to: Scoring subcommittee

from: executive director’s office

subject: cnppid irrigator lease score analysis

date: May 3, 2019

1. **EXECUTIVE SUMMARY**

This memo documents the score analysis for the Central Nebraska Public Power and Irrigation District (CNPPID) irrigator lease project implemented by the Platte River Recovery Implementation Program (PRRIP or Program) under the Water Action Plan (WAP). Initiated with a Water Leasing Agreement in September 2015, the CNPPID irrigator lease operated as a pilot program during the 2016-2018 irrigation seasons, renewed annually. In September 2018, the Program’s Governance Committee (GC) approved a new CNPPID irrigator lease agreement, extending the program for 5 years through the 2023 irrigation season.

The irrigator lease project can only operate during years in which CNPPID declares a full allocation for the irrigation season. When there is a reduced allocation, individual irrigators are allowed to transfer water amongst themselves; however, under full allocation, such transfers are not allowed, and the Program is able to step in as the only customer in the water leasing market. The project is based on a number of enrolled acres, with each acre yielding 9” or 0.75 acre-feet (AF) of water that is credited to the Lake McConaughy Environmental Account (EA) in October following the irrigation season. Acres enrolled in the lease program must be fallowed or dryland farmed. The Program pays irrigators $220 per enrolled acre (equivalent to $293.33/AF) and a $10,000 annual administration fee is paid to CNPPID.

Terms of the CNPPID irrigator lease agreement presently cap the enrollment at 3,000 acres, which is increased from 2,000 acres in the original 2015 lease agreement. Actual enrollment has increased in each successive year of project operation, from 1,037 acres during the 2016 irrigation season to 2,948 acres during the 2019 irrigation season, a nearly three-fold increase over the course of just four years.

The Program’s Executive Director’s Office (EDO) performed the score analysis for the CNPPID irrigator lease using methods approved by the GC in 2010 and consistent with other WAP projects with approved scores that contribute to the Lake McConaughy EA. This includes the No-Cost Net Controllable Conserved Water (NCCW) and the Pathfinder Municipal Account Lease. Operational assumptions evaluated in the score analysis included a range of seven acreage enrollment values and three scenarios with varying levels of reduced-allocation years in which the irrigator lease cannot occur.

Potential project scores resulting from the evaluated scenarios range from 504 AF to 1,983 AF. The analysis methods, assumptions, scenarios, and results are to be reviewed and discussed by the Scoring Subcommittee in order to reach agreement on a score recommendation to be considered by the GC for approval.

1. **INTRODUCTION**

The First Increment Water Objective for the Platte River Recovery Implementation Program (PRRIP or Program) is to reduce deficits to U.S. Fish and Wildlife Service (USFWS) target flows by 130,000 acre-feet per year (AFY) to 150,000 AFY, as measured at Grand Island, Nebraska. Program Milestone No. 4[[1]](#footnote-1) dictates that at least 50,000 AFY of that total must be developed through implementation of the Water Action Plan (WAP). Project scoring[[2]](#footnote-2) is an analytical process used to assess the capacity of a water project to contribute towards fulfilling the Program’s water goals. **Table 1** shows Program water project scores approved to date.

**Table 1. Program Water Project Scores as of May 2019**

|  |  |
| --- | --- |
| **Project** | **Score [AF]** |
| **State Water Projects** | |
| Tamarack I | 10,000 |
| Lake McConaughy EA | 70,000 |
| Pathfinder EA |
| Sub-total = | 80,000 |
| **Water Action Plan Projects** | |
| Phelps County Canal Groundwater Recharge Project | 2,700 |
| Pathfinder Municipal Account Lease | 6,350 |
| No-Cost NCCW | 260 |
| Cook Recapture Well | 160 |
| Elwood Reservoir Recharge\* | 2,800 |
| Sub-total = | 12,270 |
|  | |
| **Total =** | **92,270** |

\* Score analysis for Elwood Reservoir Recharge was reviewed by the Scoring Subcommittee in August 2018, but the recommended score of 2,800 AF has not yet been approved by the Governance Committee.

The purpose of this memo is to document the score analysis for the Central Nebraska Public Power and Irrigation District (CNPPID) irrigator lease WAP project, the description and evaluation of which are provided in the following sections. Previously operated on a year-to-year pilot project basis, a new 5-year lease agreement that starts with the 2019 irrigation season gives the EDO adequate confidence in the longevity of the project to proceed with this assessment.

