Appendix 2

Water Offset Options Group Documentation Report

Water Offset Options Group (WOOG) Documentation Report

**Report on Research and Evaluation Efforts
by the Water Offset Options Group for
the Carlsbad Project Water Operations
and Water Supply Conservation NEPA Process**

July 2005 Final Draft

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1. Introduction

This work plan was developed to document past efforts by the Water Offset Options Group (WOOG) for the ongoing Carlsbad Project Water Operations and Water Supply Conservation Environmental Impact Statement (Carlsbad Project EIS). The purpose of and need for the Carlsbad Project EIS as stated in the Federal Register Notice of Intent was "The purpose of Reclamation's proposed federal action is to conserve the Pecos Bluntnose shiner, a federally threatened fish species, and to conserve the Carlsbad Project water supply. The underlying need for Reclamation action is compliance with the Endangered Species Act and Reclamation's responsibility to conserve the Carlsbad Project water supply."

The WOOG's role in impact analysis for this EIS is limited; although given the variety and complexity of proposed offset and supplemental water sources, a thorough documentation of past efforts and planning for future efforts in the WOOG is warranted. Sections 1 through 10 of this document outline analyses and actions taken by the WOOG.

1.1. WOOG Purposes

The WOOG's primary purpose was to gather information and evaluate possible offset options to projected depletions to the Carlsbad Project Water Supply. These depletions are expected to arise from the modified operations at Sumner Dam of bypassing inflows to augment stream-flow for the Pecos Bluntnose Shiner (PBNS). The bypassing of inflows through Sumner Reservoir is expected to generate additional or "net" depletion components. The first component arises from the reduced transmission efficiency of low-flow bypasses through the reservoir as opposed to high-flow block releases. The second component arises from block release durations limited to 15-days, which also decreases the efficiency of water transmission in the Pecos River.

A recent secondary purpose identified by the EIS team is direct water acquisition for augmenting river flows to benefit the PBNS. Currently, when water is needed for augmenting stream flow, inflows are bypassed through the reservoir. However, inflow water is not always available for bypass since the supply is dependent on upstream conditions. Since instream flow demands may not coincide with the availability of inflow water for bypass, additional water supplies may be required to conserve the shiner. These supplies are termed additional water acquisition (AWA).

Finally, the WOOG is responsible for providing guidance in the selection process for offset and direct water acquisition choices. Because purely objective analyses of each offset option is difficult, the WOOG attempted to fairly and equitably evaluate options with several evaluation tools.

1.2. WOOG Carlsbad Project Supply Offset Options

Twenty-four possible water sources were suggested as offset options prior to WOOG research and evaluation, and two options were added during the research process. The options, along with a brief description of each option, are shown in Table 1.

Table 1. Water Offset Options for Depletions to Carlsbad Project Supply

Option Desig.	Option Name	Option Description
A	On-Farm Conservation	Improve irrigation efficiency and subsequently reduce diversions in the three major districts: FSID, PVACD or CID. Anticipates agreements with irrigation districts or land owners to release saved water to the river or CID in exchange for USBR payment for conservation measures.
B	Drain Construction/Renovation	Renovate drains in PVACD to augment return flows. Probably would only produce a one-time volume of drain water.

Table 1. Water Offset Options for Depletions to Carlsbad Project Supply

Option Desig.	Option Name	Option Description
C	Hernandez Idea/Plan	Recirculate water between mouth of Hondo and Acme.
D	Water Right Purchases	Buy water rights and retire in place: FSID, PVACD, or CID.
E	Water Right Leases	Lease water rights (fallow land) in FSID, PVACD, or CID.
F	Riparian Vegetation Control	Eradicate and control exotic vegetation growth, such as Salt Cedar and Russian Olive, in the riparian corridor.
G	Acequia Improvements	Improve acequia irrigation efficiency (such as Puerto de Luna and Anton Chico acequias)
H	Pump Supplemental Wells	Pump CID supplemental wells for offset water
I	Import Canadian River Water	Import Canadian River water by building a trans-basin diversion between Conchas and Santa Rosa. Water would be supplied by saved irrigation losses from lining the Arch-Hurley canal. Contract with district for transport of saved water form Canadian Basin
J	Reservoir Entitlement Storage	Increase upstream reservoir (Santa Rosa and Sumner) conservation storage limits to save on evaporation.
K	Desalination	Build desalination plant with new technology (reverse osmosis and ion exchange) to convert brackish groundwater supplies and augment river flows.
L	Change Cropping Patterns	Change cropping patterns to crops that use less water in exchange for crop subsidy. Agree with water district or landowner for payments in lieu of crop revenue and releases of saved water
M	Lower Groundwater Levels	Lower groundwater levels in the old McMillan delta area to reduce evaporation through capillary rise and plant transpiration which in turn will augment streamflow.
N	Range and Watershed Management	Eradicate mesquite and juniper from range areas tributary to river to increase river base flows. Also, thin upland forest areas (in the Sacramento Mountains) to increase mountain front recharge.
O	Cloud Seeding	Seed clouds in the Sacramento or Sangre de Cristo mountain ranges to augment precipitation.
P	Groundwater Recharge/Conjunctive Use	Use groundwater and surface water conjunctively to increase river flows over the short-term, and increase aquifer storage to supplement river base flows over the long-term.
Q	Well Field Development	Develop well field in aquifer to augment river flows.
R	Rio Hondo Flood Control	Route flood flows on the Rio Hondo to augment surface water supply.
S	Additional Metering	Additional enforcement of water right limitations on diversions and pumping to discourage over-use.
T	Evaporation Suppression	Suppress evaporation on the major reservoirs.

Table 1. Water Offset Options for Depletions to Carlsbad Project Supply

Option Desig.	Option Name	Option Description
U	Fort Sumner Area-Gravel Pit Pumping	Pump water to the Pecos River from abandoned gravel pits in the Fort Sumner area.
V	Kaiser Channel Lining	Line the Kaiser channel to save on seepage losses through the reach from Artesia to Kaiser.
W	Import Salt Basin or Capitan Reef Water	Import water from the Salt Basin or from the Capitan Reef.
X	Flash Distillation (Desalination) Power Plant	Build a flash distillation (gas-fired) power plant to desalinate brackish water; use electric sales to offset cost of distilling water.
Y	Treat Oil Field Waste Water	Treat brackish by-product water as a result of oil production; pump to river to augment supply.
Z	Renegotiate Compact-Forbearance	Renegotiate compact terms to enable purchase of water rights from farmers in the Red Bluff Irrigation District.

1.3. WOOG Evaluation Tools – A Brief Overview

WOOG evaluation tools discretized quantitative parameters, such as cost and amounts available, from qualitative, more subjective parameters such as sustainability or risk. The evaluation tools were centered on evaluation parameters. Evaluation parameters considered to evaluate offsets for CID project supply include cost, supply flexibility, salvage risk, political/social/institutional risk, amount available, proximity to CID, sustainability, time to implement, time to realize, and state-line effects. Evaluation parameters for additional water acquisition are identical except proximity to CID is replaced with proximity to the upper critical habitat for the PBNS. These evaluation parameters evolved from iterations between development of the tools and input from WOOG group members.

1.3.1. Documentation Matrices

Qualitative evaluation parameters, which include cost, variable supply, amount available, proximity, time to implement, and time to realize, are tracked in *documentation matrices*. The matrices contain both the quantitative data and cost estimates derived from report research by WOOG members. Parameters and calculations in the documentation matrix for the offset of Carlsbad Project Supply are discussed in detail in Section 3. Parameters and calculations in the documentation matrix for additional water acquisition to augment instream flows are discussed in detail in Section 8.

1.3.2. Ranking Matrices

Ranking matrices contain both qualitative evaluation parameters, which include salvage risk, political/social/institutional risk, sustainability, and state-line effects, and quantitative parameters. Quantitative parameters are ranked indirectly through *ranking criteria*, which translate quantitative ranges in the documentation matrix to ranking values on a 0 through 5 scale in the ranking matrix. Qualitative parameters are ranked directly on a 0 through 5 scale using the ranking criteria for each evaluation parameter as a framework. Ranking criteria and the ranking matrices are also discussed in detail in Section 3.

1.3.3. Option Forms

Option forms were later added to the documentation process, and provided an extension to the documentation. Most reports contained sufficient information about possible water sources to formulate an estimate for the more quantitative parameters, but assumptions were needed to properly evaluate the options. One sheet in each option form tracks these economic assumptions. Also included in the option form is a second sheet providing a brief synopsis of how the option would be implemented and any assumptions associated with that implementation. Assumptions for implementation assisted evaluation and ranking, which is also documented on the synopsis sheet. Additional discussion on option form sheets as they relate to documentation and ranking matrices for offset and additional water acquisition is found in Sections 3, 4, 8, and 9.

2. Economic Equivalence Considerations

In order to properly evaluate the cost of water for offset or additional acquisition options that have different service lives, different capital investments, and different annual operation costs, the time-value-of-money or *engineering economy* of the options must be analyzed. Engineering economy assumes that the option will be paid for by securing debt, which is a mechanism for spreading the cost of a large capital investment. Within the subject of engineering economy is the notion of *equivalence*. Steiner defines equivalence as, "…the equality of different sums considered at different times.(1996)"

2.1. Engineering Economy Calculations

Primarily, four time-value of money formulas were used to translate present and future costs into equivalent uniform annual costs. These formulas included: the single payment compound amount factor, the single payment present worth factor, the uniform series present worth factor, and the capital recovery factor. The equations are presented below:

$$F = P(1+i)^N$$ Eq. 1 Single Payment Compound Amount Factor

$$P = F\left(\frac{1}{1+i}\right)^N$$ Eq. 2 Single Payment Present Worth Factor

$$P = A\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right]$$ Eq. 3 Uniform Series Present Worth Factor

$$A = P\left[\frac{i(1+i)^N}{(1+i)^N - 1}\right]$$ Eq. 4 Capital Recovery Factor

In the preceding formulas, *P* represents present worth in year 0 (the end of the payment period preceding the first accounting period for the investment), *F* stands for future worth of an investment, *A* represents uniform series payments per period for the life of the investment, *i* represents the interest or planning rate for financing the investment, and *N* represents the number of payment periods or the time in between present and future worth.

2.2. Equivalent Uniform Annual Series for a WOOG Option Single Life-Cycle

Each water option is investigated initially on a single life-cycle basis. For the purpose of simplicity, all payment periods are assumed to be annual, and project life is the number of payments over the life of the investment. Using equations 2 and 3, future payments, whether lump-sum or uniform annual, are translated back to present worth dollars and then summed into a total present worth. This total present worth was then converted into an *equivalent uniform annual cost*, EUAC, using the capital recovery factor (Eq. 4). One series of future lump-sum and annual payments translated into EUAC, using annual payment periods and the project life, comprises one project life cycle. A brief example for a hypothetical water option, water option A, follows.

