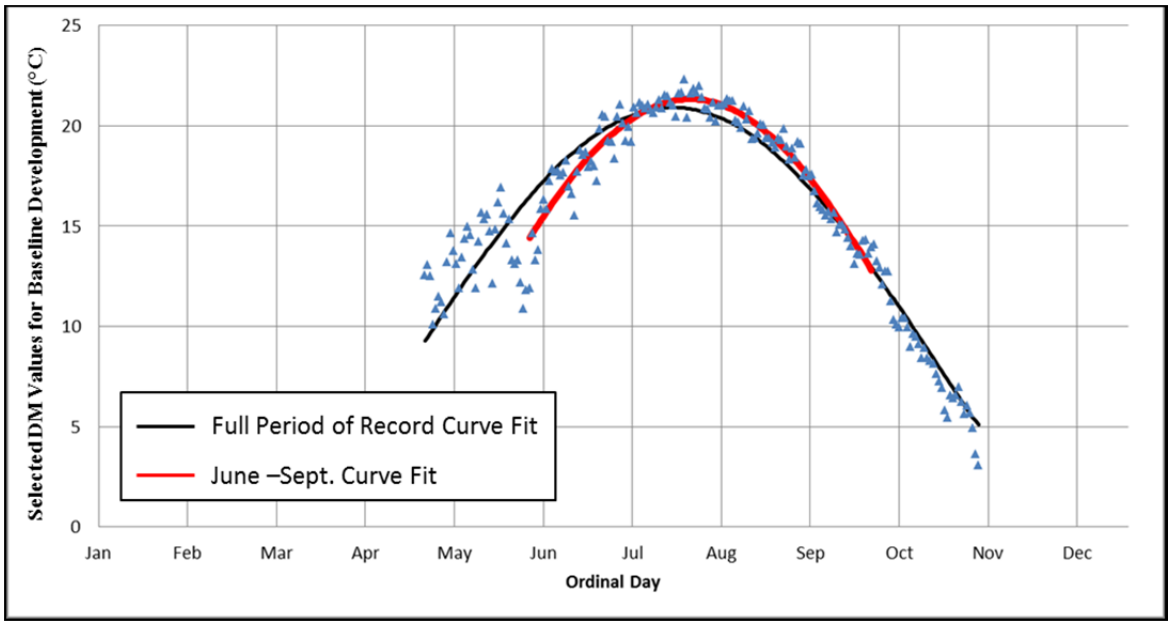

Figure 6. CR-LB DM Baseline Curve Fitting, Full Period of Record and June-through September Only

In addition to the modification to focus curve fitting on June through September, a second approach modification to definition of baseline was conducted at two locations. Curve fitting was found to be relatively poor at locations below major reservoir releases, where signs of strong operational controls on seasonal temperature response were apparent. This was observed and CR-YGAGE, downstream of Granby Reservoir, and CR-PAD, downstream of Williams Fork Reservoir. The plots were reviewed, and the selected baseline values seem to reasonably reflect typical temperature patterns observed at these locations. As such, the relatively poor fits were not found to be a result of issues with baseline value selection, so no adjustments to baseline value selection are recommended.

Instead, it was determined that, because of the operational influences on water temperature at these locations, the simple harmonic curve-fit did not perform well in generating a smoothed representation of the selected baseline values during the June through September period of focus. Specifically, the squared correlation coefficient (R^2) for the curve fit from June through September at CR-YGAGE and CR-PAD was 0.56 and 0.54, for DMs, respectively, and 0.73 and 0.72 for WATs. All other gages exhibited curve-fit R^2 values for both DM and WATs greater than 0.8, ranging from 0.83 to 0.95. An example of the relatively poor fit of the simple harmonic function is shown in Figure 7 for CR-YGAGE.

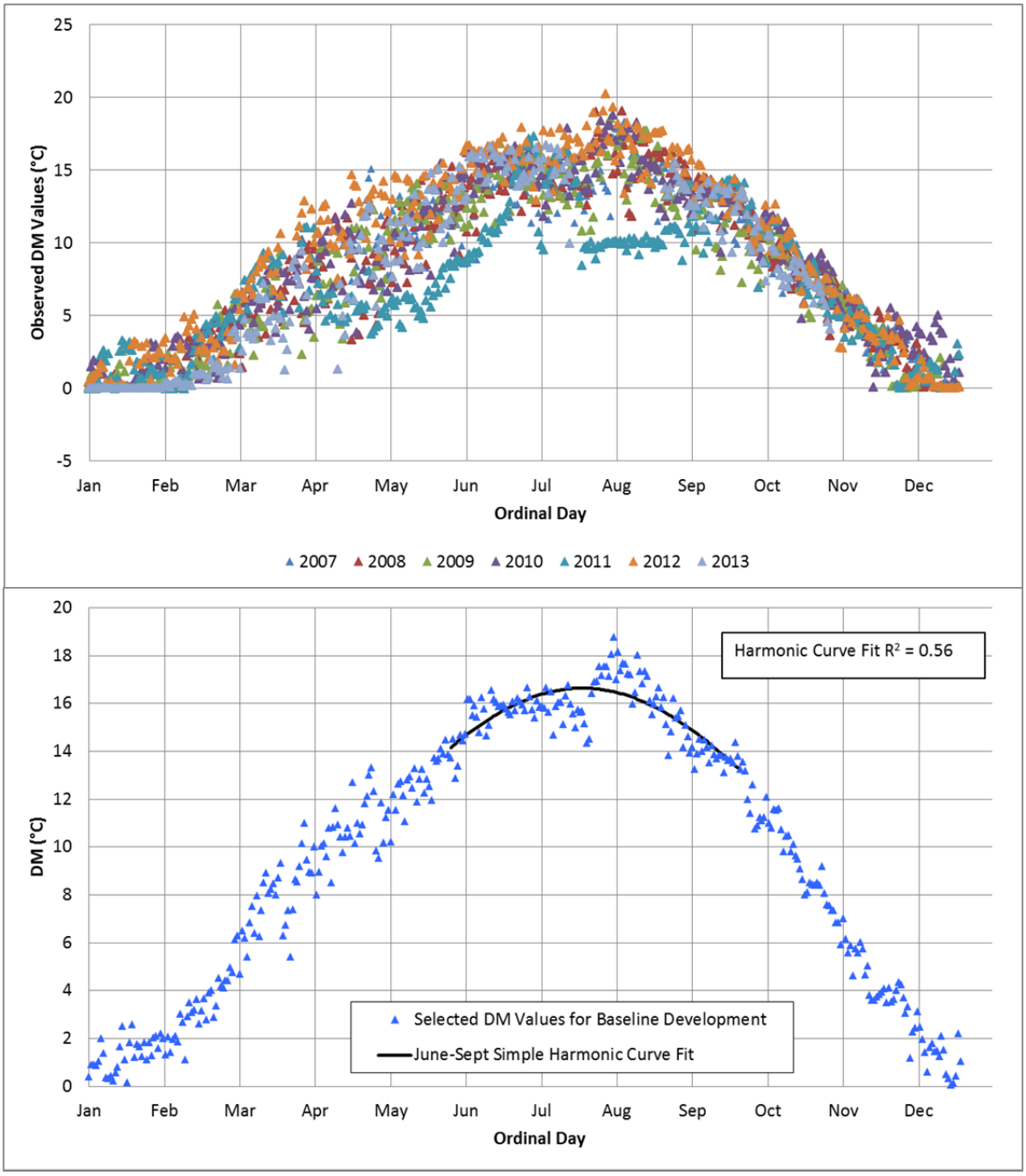

Figure 7. CR-YGAGE Baseline Development Plots to Illustrate Issues of Poor Harmonic Curve Fits Below Major Reservoir Releases

Based on this, use of a simple harmonic curve-fit for these gages (CR-YGAGE and CR-PAD) does not seem to make sense to produce a smoothed representation of the selected baseline values. Therefore, an alternative approach is proposed. Recognizing the CDPHE-stated interest in smoothing the selected baseline values to reduce resulting unnatural day-to-day variation in BAI (CDPHE, 2013a), smoothing was still conducted, but a different technique was applied. Specifically, a moving average (boxcar-type) smoothing approach was applied. This smoothing technique applies a moving

average window that extends the same duration before and after the target value, to avoid shifting the data.

This smoothing calculation replaces each date value (DM or WAT) with the average of the selected number of neighboring values. The greater the size of the window, the smoother the resulting baseline will be. A larger window, however, also results in reduced correlation with the selected baseline values. Therefore, it was decided to uniformly set the size of the averaging window to maintain a minimum R^2 value of 0.8. A window size of nine values was selected to meet this target. This resulted in smoothing of the baseline and produced June through September fits with comparable levels of correlation (with selected baseline values) to the baselines developed for other locations by the curve-fitting approach. As an example, the WAT baseline values and the resulting smoothed baseline for CR-YGAGE are presented in Figure 8. The June through September simple harmonic curve-fit attempt at this location is also shown for comparison.

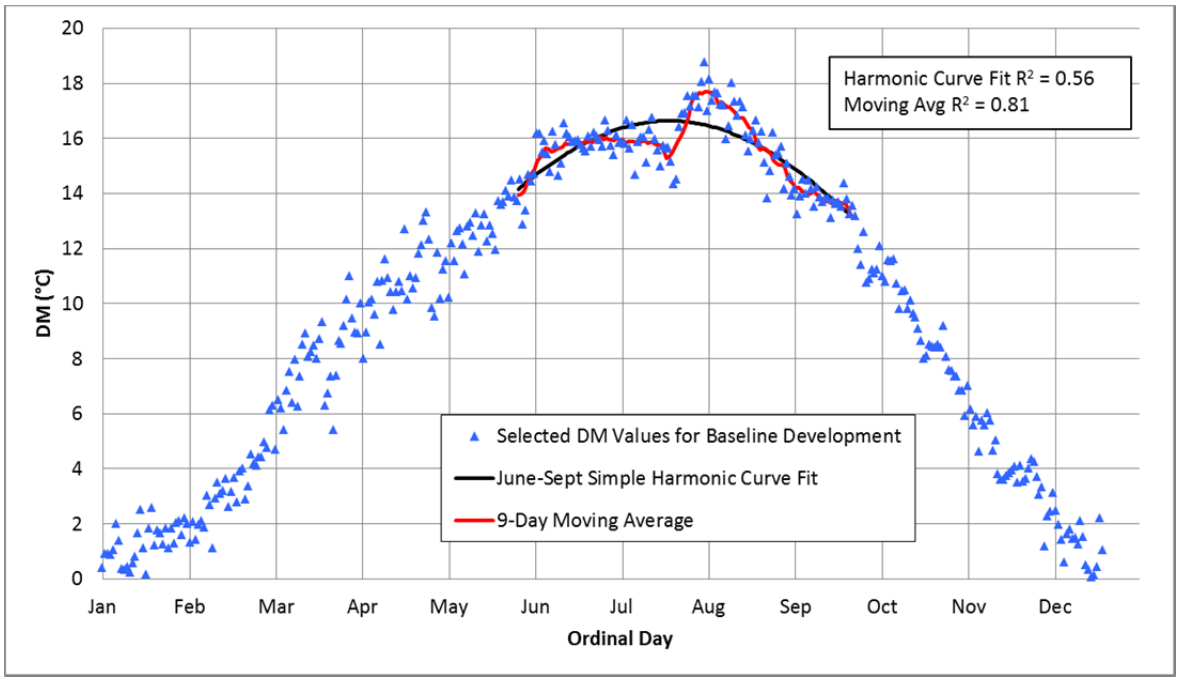

Figure 8. CR-YGAGE Baseline Development Plots Showing Simple Harmonic Curve Fit and Moving Average

D. Summary

The development of observed baselines for stream temperature largely followed the guidance provided by Colorado Department of Public Health and Environment (CDPHE, 2013a and 2014a). Because this is one of the first attempts to conduct an analysis of this type in Colorado, the analysis generated results but also looked critically at the approach and interpretation of results to support ongoing approach refinement. The following summarizes modifications made to the original CDPHE (2013a) approach:

- June through September Focus - The focus period used to develop a smoothed baseline curve was limited to the model simulation period of June through September. This was done

to limit the effects of observed data limitations (quantity or quality) of data outside of this period and to improve the fit of the curve to the selected baseline values.

- Moving Average below Major Reservoir Releases - The simple harmonic curve fit approach to creating a smoothed baseline was not applied at two locations, CR-YGAGE and CR-PAD. At these locations, DM and WAT values exhibited the effects of operations of nearby reservoir releases, and did not fit the more natural simple harmonic shape. Therefore, to generate smoothed baselines, a moving average technique was used at these locations.

All resulting June through September baseline time series for DMs and WATs are presented in Figure 9 and Figure 10, respectively. Relevant standards are also shown on these plots for perspective. These plots reflect the conceptual understanding of warming patterns in the upper Colorado River. First, Figure 9 shows increasing baseline temperatures moving downstream from CR-YGAGE until CR-HSU, which exhibits the highest DM baseline values. Downstream from CR-HSU is Byers Canyon, where shading effectively reduces DM values. The DM baseline values decrease further below Williams Fork Reservoir, as shown by CR-PAD, due to releases from Williams Fork. Similar patterns are apparent for WATs (Figure 10), though the cooling effect of shading through Byer's Canyon results in little change in baseline WATs downstream of CR-HSU, unlike the cooling effect observed for DMs. This agreement with the conceptual system understanding is reassuring in terms of application of the calculated baseline values.

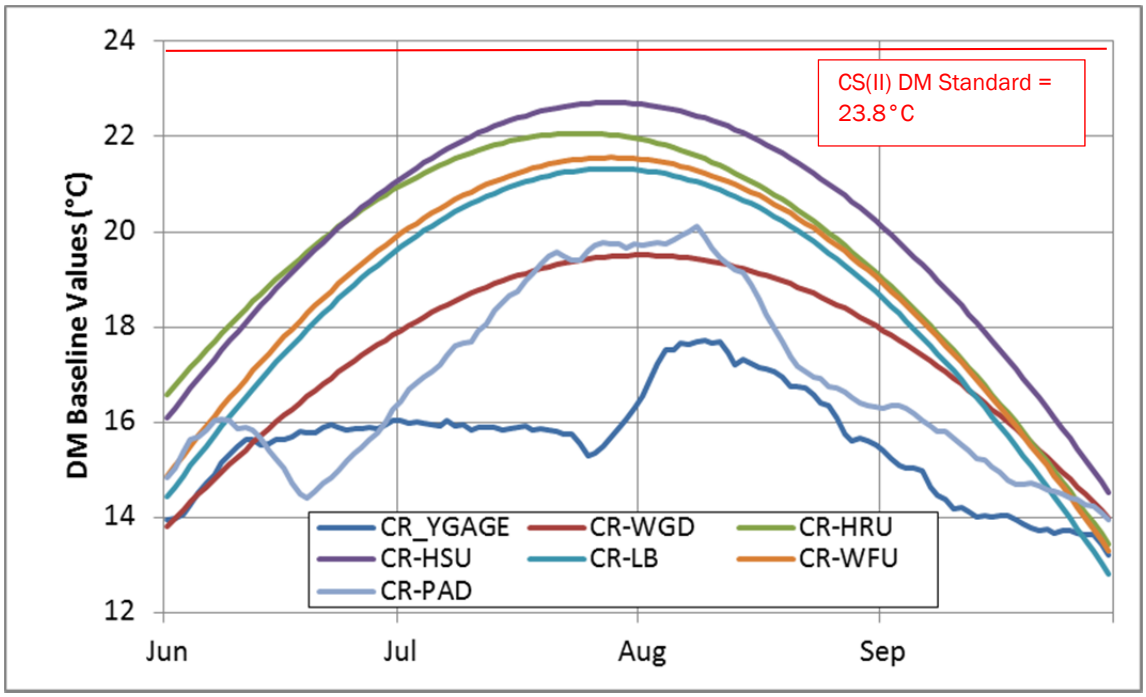

Figure 9. Baseline DM Time Series for Quantitative Analysis of Antidegradation

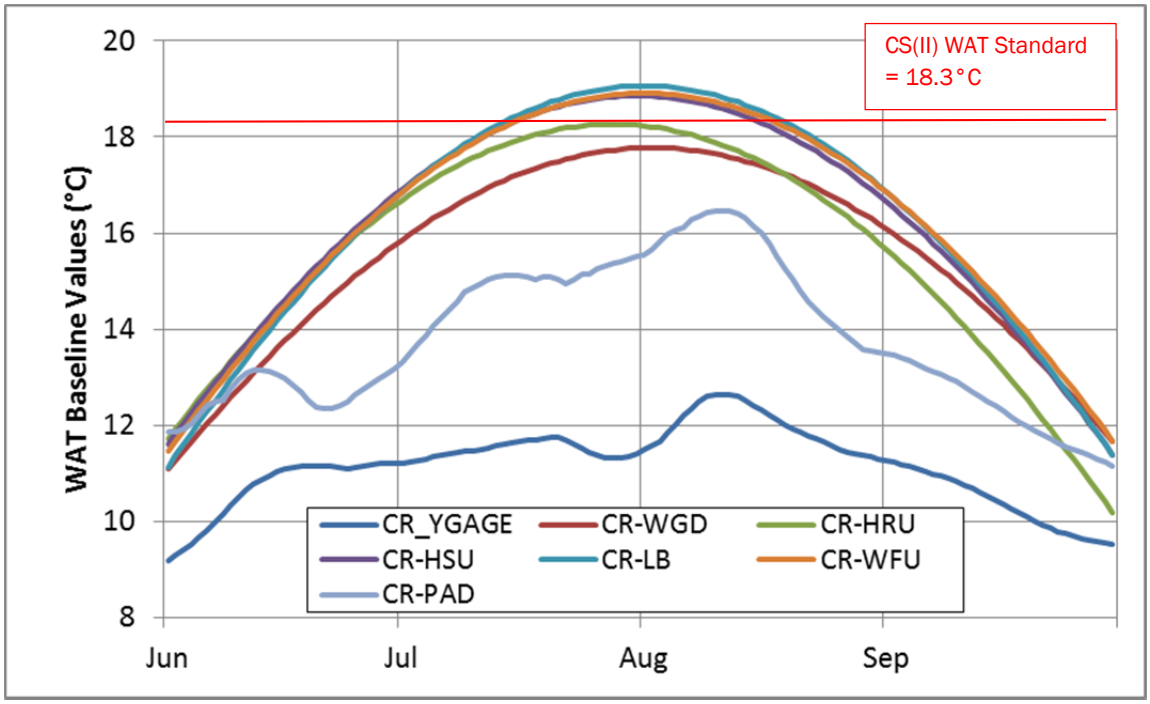

Figure 10. Baseline WAT Time Series for Quantitative Analysis of Antidegradation

II. Supporting Figures from Observed Baseline Development

This Section presents figures and tables summarizing observed-data baseline development steps.

A. CR-YGAGE Baseline Development

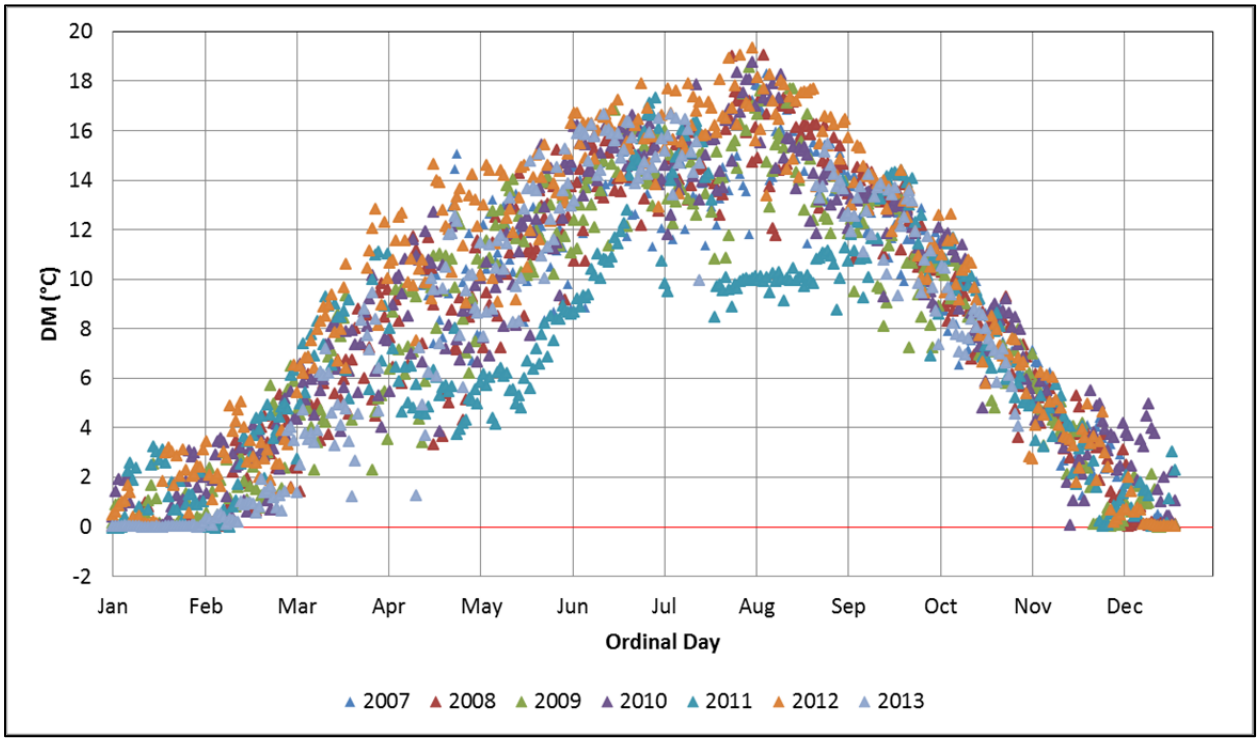

Figure 11. DM Values Calculated from CR-YGAGE Observed Water Temperature Data

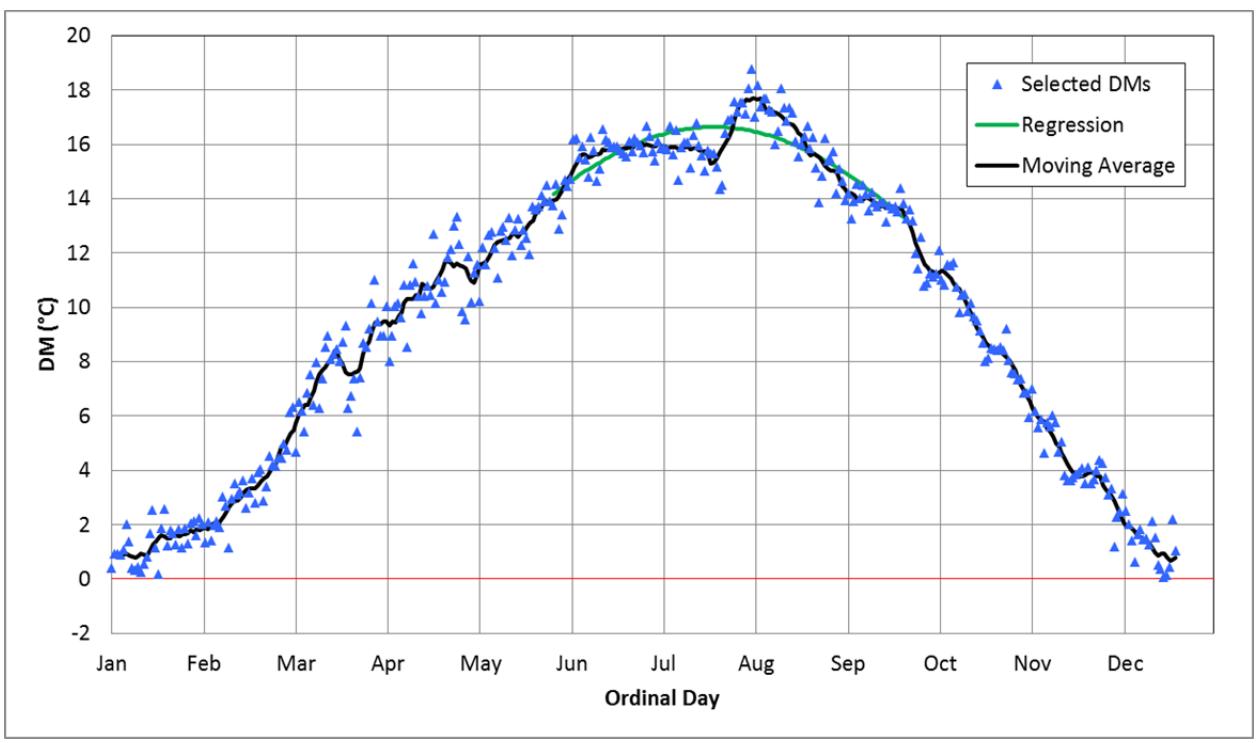

Figure 12. Selected DM Values for CR-YGAGE and DM Baseline

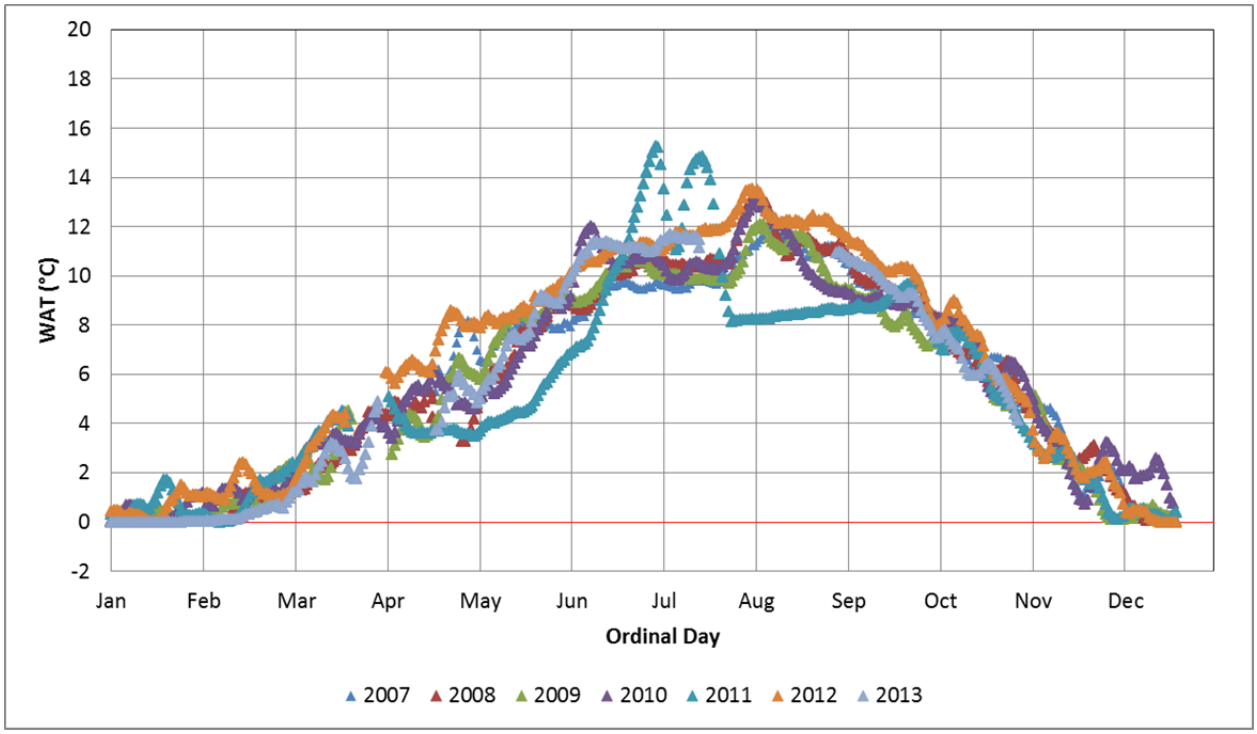

Figure 13. WAT Values Calculated from CR-YGAGE Observed Water Temperature Data

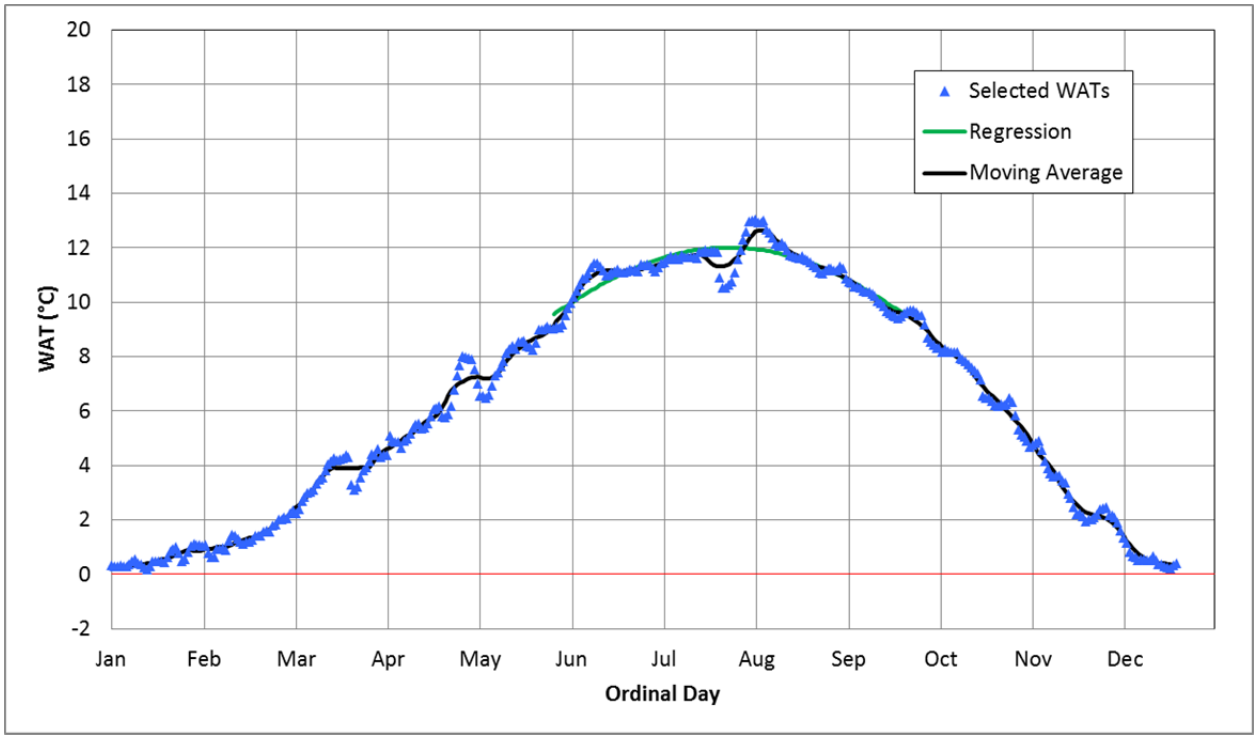

Figure 14. Selected WAT values for CR-YGAGE and WAT Baseline

B. CR-WGD Baseline Development

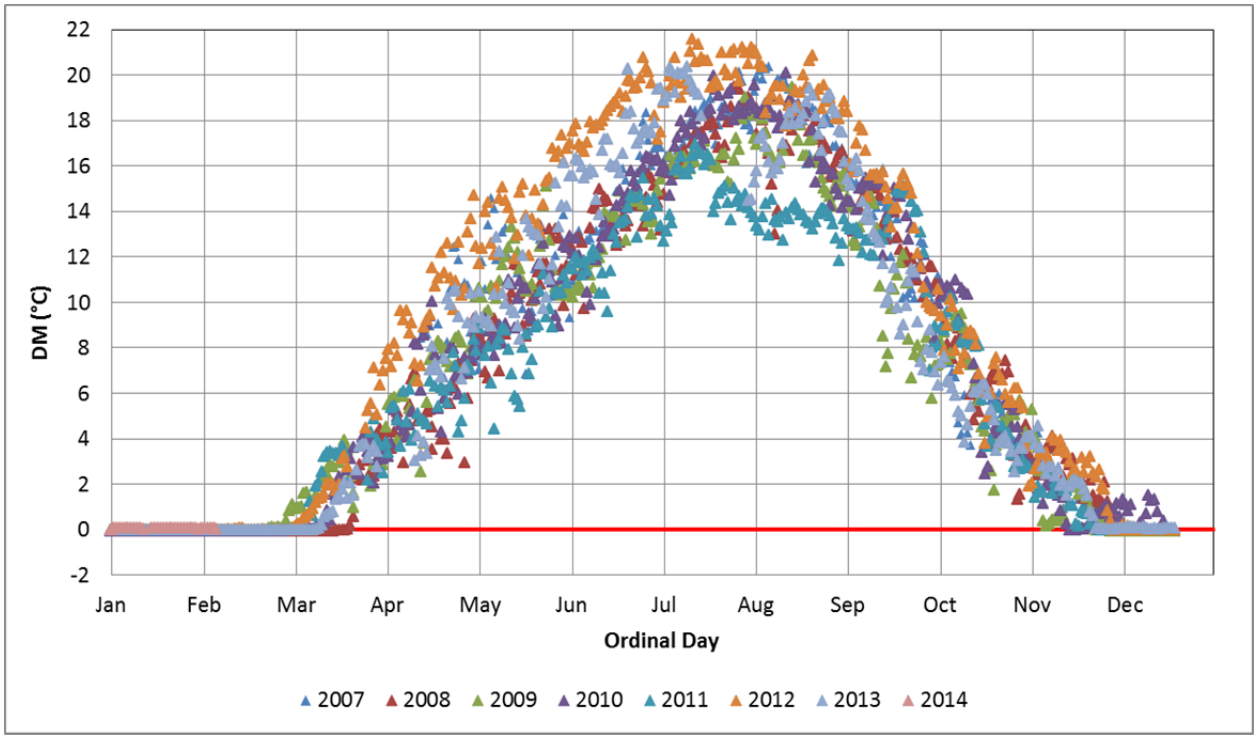

Figure 15. DM Values Calculated from CR-WGD Observed Water Temperature Data

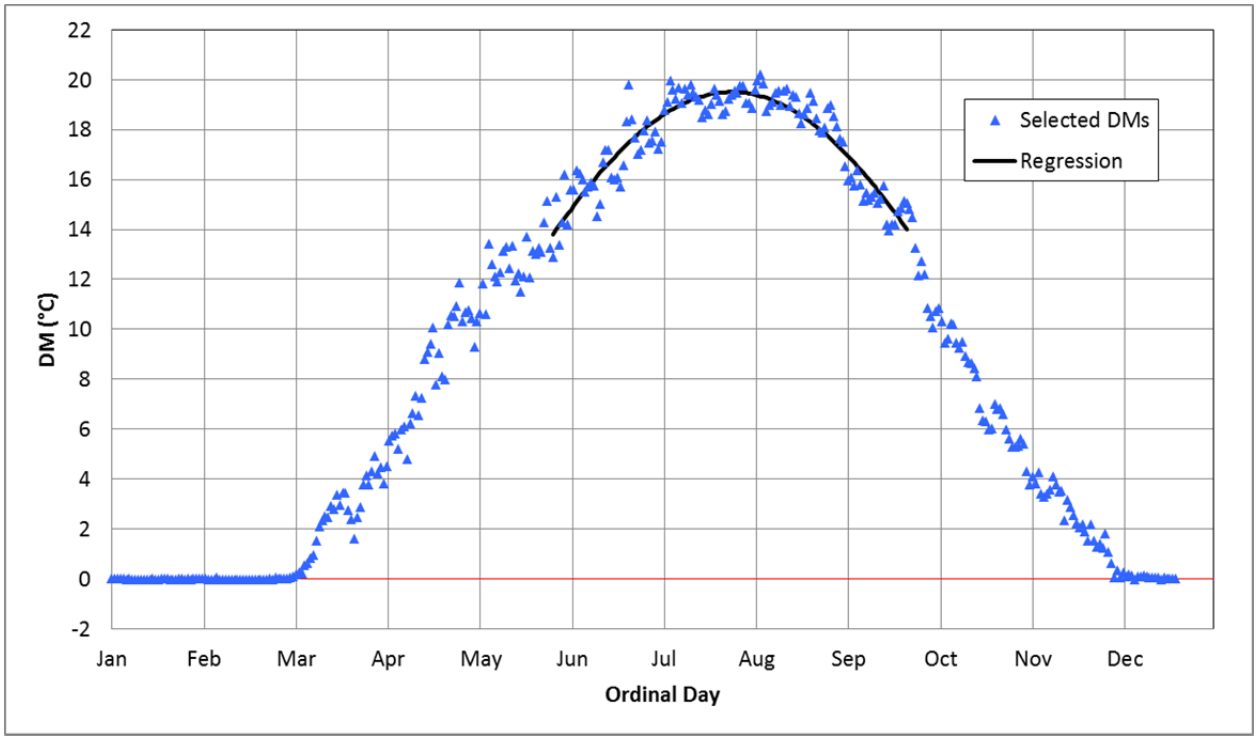

Figure 16. Selected DM Values for CR-WGD and DM Baseline

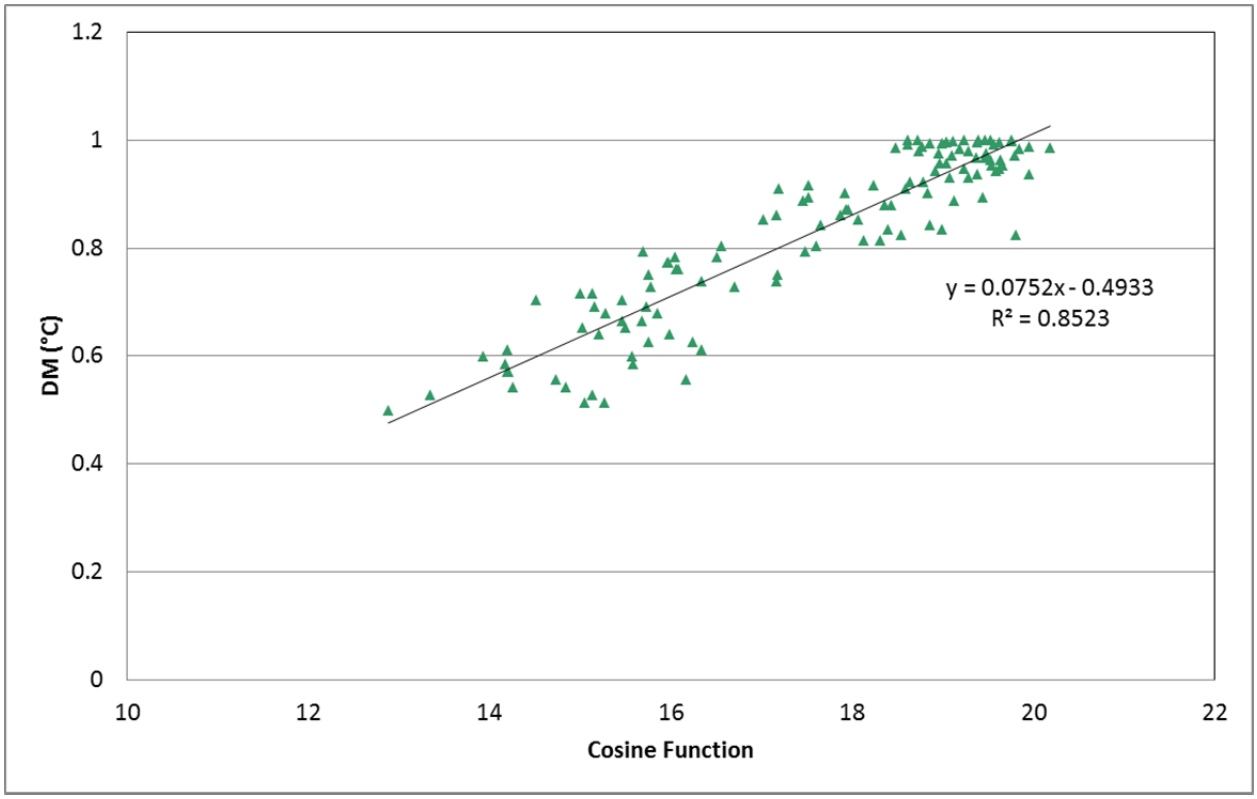

Figure 17. Relationship Used to Calculate Baseline Cosine Function Equation for CR-WGD DMs

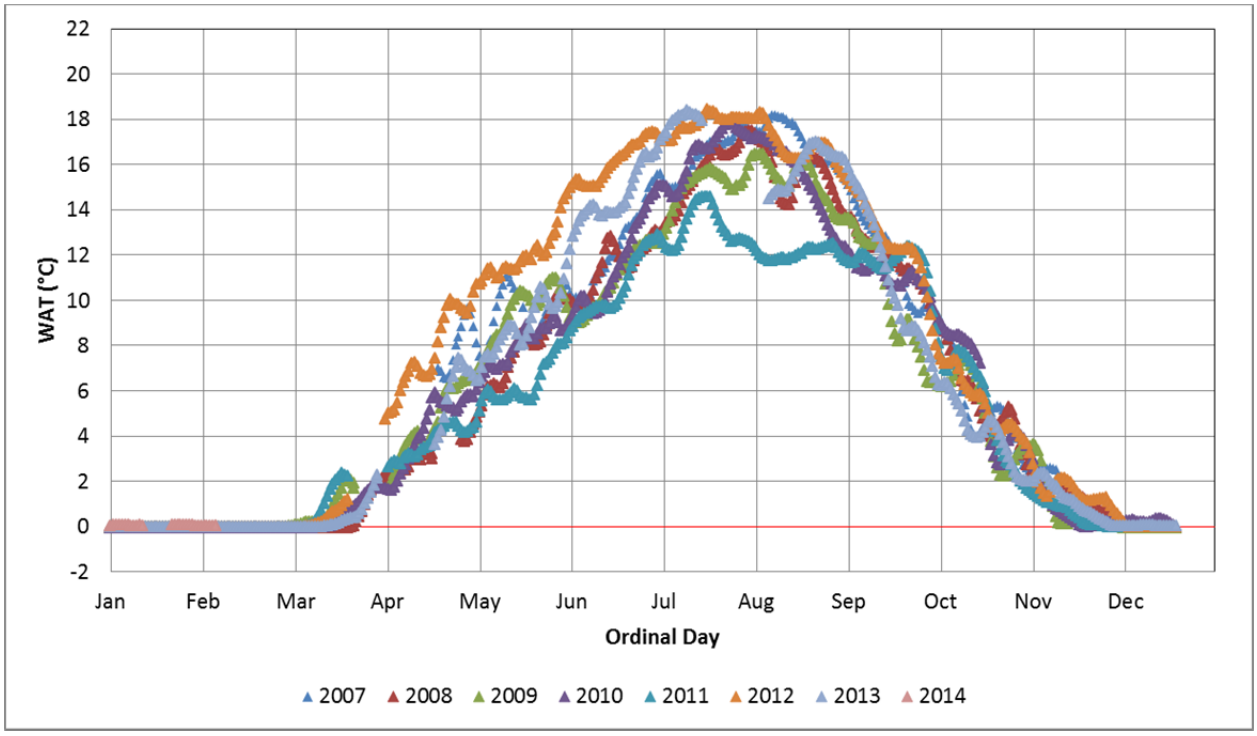

Figure 18. WAT Values Calculated from CR-WGD Observed Water Temperature Data

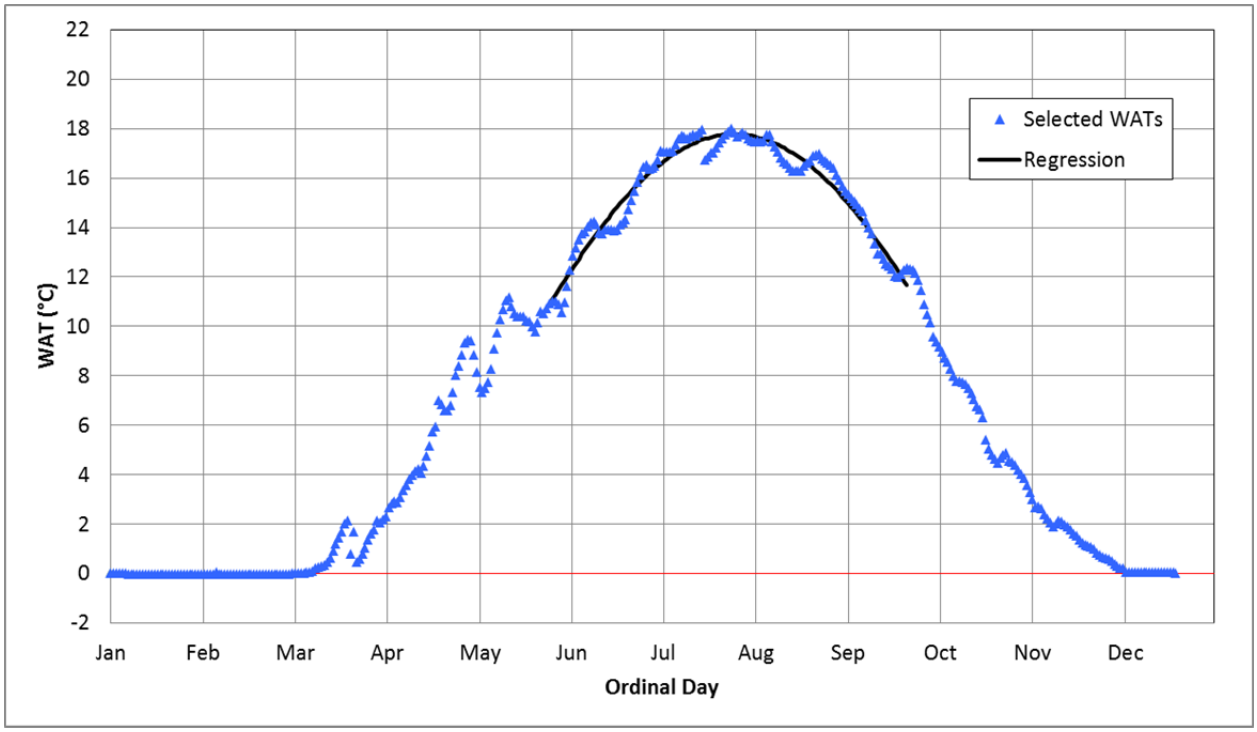

Figure 19. Selected WAT values for CR-WGD and WAT Baseline

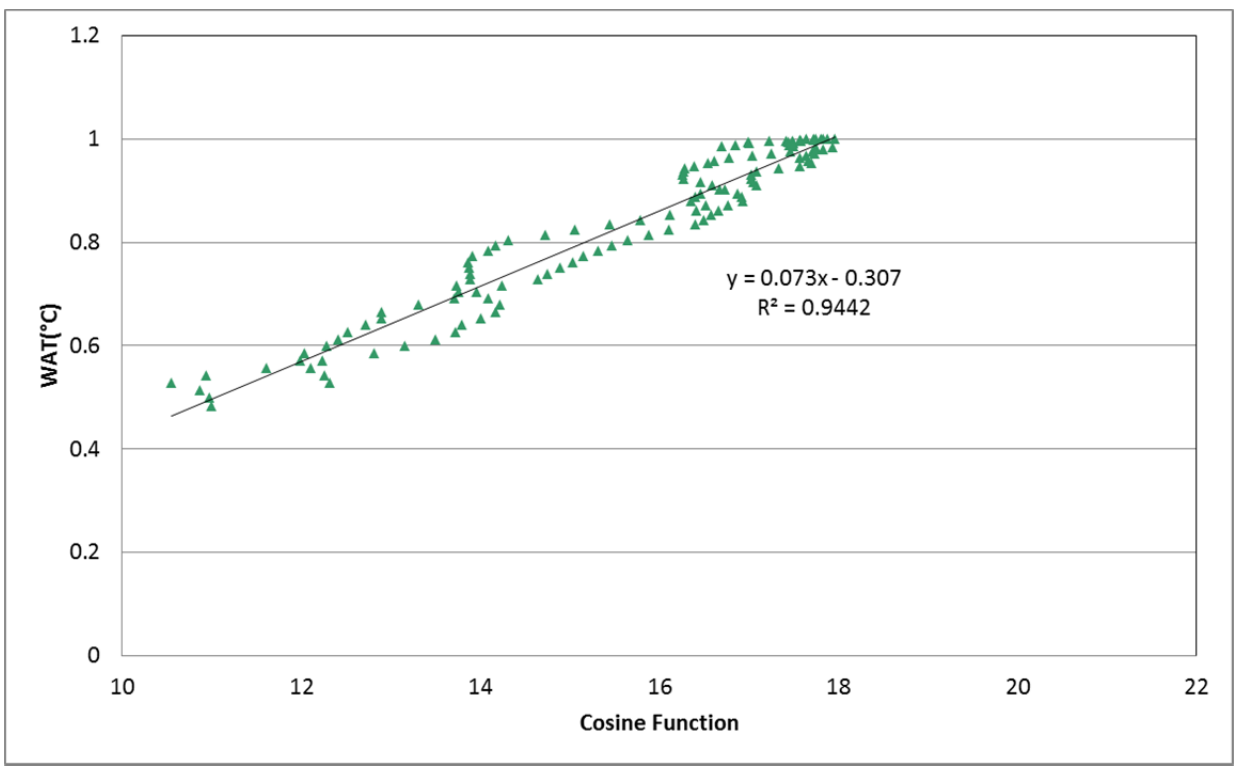

Figure 20. Relationship Used to Calculate Baseline Cosine Function Equation for CR-WGD WATs

C. CR-HSU Baseline Development

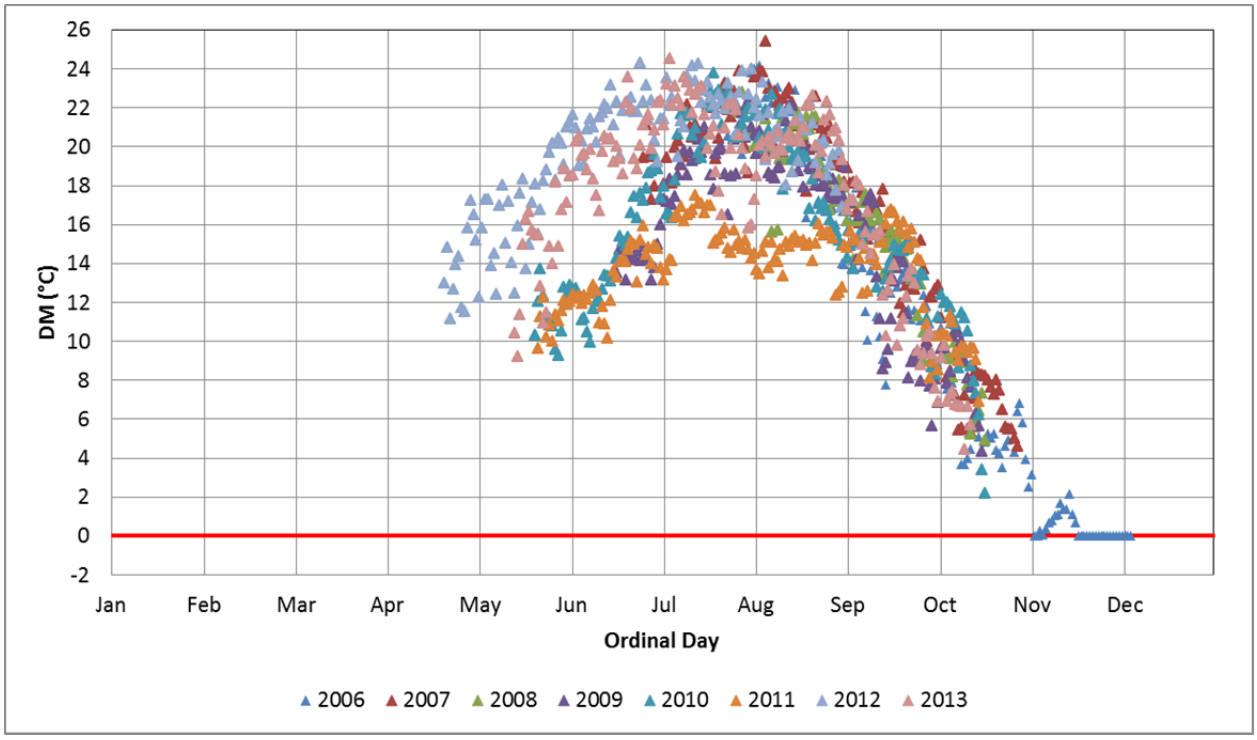

Figure 21. DM Values Calculated from CR-HSU Observed Water Temperature Data

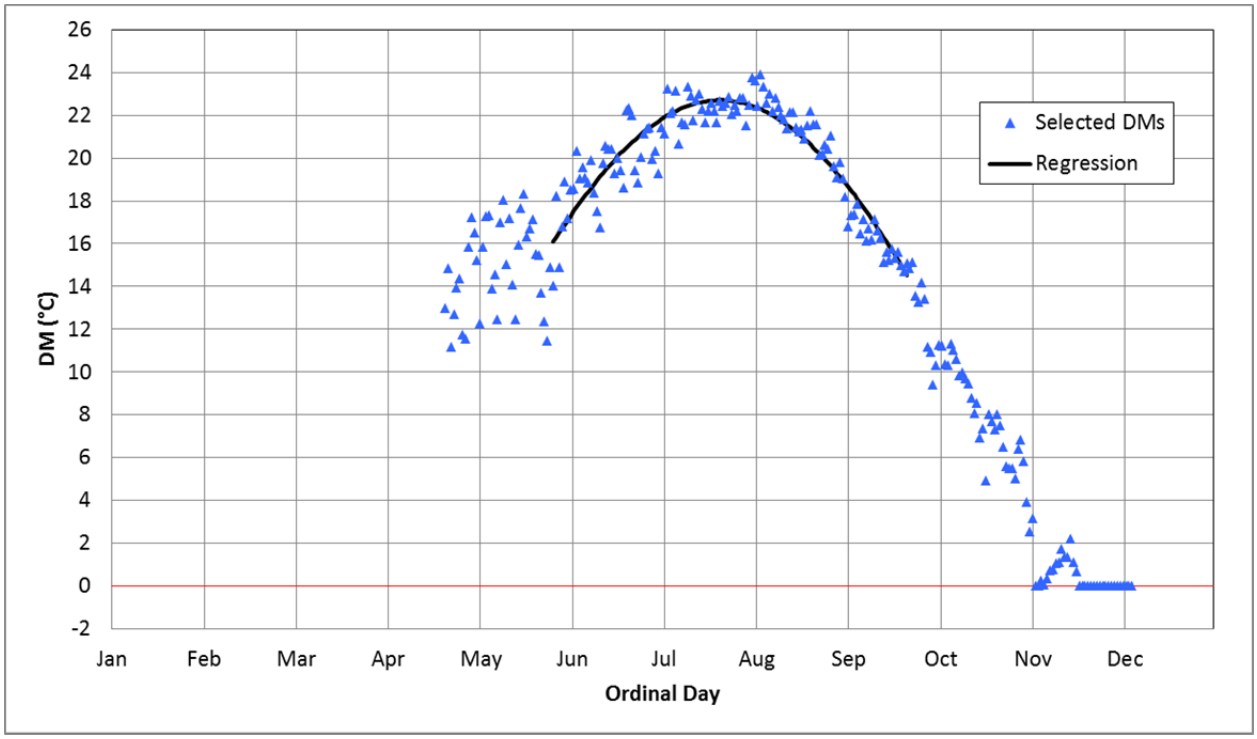

Figure 22. Selected DM Values for CR-HSU and DM Baseline

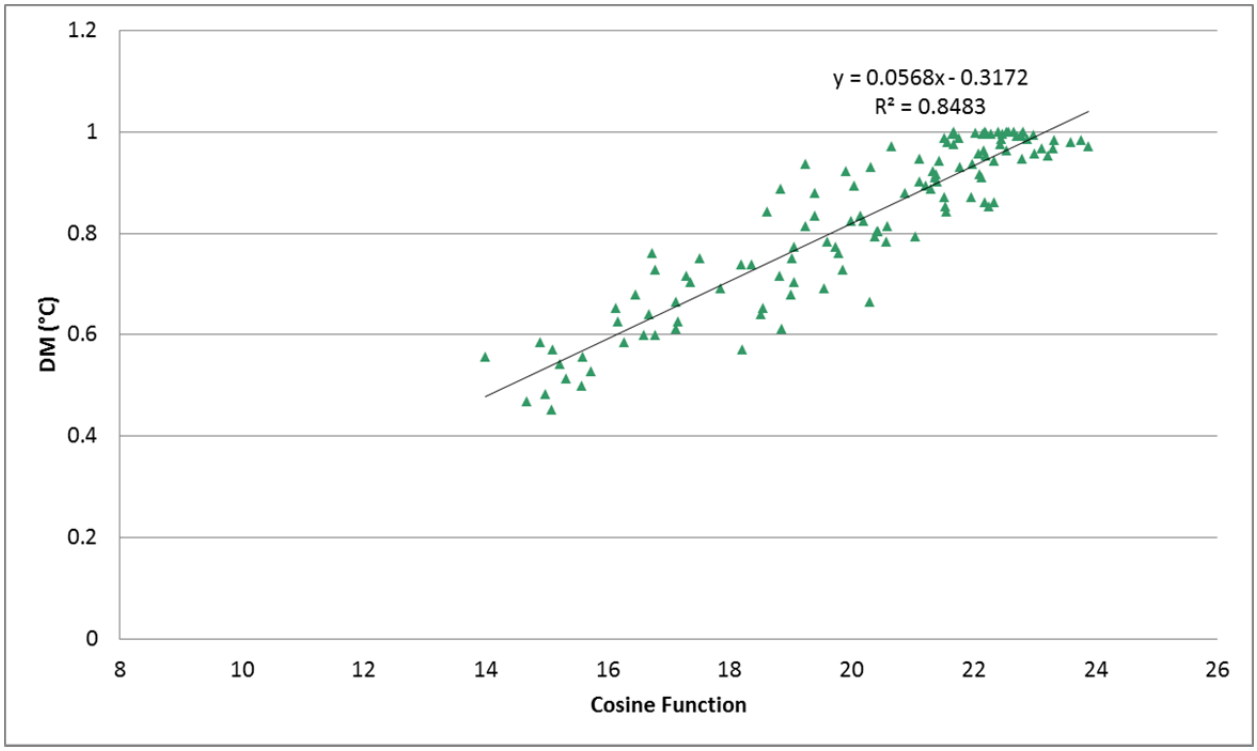

Figure 23. Relationship Used to Calculate Baseline Cosine Function Equation for CR-HSU DMs

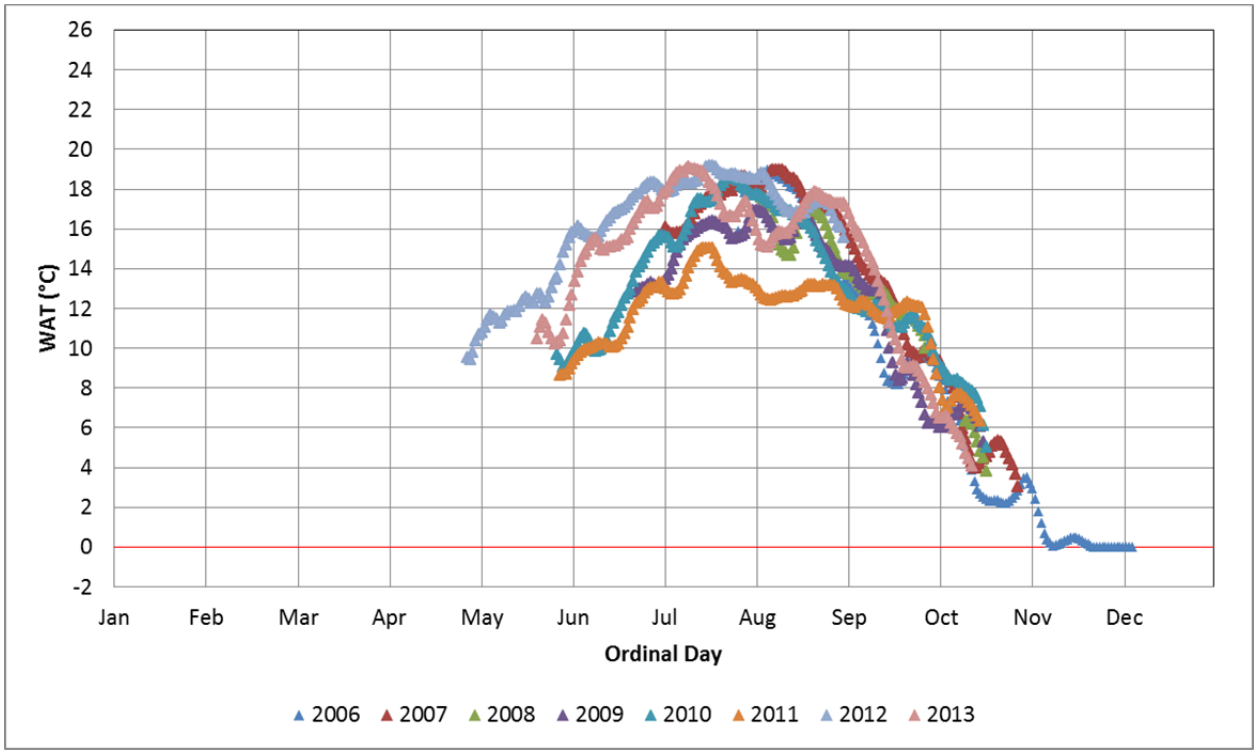

Figure 24. WAT Values Calculated from CR-HSU Observed Water Temperature Data

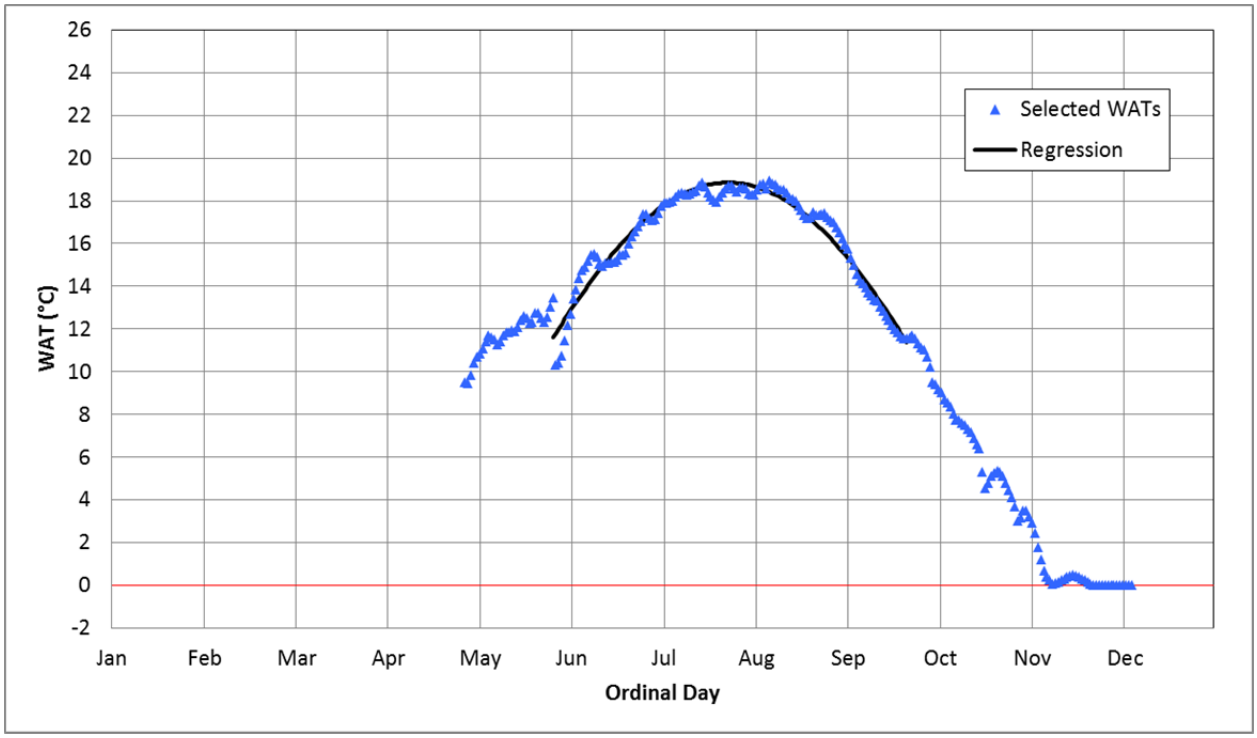

Figure 25. Selected WAT values for CR-HSU and WAT Baseline

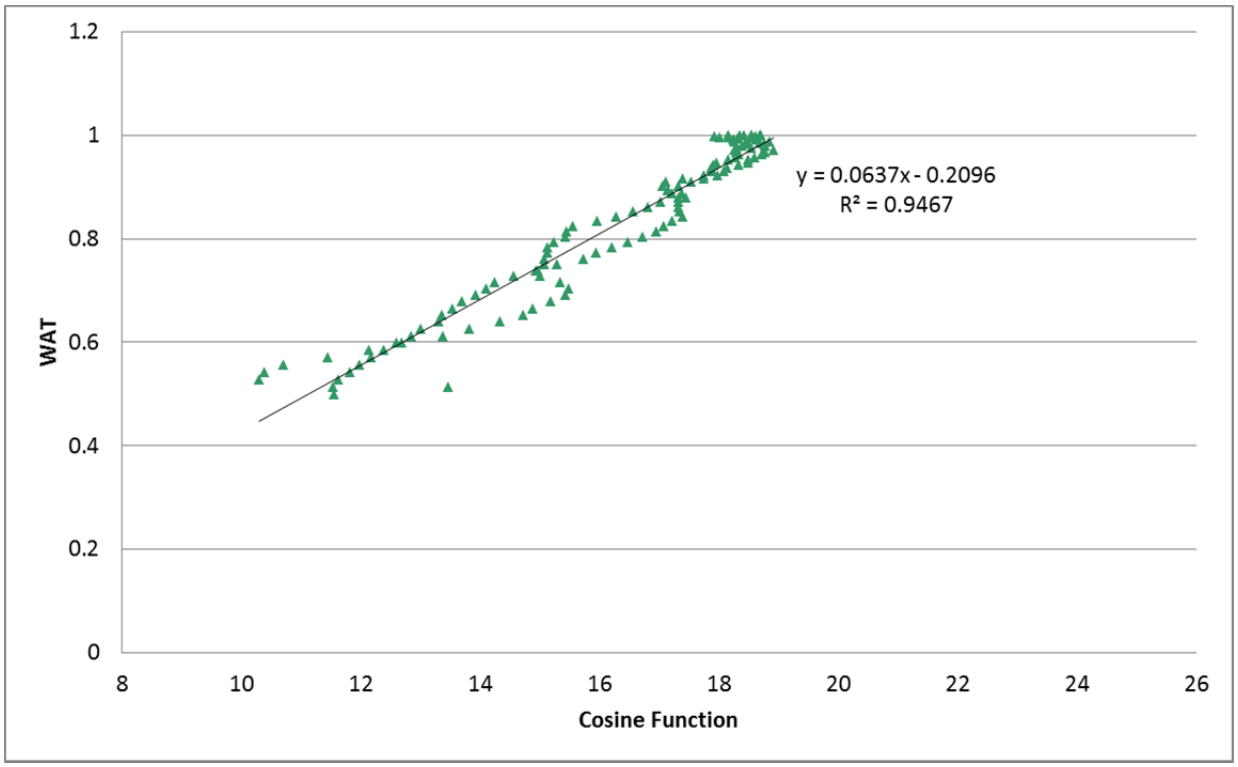

Figure 26. Relationship Used to Calculate Baseline Cosine Function Equation for CR-HSU WATs

D. CR-HRU Baseline Development

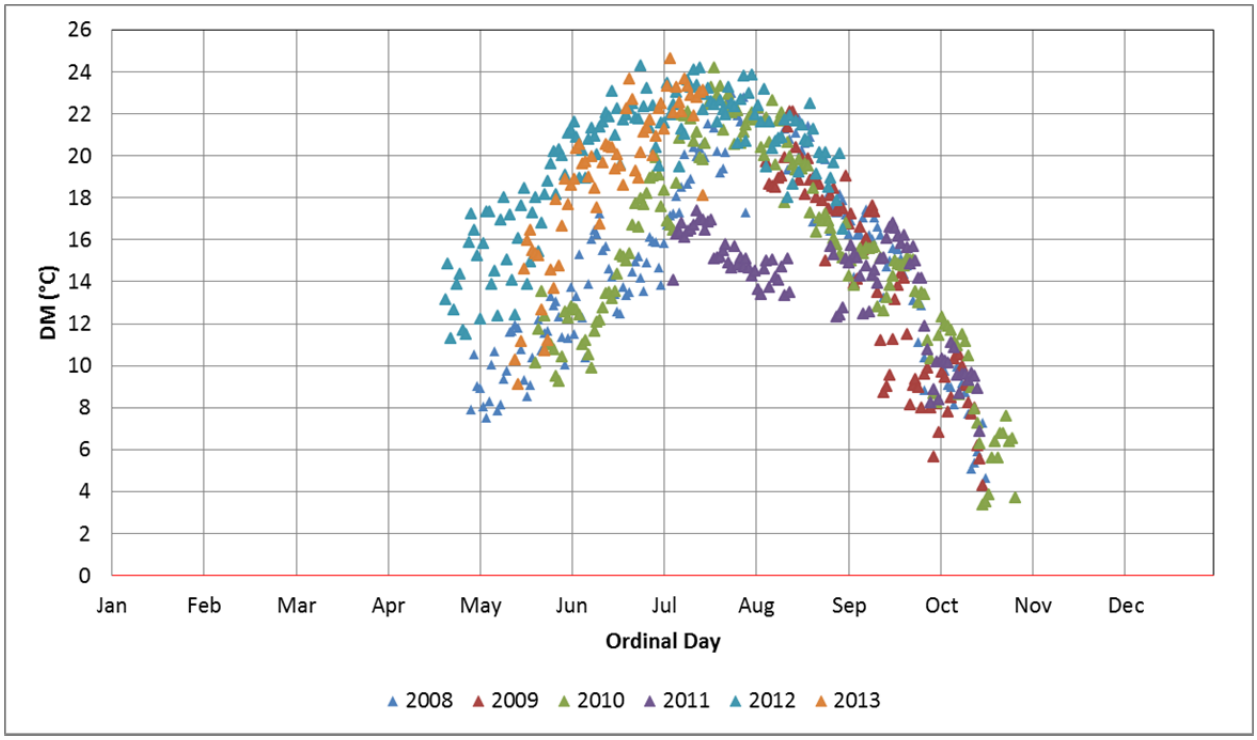

Figure 27. DM Values Calculated from CR-HRU Observed Water Temperature Data

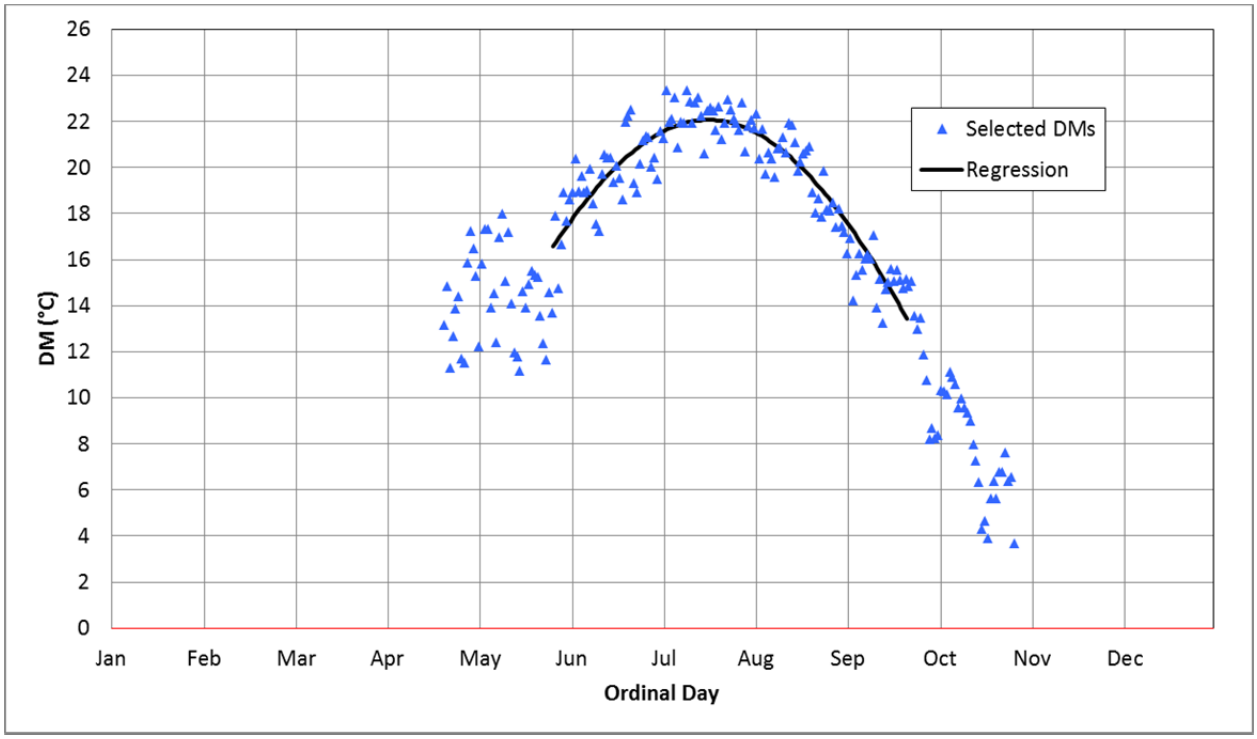

Figure 28. Selected DM Values for CR-HRU and DM Baseline

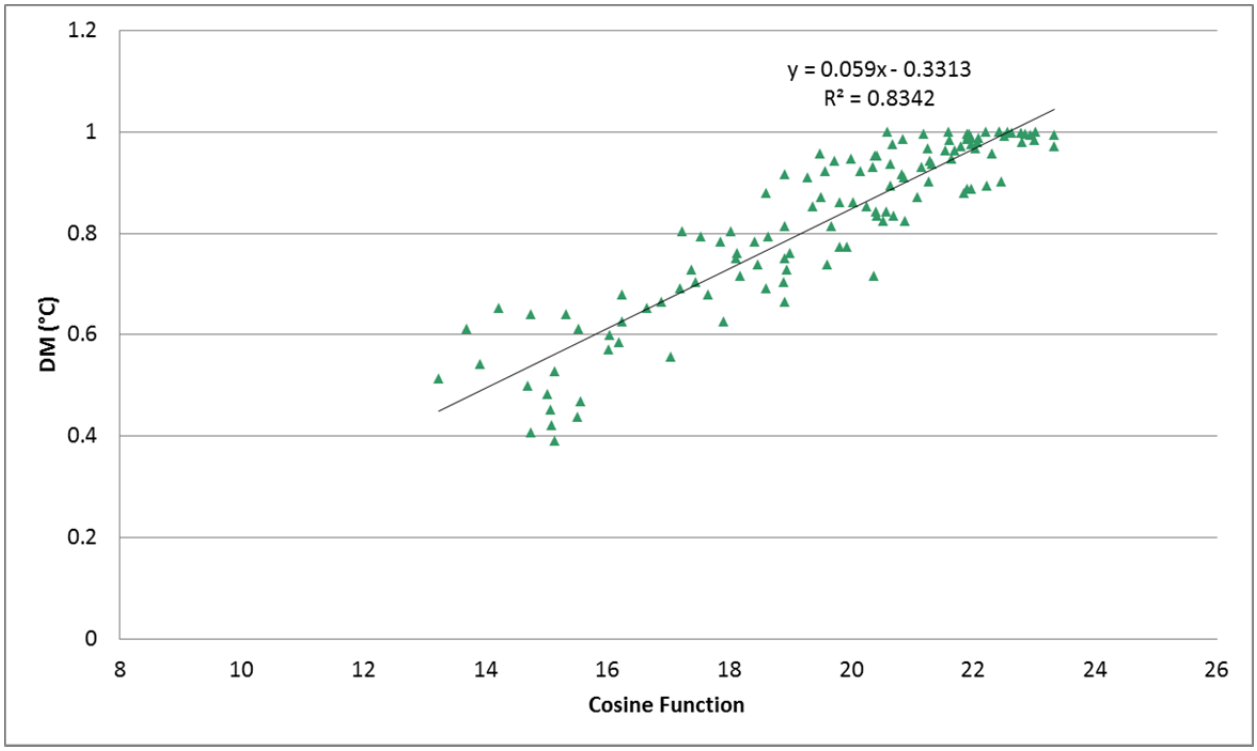

Figure 29. Relationship Used to Calculate Baseline Cosine Function Equation for CR-HRU DMs