1. **CNPPID IRRIGATOR LEASE PROJECT**

Beginning with the 2016 irrigation season, the Program and CNPPID entered into a series of temporary agreements to lease water directly from irrigators within the CNPPID systems. Irrigators agree to fallow or dryland farm designated parcels, which are typically odd-shaped or otherwise difficult to irrigate. The project operated as a pilot program from 2016 to 2018, after which the Program’s Governance Committee (GC) approved a continuation of the project for 5 years, through the 2023 irrigation season. In order to carry out the project, the CNPPID must declare a full allocation[[3]](#footnote-3), in which case individual irrigators cannot transfer water amongst themselves and the Program is the only potential customer for water leasing. The Program pays a fee of $10,000 to the CNPPID to administer the irrigator leasing program each year.

For each acre enrolled in the irrigator lease program, the Program is credited with 9 inches (0.75 AF) of water in the Lake McConaughy Environmental Account (EA), on or around October 1 following the end of the irrigation season. Enrollment was originally capped at 2,000 acres, but participation has grown each year of project operation, and the new 5-year lease agreement set a cap of 3,000 acres beginning with the 2019 irrigation season. The cost to the Program is set at $220 per acre enrolled in the lease, which translates to $293.33 per AF when considering the 0.75 AF/acre yield.

**Table 2** shows the acres enrolled and volume credited to the Lake McConaughy EA during each year of the CNPPID irrigator lease. Supporting documents included in **Appendices A-D** include the annual leasing agreements, amendments to those lease agreements, invoices paid by the Program to CNPPID for irrigator lease water, and letters from Nebraska Department Natural Resources (NDNR) to CNPPID confirming that irrigator lease water was credited to the Lake McConaughy EA under appropriation A-17695 in October of the year.

**Table 2. Annual Enrollment in CNPPID Irrigator Lease Program**

|  |  |  |
| --- | --- | --- |
| **Irrigation Season** | **Acres Enrolled** | **Volume Credited to Lake McConaughy EA**  **[AF]** |
| 2016 | 1,037 | 778 |
| 2017 | 1,275 | 956 |
| 2018 | 2,055 | 1,541 |
| 2019 | 2,948 | 2,211\* |

\* Volume anticipated to be credited in October 2019, based on acres enrolled.

1. **METHODS**

The Program’s ad-hoc Scoring Subcommittee was originally formed in 2010 to advance discussions regarding scoring analyses for proposed WAP projects, at that time specifically for the J-2 Regulating Reservoirs project. The Program’s EDO worked with the Scoring Subcommittee to develop a J-2 Regulating Reservoir Scoring Case Study[[4]](#footnote-4). Based on the findings of the Case Study, the Scoring Subcommittee proposed WAP project scoring methods to the GC[[5]](#footnote-5), and the GC approved the recommended methodology in June 2010[[6]](#footnote-6). The methods approved by the GC was intended for use in future scoring of WAP projects to maintain consistency in project scoring. However, the Subcommittee and GC also recognized that additional assumptions and variations in the scoring methodology may need to be addressed on a case-by-case basis for other WAP projects.

In order to align with the Scoring Subcommittee’s past recommendations, the methods used for the CNPPID irrigator lease score analysis followed the same approach and held to the same general assumptions and project-specific assumptions similar to score analyses previously approved for the No-Cost NCCW[[7]](#footnote-7) and Pathfinder Municipal Account Lease[[8]](#footnote-8),[[9]](#footnote-9) projects, both of which also contribute to the Lake McConaughy EA.

1. **General Assumptions and Analysis Methods**

The general assumptions used for scoring of the CNPPID irrigator lease project are listed in **Table 3**. These general assumptions are consistent with previous score analyses for all WAP projects listed in Table 1.