Water option A is a 15-year investment that costs $10,000 upfront capital and $1,000/year operation and maintenance costs. The disbursements in a single life-cycle for Option A are shown graphically in Figure 1.

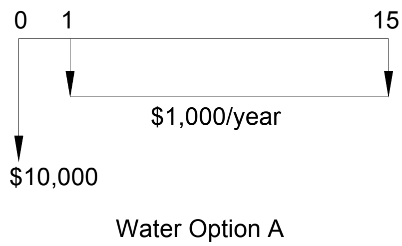

Figure 1. Disbursement Schedule for Water Option A.

The large arrow pointing down represents the initial capital investment. Initial capital investments are typically made before any other payments on the project are made. An initial capital investment is analogous to the down payment on a car or a house. Within the timeline, the initial capital investment is represented in *year 0*, which is a distinction arising from the payments being made at the end of the payment period rather than the beginning. Year 0 is the end of the year *before* the year the first payment is made on the investment (year 1). The two arrows pointing down with the line drawn in between the points of the arrows represents the annual operation and maintenance costs at $1,000/year. The horizontal line connecting all the arrows represents time over the life of the investment from year zero to year fifteen.

In order to convert this disbursement schedule into an EUAC, we must use one of the formulas in the previous section. The interest (or planning) rate of 10% completes the needed unknowns. Since there are two different approaches to computing EUAC for the given project life-cycle, this example will demonstrate them both.

The first method converts the annual series to present worth, and then sums that value with the initial capital investment to compute the *total net present value* of the investment. Finally, the total net present value is then converted to an equivalent annual series. For the first calculation, Eq. 3, the uniform series present worth factor, is used. The total net present value is equal to $10,000 + $1,000 (1.1^15-1)/(.1*1.1^15) = $17,600. For the second calculation, converting the total net present value to an equivalent annual series, Eq. 4, which is the capital recovery factor, is used. The equivalent uniform annual series for this investment is equal to $17,600*(.1*1.1^15)/(1.1^15-1) = $2,310. The graphical depiction of the conversion from the original investment schedule is shown in Figure 2.

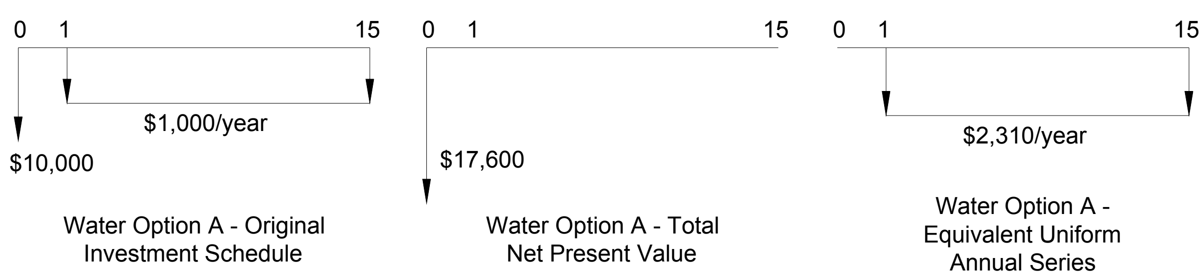

Figure 2. Converting Water Option A's Investment Schedule to an Equivalent Uniform Annual Series using Total Net Present Value.

Alternatively, the initial capital investment could be directly converted to an annual series and then combined with the two annual series. The equivalent uniform annual cost of the $10,000 capital investment is computed using Equation 4, the capital recovery factor. The calculation follows as $1,000 + $10,000*(.1*1.1^15)/(1.1^15-1) = $2,310 (per year).

2.3. Equivalent Project Life vs. EUAC

Originally, water offset options were to be compared using "equivalent project life" (USBR, 2003). After consideration for infinite replacement of a given water offset option, "equivalent uniform annual cost" or EUAC was used instead of equivalent project life (Piper, 2003).

Consider the following example. Option A produces 100 acre-ft/year. In other words, Option A has an equivalent uniform annual benefit of 100 acre-ft/year. Figure 3 shows the equivalent uniform annual cost and benefit diagrams for the life-cycle of Option A.

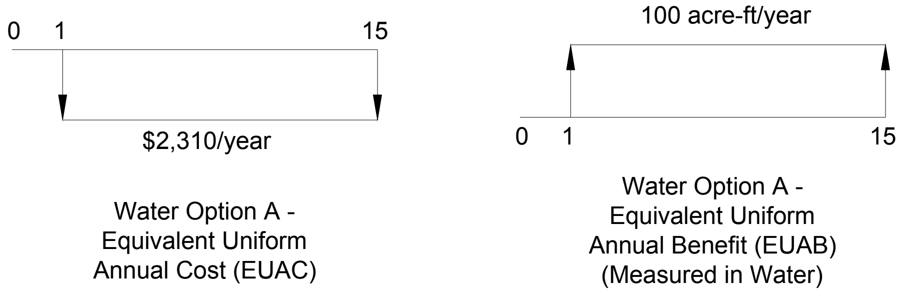

Figure 3. Equivalent Uniform Annual Costs and Benefits for Water Option A.

Water Option B produces 200 acre-ft/year, while costing $20,000 of initial capital with $1,000 per year of operation and maintenance costs. Option B has a service life of 10 years. Calculating the EUAC, again with Equation 4—the capital recovery factor, yields $1,000 + $20,000*(.1*1.1^10)/(1.1^10-1) = $4,250 (per year). Figure 4 shows the equivalent uniform annual cost and benefit diagrams for the life-cycle of Option B.

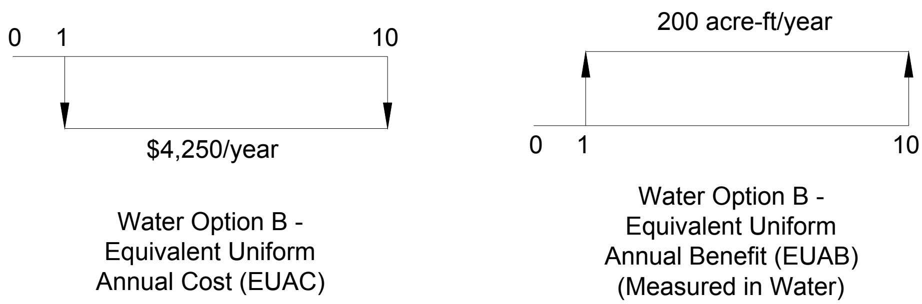

Figure 4. Equivalent Uniform Annual Costs and Benefits for Water Option B.

Given the two options and their various parameters, which option is the most economical? First, equivalent project life will be used to show which option is the most economical. 10-years will be the equivalent project life. This means that Option A must be translated into a 10-year project life. First, the annual series is converted to present worth using the uniform series present worth factor—Equation 3. The previous result was $17,600. Converting this to a 10-year annual series requires Equation 4, which yields $17,600*(.1*1.1^10)/(1.1^10-1) = $2,860 (per year). The benefit must also be translated to be equivalent to the 10-year project life. This requires assigning an arbitrary dollar value for the benefit of water. For this exercise, the benefit will be $100/acre-ft. Multiplying $100/acre-ft by the amount of water (100 acre-ft/year) yields an equivalent uniform annual benefit (EUAB) of $10,000/year. Converting the uniform annual benefit to a total net present benefit requires the uniform series present worth factor, and yields $10,000*(1.1^15-1)/(.1*1.1^15) = $76,100. Converting the total net present benefit to the equivalent project life, using the capital recovery factor, yields $76,100* (.1*1.1^10)/(1.1^10-1) = $12,400 (per year). The benefits of Option B must still be converted to dollars. Using the assignment of $100/acre-ft, Option B has an EUAB of $20,000.   Figure 5 graphically depicts the conversion of Option A's 15-year cost life-cycle to a 10-year cost life cycle. Figure 6 shows the transformation of Option A's 15-year benefit life-cycle to a 10-year benefit life-cycle.

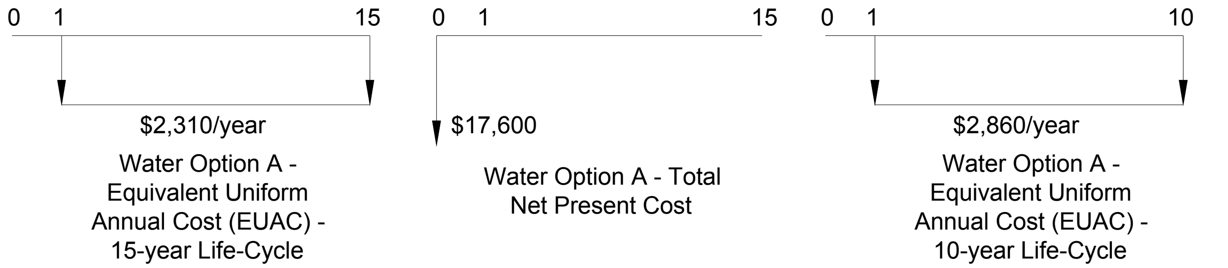

Figure 5. Conversion of Option A's 15-year cost schedule to a 10-year schedule.

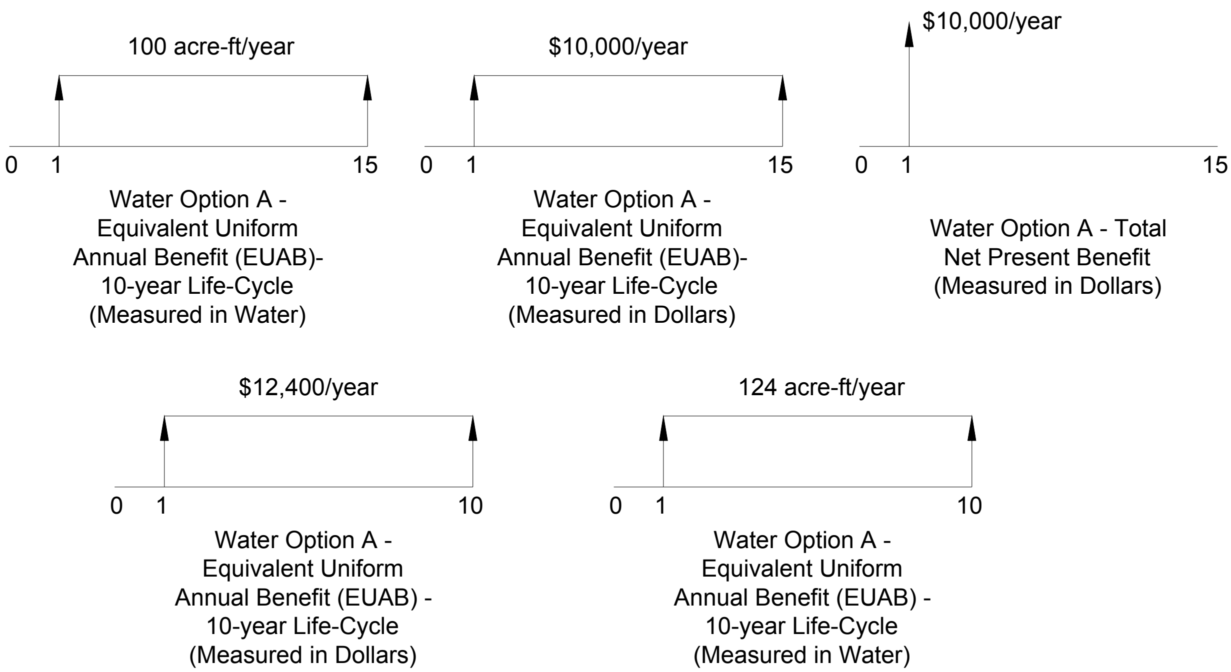

Figure 6. Conversion of Option A's 15-year benefit schedule to a 10-year schedule.