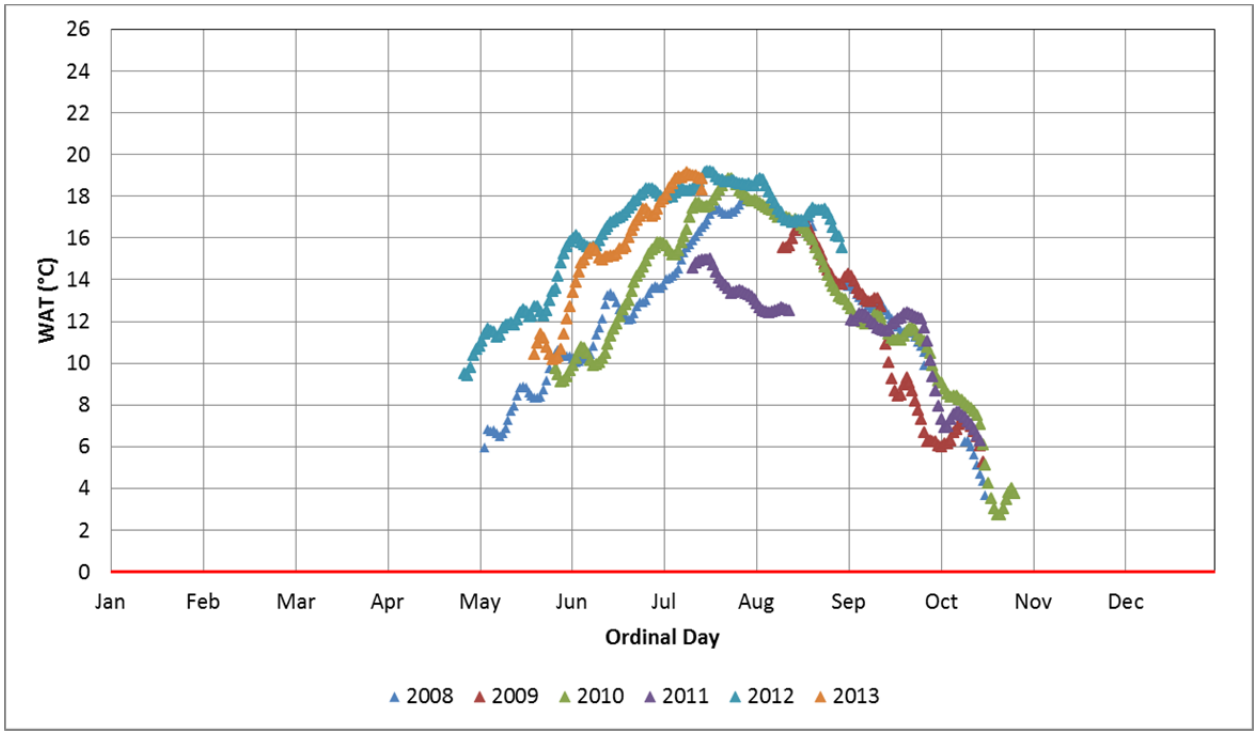

Figure 30. WAT Values Calculated from CR-HRU Observed Water Temperature Data

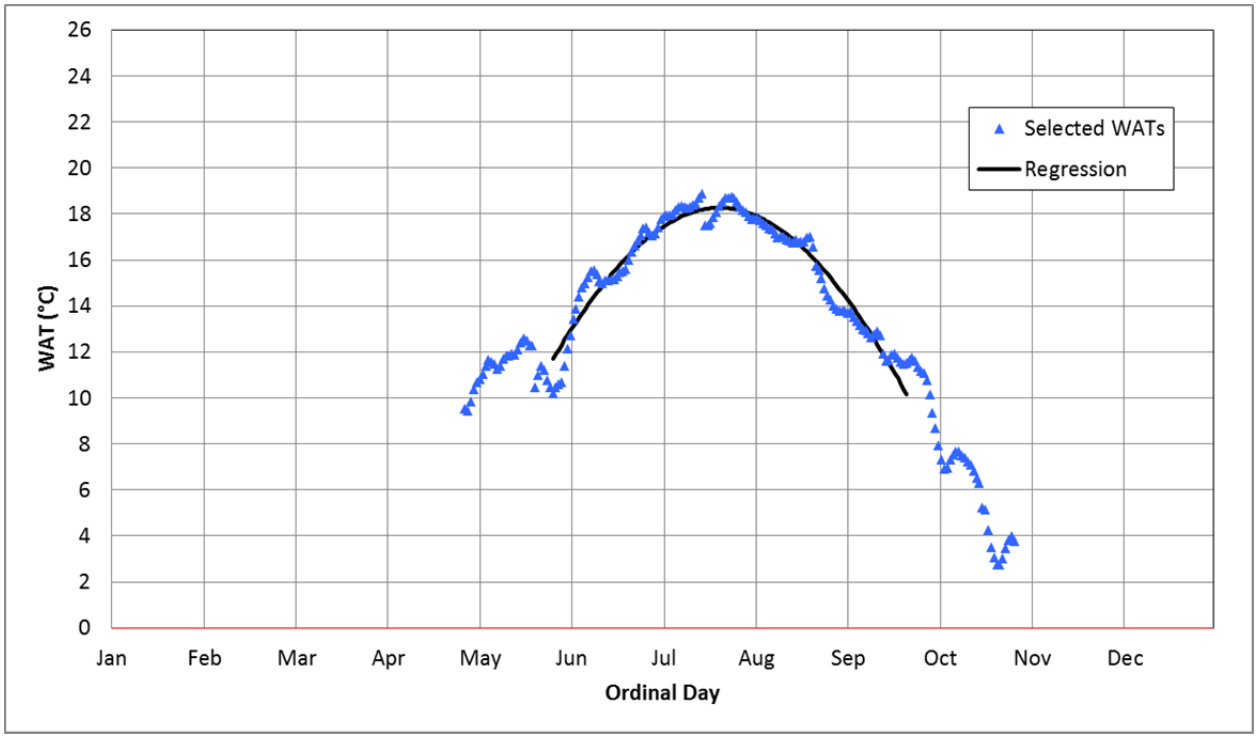

Figure 31. Selected WAT values for CR-HRU and WAT Baseline

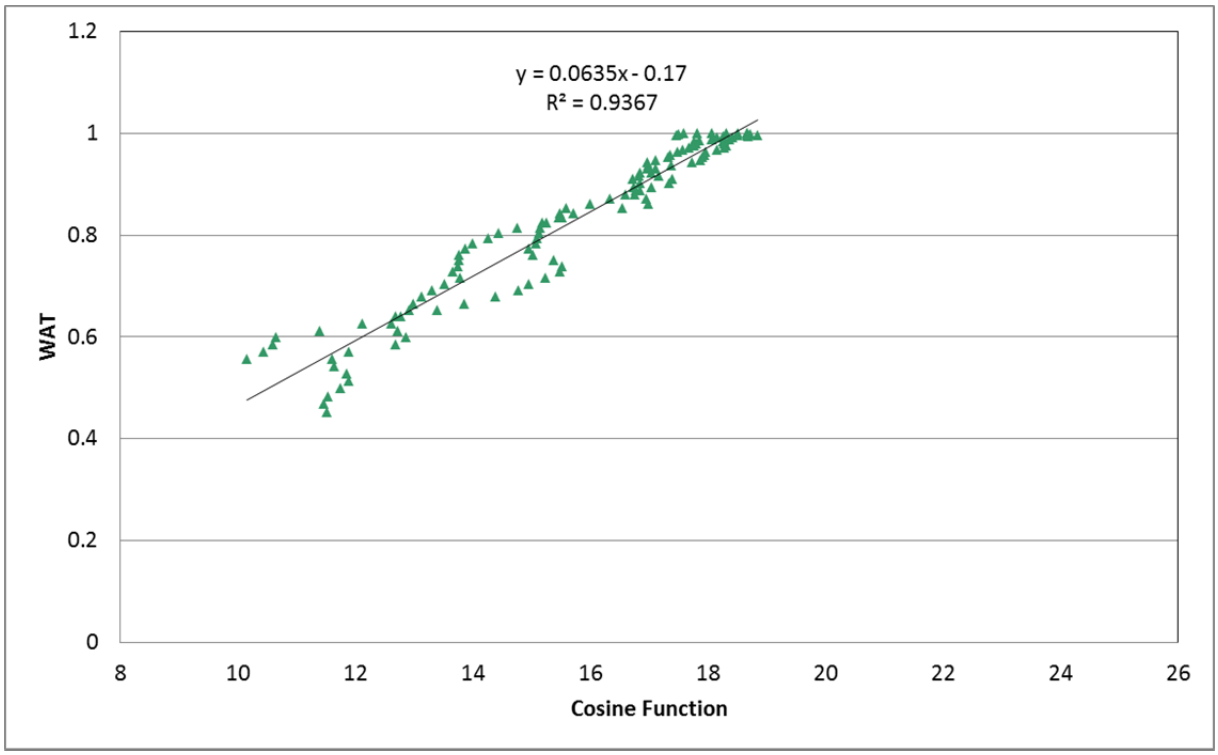

Figure 32. Relationship Used to Calculate Baseline Cosine Function Equation for CR-HRU WATs

E. CR-LB Baseline Development

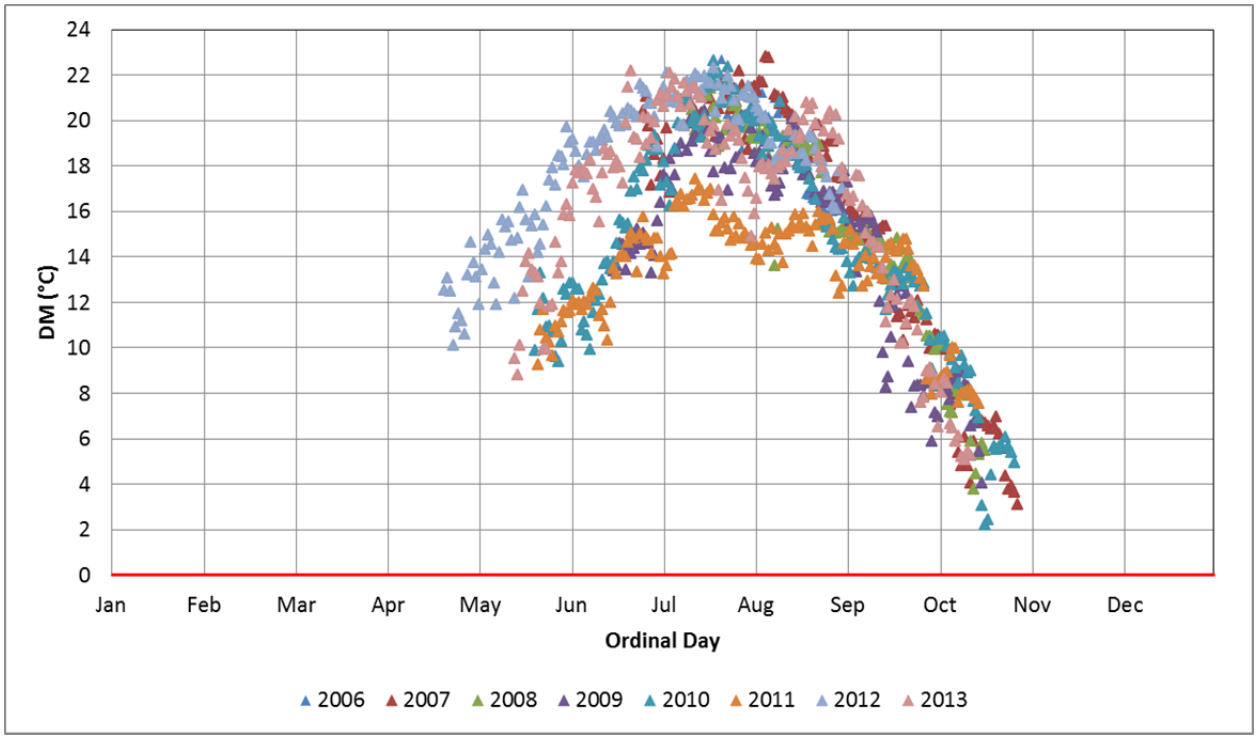

Figure 33. DM Values Calculated from CR-LB Observed Water Temperature Data

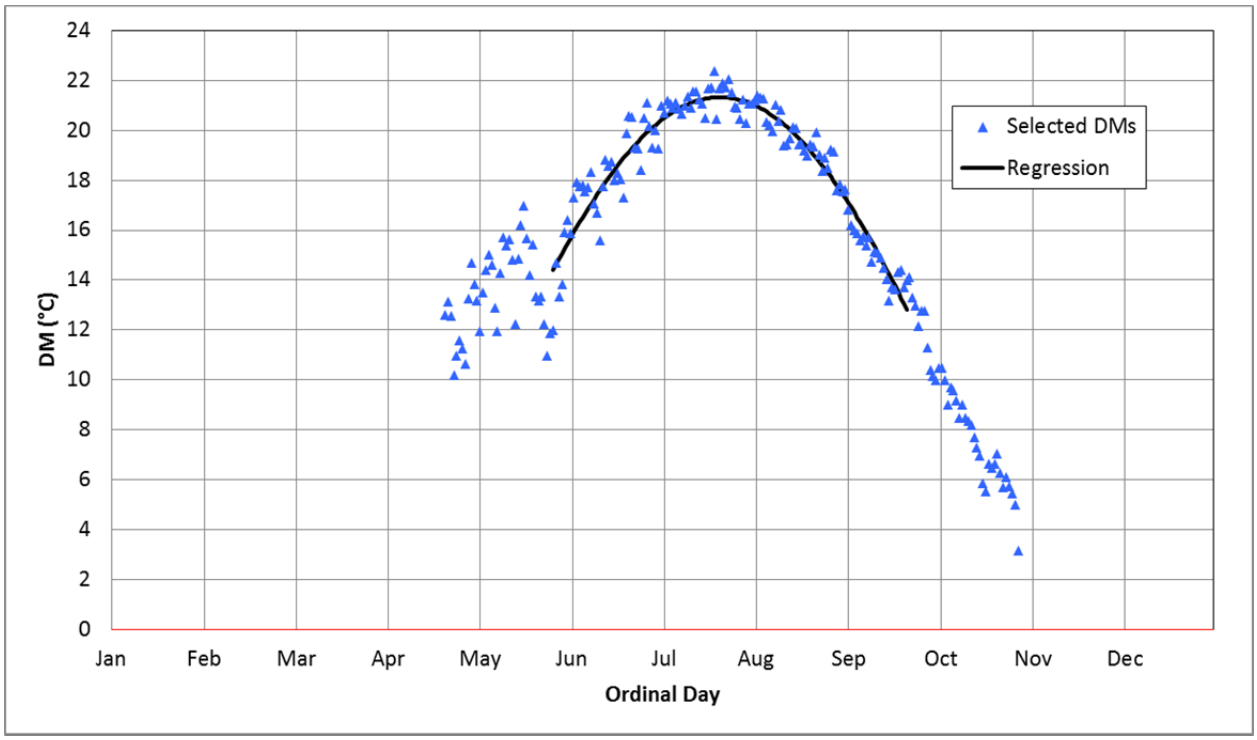

Figure 34. Selected DM Values for CR-LB and DM Baseline

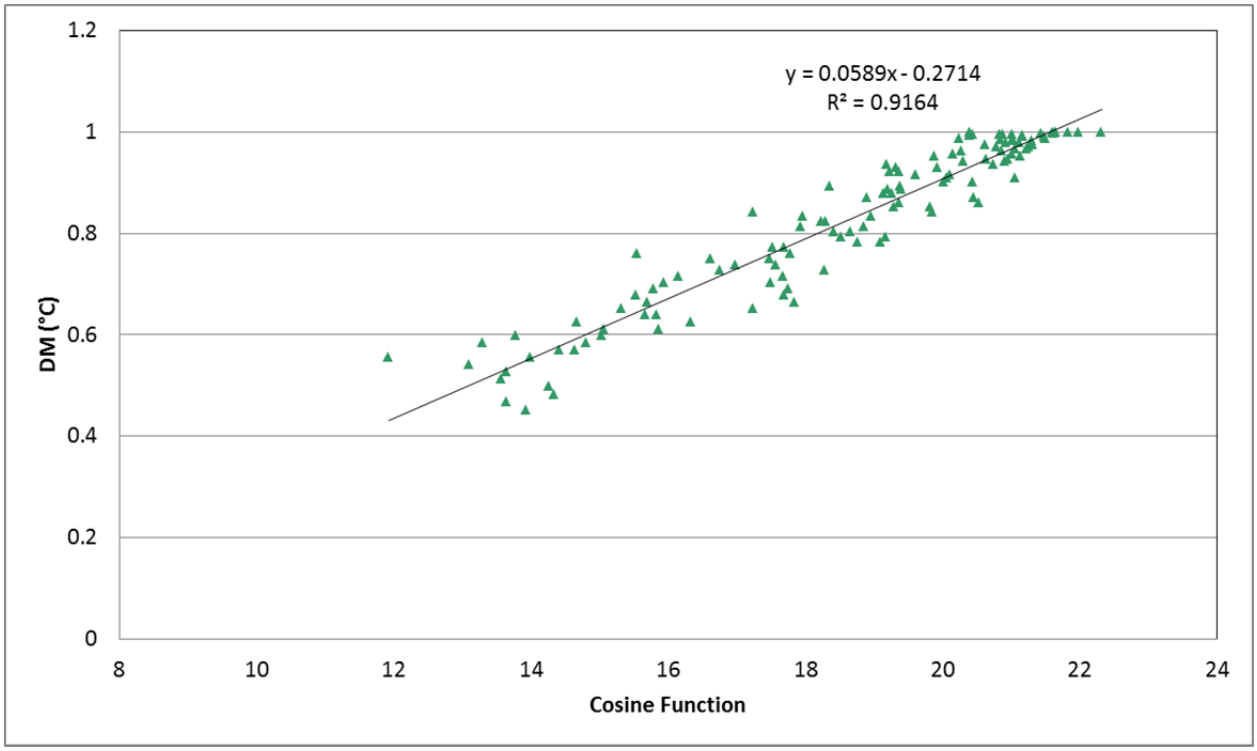

Figure 35. Relationship Used to Calculate Baseline Cosine Function Equation for CR-LB DMs

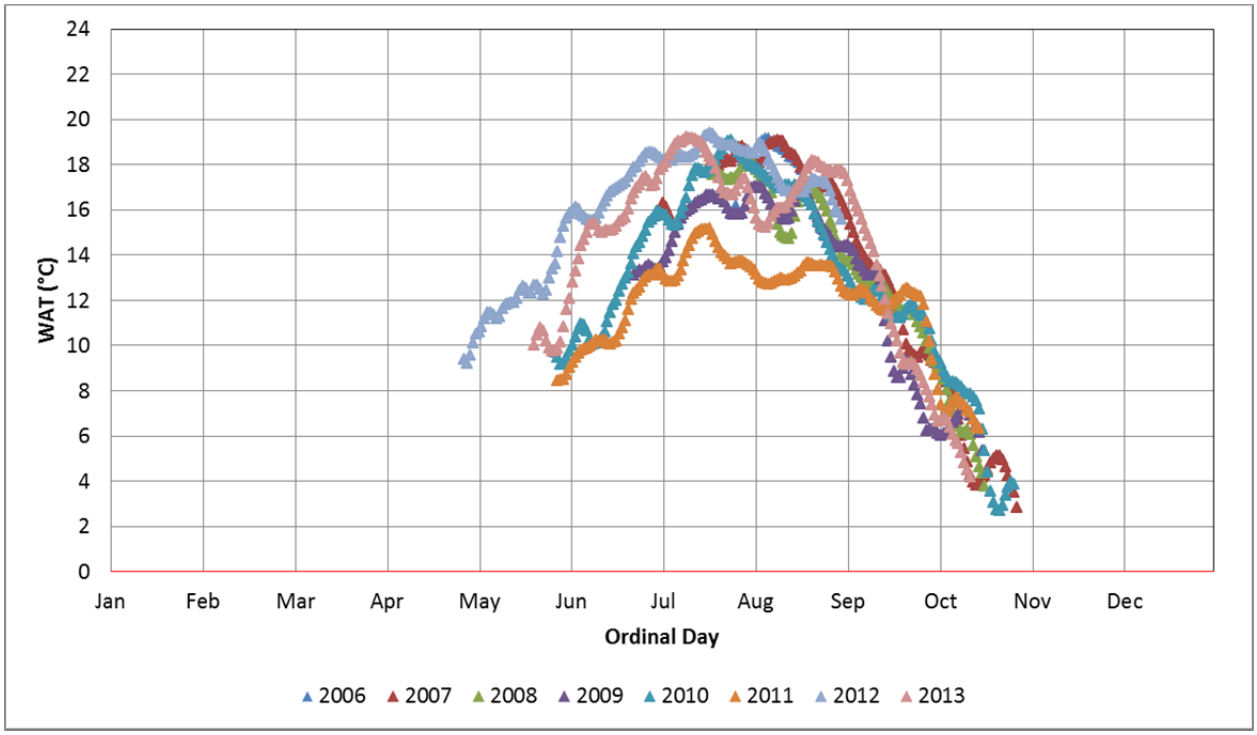

Figure 36. WAT Values Calculated from CR-LB Observed Water Temperature Data

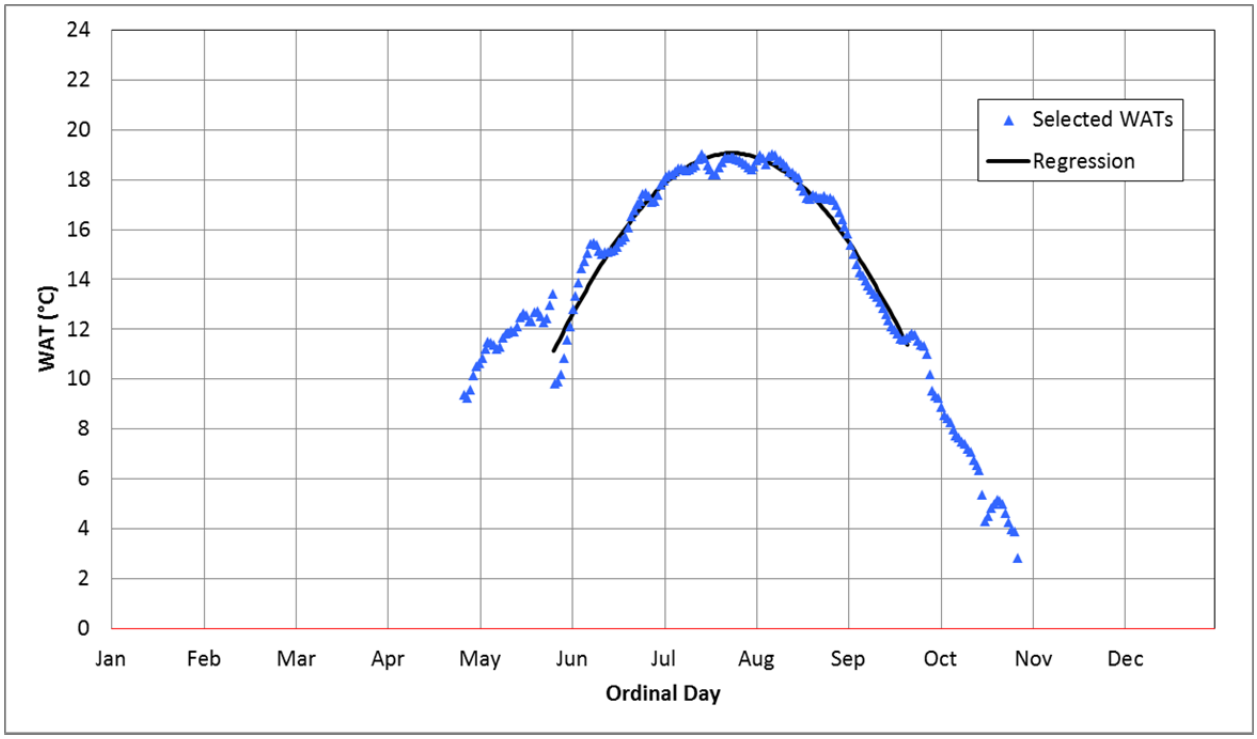

Figure 37. Selected WAT values for CR-LB and WAT Baseline

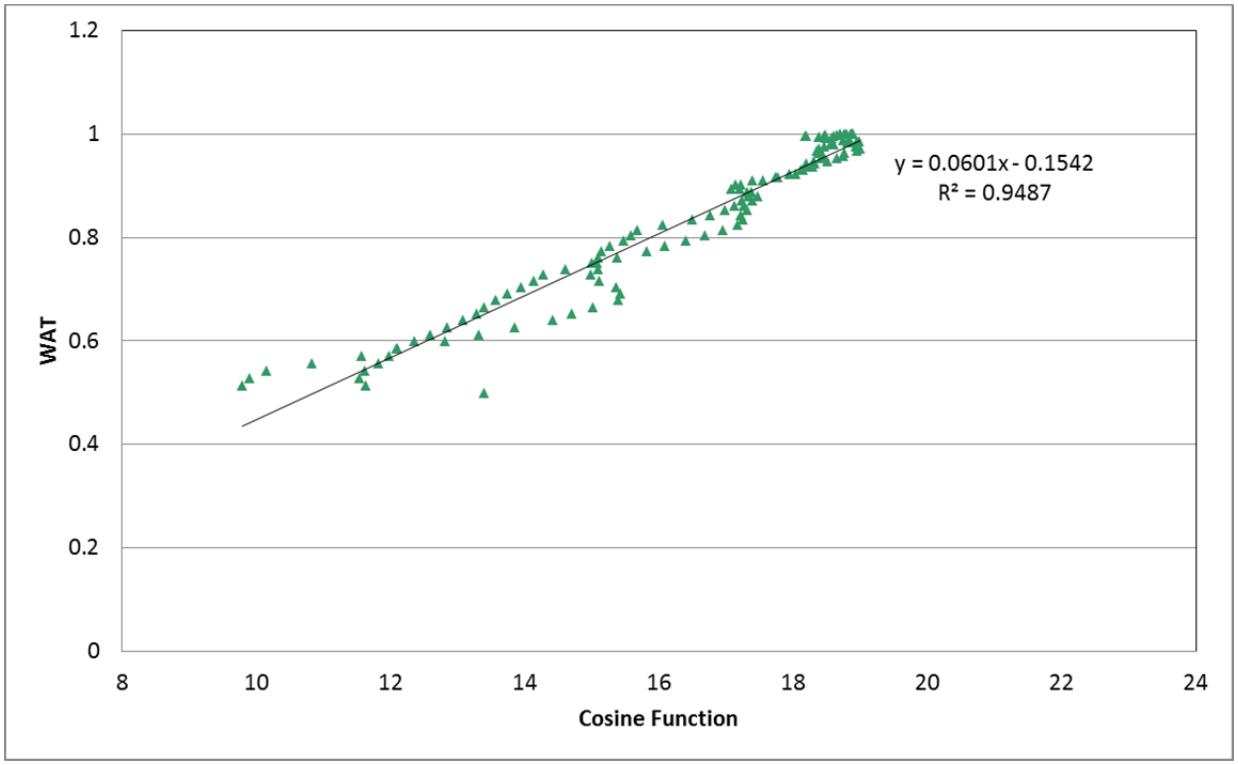

Figure 38. Relationship Used to Calculate Baseline Cosine Function Equation for CR-LB WATs

F. CR-WFU Baseline Development

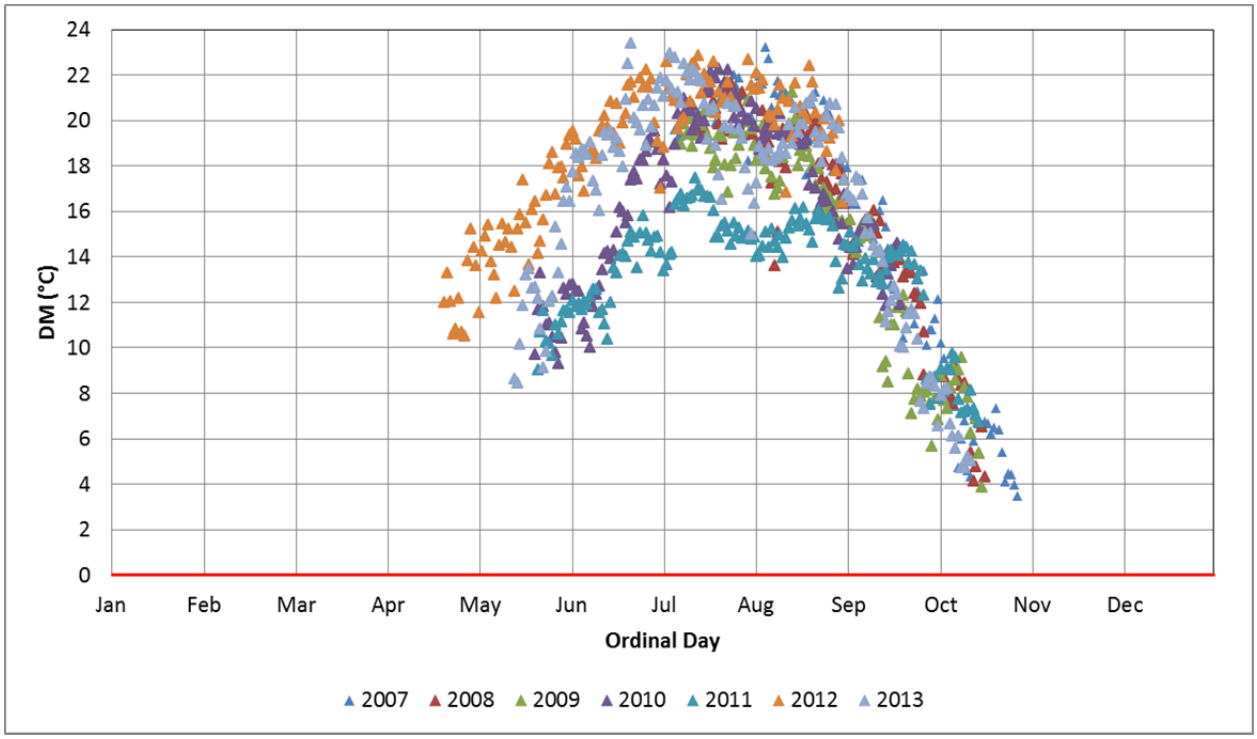

Figure 39. DM Values Calculated from CR-WFU Observed Water Temperature Data

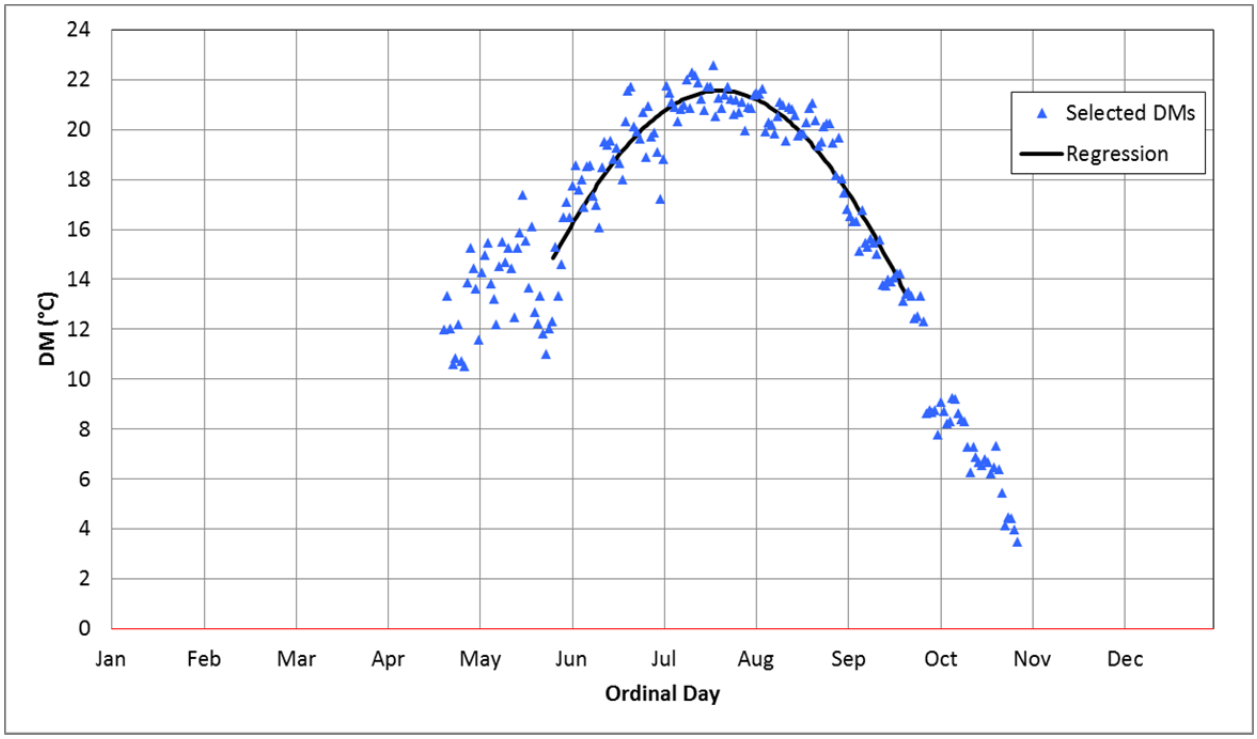

Figure 40. Selected DM Values for CR-WFU and DM Baseline

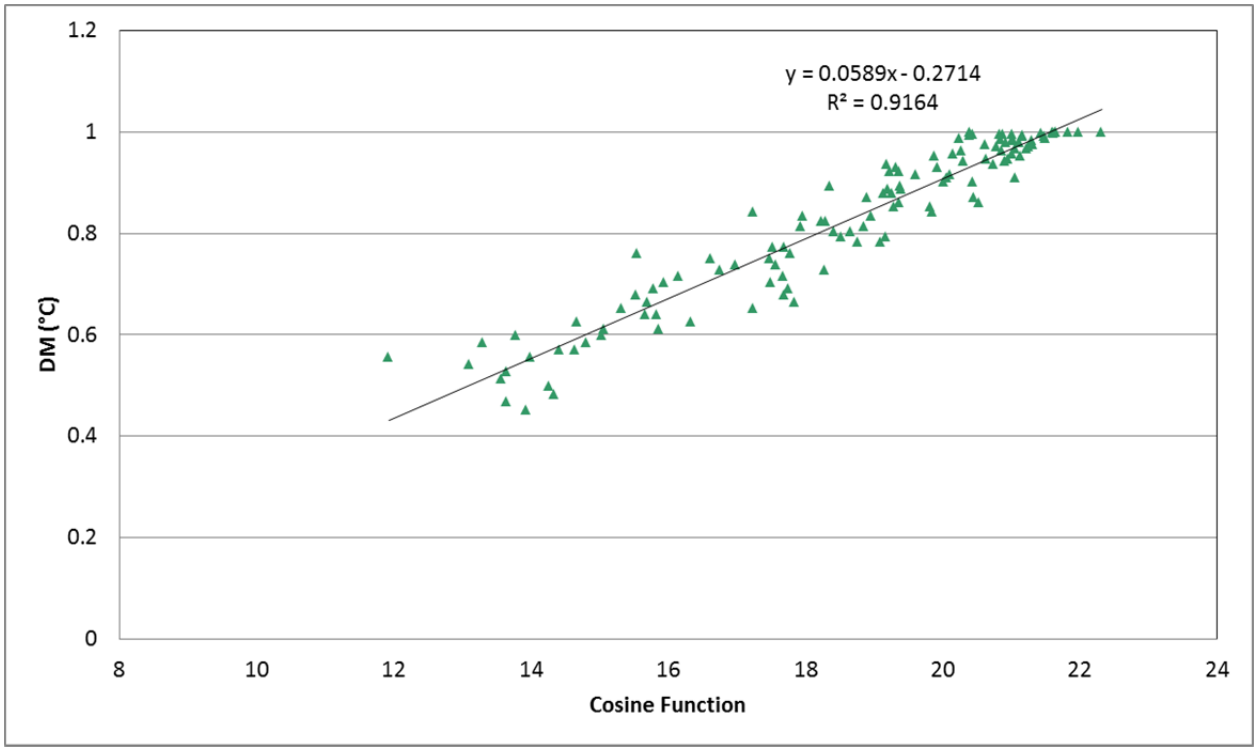

Figure 41. Relationship Used to Calculate Baseline Cosine Function Equation for CR-WFU DMs

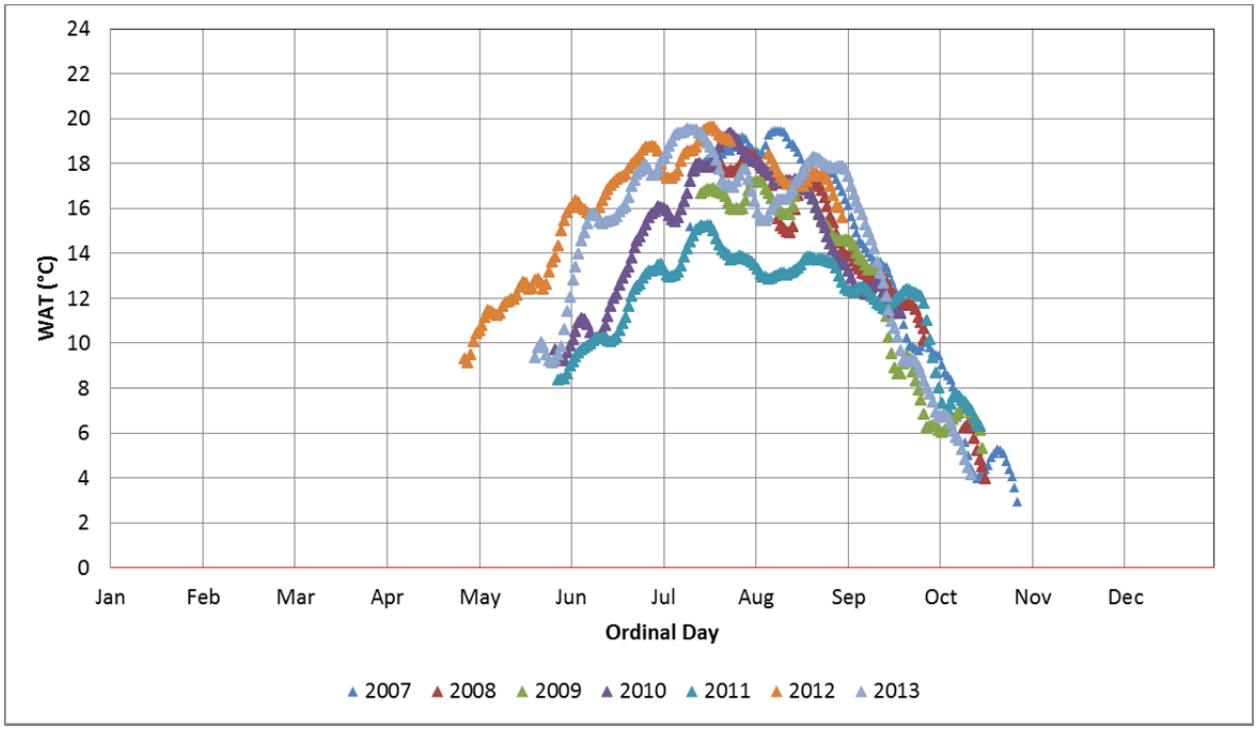

Figure 42. WAT Values Calculated from CR-WFU Observed Water Temperature Data

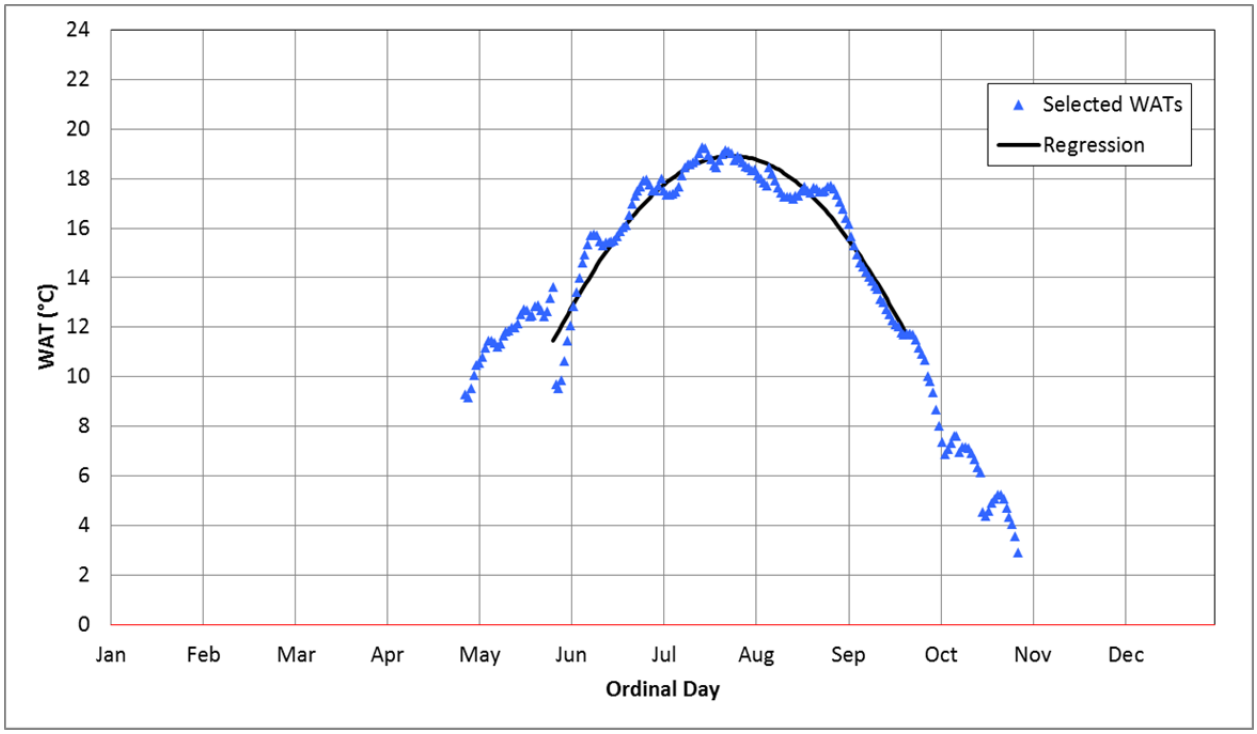

Figure 43. Selected WAT values for CR-WFU and WAT Baseline

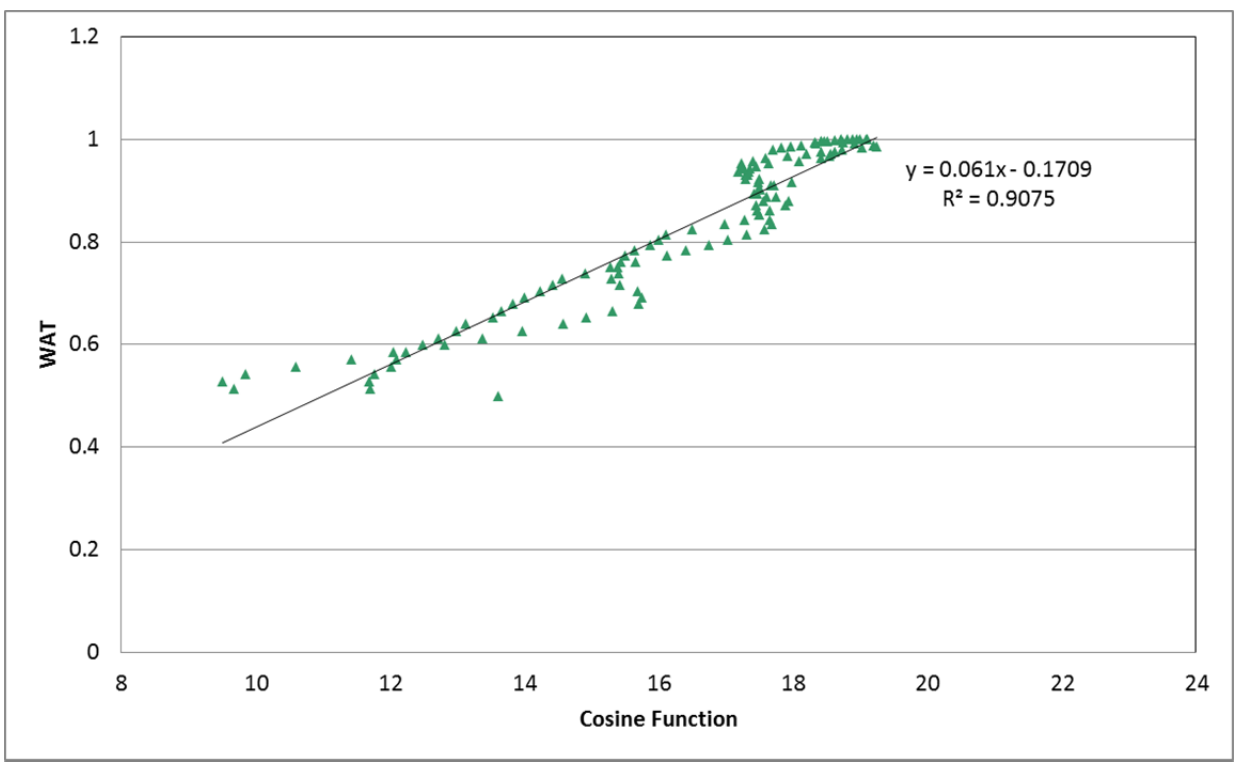

Figure 44. Relationship Used to Calculate Baseline Cosine Function Equation for CR-WFU WATs

G. CR-PAD Baseline Development

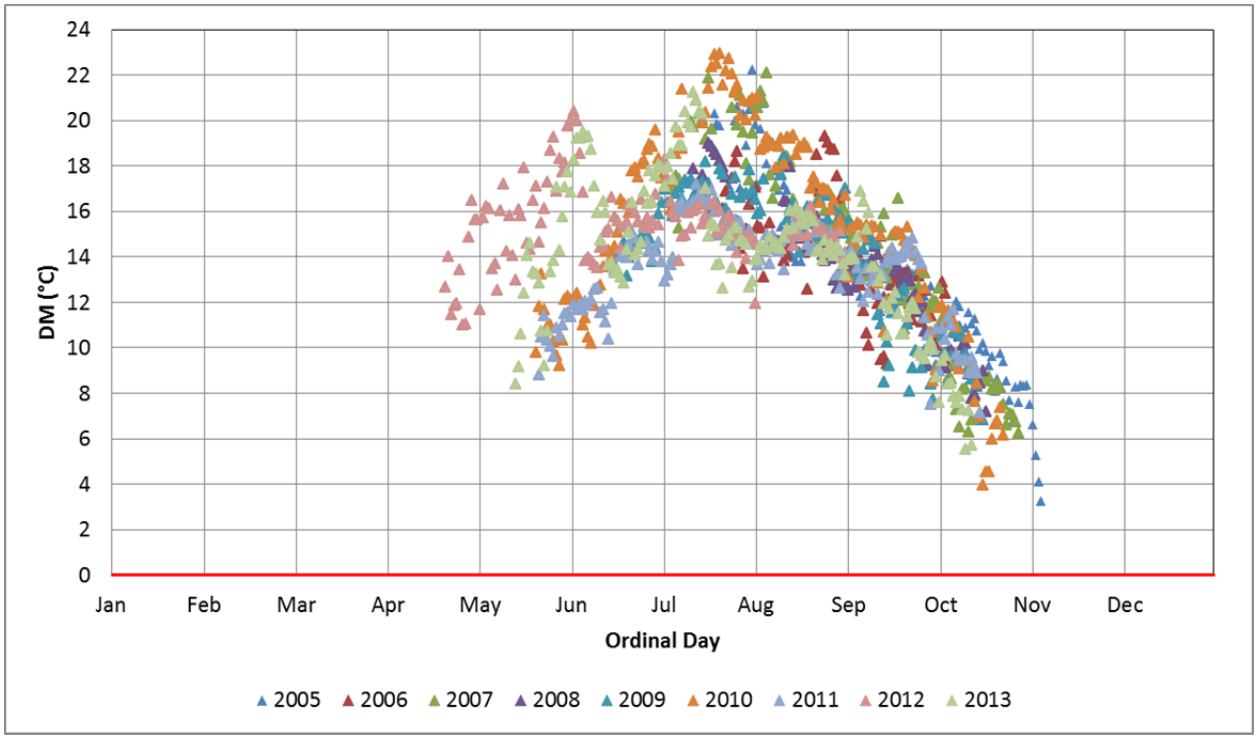

Figure 45. DM Values Calculated from CR-PAD Observed Water Temperature Data

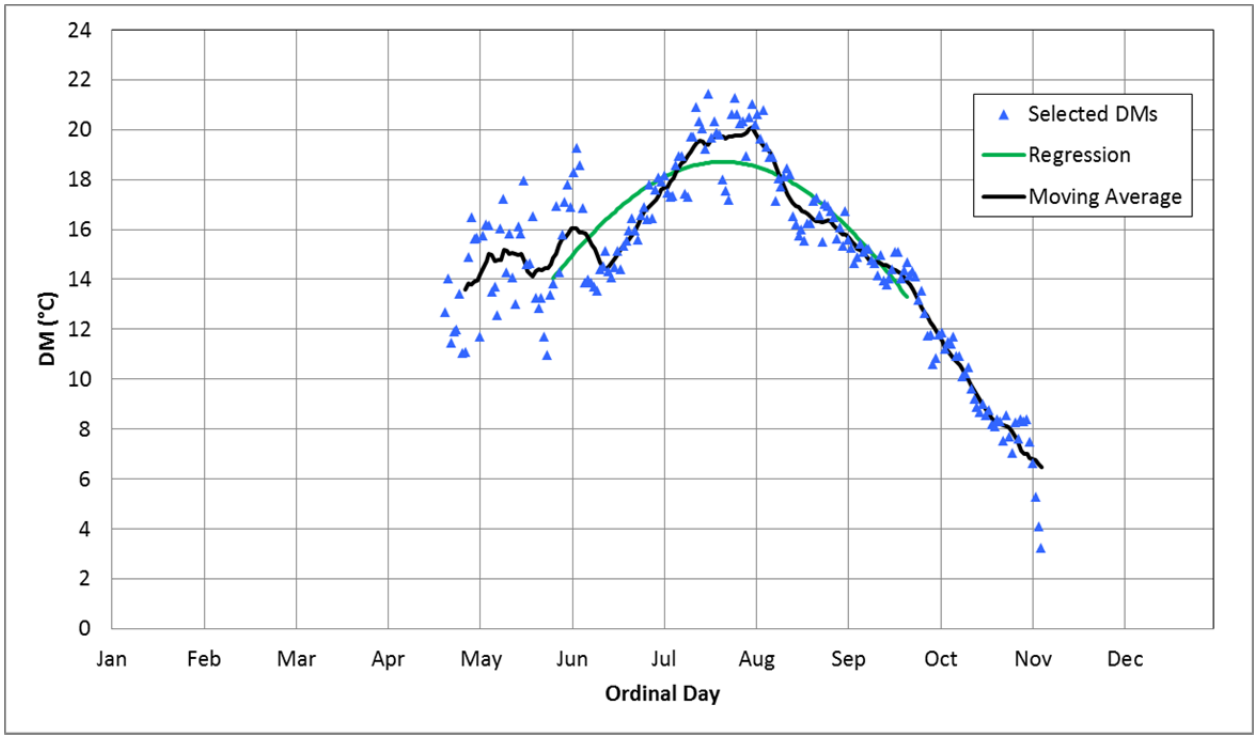

Figure 46. Selected DM Values for CR-PAD and DM Baseline

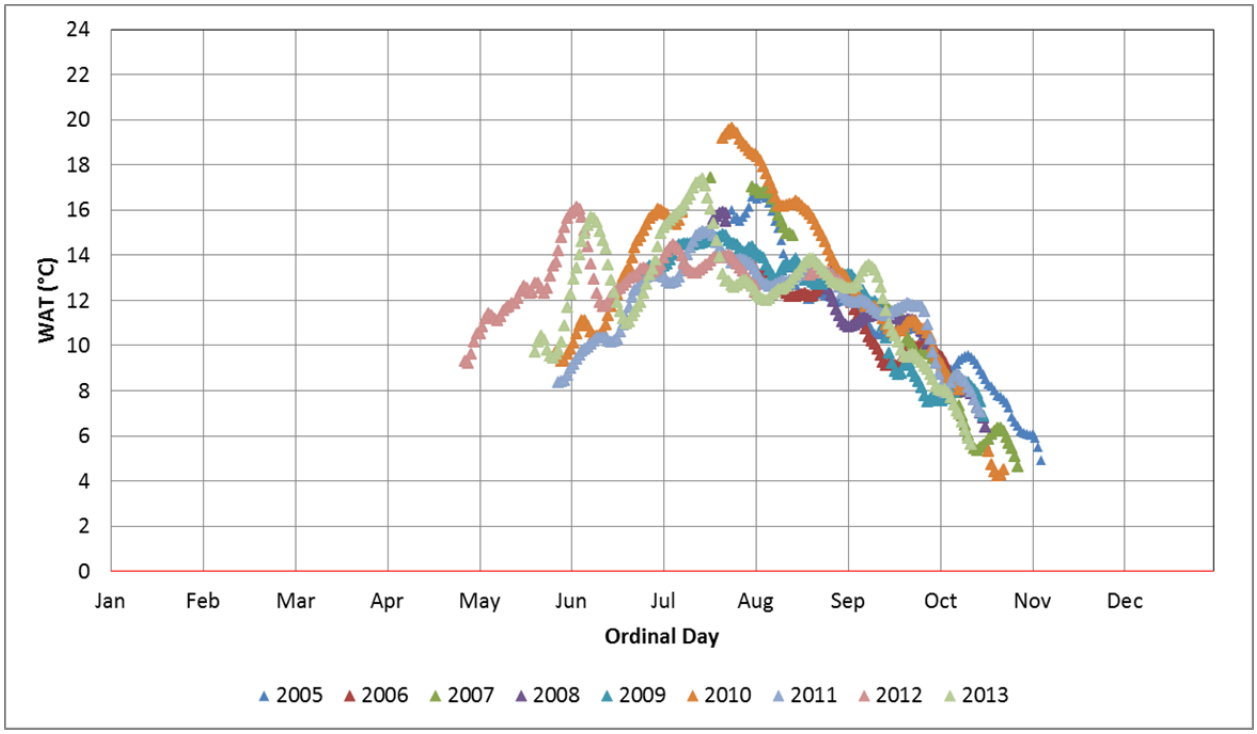

Figure 47. WAT Values Calculated from CR-PAD Observed Water Temperature Data

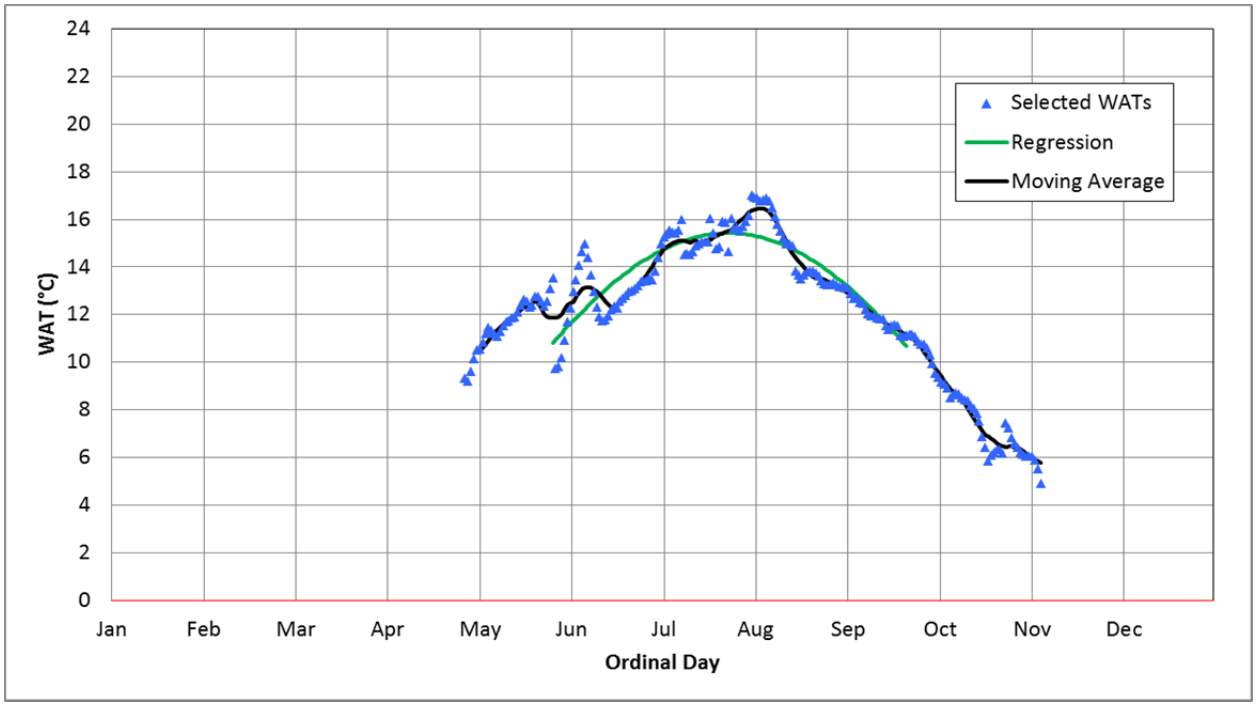

Figure 48. Selected WAT values for CR-PAD and WAT Baseline

H. Baseline Time Series Equations

This section presents the June-September WAT and DM baseline equations (Table 1 and Table 2) developed from data presented in the previous section, following the approach described in the main technical memorandum. For CR-YGAGE and CR-PAD, where moving averages were applied to develop the smooth baseline, the resulting daily time series is presented (Table 3).

Table 1. WAT Baseline Equations

		Slope		Intercept
CRWGD	y =	12.937	x +	4.838
CRHSU	y =	14.870	x +	3.984
CRHRU	y =	14.763	x +	3.501
CRLB	y =	15.793	x +	3.272
CRWFU	y =	14.866	x +	4.051

Table 2. DM Baseline Equations

		Slope		Intercept
CRWGD	y =	11.327	x +	8.177
CRHSU	y =	14.926	x +	7.782
CRHRU	y =	14.147	x +	7.923
CRLB	y =	15.551	x +	5.776
CRWFU	y =	15.074	x +	6.485

Table 3. Moving Average Results for CR-YGAGE and CR-PAD Baselines

WAT Smoothed Baseline Values			DM Smoothed Baseline Values		
Date	CR-YGAGE	CR-PAD	Date	CR-YGAGE	CR-PAD
1-Jun	9.1	11.7	1-Jun	13.9	14.1
2-Jun	9.2	11.3	2-Jun	14.0	14.6
3-Jun	9.3	10.8	3-Jun	14.1	15.2
4-Jun	9.4	10.5	4-Jun	14.3	16.0
5-Jun	9.6	11.0	5-Jun	14.5	16.7
6-Jun	9.8	11.6	6-Jun	14.7	17.2
7-Jun	9.9	12.2	7-Jun	14.9	17.2
8-Jun	10.1	12.9	8-Jun	15.2	17.1
9-Jun	10.4	13.5	9-Jun	15.3	16.9
10-Jun	10.6	14.0	10-Jun	15.5	16.6
11-Jun	10.7	14.3	11-Jun	15.6	16.1
12-Jun	10.9	14.3	12-Jun	15.6	15.8
13-Jun	11.0	14.1	13-Jun	15.5	15.3
14-Jun	11.1	13.6	14-Jun	15.5	14.8
15-Jun	11.1	13.0	15-Jun	15.6	14.4
16-Jun	11.1	12.5	16-Jun	15.6	14.1
17-Jun	11.2	12.1	17-Jun	15.7	14.2
18-Jun	11.2	11.9	18-Jun	15.8	14.2
19-Jun	11.2	11.9	19-Jun	15.8	14.3
20-Jun	11.1	12.0	20-Jun	15.8	14.4

WAT Smoothed Baseline Values			DM Smoothed Baseline Values		
Date	CR-YGAGE	CR-PAD	Date	CR-YGAGE	CR-PAD
21-Jun	11.1	12.1	21-Jun	15.9	14.6
22-Jun	11.1	12.3	22-Jun	15.9	14.8
23-Jun	11.1	12.4	23-Jun	15.9	14.9
24-Jun	11.1	12.5	24-Jun	15.8	15.1
25-Jun	11.1	12.7	25-Jun	15.8	15.2
26-Jun	11.1	12.8	26-Jun	15.9	15.4
27-Jun	11.2	12.9	27-Jun	15.9	15.6
28-Jun	11.2	13.0	28-Jun	15.9	15.8
29-Jun	11.2	13.1	29-Jun	16.0	16.1
30-Jun	11.2	13.2	30-Jun	16.0	16.3
1-Jul	11.2	13.3	1-Jul	16.0	16.4
2-Jul	11.2	13.4	2-Jul	16.0	16.6
3-Jul	11.3	13.4	3-Jul	16.0	16.8
4-Jul	11.3	13.5	4-Jul	16.0	17.0
5-Jul	11.3	13.7	5-Jul	15.9	17.3
6-Jul	11.3	14.0	6-Jul	15.9	17.4
7-Jul	11.4	14.4	7-Jul	16.0	17.4
8-Jul	11.4	14.8	8-Jul	15.9	17.6
9-Jul	11.4	15.1	9-Jul	15.9	17.6
10-Jul	11.5	15.3	10-Jul	15.8	17.9
11-Jul	11.5	15.4	11-Jul	15.9	18.1
12-Jul	11.6	15.5	12-Jul	15.9	18.0
13-Jul	11.6	15.6	13-Jul	15.9	17.9
14-Jul	11.6	15.4	14-Jul	15.8	18.1
15-Jul	11.6	15.2	15-Jul	15.9	18.4
16-Jul	11.6	15.0	16-Jul	15.9	18.7
17-Jul	11.7	14.8	17-Jul	15.9	19.1
18-Jul	11.7	14.6	18-Jul	15.8	19.2
19-Jul	11.7	14.7	19-Jul	15.9	19.3
20-Jul	11.7	14.8	20-Jul	15.8	19.6
21-Jul	11.8	14.9	21-Jul	15.8	19.8
22-Jul	11.8	15.0	22-Jul	15.8	20.1
23-Jul	11.8	15.2	23-Jul	15.8	20.2
24-Jul	11.7	15.3	24-Jul	15.5	20.2
25-Jul	11.6	15.2	25-Jul	15.3	19.8
26-Jul	11.4	15.2	26-Jul	15.3	19.5
27-Jul	11.3	15.4	27-Jul	15.5	19.2
28-Jul	11.2	15.3	28-Jul	15.7	19.4
29-Jul	11.1	15.2	29-Jul	15.9	19.3
30-Jul	11.1	15.5	30-Jul	16.1	19.5
31-Jul	11.1	15.6	31-Jul	16.3	19.4
1-Aug	11.1	15.6	1-Aug	16.5	19.5
2-Aug	11.3	15.5	2-Aug	16.8	19.4
3-Aug	11.6	15.7	3-Aug	17.2	19.7
4-Aug	11.9	15.7	4-Aug	17.5	20.1
5-Aug	12.1	15.8	5-Aug	17.5	20.4
6-Aug	12.4	16.1	6-Aug	17.7	20.4
7-Aug	12.6	16.3	7-Aug	17.6	20.2

WAT Smoothed Baseline Values			DM Smoothed Baseline Values		
Date	CR-YGAGE	CR-PAD	Date	CR-YGAGE	CR-PAD
8-Aug	12.7	16.6	8-Aug	17.7	20.2
9-Aug	12.8	16.7	9-Aug	17.7	20.1
10-Aug	12.8	16.9	10-Aug	17.7	20.0
11-Aug	12.8	16.9	11-Aug	17.7	20.0
12-Aug	12.7	16.8	12-Aug	17.4	19.6
13-Aug	12.6	16.7	13-Aug	17.2	19.3
14-Aug	12.5	16.6	14-Aug	17.3	19.0
15-Aug	12.4	16.4	15-Aug	17.2	18.7
16-Aug	12.3	16.1	16-Aug	17.2	18.6
17-Aug	12.2	15.8	17-Aug	17.1	18.3
18-Aug	12.1	15.5	18-Aug	17.1	18.0
19-Aug	12.0	15.3	19-Aug	16.9	17.7
20-Aug	11.9	15.1	20-Aug	16.8	17.3
21-Aug	11.8	14.8	21-Aug	16.8	17.2
22-Aug	11.8	14.5	22-Aug	16.7	16.9
23-Aug	11.7	14.2	23-Aug	16.6	16.8
24-Aug	11.6	13.9	24-Aug	16.4	16.6
25-Aug	11.6	13.7	25-Aug	16.3	16.4
26-Aug	11.5	13.7	26-Aug	16.1	16.3
27-Aug	11.5	13.7	27-Aug	15.7	16.3
28-Aug	11.4	13.8	28-Aug	15.6	16.2
29-Aug	11.3	13.8	29-Aug	15.7	16.4
30-Aug	11.3	13.7	30-Aug	15.6	16.5
31-Aug	11.3	13.6	31-Aug	15.5	16.6
1-Sep	11.2	13.4	1-Sep	15.4	16.6
2-Sep	11.2	13.4	2-Sep	15.2	16.6
3-Sep	11.2	13.3	3-Sep	15.1	16.4
4-Sep	11.2	13.3	4-Sep	15.0	16.2
5-Sep	11.1	13.2	5-Sep	15.0	16.3
6-Sep	11.1	13.2	6-Sep	15.0	16.3
7-Sep	11.1	13.2	7-Sep	14.6	16.1
8-Sep	11.0	13.2	8-Sep	14.5	15.8
9-Sep	10.9	13.1	9-Sep	14.4	15.6
10-Sep	10.8	13.0	10-Sep	14.2	15.5
11-Sep	10.8	12.9	11-Sep	14.2	15.4
12-Sep	10.7	12.8	12-Sep	14.1	15.3
13-Sep	10.6	12.6	13-Sep	14.0	15.3
14-Sep	10.5	12.5	14-Sep	14.0	15.1
15-Sep	10.4	12.4	15-Sep	14.0	15.0
16-Sep	10.4	12.2	16-Sep	14.0	14.9
17-Sep	10.3	12.1	17-Sep	14.0	14.9
18-Sep	10.2	12.0	18-Sep	14.0	14.8
19-Sep	10.1	11.9	19-Sep	13.9	14.6
20-Sep	10.0	11.9	20-Sep	13.8	14.5
21-Sep	9.9	11.8	21-Sep	13.7	14.4
22-Sep	9.8	11.7	22-Sep	13.7	14.4
23-Sep	9.7	11.6	23-Sep	13.7	14.4
24-Sep	9.6	11.6	24-Sep	13.7	14.4

WAT Smoothed Baseline Values		
Date	CR-YGAGE	CR-PAD
25-Sep	9.6	11.5
26-Sep	9.6	11.4
27-Sep	9.5	11.4
28-Sep	9.5	11.3
29-Sep	9.6	11.2
30-Sep	9.6	11.1

DM Smoothed Baseline Values		
Date	CR-YGAGE	CR-PAD
25-Sep	13.7	14.4
26-Sep	13.7	14.4
27-Sep	13.6	14.4
28-Sep	13.6	14.5
29-Sep	13.4	14.5
30-Sep	13.2	14.3

III. Comparison of Observed and Modeled Baselines

This section presents the baseline time series grouped by stations, comparing observed-data baselines to modeled baselines (Existing Conditions simulation results from the Upper Colorado River Dynamic Temperature Model [Hydros, 2011]). These figures support the discussion presented in Section 1.3.2 of the Technical Memorandum.