**Table 3. Key Scoring Assumptions**

| **Component** | **Data** |
| --- | --- |
| Hydrology | OPSTUDY Adjusted Present Condition with Three State Projects (without pulse flows). |
| Hydrologic Condition[[10]](#footnote-10) | Annual |
| Analysis Period | 1947-1994 |
| Analysis Time Step | Monthly |
| Excesses/Shortages Calculation | @ Grand Island |
| Target Flows | Program Document, Attachment 5, Appendix A-5, Column 8[[11]](#footnote-11) |
| Routing (River Transit Losses) | WMC Loss Model[[12]](#footnote-12) |

In the spreadsheet score model, releases are made from the Lake McConaughy EA during months with target flow shortages at Grand Island, subject to timing constraints described in the next section. Corresponding to the assumptions outlined in Table 3, the shortages were calculated based on OPSTUDY modeled Grand Island flows over the analysis period 1947-1994 and USFWS target flows as dictated by the annual hydrologic condition, all on a monthly time step. Evaporation rates derived from OPSTUDY data that are applied to water in storage in the Lake McConaughy EA are shown in **Table 4**. Modeled releases from the Lake McConaughy EA are routed to Grand Island using transit loss factors derived from the WMC Loss Model, which are variable by month and hydrologic condition, as shown in **Table 5**. The volume of released water reaching Grand Island after the application of transit losses is the score credit for that month. The monthly score credits are summed annually and then averaged over the 48-year analysis period to get an estimated score for a particular project operations scenario.

**Table 4.** **Average monthly evaporation from the Lake McConaughy EA.**

|  |  |
| --- | --- |
| **Month** | **Average percent of evaporation** |
| Jan | 0.06% |
| Feb | 0.21% |
| Mar | 0.23% |
| Apr | 0.36% |
| May | 0.40% |
| Jun | 0.44% |
| Jul | 0.78% |
| Aug | 0.72% |
| Sep | 0.38% |
| Oct | 0.22% |
| Nov | 0.10% |
| Dec | 0.03% |

**Table 5.** **Average transit losses from Lake McConaughy to Grand Island.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Month** | **Normal** | **Wet** | **Dry** |
| Jan | 14% | 13% | 16% |
| Feb | 9% | 10% | 11% |
| Mar | 5% | 5% | 7% |
| Apr | 7% | 9% | 10% |
| May | 10% | 9% | 11% |
| Jun | 14% | 13% | 37% |
| Jul | 26% | 11% | 62% |
| Aug | 28% | 16% | 74% |
| Sep | 30% | 21% | 66% |
| Oct | 19% | 12% | 48% |
| Nov | 14% | 10% | 27% |
| Dec | 14% | 11% | 16% |

1. **Project-Specific Assumptions**

As shown in Table 1, the Lake McConaughy EA (as supplied by Storable Natural Inflows or SNI) and Pathfinder EA were credited with a combined score of 70,000 AF[[13]](#footnote-13). Although water originating from individual WAP projects loses its unique identity once it is credited to the Lake McConaughy EA, the WAP projects are still treated as if operated independently for the purpose of evaluating score. This approach is justified for a number of reasons:

* The EDO does not have the means to reproduce the score analysis[[14]](#footnote-14) for the combined Lake McConaughy EA and Pathfinder EA, and thus cannot simply add new contributions to the overall project operations, as was done for the score analysis of the Cook Recapture Well when it was added to the Phelps County Canal Groundwater Recharge Project.
* All of the individual WAP projects contributing to the Lake McConaughy EA do so only once per year, in October.
* The magnitudes of the individual WAP projects are much smaller than the combination of Pathfinder EA water and SNI into the Lake McConaughy EA, ranging from 314 AF (No-Cost NCCW) to 9,600 AF (maximum Pathfinder Municipal Account Lease, which is generally reduced by about 10 percent due to North Platte River transit losses), and therefore do not individually have significant effects on Lake McConaughy EA operations.
* The magnitudes of the individual WAP projects are generally much smaller than the target flow shortages at Grand Island, as calculated based on OPSTUDY hydrology. Monthly shortage volumes at Grand Island over the period 1947-1994 range from 0 AF to 131,300 AF, with a median of 10,200 AF. Thus, the annual contributions to the Lake McConaughy EA from individual WAP projects are generally inadequate to fully eliminate the shortage for a month, let alone an entire year. Monthly shortages are tabulated in **Appendix E**.
* Contributions from a relatively small-scale individual WAP project are unlikely to significantly change overall operations of the Lake McConaughy EA, and the individual project scores can still be summed to get an approximate cumulative score attributable to all sources added to the Lake McConaughy EA.