Since both series' costs and benefits are now in a 10-year cycle they can be directly compared. Figure 7 shows the 10-year life-cycle costs and benefits of Options A and B with final annual costs reduced to dollars per acre-ft.

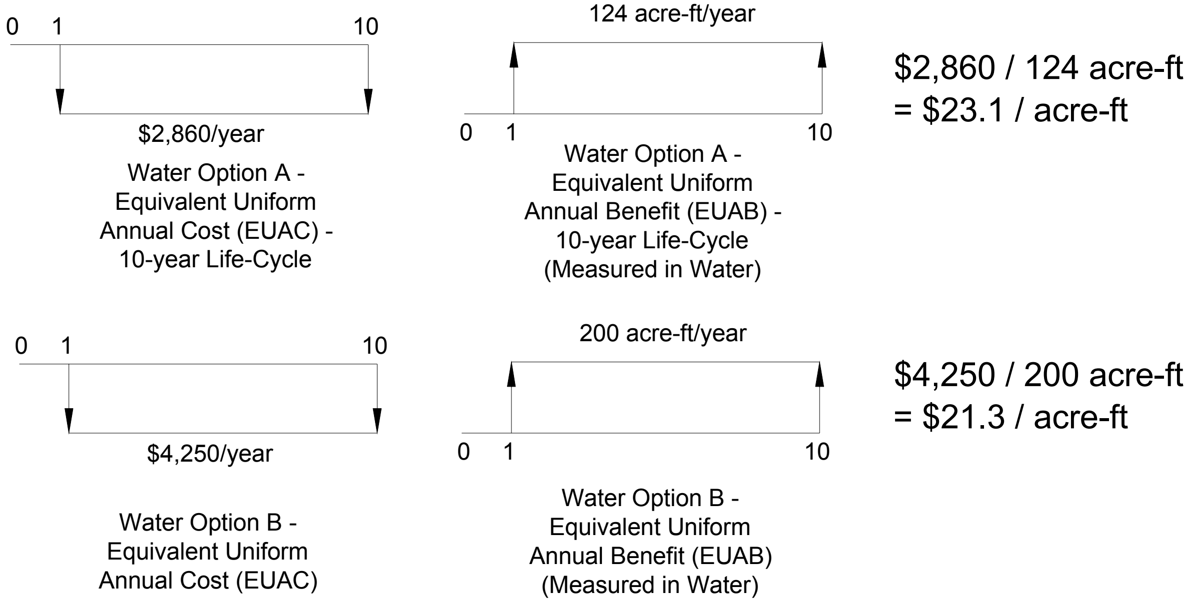

Figure 7. Comparison of Water Options A and B, with final dollar per acre-ft unit costs.

An alternative methodology to using equivalent project life, is direct use of unit costs developed from EUAC. Returning to Figures 3 and 4, and computing the final per-unit cost of Option's A and B arrives at the same result as shown in Figure 7. Option A, from figure 3, has and EUAC of $2,310/year, a benefit of 100 acre-ft/year; and a unit cost of $23.1 per acre-ft; precisely what is shown in Figure 7. Similarly, from Figure 4, Option B has an EUAC of $4,250/year with a benefit of 200 acre-ft/year. The unit cost for Option B is $21.3/acre-ft, which is equal to the amount shown in Figure 7. From this demonstration, it is clear that the concept of equivalent uniform annual cost serves to determine the unit cost of the water resource, and does not require additional economic considerations for project life. From an analytical standpoint, conversions using an equivalent project life can distort benefits. Option A yields 100 acre-ft/year; however, when Option A is translated to a 10-year cost cycle its *representative* benefit is 124 acre-ft/year. This does not mean that Option A can produce 124 acre-ft/year.

2.4. Infinite Replacement

Considering the purposes and needs of this EIS, it is probable that water offsets must be permanent solutions. This permanent solution implies infinite replacement will be needed for any type of water option. Since it was demonstrated that EUAC is just as resilient as alternative methods in determining the final unit cost of water, EUAC will be used again for infinite replacement. Consider the diagram shown in Figure 8. Option A's life-cycle is now repeating through time.

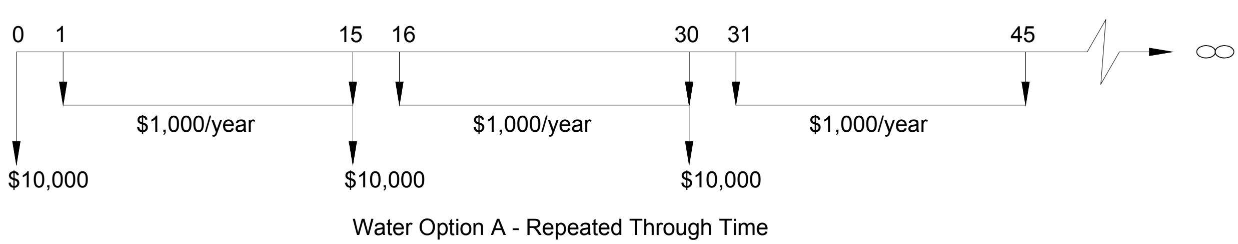

Figure 8. Water Option A costs repeated through time.

The total net present cost of the first life-cycle of Option A in year zero is $17,600. What about the cost of the second life cycle at the beginning of year 16? Again using the uniform series present worth factor, the second life cycle cost at the beginning of year 16 is equal to $10,000 + $1,000*(1.1^(30-15)-1)/(.1*1.1^(30-15)) = $17,600. The second life-cycle cost at the beginning of year 16 is equal to the first life-cycle cost in year zero. The third life-cycle cost at the beginning of year 31 is also equal to the first life-cycle cost in year zero. Figure 9 shows the repeating life-cycle costs for Option A with the costs transformed into equivalent uniform annual costs. Figure 10 shows the repeating life-cycle benefits for Option A, which are already an equivalent uniform series.

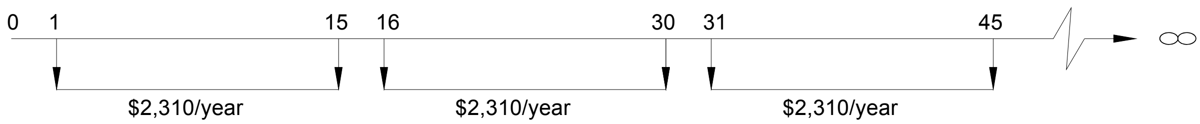

Figure 9. Water Option A – EUAC Repeated Through Time.

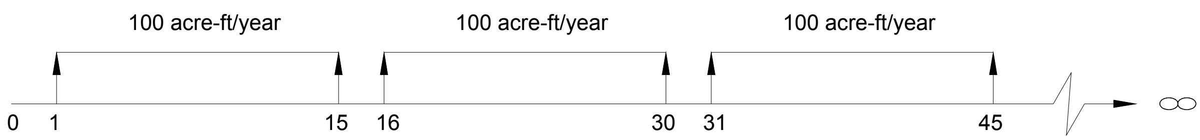

Figure 10. Water Option A –EUAB Repeated Through Time

Looking at both figures, it is apparent that in any given year the cost of the option is $2,310 and the benefit is 100 acre-ft/year. Again, the unit cost is $23.1/acre-ft.

The preceding sections both demonstrate that simply calculating the unit-cost of water from the equivalent uniform annual cost, which is derived from the original disbursement schedule for the option, will account for both the unequal service lives of different options and the infinite replacement of those options.

2.5. Inflation

Inflation is considered in the formulation of the government planning rate for water projects. Classical economic analysis implementing the inflation rate with the current interest rate for investment was not performed for this reason.

3. WOOG Documentation Matrix for Offsetting Depletions to Carlsbad Project Supply

The matrix is the primary tool utilized by the WOOG in their evaluation of alternative water sources. The WOOG utilizes four matrices for their documentation, screening and sorting efforts. Two matrices are for documentation, screening and sorting of CID offset options and two matrices are used for looking at additional water acquisition options. This section covers the CID offset option elements and economic analyses as documented in the *CID Offset Documentation Matrix*. This matrix is shown in Appendix A as Table 1.

3.1. Research, Investigation, and Central Documentation of Offset Options

The first step in the WOOG's ranking of offset options was research by group members. Research tasks addressing each of the options shown in Table 1 were assigned to WOOG group members. Most group members wrote summary reports or memoranda presenting pertinent information concerning each option.

Alternatively, some group members assembled the research and provided it directly to the WOOG to formulate estimates and document the information. Report parameters were assembled and centrally documented in the CID Offset Documentation Matrix, which is discussed in the next section.