A. CR-YGAGE Baseline Comparison

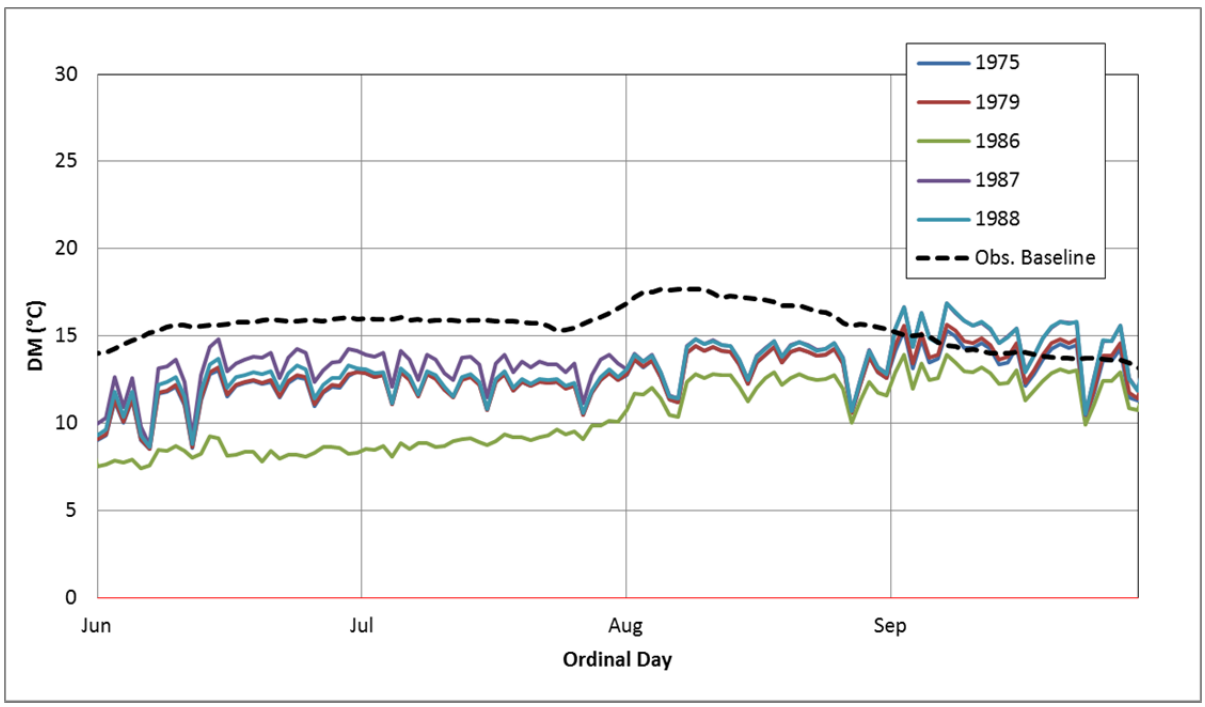

Figure 49. June-Sept DM Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-YGAGE

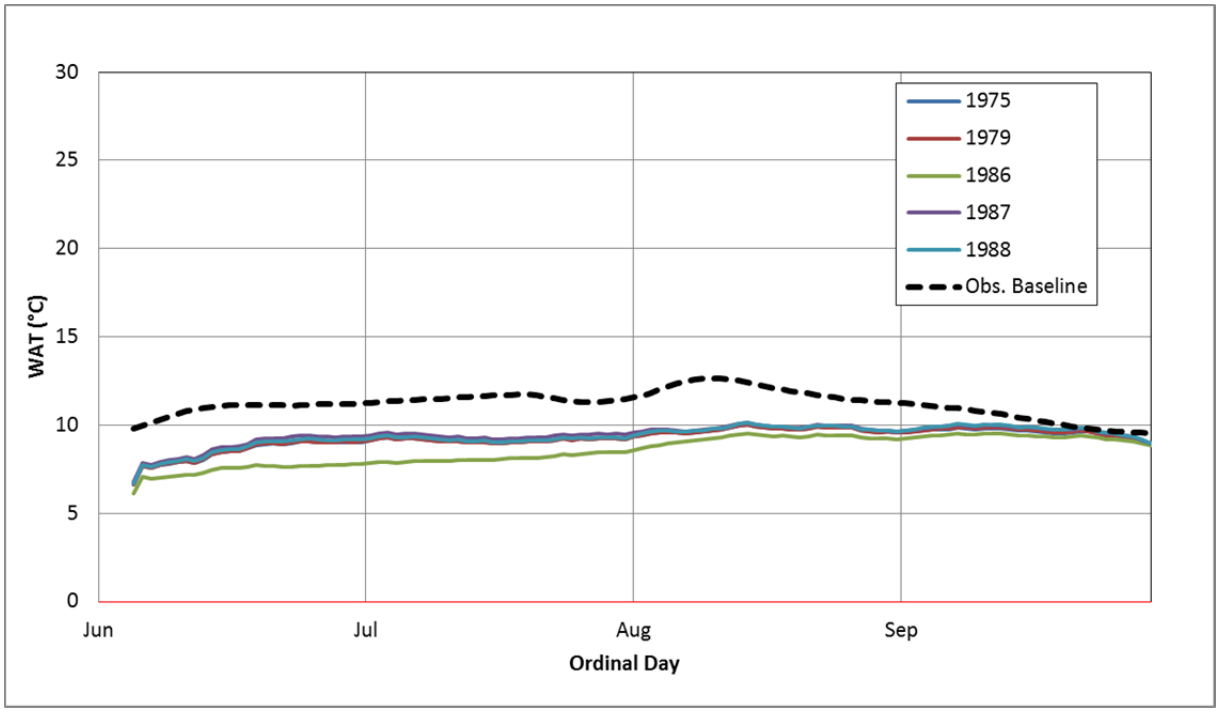

Figure 50. June-Sept WAT Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-YGAGE

B. CR-WGD Baseline Comparison

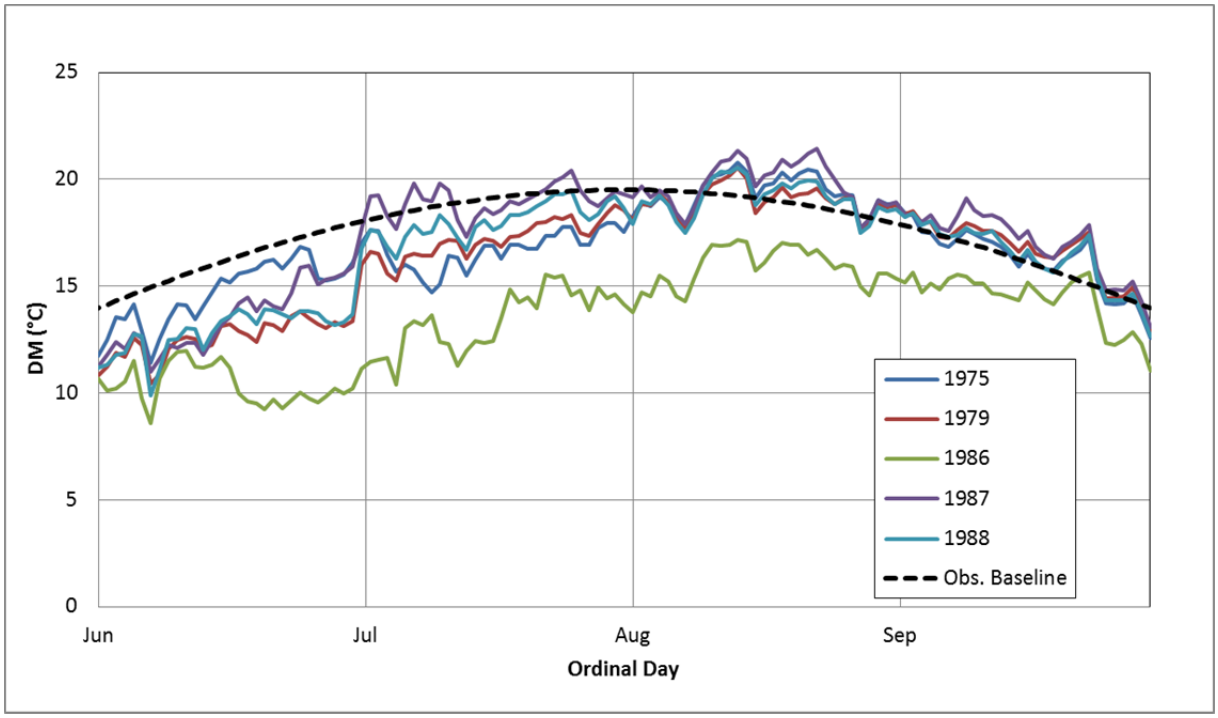

Figure 51. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-WGD

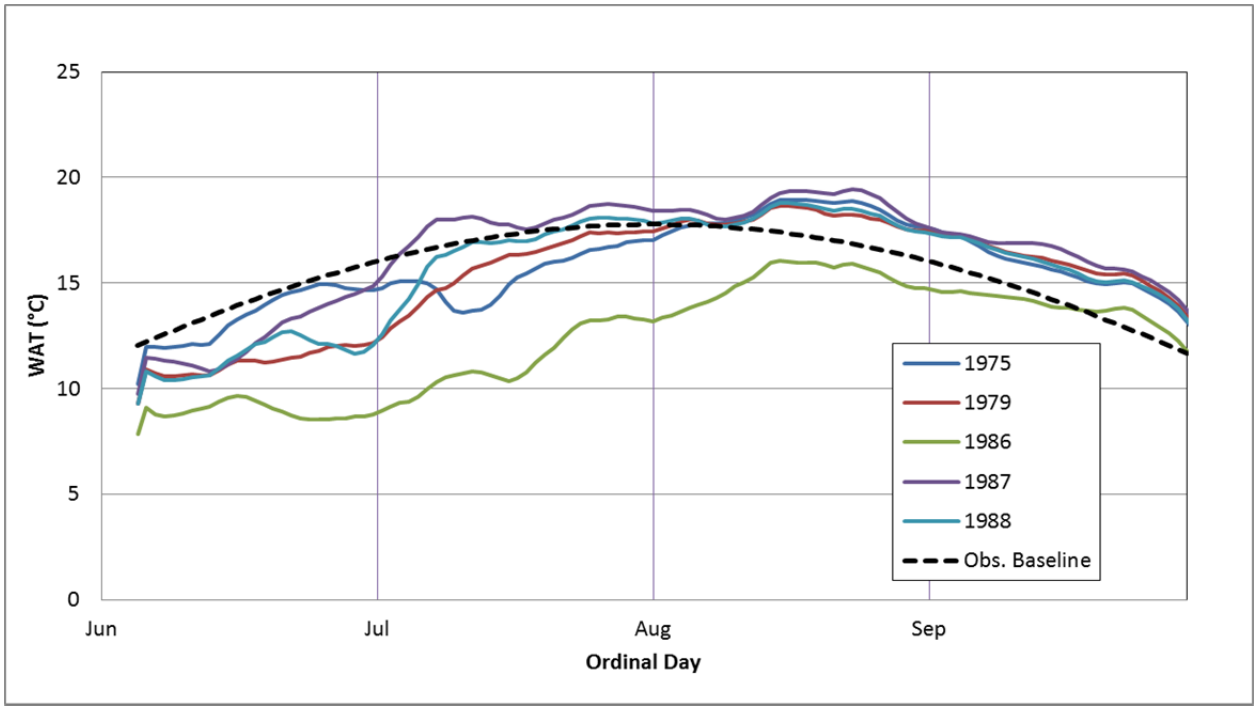

Figure 52. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-WGD

C. CR-HSU Baseline Comparison

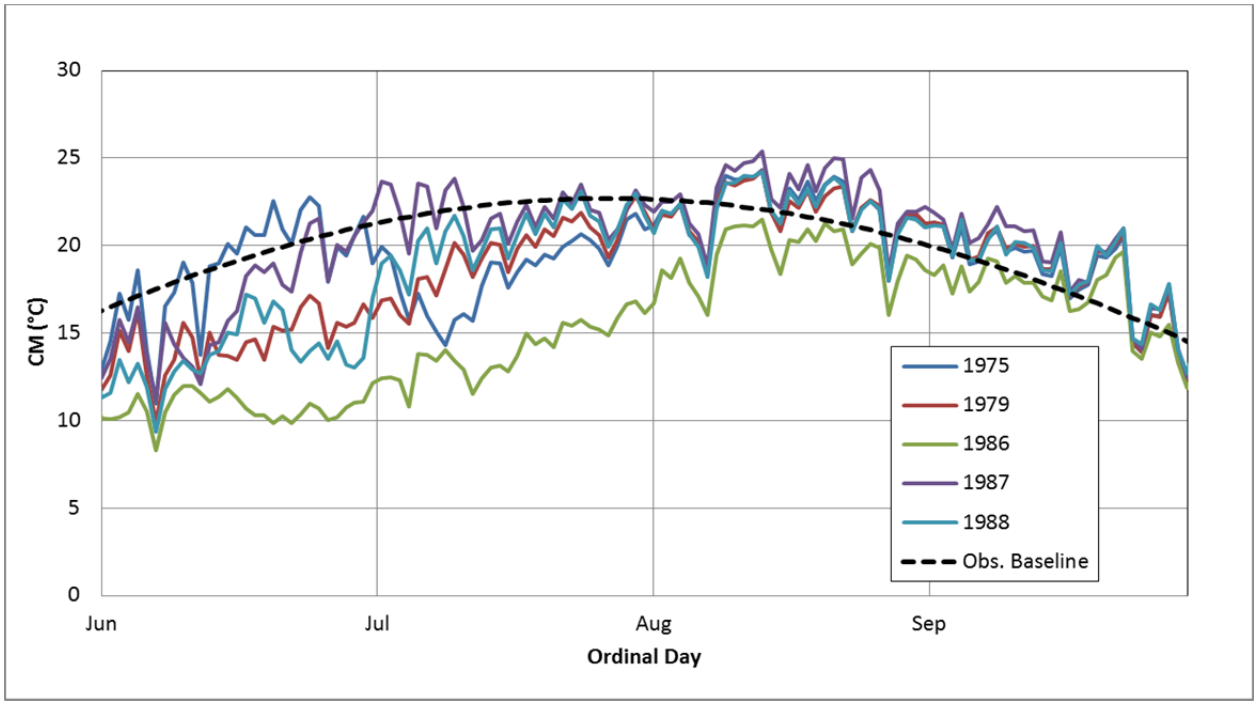

Figure 53. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HSU

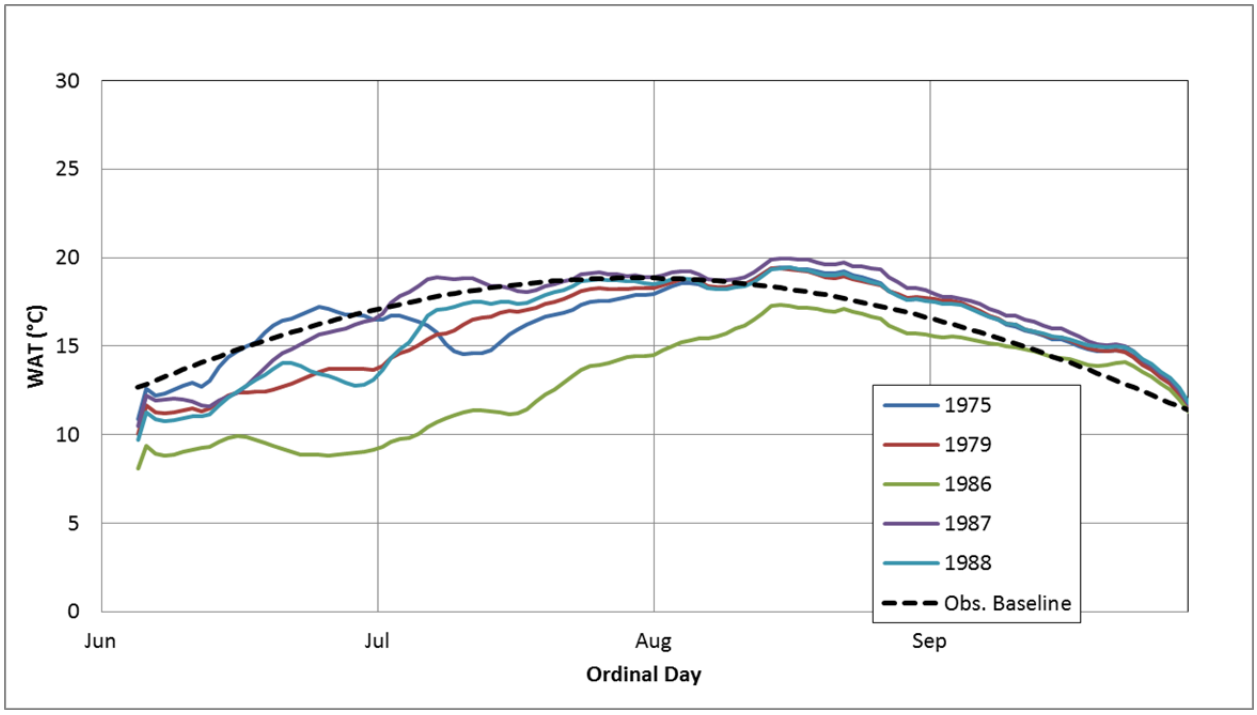

Figure 54. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HSU

D. CR-HRU Baseline Comparison

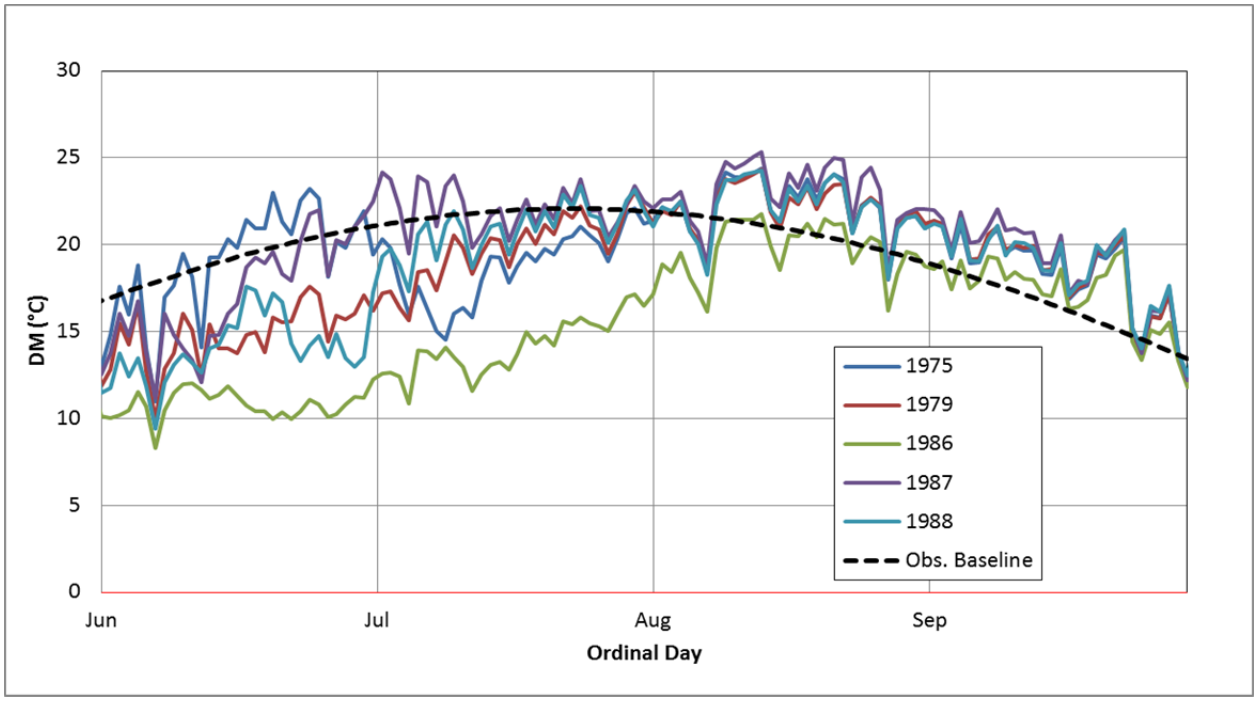

Figure 55. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HRU

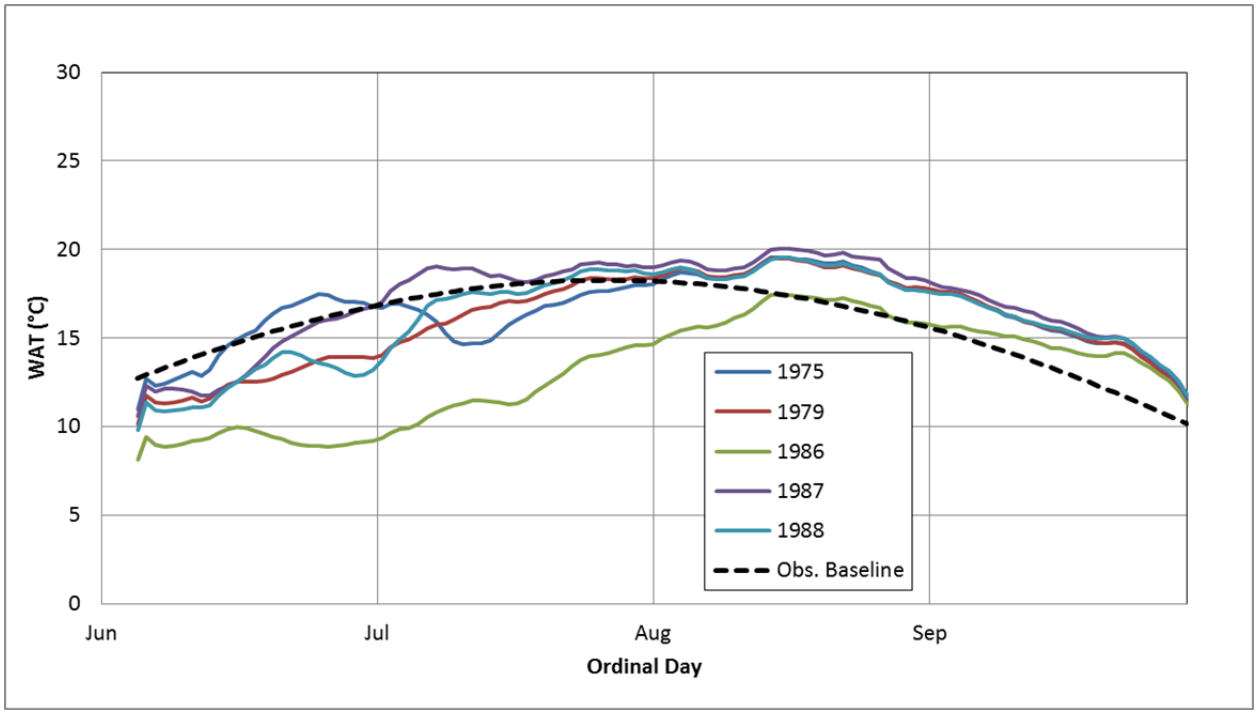

Figure 56. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-HRU

E. CR-LB Baseline Comparison

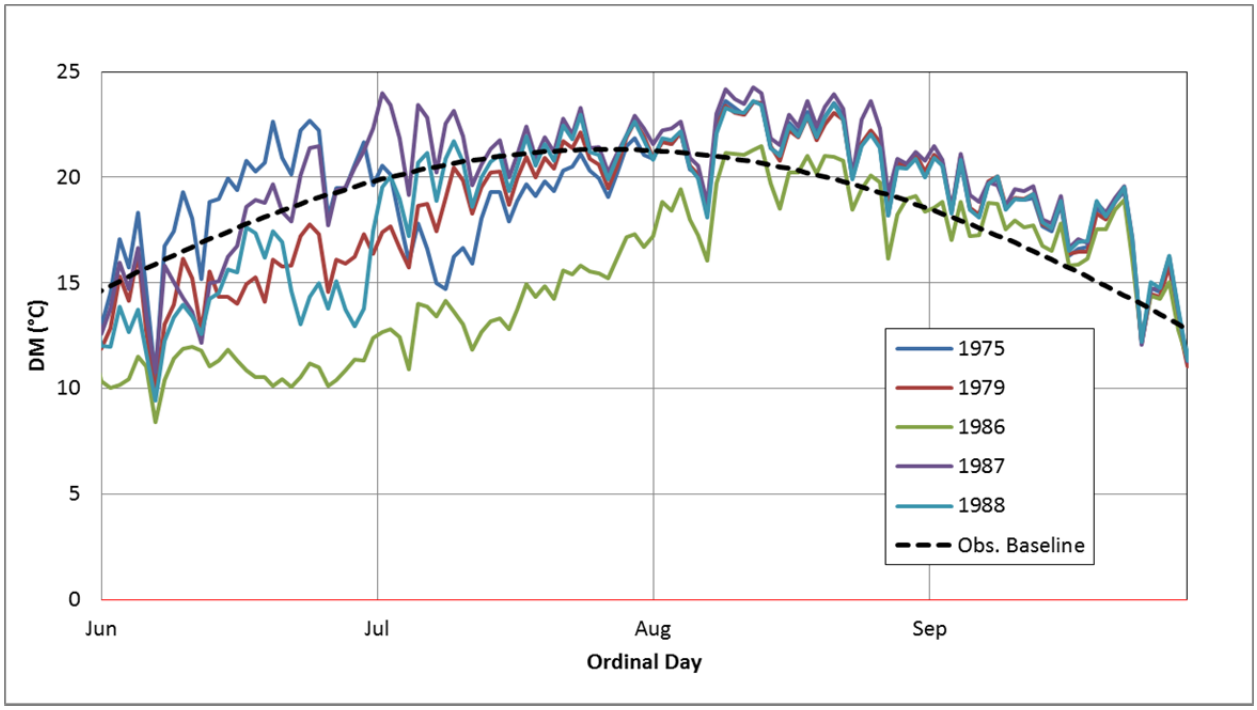

Figure 57. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-LB

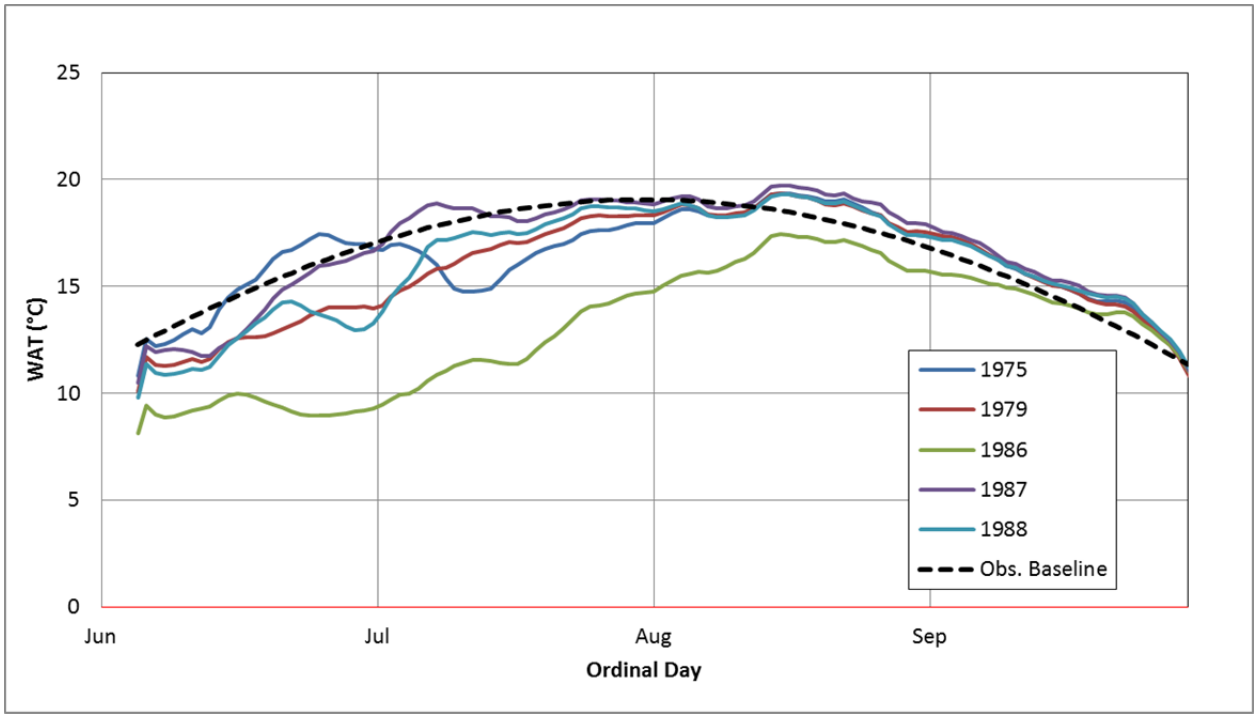

Figure 58. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-LB

A. CR-WFU Baseline Comparison

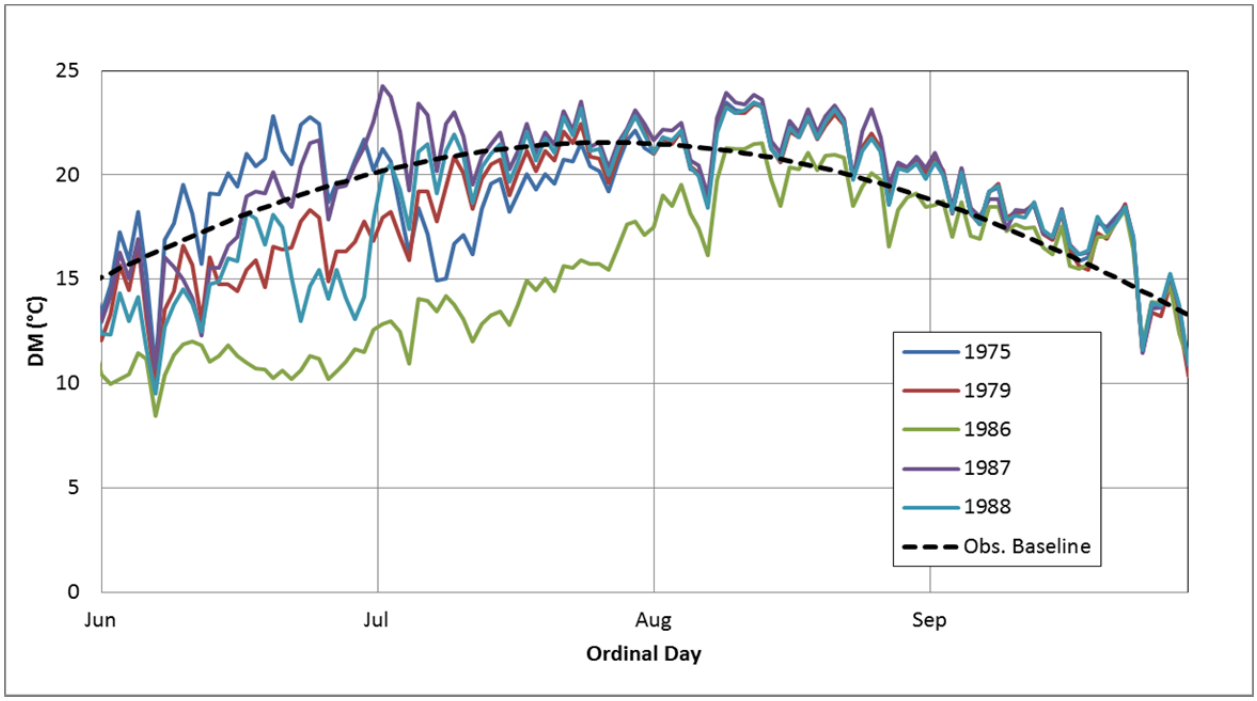

Figure 59. June-Sept DM Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-WFU

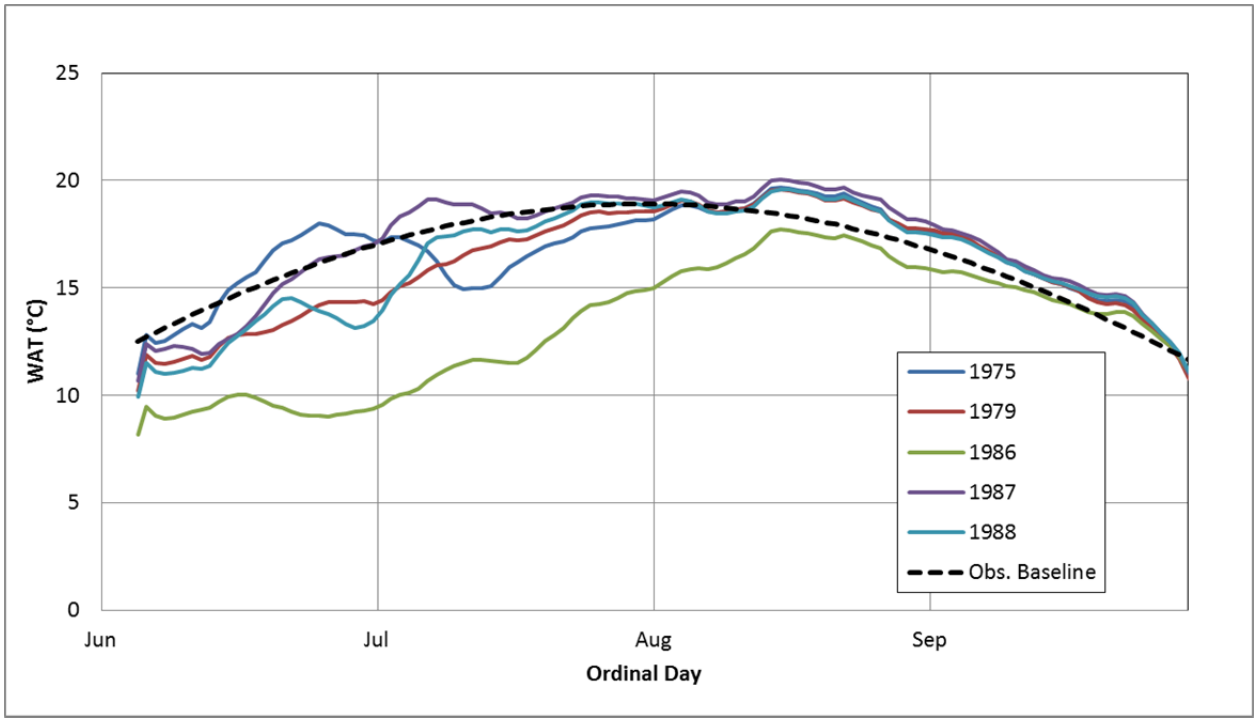

Figure 60. June-Sept WAT Baseline from Observed Data (Regression) and Existing Conditions Model Results for CR-WFU

A. CR-PAD Baseline Comparison

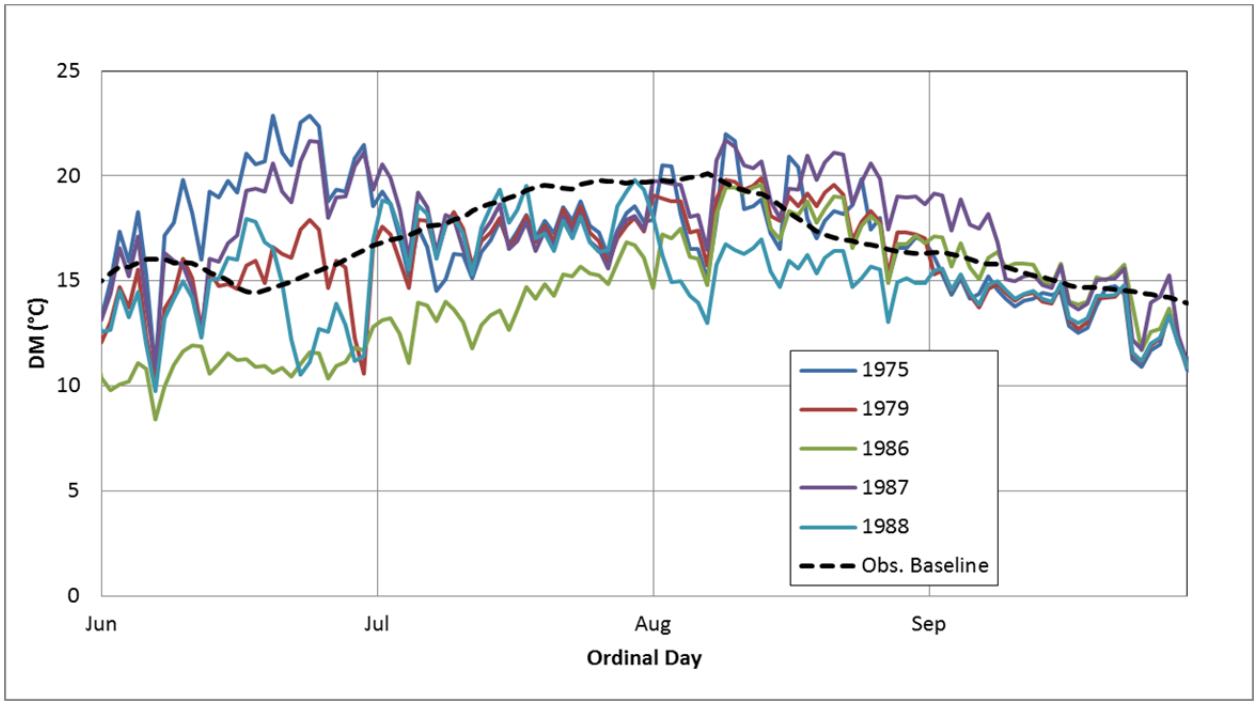

Figure 61. June-Sept DM Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-PAD

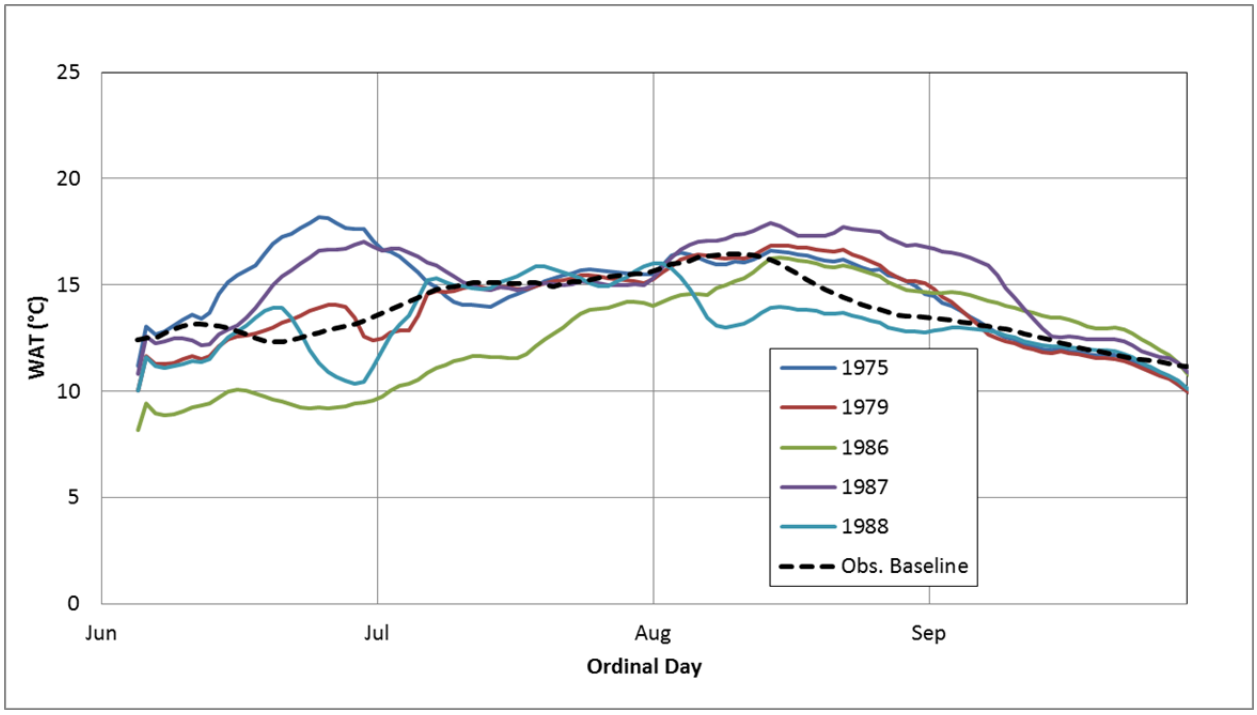

Figure 62. June-Sept WAT Baseline from Observed Data (Moving Average) and Existing Conditions Model Results for CR-PAD

Attachment B: Supporting Information for Calculation of Available Increment and Results Assessment

This attachment presents graphical presentations of calculated baseline available increments (BAIs) by station (Section I) and by year (Section II). Results plots comparing simulated temperature differences to the BAI and 15% of the BAI are also provided (Section III). These figures support the main technical memorandum discussion.

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I. Development of Modeled Available Increment – By Station

The BAIs for the modeled results were calculated by subtracting the existing-conditions simulation results for each gage and year from the relevant standard (DM or WAT). BAI values were then multiplied by 0.15 to determine the 15% BAI time series for comparison to simulated temperature effects. This section presents the 15% BAI time series grouped by station.