Other assumptions made in the score analysis that are specific to the operations of the CNPPID irrigator lease project include the following:

* CNPPID irrigator lease water is credited to the Lake McConaughy EA in October.
* Evaporation losses are assessed while the leased water is stored in the Lake McConaughy EA until it is released to reduce shortages to US Fish and Wildlife Service target flows.
* A spring release pattern[[15]](#footnote-15) is assumed, with releases to reduce target flow deficits starting in March of most years, consistent with typical releases during the spring whooping crane migration.
* If there are no shortages at Grand Island in March of a given year, releases from the Lake McConaughy EA are delayed until the first month with shortages (as late as August of some years)[[16]](#footnote-16).

For the purpose of evaluating score for the CNPPID irrigator lease, it was also necessary to make assumptions about the number of acres enrolled in the lease program each year as well as the possibility of years with reduced allocations in which the lease would not be able to occur.

* The EDO tested seven acreage-enrollment options. Enrolled acres were assumed to remain at a constant level across the 1947-1994 period, i.e., not variable from one year to the next except as dictated by the reduced-allocation scenarios discussed below.
  + The three past and present enrollment cap levels (2,000 acres; 2,100 acres; and 3,000 acres)
  + The four actual enrollment levels from 2016-2019 (1,037 acres; 1,275 acres; 2,055 acres; and 2,948 acres).
* The EDO considered three allocation scenarios:
  + Scenario 1: Full allocation in all years, 1947-1994 (0 percent reduced allocation). This scenario was directly simulated using the score model.
  + Scenario 2: Full allocation in all wet and normal years, reduced allocation in all dry years. Dry years represent 25 percent of the study period, or 12 out of 48 years. In those years, enrolled acreage was assumed to be zero. This scenario was directly simulated using the score model.
  + Scenario 3: Allocation corresponding to CNPPID’s historical operations. While CNPPID had full allocations for all years 1947-1994, there have been subsequent years with reduced allocation[[17]](#footnote-17), 2005-2009 and 2013-2015, which is 8 years out of 78 total years of irrigation operations (10.26 percent of the time). Since all of the reduced-allocation years were within or immediately preceding the First Increment, the EDO determined that a scenario corresponding to this frequency of reduced allocation should be represented in the score analysis.

As indicated in Table 3, score analyses utilize the annual hydrologic condition, applied to each monthly time step. **Table 6** shows the annual hydrologic condition for the years following the end of the 1947-1994 model study period; years with reduced allocation are highlighted.

**Table 6. Annual Hydrologic Condition, 1995-2018**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Annual Hydrologic Condition** | **Year** | **Annual Hydrologic Condition** |
| 1995 | WET | 2007 | NORMAL |
| 1996 | WET | 2008 | NORMAL |
| 1997 | WET | 2009 | NORMAL |
| 1998 | WET | 2010 | WET |
| 1999 | WET | 2011 | WET |
| 2000 | WET | 2012 | NORMAL |
| 2001 | NORMAL | 2013 | NORMAL |
| 2002 | DRY | 2014 | NORMAL |
| 2003 | DRY | 2015 | WET |
| 2004 | DRY | 2016 | WET |
| 2005 | DRY | 2017 | WET |
| 2006 | DRY | 2018 | NORMAL |

For the eight years with reduced allocations, only two (2005 and 2006) were defined as dry years based on the annual hydrologic condition; all others were wet or normal years. Rather than randomly cherry-pick five dry years[[18]](#footnote-18) in the 1947-1994 period to have reduced allocations, the EDO evaluated Scenario 3 based on the results of Scenario 1 and Scenario 2. Specifically, it was assumed that since score results under Scenario 2 (25 percent years with reduced allocations) were uniformly reduced by 26.45 percent relative to Scenario 1, then scores under Scenario 3 (10.26 percent years with reduced allocations) must be 10.86 percent less than Scenario 1.