3.2. CID Offset Documentation Matrix Parameter Summary

The CID Offset Documentation Matrix contains several different parameters. Some of the parameters were merely used for documentation while other parameters are used throughout the ranking process. Occasionally parameters were listed on the documentation matrix but were not used since they were less quantitative in nature. These parameters were retained for completeness and as a placeholder for any quantitative information that became available. Parameters contained in the WOOG ranking matrix include:

- **ID:** Arbitrary identification code for each primary option set (letters) and subsets (numbers).
- **Description:** Short descriptive name for the option.
- **Lead Reviewer:** Lead researcher for exploring logistics of options. Responsible for getting sufficient information to the WOOG for the option to be ranked or eliminated.
- **EUAC:** Equivalent Uniform Annual Cost ($/year) for the given option. Derived from upfront capital cost, operation and maintenance cost, government planning rate (interest rate), project life, and amount available.
- **Supply flexibility:** Qualitative parameter; column in documentation matrix was left as placeholder for completeness. Actual timing ranking is performed in the ranking matrix.
- **Salvage Risk:** Qualitative parameter; column in documentation matrix was left as placeholder for completeness. Actual salvage risk ranking is performed in ranking matrix.
- **Political, Social, Legal, and Institutional Risk:** Qualitative parameter; column in documentation matrix was left as placeholder for completeness. Actual political risk ranking is performed in the ranking matrix.
- **Amount Available:** Estimated volume amount per year (acre-ft/year), at the source, that the offset option is projected to generate.
- **Proximity to CID:** Documents river distance (by total river mile) from CID.
- **Sustainability:** Qualitative parameter; column in documentation matrix was left as placeholder for completeness. Actual sustainability ranking is performed in the ranking matrix.
- **Time to Implement:** Amount of time needed (years) to resolve all legal, financial, and infrastructure related issues.
- **Time to Realize:** Time between completion of the project (end of time to implement) and the actual realization of offset water.
- **Willing Seller:** Originally derived for water right purchases and land retirement; willing seller indicates that the water rights were not condemned by a governmental entity. Since it was determined that only willing sellers would be considered this categorization became moot. WOOG options with a "NO" entry for willing seller are not viable options.
- **Upfront Capital Cost:** The amount of money needed at the start of the investment ($). All initial capital investments are considered to start at the beginning of the first year (also termed year zero). Used to compute total net present value of options, and subsequently used to compute EUAC. See Section 2 for further information on engineering economy calculations.
- **Operation & Maintenance:** Annual investment costs ($/year) for the option. Includes more than O&M for some options such as power generation and tax credits. Used to compute total net present value of options, and subsequently used to compute EUAC. See Section 2 for further information on engineering economy calculations.
- **Project Life:** The life of the project (years) before replacement is needed.
- **Total Cost (NPV):** The total net present value (in year zero) of the option including all upfront capital costs, annual maintenance costs, and any other costs or benefits associated with the option. See Section 2 for further information on engineering economy calculations.
- **Parameter Comments:** Used to note variations of some parameters, pertinent assumptions made about the option, or notes concerning elimination of the option.

In addition to the parameters categories, the documentation matrix also contains some parameter color coding. Table 2 shows the final color coding for the parameter entries of the CID Offset Documentation Matrix. Mr. Phil Soice of Southwest Water Consultants, and Mr. Tomas Stockton of Tetra Tech, Inc. were responsible for assembly, analysis and estimation of any parameters for the CID Offset Documentation Matrix; subsequently, their names are reflected in the color legend for estimated parameters.

Table 2. CID Offset Documentation Matrix - Color Legend

	-Base Parameter from report/investigation/or derived from alternative source
	-Parameter estimated by Stockton
	-Original costs annualized with 5.875% planning rate to reflect time value of money by Stockton
	-Options eliminated
	-Subjective parameter-not determined in this matrix.
	-Parameter estimated by Soice

In addition to the color coding for parameter estimation, option elimination, or engineering economy calculation, coding was established for the more qualitative parameters that were not used in the matrix, but were left in for consistency.

3.3. Sub-categories of Offset Options

Original offset options were divided into sub-categories to evaluate different input parameters that are associated with the option. For example, on farm conservation could be implemented in a number of places including the Fort Sumner Irrigation District (FSID), the Pecos Valley Artesian Conservancy District (PVACD), or CID itself. Each of these inputs was divided into sub-categories since differing irrigation districts would affect input parameters such as proximity to CID and amount available. A brief description of options containing sub-category options and why they were divided follows:

- **On Farm Conservation (A):** Differing irrigation districts have different proximities to CID and also have different amounts available based on irrigated acreage.
- **Canal Refurbishing (B):** Two irrigation districts have canals. Multiple input parameters include proximity to CID and amount available.
- **Hernandez Idea (C):** Multiple flow rates for pump operation leads to different costs and amounts to recirculate.
- **Water Right Purchase (D):** Water right purchase options contain two tiers of sub-categories. The first tier is options that have projected prices based on time regression of prices from the 1990's. The second tier are options that are additionally inflated (after the time regression) by 40%; these options are indicated with an "X" following their designation. Also, water right purchase options are divided by district, and type (surface, shallow groundwater, and artesian groundwater), which affects the amount available for each sub-category option.
- **Water Right Lease (E):** Water right lease options are divided by district and type (surface, shallow groundwater, and artesian groundwater), which affects the amount available for each sub-category option.
- **Riparian Vegetation Control (F):** Three subsets were studied including removing Salt Cedar, replacing Russian Olive trees with Cottonwood trees, and replacing Kochia weed on the old McMillan delta with rye grasses. All of these sub-categories contained variations in almost every category.
- **Desalination (K):** This option contained two different assumptions for feed water total dissolved solids. The first sub-category assumes normal brackish range TDS (~10,000 mg/L) while the second assumes feed water closer to the salinity of ocean water TDS (~35,000 mg/L).
- **Change Cropping Patterns (L):** Cropping pattern changes were all applied to the CID, but were split into different sub-categories using the input parameters from three different replacement crops or the average cost of all three replacement crops. The available amounts for these crops types were later revised since original saved amounts used a large total farm diversion per acre (4.5'/acre) that included water stacking practices within the CID. It was anticipated that these stacked water amounts over the full allotment (3.7'/acre) would not be available as saved water. Subsequently, the numbers

were reduced and the crop names were relabeled to relative crop water use amounts. This change is only reflected in the final WOOG lists developed for ranking. Other related WOOG media including the ranking process itself were not revised to reflect this change since it was considered inconsequential to the ranking process.

- **Range and Watershed Management (N):** This option was split into two tiers of sub-categories. The first tier distinguished range and watershed management in the lower watershed, such as management of vegetation in the adjacent uplands to the Pecos River, from upper watershed management, which is the management of the forest in the headwaters of the Pecos River or the headwaters of the Rio Hondo. The second tier divisions depend on the sub-category for the first tier. Lower watershed management recognized range divisions indicated by the researcher for salvage (upper, lower, and average amounts available) and upper watershed management was split into the range of costs associated with it (upper limit costs, lower limit costs, and average costs).
- **Develop Well Field (Q):** Well field development was split into two sub-categories depending on the location of the well field, which ultimately affected cost parameters.
- **Evaporation Suppression (T):** This option was also divided into two tiers of sub-categories. The first tier divided new evaporation suppression methods from old evaporation suppression methods, which varied in cost. Additional sub-categories were then created for the aggregate of all the reservoirs, and for the individual reservoirs: Santa Rosa, Sumner, and Brantley.
- **Desalination/Cogeneration Power Plant:** This option was divided into nine categories with three tiers to provide adequate perspective on the energy prices inherent with the option. The first tier analyzed water production without any power sales, the second tier examined water production coupled with power sales to the industrial sector, and finally the third tier examined water production coupled with power sales to all sectors. Each tier contains three sub-categories. The first sub-category uses energy prices from 2002. The second sub-category uses energy prices from the past three years and the third sub-category uses energy prices from the last 10-years.
- **Oil Field Production Well Wastewater:** This option contained two sub-categories for finished (product) water TDS. One assumes more rigorous treatment of the water with product water TDS less than 500 mg/L while the other assumes product water TDS less than 5000 mg/L.

The WOOG investigated a total of 80 combined categories and sub-categories of options.

3.4. Quantitative Data in the Offset Option Forms

In addition to storing summary quantitative data in the documentation matrix, detailed quantitative data are also stored in the option forms. The second sheet in the each option form is the EUAC computation sheet which lists data from the original research report along with any assumptions in the analysis. Figure 1 is a copy of the second page of the option form showing the different elements incorporated. The following fields are included on the EUAC computation sheet of the options forms:

- **Option Designation:** Option letter and sub-category number of the option.
- **Option Name:** Short descriptive name for option (same as “description” in documentation matrix).
- **Principle Investigator:** WOOG member responsible for memorandum or research concerning option.
- **EUAC:** Equivalent uniform annual cost (in dollars per acre-ft) of the option as calculated using the engineering economy principles discussed in Section 2.
- **Initial Capital Cost in year 0:** Initial capital cost (in dollars) of the option at the beginning of the first year (year 0).
- **O & M Costs:** Any annually recurring costs (in dollars) associated with the option.
- **Project Life:** The total time (years) the project will last before it requires complete replacement (new capital investment).
- **Discount Rate:** The planning rate used by the Bureau of Reclamation for water projects; currently the rate is 5.875%.
- **Total Present Worth:** The total amount of money the project is worth (in dollars) if all of the investment is considered in year zero.
- **Notes and Reference Numbers:** Contains data from research and reports along with any assumptions made for EUAC calculation.

Water Offset Options Group (WOOG) Option Processing Form

Option Designation:	Y-2
Option Name:	Oil Field Production Well Waste Water-High TDS
Principle Investigator:	Sims
General Location:	Vicinity of Brantley Reservoir
River Mile Location:	close to 469
Water Salvage Amount (acre-ft/year):	9030
EUAC ($/acre-ft):	$1,687.17
Initial Capital Cost in year 0:	$ 31,599,000
O & M costs: ($ each year-over project life)	$ 7,879,000
Project Life: (years) (before replacement is needed)	10
Discount Rate: (fixed for all options)	0.05875
Total Present Worth: ($ in year 0)	$89,934,105.94

Notes and Reference Numbers:

Total Capital Cost: $14,315,000 raw water pumping and piping; $5,646,000 residual disposal; $11,638,000 delivery system to Pecos below Brantley Dam

Annual O&M: $480,000 raw water pumping and piping; $6,429,000 residual disposal; $970,000 delivery system operation costs

Additional $1342/acre-ft treatment cost.
$1000/acre-ft tax credit

Figure 11. WOOG Option Processing Form—EUAC Computation Sheet

4. WOOG Ranking Matrix for Offsetting Depletions to Carlsbad Project Supply

The CID Offset Ranking Matrix is the final tool in the documentation and ranking process. Certain Offset Options were truncated prior to ranking due to a need and desire to limit the analysis to those options that reasonably provide the needed offsets. Quantitative parameters are translated into ranks from the documentation matrix using ranking criteria. Qualitative parameters are ranked directly using the guidance of the ranking criteria. The following sections explain the CID Offset Ranking Matrix and its components, including truncated option and both qualitative and quantitative ranking criteria. In addition, the following sections give a history for the ranking process of CID offset options along with a description of the ranking sheet portion of the option forms.