A. CR-YGAGE 15% Available Increment

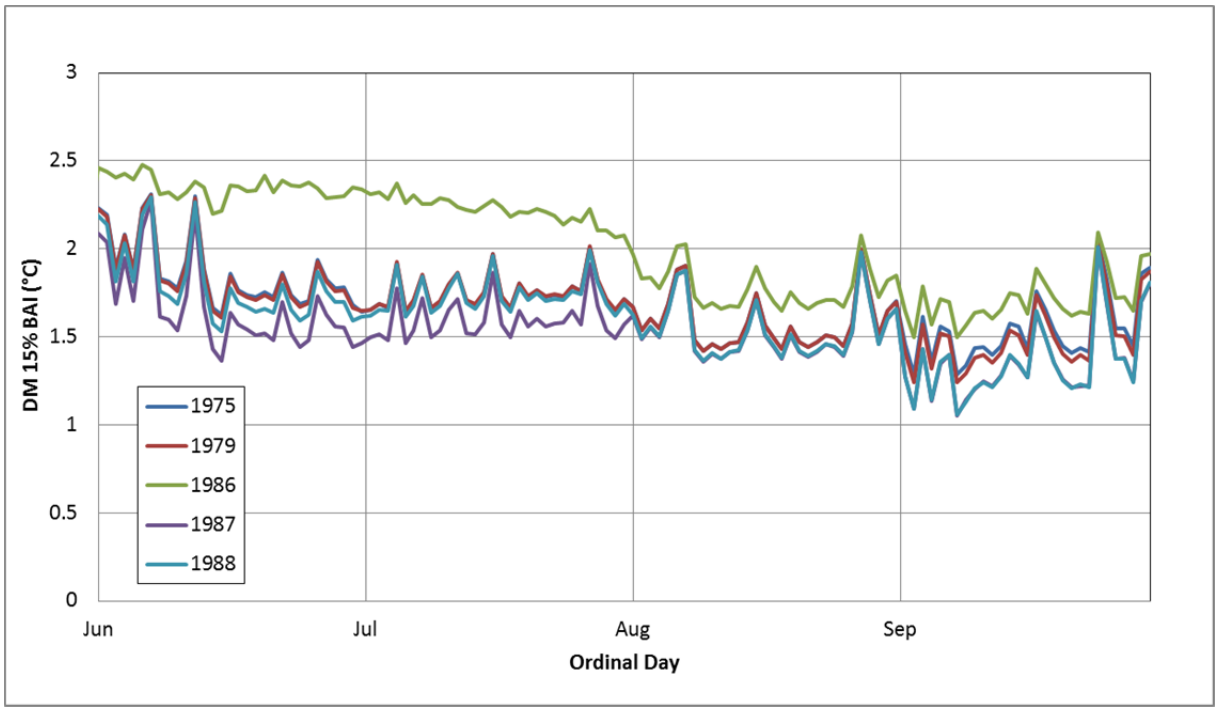


Figure 1. CR-YGAGE DM 15% BAI

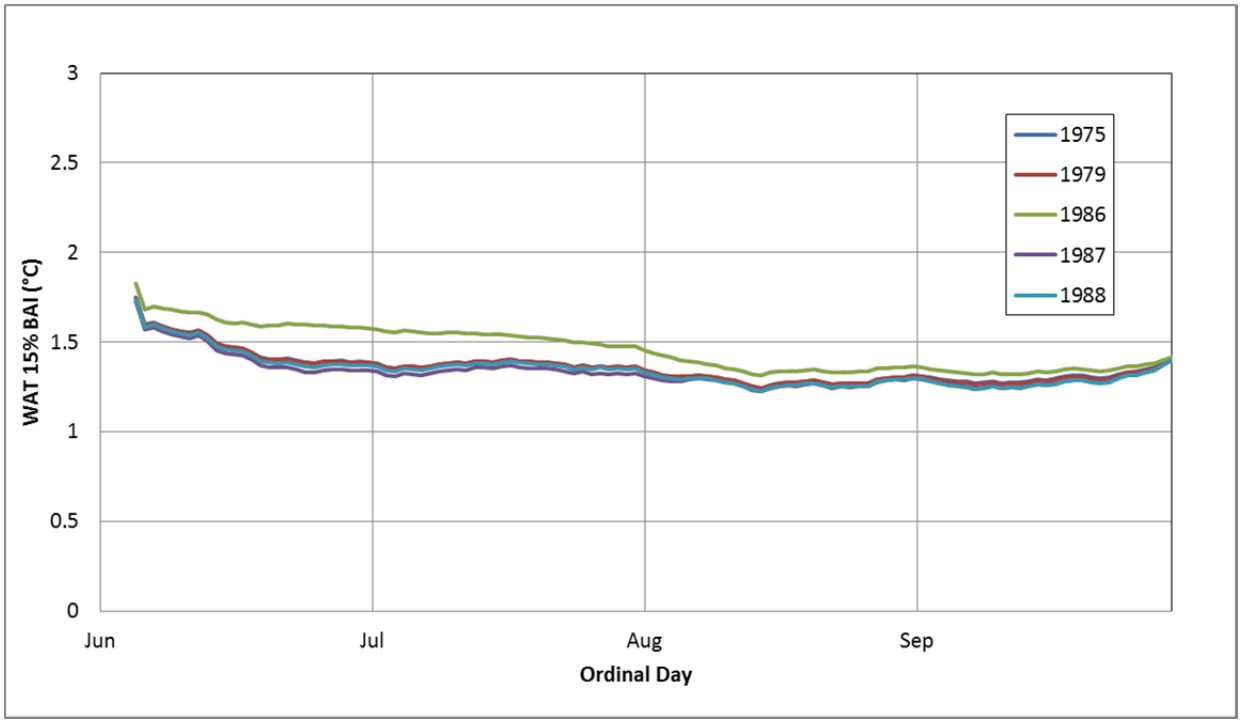


Figure 2. CR-YGAGE WAT 15% BAI

A. CR-WGD 15% Available Increment

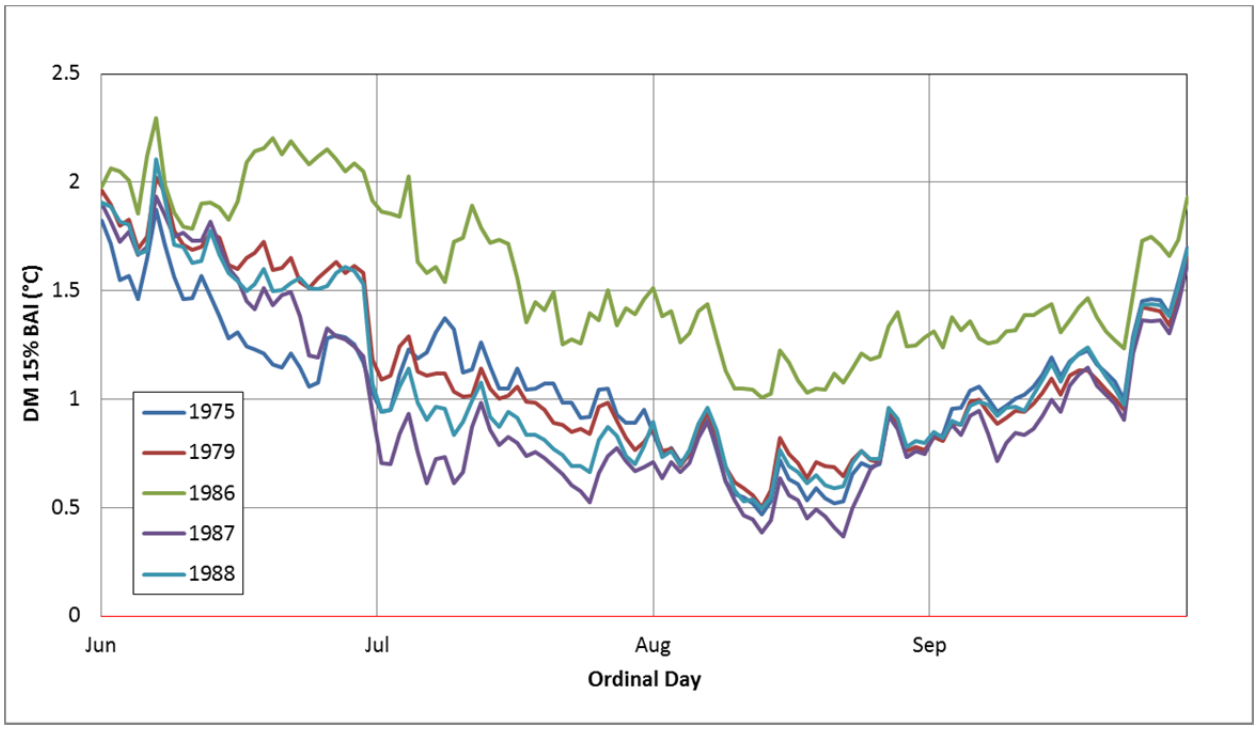


Figure 3. CR-WGD DM 15% BAI

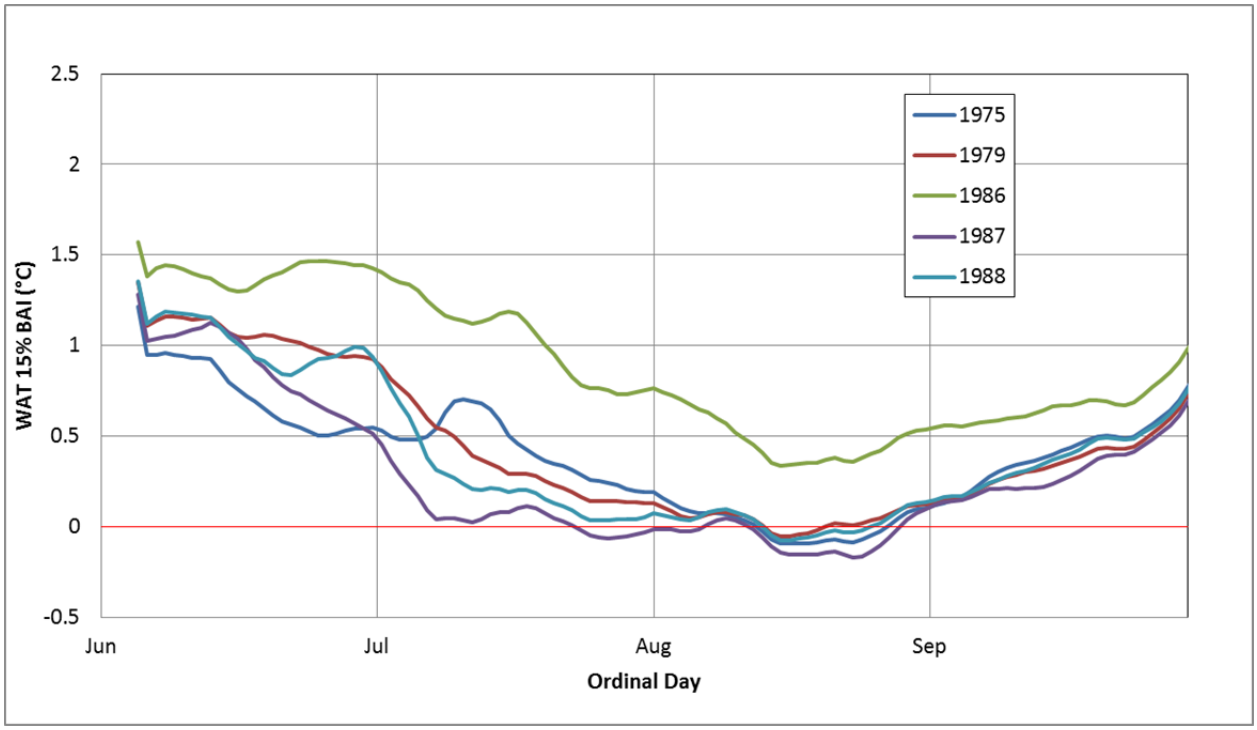


Figure 4. CR-WGD WAT 15% BAI

B. CR-HSU 15% Available Increment

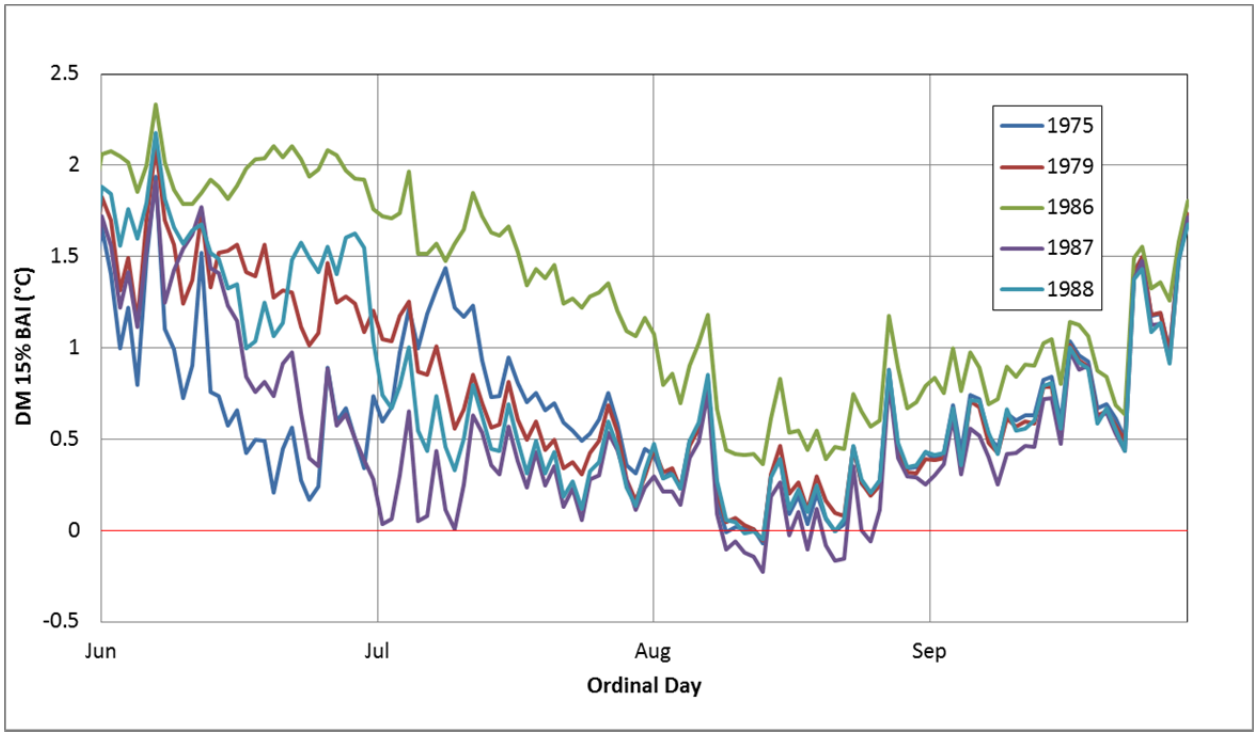


Figure 5. CR-HSU DM 15% BAI

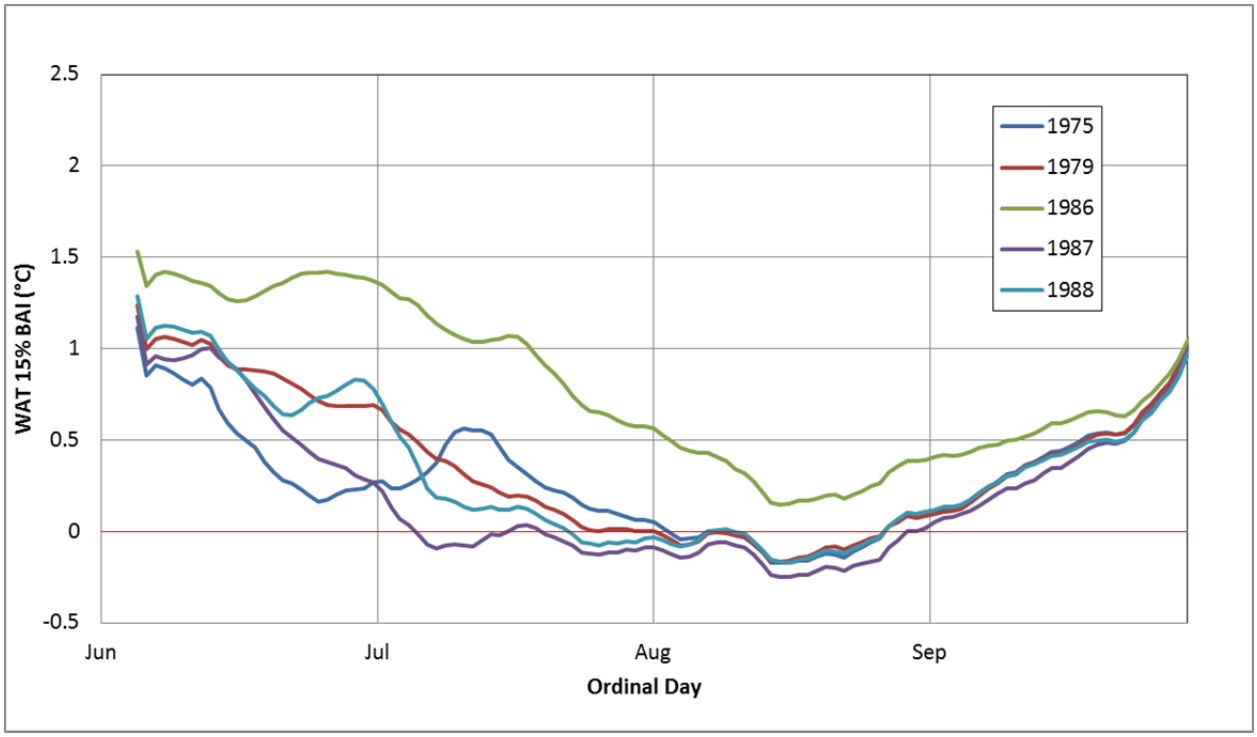


Figure 6. CR-HSU WAT 15% BAI

C. CR-HRU 15% Available Increment

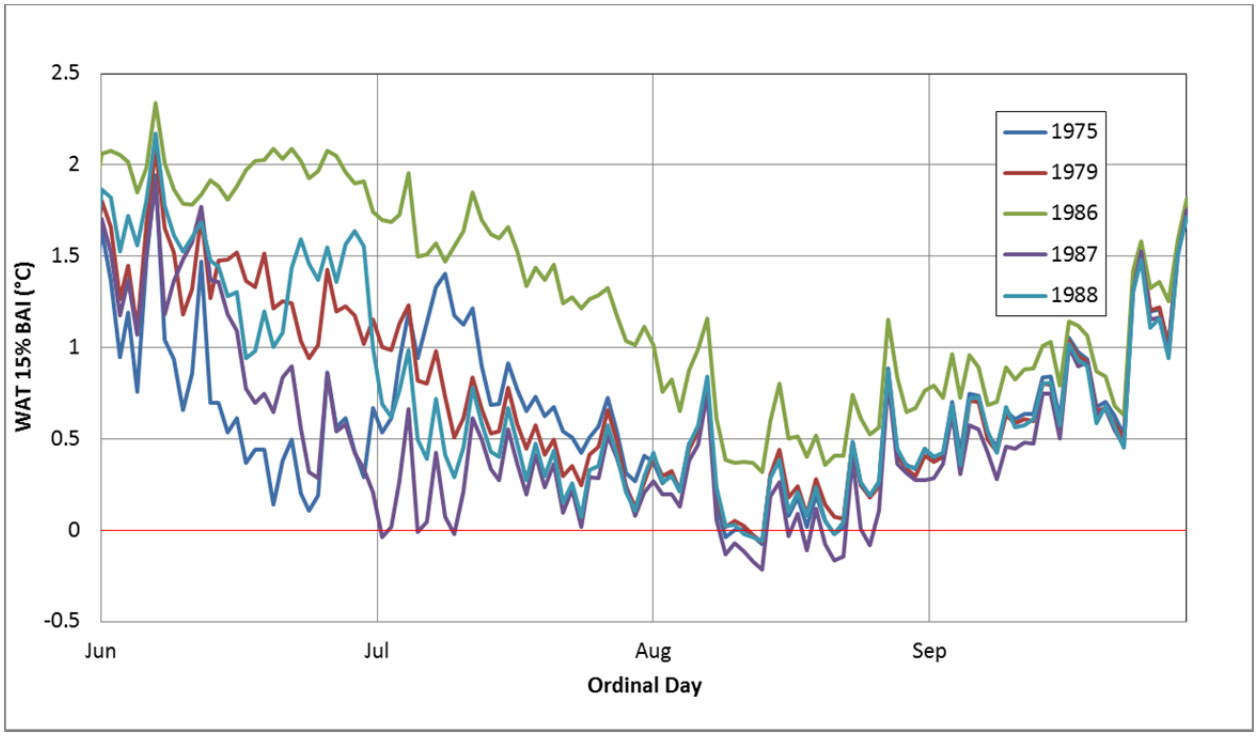


Figure 7. CR-HRU DM 15% BAI

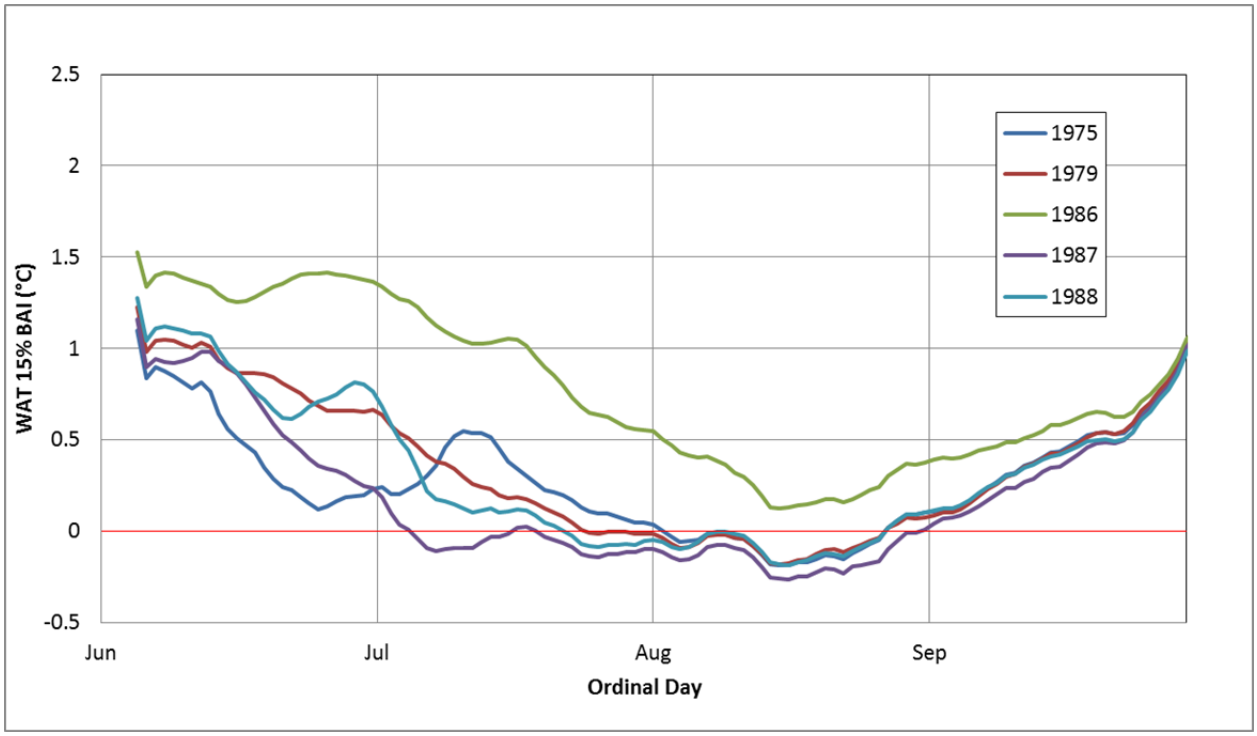


Figure 8. CR-HRU WAT 15% BAI

D. CR-LB 15% Available Increment

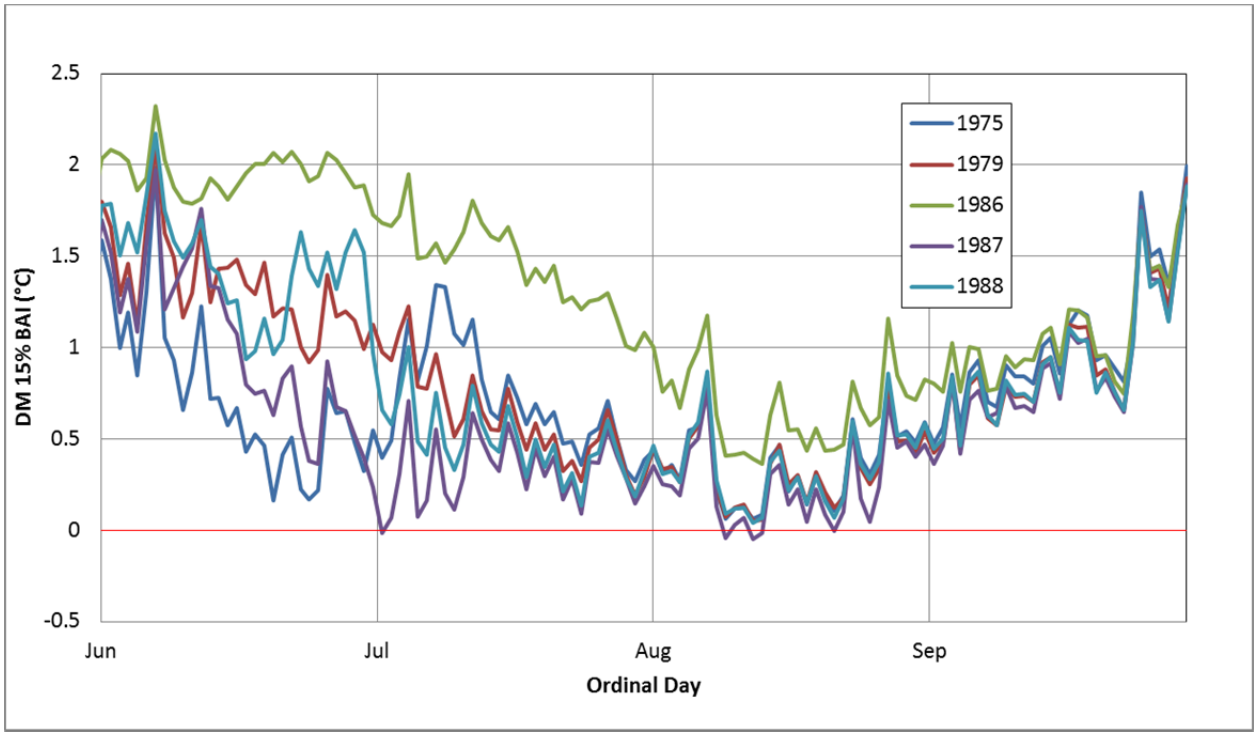


Figure 9. CR-LB DM 15% BAI

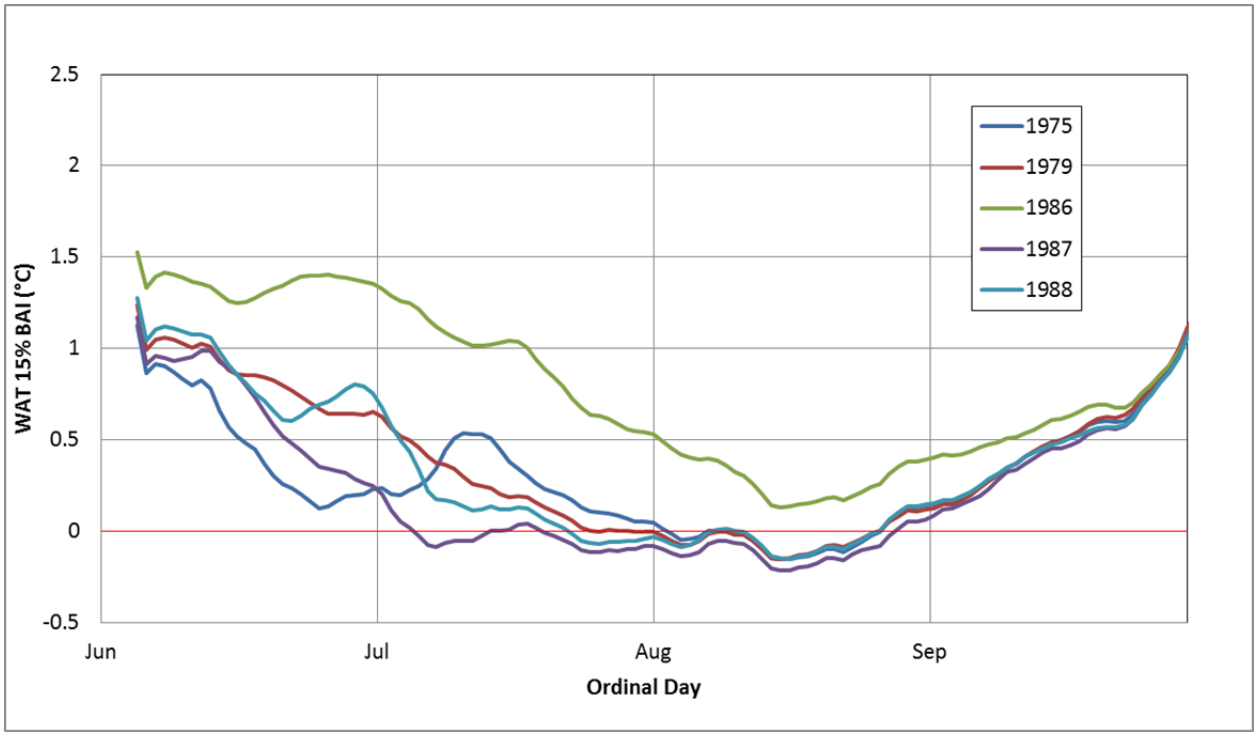


Figure 10. CR-LB WAT 15% BAI

E. CR-WFU 15% Available Increment

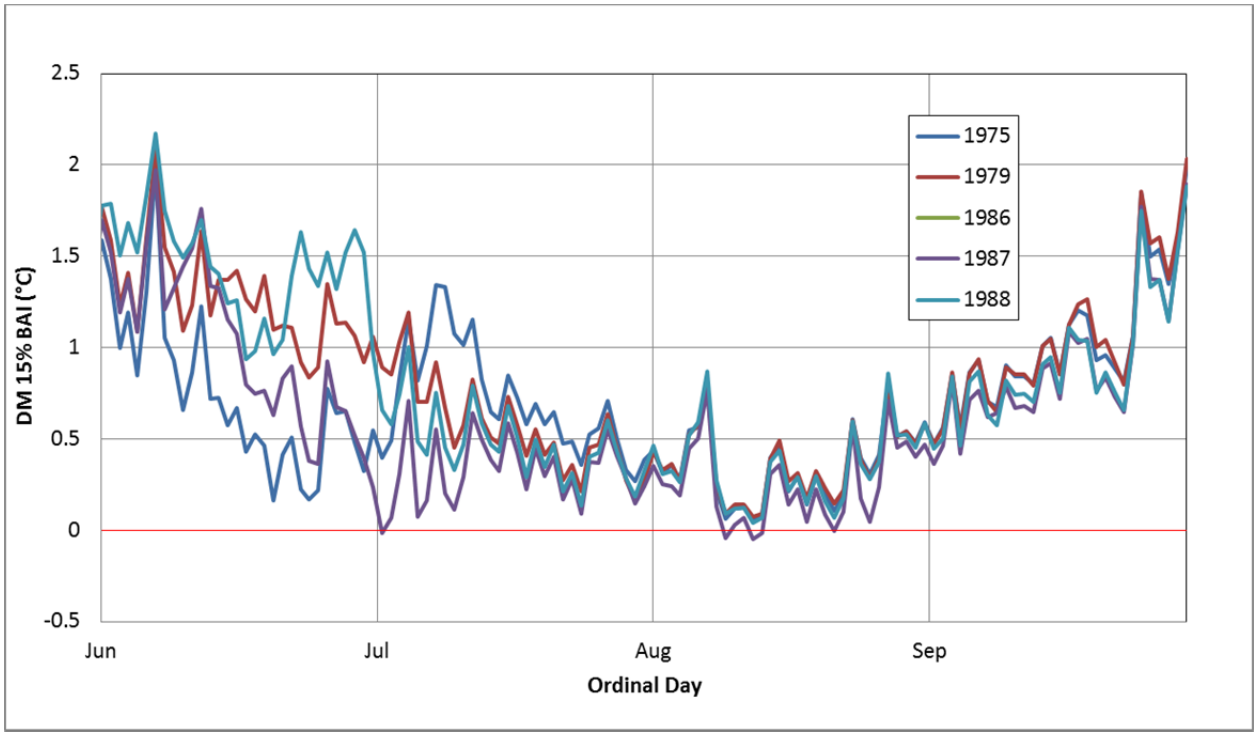


Figure 11. CR-WFU DM 15% BAI

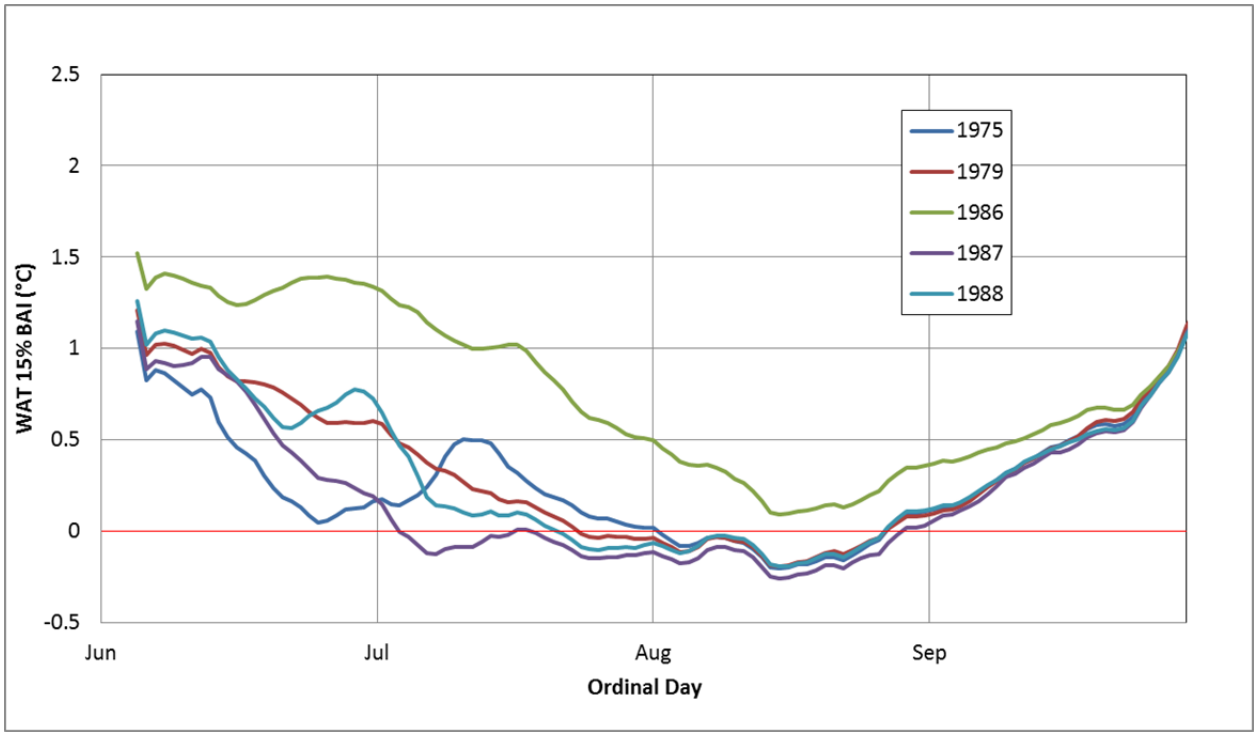


Figure 12. CR-WFU WAT 15% BAI

F. CR-PAD 15% Available Increment

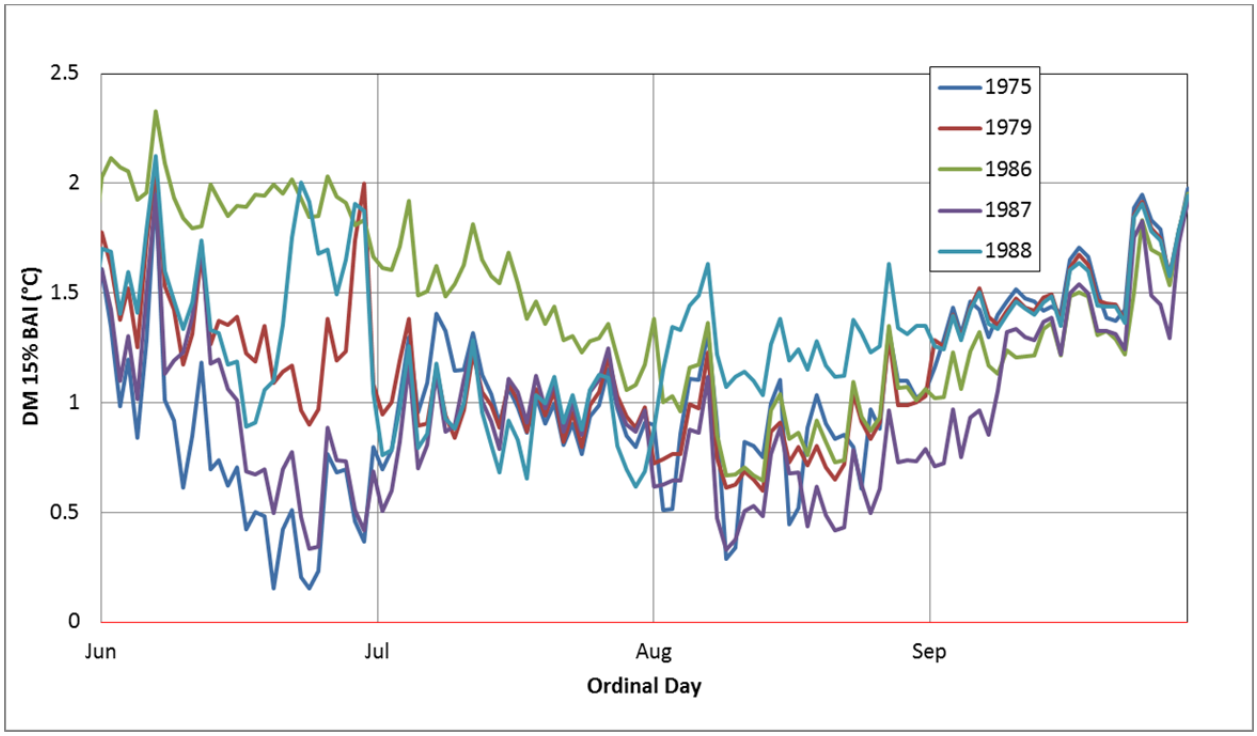


Figure 13. CR-PAD DM 15% BAI

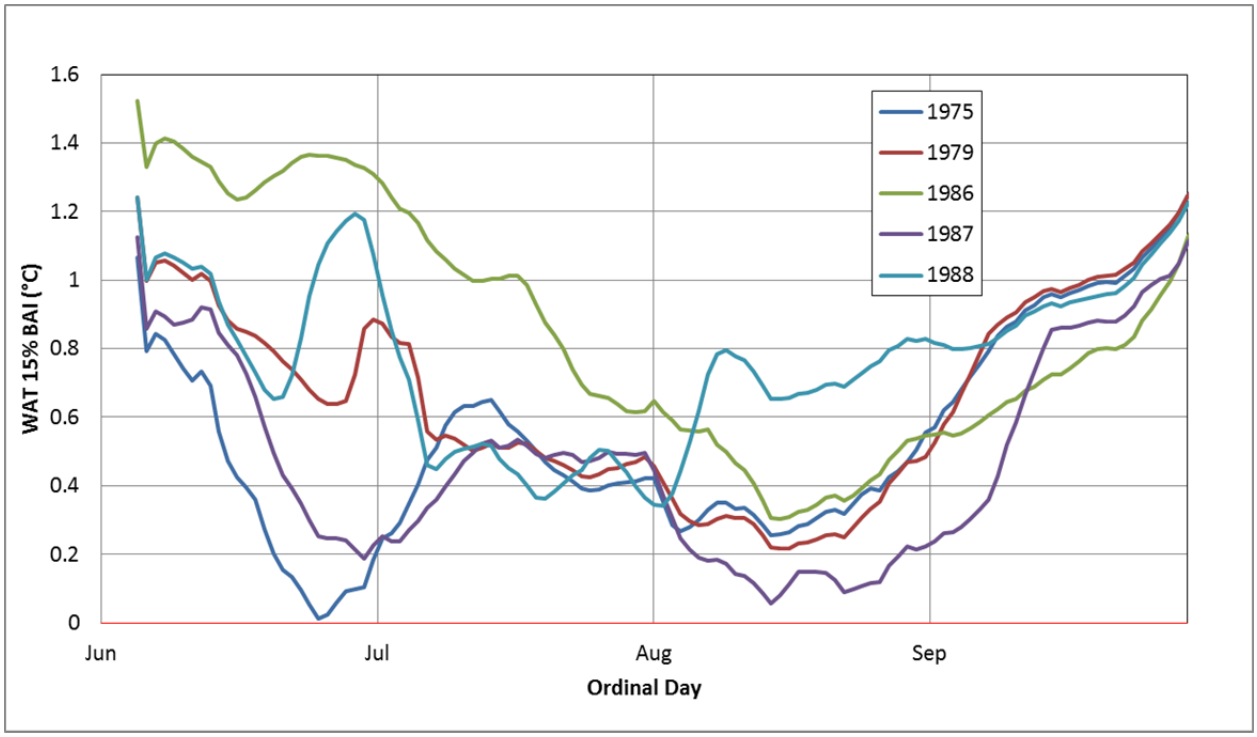


Figure 14. CR-PAD WAT 15% BAI

II. Development of Modeled Available Increment –by Year

This section presents the calculated 15% BAI time series grouped by simulation year. This presentation provides opportunity to review resulting 15% BAI values across the assessment reach within a given simulation year, complimenting the presentation in the previous section with values grouped by station.

A. 1975 Available Increment Calculation

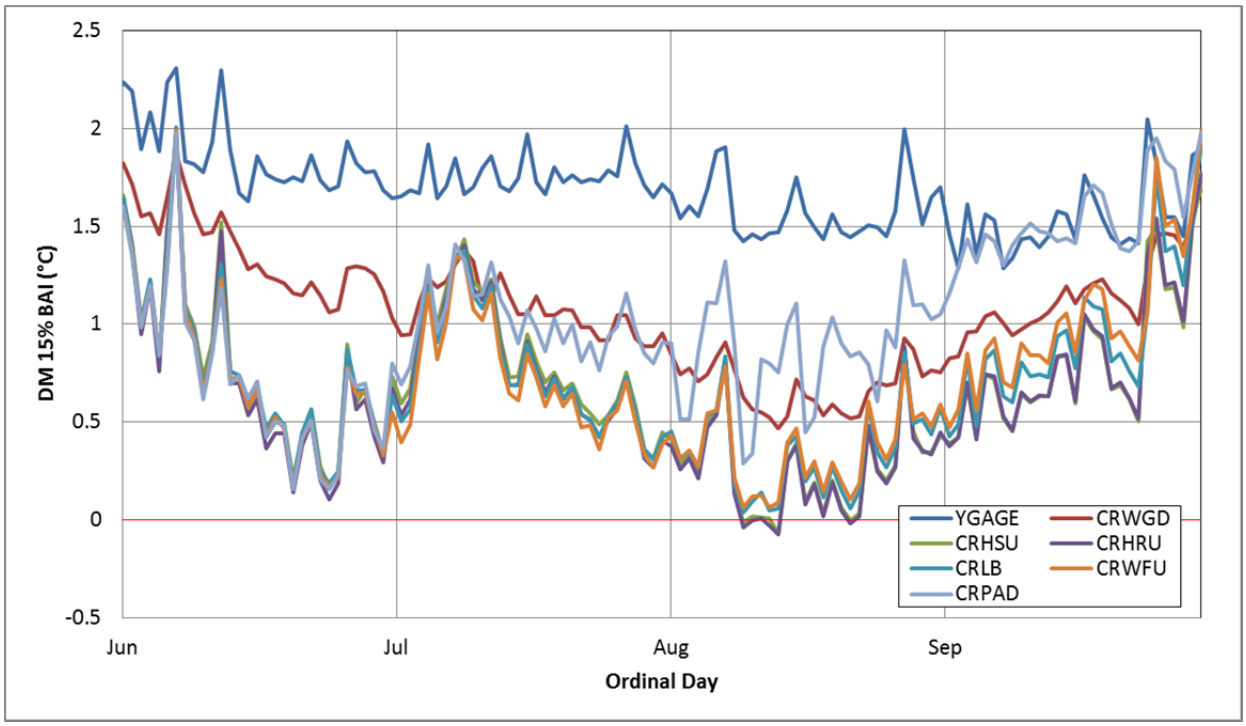


Figure 15. 1975 DM 15% BAI

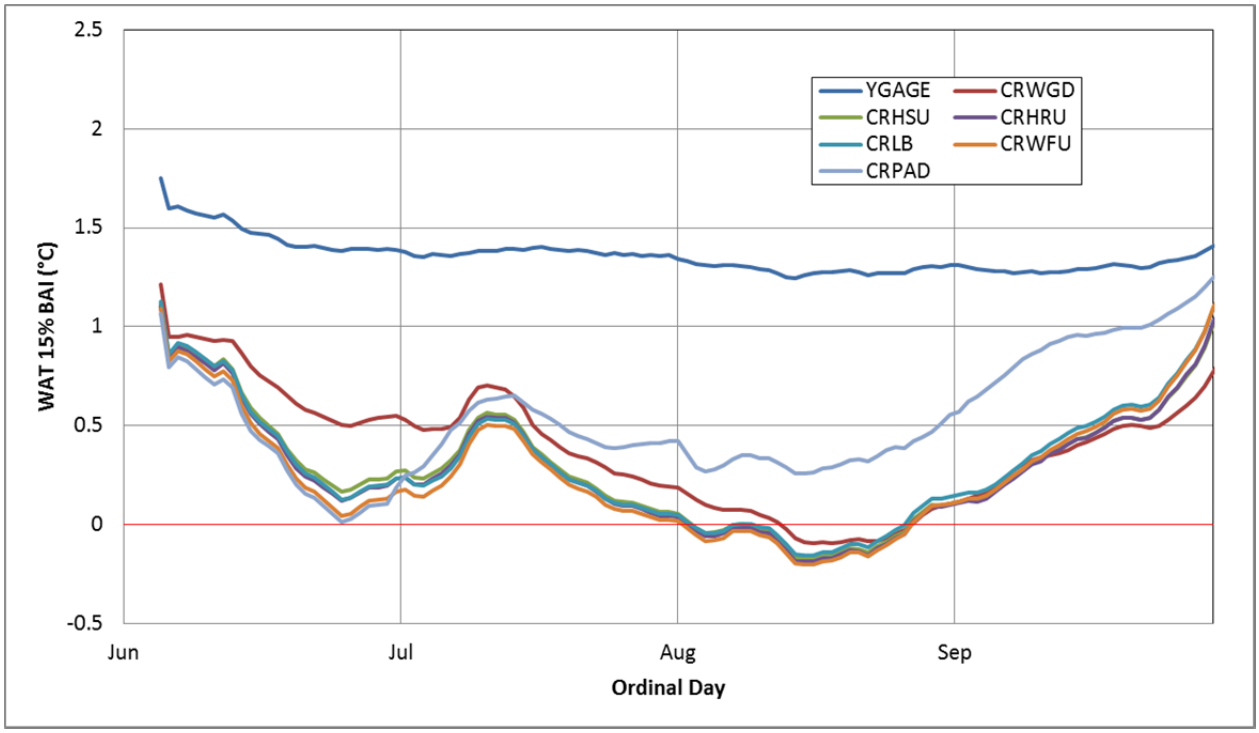


Figure 16. 1975 WAT 15% BAI

B. 1979 Available Increment Calculation

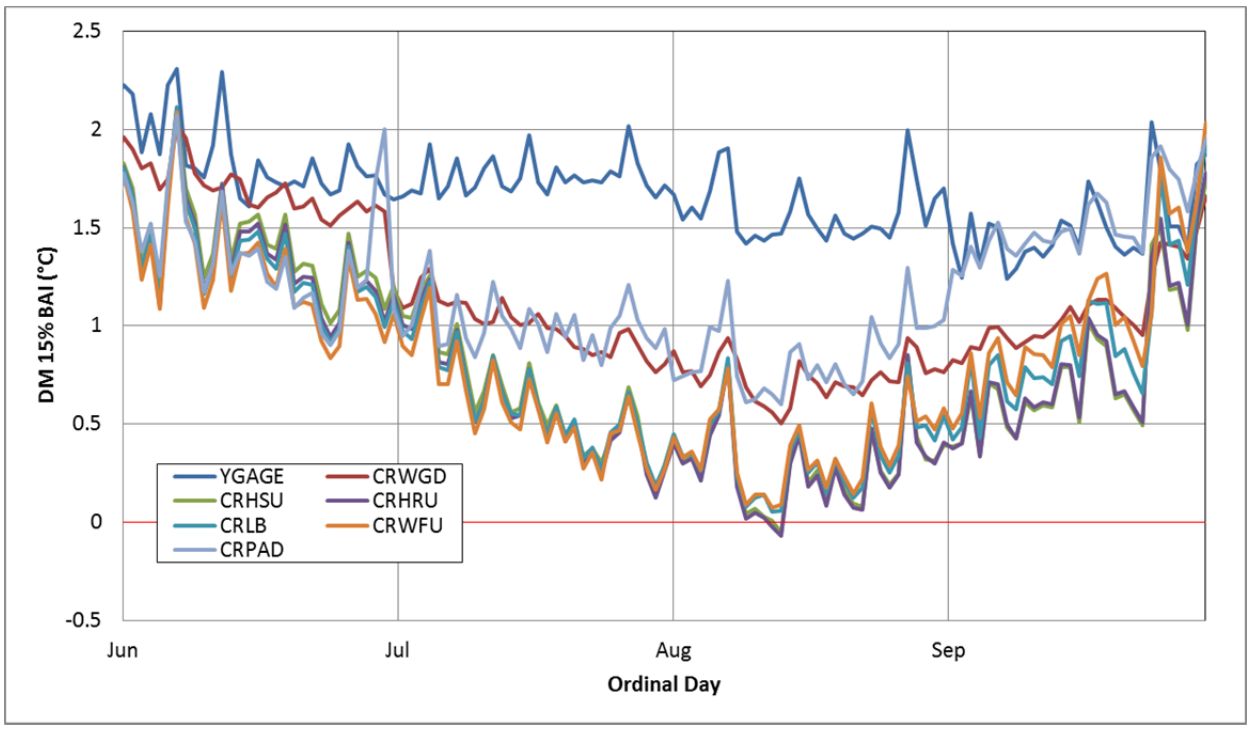


Figure 17. 1979 DM 15% BAI

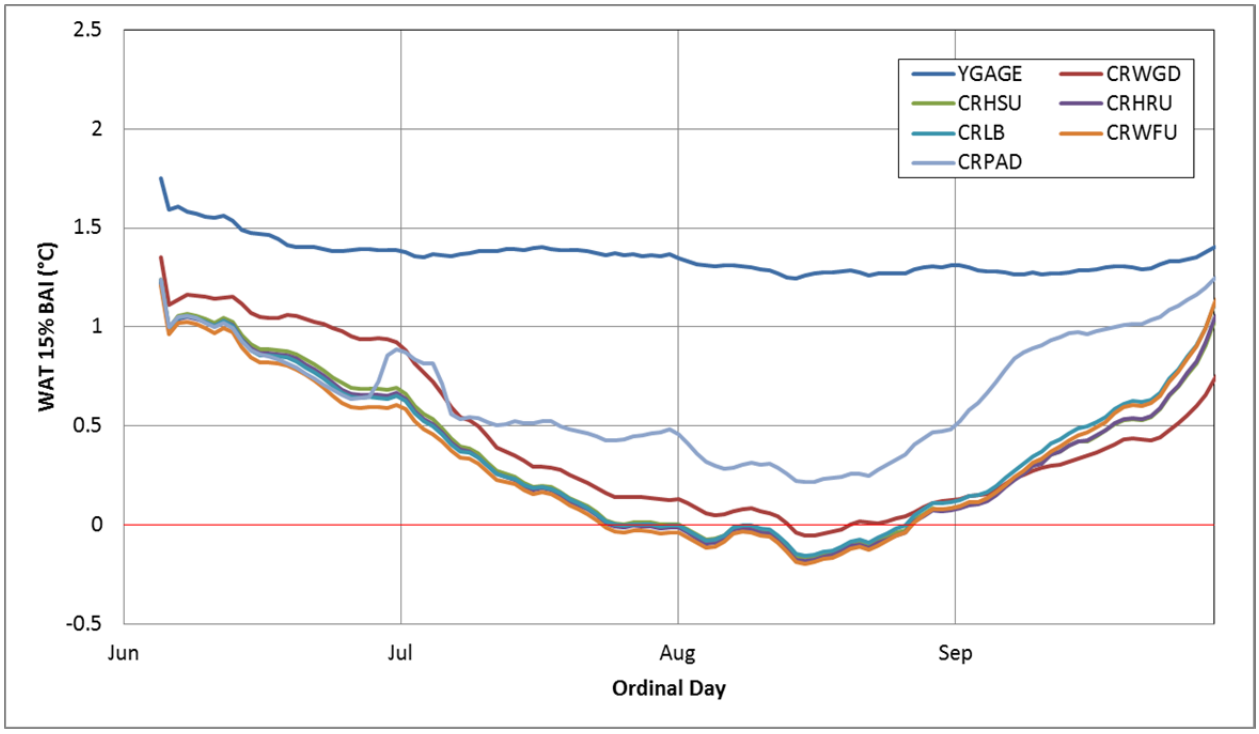


Figure 18. 1979 WAT 15% BAI

C. 1986 Available Increment Calculation

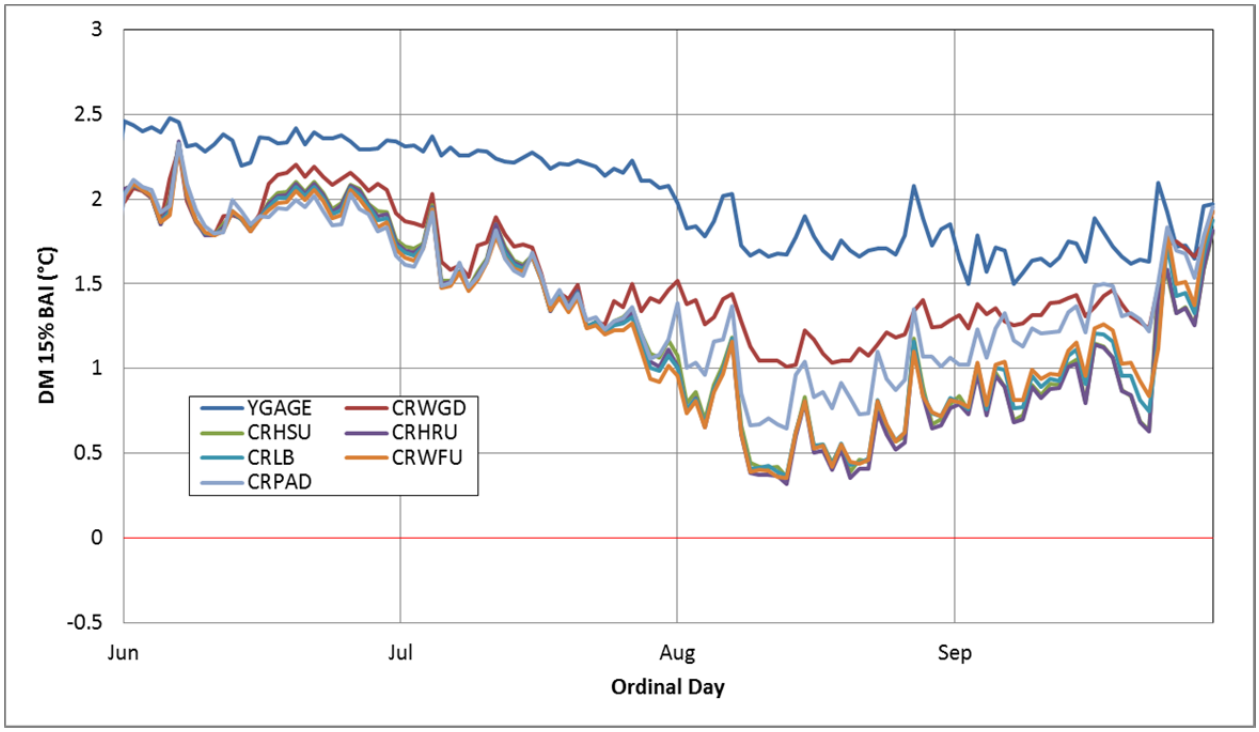


Figure 19. 1986 DM 15% BAI

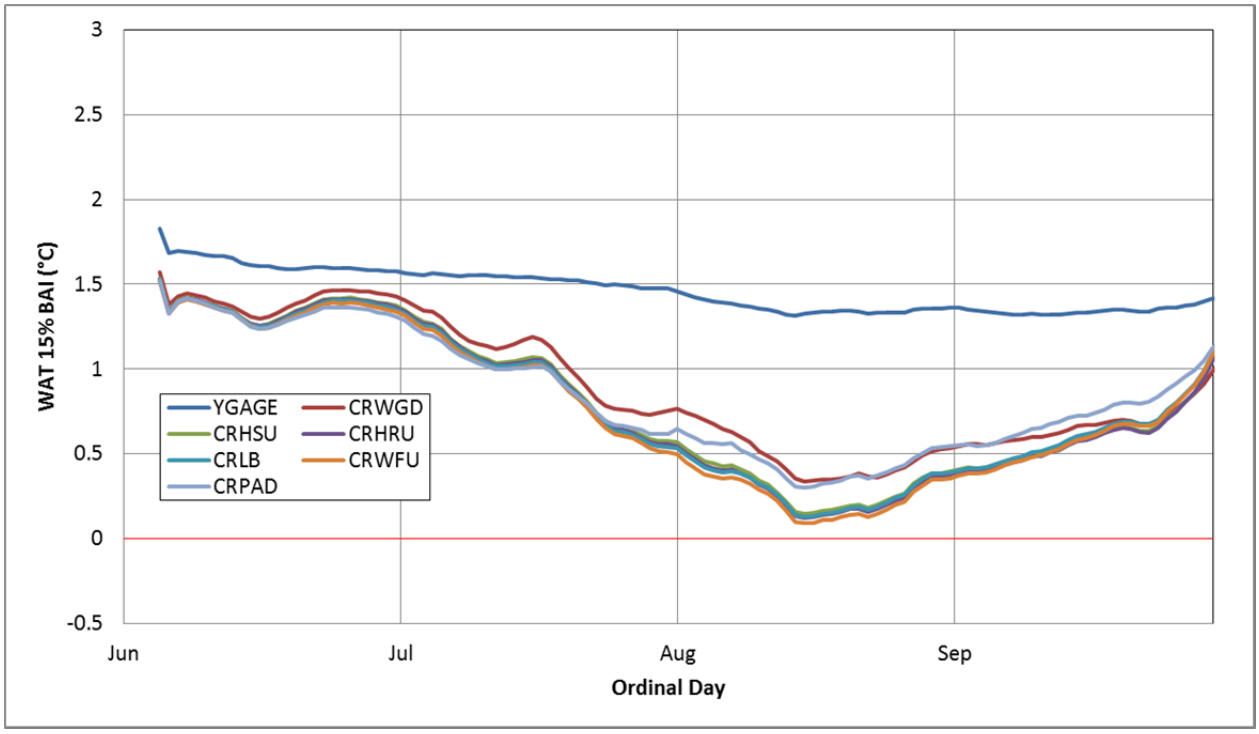


Figure 20. 1986 WAT 15% BAI

D. 1987 Available Increment Calculation

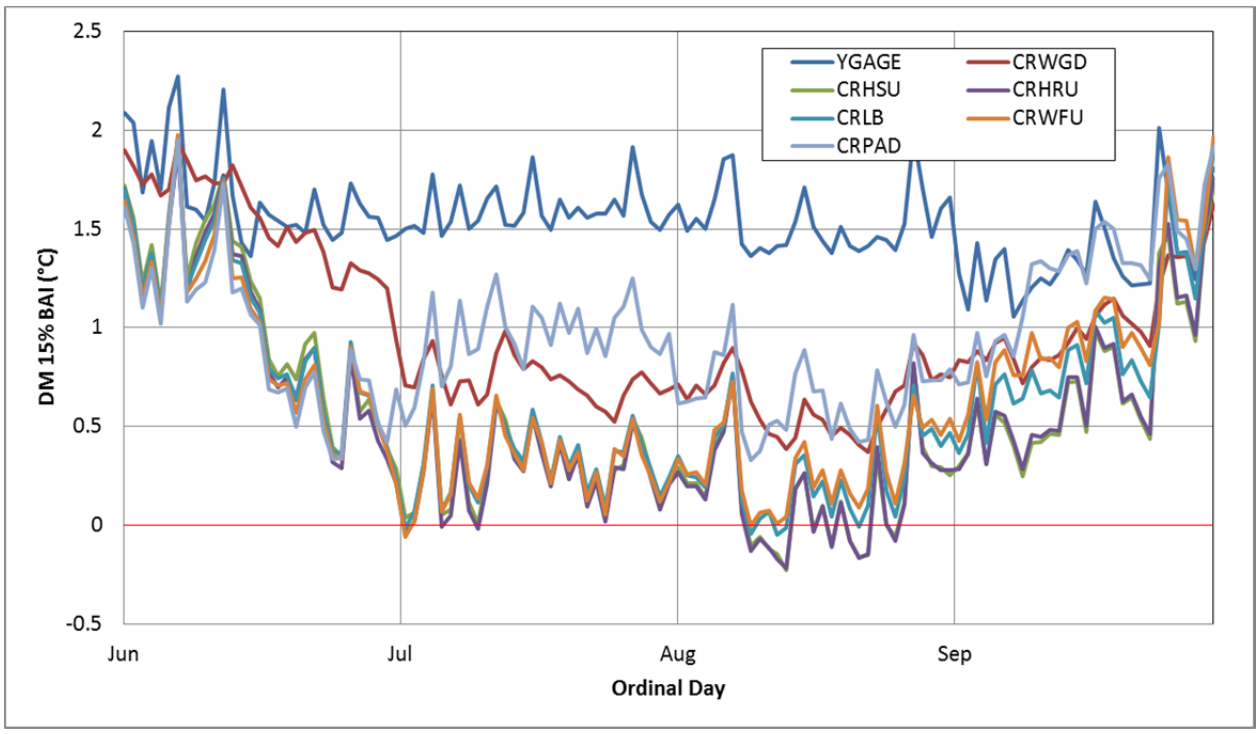


Figure 21. 1987 DM 15% BAI

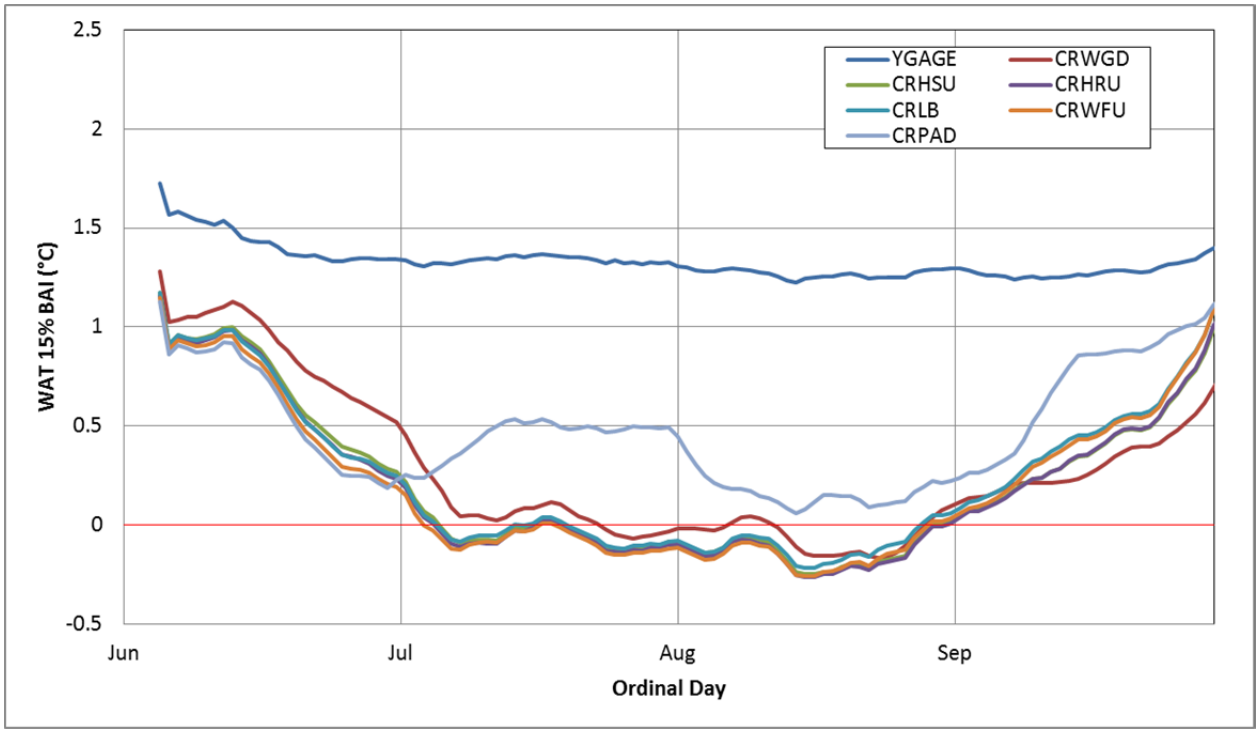


Figure 22. 1987 WAT 15% BAI

E. 1988 Available Increment Calculation

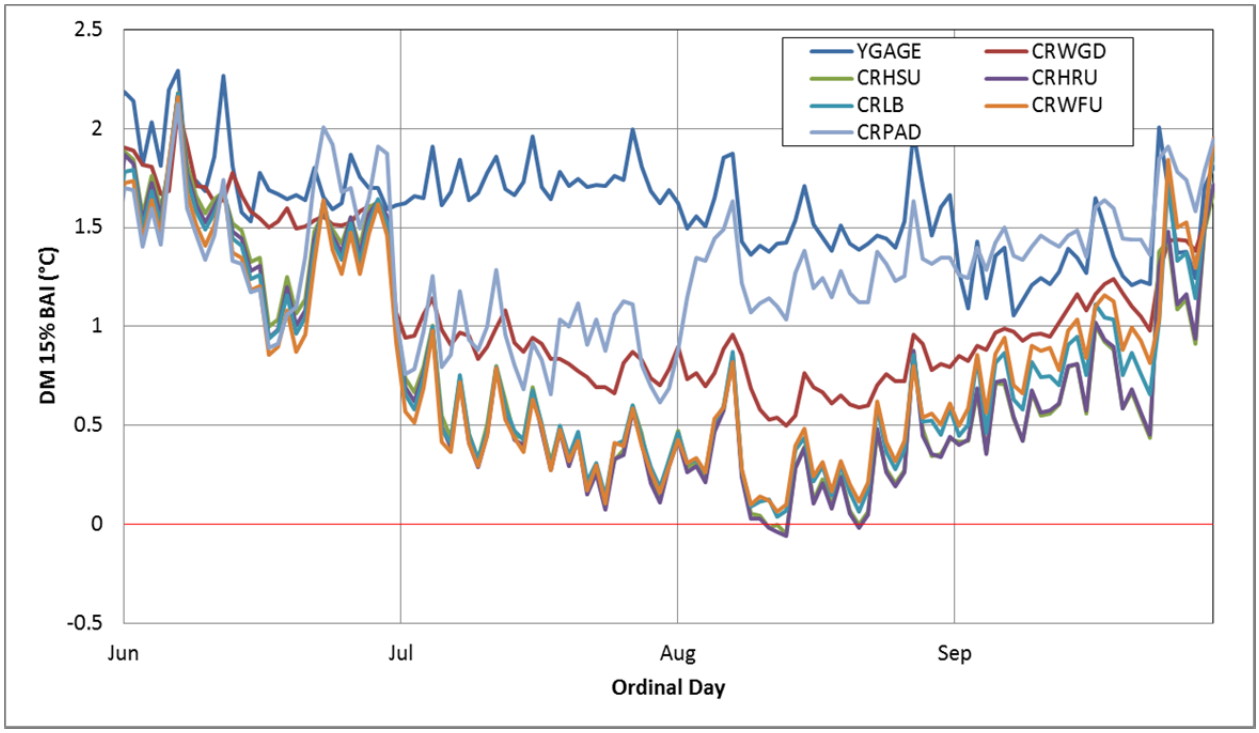


Figure 23. 1988 DM 15% BAI

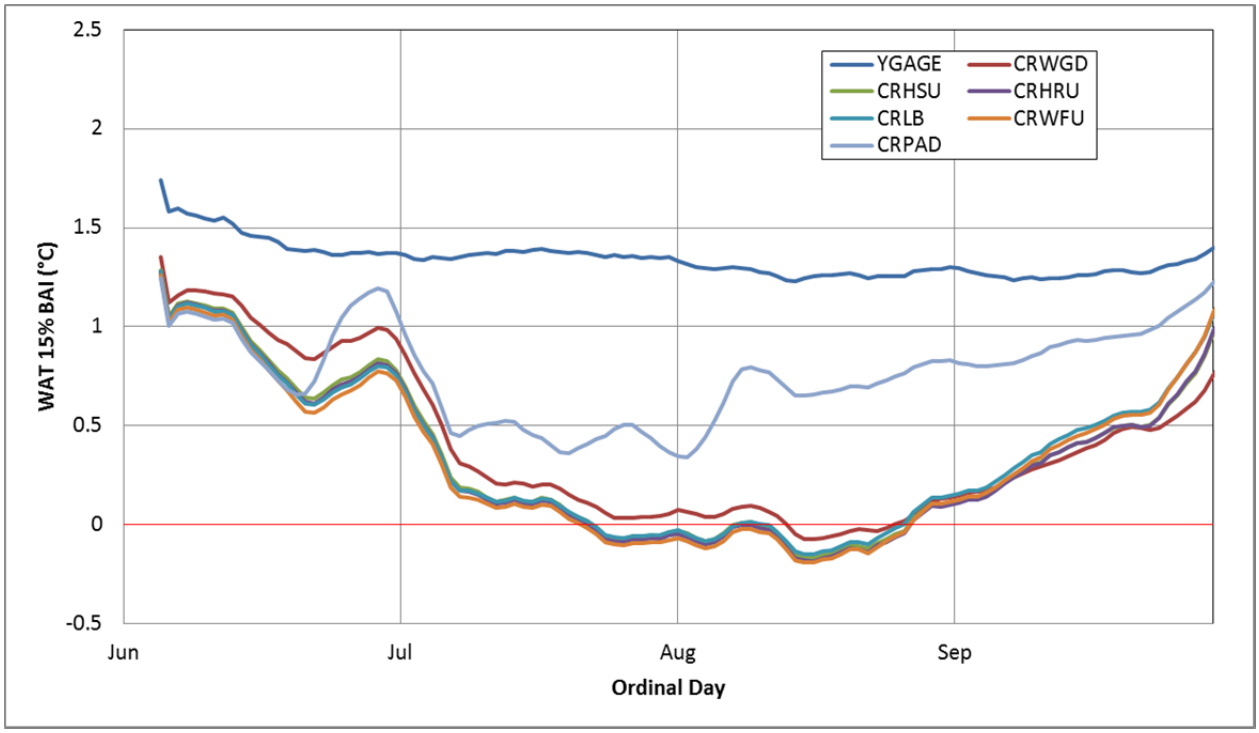


Figure 24. 1988 WAT 15% BAI

III. Individual Gage and Year Comparison Plots – Results

This section presents simulate temperature differences between cumulative-effects and existing-conditions model runs. Simulated differences are presented for WATs and DMs and compared to the relevant BAI and 15% BAI time series.

A. CR-YGAGE Modeled Differences Compared to Baseline

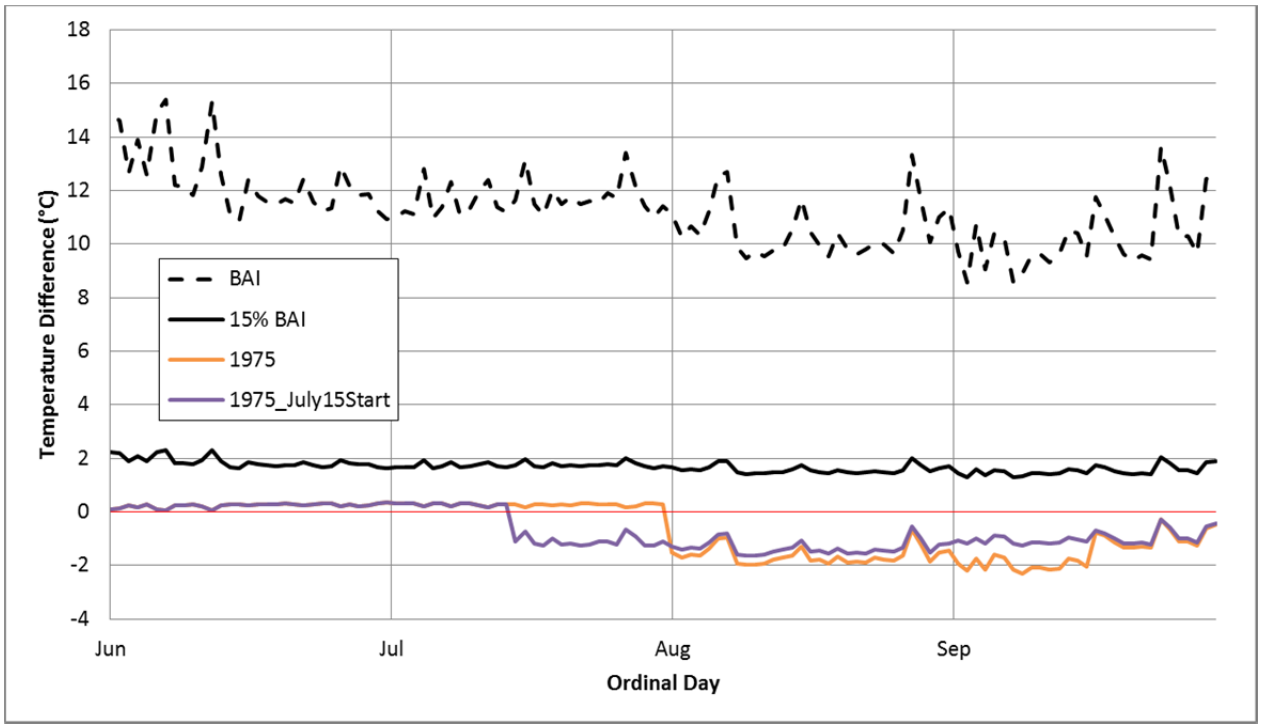


Figure 25. 1975 Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

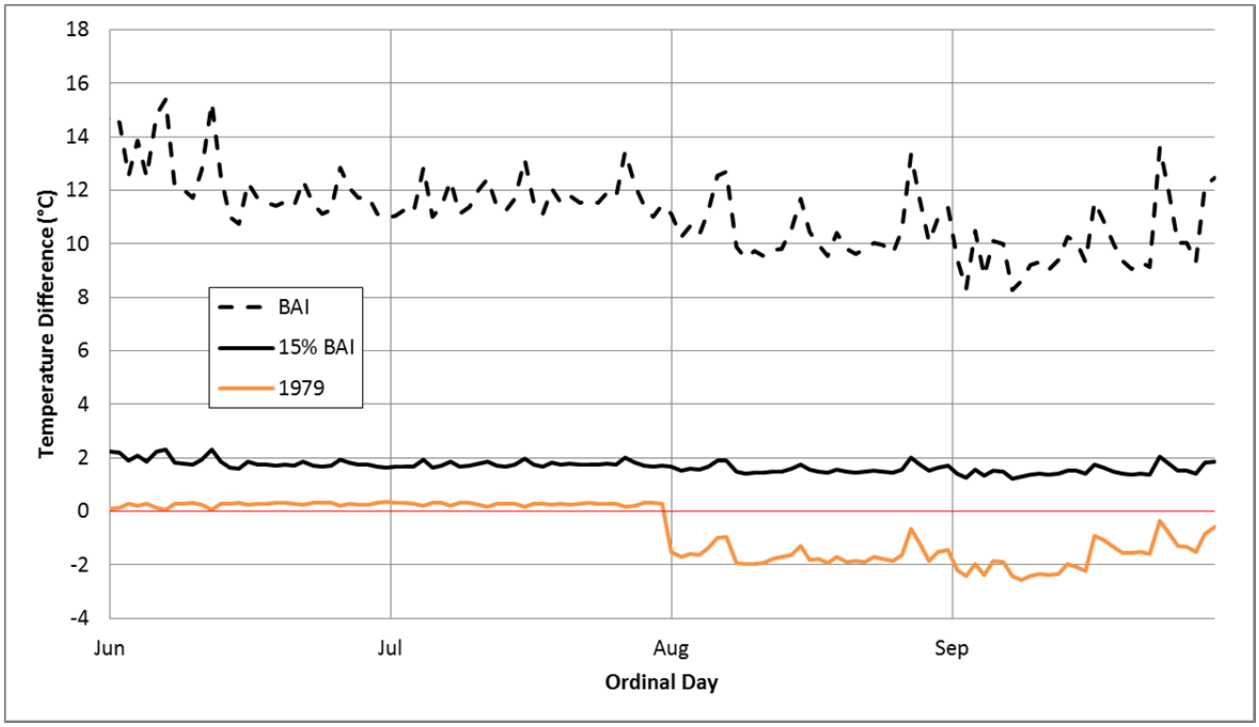


Figure 26. 1979 Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

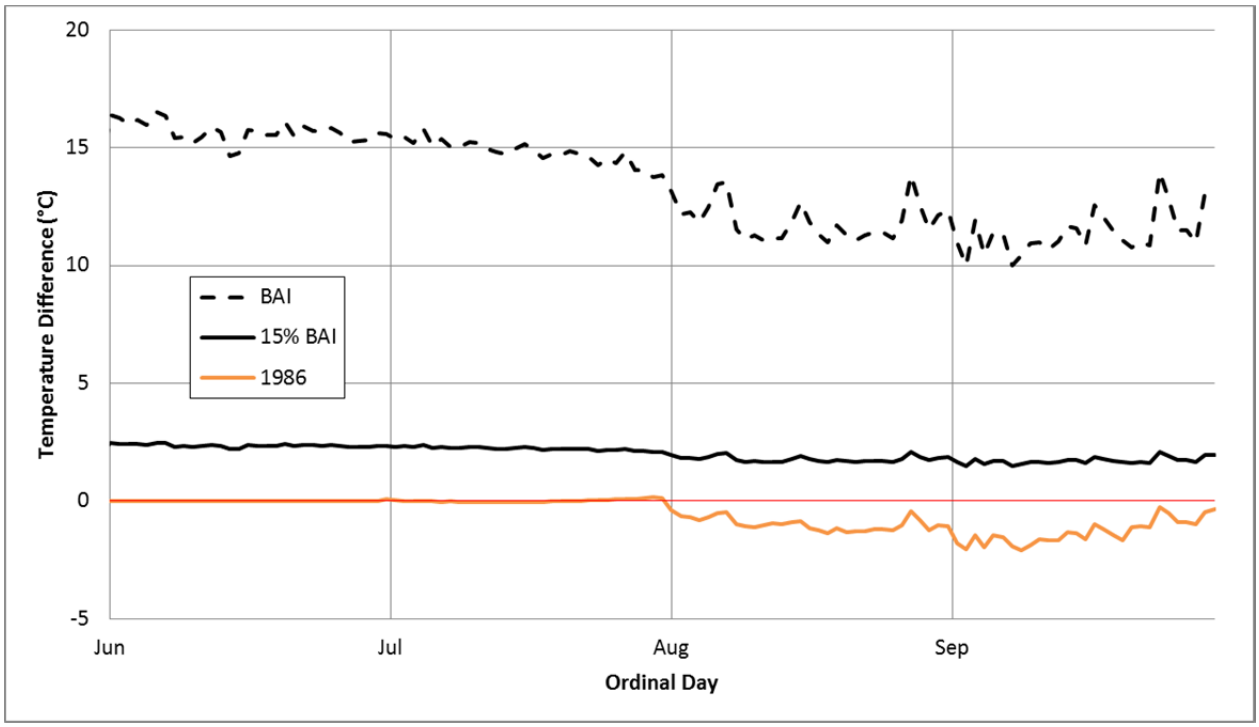


Figure 27. 1986 Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

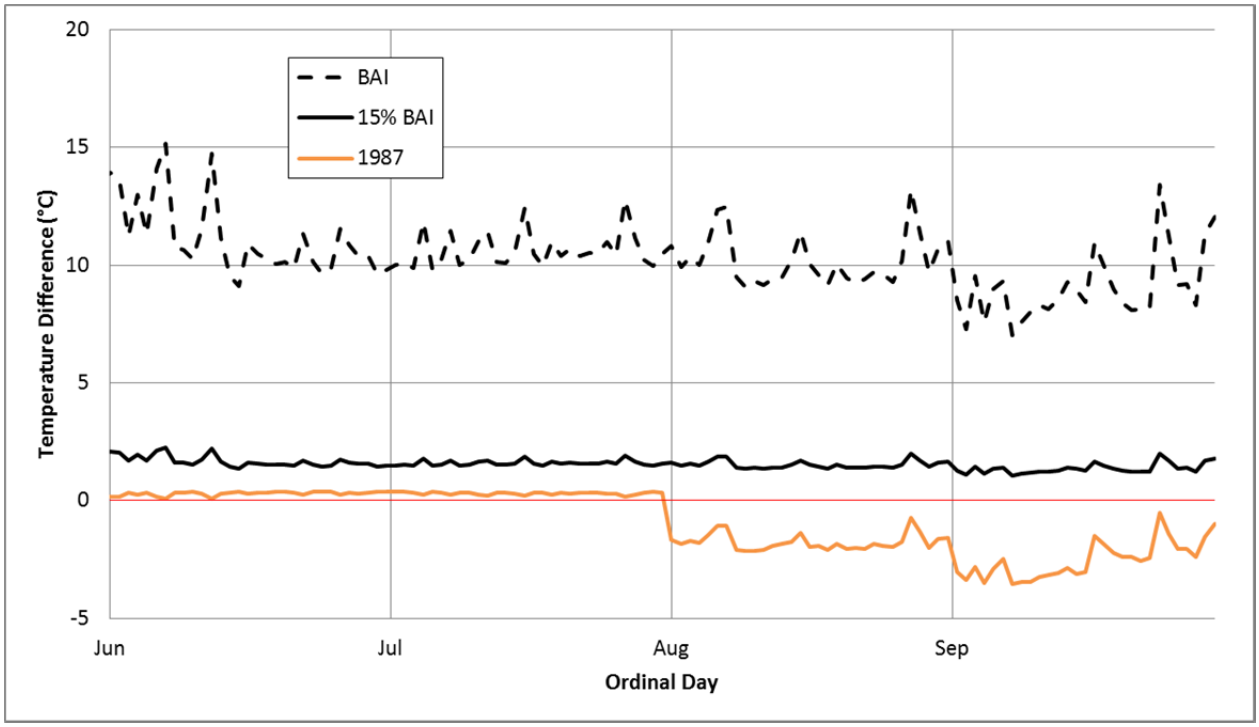


Figure 28. 1987 Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

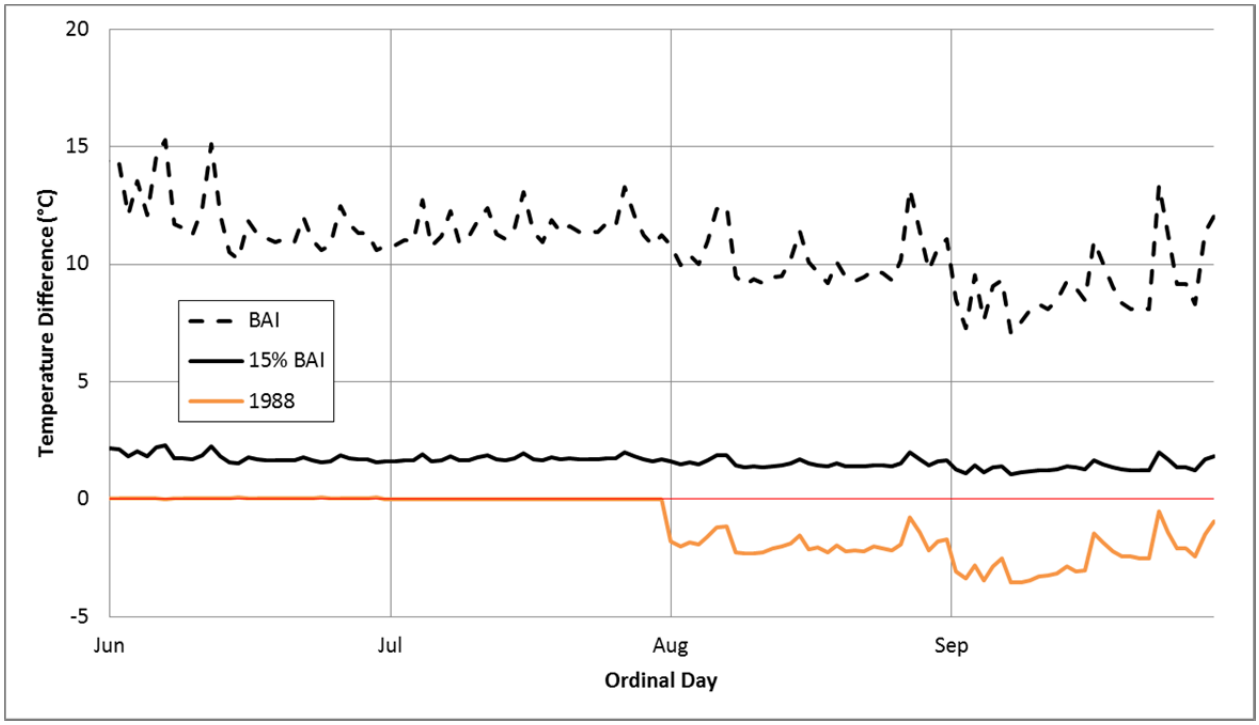


Figure 29. 1988 Model-Simulated DM Differences at CR-YGAGE Compared to the BAI and 15% BAI

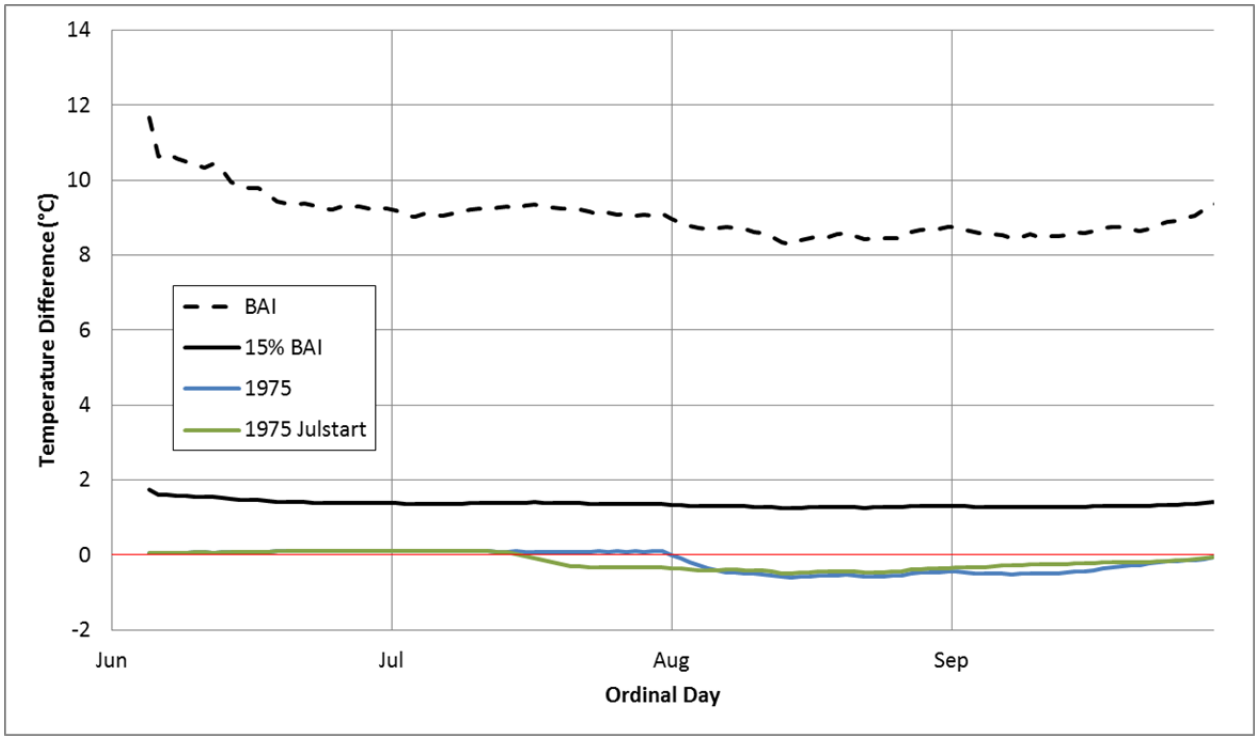


Figure 30. 1975 Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

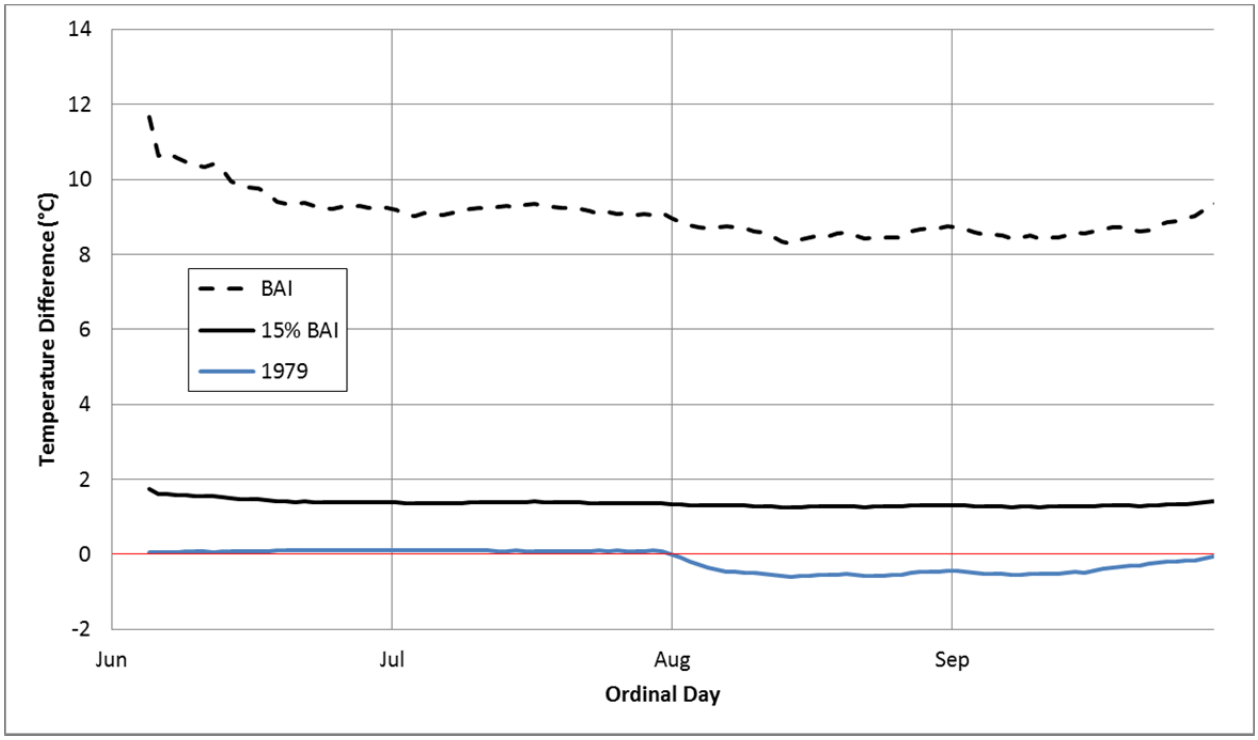


Figure 31. 1979 Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

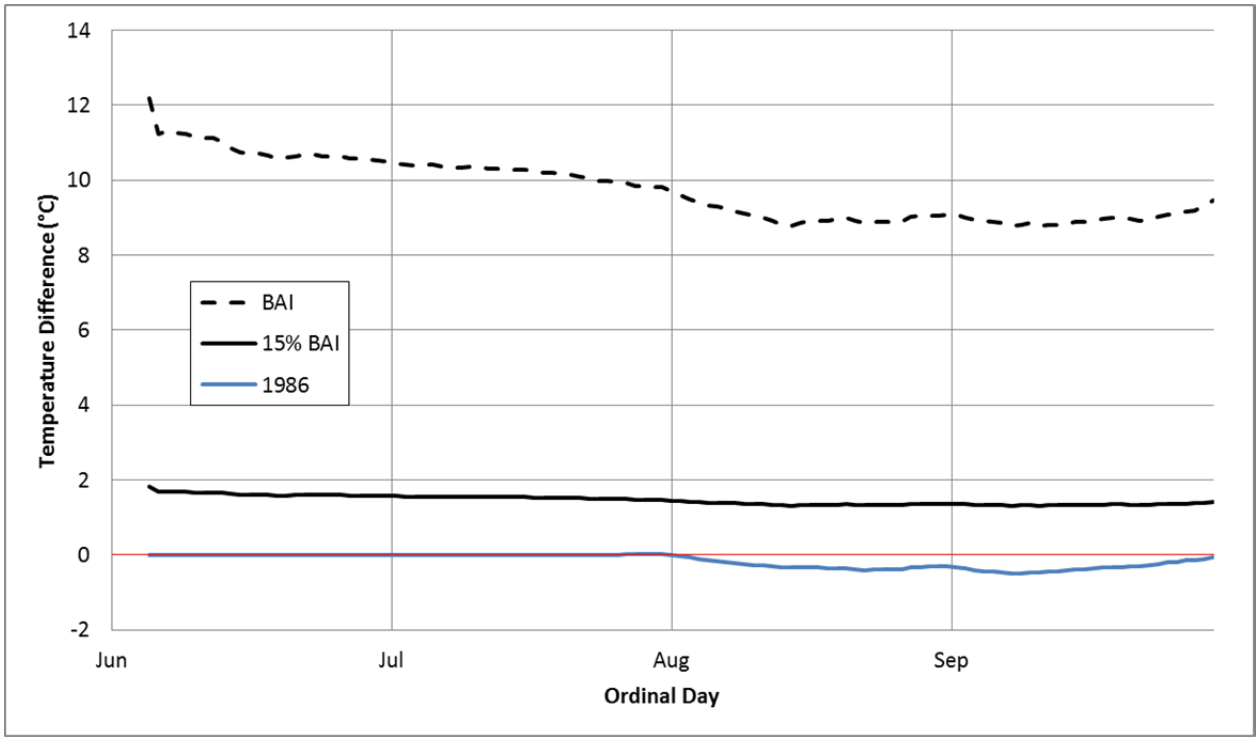


Figure 32. 1986 Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

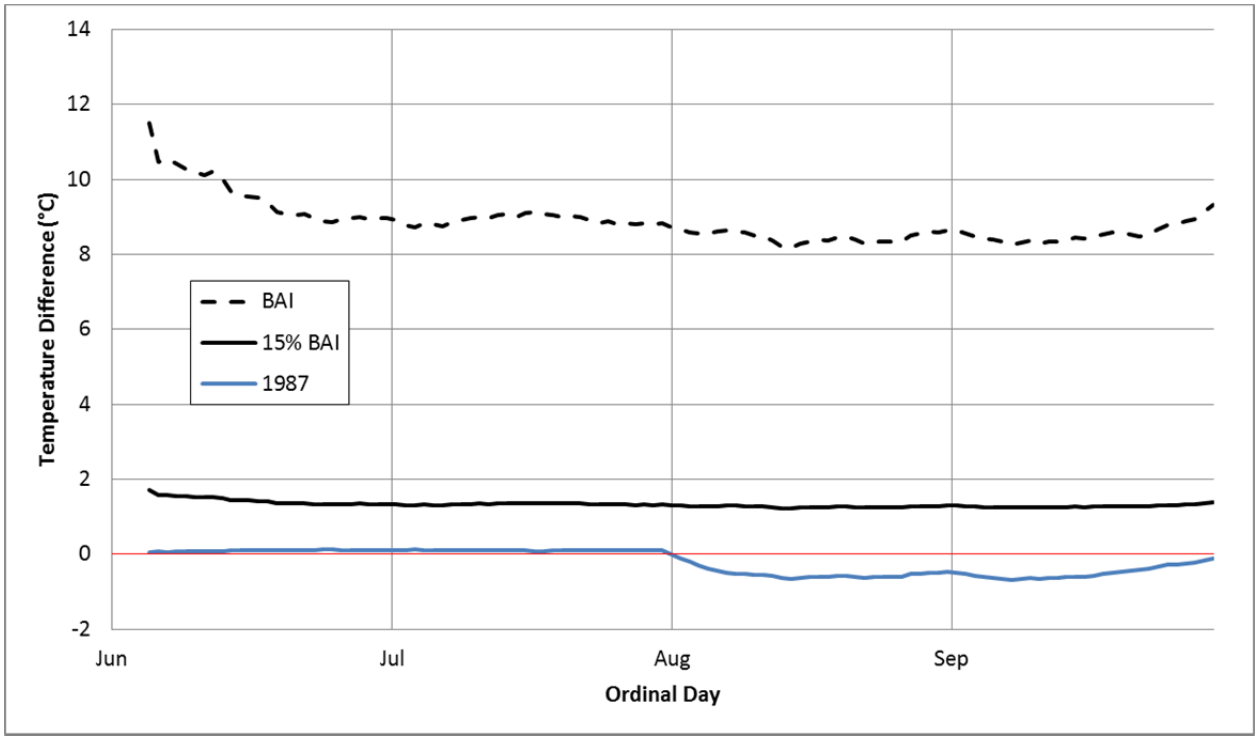


Figure 33. 1987 Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

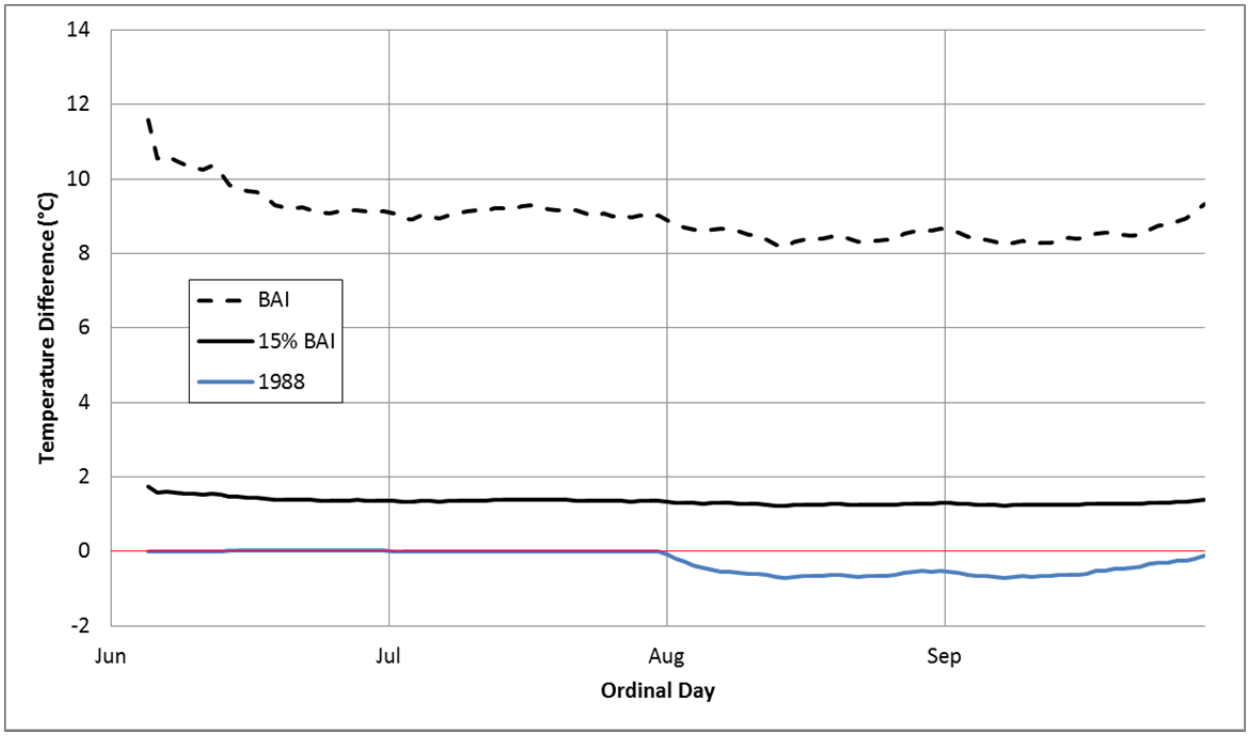


Figure 34. 1988 Model-Simulated WAT Differences at CR-YGAGE Compared to the BAI and 15% BAI

B. CR-WGD Modeled Differences Compared to Baseline

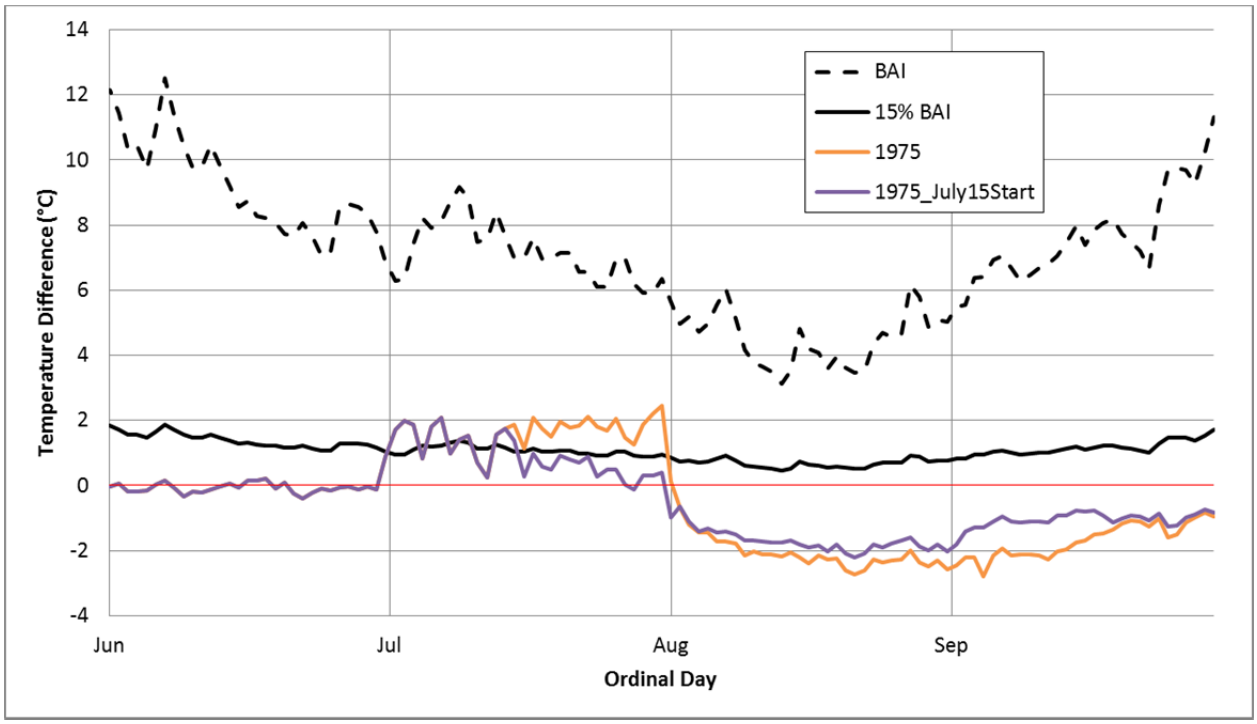


Figure 35. 1975 Model-Simulated DM Differences at CR-WGD Compared to the BAI and 15% BAI