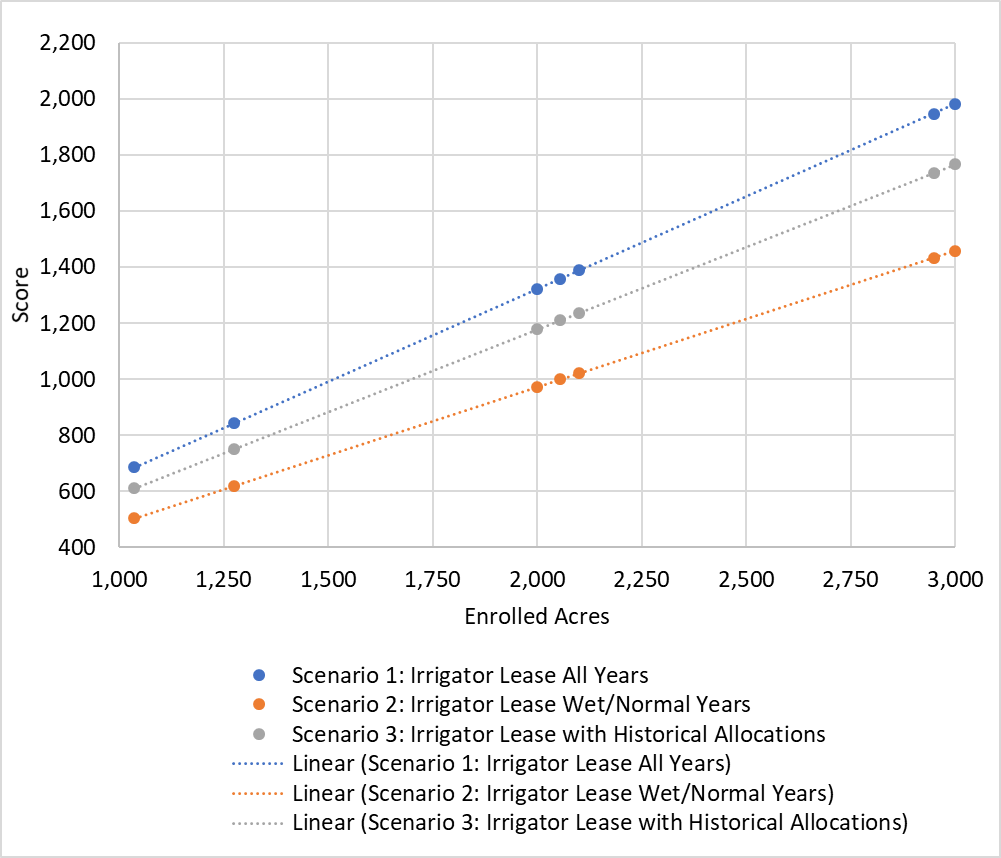
1. **RESULTS**

**Table 7** summarizes the results of the CNPPID irrigator lease score analysis, which vary based on both the enrolled acreage and the frequency of reduced allocations. **Figure 1** illustrates the results graphically. Efficiency is the score divided by the volume credited to the Lake McConaughy EA.

Scenario 1 monthly and annual results showing shortage reduction (score) credits at Grand Island are tabulated in **Appendix F**. The same monthly and annual results for Scenario 2 are presented in **Appendix G**. Since the scores estimated for Scenario 3 are interpolated from the Scenario 1 and Scenario 2 results, full monthly and annual model output is not available.

**Table 7. Results of CNPPID Irrigator Lease Score Analysis**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Acres Enrolled** | **Credit to EA [AF]** | **Scenario 1** | | **Scenario 2** | | **Scenario 3** | |
| **Score** | **Efficiency** | **Score** | **Efficiency** | **Score** | **Efficiency** |
| 1,037 | 778 | 686 | 88% | 504 | 65% | 612 | 79% |
| 1,275 | 956 | 842 | 88% | 620 | 65% | 751 | 79% |
| 2,000 | 1,500 | 1,322 | 88% | 972 | 65% | 1,178 | 79% |
| 2,055 | 1,541 | 1,358 | 88% | 999 | 65% | 1,211 | 79% |
| 2,100 | 1,575 | 1,388 | 88% | 1,021 | 65% | 1,237 | 79% |
| 2,948 | 2,211 | 1,948 | 88% | 1,433 | 65% | 1,736 | 79% |
| 3,000 | 2,250 | 1,983 | 88% | 1,458 | 65% | 1,768 | 79% |

****

**Figure 1. Score vs Enrolled Acres, CNPPID Irrigator Lease**

As shown in Figure 1, the score analysis results essentially produce a box that is bounded on one end by the minimum actual enrolled acreage (1,037 acres) and on the other end by the maximum contractual enrollment cap (3,000 acres). On the top, the box is bounded by Scenario 1, with full allocation in all years; on the bottom, the box is bounded by Scenario 2, with full allocation in only wet and normal years (36 out of 48 years, or 75 percent) and reduced allocation in all dry years (12 out of 48 years, or 25 percent). Scenario 3, representing the historical frequency of years with reduced allocations, is represented by the gray marker dots and line across the middle. Results for each of the three scenarios are follow linear trends across the range of enrolled acres.