4.1. Truncated Options

Ten Offset Options were truncated after preliminary investigation of their merits and were not further analyzed. These options were duplicates of other options, options without offset capabilities or options that did not meet offset needs. Options B, C-1, C-2, C-3, C-4, G, J, M, P and R were truncated from receiving further analysis. Option B, renovation of drains in the Roswell Area, was eliminated from further consideration because private water rights to drain water exist, and it is questionable if the supply could be sustained. It appeared that the water supply may have been a relatively small one-time volume of water and that the water source may not be continuous. Option C-1, C-2, C-3 and C-4 were variations on an option to re-circulate water in the Pecos River to create flow for the shiner. This option actually causes depletion of Pecos River flows and does not offset depletions. These options were forwarded to the Alternative Development Group for possible consideration as an alternative method of providing water for the shiner. Options M and P included development of groundwater resources as a buffer to the variability of surface water, and were considered duplicative of Options Q-BV and Q-SR which also developed groundwater supplies. Options G and R were projects by the Corps of Engineers that were completed before the end of the EIS and whatever offset benefits that were created were no longer available for implementation. Finally, option J envisioned moving Carlsbad Project storage upstream to benefit from the reduced evaporation at higher elevations. However, it was concluded that permitting new conservation storage was not likely because of compact restraints, and transferring conservation storage upstream caused the lower reservoirs to spill more often because of side inflows to the Pecos River. Losses to spills more than offset the reduced evaporative losses. For these reasons ten,offset options were truncated without further analysis.

4.2. Quantitative Parameters and Ranking Criteria for Offset Options

Quantitative parameters in the ranking process include equivalent uniform annual cost (EUAC), amount available, proximity to CID, time to implement, and time to realize. Each qualitative parameter is also linked to the ranking matrix with ranking criteria. The ranking criteria translate the quantitative numbers from the documentation to a 0 through 5 scale to be inserted in the ranking matrix.

The following tables, Tables 3-7, detail the ranking criteria for the quantitative parameters. Included with the tables is a brief description of how the ranking criteria are applied to the parameters in the documentation matrix in order to translate values into ranks.

Table 3. Cost Ranking Criteria Table

Annual uniform cost per acre-ft available each year.	
Rank	EUAC ($/acre-ft/year), less than or equal to dollar amount:
5	50
4	100
3	500
2	1000
1	2000
0	10000

Table 4. Amount Available Ranking Criteria Table

Greater than or equal to acre-ft/year:	
Rank	Amount (acre-ft/year)
5	20000
4	15000
3	10000
2	5000
1	1000
0	0

Table 5. River Mile Ranking Criteria Table

Based on where on the river the water would be realized or where the outfall would be located if the offset source is not adjacent to the river. Additional criteria addresses effected compact calculations or a downstream location from Avalon Reservoir.		
Rank	River Mile	Description/Other Conditions
5	≤479	Less than or equal to RM 479, on CID, or very near CID lands.
4	≤586	Less than or equal to RM 586 (below Acme)
3	≤709	Less than or equal to RM 709 (below Sumner)
2	≥709	Greater than RM 709 (above Sumner) not subject to compact calculations.
1	≥709	Greater than RM 709 subject to compact calculations.
0	N/A	Below Avalon

Table 6. Time to Implement Ranking Criteria Table

Based on time to resolve all legal, financial, and infrastructure related issues to implement option.	
Rank	Less than or equal to (years):
5	1
4	2
3	5
2	7
1	9
0	Greater than 9

Table 7. Time to Realize Ranking Criteria Table

Time before water is physically realized after offset option is implemented. Measured from end of time to implement.	
Rank	Less than or equal to (years):
5	1
4	5
3	10
2	15
1	20
0	Greater than 20

4.3. Qualitative Parameters and Ranking Criteria for Offset Options

Some ranking parameters were more qualitative. These parameters included supply flexibility; salvage risk; political, legal, social, and institutional risk; sustainability, along with stateline effects. The WOOG structured ranking criteria for these parameters to be as objective as possible; however, the qualitative parameters still were partially subjective.

Tables 8-12 detail the qualitative ranking criteria. Also included with the table is a short description of the purpose of the parameter and how it applies to the ranking of offset options.

Table 8. Supply Flexibility Ranking Criteria Table

Using average offset = 5000 acre-ft or average yield (of the given amount available) and additional merit achieved by having the ability to take 3 times that amount on a planned basis. Based on how much water is available consistently.	
Rank	Timing
5	Provides 3x the average offset amount consistently from year to year.
4	Provides 3x the average offset amount with random yearly timing.
3	Provides average offset amount consistently from year to year.
2	Provides average offset amount with random yearly timing.
1	Provides below-average offset amount consistently from year to year.
0	Provides below-average offset amount with random yearly timing.

Table 9. Salvage Risk Ranking Criteria Table

Evaluated by the probability of whether salvage will occur.	
Rank	Relative degree of risk:
5	Certain salvage will occur (very low risk)
4	
3	
2	
1	
0	Salvage very uncertain (very high risk)

Table 10. Political, Legal, Social, and Institutional Risk Ranking Criteria Table

Encompasses risks associated with funding, popular opinion (public approval), permitting, political climate, and administration.	
Rank	Relative degree of risk:
5	Very low risk
4	
3	
2	
1	
0	Very high risk

Table 11. Stateline Effects Ranking Criteria Table

Ranked by whether offset option will have a negative, positive, or no effect on state-line compact deliveries.	
Rank	Effect
5	Positive effect to stateline
2.5	No Effect
0	Negative Effect

Table 12. Sustainability Ranking Criteria Table

Evaluated by the probability of whether salvage is sustainable.	
Rank	Relative degree of sustainability:
5	Infinitely sustainable resources
4	Somewhat sustainable over the long-term
3	Somewhat sustainable over the short-term, random periodic availability over the long-term
2	No short-term sustainability, random periodic availability over the long term
1	No short-term sustainability, will not be available again over the long term
0	One use – cannot be renewed

4.4. Ranking of Offset Options

Ranking of offset options was first accomplished by a trial run with the entire WOOG. After ranking three options, the WOOG group elected to have *ranking officers*. The ranking officers that were chosen by the group were Mr. Phil Soice of Southwest Water Consultants, and Mr. Tomas Stockton of Tetra Tech, Inc. Mr. Stockton made the first analysis using the ranking process and returned to the group with his results. Mr. Stockton showed the initial results to the WOOG, suggesting some minor modifications to the ranking criteria. At that time, the New Mexico Interstate Commission requested adding an additional criterion to cover "state-line effects" and for completeness the effects on the shiner were included as "PBNS effects". After the final ranking by the ranking officers, the criteria were once again revised and the "PBNS effects" criteria were eliminated because a separate analysis for additional water for the shiner was instituted. The preceding section represents the final criteria recommended by the WOOG for the ranking of offset options.

Ranking by the officers was accomplished independently although some revisions occurred following the review of the ranking exercises accomplished by both officers. Mr. Soice had the benefit of seeing Mr. Stockton's initial ranking, and Mr. Stockton had the benefit of seeing Mr. Soice's initial ranking before finalizing their rankings. Given some of the remaining ambiguity in the qualitative ranking criteria, ranking officers were still left with some judgment calls. The completed ranking matrices, two from each officer (one for offset options and one for AWA), are shown as Tables A.2 ,A.3, A.5, and A.6 in the Appendix. Final ranking tallies were summed together and then sorted by score. The ranking matrices also allowed for "weighting" factors, which are discussed in Section 6. Options with equal scores are then ranked by EUAC, with the lower cost option receiving the higher rank. The final results of the ranking of CID offset options, without weighting factors applied, are shown in Table 13.

Table 13. Final Standings for Equally Weighted Ranking of CID Offset Options – Combined Ranking from both Officers

Rank	Desig-nation	Option Name/Description	Combined Total Score (unitless)	EUAC ($/acre-ft/year)
1	Q1-SR	Develop Well Field Seven Rivers	77.0	290
2	Q1-BV	Develop Well Field Buffalo Valley	76.0	264
3	D-1B	Water Right Purch Sur Roswell Area	74.0	99
4	W	Water imprt. From Salt Bas. or Cap. Reef	74.0	620
5	E-1B	Water Right Lease Sur Roswell Area	73.0	91
6	D-2A	Water Right Purch Shallow PVACD	72.0	67
7	D-2AX	Water Right Purch Shallow PVACD	72.0	94
8	D-1A	Water Right Purch Sur FSID	72.0	99
9	D-1BX	Water Right Purch Sur Roswell Area	72.0	139
10	L-3	Change Cropping Patterns (CID)-Small Grain	71.5	128
11	E-2A	Water Right Lease Shallow PVACD	71.0	69
12	E-1A	Water Right Lease Sur FSID	71.0	91
13	D-1C	Water Right Purch Sur CID	71.0	99
14	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	70.0	-1164
15	N-6	Range and (Upper) Watershed Management-no cost	70.0	-378
16	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	70.0	-236
17	D-3A	Water Right Purch Artesian PVACD	70.0	84
18	E-1C	Water Right Lease Sur CID	70.0	91
19	D-1AX	Water Right Purch Sur FSID	70.0	139
20	D-3AX	Water Right Purch Artesian PVACD	69.0	118
21	D-1CX	Water Right Purch Sur CID	69.0	139

Table 13. Final Standings for Equally Weighted Ranking of CID Offset Options – Combined Ranking from both Officers

Rank	Desig-nation	Option Name/Description	Combined Total Score (unitless)	EUAC ($/acre-ft/year)
22	F-1	Rip. Veg. Control-Salt Cedar	68.0	27
23	E-3A	Water Right Lease Artesian PVACD	68.0	106
24	F-2	Veg. Control-Kochia Eradication	67.0	13
25	E-2B	Water Right Lease Shallow CID	66.5	69
26	L-2	Change Cropping Patterns (CID)-Cotton	66.5	175
27	S	Additional Metering	66.0	16
28	A-5	Canal Refurbishing-CID	66.0	44
29	N-5	Range and (Upper) Watershed Management-prob. cost	66.0	482
30	K-1	Desalinization-Lower Limit Cost	66.0	652
31	D-2B	Water Right Purch Shallow CID	65.5	67
32	D-3B	Water Right Purch Reef CID	65.5	84
33	D-2BX	Water Right Purch Shallow CID	65.5	94
34	D-3BX	Water Right Purch Reef CID	65.5	118
35	L-1	Change Cropping Patterns (CID)-Ave. All Crops	65.5	144
36	I	Import Canadian River Water	65.5	285
37	A-3	On Farm Conservation-CID	65.0	50
38	Y-2	Oil Field Production Well Waste Water-High FW TDS	65.0	1687
39	E-3B	Water Right Lease Reef CID	64.5	106
40	L-4	Change Cropping Patterns (CID)-Corn	64.5	147
41	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	64.0	862
42	K-2	Desalinization-Upper Limit Cost	64.0	1639
43	V	Kaiser Channel Lining	63.0	180
44	Y-1	Oil Field Production Well Waste Water-Low FW TDS	63.0	3188
45	T-1	Evaporation Suppresion-Old Methods	62.3	100
46	A-4	Canal Refurbishing-FSID	62.0	3
47	N-1	Rng. And Watershed Management-Upper Limit	62.0	6
48	U	FS Area Gravel Pit Pumping	62.0	9.5
49	N-2	Rng. And Watershed Management-Average	62.0	10.1
50	Z	Renegotiate Compact-Forebearance	62.0	145
51	N-4	Range and (Upper) Watershed Management-high cost	62.0	1134
52	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	62.0	1484
53	O	Cloud Seeding	61.0	1
54	A-1	On Farm Conservation-FSID	60.0	96
55	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	60.0	2222
56	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	60.0	3082
57	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	60.0	7026
58	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	60.0	7884
59	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	60.0	8965
60	T-1C	Evaporation Suppresion-Old Methods (Brantley)	59.0	100
61	F-3	Replace Russian Olive trees with Cottonwood trees	58.0	51
62	N-3	Rng. And Watershed Management-Lower Limit	56.0	57
63	A-2	On Farm Conservation-PVACD	54.0	216
64	T-1B	Evaporation Suppresion-Old Methods (Sumner)	51.0	100