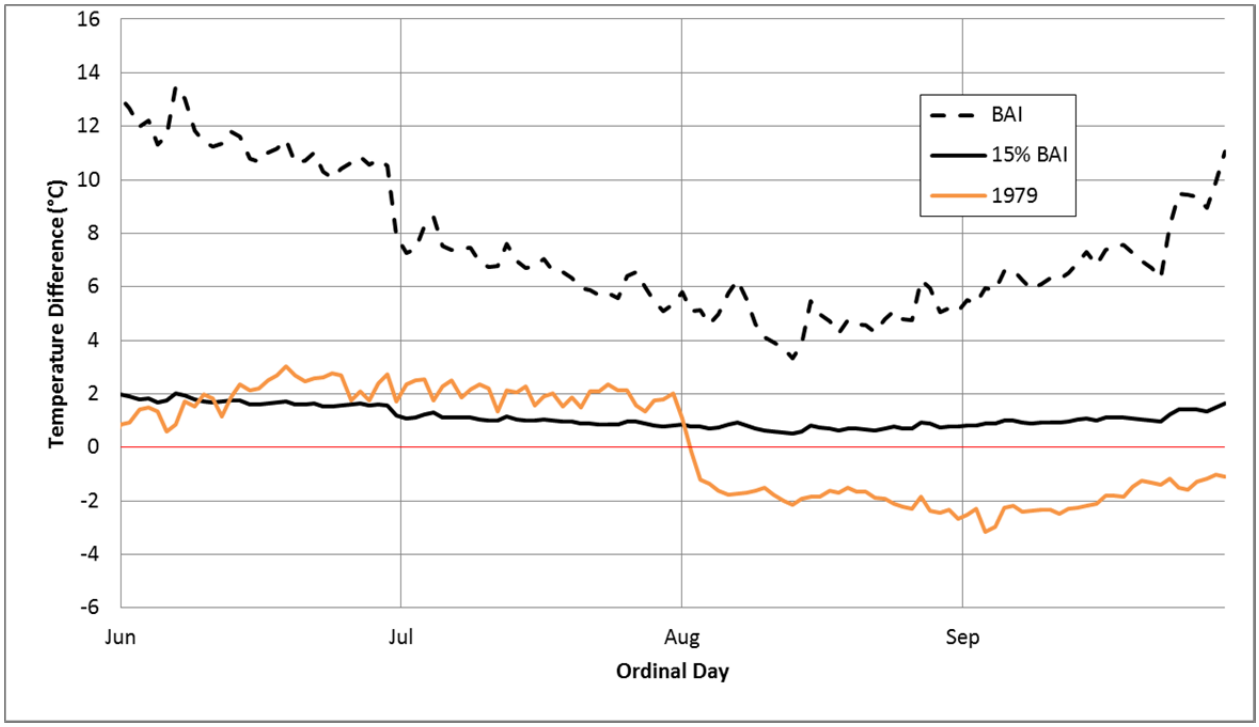


Figure 36. 1979 Model-Simulated DM Differences at CR-WGD Compared to the BAI and 15% BAI

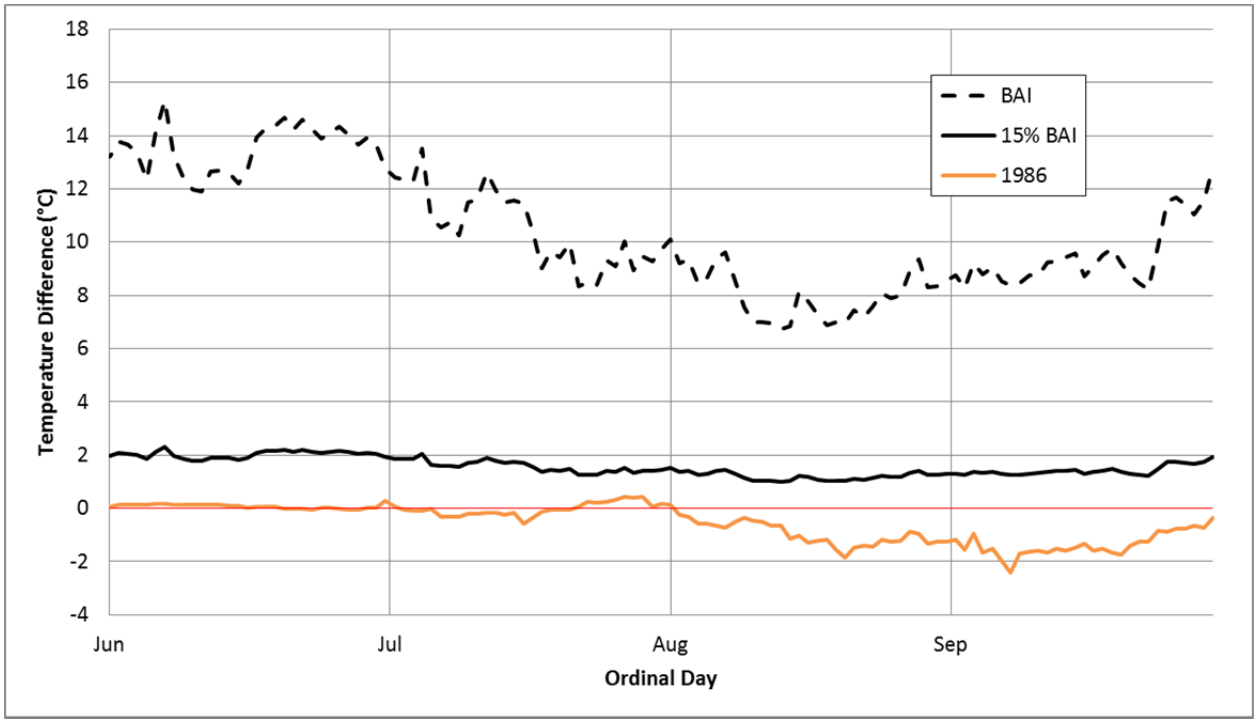


Figure 37. 1986 Model-Simulated DM Differences at CR-WGD Compared to the BAI and 15% BAI

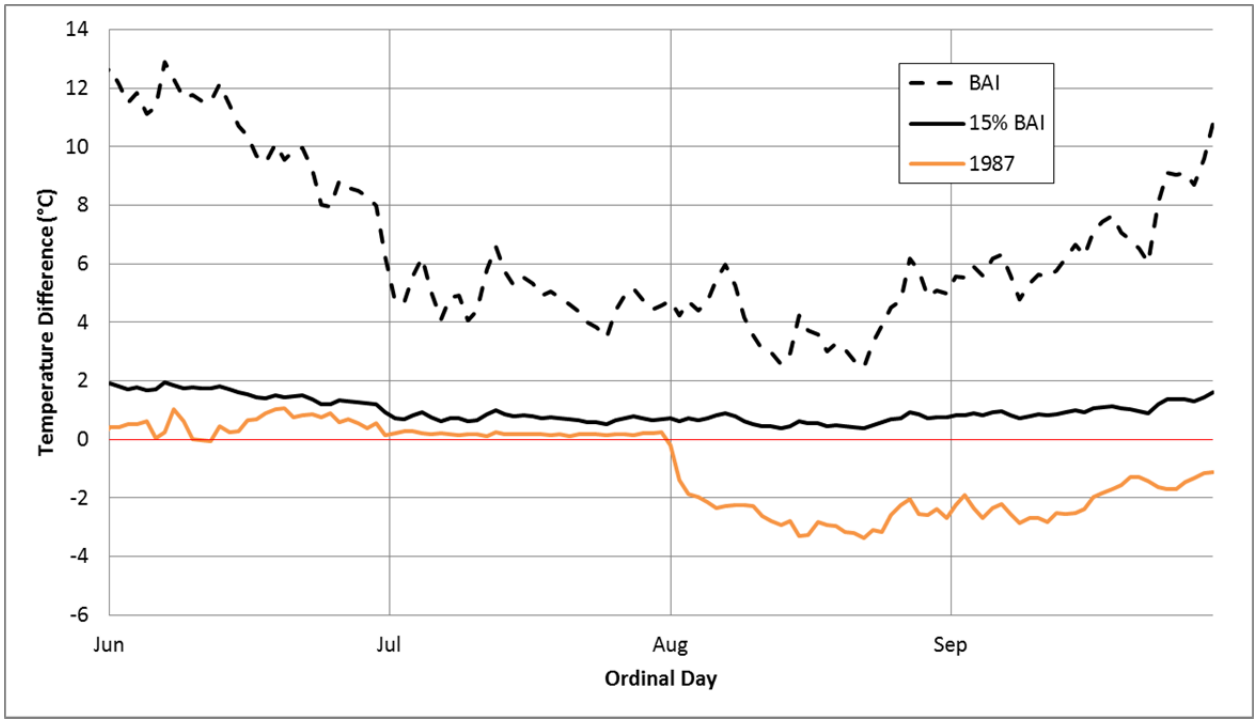


Figure 38. 1987 Model-Simulated DM Differences at CR-WGD Compared to the BAI and 15% BAI

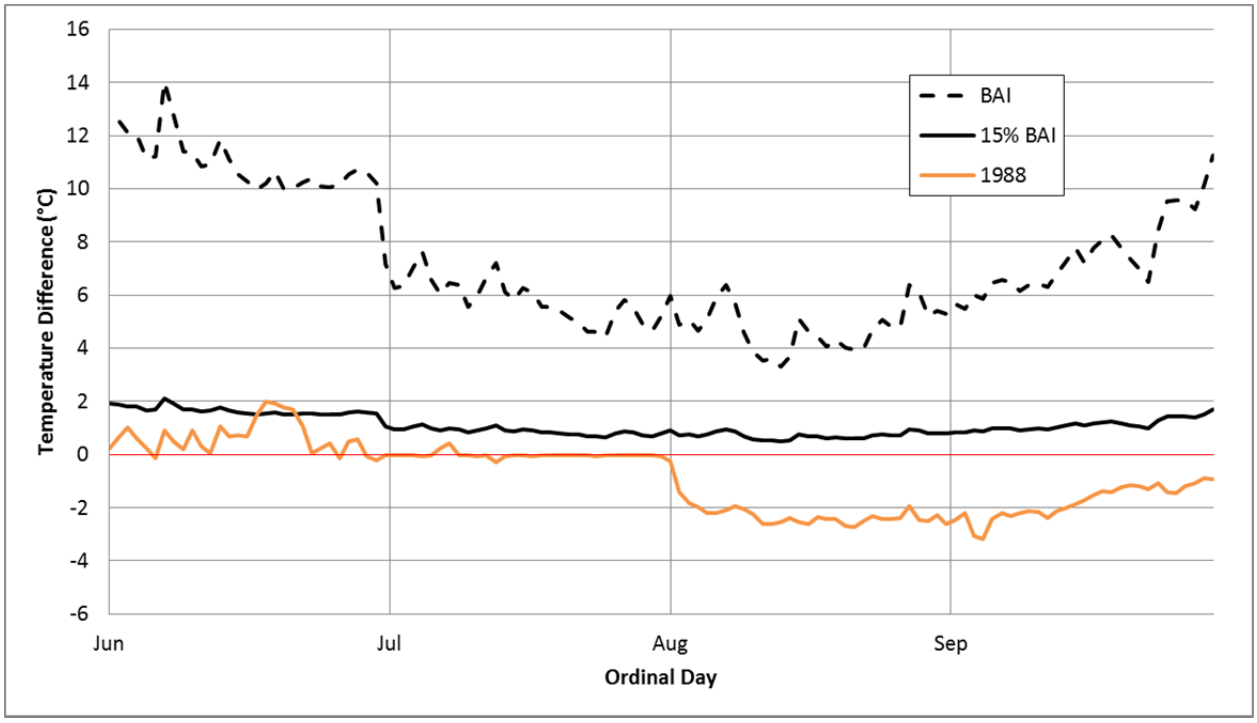


Figure 39. 1988 Model-Simulated DM Differences at CR-WGD Compared to the BAI and 15% BAI

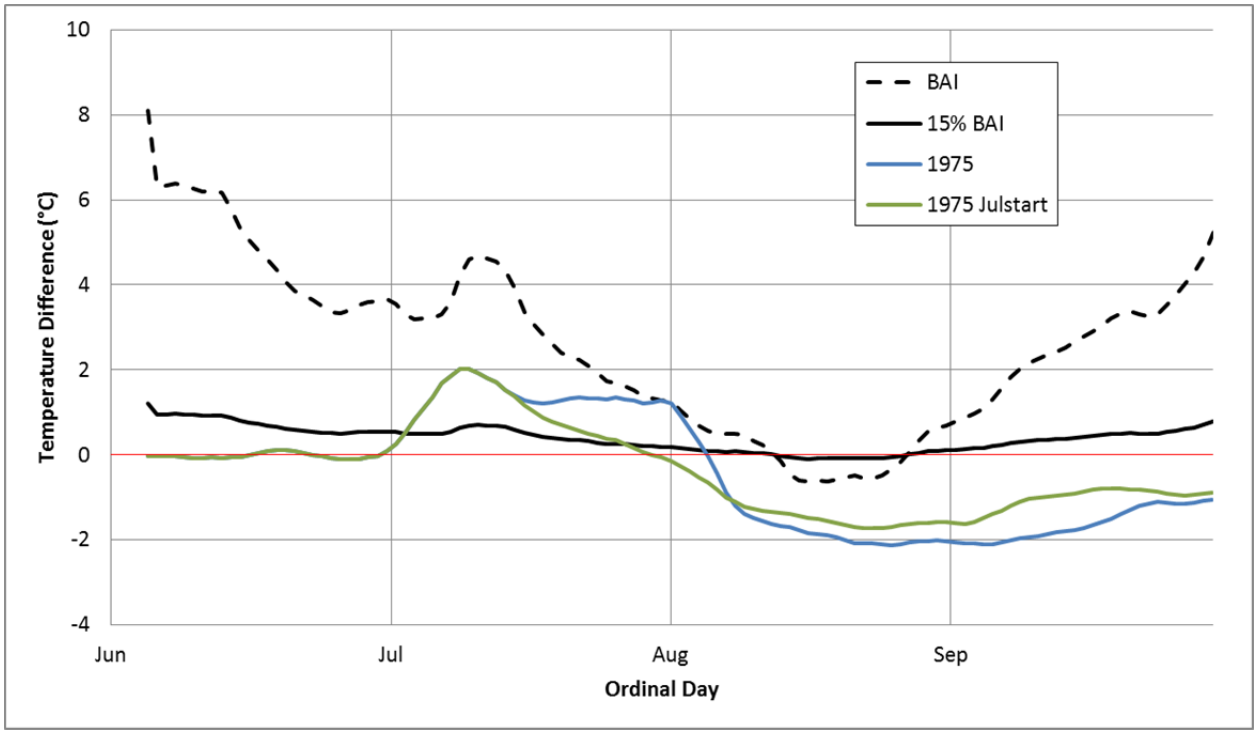


Figure 40. 1975 Model-Simulated WAT Differences at CR-WGD Compared to the BAI and 15% BAI

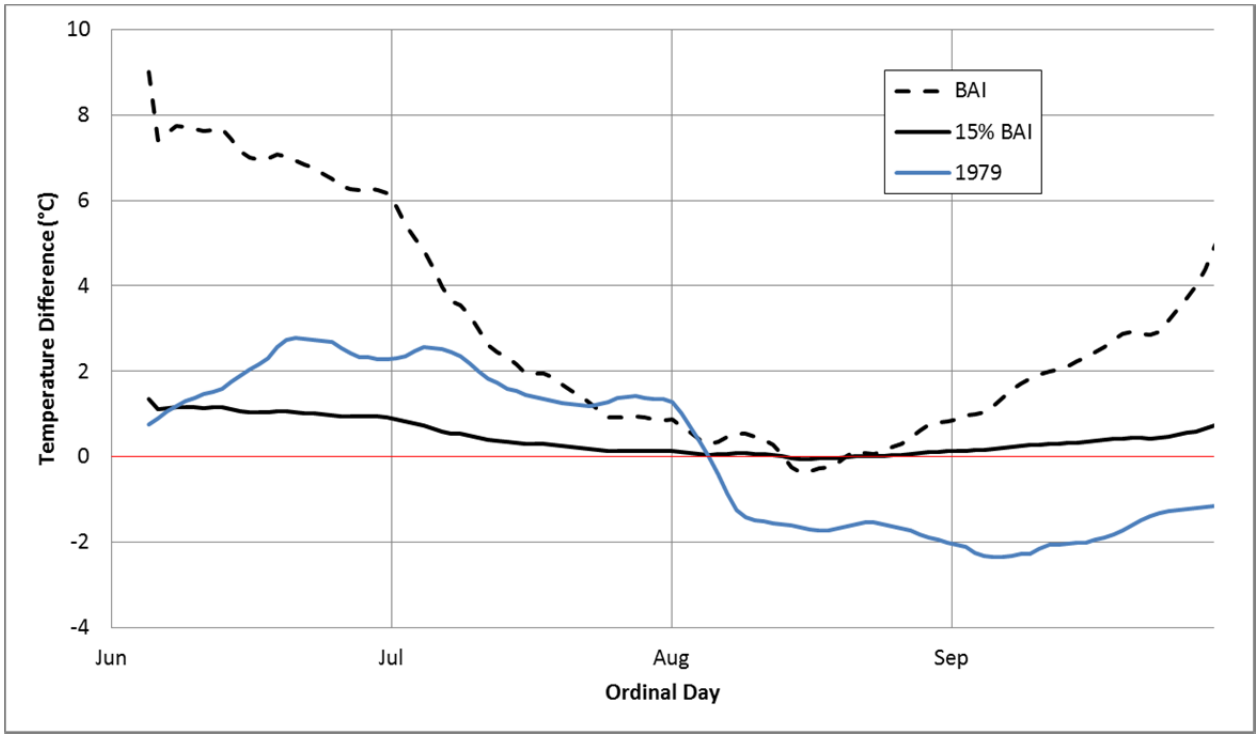


Figure 41. 1979 Model-Simulated WAT Differences at CR-WGD Compared to the BAI and 15% BAI

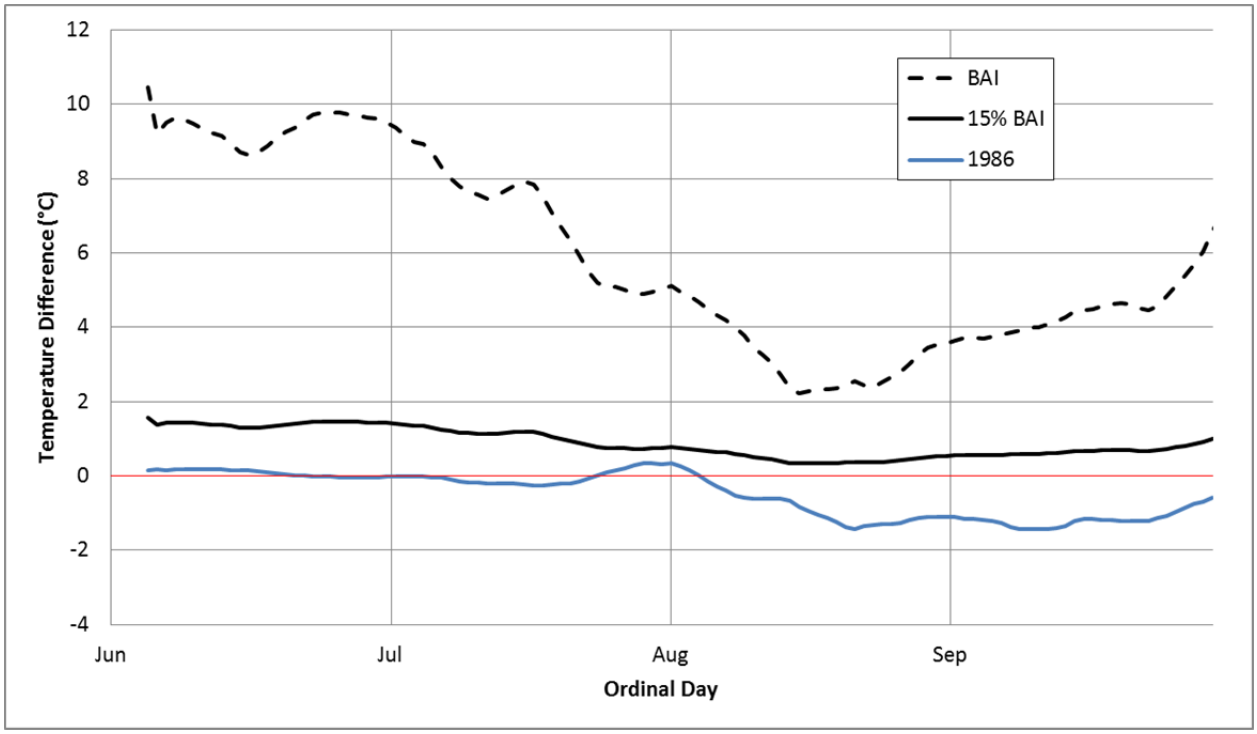


Figure 42. 1986 Model-Simulated WAT Differences at CR-WGD Compared to the BAI and 15% BAI

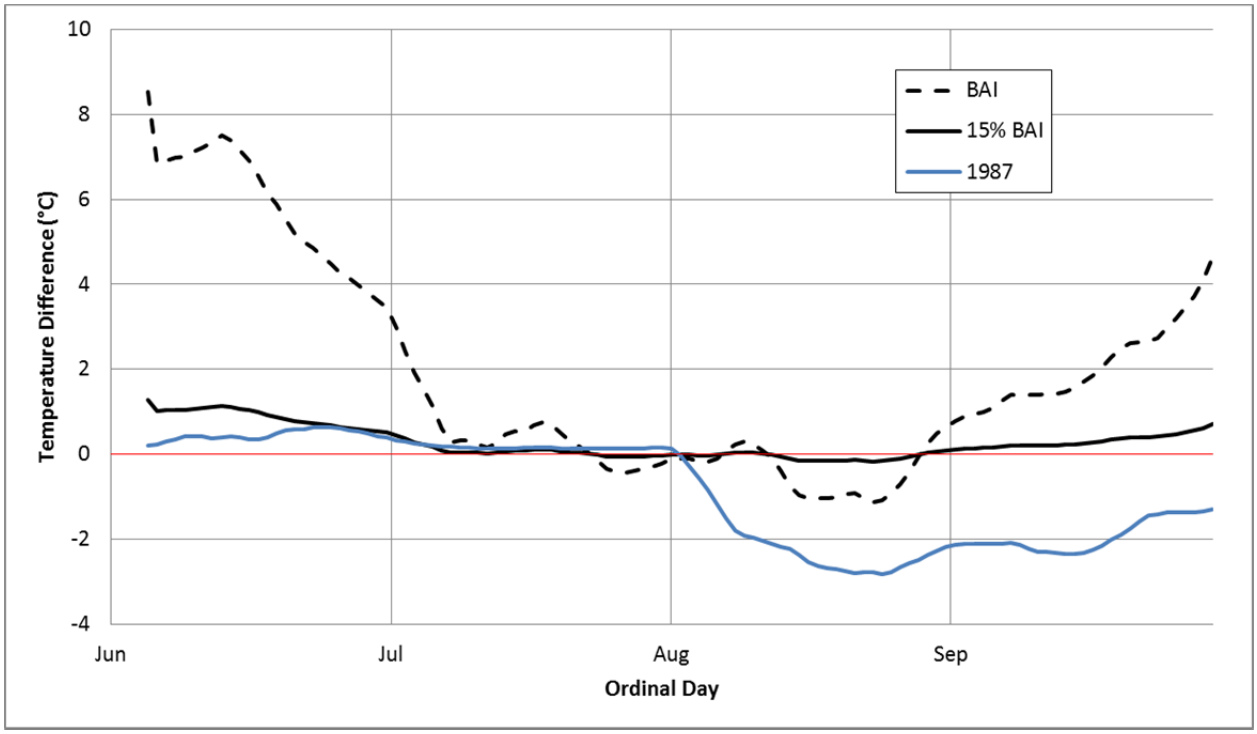


Figure 43. 1987 Model-Simulated WAT Differences at CR-WGD Compared to the BAI and 15% BAI

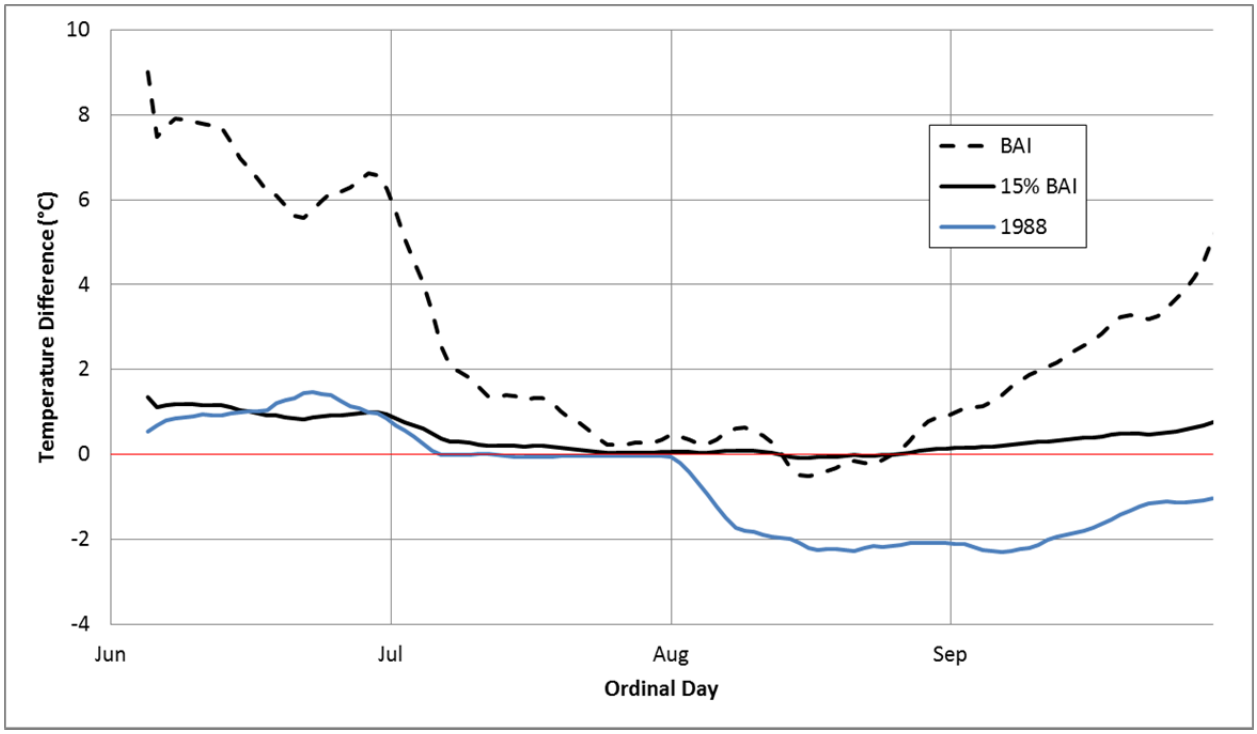


Figure 44. 1988 Model-Simulated WAT Differences at CR-WGD Compared to the BAI and 15% BAI

C. CR-HSU Modeled Differences Compared to Baseline

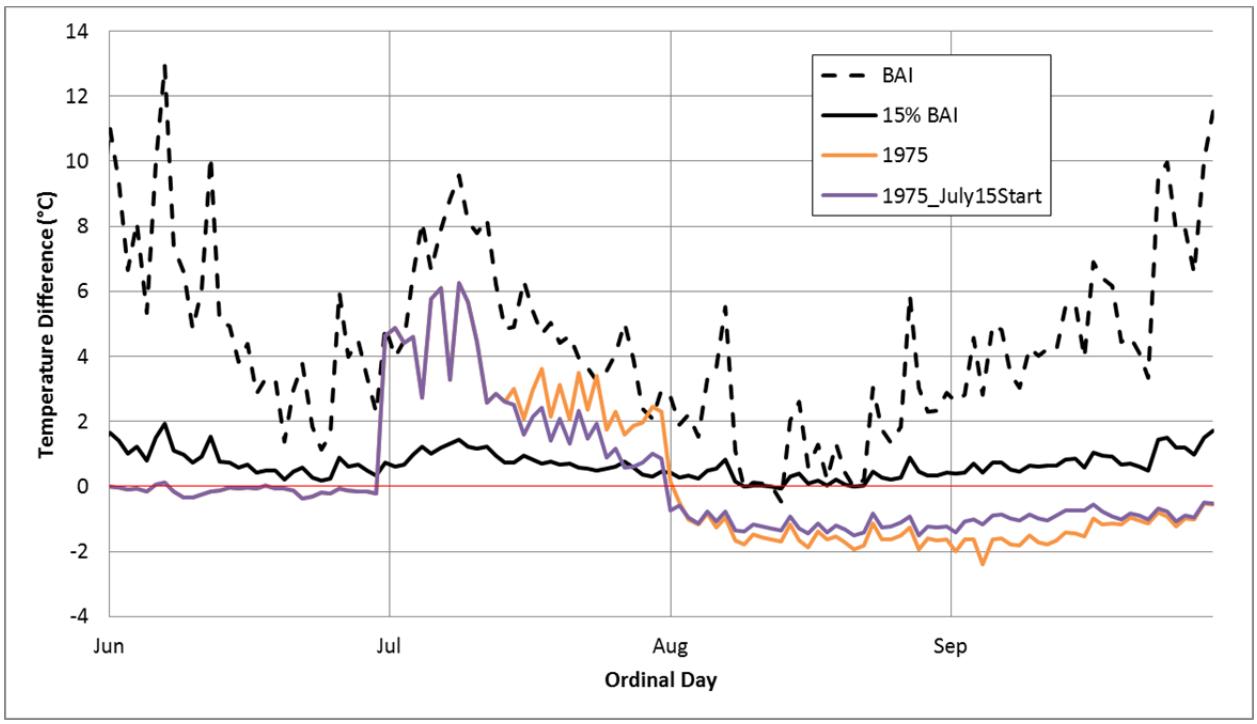


Figure 45. 1975 Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

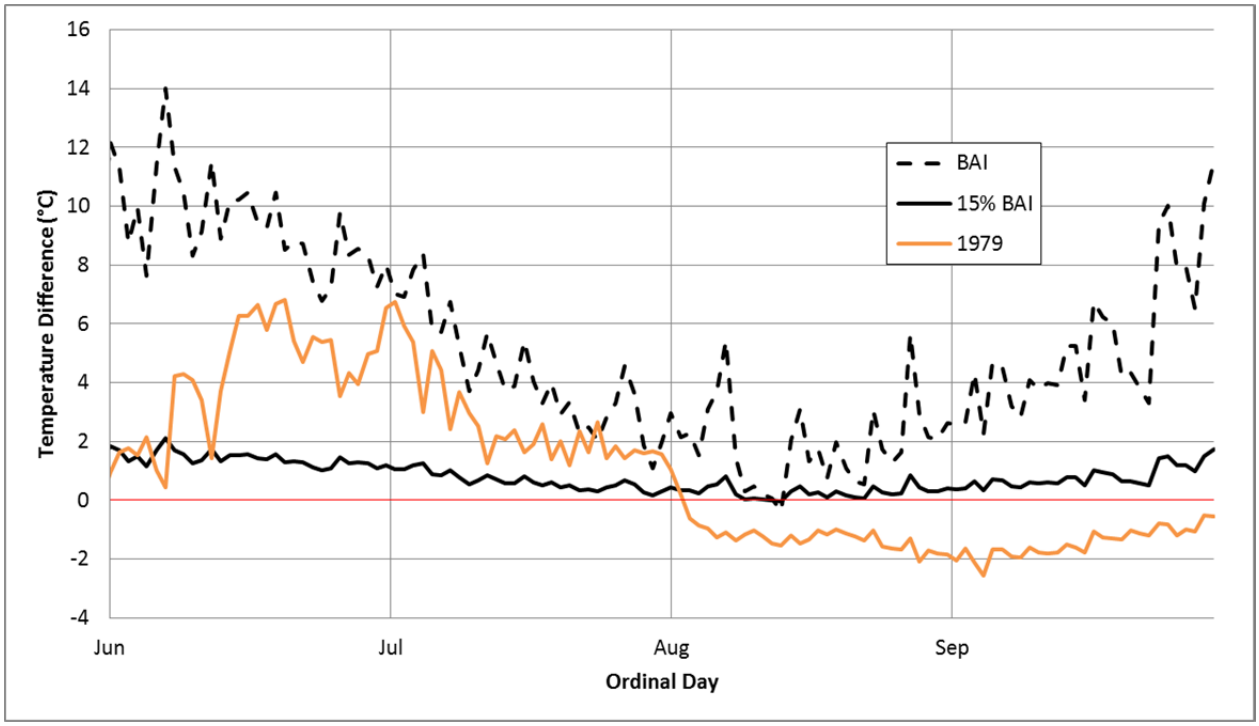


Figure 46. 1979 Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

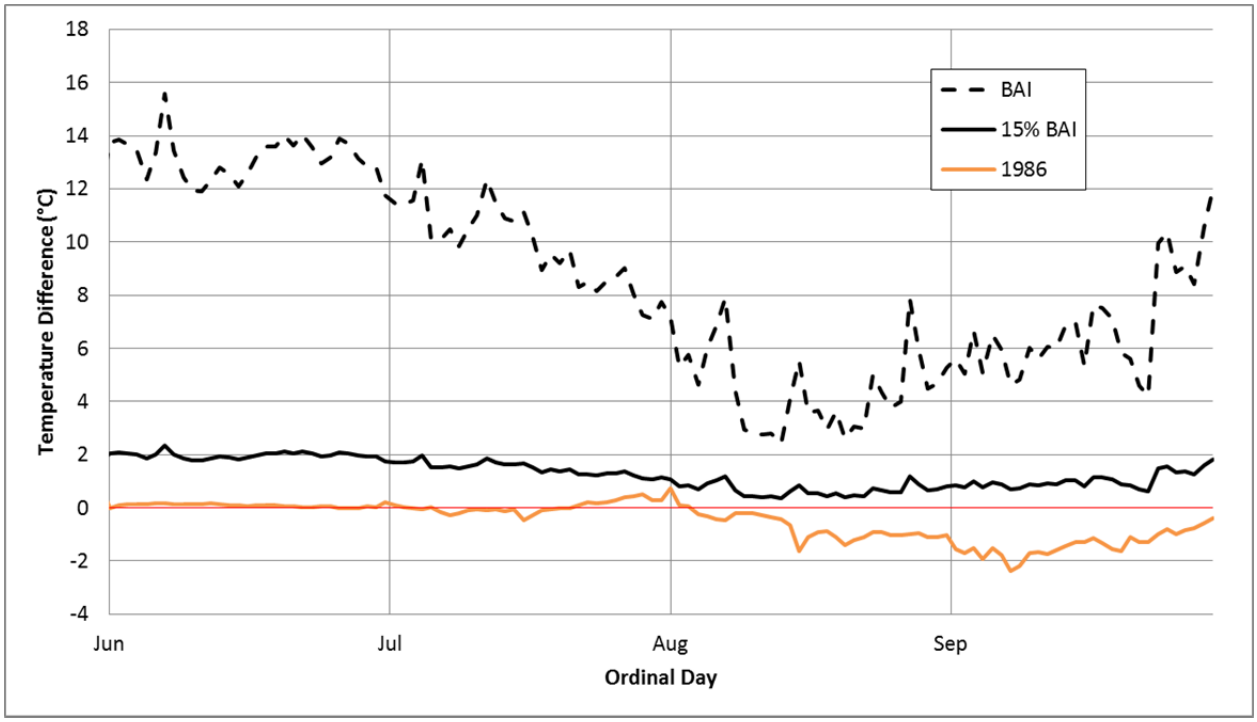


Figure 47. 1986 Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

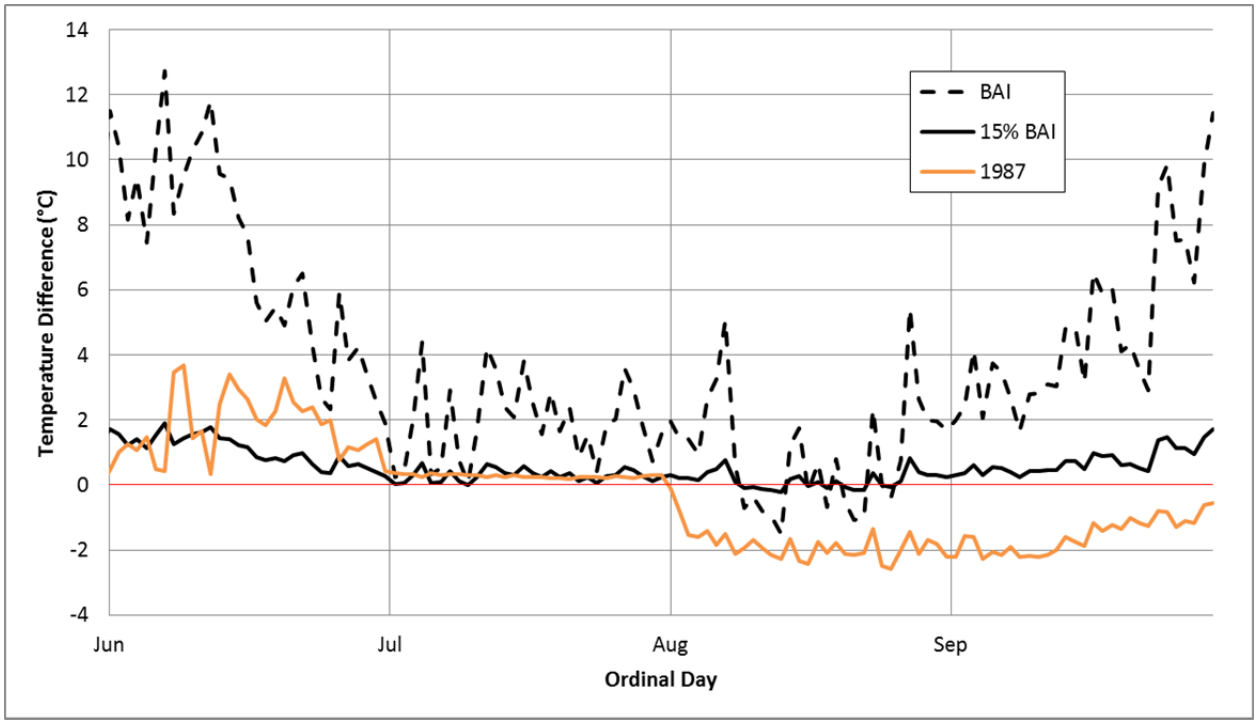


Figure 48. 1987 Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

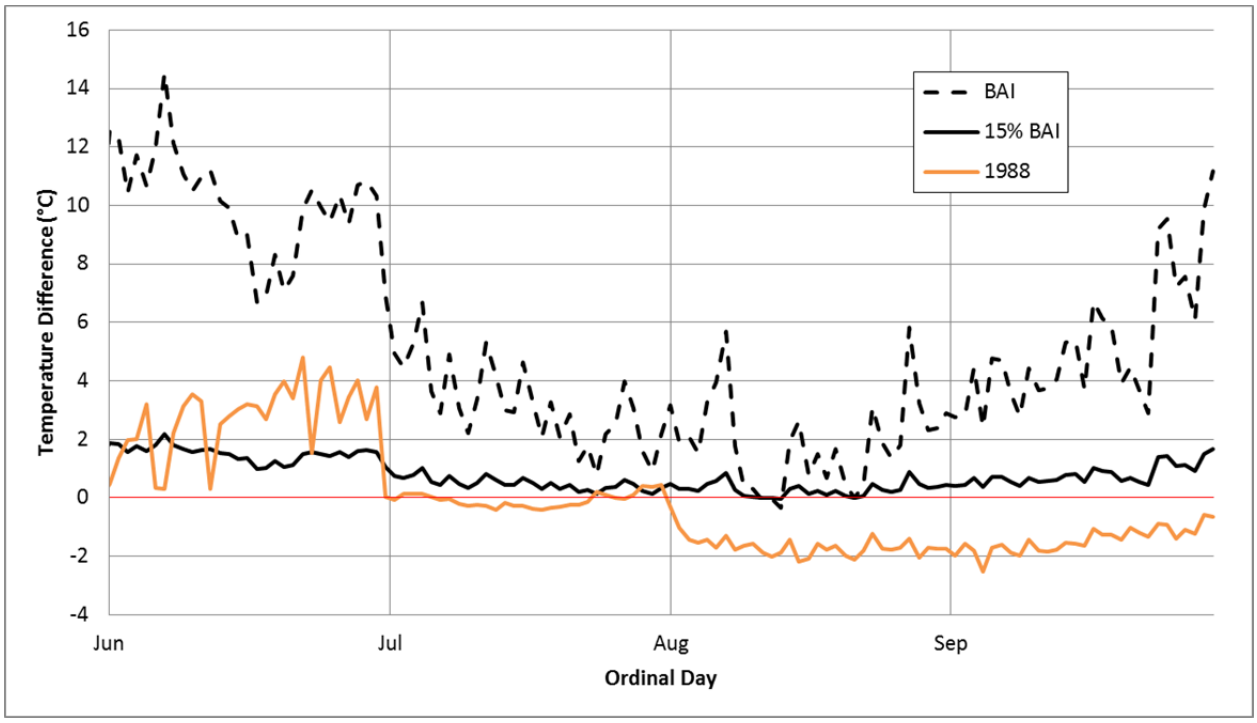


Figure 49. 1988 Model-Simulated DM Differences at CR-HSU Compared to the BAI and 15% BAI

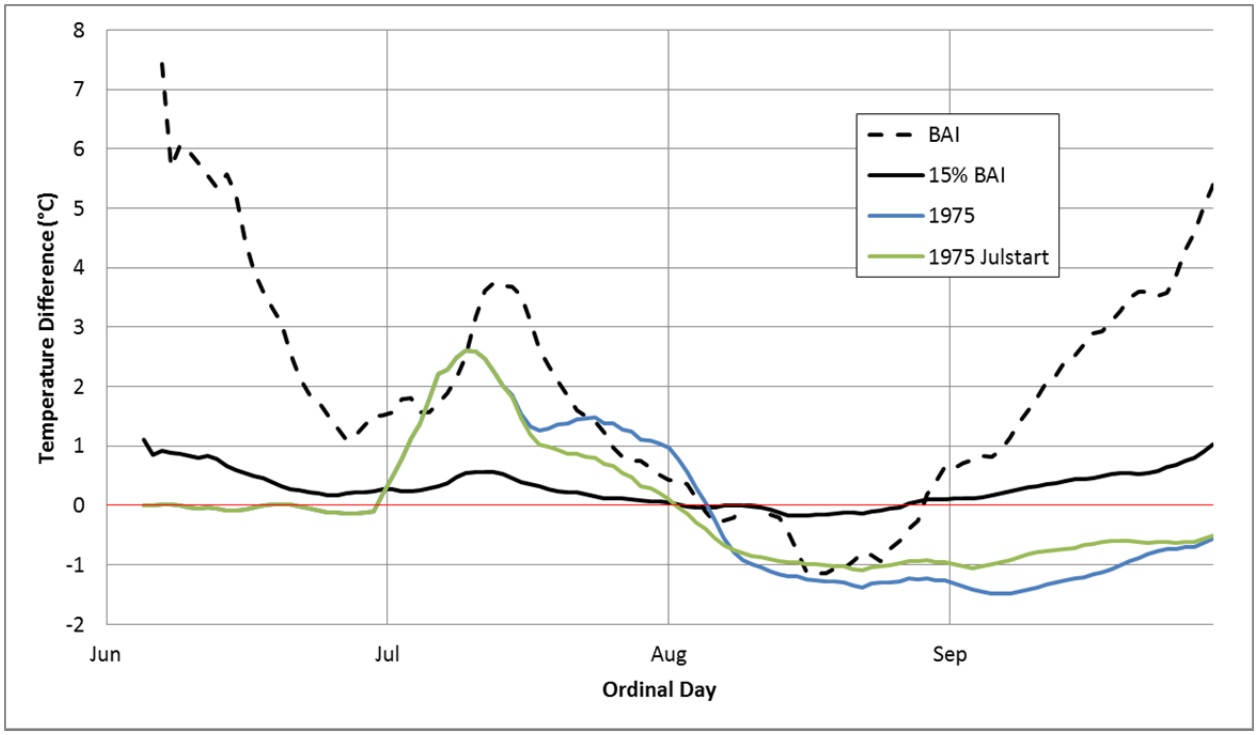


Figure 50. 1975 Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

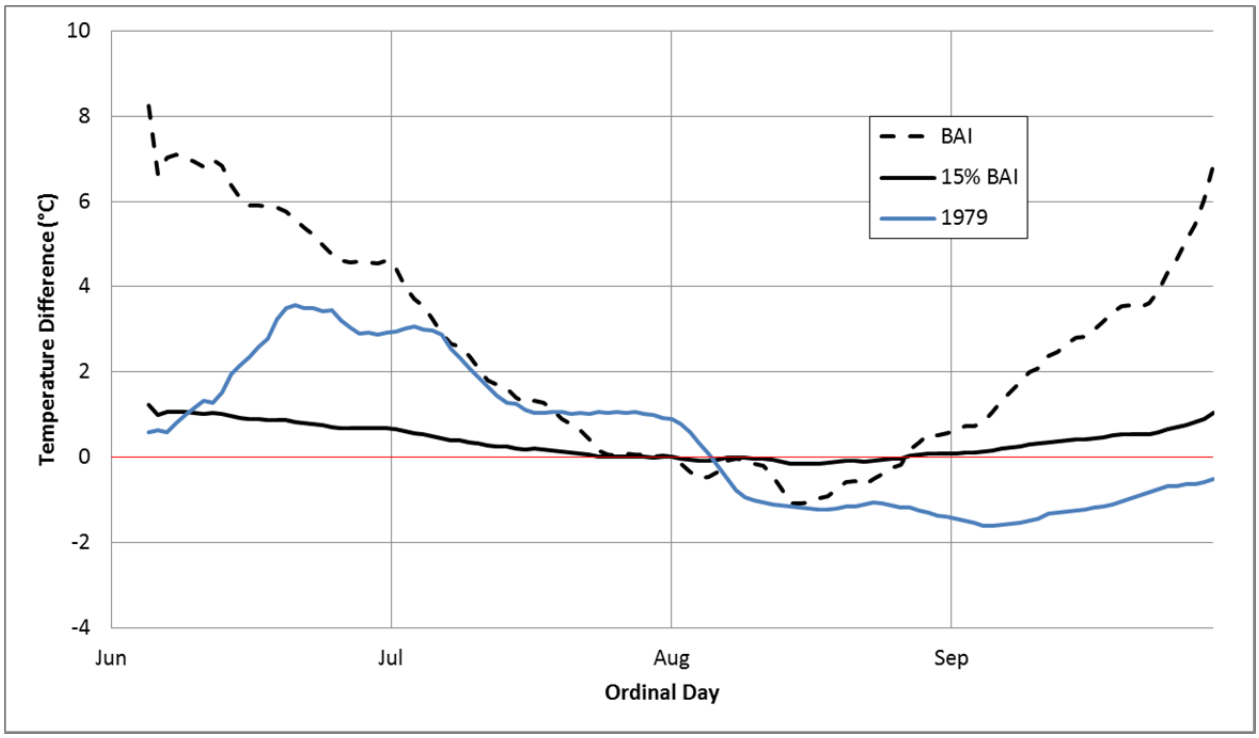


Figure 51. 1979 Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

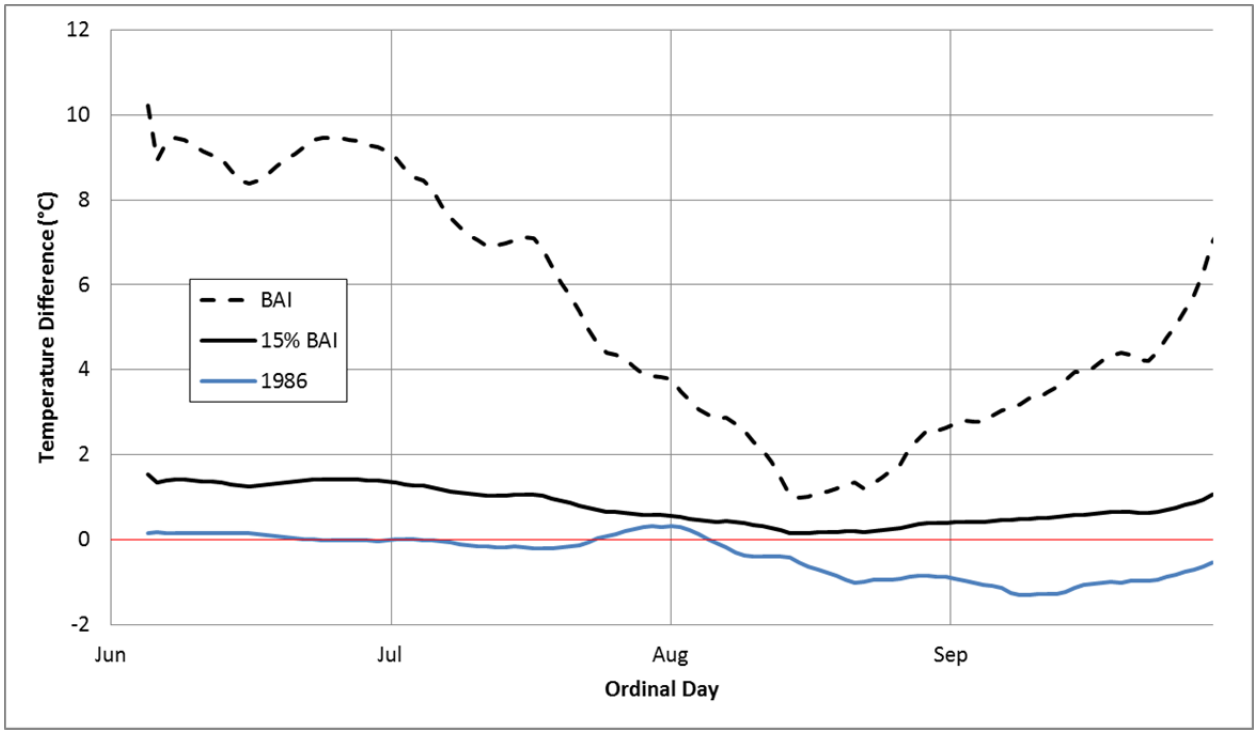


Figure 52. 1986 Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

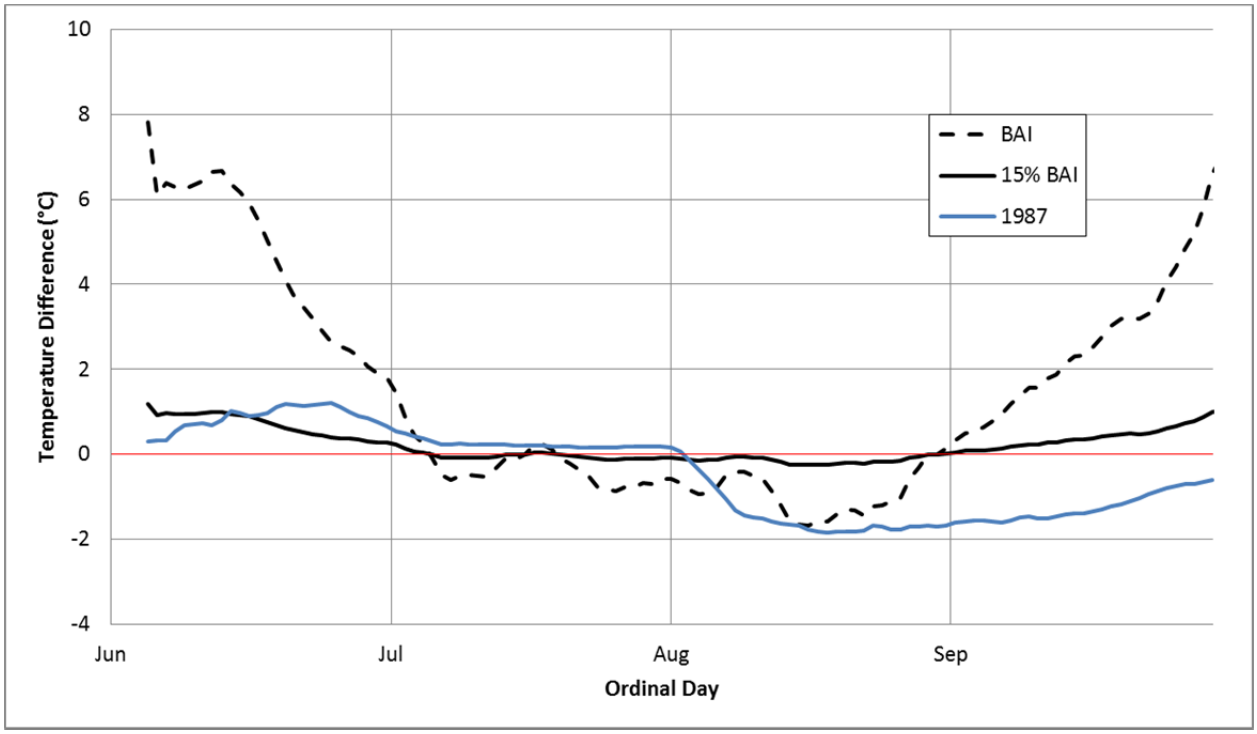


Figure 53. 1987 Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

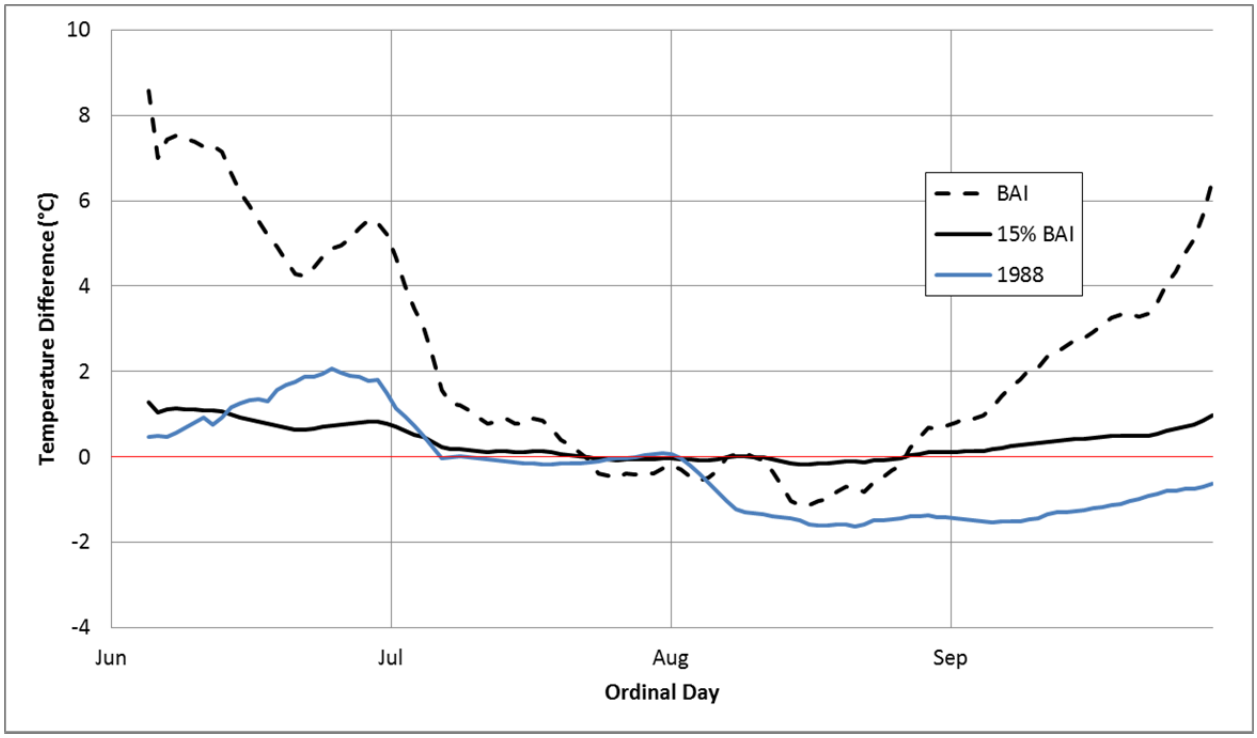


Figure 54. 1988 Model-Simulated WAT Differences at CR-HSU Compared to the BAI and 15% BAI

D. CR-HRU Modeled Differences Compared to Baseline

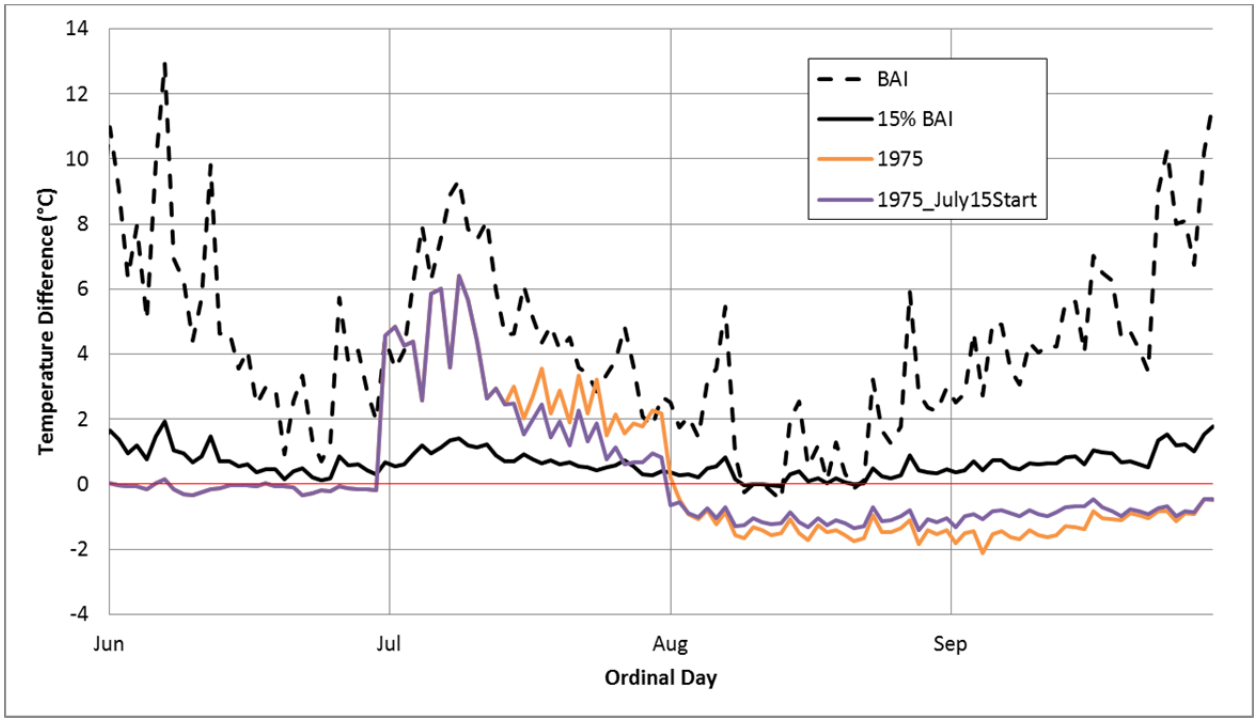


Figure 55. 1975 Model-Simulated DM Differences at CR-HRU Compared to the BAI and 15% BAI

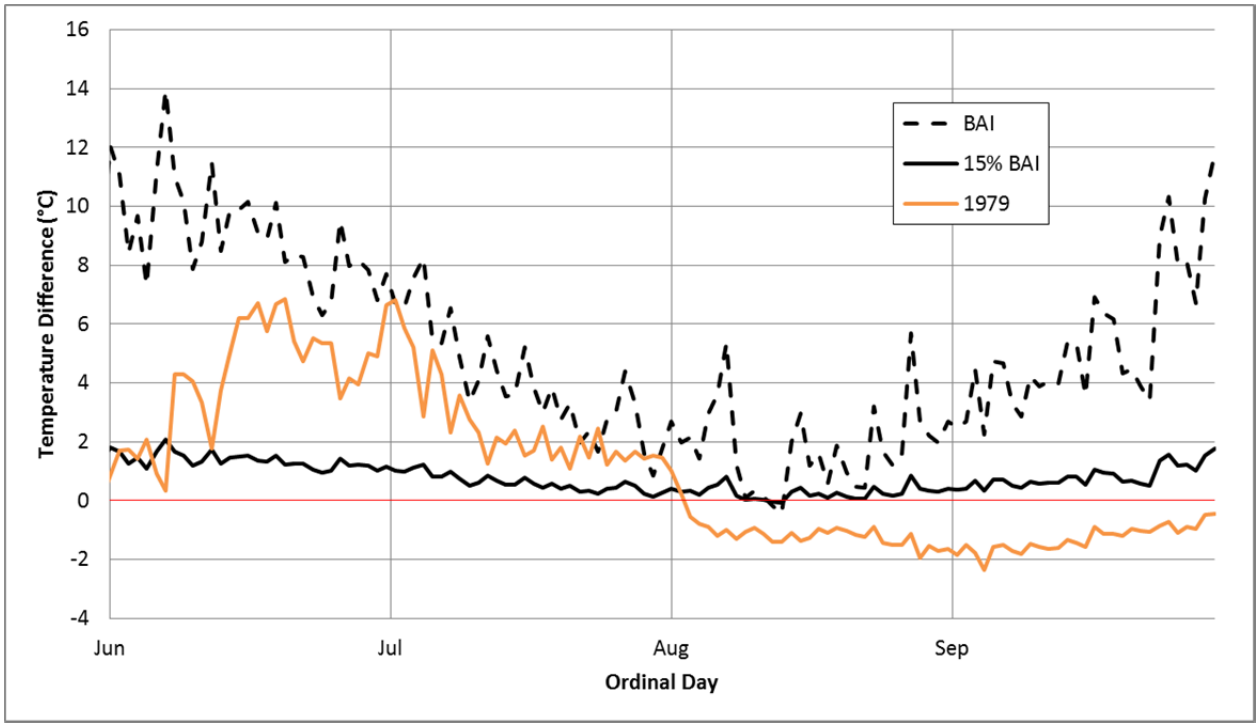


Figure 56. 1979 Model-Simulated DM Differences at CR-HRU Compared to the BAI and 15% BAI

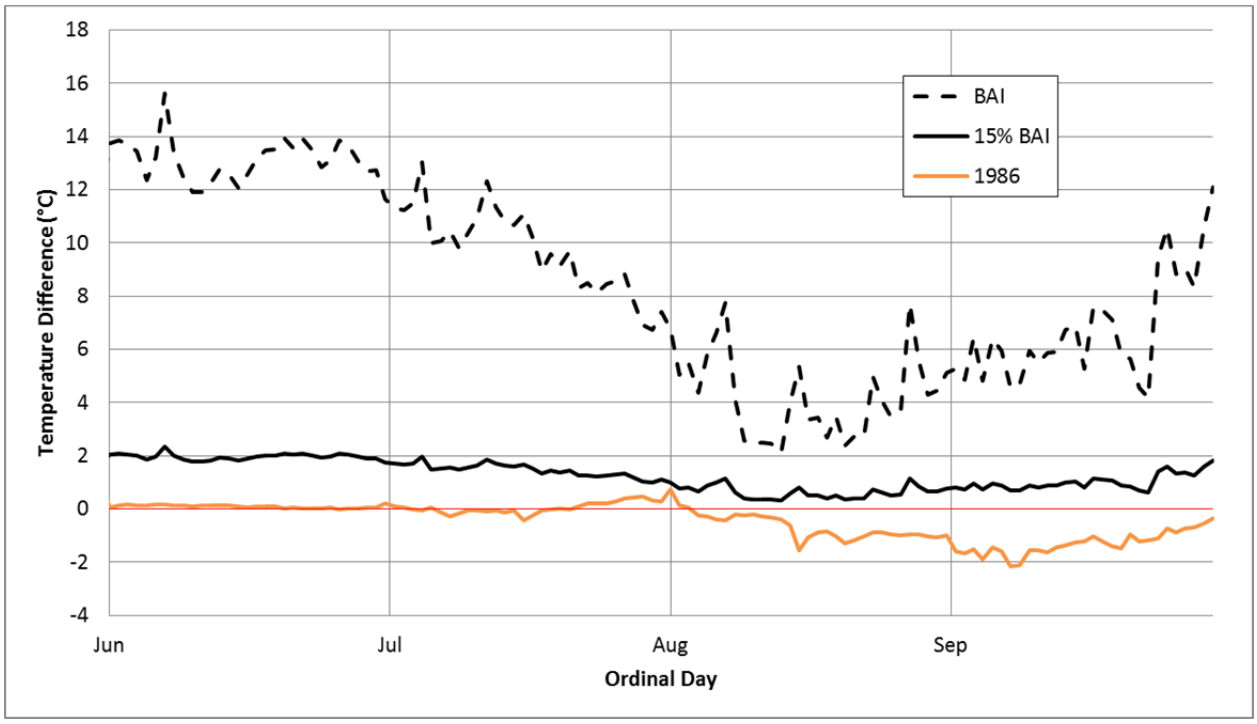


Figure 57. 1986 Model-Simulated DM Differences at CR-HRU Compared to the BAI and 15% BAI

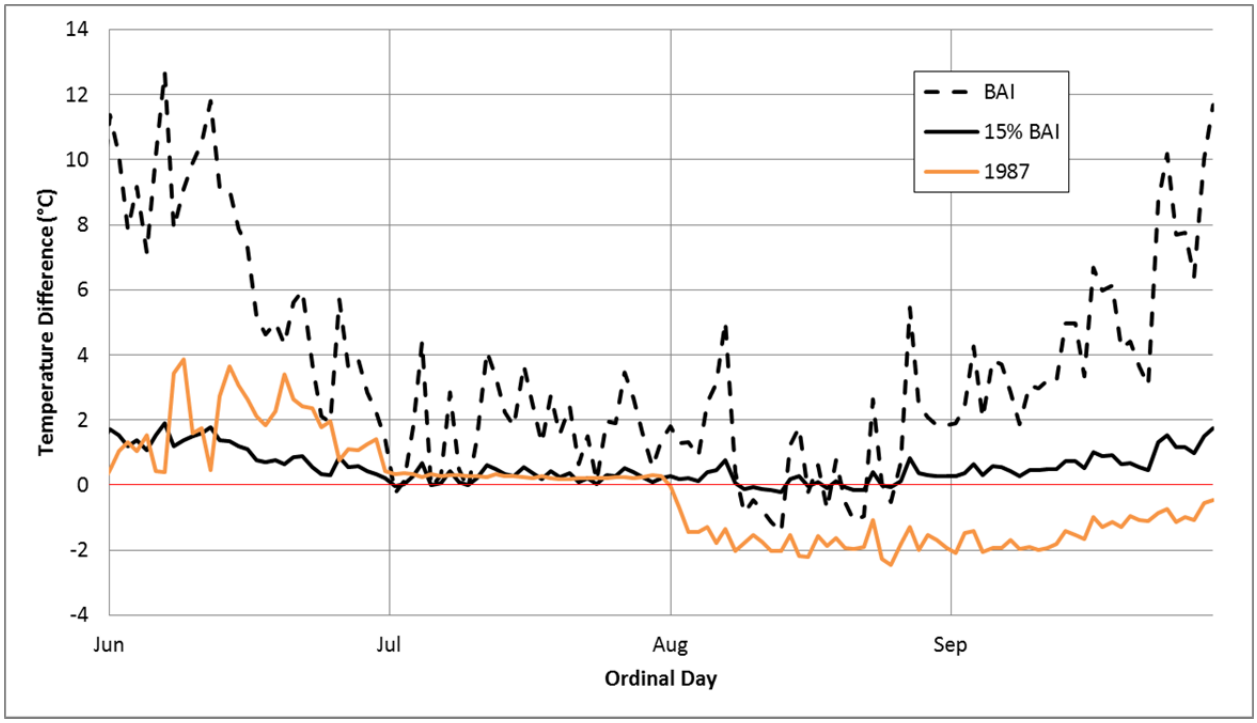


Figure 58. 1987 Model-Simulated DM Differences at CR-HRU Compared to the BAI and 15% BAI

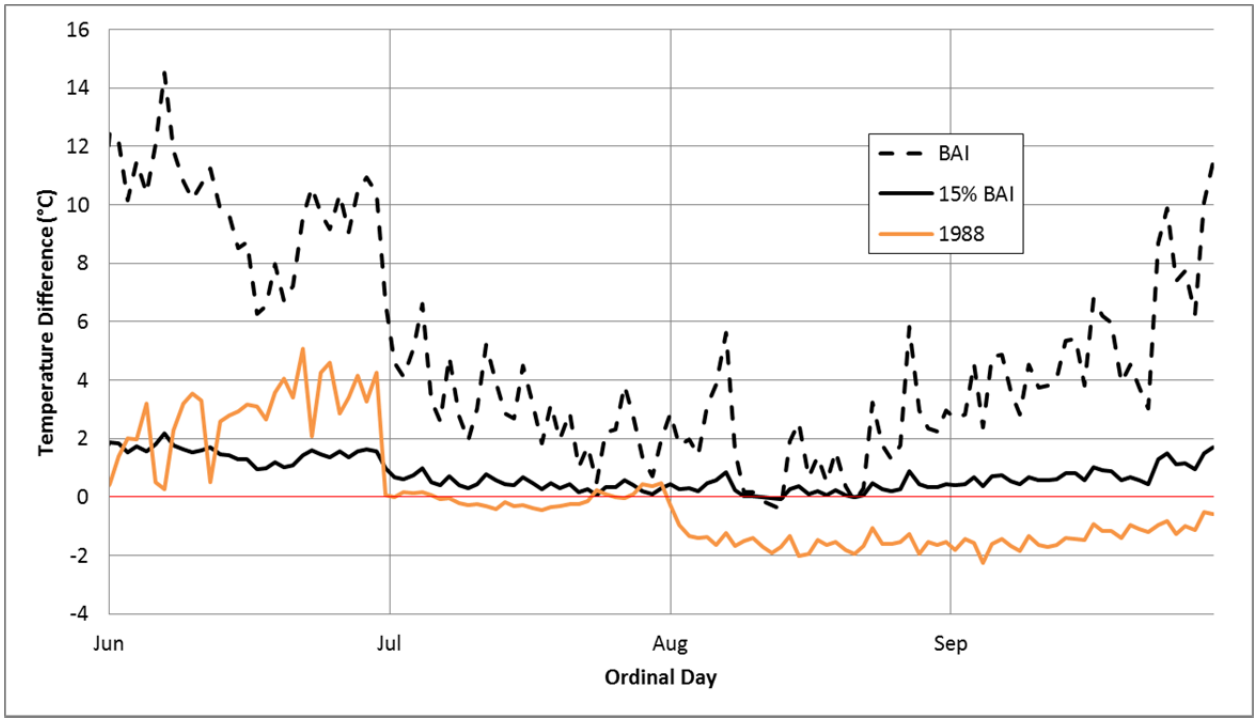


Figure 59. 1988 Model-Simulated DM Differences at CR-HRU Compared to the BAI and 15% BAI