The EDO suggests that the score to be recommended for the CNPPID irrigator lease project lies somewhere within that box, ranging from a minimum of 504 AF (Scenario 2 with 1,037 acres enrolled) to a maximum of 1,983 AF (Scenario 1 with 3,000 acres enrolled), subject to the opinions of the Scoring Subcommittee regarding assumptions of enrolled acres and the frequency of reduced-allocation years (i.e., years in which the irrigator lease cannot operate).

Regarding enrolled acreage, it is anticipated that under present conditions, year-to-year enrollment will likely remain similar[[19]](#footnote-19). However, there are two potential conditions that could impact future enrollment:

1. During the first three years of the CNPPID irrigator lease, there was adequate precipitation to grow a good dryland crop, but a dry growing season and poor dryland yields may cause growers to re-evaluate participation.
2. Improvement in commodity prices may also influence participation if growers are unwilling to risk a potential dry growing season and low yields compared to expected yields (and income) under irrigation.

In addition, while it is certainly possible that the enrollment cap could increase above 3,000 acres, that is the limit defined in the current 5-year water leasing agreement for the 2019-2023 irrigation seasons. At this time, with a fairly wide range of acreage enrollments through the first four years of project operations, the EDO found it unnecessary to speculate on potential future increases to the enrollment cap. If and when such a scenario arises, the EDO can work with the Scoring Subcommittee to update this analysis and modify the results presented in Table 7 and Figure 1 to determine if changes to the score are warranted.

Finally, the EDO requests feedback from the Scoring Subcommittee regarding reduced-allocation years. Scenario 2, with 25 percent of years having reduced allocation, far exceeds the historical occurrence of such years. In Scenario 3, the frequency of reduced-allocation years is considered in the context of the full history of CNPPID irrigation operations. However, given that all eight of those reduced-allocation years are clustered within the most recent 15 years immediately preceding and including the duration of the Program’s First Increment, it merits consideration of whether this occurrence represents a new operational paradigm for CNPPID or whether it was an anomalous condition not likely to recur during the anticipated operational period for the CNPPID irrigator lease.