Table 13. Final Standings for Equally Weighted Ranking of CID Offset Options – Combined Ranking from both Officers

Rank	Desig-nation	Option Name/Description	Combined Total Score (unitless)	EUAC ($/acre-ft/year)
65	T-1A	Evaporation Suppresion-Old Methods (Santa Rosa)	49.0	100
66	T-2	Evaporation Suppresion-New Research	47.3	3
67	T-2C	Evaporation Suppresion-New Methods (Brantley)	44.0	3
68	T-2B	Evaporation Suppresion-New Methods (Sumner)	36.0	3
69	T-2A	Evaporation Suppresion-New Methods (Santa Rosa)	32.0	3
70	B	Drain Construction	Elim.	0
71	C-1	Hernandez Idea-10 cfs	Elim.	3516
72	C-2	Hernandez Idea-25 cfs	Elim.	2198
73	C-3	Hernandez Idea-50 cfs	Elim.	1403
74	C-4	Hernandez Idea-90 cfs	Elim.	1000
75	G	Acequia Improvements	Elim.	28
76	H	Pump Supplemental Wells	Elim.	0
77	J	Res. Entitlement Storage Flexibility	Elim.	0
78	M	Lower Groundwater Levels	Elim.	0
79	P	GW recharge/conjunctive use	Elim.	0
80	R	Rio Hondo Flood Control	Elim.	0

4.5. Qualitative Ranking for Offset Options in the Option Forms

In addition to the documentation in the ranking matrices, option forms also contain a ranking sheet. The ranking sheet gives a brief synopsis of how the ranking officers assumed the option would be implemented. Also contained on the ranking sheet are ranking columns showing the assigned ranks and reasoning the ranking officers had for assigning the ranks. The ranking sheet also contained listings of the technical researcher/report writer, the unanimous agreement of the WOOG, dissenting opinions, and general comments. This sheet is shown in Figure 12.

Commentary concerning the ranking is listed in black if both officers had the same conclusion concerning the ranking of that particular parameter for the option in question. Otherwise, Mr. Soice's comments and ranking numbers are all listed in blue font and Mr. Stockton's comments and ranking numbers are all listed in green font.

Water Offset Option V

Description of Option:
Line Kaiser Canal
The Kaiser Channel is an artificial, unlined canal traversing the old McMillan lakebed delta for 13 miles. Losses through this section of the Pecos river were estimated at 10,600 acre-feet during 1998. Adjusting the loss calculation for surface evaporation which would continue even with lining, the net loss from the Kaiser Channel for this 13 mile section was 9,600 acre feet per year. Some of this seepage may reappear in the Pecos river, but for this analysis all seepage was considered consumed. This option would line this 13-mile reach of the channel, making the salvaged water available for CID.

Technical Report Available?	Yes
Author of Technical Report?	Stockton
Unanimous Agreement of WOOG?	
Dissenting Opinion?	

Important Comments:

	Ranking Criteria		Phil Soice WOOG Criteria Rank	Tom Stockton WOOG Criteria Rank
1)	Cost See Option Processing Form		3	3
2)	Timing Consistent Average assumed offset amount provided inconsistently (varies with streamflow)		3	2
3)	Offset Risk Seepage may have reached Pecos river anyway Seepage most likely consumed on McMillan Delta and old lakebed		4	5
4)	Political Risk Capital intensive Capital intensive and environmentally unpopular ("river paving")		2	0
5)	Amount Available 9600 afy		2	2
6)	Close to CID River Mile 479 Concur, one end is at RM479		5	5
7)	Sustainable Indefinitely Concrete channel will require maintenance, sediment may become a problem		5	4
8)	Time to Implement Less than 5 years Greater than 9 years		3	0
9)	Time to Realize Savings realized in same year		5	5
10)	Benefit to State Line Little or no effect on state line		2.5	2.5
	Equivalent Uniform Annual Cost	$180/afy		
	Total Score		34.5	28.5

Figure 12. The Ranking Sheet portion of the Option Form.

5. WOOG Maximum Offset with Respect to Alternative Screening

The WOOG addressed another work item that pertained to the screening of alternatives developed in this EIS. The Alternative Development Group for the ongoing Carlsbad Project Water Operations and Water Supply Conservation Environmental Impact Statement requested WOOG to provide a value for a maximum offset amount. This request would be used by the Alternative Development Group for the purpose of screening options based on water available for offset.

The WOOG responded with the following, which is quoted from their memorandum to the Alternative Development Group:

> "The WOOG did not determine *maximum offset amounts* for the following reasons:
>
> - the WOOG's members were reluctant to set arbitrary limits on the amount of water that is available to offset options for the PBNS,
> - the WOOG does not know the availability of funds or the reasonableness of their expenditure for offset options,
> - the WOOG's members all share the same perspective that instream flow requirements for the PBNS should be determined initially based on biological considerations, followed by a determination of depletions from hydrologic considerations. WOOG can then effectively determine options to offset those depletions" (2003).

In addition to the points above, the WOOG formulated conclusions summarizing their decision to not put a limit on the maximum offset. The conclusion is quoted from the same memorandum to the Alternative Development Group:

> "Two main points form the basis and conclusions of this memorandum. First, the WOOG does not believe that there is a practical *maximum offset amount* that limits the amount of offsets that can be obtained in the Pecos River Basin. Offset options amounting to several hundred thousand acre feet per year have been identified although the desirability of many offsets from cost and other perspectives is marginal at best. The economic viability of, or reasonableness of, the various WOOG offset options are a matter for management to determine. Second, not only should the required offset be determined, but the computation of that amount should consider the water right administration involved with the option. WOOG suggests that the most efficient method of developing viable alternatives is for the Biology Work Group (BWG) to devise the required instream flow(s), the Hydrology/Water Operations Work Group (HWG) to determine the net depletion to CID's supply given the instream flow requirements that the BWG has set, management to decide the reasonableness of expending funds on facilitating the goals of this EIS, and the WOOG to select an appropriate offset option" (2003).

The second point in the conclusion applies to the administration of water rights associated with certain options. Groundwater retirement options may require less total acquisition considering the right may be pumped in excess of the average yield as long as it does not exceed the total allotment for any given 5-year period.

6. Application of WOOG Tools for Formulation of Preferred Offset Options

The following sections contain: sample assignments of offset options to operational alternatives including a review of WOOG tools; formulation of "A" and "B" lists; additional water acquisition discussion and options; WOOG tools for evaluating additional water acquisition options; and WOOG suggestions for water offset options and additional water acquisition options.

6.1. Alternative Offset Demands

The screened list of alternatives for the reoperation of Sumner Dam is shown in Table A-3, located in the Appendix. This is the list of final alternatives to be analyzed in the impact analysis portion of this EIS. The WOOG role in this analysis of options is limited since all of the WOOG options were carried forward through this EIS. The WOOG examined options for the best match with certain operational alternatives. In order to accomplish this, first the offset *demands* of the alternatives should be examined.

The need for offset water is the primary output of the alternatives, as far as the WOOG is concerned. The Hydrology/Water Operations Group for the Carlsbad Water Supply and Conservation EIS (HWG) completed preliminary modeling results predicting net depletions caused by each alternative (Briggs et al., 2004). This net depletion is the primary demand for water. A secondary demand is for additional water supplies acquired for periods when CID reoperations are not sufficient to meet the needs of the shiner. Considering the purpose and need of this EIS, all net-depletions to CID due to reoperation of Sumner Dam will be offset. Whether these depletions will be offset on an average basis or discretely on an annual basis has yet to be determined; however, the conservative assumption would be that the depletions require full offsets in the year which they occur. Equation 5 equates the "average annual corrected reoperation net depletion (Tetra Tech, 2003)" with the "average annual alternative offset demand". Equation 6 determines the additional amount required on an annual basis to offset the variability of the maximum or annual depletions exceeding the average. Amounts of offset required over and above the average would be facilitated best by options that can be implemented (or not implemented) on a year-by-year basis, such as surface water retirement leases or pumped well field rights. Additional information on alternative offset demands can be located in Hydrology Work Group documentation.

$$\begin{array}{l} \textit{Average Annual} \\ \textit{Reoperation Alternative} \\ \textit{Offset Demand} \end{array} = \begin{array}{l} \textit{Average Annual Corrected} \\ \textit{Reoperation Net Depletion} \\ \textit{to CID Supply} \end{array} \qquad \text{Eq. 5}$$

$$\begin{array}{l} \textit{Maximum Required} \\ \textit{Variable Offset} \\ \textit{Demand} \end{array} = \begin{array}{l} \textit{60-Year Maximum Transmission} \\ \textit{Loss between Sumner and Brantley} \\ \textit{Due to Bypass Operations} \end{array} - \begin{array}{l} \textit{Average Annual Corrected} \\ \textit{Reoperation Net Depletion} \\ \textit{to CID Supply} \end{array} \qquad \text{Eq. 6}$$

Table 14 shows the average annual reoperation alternative offset demand and the annual required variable offset for the alternatives currently selected in this EIS. The values shown in the table were derived using the equations above from the final planning model amounts for reoperating Sumner Dam as predicted by the Hydrology/Water Operations Group (Stockton, Personal Communication, 2005).

Table 14. Estimated Average and Maximum Annual Net Depletions due to the Reoperation of Sumner Dam

Alternative Designation	Average Annual Reoperation Alternative Offset Demand (acre-ft)[1]	Maximum Required Variable Offset Demand (acre-ft)[1 2]
Taiban Constant	1,200	500
Taiban Variable	1,200 to 1,700	700 to 2,000
Acme Constant	3,900	3,000
Acme Variable	3,000	2,900

Table 14. Estimated Average and Maximum Annual Net Depletions due to the Reoperation of Sumner Dam

Alternative Designation	Average Annual Reoperation Alternative Offset Demand (acre-ft)[1]	Maximum Required Variable Offset Demand (acre-ft)[1 2]
Critical Habitat	1,200	200
No Action (Current BO)	1,600	3,800[3]

[1]Uses final reoperation modeling HWG results.
[2]Uses estimated maximum additional transmission loss between Sumner and Brantley due to bypass operations.
[3]The No Action maximum variable amount does not compare directly with other variable amounts since this alternative was not modeled with the 6-week no-release restriction which tends to increase (due to spill trend changes) the average total net depletion and subsequently the average annual offset demand used in equation 6.