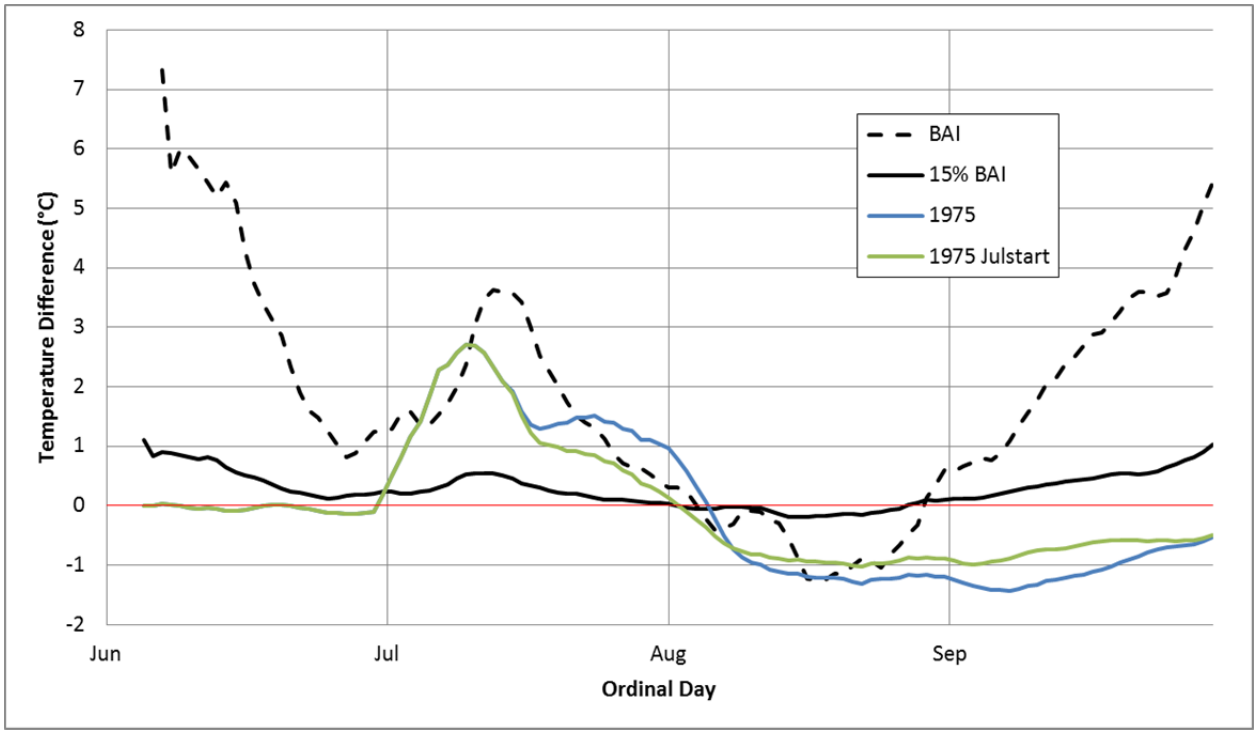


Figure 60. 1975 Model-Simulated WAT Differences at CR-HRU Compared to the BAI and 15% BAI

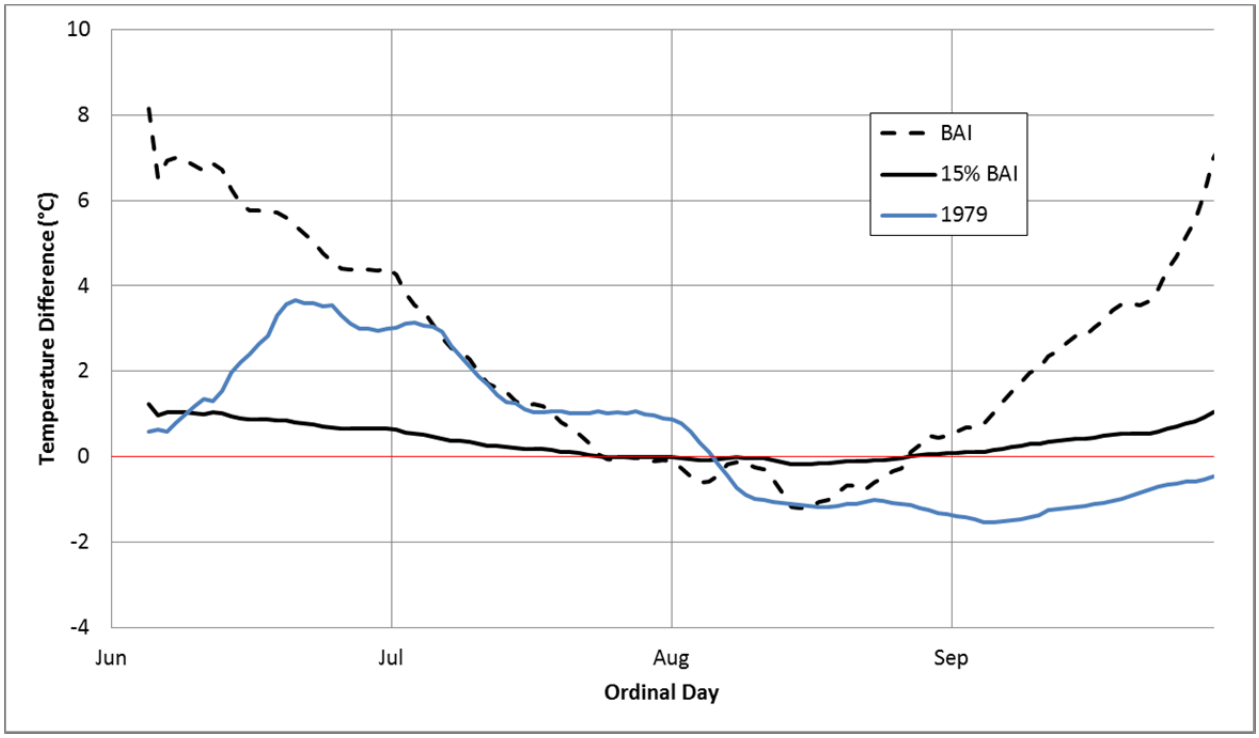


Figure 61. 1979 Model-Simulated WAT Differences at CR-HRU Compared to the BAI and 15% BAI

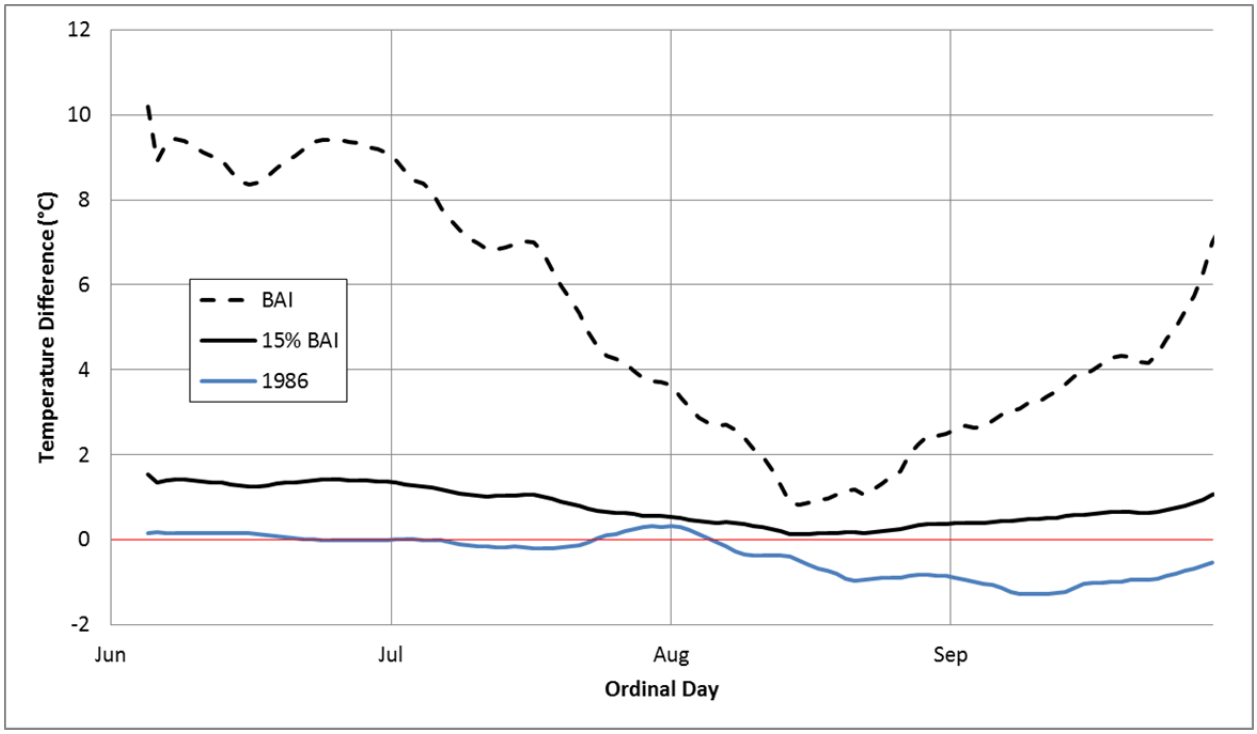


Figure 62. 1986 Model-Simulated WAT Differences at CR-HRU Compared to the BAI and 15% BAI

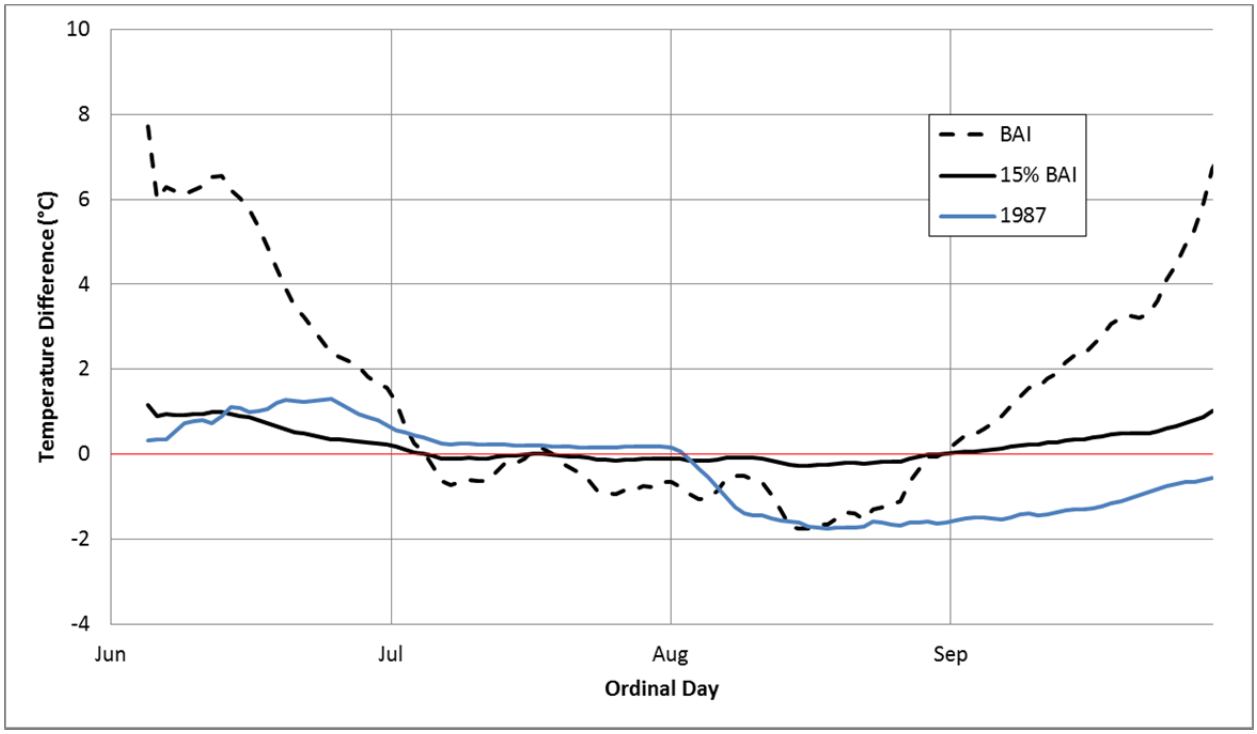


Figure 63. 1987 Model-Simulated WAT Differences at CR-HRU Compared to the BAI and 15% BAI

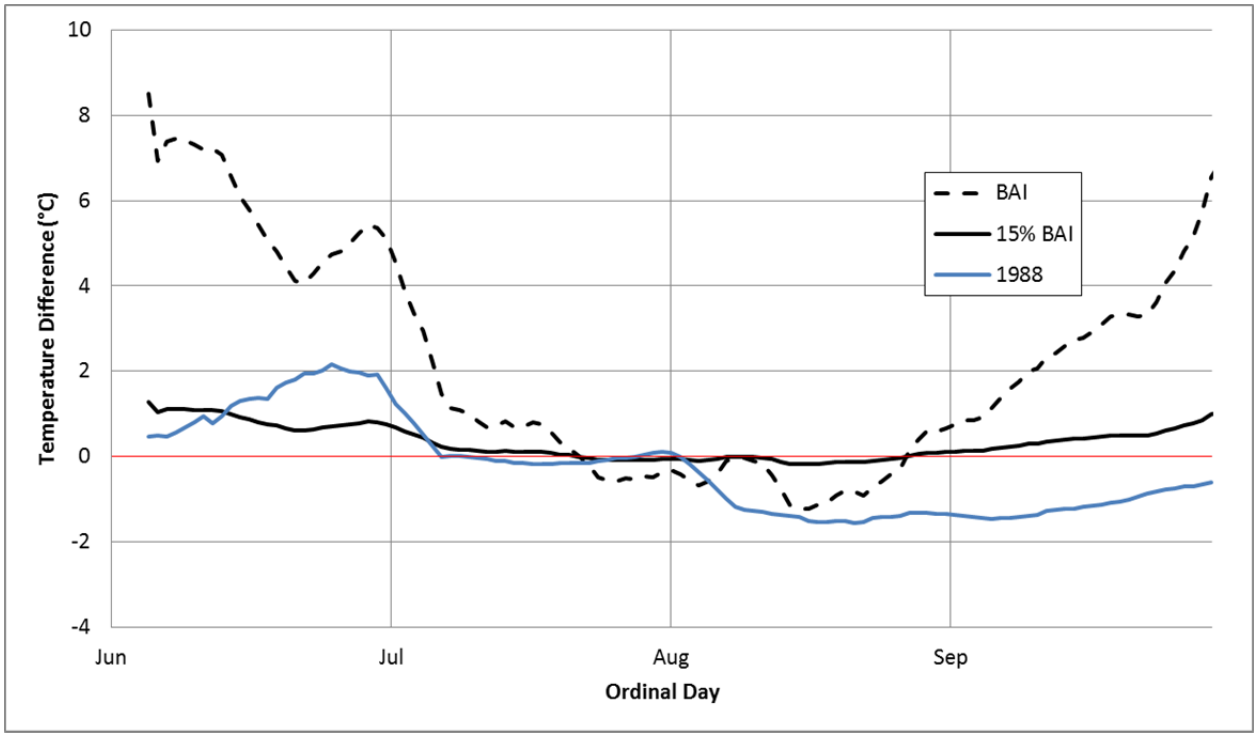


Figure 64. 1988 Model-Simulated WAT Differences at CR-HRU Compared to the BAI and 15% BAI

E. CR-LB Modeled Differences Compared to Baseline

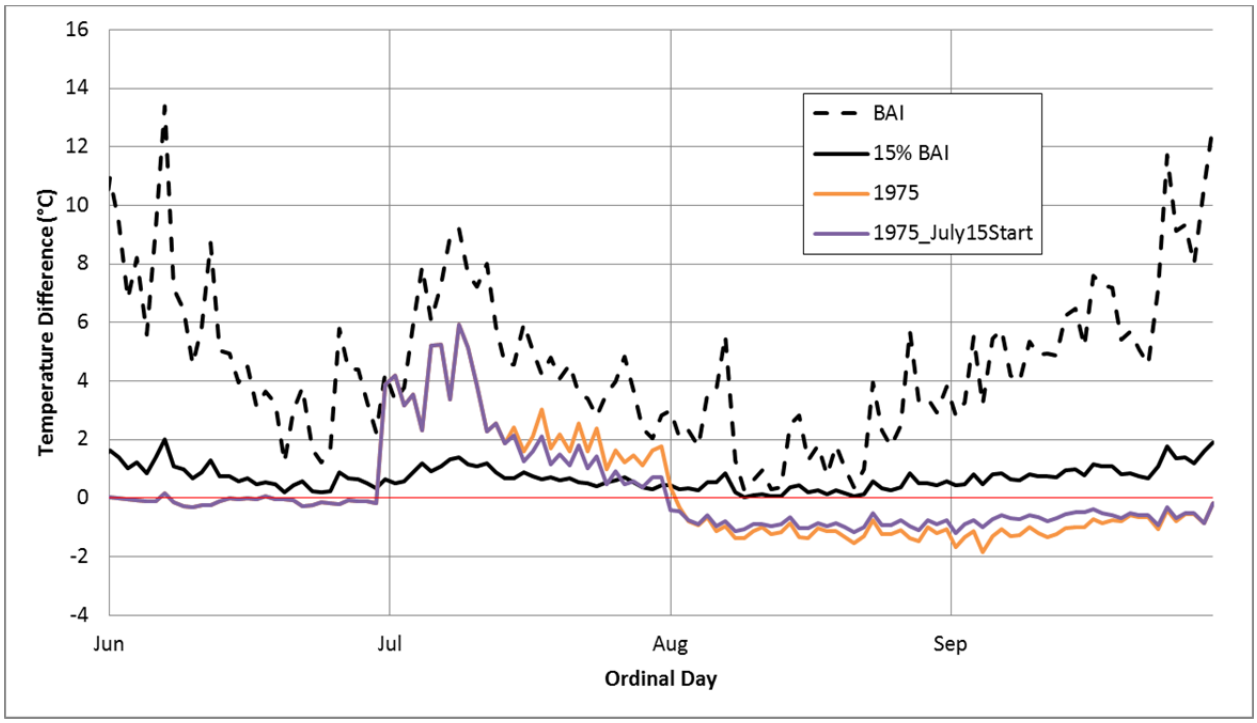


Figure 65. 1975 Model-Simulated DM Differences at CR-LB Compared to the BAI and 15% BAI

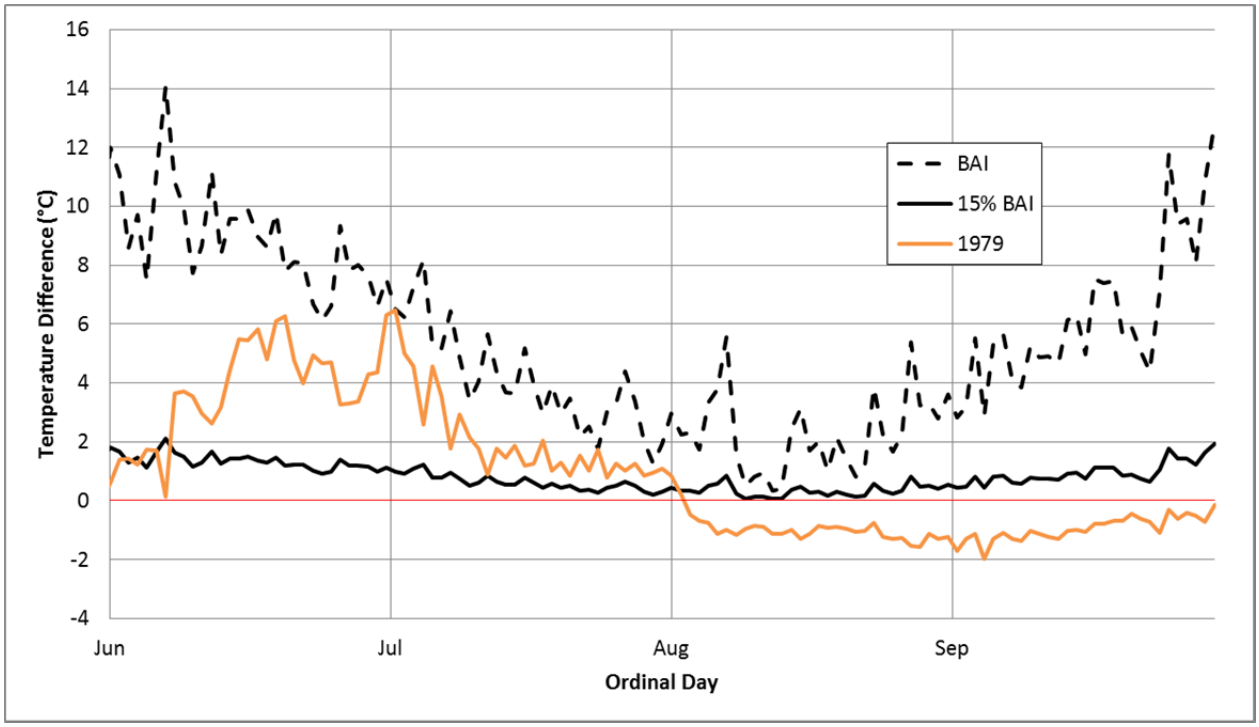


Figure 66. 1979 Model-Simulated DM Differences at CR-LB Compared to the BAI and 15% BAI

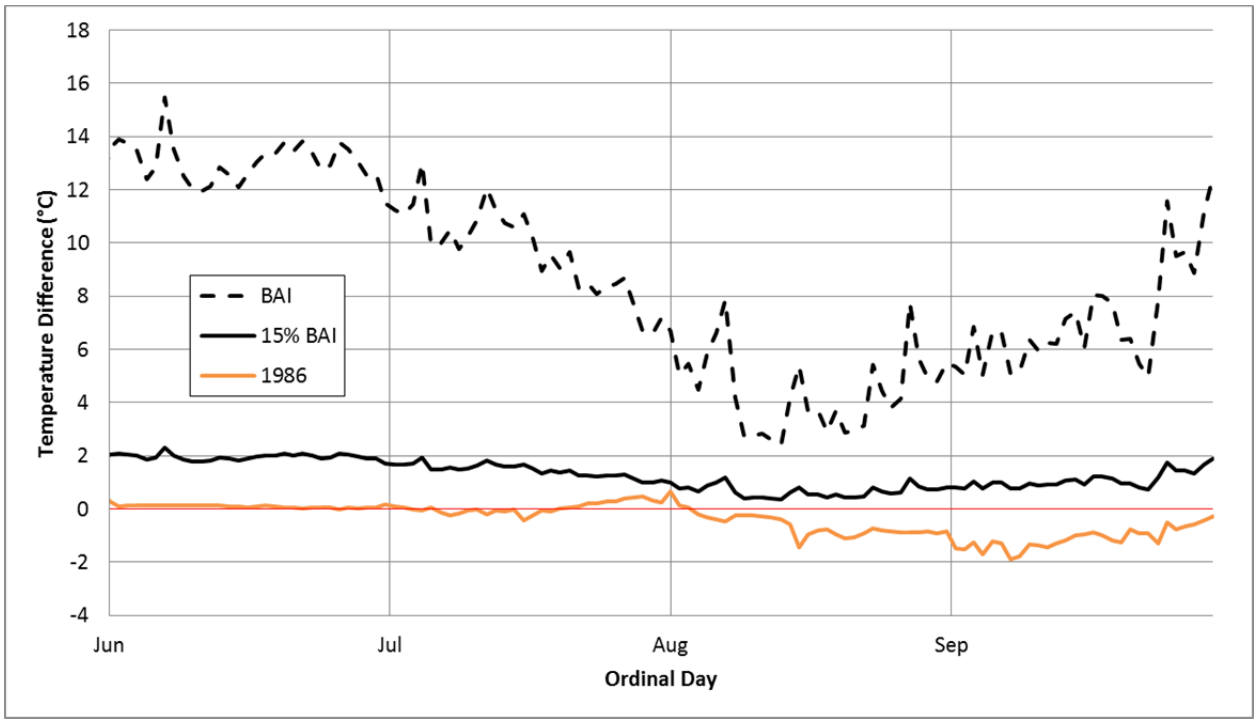


Figure 67. 1986 Model-Simulated DM Differences at CR-LB Compared to the BAI and 15% BAI

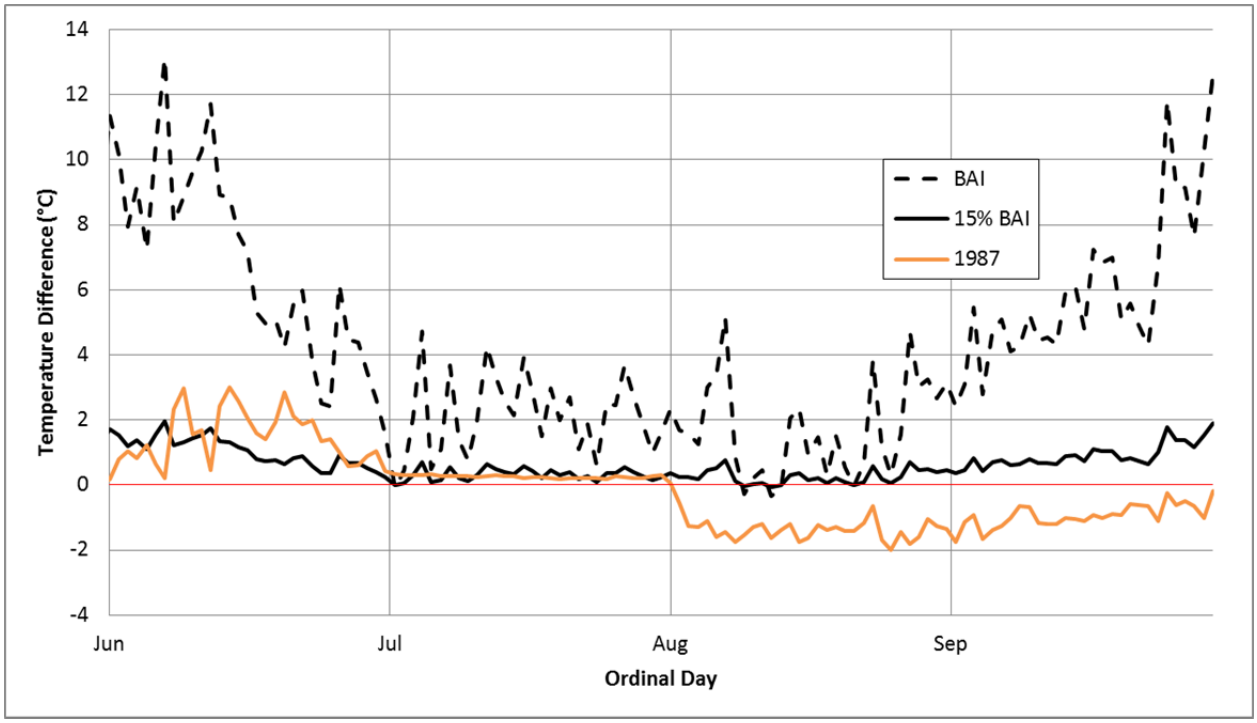


Figure 68. 1987 Model-Simulated DM Differences at CR-LB Compared to the BAI and 15% BAI

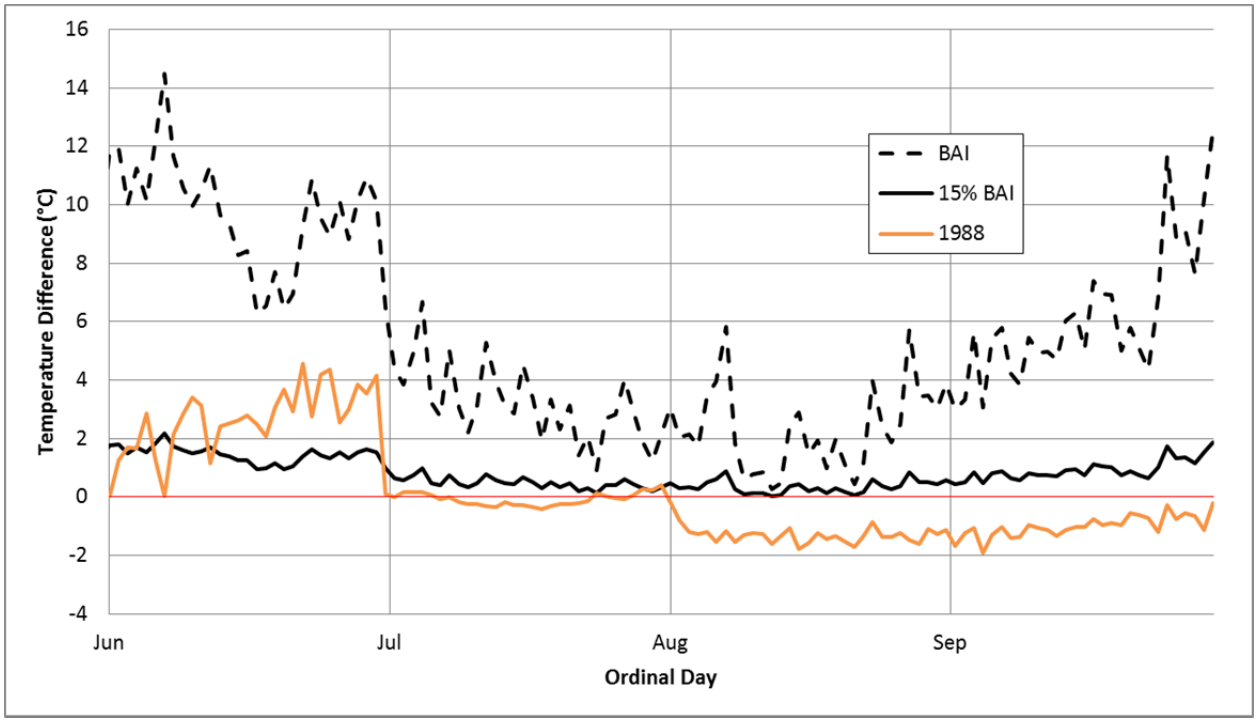


Figure 69. 1988 Model-Simulated DM Differences at CR-LB Compared to the BAI and 15% BAI

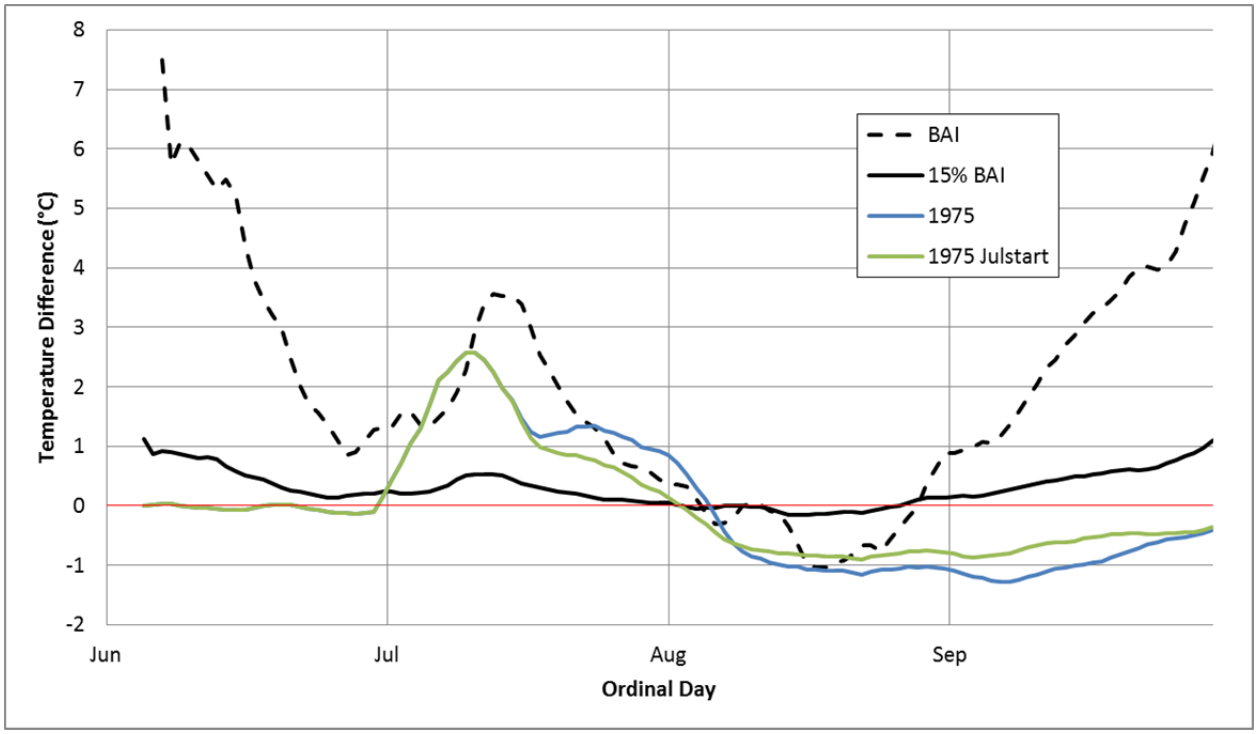


Figure 70. 1975 Model-Simulated WAT Differences at CR-LB Compared to the BAI and 15% BAI

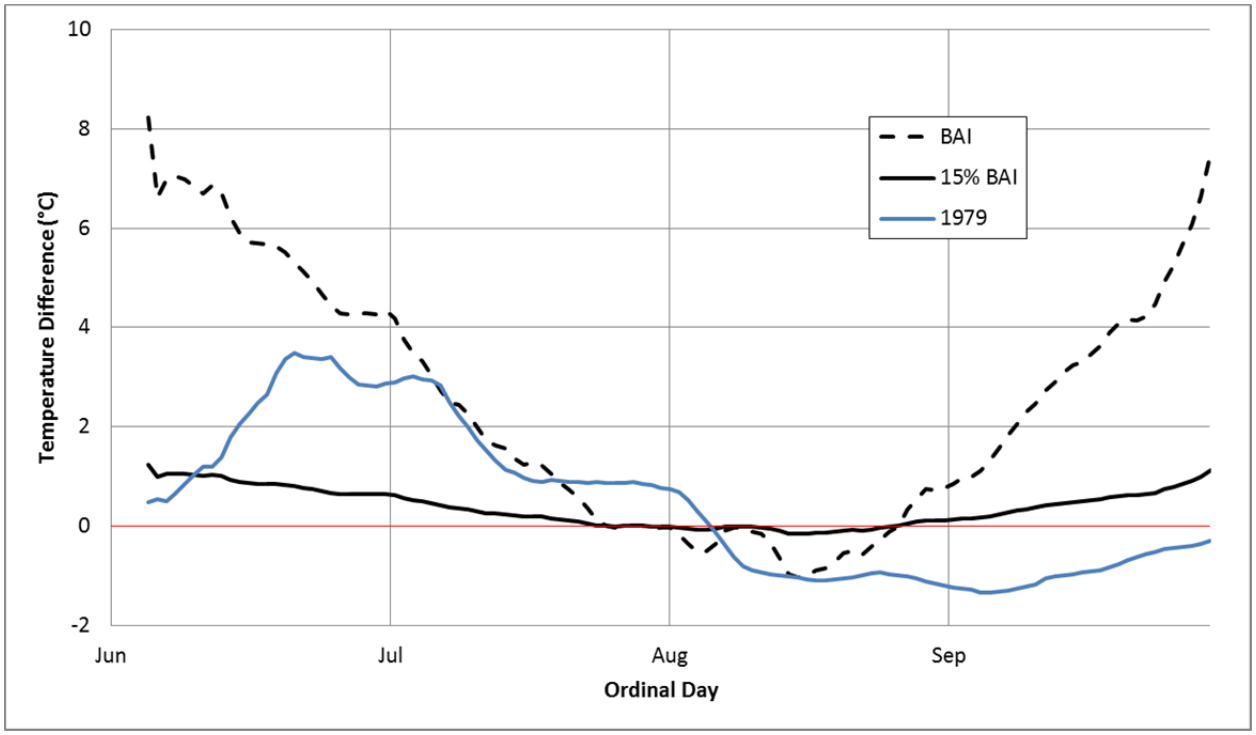


Figure 71. 1979 Model-Simulated WAT Differences at CR-LB Compared to the BAI and 15% BAI

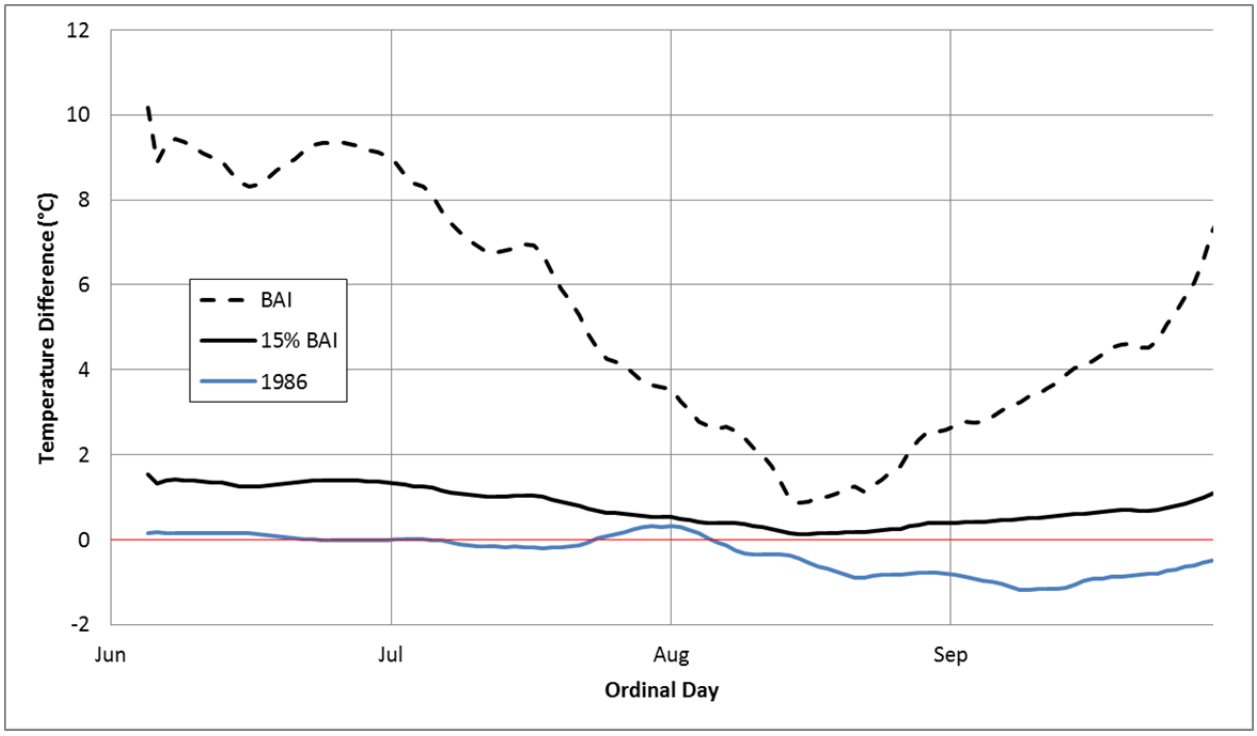


Figure 72. 1986 Model-Simulated WAT Differences at CR-LB Compared to the BAI and 15% BAI

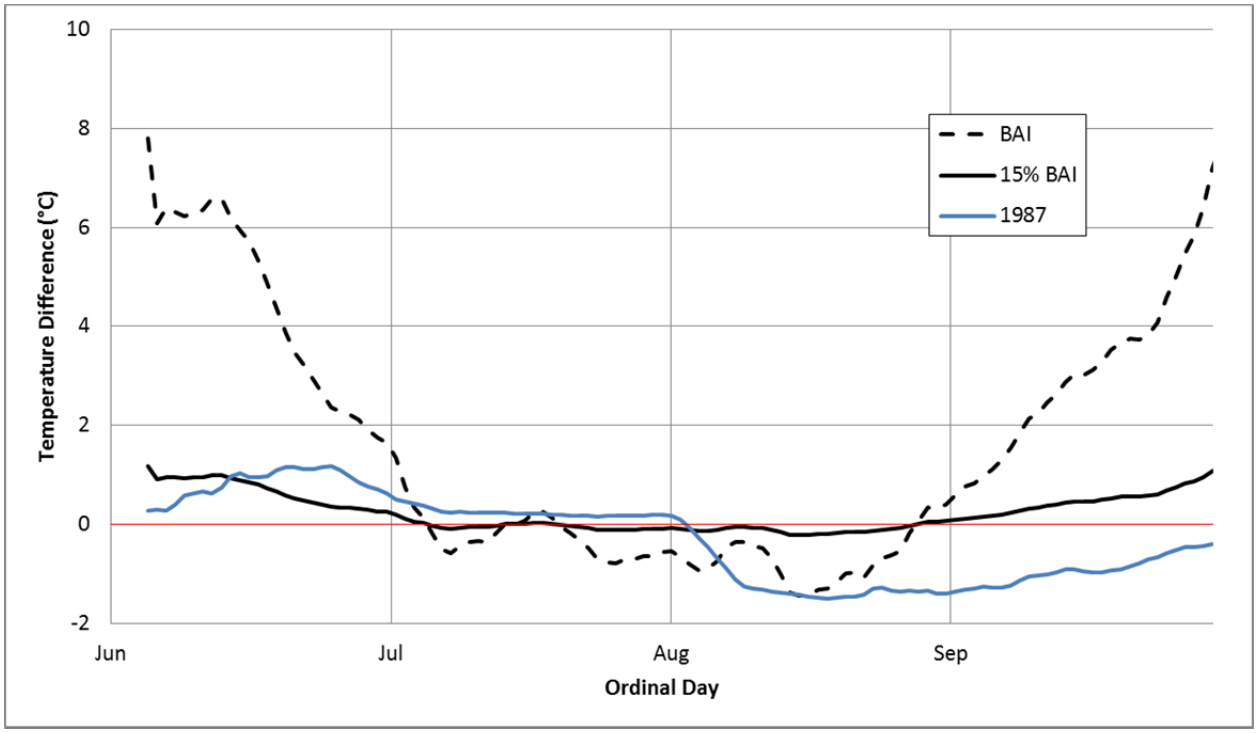


Figure 73. 1987 Model-Simulated WAT Differences at CR-LB Compared to the BAI and 15% BAI

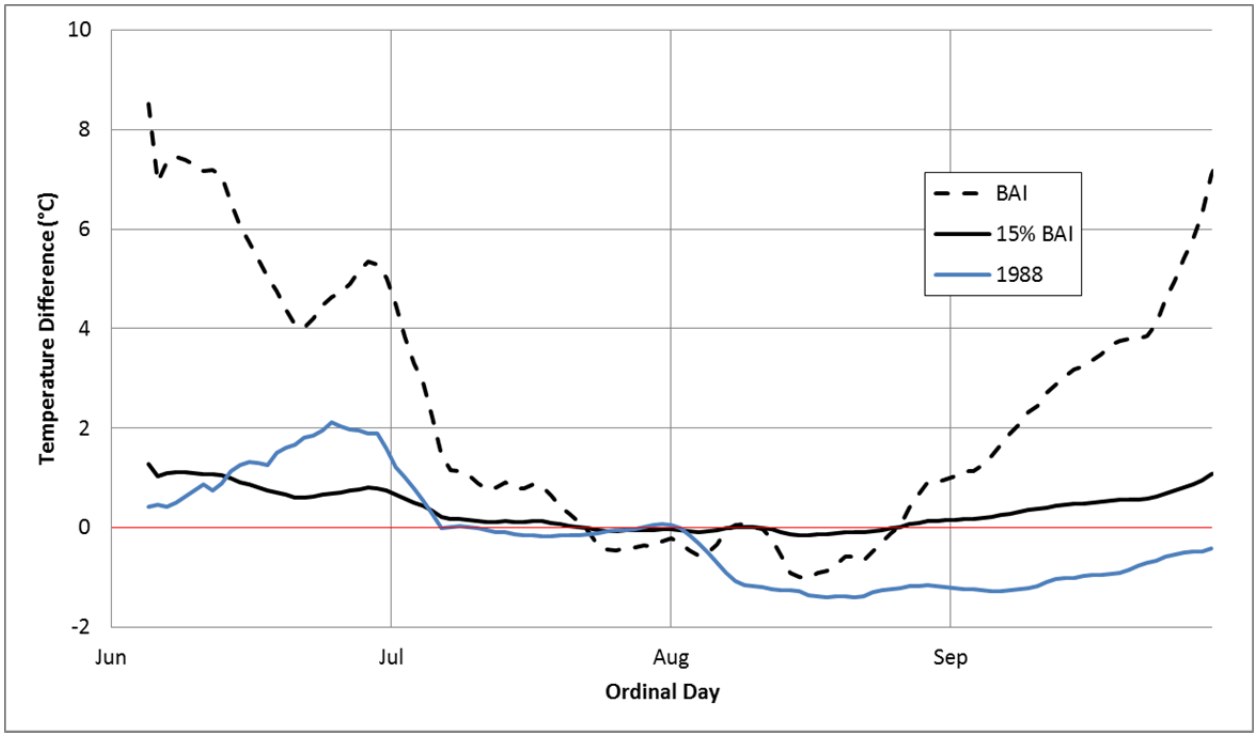


Figure 74. 1988 Model-Simulated WAT Differences at CR-LB Compared to the BAI and 15% BAI

F. CR-WFU Modeled Differences Compared to Baseline

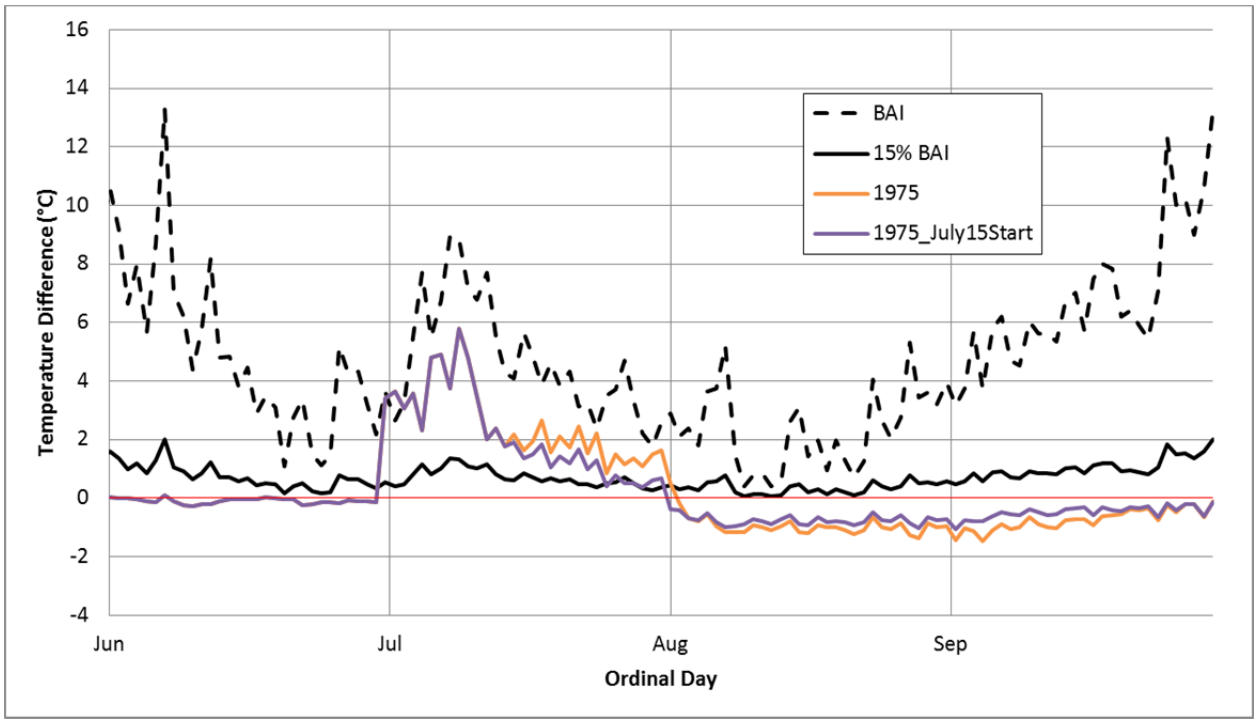


Figure 75. 1975 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

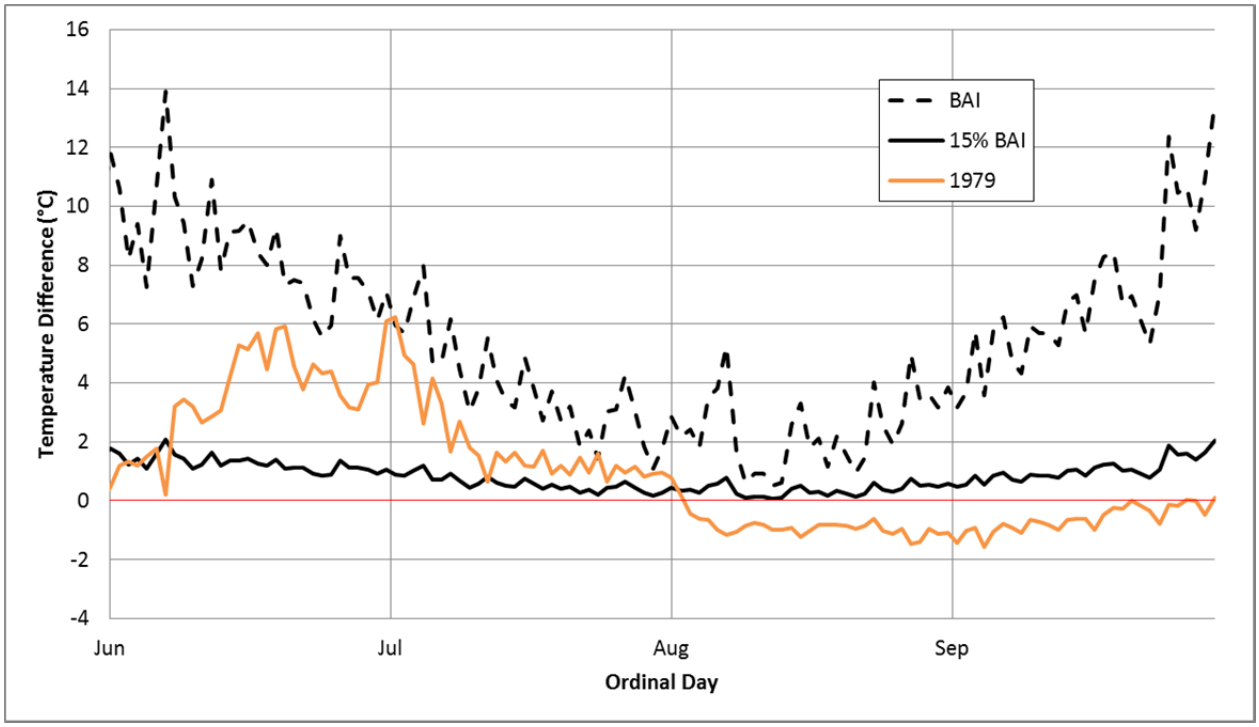


Figure 76. 1979 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

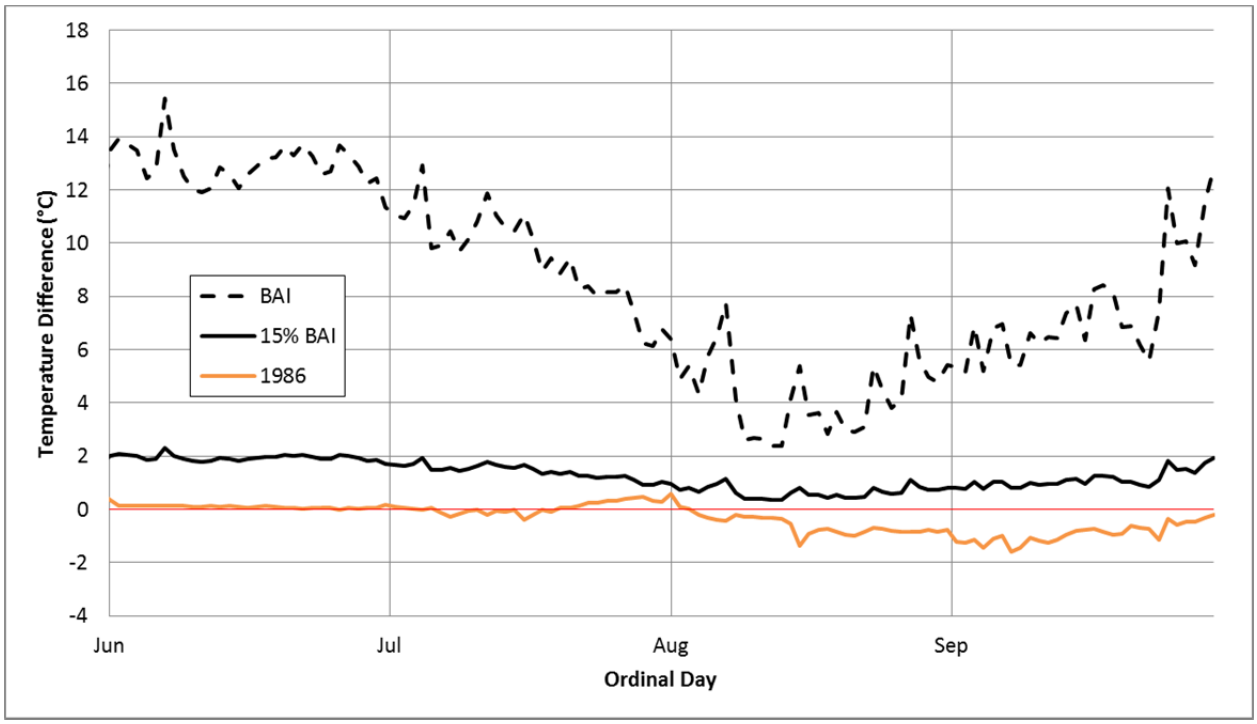


Figure 77. 1986 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

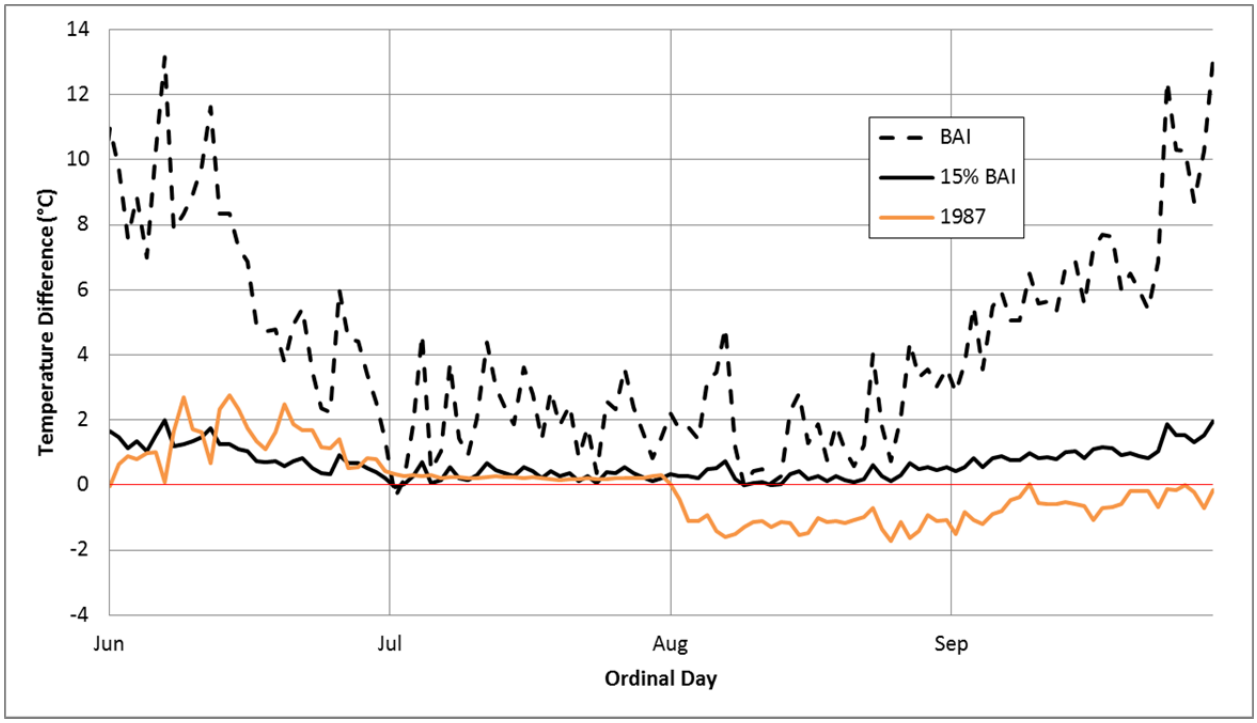


Figure 78. 1987 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

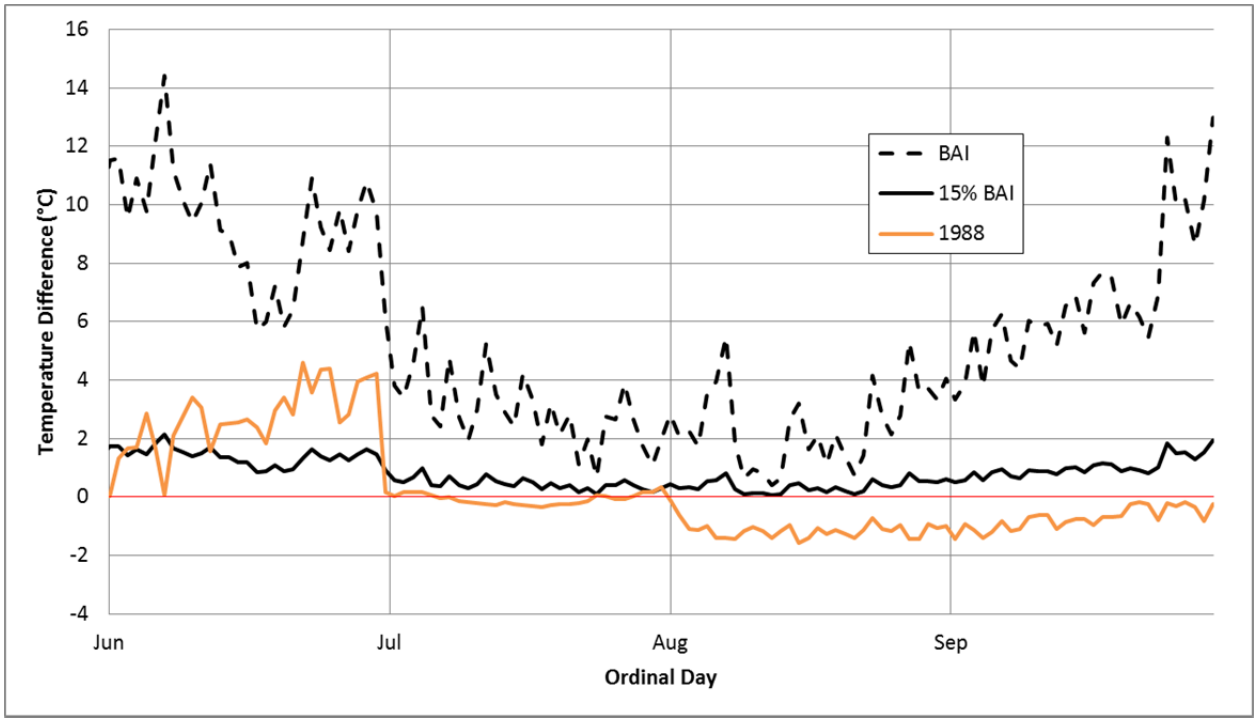


Figure 79. 1988 Model-Simulated DM Differences at CR-WFU Compared to the BAI and 15% BAI

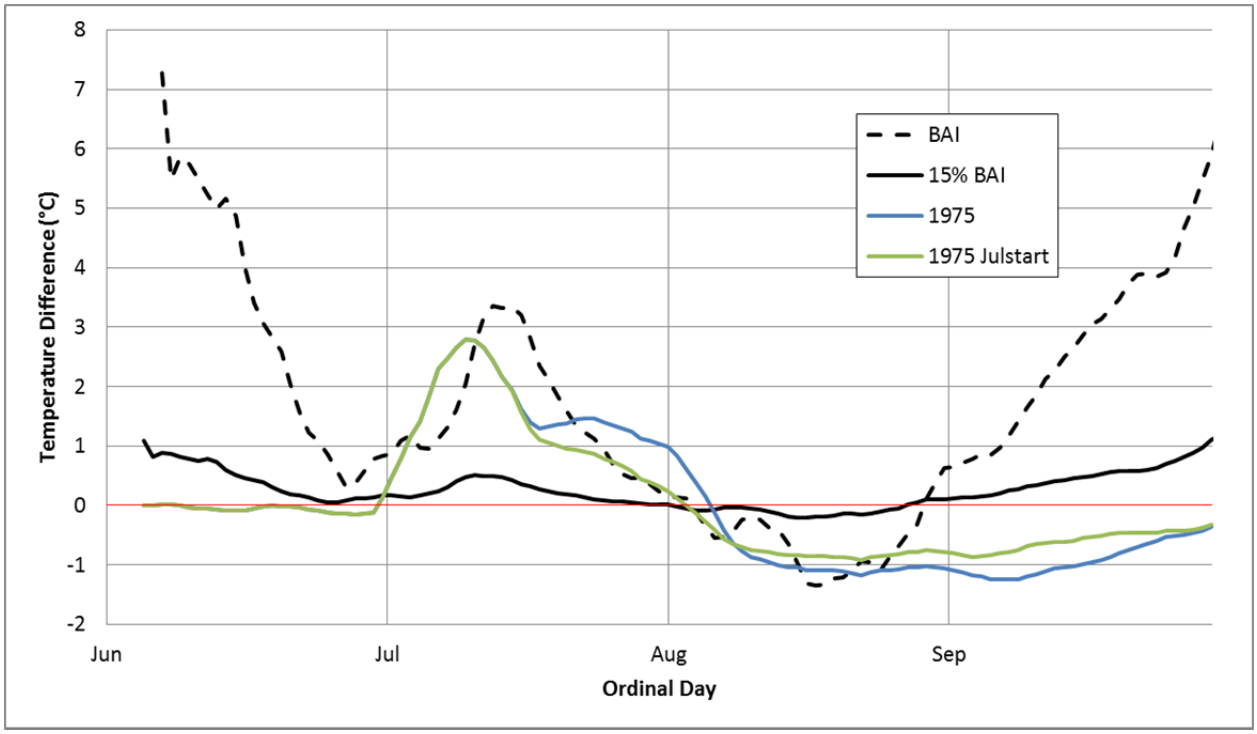


Figure 80. 1975 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

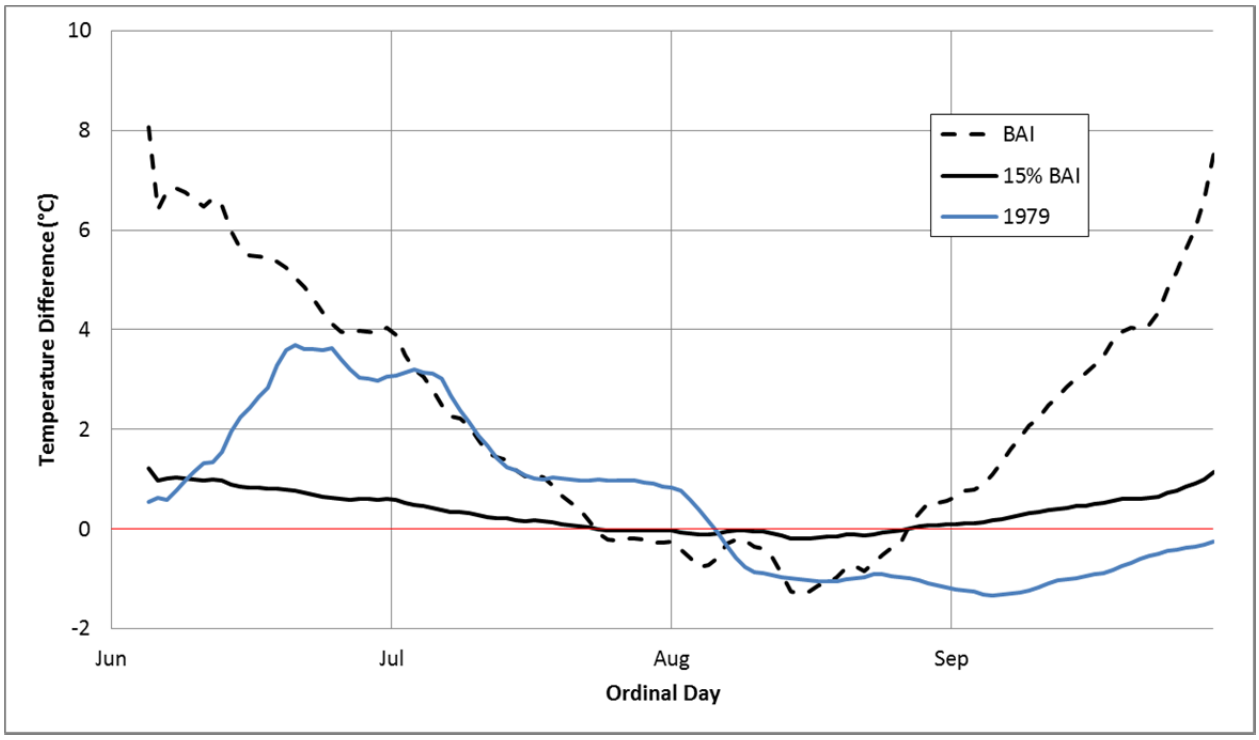


Figure 81. 1979 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

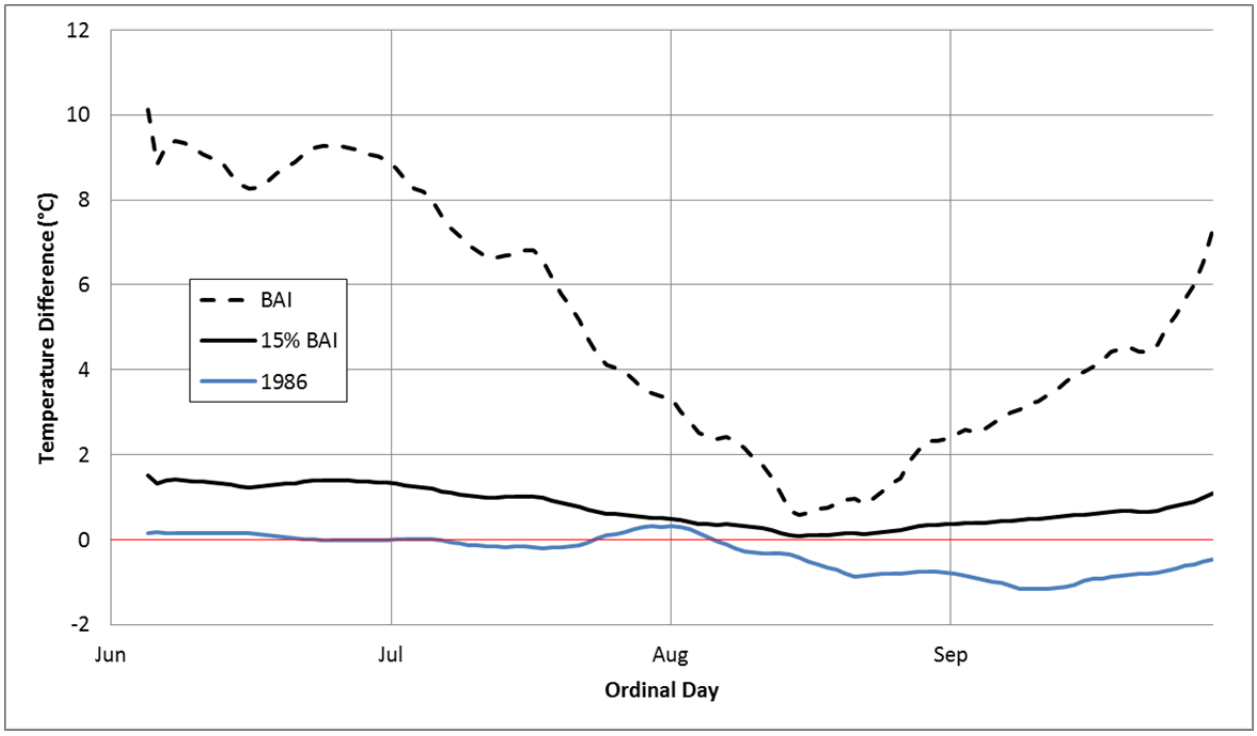


Figure 82. 1986 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

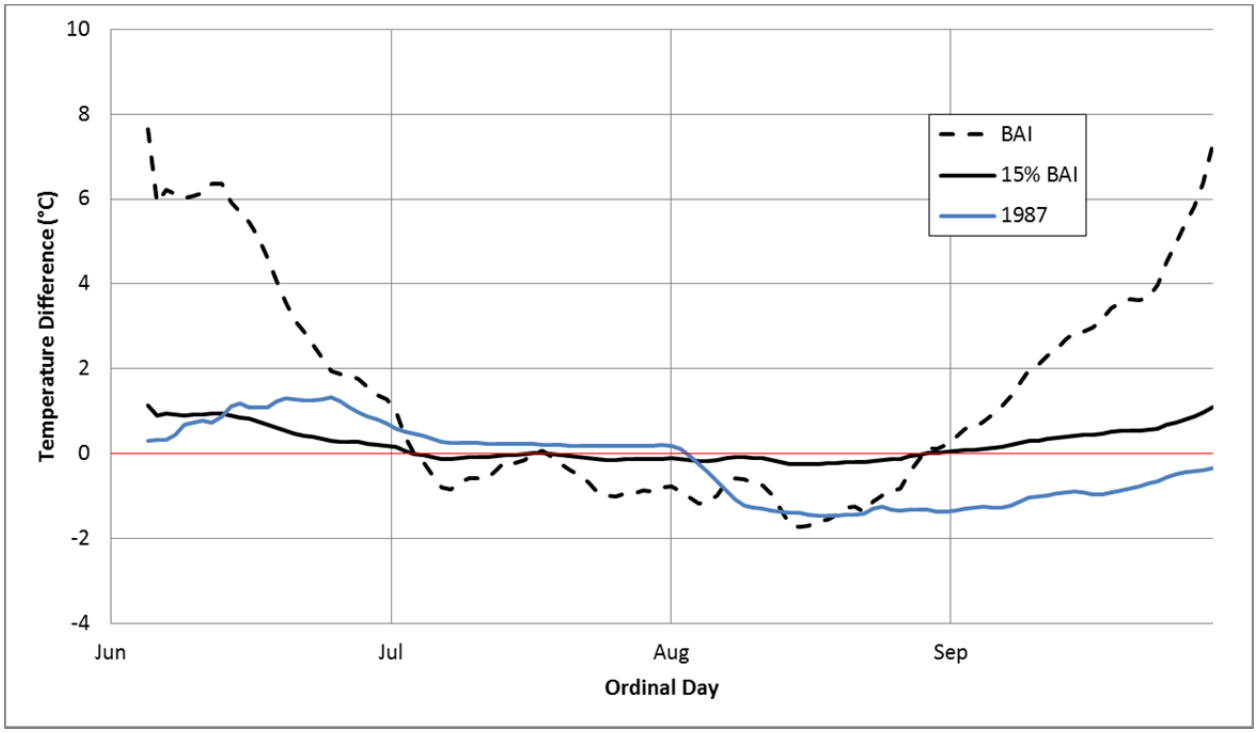


Figure 83. 1987 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

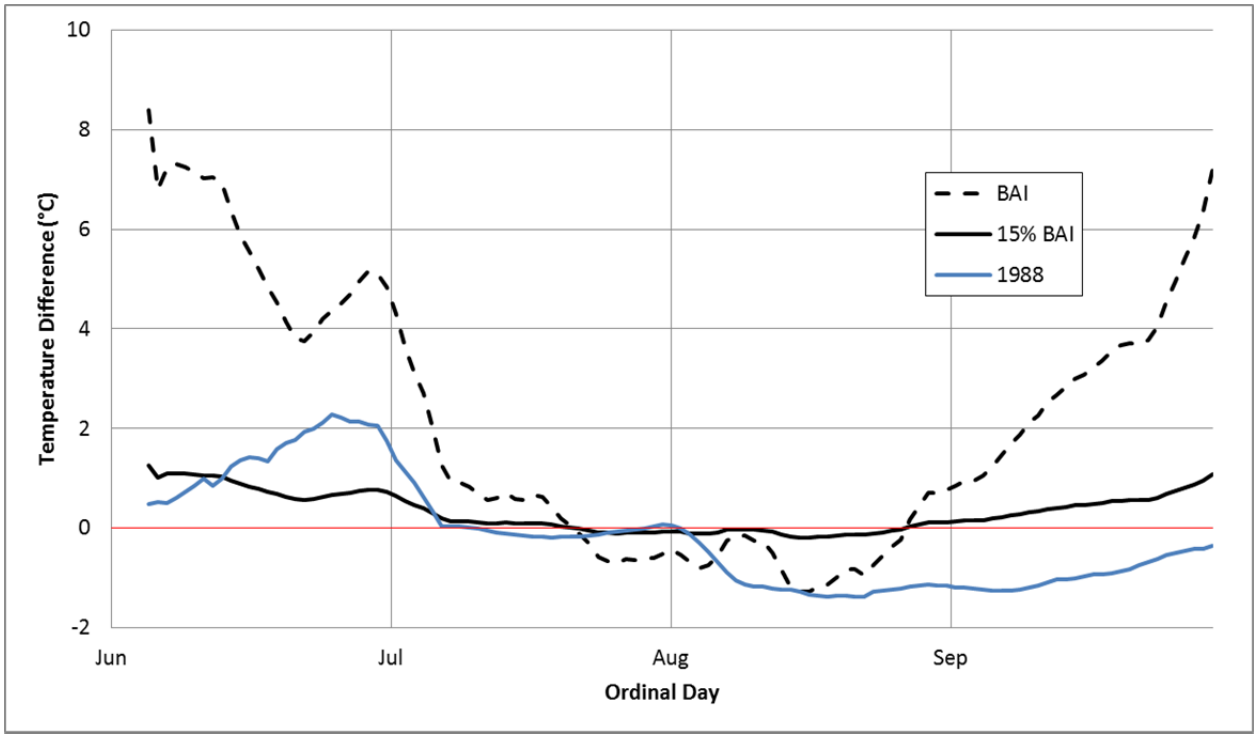


Figure 84. 1988 Model-Simulated WAT Differences at CR-WFU Compared to the BAI and 15% BAI