**Appendix A**

CNPPID Irrigator Lease Documents

2016 Irrigation Season

**Appendix B**

CNPPID Irrigator Lease Documents

2017 Irrigation Season

**Appendix C**

CNPPID Irrigator Lease Documents

2018 Irrigation Season

**Appendix D**

CNPPID Irrigator Lease Documents

2019 Irrigation Season

**Appendix E**

CNPPID Irrigator Lease Score Analysis

OPSTUDY Modeled Shortages at Grand Island

**Appendix F**

CNPPID Irrigator Lease Score Analysis Results

Scenario 1 Score Credit at Grand Island

**Appendix G**

CNPPID Irrigator Lease Score Analysis Results

Scenario 2 Score Credit at Grand Island

1. Program Document, Attachment 2 [↑](#footnote-ref-1)
2. As defined in the Water Plan Reference Materials (Program Document, Attachment 5, Section 11), “scoring” refers to quantifying…the extent to which a water project results (or is anticipated to result) in reductions in stream flow shortages to target flows, as compared to the present condition. [↑](#footnote-ref-2)
3. CNPPID’s full irrigation allocation is 18 inches per acre. Irrigation contracts are for 18 inches of total water use; irrigators pay a base contract rate for the first 9 inches and escalating costs for each additional inch over 9 inches and up to the full 18 inches (Cory Steinke, CNPPID Civil Engineer, personal email communication, March 26, 2018). [↑](#footnote-ref-3)
4. Water Action Plan Project Scoring Case Study: CNPPID Reregulating Reservoir. PRRIP – ED Office Final. April 22, 2010. [↑](#footnote-ref-4)
5. CNPPID Reregulating Reservoir Scoring Recommendation. PRRIP – ED Office Final. May 12, 2010. [↑](#footnote-ref-5)
6. PRRIP Governance Committee Meeting Minutes. June 8-9, 2010. [↑](#footnote-ref-6)
7. No-Cost Net Controllable Conserved Water Recommended Score and Scoring Analysis. PRRIP – ED Office Final. February 23, 2016. [↑](#footnote-ref-7)
8. Pathfinder Municipal Account Recommended Score and Scoring Analysis. PRRIP – ED Office Final. March 17, 2014. [↑](#footnote-ref-8)
9. Update to the Pathfinder Municipal Account Lease Scoring Analysis. PRRIP – ED Office Final. October 5, 2018. [↑](#footnote-ref-9)
10. The annual hydrologic condition is based on a ranking of annual flow volumes at the Grand Island gage for the period 1947-1994. Using methods developed by USFWS, years with annual flow volumes in the bottom 25 percent (12 of 48 years) are designated as “dry” years, the top 33 percent (16 of 48 years) are designated as “wet” years, and the middle 42 percent (20 of 48 years) are “normal” years. [↑](#footnote-ref-10)
11. Target flows in “average cfs” were summed on a monthly basis and converted to acre-feet as a monthly target flow volume in the scoring model. [↑](#footnote-ref-11)
12. The WMC Loss Model was first developed by the Water Management Committee as part of the Water Conservation/Supply Reconnaissance Study (Boyle et al. 1999, Chapter 7 and Appendix E), covering the period 1975-1994. The model period was updated to include 1995-2006 as part of the Water Management Study, Phase I (Boyle 2009). Use of the WMC Loss Model for routing in WAP project score analyses was approved by the GC in 2010 (GC Meeting Minutes, June 2010). [↑](#footnote-ref-12)
13. The 1997 Platte River Cooperative Agreement states that the “…three [state] projects together will provide an average contribution of 70,000 acre-feet toward the first increment objective of reducing shortages to target flows…” Later, in the 2005 Water Plan Reference Materials (Program Document, Attachment 5, Section 11, Appendix B), it states that “…the initial Program projects…were evaluated and determined using the [Central Plate River OPSTUDY] Model during NEPA review to provide an average reduction in shortage of 80,000 acre-feet per year. The shortage reduction assigned to each project individually has not been determined (at this time)…” In the Program Document description of the Tamarack I project (Attachment 5, Section 3), it is stated that “…Tamarack I is estimated to develop an average annual yield of at least 10,000 acre-feet during times of target flow shortages…” Although there is no known documentation explicitly stating so, it is assumed by the EDO that if the three state projects collectively provide 80,000 AF of shortage reduction, and Tamarack I provides 10,000 AF of shortage reduction, then the Pathfinder EA and Lake McConaughy EA together provide 70,000 AF of shortage reduction. [↑](#footnote-ref-13)
14. The analyses to estimate project-related shortage reductions were performed using the Fortran77-based Central Platte River Model (OPSTUDY8) in the late 1990s to early 2000s, and the resulting project scores were a product of both modeling and negotiations. Fifteen or more years later, these model runs cannot be readily reproduced or modified to accommodate the added contributions of individual WAP projects. [↑](#footnote-ref-14)
15. Previous score analyses also considered a “shortage distribution” release pattern, in which proportional EA releases are made in all months of the year having shortages at Grand Island, as calculated from OPSTUDY hydrology. For the 2018 update to the Pathfinder Municipal Account Lease score analysis, the “spring release” pattern was deemed the most realistic, and the assumption is carried forward here. [↑](#footnote-ref-15)
16. In the original 2014 Pathfinder Municipal Account Lease score analysis, this was identified as the “annual pattern” scenario. Two other scenarios were evaluated in that analysis but found to “…not produce significantly different results.” In subsequent score analyses for the No-Cost NCCW in 2016 and an update for the Pathfinder Municipal Account Lease in 2018, only the “annual pattern” was carried forward in conjunction with the “spring release” scenario. [↑](#footnote-ref-16)
17. Dave Ford, CNPPID Irrigation Operations Manager, personal email communications, April 8, 2019. [↑](#footnote-ref-17)
18. 5/48 = 0.1042, or 10.42 percent, thus 5 years being the closest integer value to 10.26 percent of 48 years. [↑](#footnote-ref-18)
19. Dave Ford, CNPPID Irrigation Manager, personal email communication, April 8, 2019. [↑](#footnote-ref-19)