It is apparent that a minimum required offset will need to be offset with a constant amount that is available every year. Other than the minimum, the required annual amount, and the frequency with which that amount must be obtained, is variable. WOOG members expressed that an added factor of safety would be to simply use the average offset amount (as opposed to the minimum offset amount) as the lower bound of offset water to be obtained on an annual basis. For this reason, minimum offset amounts were not presented here.

6.2. Option Results Weighting the Ranking Matrix

Built into the ranking matrix is the ability to prioritize some of the ranking criteria by assigning more weight to certain criteria. From the beginning of the ranking process, emphasis was placed on the feasibility of the water offset options more than the cost of those options. The weighted percentage that each ranking criterion holds within the matrix, not examining the interdependencies of criterion such as cost, is 1/10 or 10%. This means that 90% of the ranking criteria do not consider cost. 90% of the criteria, not counting the interdependency of EUAC on amount available, do not consider the amount. In fact, 80% of the criteria emphasize obtaining wet-water in Brantley reservoir in a timely fashion.

In order to devise a weighting scheme for the selection of options, important criteria for offset must be defined and ordered. From Table 13, the average required offset each year is known. This average offset should be sustainable. In addition, this amount should be available in a timely manner since depletions will occur as soon as operations are changed. Further, options that satisfy the average depletion should have minimal risk. In addition, options can be stacked to form the minimum amount needed every year, provided they are sustainable. Table 14 proposes a weighting strategy for the ranking of options meeting all of the aforementioned priorities.

Justification of the weighting strategy for offset of net depletions above the average and up to the maximum is somewhat different. The supply flexibility category is very important since an increased supply of water upon demand is vital. In addition, the source would have to be sustainable even though it would only be needed periodically. An additional desirable requisite is that the source be flexible in terms of its available amount and its administration, without committing large amounts of capital. Table 15 reflects weights for timing and sustainability ranking criteria. Tables 16 and 17 show the respective standing results for an average offset weighting strategy and a maximum offset weighting strategy.

Table 15. Weighting Strategies for Offsetting Average and Maximum Net Depletions.

WOOG Ranking Criteria:	Approximate Original Weights	Weights for Prioritization of Average Offset	Weights for Prioritization of Additional Offset Needed (above average) to Meet Maximum
EUAC ($/acre-ft/year)	1	0.5	0.75
Timing	1	0.5	2.0
Salvage Risk	1	1.25	0.75
Political, Legal, Social, and Institutional Risk	1	1.25	0.75
Amount Available (acre-ft)	1	0.5	0.75
Proximity to CID (river miles)	1	0.5	0.75
Sustainability	1	2.0	2.0
Time to Implement	1	1.5	0.75
Time to Realize	1	1.5	0.75
State-line Effects	1	0.5	0.75
Total	10	10	10

Table 16. Weighted Standings for Offset of Average Net Depletions

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	D-1B	Water Right Purch/Land Retirement-Surface (Roswell Area)	84.3	99
2	D-1A	Water Right Purch/Land Retirement-Surface (FSID)	83.3	99
3	D-1BX	Water Right Purch/Land Retirement-Surface (Roswell Area)	83.3	139
4	D-1C	Water Right Purch/Land Retirement-Surface (CID)	82.8	99
5	D-1AX	Water Right Purch/Land Retirement-Surface (FSID)	82.3	139
6	D-1CX	Water Right Purch/Land Retirement-Surface (CID)	81.8	139
7	E-1B	Water Right Lease/Land Fallowing-Surface (Roswell Area)	81.0	91
8	Q1-SR	Develop Well Field-Seven Rivers	81.0	290
9	Q1-BV	Develop Well Field-Buffalo Valley	80.5	264
10	E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	80.0	91
11	E-1C	Water Right Lease/Land Fallowing-Surface (CID)	79.5	91
12	D-2A	Water Right Purch/Land Ret.-Shallow GW (PVACD)	77.8	67
13	D-2AX	Water Right Purch/Land Ret.-Shallow GW (PVACD)	77.8	94
14	D-3BX	Water Right Purch/Land Ret.-Reef GW (CID)	75.3	118
15	D-3AX	Water Right Purch/Land Ret.-Artesian GW (PVACD)	75.0	118
16	D-3A	Water Right Purch/Land Ret.-Artesian GW (PVACD)	74.8	84
17	D-2B	Water Right Purch/Land Ret.-Shallow GW (CID)	74.5	67
18	E-2A	Water Right Lease/Land Flw.-Shallow GW (PVACD)	74.5	69
19	D-3B	Water Right Purch/Land Ret.-Reef GW (CID)	74.5	84
20	D-2BX	Water Right Purch/Land Ret.-Shallow GW (CID)	74.5	94

Table 16. Weighted Standings for Offset of Average Net Depletions

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
21	E-2B	Water Right Lease/Land Flw.-Shallow GW (CID)	74.3	69
22	E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	73.3	106
23	E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	72.0	106
24	L-3	Change Cropping Patterns (CID)-Small Grain	72.0	128
25	Y-2	Oil Field Production Well Waste Water-High FW TDS	71.0	1687
26	W	Water imprt. From Salt Bas. or Cap. Reef	70.5	620
27	S	Additional Metering	70.3	16
28	K-1	Desalinization-Lower Limit Cost	70.0	652
29	Y-1	Oil Field Production Well Waste Water-Low FW TDS	70.0	3188
30	A-3	On Farm Conservation-CID	69.5	50
31	L-2	Change Cropping Patterns (CID)-Cotton	69.5	175
32	A-5	Canal Refurbishing-CID	69.3	44
33	F-2	Veg. Control-Kochia Eradication	69.0	13
34	L-1	Change Cropping Patterns (CID)-Ave. All Crops	69.0	144
35	K-2	Desalinization-Upper Limit Cost	69.0	1639
36	L-4	Change Cropping Patterns (CID)-Corn	68.5	147
37	F-1	Rip. Veg. Control-Salt Cedar	68.0	27
38	U	FS Area Gravel Pit Pumping	66.3	10
39	V	Kaiser Channel Lining	66.3	180
40	N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	65.0	-378
41	A-4	Canal Refurbishing-FSID	65.0	3
42	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	64.5	-1164
43	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	64.5	-236
44	I	Import Canadian River Water	64.5	285
45	A-1	On Farm Conservation-FSID	64.0	96
46	Z	Renegotiate Compact-Forebearance	63.5	145
47	N-5	Rng. and (Upper) Watershed Mng.-Average Cost	63.0	482
48	O	Cloud Seeding	62.0	1
49	N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	62.0	10
50	F-3	Replace Russian Olive trees with Cottonwood trees	61.5	51
51	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	61.5	862
52	N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	61.0	1134
53	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	60.5	1484
54	T-1	Evap. Suppresion-Old Methods (All Major)	60.2	100
55	N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	60.0	6
56	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	59.5	2222
57	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	59.5	3082
58	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	59.5	7026
59	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	59.5	7884
60	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	59.5	8965
61	N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	59.0	57
62	T-1C	Evap. Suppresion-Old Methods (Brantley)	58.5	100
63	A-2	On Farm Conservation-PVACD	55.0	216
64	T-1B	Evap. Suppresion-Old Methods (Sumner)	54.5	100
65	T-1A	Evap. Suppresion-Old Methods (Santa Rosa)	53.5	100

Table 16. Weighted Standings for Offset of Average Net Depletions

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
66	T-2	Evap. Suppresion-New Rsrch. (All Major)	33.7	3
67	T-2C	Evap. Suppresion-New Rsrch. (Brantley)	32.0	3
68	T-2B	Evap. Suppresion-New Rsrch. (Sumner)	28.0	3
69	T-2A	Evap. Suppresion-New Rsrch. (Santa Rosa)	26.0	3

Table 17. Weighted Standings for Offset of Maximum Net Depletions

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	Q1-SR	Develop Well Field-Seven Rivers	76.5	290
2	Q1-BV	Develop Well Field-Buffalo Valley	75.8	264
3	W	Water imprt. From Salt Bas. or Cap. Reef	75.5	620
4	D-2A	Water Right Purch/Land Ret.-Shallow GW (PVACD)	74.0	67
5	D-2AX	Water Right Purch/Land Ret.-Shallow GW (PVACD)	74.0	94
6	D-1B	Water Right Purch/Land Retirement-Surface (Roswell Area)	73.0	99
7	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	72.5	-1164
8	N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	72.5	-378
9	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	72.5	-236
10	D-3A	Water Right Purch/Land Ret.-Artesian GW (PVACD)	72.5	84
11	L-3	Change Cropping Patterns (CID)-Small Grain	72.4	128
12	D-3AX	Water Right Purch/Land Ret.-Artesian GW (PVACD)	71.8	118
13	D-1A	Water Right Purch/Land Retirement-Surface (FSID)	71.5	99
14	D-1BX	Water Right Purch/Land Retirement-Surface (Roswell Area)	71.5	139
15	D-1C	Water Right Purch/Land Retirement-Surface (CID)	70.8	99
16	D-1AX	Water Right Purch/Land Retirement-Surface (FSID)	70.0	139
17	E-2A	Water Right Lease/Land Flw.-Shallow GW (PVACD)	69.5	69
18	N-5	Rng. and (Upper) Watershed Mng.-Average Cost	69.5	482
19	D-1CX	Water Right Purch/Land Retirement-Surface (CID)	69.3	139
20	I	Import Canadian River Water	69.1	285
21	Z	Renegotiate Compact-Forebearance	69.0	145
22	F-1	Rip. Veg. Control-Salt Cedar	68.5	27
23	E-1B	Water Right Lease/Land Fallowing-Surface (Roswell Area)	68.5	91
24	A-5	Canal Refurbishing-CID	68.3	44
25	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	68.0	862
26	A-3	On Farm Conservation-CID	67.5	50
27	E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	67.3	106
28	S	Additional Metering	67.0	16
29	E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	67.0	91
30	K-1	Desalinization-Lower Limit Cost	67.0	652
31	D-2B	Water Right Purch/Land Ret.-Shallow GW (CID)	66.6	67
32	D-3B	Water Right Purch/Land Ret.-Reef GW (CID)	66.6	84
33	D-2BX	Water Right Purch/Land Ret.-Shallow GW (CID)	66.6	94