G. CR-PAD Modeled Differences Compared to Baseline

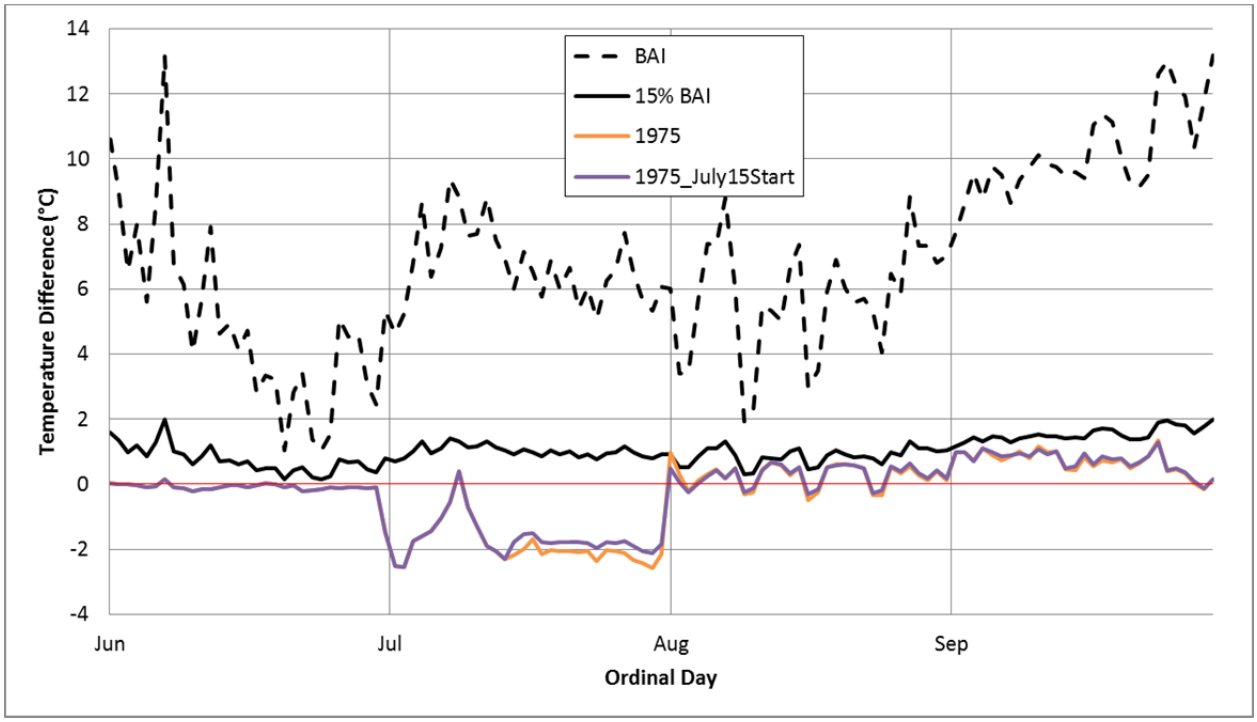


Figure 85. 1975 Model-Simulated DM Differences at CR-PAD Compared to the BAI and 15% BAI

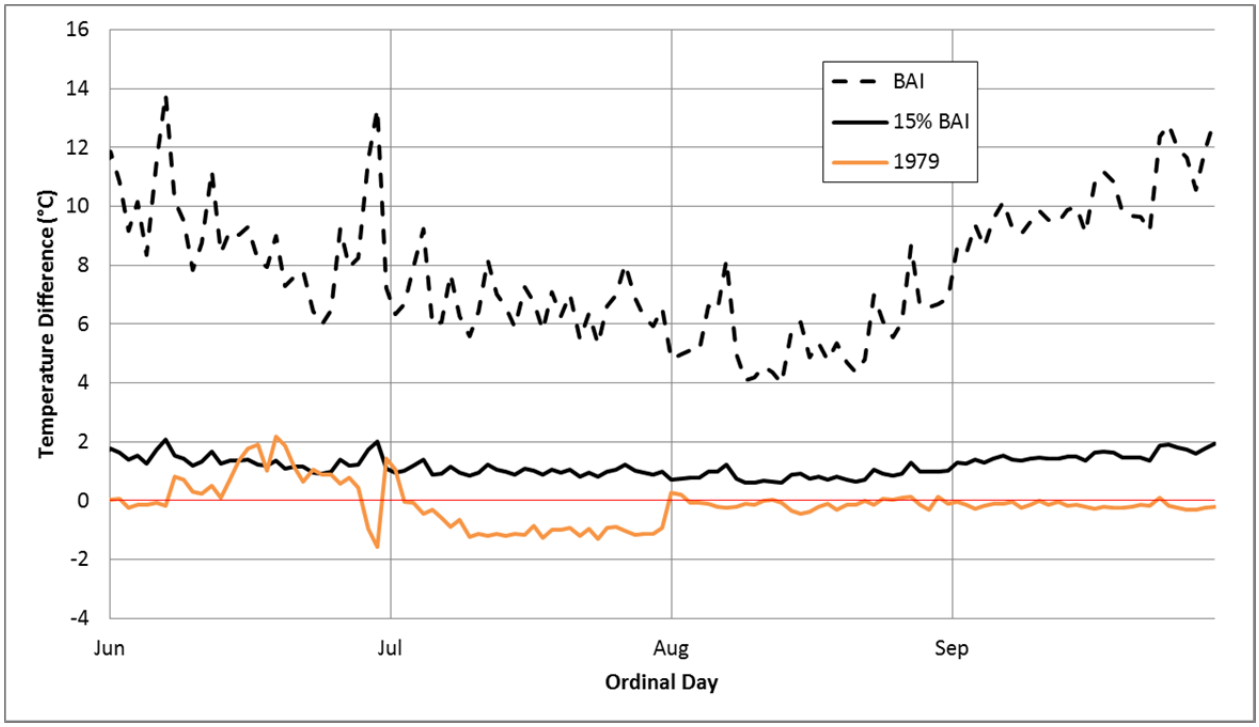


Figure 86. 1979 Model-Simulated DM Differences at CR-PAD Compared to the BAI and 15% BAI

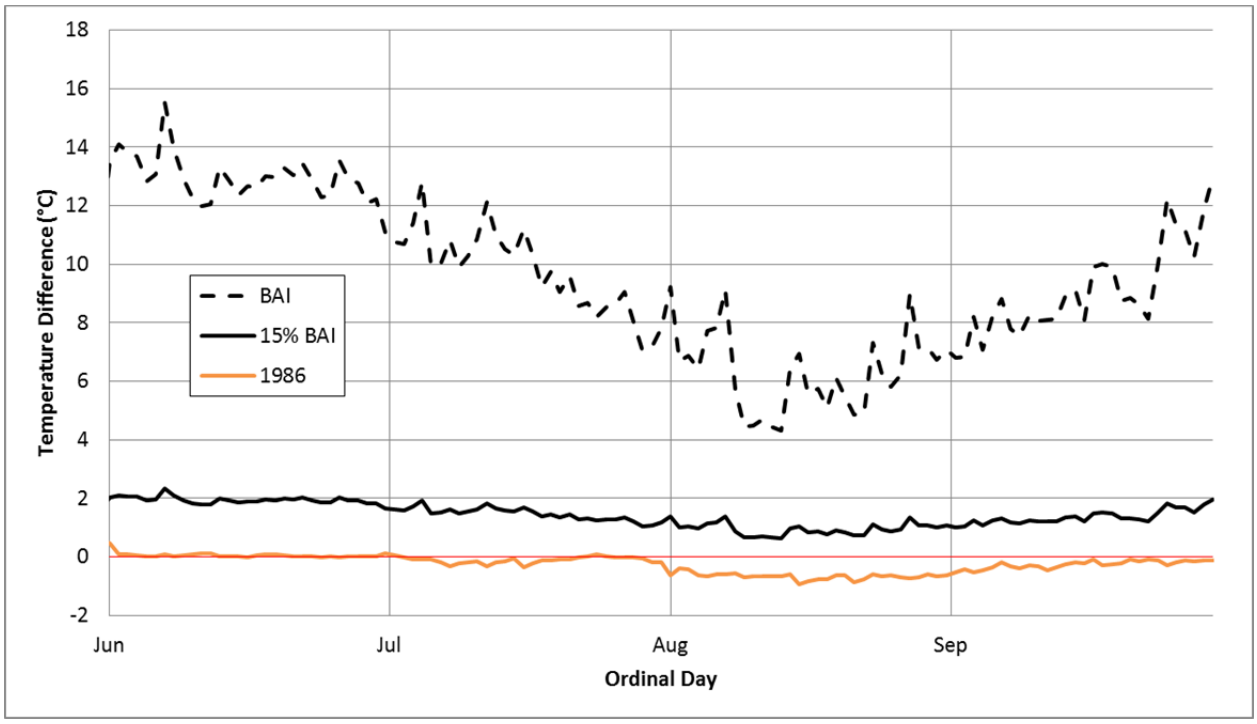


Figure 87. 1986 Model-Simulated DM Differences at CR-PAD Compared to the BAI and 15% BAI

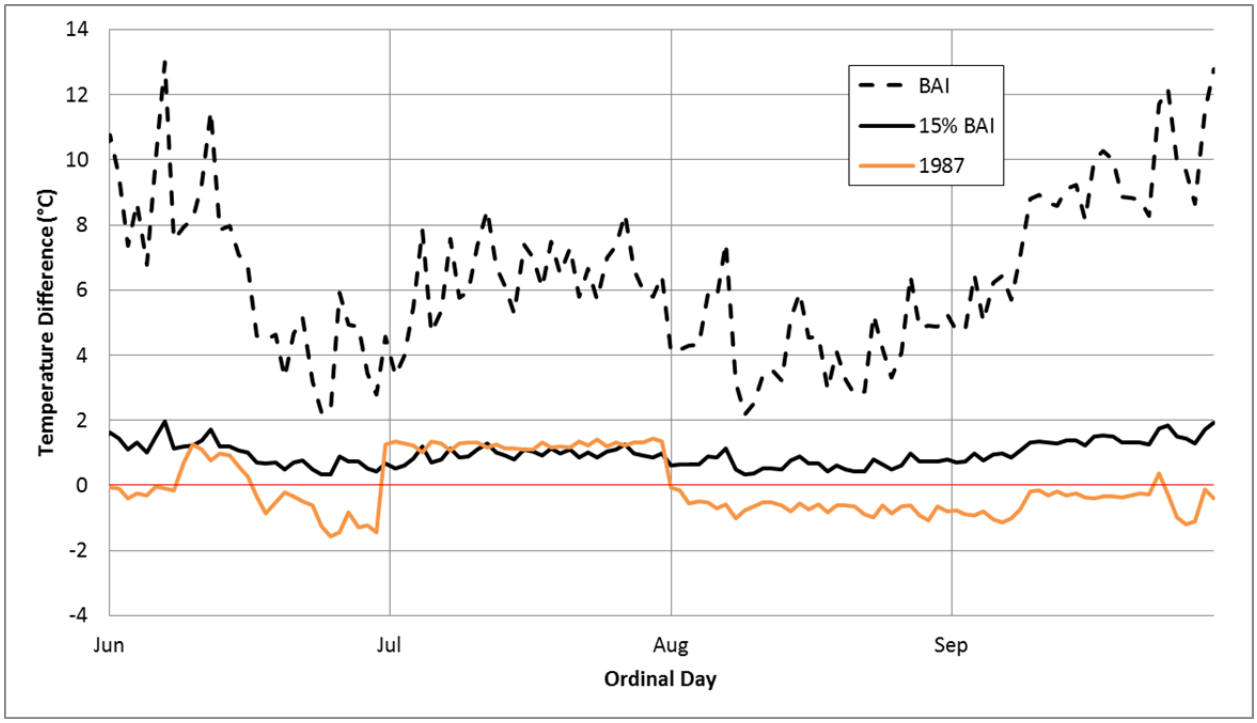


Figure 88. 1987 Model-Simulated DM Differences at CR-PAD Compared to the BAI and 15% BAI

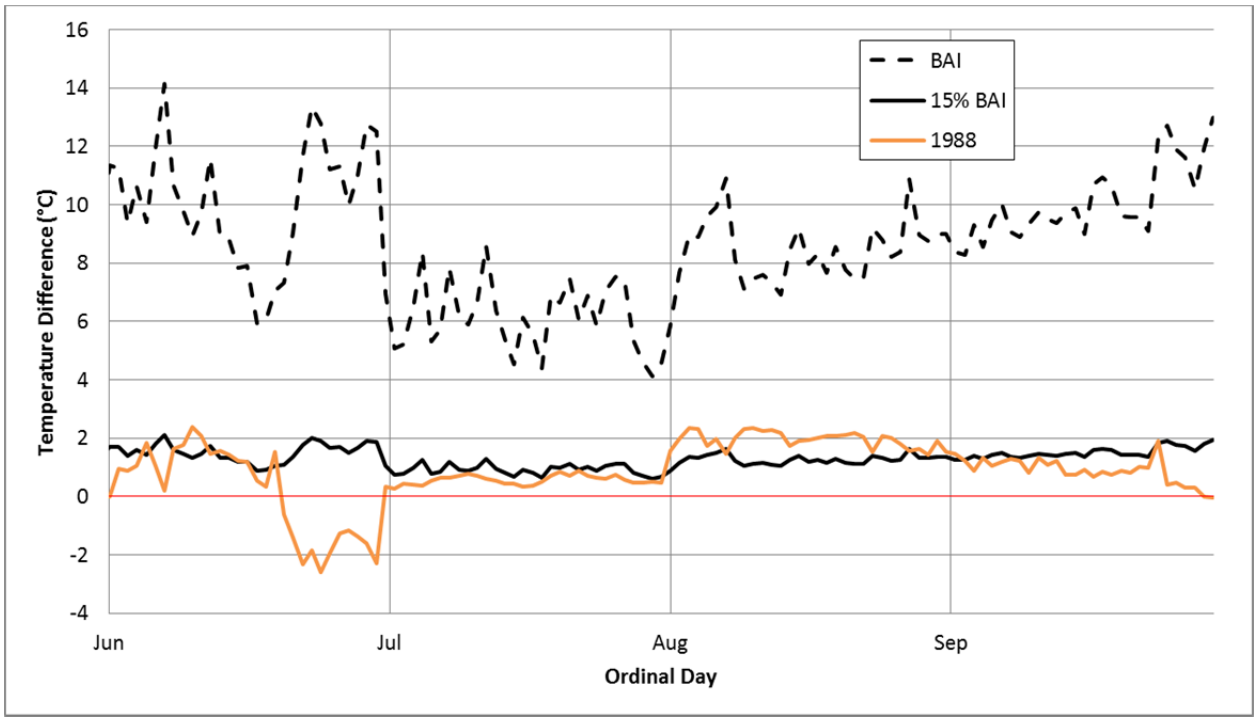


Figure 89. 1988 Model-Simulated DM Differences at CR-PAD Compared to the BAI and 15% BAI

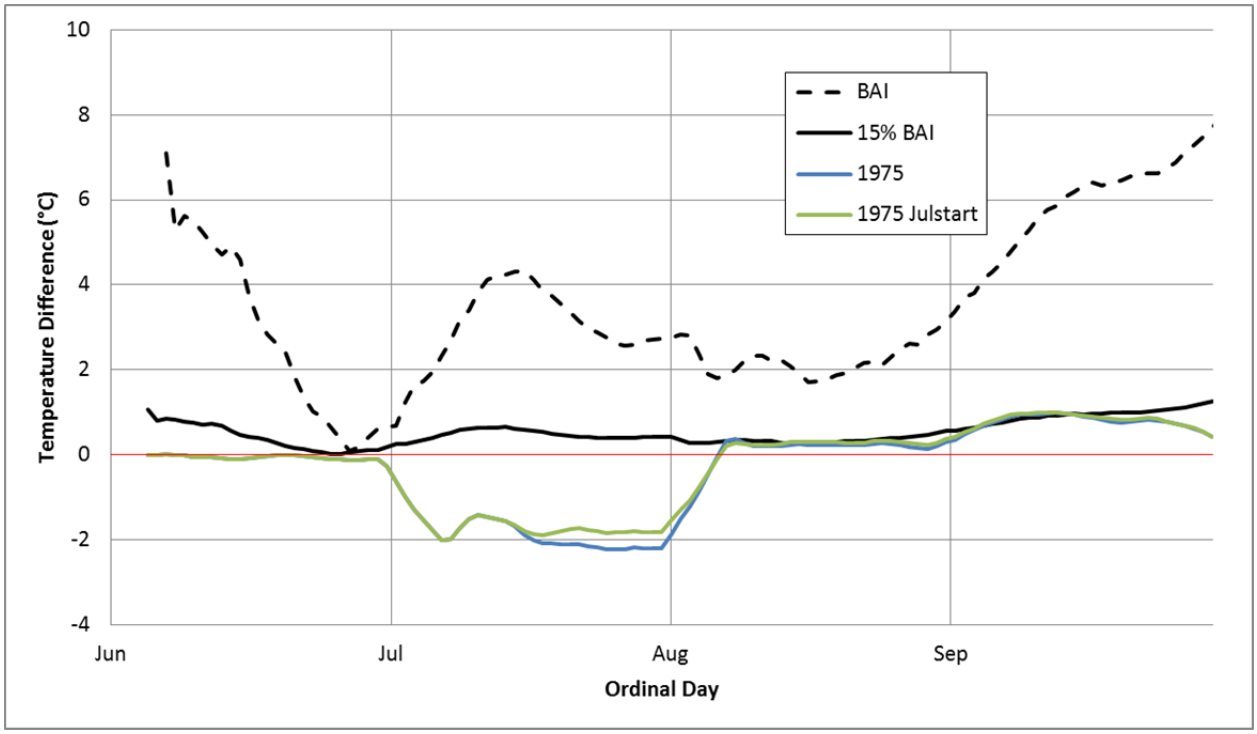


Figure 90. 1975 Model-Simulated WAT Differences at CR-PAD Compared to the BAI and 15% BAI

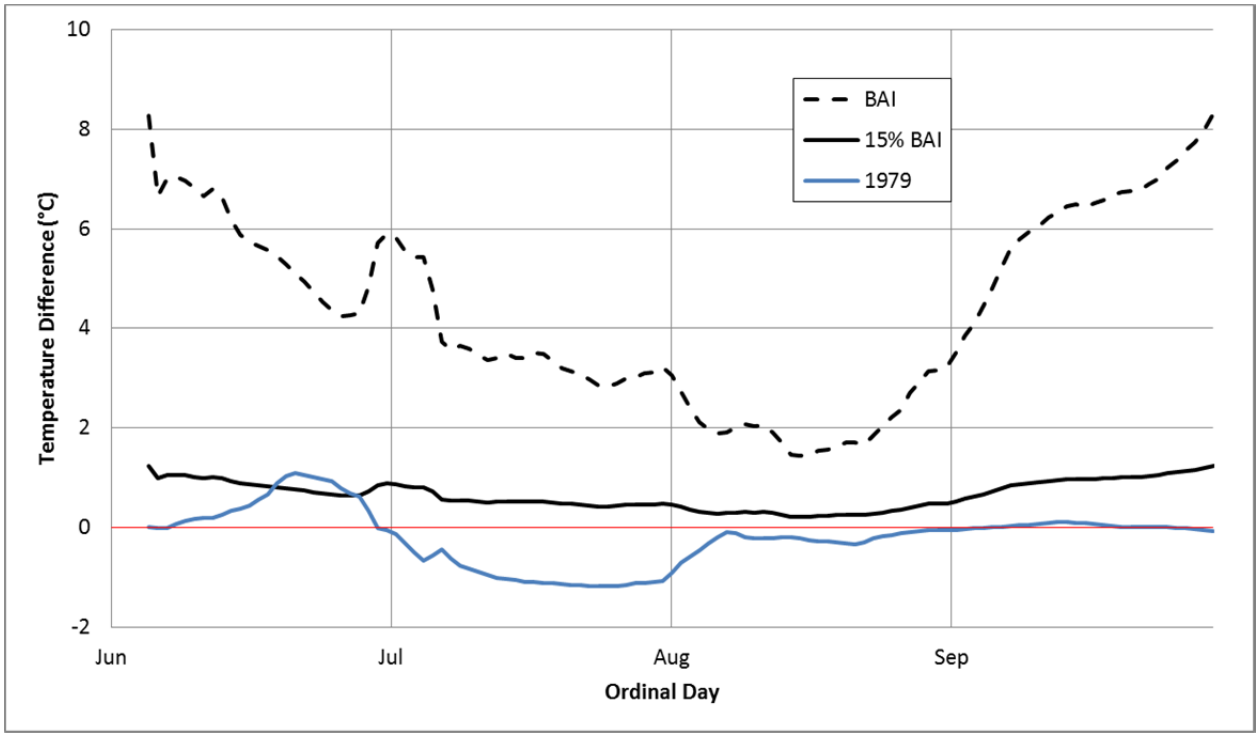


Figure 91. 1979 Model-Simulated WAT Differences at CR-PAD Compared to the BAI and 15% BAI

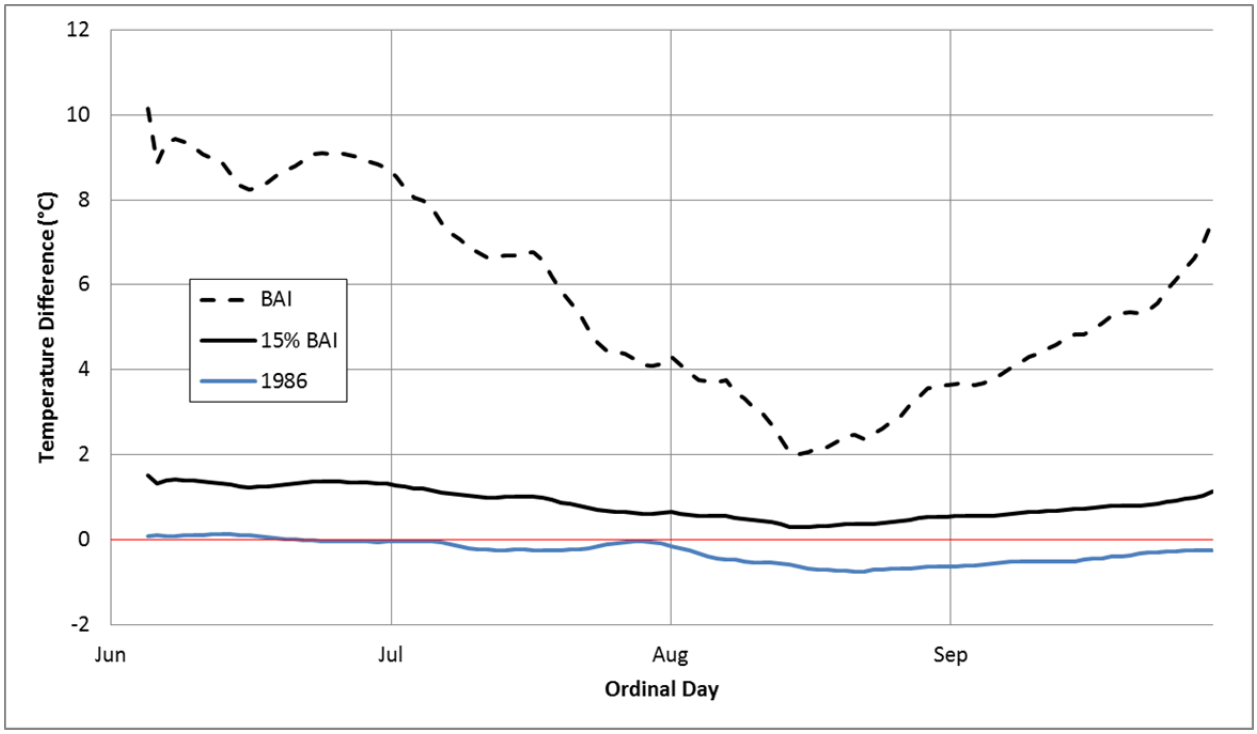


Figure 92. 1986 Model-Simulated WAT Differences at CR-PAD Compared to the BAI and 15% BAI

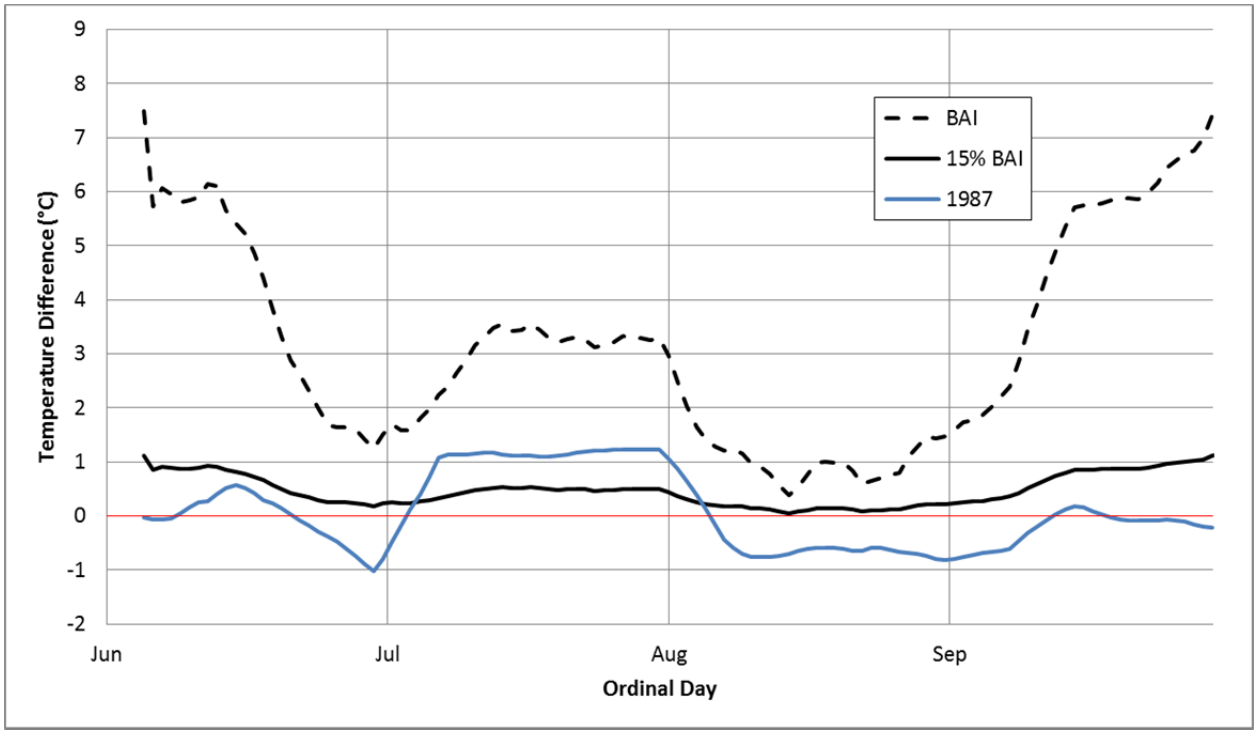


Figure 93. 1987 Model-Simulated WAT Differences at CR-PAD Compared to the BAI and 15% BAI

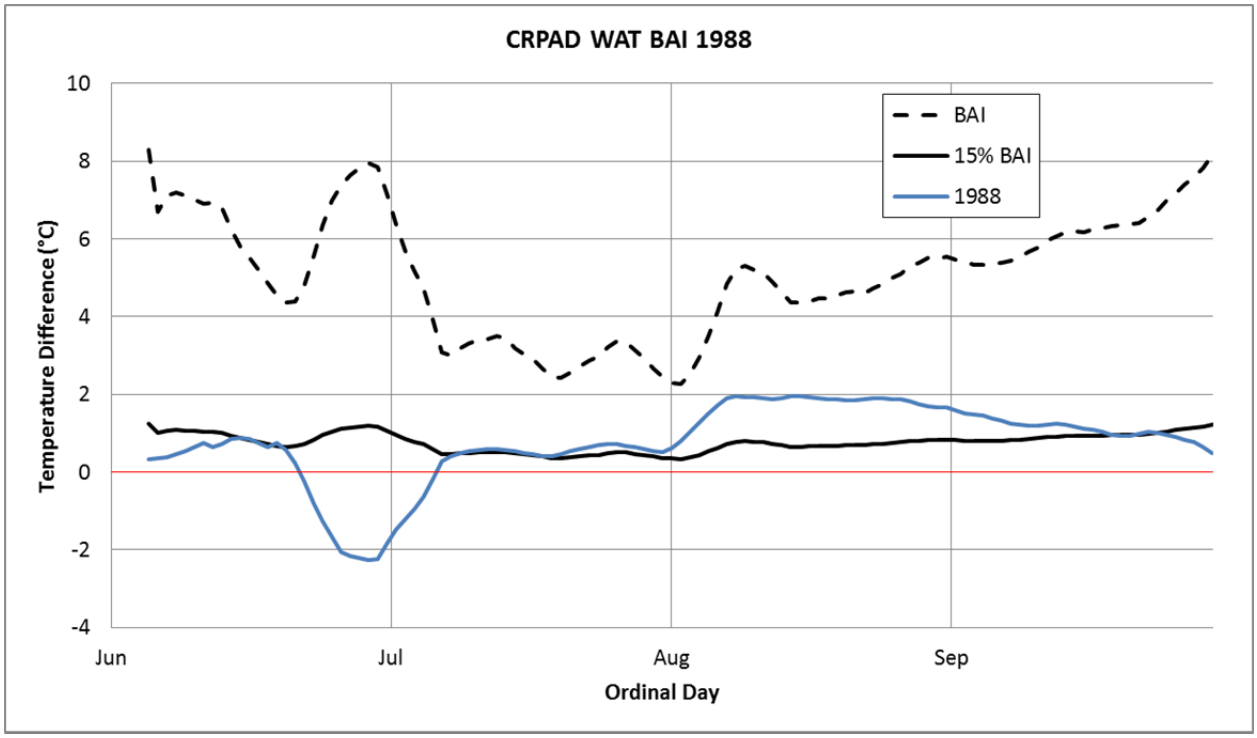
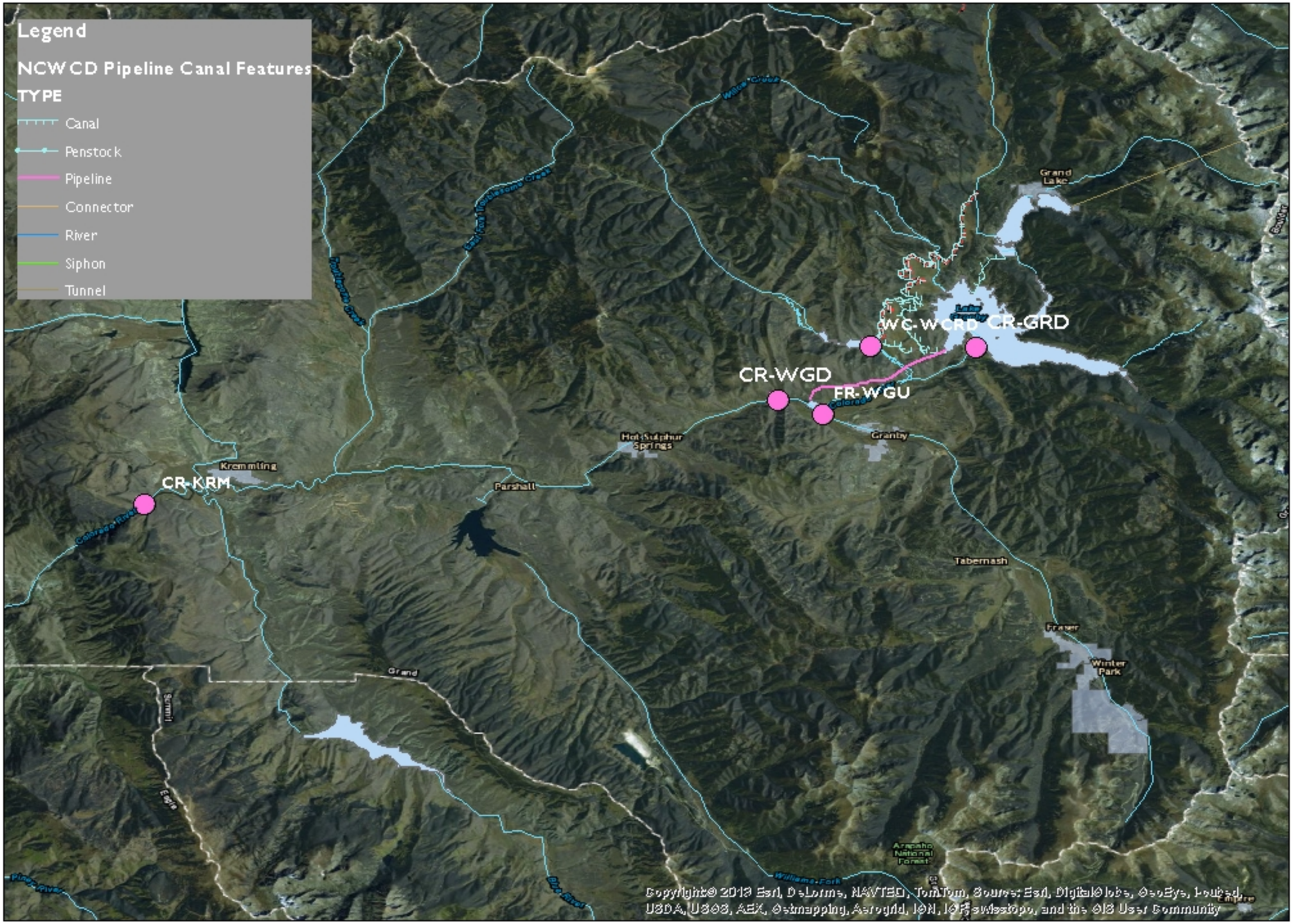


Figure 94. 1988 Model-Simulated WAT Differences at CR-PAD Compared to the BAI and 15% BAI

APPENDIX G - MODELING WATER QUALITY SITES MAPS

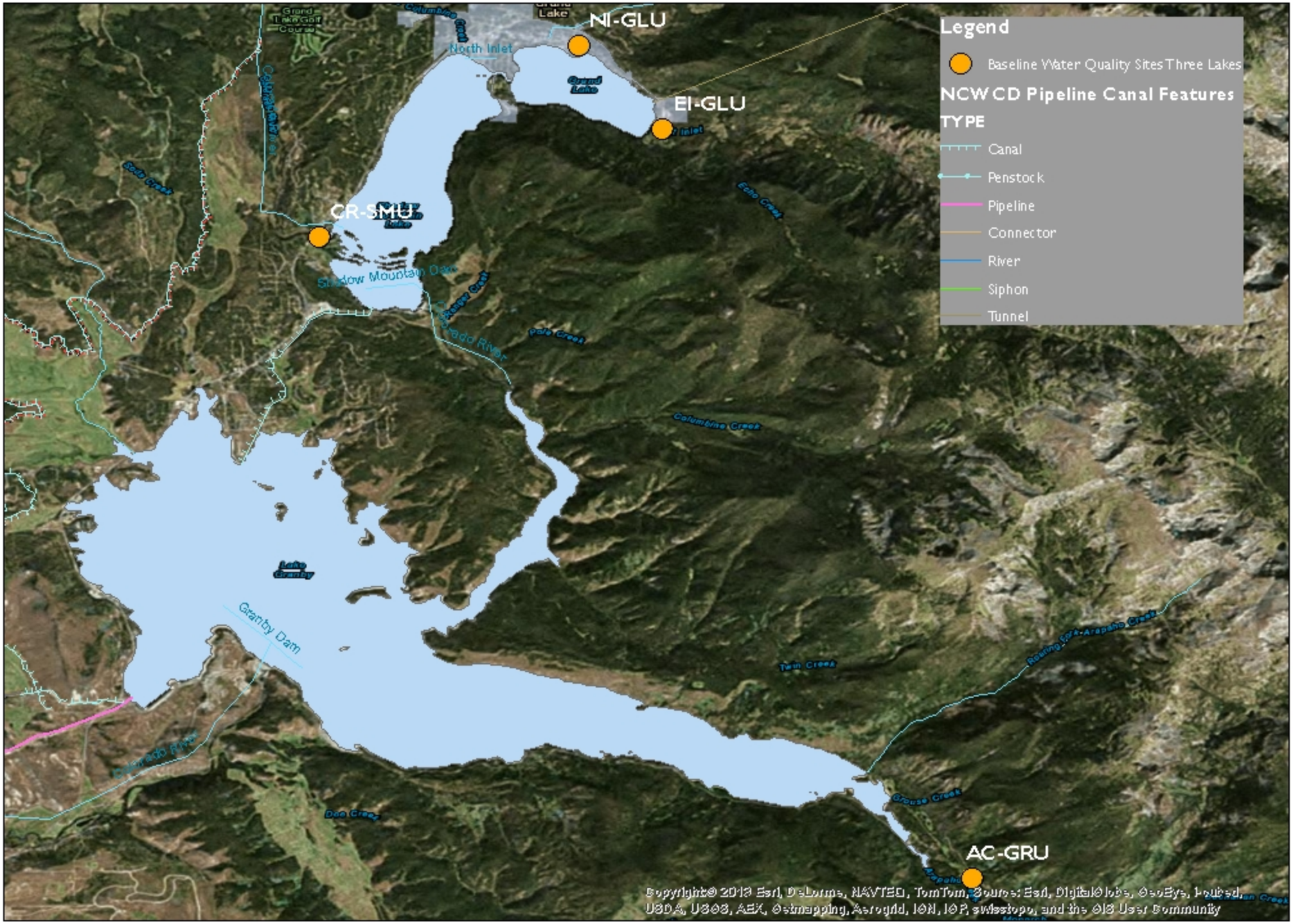
WATER QUALITY SITES USED IN SURROGATE BASELINE ANALYSIS

Colorado River

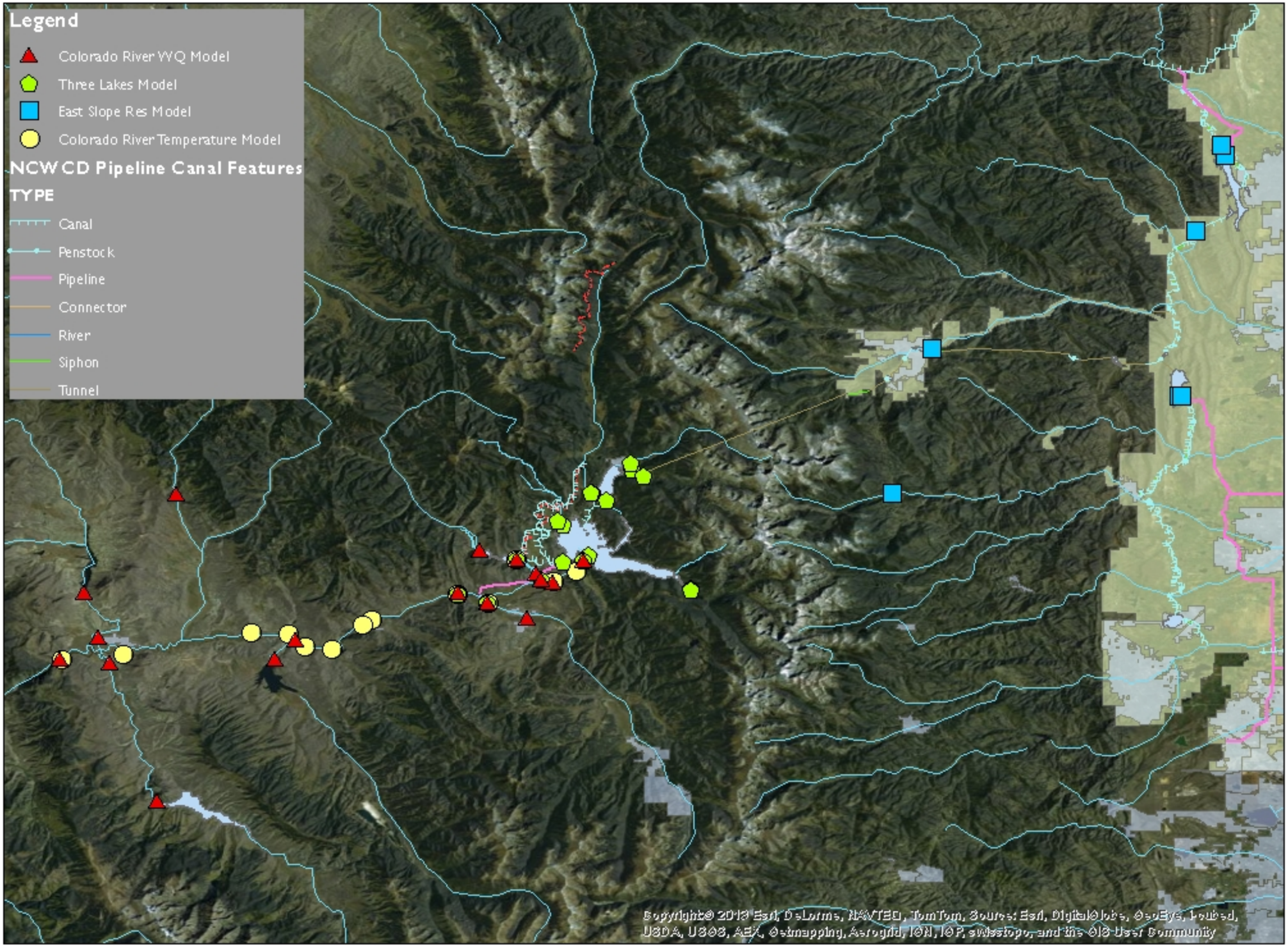


WATER QUALITY SITES USED IN SURROGATE BASELINE ANALYSIS

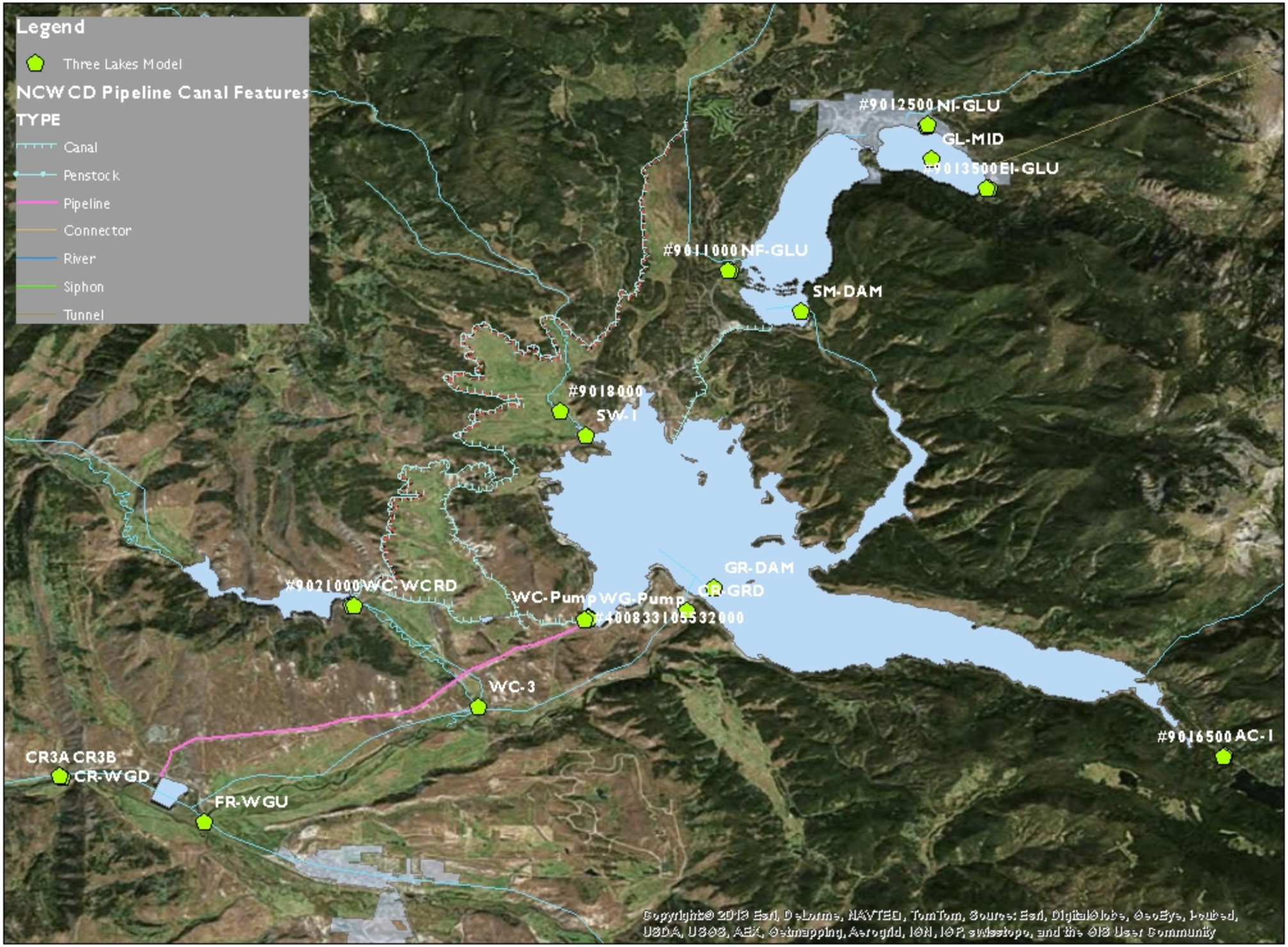
Three Lakes



Windy Gap Firming Project - Water Quality Sites

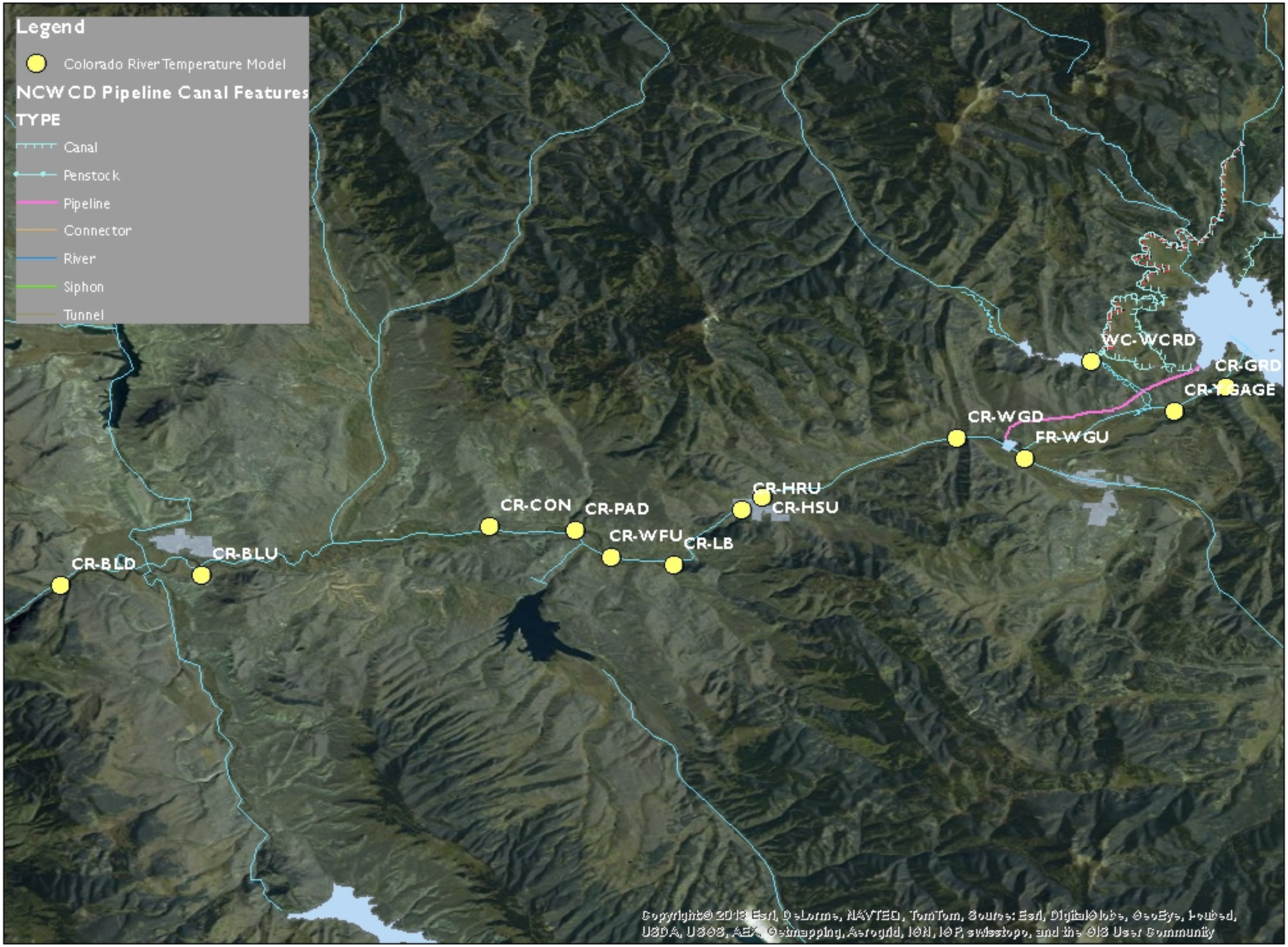


Windy Gap Firming Project - Three Lakes Model

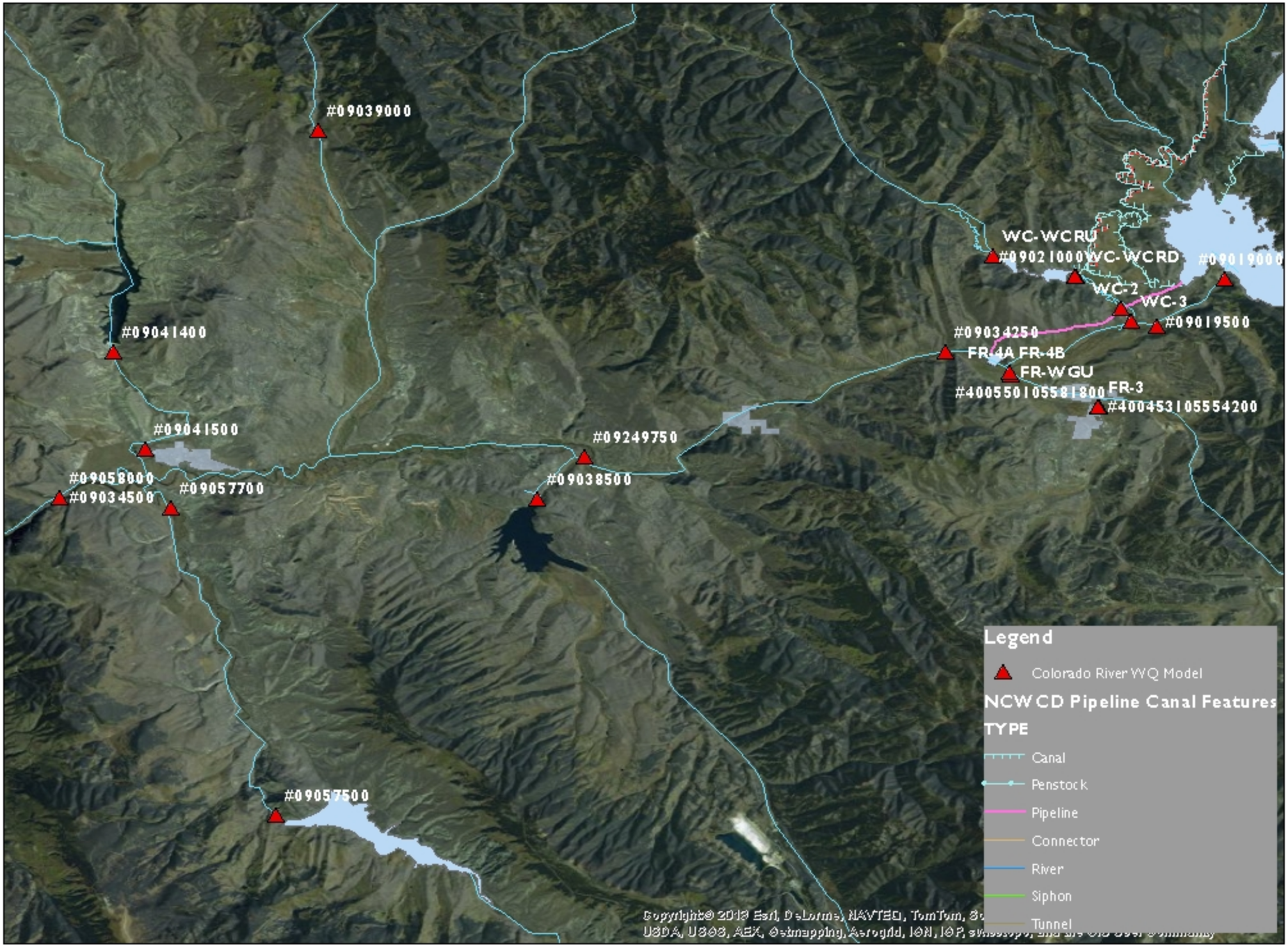


Three Lakes Model - Reservoir Sites

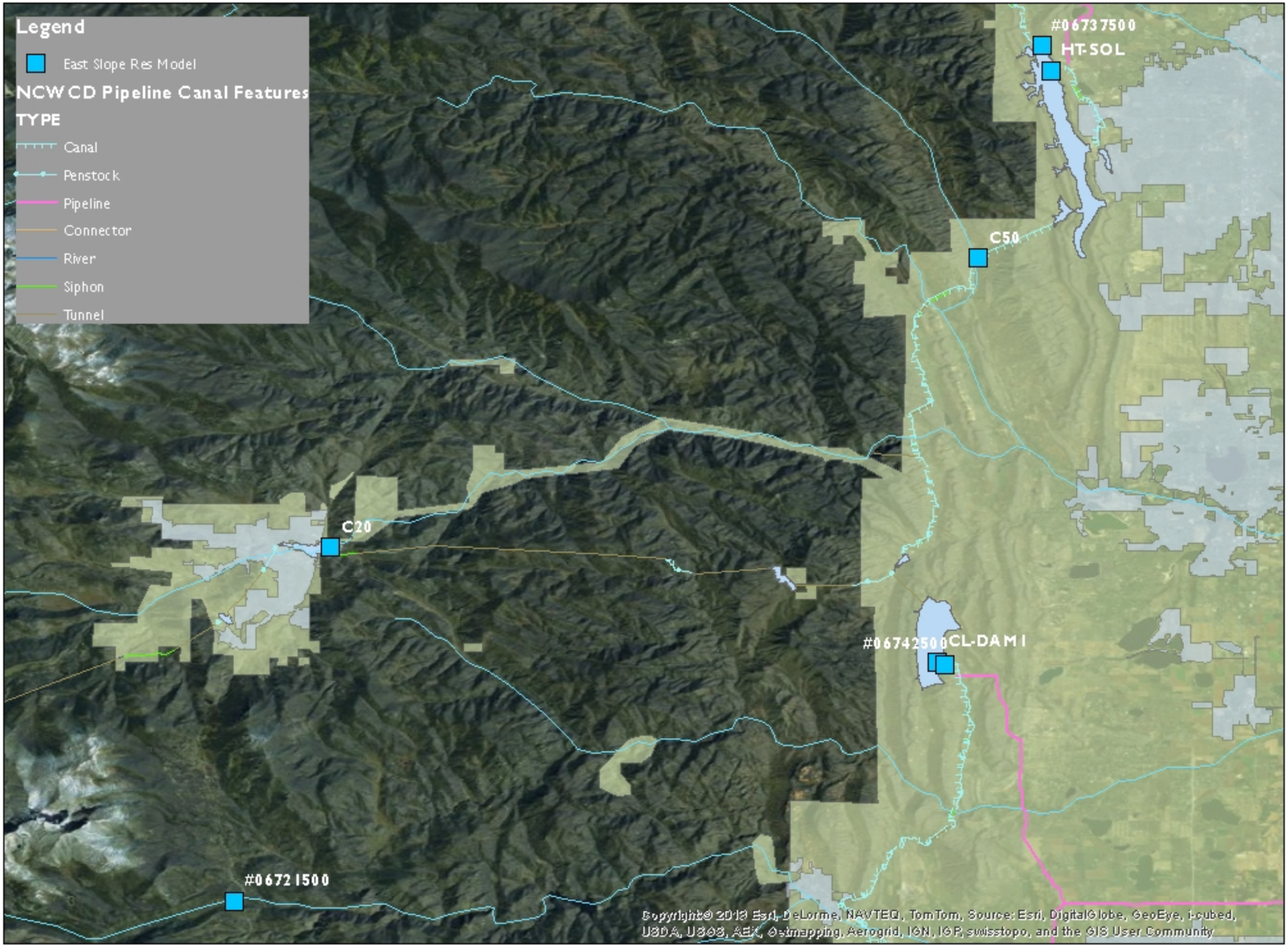
Windy Gap Firming Project - Colorado River Temperature Model



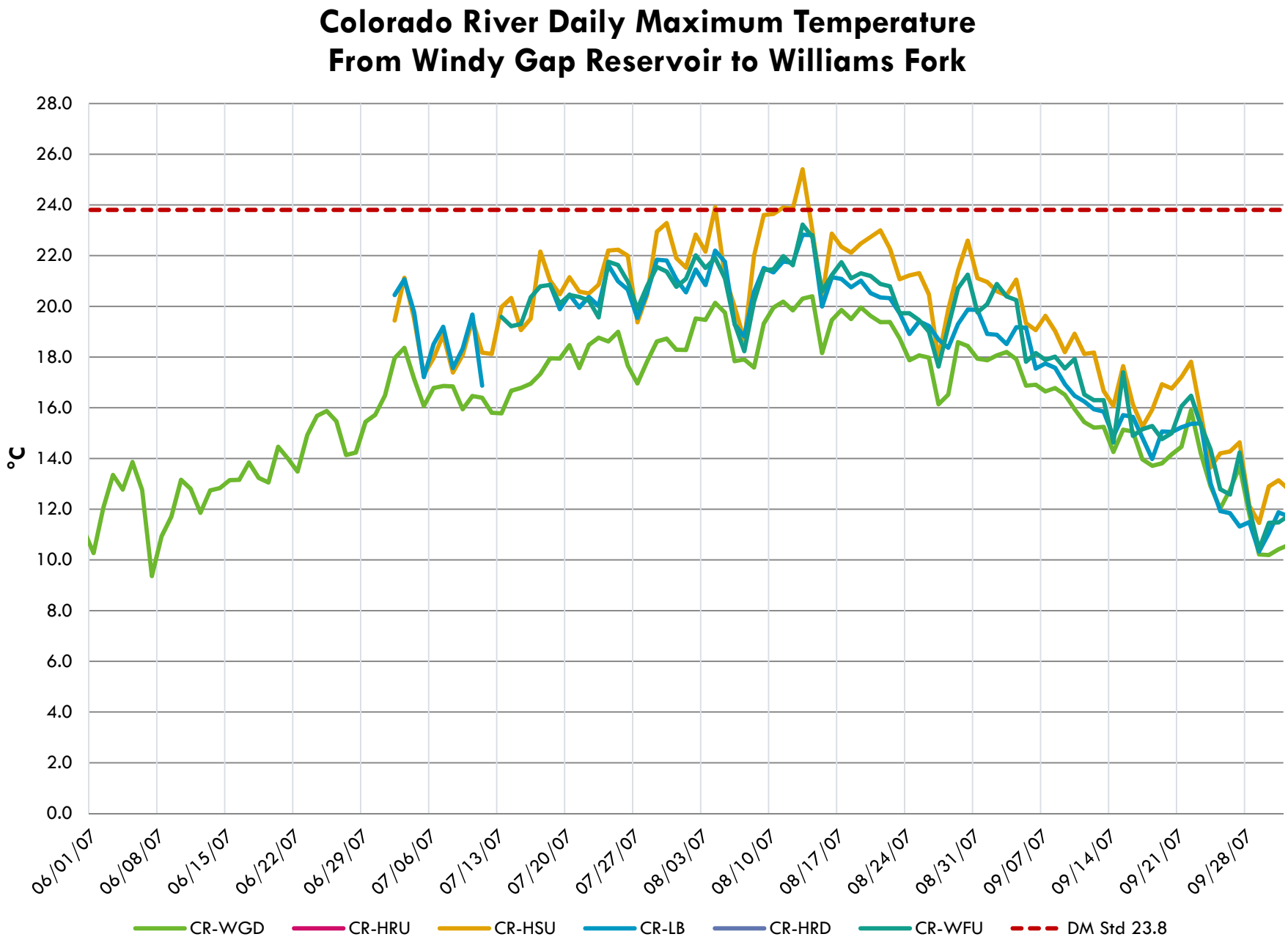
Windy Gap Firming Project - Colorado River WQ Model



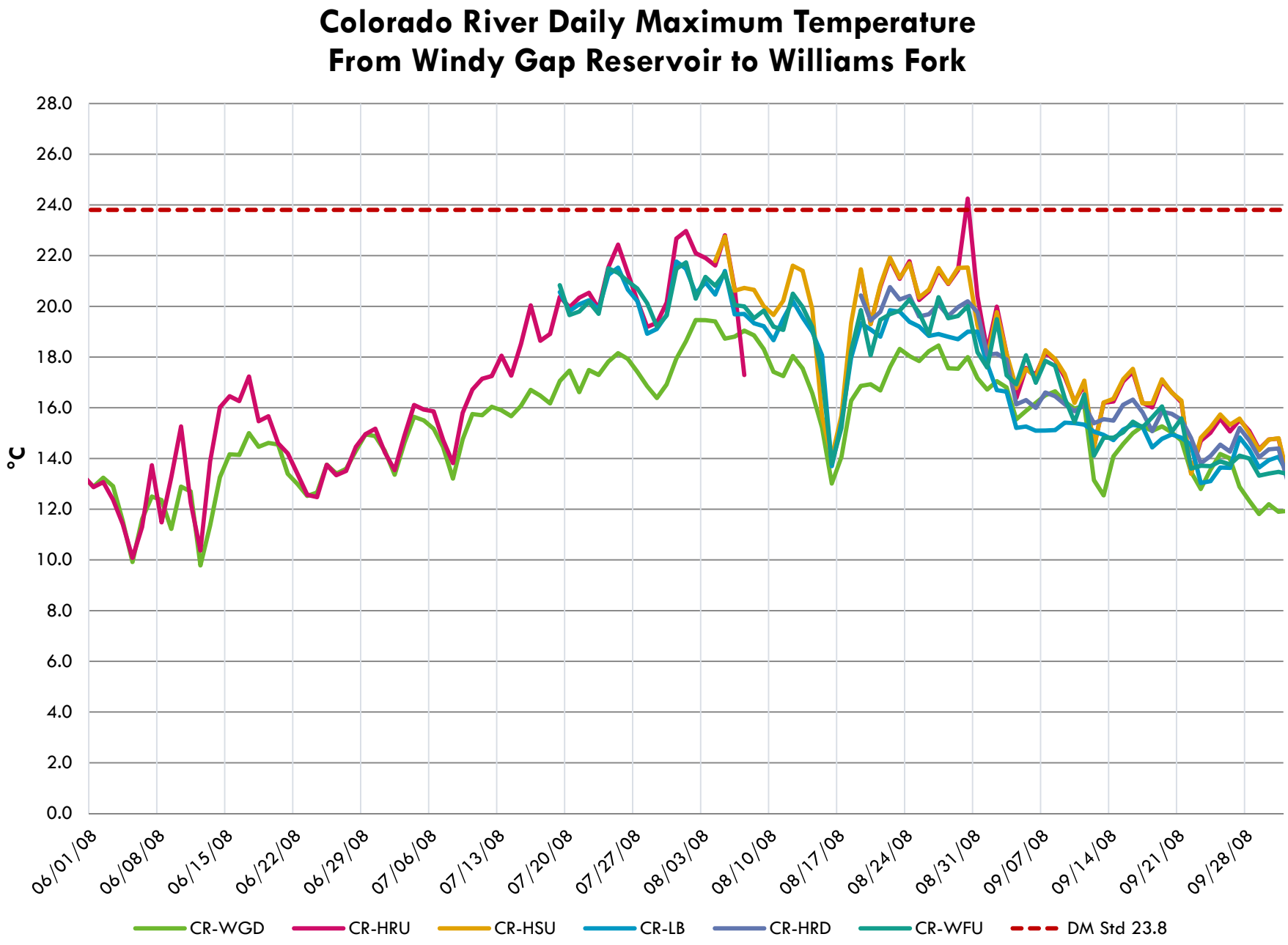
Windy Gap Firming Project - East Slope Reservoirs Model



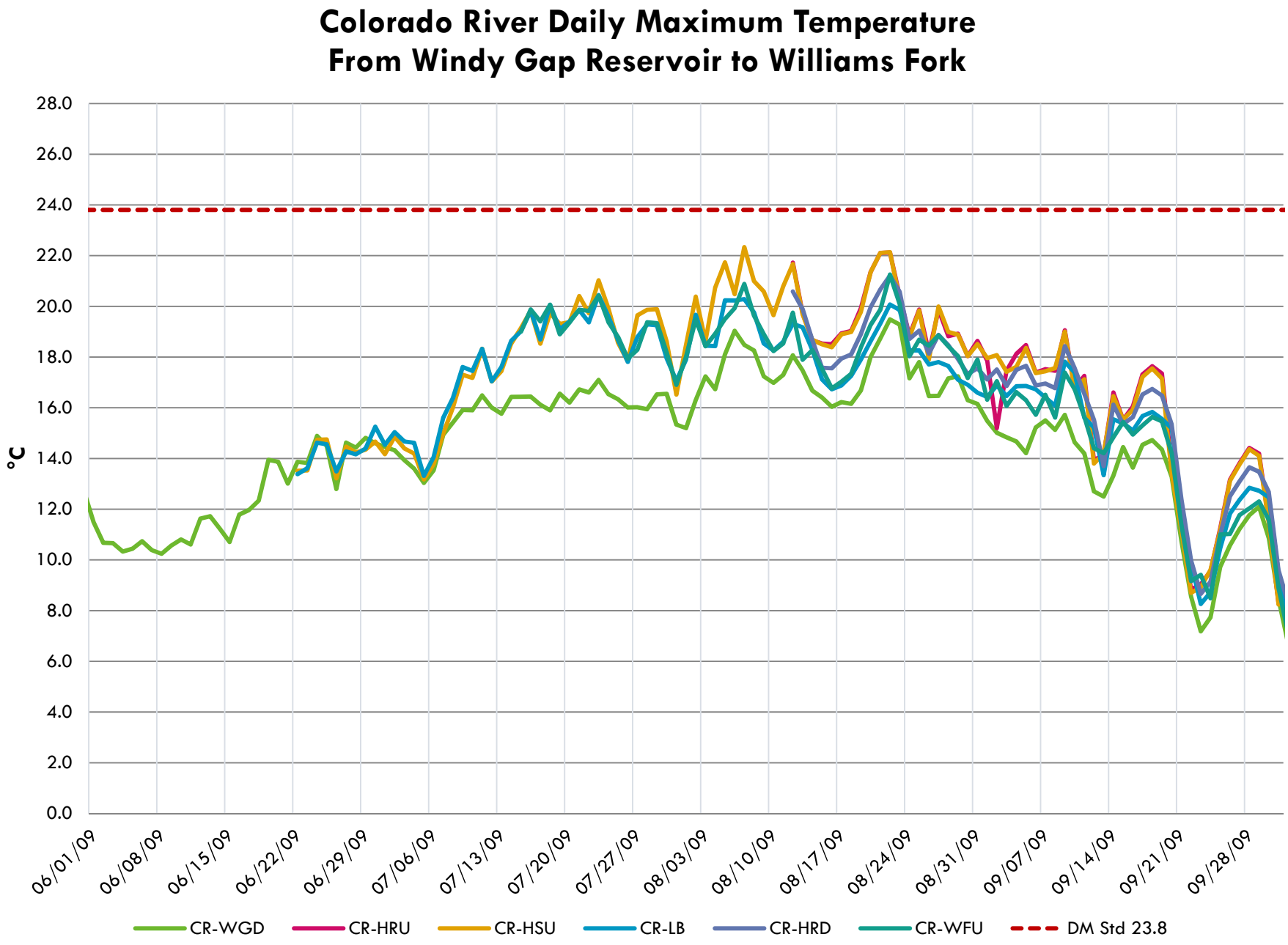
APPENDIX H - COLORADO RIVER WATER TEMPERATURE CHARTS



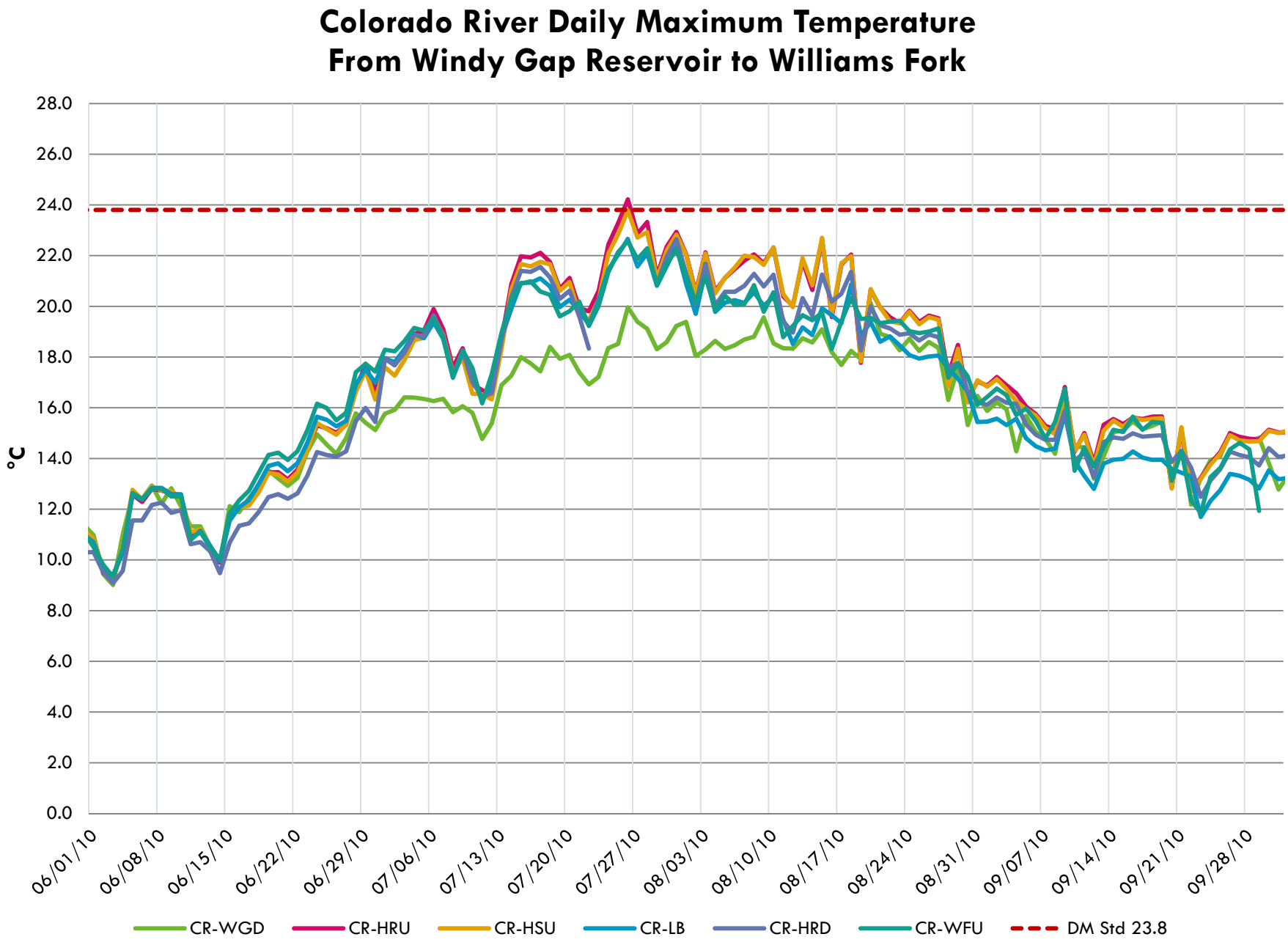
CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



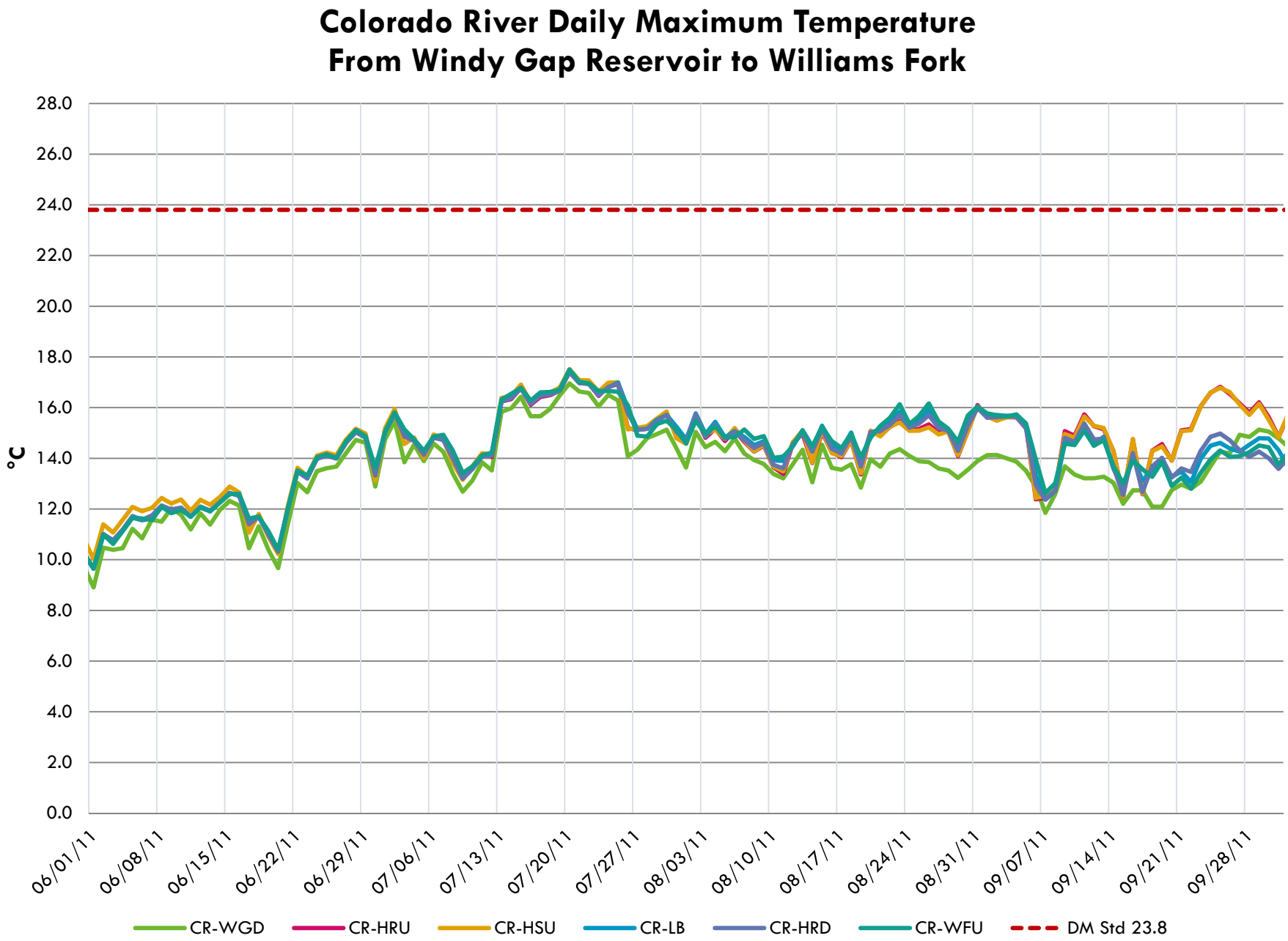
CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



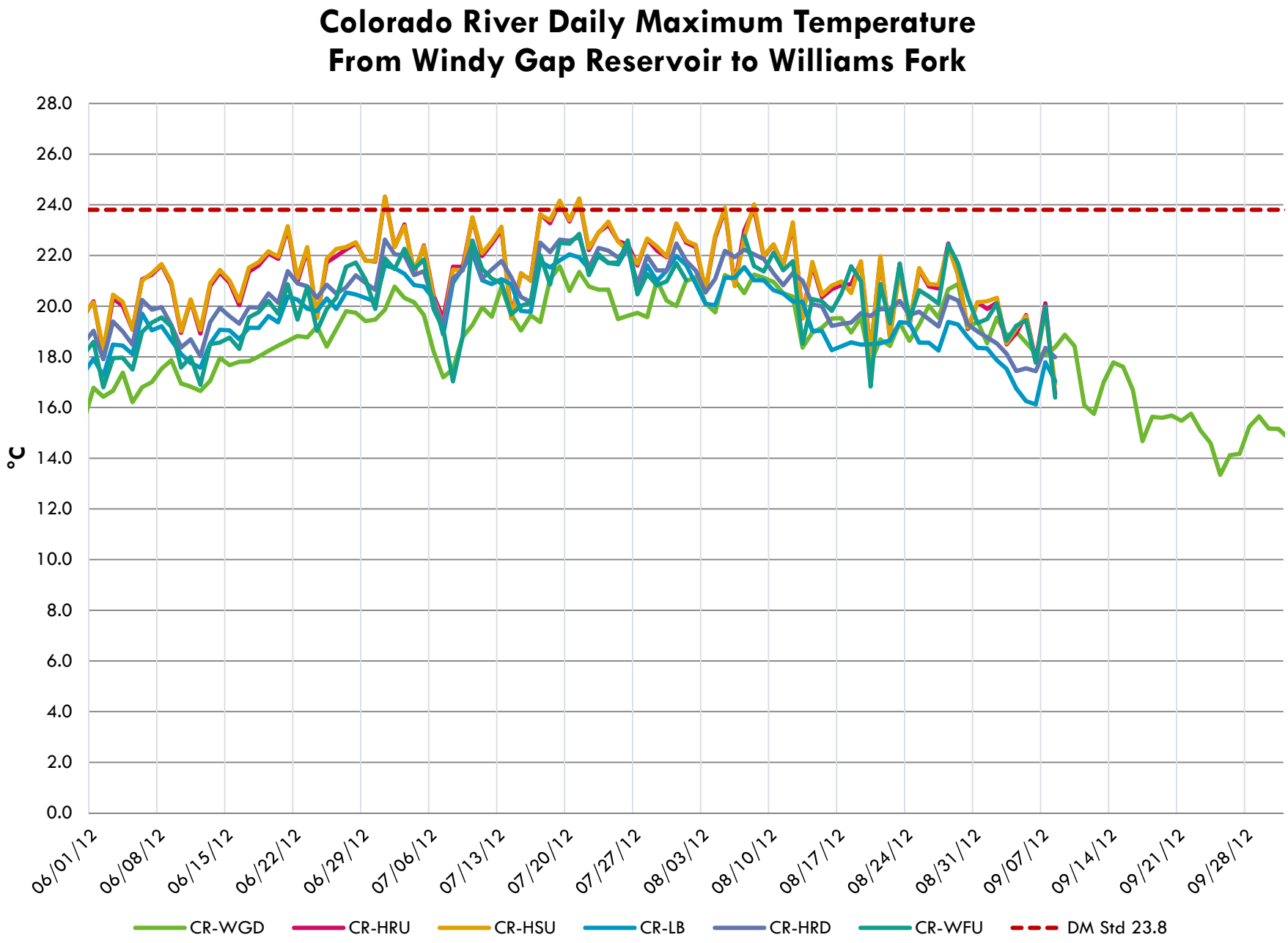
CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



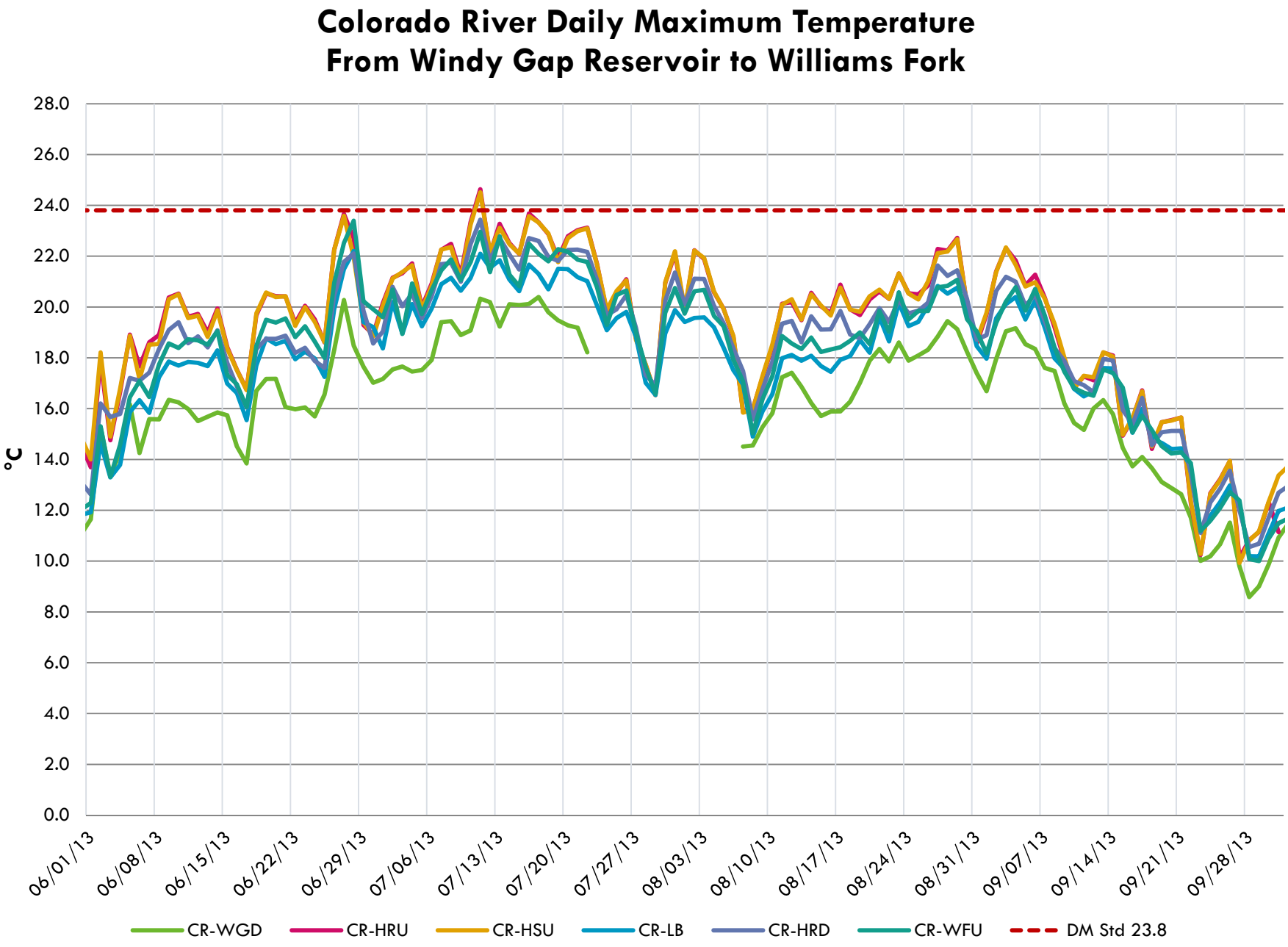
CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



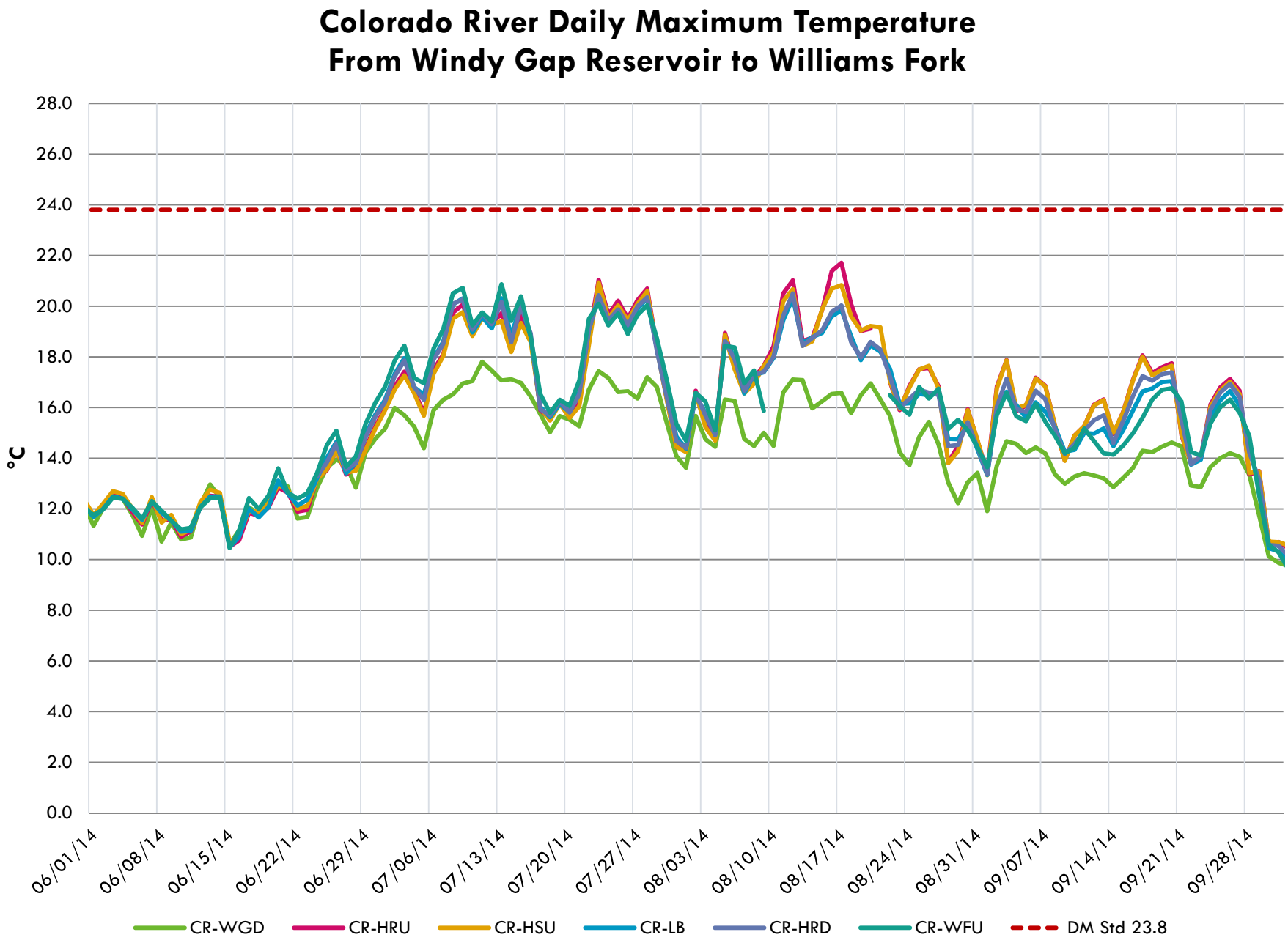
CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



CR-WGD: downstream of Windy Gap Reservoir, CR-HRU: upstream of Hot Sulphur Resort, CR-HSU: upstream of the town of Hot Sulphur, CR-LB: at Lone Buck, CR-HRD: downstream of Hot Sulphur Resort, CR-WFU: upstream of Williams Fork



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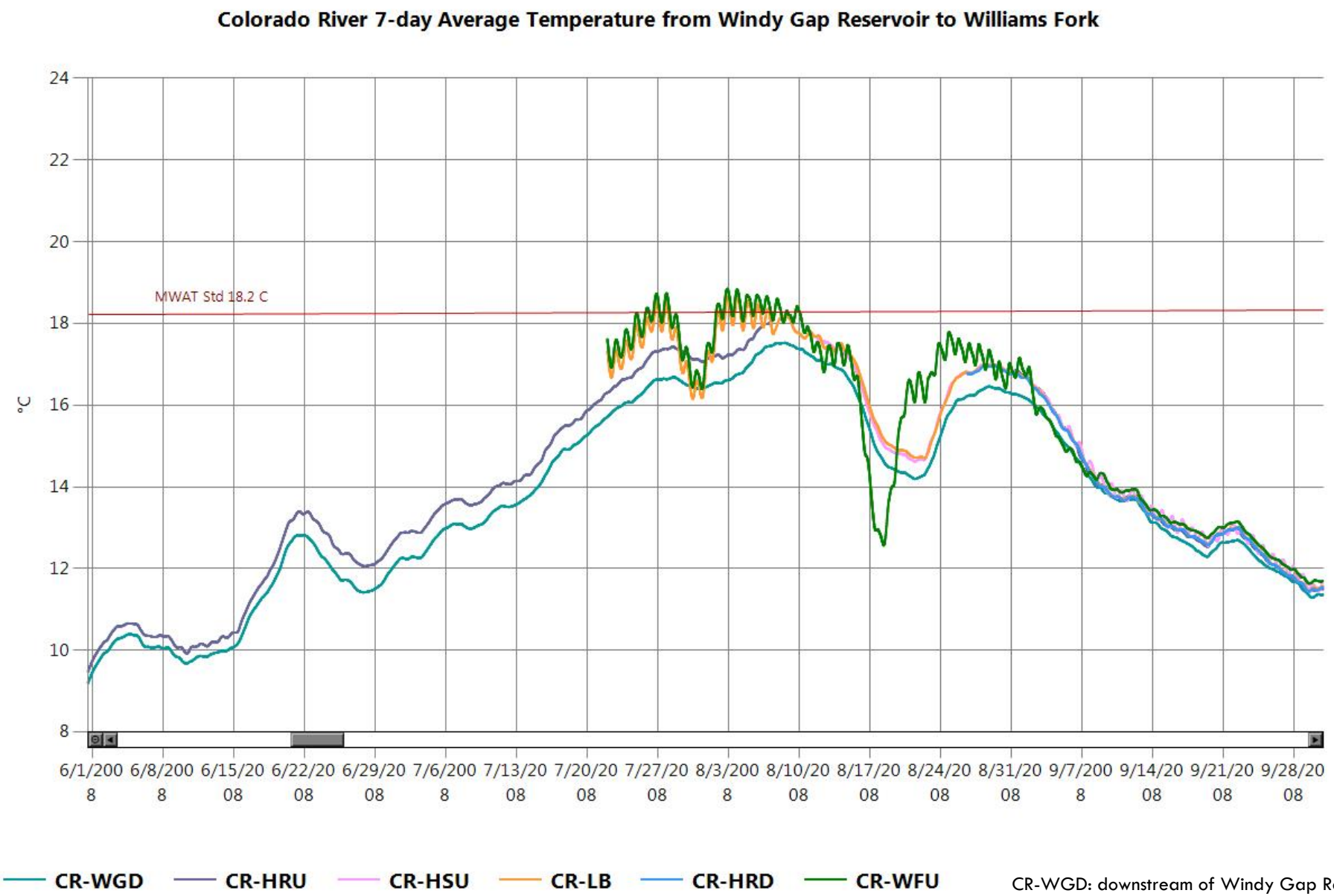

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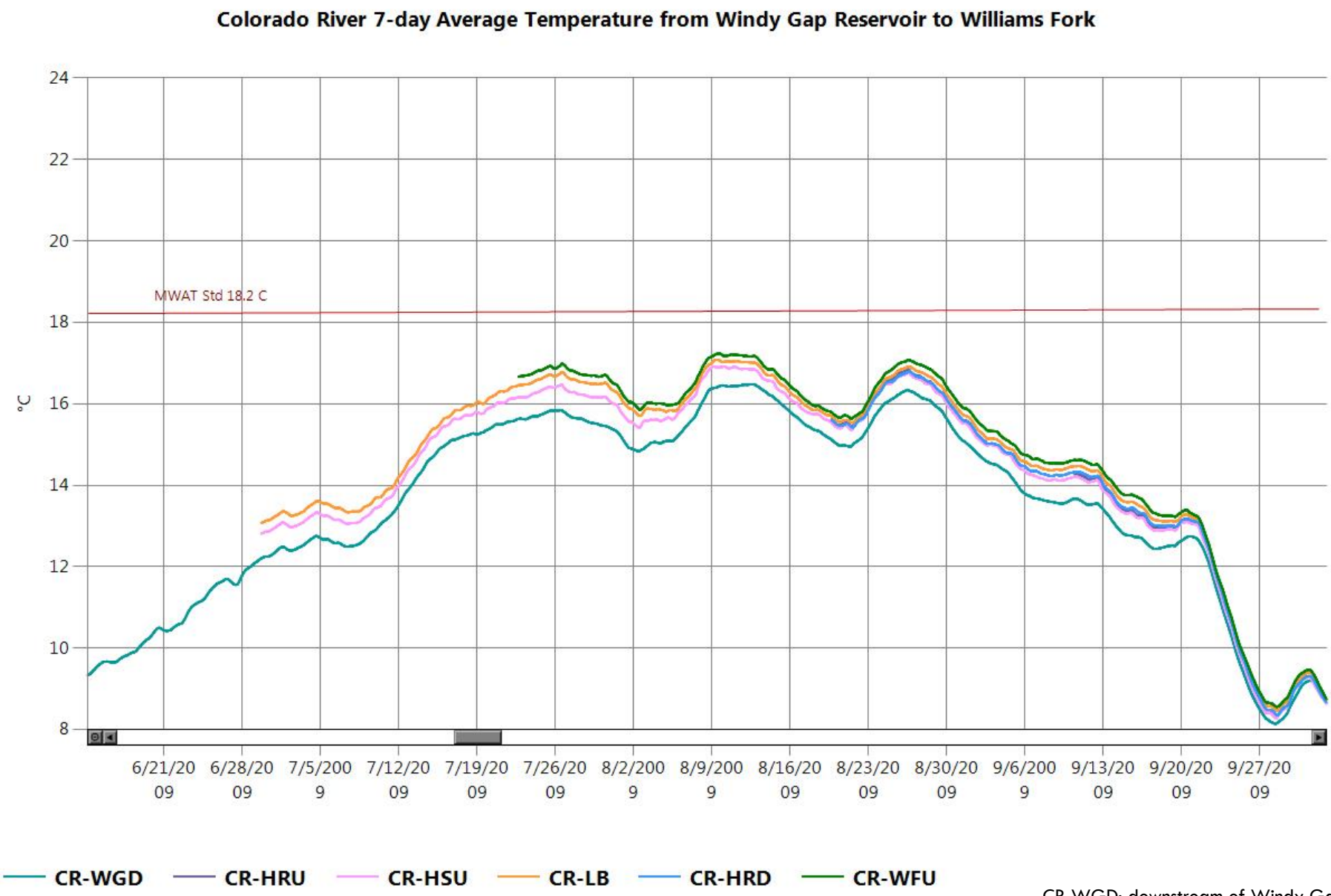

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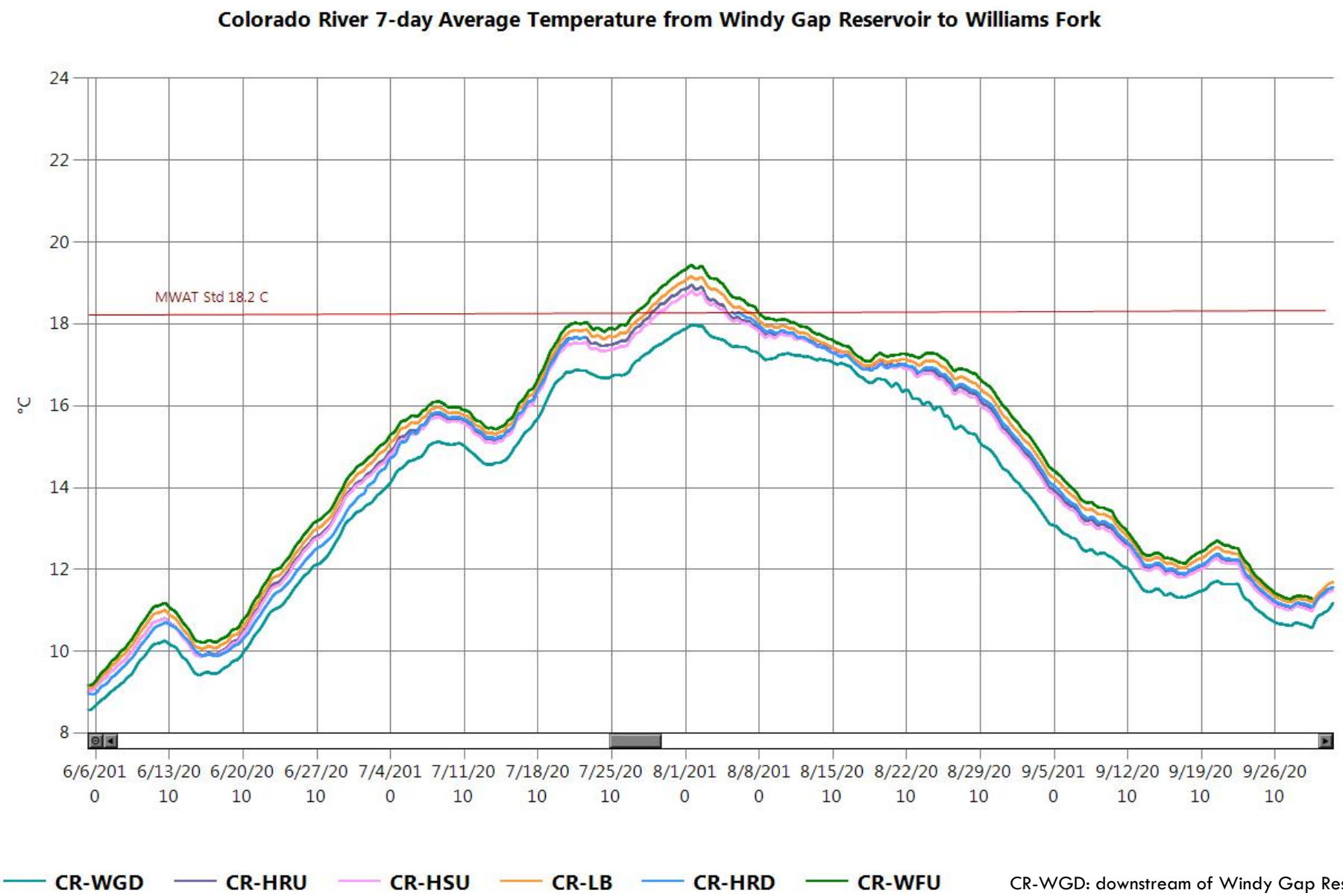

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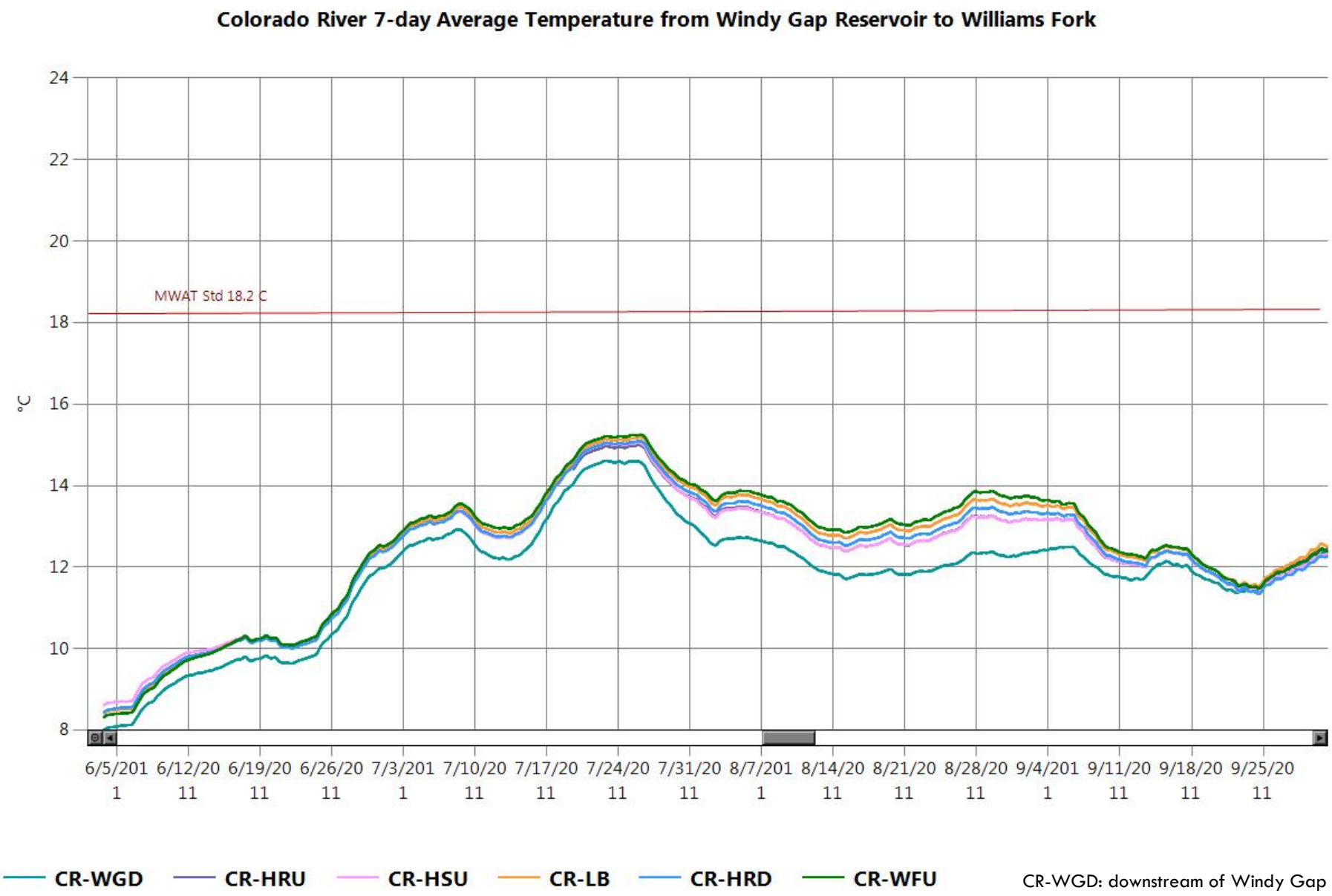

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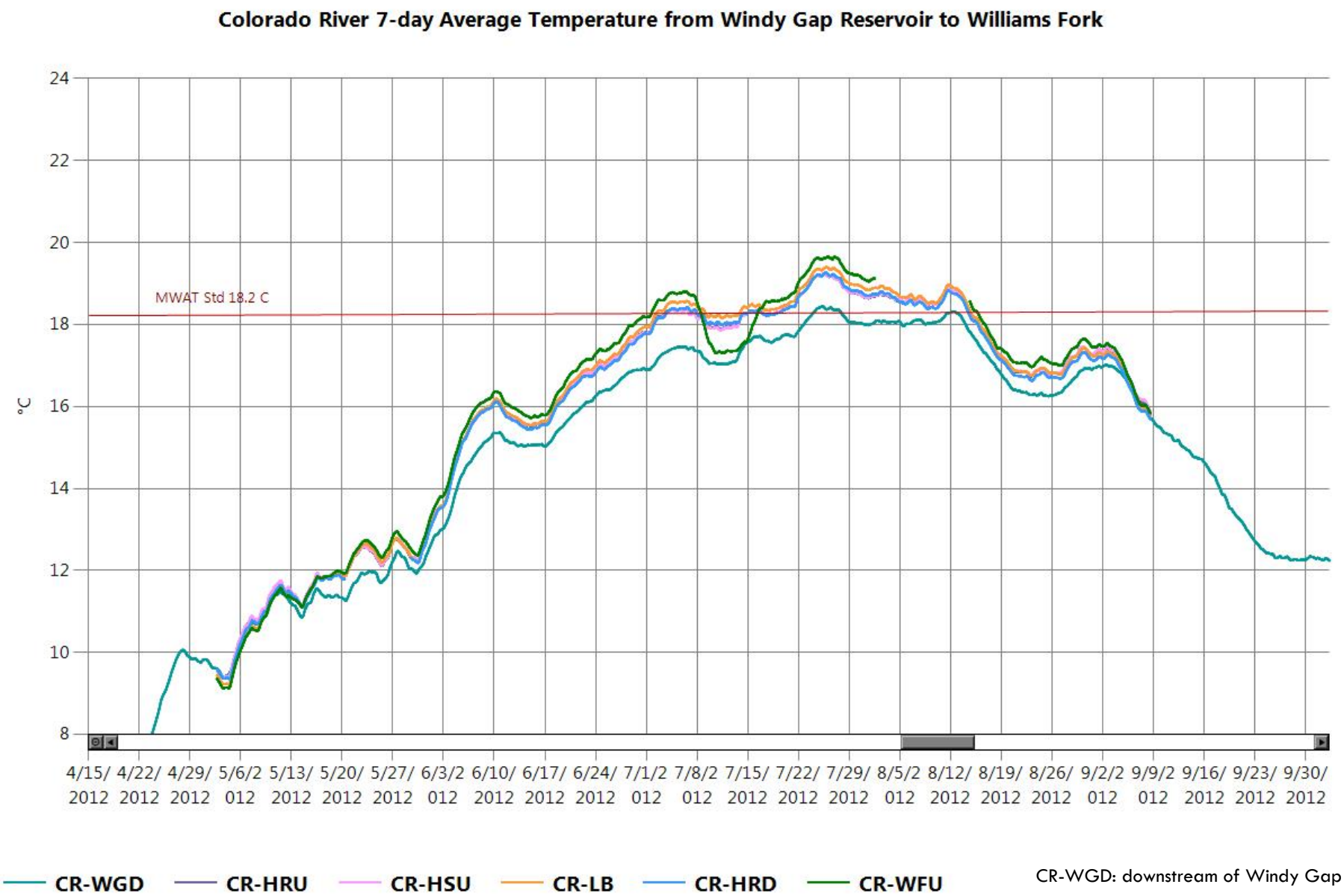

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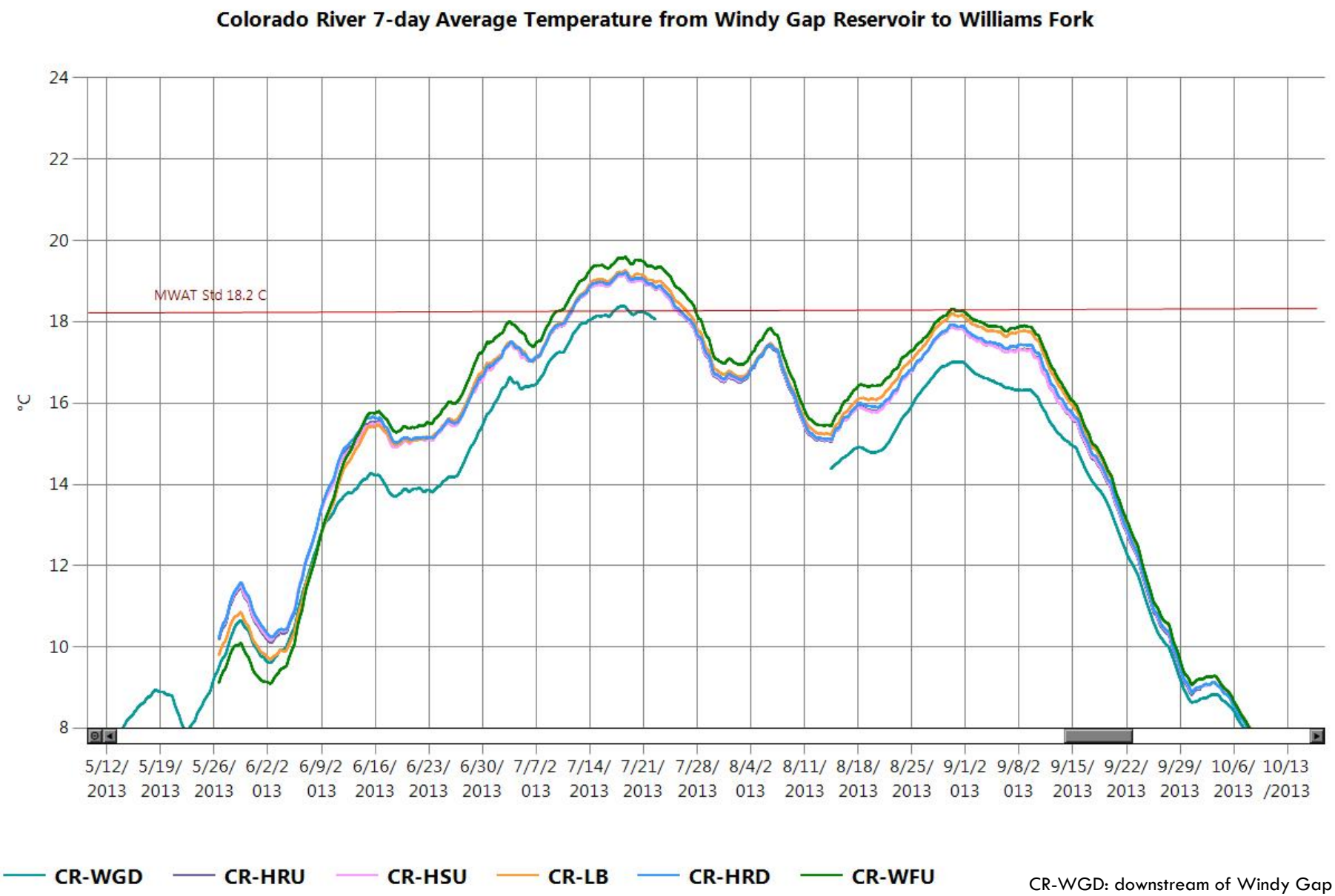

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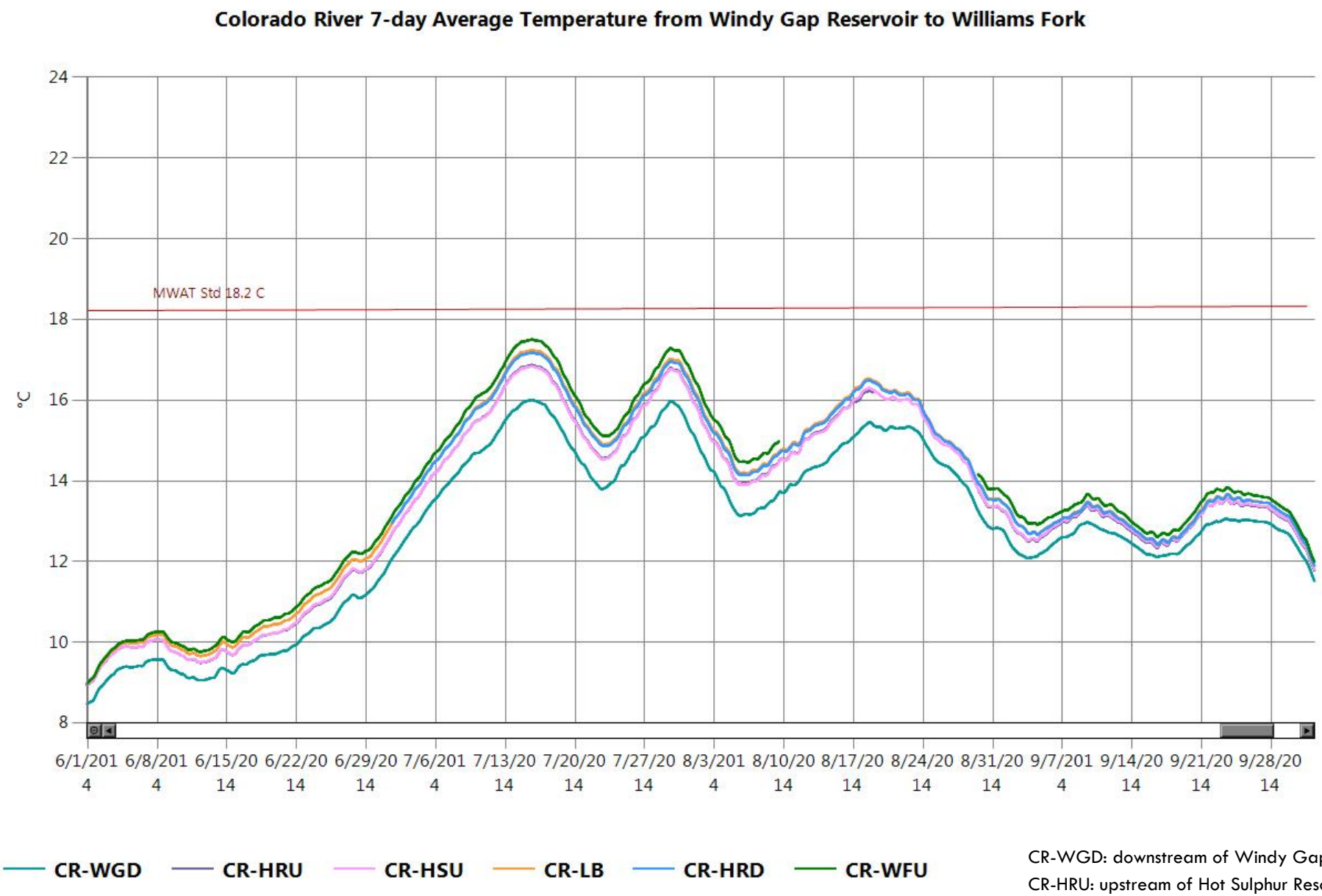

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APPENDIX I - ASSUMED CONCENTRATIONS FOR INFLOWS INTO LAKE ESTES

M30 = Big Thompson
C10 = Flow from the Adams Tunnel

	Chloride (mg/L)	
Month	**M30**	**C10**
Jan	5.47	0.76
Feb	5.98	0.8
Mar	7.31	0.76
Apr	4.88	0.86
May	1.8	0.61
Jun	0.69	0.39
Jul	0.87	0.33
Aug	1.38	0.36
Sep	1.77	0.39
Oct	2.54	0.61
Nov	4.14	0.59
Dec	4.51	0.6

	Sulfate (mg/L)	
Month	**M30**	**C10**
Jan	3.81	3.59
Feb	3.92	3.65
Mar	4.06	3.72
Apr	3.70	3.47
May	2.65	3.10
Jun	1.53	2.21
Jul	1.45	1.94
Aug	1.72	2.10
Sep	2.29	2.80
Oct	2.88	2.98
Nov	3.39	2.83
Dec	3.50	3.05

	Dissolved Arsenic (ug/)	
Month	**M30**	**C10**
Jan	0.08	0.2
Feb	0.06	0.19
Mar	0.09	0.2
Apr	0.1	0.19
May	0.13	0.2
Jun	0.11	0.16
Jul	0.08	0.14
Aug	0.08	0.21
Sep	0.09	0.25
Oct	0.07	0.21
Nov	0.07	0.17
Dec	0.07	0.19

	Dissolved Copper (ug/L)	
Month	**M30**	**C10**
Jan	1.5	1.1
Feb	1.7	2.5
Mar	1.5	0.84
Apr	1.9	1.25
May	2.2	1.7
Jun	1.9	1.2
Jul	1.2	1.2
Aug	1.1	1.04
Sep	1.4	1.1
Oct	0.8	0.847
Nov	1.2	1.95
Dec	1.5	1

	Total Recov Iron (ug/L)	
Month	**M30**	**C10**
Jan	306.5	97.4
Feb	306.5	97.4
Mar	306.5	97.4
Apr	306.5	97.4
May	306.5	97.4
Jun	306.5	97.4
Jul	306.5	97.4
Aug	306.5	97.4
Sep	306.5	97.4
Oct	306.5	97.4
Nov	306.5	97.4
Dec	306.5	97.4

	Dissolved Iron (ug/L)	
Month	**M30**	**C10**
Jan	93	20.4
Feb	74.8	25.2
Mar	137	29.8
Apr	180	31
May	127	40.7
Jun	82.4	34.5
Jul	72.2	30.1
Aug	85.8	23.8
Sep	110	23.2
Oct	118	15.5
Nov	121	16.2
Dec	100	16.3

	Dissolved Lead (ug/L)	
Month	**M30**	**C10**
Jan	0.05	0.03
Feb	0.05	0.07
Mar	0.05	0.02
Apr	0.07	0.03
May	0.07	0.05
Jun	0.06	0.05
Jul	0.07	0.04
Aug	0.05	0.04
Sep	0.05	0.03
Oct	0.03	0.02
Nov	0.05	0.02
Dec	0.05	0.05

	Dissolved Manganese (ug/L)	
Month	**M30**	**C10**
Jan	7.06	0.63
Feb	7.09	0.80
Mar	10.80	1.69
Apr	5.47	1.29
May	5.99	1.59
Jun	3.52	1.17
Jul	3.42	0.77
Aug	3.72	0.71
Sep	4.30	0.78
Oct	5.39	0.52
Nov	7.34	0.81
Dec	6.86	0.61

	Dissolved Nickel (ug/L)	
Month	**M30**	**C10**
Jan	0.25	0.40
Feb	0.27	0.28
Mar	0.30	0.28
Apr	0.29	0.25
May	0.36	0.26
Jun	0.28	0.20
Jul	0.18	0.16
Aug	0.18	0.20
Sep	0.17	0.20
Oct	0.18	0.18
Nov	0.26	0.17
Dec	0.34	0.34

	Dissolved Zinc (ug/L)	
Month	**M30**	**C10**
Jan	2.20	1.10
Feb	2.20	1.10
Mar	2.20	1.10
Apr	2.20	1.10
May	2.20	1.10
Jun	2.20	1.10
Jul	2.20	1.10
Aug	2.20	1.10
Sep	2.20	1.10
Oct	2.20	1.10
Nov	2.20	1.10
Dec	2.20	1.10

	Total Nitrogen (ug/L)	
Month	**M30**	**C10**
Jan	970	Model Output
Feb	970	Model Output
Mar	865	Model Output
Apr	610	Model Output
May	370	Model Output
Jun	330	Model Output
Jul	365	Model Output
Aug	430	Model Output
Sep	490	Model Output
Oct	485	Model Output
Nov	1000	Model Output
Dec	650	Model Output

	Total Phosphorus (ug/L)	
Month	**M30**	**C10**
Jan	70	Model Output
Feb	112.5	Model Output
Mar	127	Model Output
Apr	64.5	Model Output
May	25	Model Output
Jun	20	Model Output
Jul	20	Model Output
Aug	22.5	Model Output
Sep	33	Model Output
Oct	59	Model Output
Nov	54	Model Output
Dec	45	Model Output

APPENDIX J - ASSUMED CONCENTRATIONS FOR INFLOWS INTO WINDY GAP DIVERSION DAM

CR-WGU = Colorado River above the confluence with the Fraser River
FR = Fraser River

	Chloride (mg/L)	
Month	**CR-WGU**	**FR**
Jan	2.99	6.66
Feb	3.80	7.85
Mar	1.68	7.65
Apr	3.15	7.00
May	2.00	3.75
Jun	2.00	2.40
Jul	2.00	3.22
Aug	2.81	5.50
Sep	4.30	4.50
Oct	3.61	6.36
Nov	2.75	6.76
Dec	2.18	6.37

	Sulfate (mg/L)	
Month	**CR-WGU**	**FR**
Jan	7.98	6.27
Feb	5.88	6.14
Mar	8.16	7.53
Apr	5.75	5.00
May	5.26	3.75
Jun	4.00	2.64
Jul	2.70	3.00
Aug	3.00	1.59
Sep	5.00	4.00
Oct	6.58	5.37
Nov	6.04	6.18
Dec	5.24	5.75

	Dissolved Arsenic (ug/L)	
Month	**CR-WGU**	**FR**
Jan	0.43	0.37
Feb	0.43	0.37
Mar	0.43	0.37
Apr	0.43	0.37
May	0.43	0.37
Jun	0.43	0.37
Jul	0.43	0.37
Aug	0.43	0.37
Sep	0.43	0.37
Oct	0.43	0.37
Nov	0.43	0.37
Dec	0.43	0.37

	Dissolved Copper (ug/L)	
Month	**CR-WGU**	**FR**
Jan	0.53	0.69
Feb	0.50	0.72
Mar	0.59	0.91
Apr	0.90	0.94
May	0.87	1.10
Jun	0.96	0.90
Jul	0.84	0.82
Aug	0.59	0.90
Sep	0.71	0.79
Oct	0.59	0.83
Nov	0.61	0.61
Dec	0.60	0.58

	Dissolved Iron (ug/L)	
Month	**CR-WGU**	**FR**
Jan	81.80	126.50
Feb	71.70	119.00
Mar	102.00	248.00
Apr	126.50	255.50
May	105.00	180.00
Jun	99.00	170.00
Jul	155.00	205.00
Aug	155.00	265.00
Sep	117.25	253.50
Oct	118.00	224.00
Nov	88.10	207.50
Dec	74.55	119.50

	Total Recoverable Iron (ug/L)	
Month	**CR-WGU**	**FR**
Jan	348.00	349.50
Feb	307.00	427.00
Mar	388.00	919.00
Apr	556.50	945.00
May	716.00	926.00
Jun	603.00	725.00
Jul	499.00	527.50
Aug	590.00	625.50
Sep	470.00	570.00
Oct	389.00	382.00
Nov	340.00	414.50
Dec	226.50	269.50

	Dissolved Lead (ug/L)	
Month	**CR-WGU**	**FR**
Jan	0.03	0.07
Feb	0.03	0.07
Mar	0.03	0.07
Apr	0.03	0.07
May	0.03	0.07
Jun	0.03	0.07
Jul	0.03	0.07
Aug	0.03	0.07
Sep	0.03	0.07
Oct	0.03	0.07
Nov	0.03	0.07
Dec	0.03	0.07

	Dissolved Manganese (ug/L)	
Month	**CR-WGU**	**FR**
Jan	117.00	37.25
Feb	68.70	34.50
Mar	61.20	42.10
Apr	79.30	26.70
May	41.30	19.60
Jun	38.50	17.00
Jul	36.70	27.10
Aug	43.80	21.25
Sep	19.50	21.45
Oct	41.70	20.75
Nov	44.65	40.60
Dec	41.75	28.00

	Dissolved Nickel (ug/L)	
Month	**CR-WGU**	**FR**
Jan	0.34	0.46
Feb	0.34	0.46
Mar	0.34	0.46
Apr	0.34	0.46
May	0.34	0.46
Jun	0.34	0.46
Jul	0.34	0.46
Aug	0.34	0.46
Sep	0.34	0.46
Oct	0.34	0.46
Nov	0.34	0.46
Dec	0.34	0.46

	Dissolved Zinc (ug/L)	
Month	**CR-WGU**	**FR**
Jan	1.20	1.60
Feb	1.20	1.60
Mar	1.20	1.60
Apr	1.20	1.60
May	1.20	1.60
Jun	1.20	1.60
Jul	1.20	1.60
Aug	1.20	1.60
Sep	1.20	1.60
Oct	1.20	1.60
Nov	1.20	1.60
Dec	1.20	1.60

	Total Nitrogen (ug/L)	
Month	**CR-WGU**	**FR**
Jan	Model Results	932.00
Feb	Model Results	738.50
Mar	Model Results	805.50
Apr	Model Results	481.50
May	Model Results	390.00
Jun	Model Results	372.00
Jul	Model Results	323.50
Aug	Model Results	386.00
Sep	Model Results	269.00
Oct	Model Results	231.50
Nov	Model Results	286.50
Dec	Model Results	582.50

	Total Nitrogen (ug/L)	
Month	**CR-WGU**	**FR**
Jan	Model Results	82.50
Feb	Model Results	90.00
Mar	Model Results	112.00
Apr	Model Results	74.00
May	Model Results	62.00
Jun	Model Results	56.00
Jul	Model Results	32.50
Aug	Model Results	77.00
Sep	Model Results	47.00
Oct	Model Results	33.00
Nov	Model Results	34.00
Dec	Model Results	56.00

APPENDIX K - PROJECTED SHORTAGE IN FIRM ANNUAL YIELD OF WINDY GAP PARTICIPANTS

Participant	Firm Supply	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	Year of Projected Shortage
Broomfield	13,739	-561	-3,561	-5,661	-6,761	-7,961	-9,361	-10,661	-10,661	-10,661	-10,661	2005
CWCWD	2,786	-414	-814	-1,114	-1,414	-1,714	-1,914	-2,314	-2,614	-2,814	-3,114	2005
Erie	2,145	-355	-2,255	-3,755	-5,255	-6,755	-6,755	-6,755	-6,755	-6,755	-6,755	2005
Evans	9,298	4,698	3,398	2,298	898	-402	-1,802	-3,502	-4,002	-4,002	-4,002	2025
Fort Lupton	3,538	-562	-662	-862	-1,162	-1,462	-1,662	-2,062	-2,362	-2,762	-3,262	2005
Greeley	43,850	16,150	11,450	6,050	-50	-4,650	-9,650	-15,150	-21,150	-27,650	-34,650	2020
Lafayette	4,534	34	-966	-1,966	-2,966	-3,966	-4,066	-4,066	-4,066	-4,066	-4,066	2006
LTWD	5,510	-490	-1,490	-2,690	-3,890	-5,190	-6,590	-7,990	-9,690	-11,490	-13,590	2005
Longmont	30,963	5,063	2,863	663	-1,537	-4,937	-7,137	-8,187	-9,237	-10,287	-11,337	2017
Louisville	5,063	63	-237	-537	-937	-1,237	-1,437	-1,637	-1,837	-1,837	-1,837	2006
Loveland	17,792	3,392	1,892	-8	-2,208	-4,708	-6,908	-9,008	-9,508	-10,008	-10,508	2015
MPWCD[1]	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Platte River	0	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	2005
Superior	1,544	-956	-1,456	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	2005
Cumulative Total[2]	140,762	20,912	3,012	-14,488	-32,188	-49,888	-64,188	-78,238	-88,788	-99,238	-110,688	26,124

1 Grand and Summit Counties 2000 total water demand based on the UPCO Study (Hydrosphere 2003a) is about 11,000 AF. Sources other than Windy Gap are currently used to meet water demands. The MPWCD has an immediate need for Windy Gap water for use in augmentation of other withdrawals and diversions.

2 The cumulative total includes the total firm supply of all participants and the collective surplus or shortage in firm annual yield. Participants individually meet any shortages.

APPENDIX L - LAKE AND RESERVOIR LEVELS AND HYPOLIMNETIC DISSOLVED OXYGEN LEVELS

Table 57 - Granby Reservoir Elevation: WGFP vs. Existing Conditions

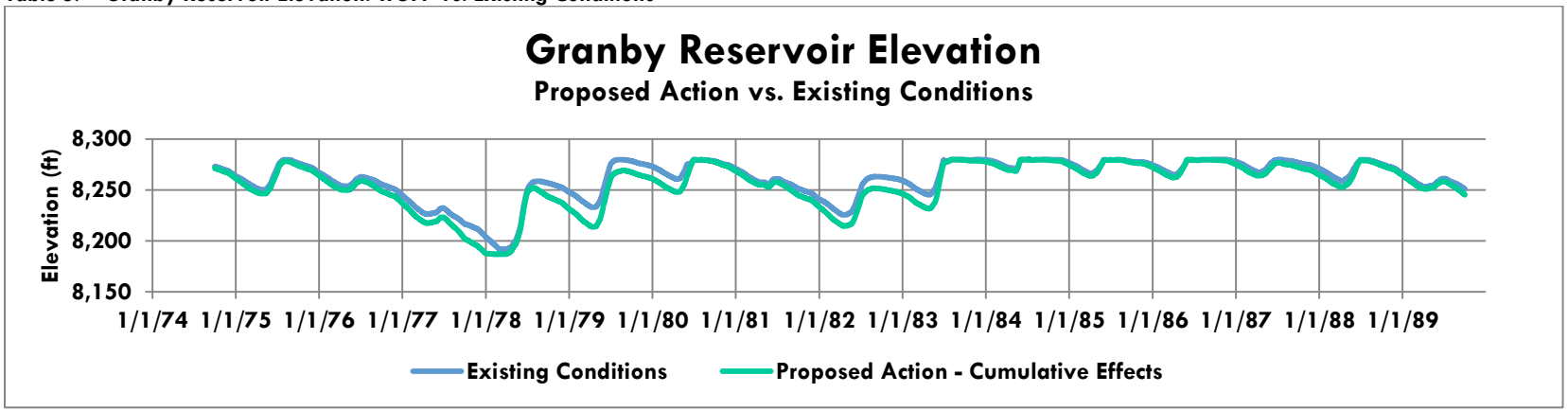

Table 58 - Granby Reservoir Hypolimnetic Dissolved Oxygen: WGFP vs. Existing Conditions

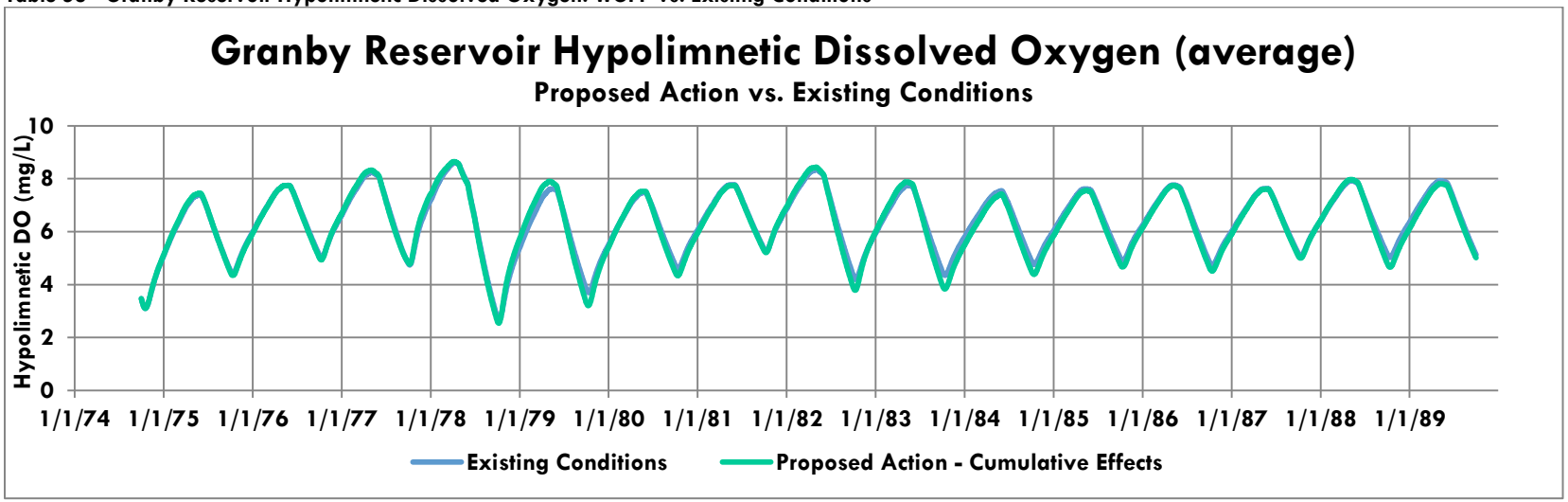

Table 59 - Grand Lake Hypolimnetic Dissolved Oxygen: WGFP vs. Existing Conditions

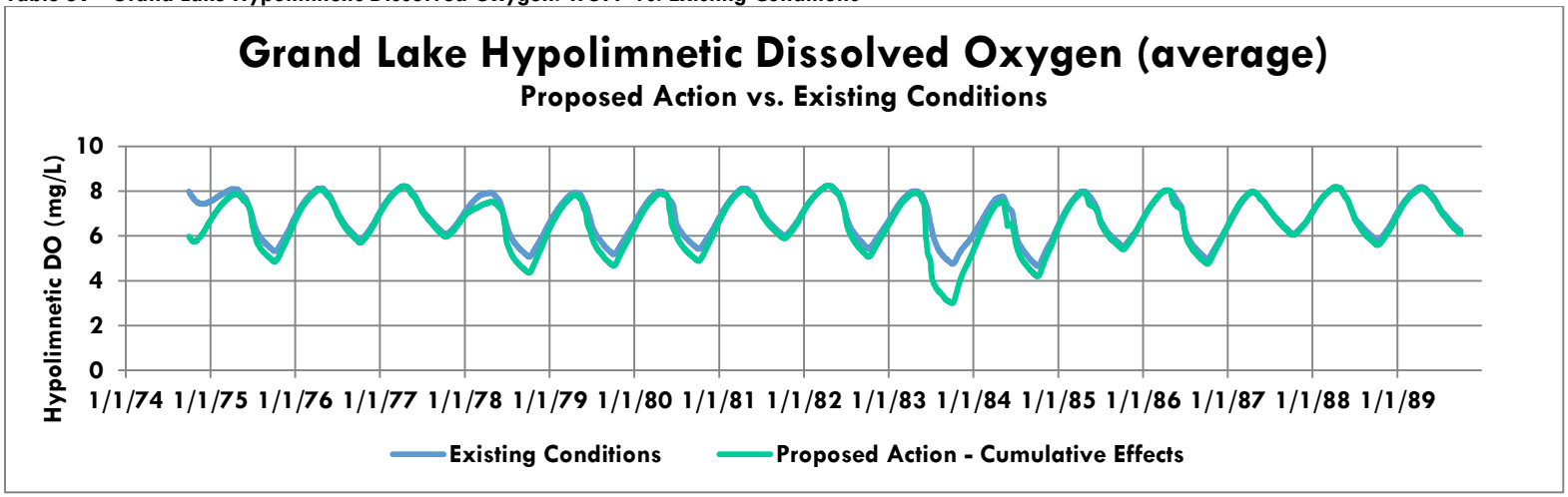

Table 60 - Shadow Mountain Dissolved Oxygen: WGFP vs. Existing Conditions

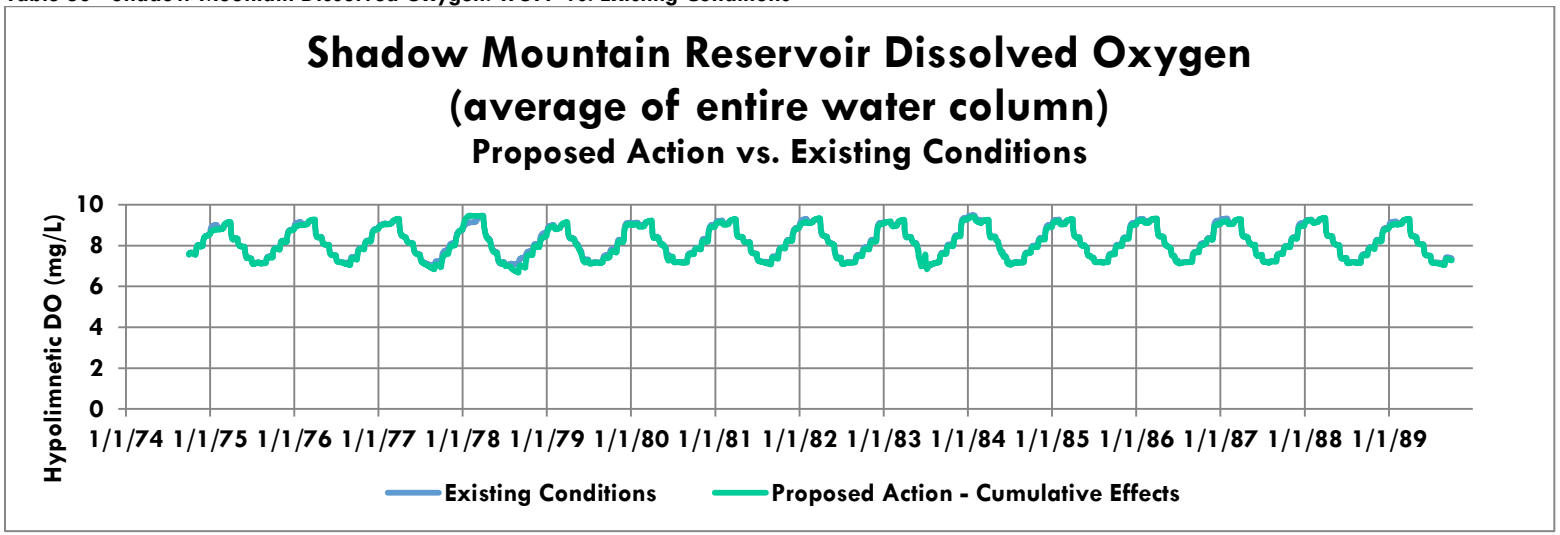

Table 61 - Horsetooth Reservoir Elevation: WGFP vs. Existing Conditions

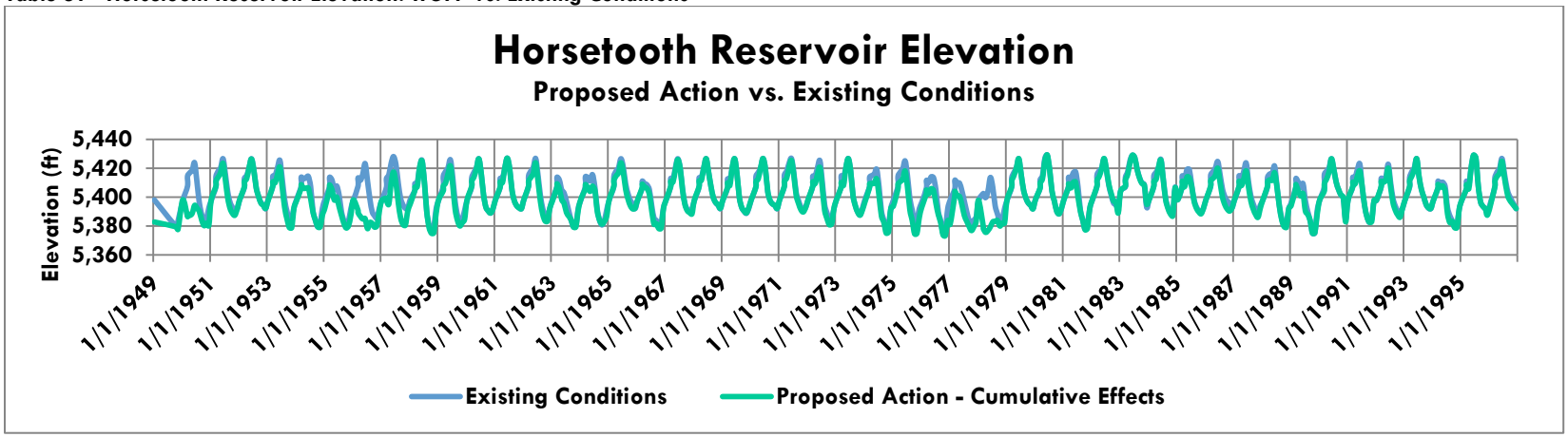
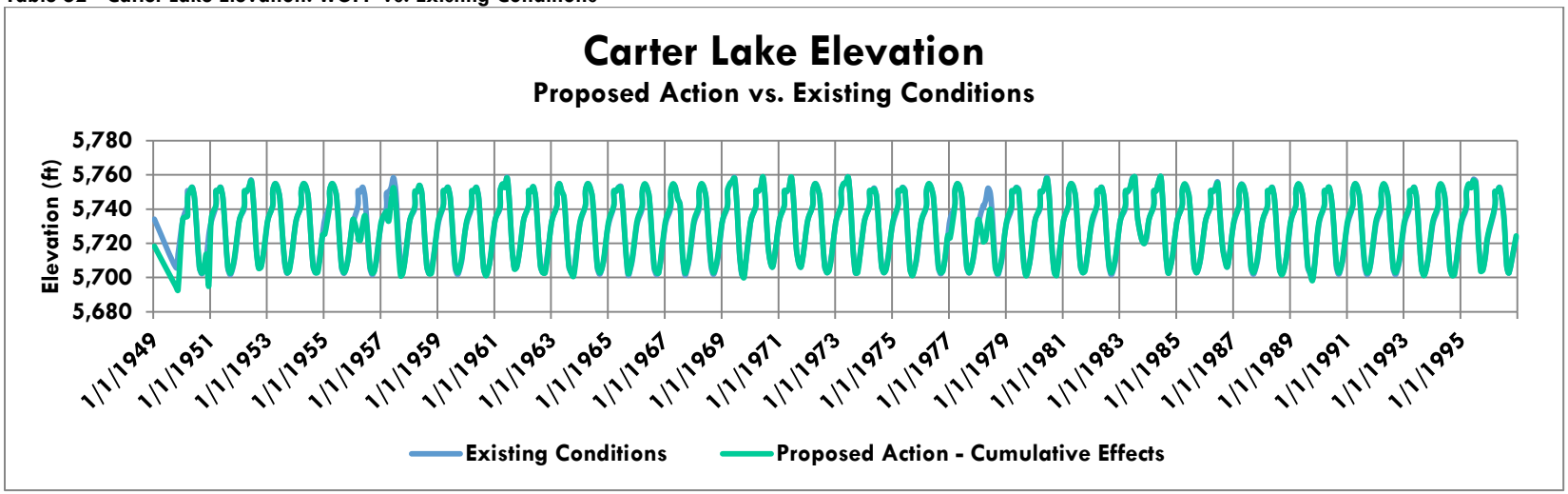
Table 62 - Carter Lake Elevation: WGFP vs. Existing Conditions