Table 17. Weighted Standings for Offset of Maximum Net Depletions

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
34	D-3BX	Water Right Purch/Land Ret.-Reef GW (CID)	66.6	118
35	F-2	Veg. Control-Kochia Eradication	66.5	13
36	N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	66.5	1134
37	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	66.5	1484
38	E-1C	Water Right Lease/Land Fallowing-Surface (CID)	66.3	91
39	Y-2	Oil Field Production Well Waste Water-High FW TDS	66.3	1687
40	L-2	Change Cropping Patterns (CID)-Cotton	66.1	175
41	K-2	Desalinization-Upper Limit Cost	65.5	1639
42	L-1	Change Cropping Patterns (CID)-Ave. All Crops	65.4	144
43	A-4	Canal Refurbishing-FSID	65.3	3
44	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	65.0	2222
45	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	65.0	3082
46	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	65.0	7026
47	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	65.0	7884
48	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	65.0	8965
49	V	Kaiser Channel Lining	64.8	180
50	Y-1	Oil Field Production Well Waste Water-Low FW TDS	64.8	3188
51	L-4	Change Cropping Patterns (CID)-Corn	64.6	147
52	N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	64.0	6
53	N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	64.0	10
54	A-1	On Farm Conservation-FSID	63.8	96
55	E-2B	Water Right Lease/Land Flw.-Shallow GW (CID)	63.6	69
56	T-1	Evap. Suppresion-Old Methods (All Major)	63.0	100
57	E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	62.1	106
58	F-3	Replace Russian Olive with Cottonwood	61.0	51
59	O	Cloud Seeding	60.8	1
60	A-2	On Farm Conservation-PVACD	59.3	216
61	T-1C	Evap. Suppresion-Old Methods (Brantley)	58.0	100
62	N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	57.0	57
63	U	FS Area Gravel Pit Pumping	56.5	10
64	T-1B	Evap. Suppresion-Old Methods (Sumner)	52.0	100
65	T-1A	Evap. Suppresion-Old Methods (Santa Rosa)	50.5	100
66	T-2	Evap. Suppresion-New Rsrch. (All Major)	44.2	3.3
67	T-2C	Evap. Suppresion-New Rsrch. (Brantley)	39.3	3
68	T-2B	Evap. Suppresion-New Rsrch. (Sumner)	33.3	3
69	T-2A	Evap. Suppresion-New Rsrch. (Santa Rosa)	27.8	3

Comparing the results of Tables 16 and 17 with Table 13, it is evident that the weighting schemes worked as intended. For offset of the average depletion, options that are sustainable and also implemented fairly quickly rose to the top of the list. Practically, lease or purchase of surface water options will be vital to having a sustainable supply with very little risk involved. For offsets of the maximum depletion, expected results included more groundwater options dominating the top of the list. This is reasonable since the five-year accounting period for groundwater rights in the basin provides greater flexibility of supply than that associated with surface rights. Weighting of the options considering the type of offset being met is a refinement of the un-weighted ranking of offset options. The next step is sorting of the lists to determine “A” and “B” lists.

6.3. Preferred Offset Options – “A” List

Since the WOOG list of options is too extensive for analysis of all options in the impact analysis portion of this NEPA process, three “A” lists, one for un-weighted option ranking and two for weighted option ranking, including average and maximum offsets, were developed to narrow the options to be analyzed. Time to implement and time to realize were considered the most appropriate screening choices to narrow the options shown in tables 13, 16 and 17. In addition, some options are beyond the scope of this NEPA process in terms of the environmental evaluation of their effects, and would in fact require their own Environmental Impact Statement to be built. These two screening filters were used in combination to develop the “A” lists for un-weighted options and weighted average and maximum offsets.

Three years was the maximum amount of time lapse acceptable for an option to provide water to the Pecos River. The combination of time to implement the option and time to realize water in the river was limited to three years as the maximum amount of time acceptable for an option to be on the “A” list. In terms of ranking for an option to be on the “A” list, it must have at least a “4” for time to implement and it must also have a “5” for time to realize (See Tables 6 & 7).

For the EIS filter, complex options that required planning beyond the scope of this NEPA process were also cut from the “A” lists. The flash distillation power plant (Option X) was one such complex project whose planning and environmental permitting would likely exceed three years to implement. It was assumed that private investment would drive this option with possible tax incentives by the Federal, State, and local governments to offset the decreased power generating ability from the added benefit of flash distillation (i.e. pay for the water that is generated). It may be possible that it could be built privately with the EIS work required in less than the 3-year cutoff window, but Reclamation involvement would likely invoke environmental analyses. Table 18 shows the “A” list for equally weighted offset options, Table 19 shows the “A” list for average weighted offset options, and Table 20 shows the “A” list for maximu weighted offset options. Figures 13, 14, and 15 illustrate the respective equally weighted, average weighted, and maximum weighted A-lists. Since the same filter criteria were used for all offset options, all “A” lists contain the same options; however, the most suitable options are still ordered by overall combined score.

It should be noted that offset amounts are for delivery of offset water to the Pecos River in the amounts determined by the WOOG. Losses incurred to these amounts by delivery to the Carlsbad Project were left for determination by the Hydrology Group through modeling of the stream system (Tetra Tech, 2005). Average efficiencies for water offset options, which take into account transit delivery losses to Brantley reservoir from the offset source, are shown on Table 18 for use in example calculations. The WOOG did not attempt to incorporate the efficiency factor into the ultimate cost of all of the offset options; adjusted EUAC is only shown for A-list options.

Table 18 "A" List – Equally Weighted Ranking of Water Offset Options with Estimated Offset Efficiencies, Effective Offset, and EUAC Adjusted for Efficiency

Rank	Desig-nation	Option Name/Description	Amount Available acre-feet/ year[1]	Transit Efficiency from Offset Source to Brantley Reservoir	Average Effective Offset[3]	Combined Total Score (unitless)	Adjusted EUAC ($/acre-ft/year)[5]
1	Q1-SR	Develop well field (Seven Rivers)	10,000	67%	6,700	77.0	433
2	Q1-BV	Develop well field: Buffalo Valley	10,000	58%	5,800	76.0	455
3	D-1B	Water right purchase: Roswell area	1,600	55%	1,300	74.0	180
4	E-1B	Water right lease: Roswell area	1,600	55%	1,300	73.0	165
5	D-1A	Water right purchase: FSID	1,000	23%	300	72.0	431
6	D-1BX	Water right purchase: Roswell area	1,600	55%	1,300	72.0	252
7	L-3[2]	Change cropping patterns (CID): very low water use crop	10,500	100%[4]	10,500	71.5	182
8	E-1A	Water right lease: FSID	1,000	23%	300	71.0	396
9	D-1C	Water right purchase: CID	3,150	100%[4]	3,150	71.0	99
10	E-1C	Water right lease: CID	3,150	100%[4]	3,150	70.0	91
11	D-1AX	Water right purchase: FSID	1,000	23%	300	70.0	603
12	D-1CX	Water right purchase: CID	3,150	100%[4]	3,150	69.0	139
13	L-2[2]	Change cropping patterns (CID): low water use crop	8,800	100%[4]	8,800	66.5	249
14	L-1[2]	Change cropping patterns (CID): ave. water use	8,900	100%[4]	8,900	65.5	206
15	L-4[2]	Change cropping patterns (CID): med. water use crop	6,000	100%[4]	6,000	64.5	209
16	U	FSID gravel pit pumping	300	74%	222	62.0	13

[1]Options designated with an "X" do not represent a unique amount of water, only an escalated cost for another listed option. CIR amount presented for options involving water rights retirement.
[2]The Change of Cropping Patterns is based on conversion of 5,000 acres of alfalfa to the indicated water use; the acreage conversion is available only once. Amount available reflects 2005 revision accounting for water stacking (See section 3.3).

[3]Note that "amount available" column multiplied by efficiency in this column does not yield effective offset for non-project offsets. Only diverted amounts (convert from CIR amount by multiplying by 3 AF/acre and dividing by 2.1 AF/acre) can be multiplied by efficiencies in this column to determine effective offset.
[4]Project (CID) derived offset efficiencies don't apply to diverted amounts as do other efficiencies. Multiplication for average effective offset is direct (no conversion to diverted amount is necessary).

[5]EUAC was "adjusted" to account for offset option efficiencies.

Table 19. Average Offset - "A" List Water Offset Options

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	D-1B	Water Right Purch/Land Retirement-Surface (Roswell Area)	84.3	99
2	D-1A	Water Right Purch/Land Retirement-Surface (FSID)	83.3	99
3	D-1BX	Water Right Purch/Land Retirement-Surface (Roswell Area)	83.3	139
4	D-1C	Water Right Purch/Land Retirement-Surface (CID)	82.8	99
5	D-1AX	Water Right Purch/Land Retirement-Surface (FSID)	82.3	139
6	D-1CX	Water Right Purch/Land Retirement-Surface (CID)	81.8	139
7	E-1B	Water Right Lease/Land Fallowing-Surface (Roswell Area)	81.0	91
8	Q1-SR	Develop Well Field-Seven Rivers	81.0	290
9	Q1-BV	Develop Well Field-Buffalo Valley	80.5	264
10	E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	80.0	91
11	E-1C	Water Right Lease/Land Fallowing-Surface (CID)	79.5	91
12	L-3	Change Cropping Patterns (CID)-Small Grain	72.0	128
13	L-2	Change Cropping Patterns (CID)-Cotton	69.5	175
14	L-1	Change Cropping Patterns (CID)-Ave. All Crops	69.0	144
15	L-4	Change Cropping Patterns (CID)-Corn	68.5	147
16	U	FS Area Gravel Pit Pumping	66.3	10

Table 20. Maximum Offset - "A" List Water Offset Options

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	Q1-SR	Develop Well Field-Seven Rivers	76.5	290
2	Q1-BV	Develop Well Field-Buffalo Valley	75.8	264
3	D-1B	Water Right Purch/Land Retirement-Surface (Roswell Area)	73.0	99
4	L-3	Change Cropping Patterns (CID)-Small Grain	72.4	128
5	D-1A	Water Right Purch/Land Retirement-Surface (FSID)	71.5	99
6	D-1BX	Water Right Purch/Land Retirement-Surface (Roswell Area)	71.5	139
7	D-1C	Water Right Purch/Land Retirement-Surface (CID)	70.8	99
8	D-1AX	Water Right Purch/Land Retirement-Surface (FSID)	70.0	139
9	D-1CX	Water Right Purch/Land Retirement-Surface (CID)	69.3	139
10	E-1B	Water Right Lease/Land Fallowing-Surface (Roswell Area)	68.5	91
11	E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	67.0	91
12	E-1C	Water Right Lease/Land Fallowing-Surface (CID)	66.3	91
13	L-2	Change Cropping Patterns (CID)-Cotton	66.1	175
14	L-1	Change Cropping Patterns (CID)-Ave. All Crops	65.4	144
15	L-4	Change Cropping Patterns (CID)-Corn	64.6	147
16	U	FS Area Gravel Pit Pumping	56.5	10

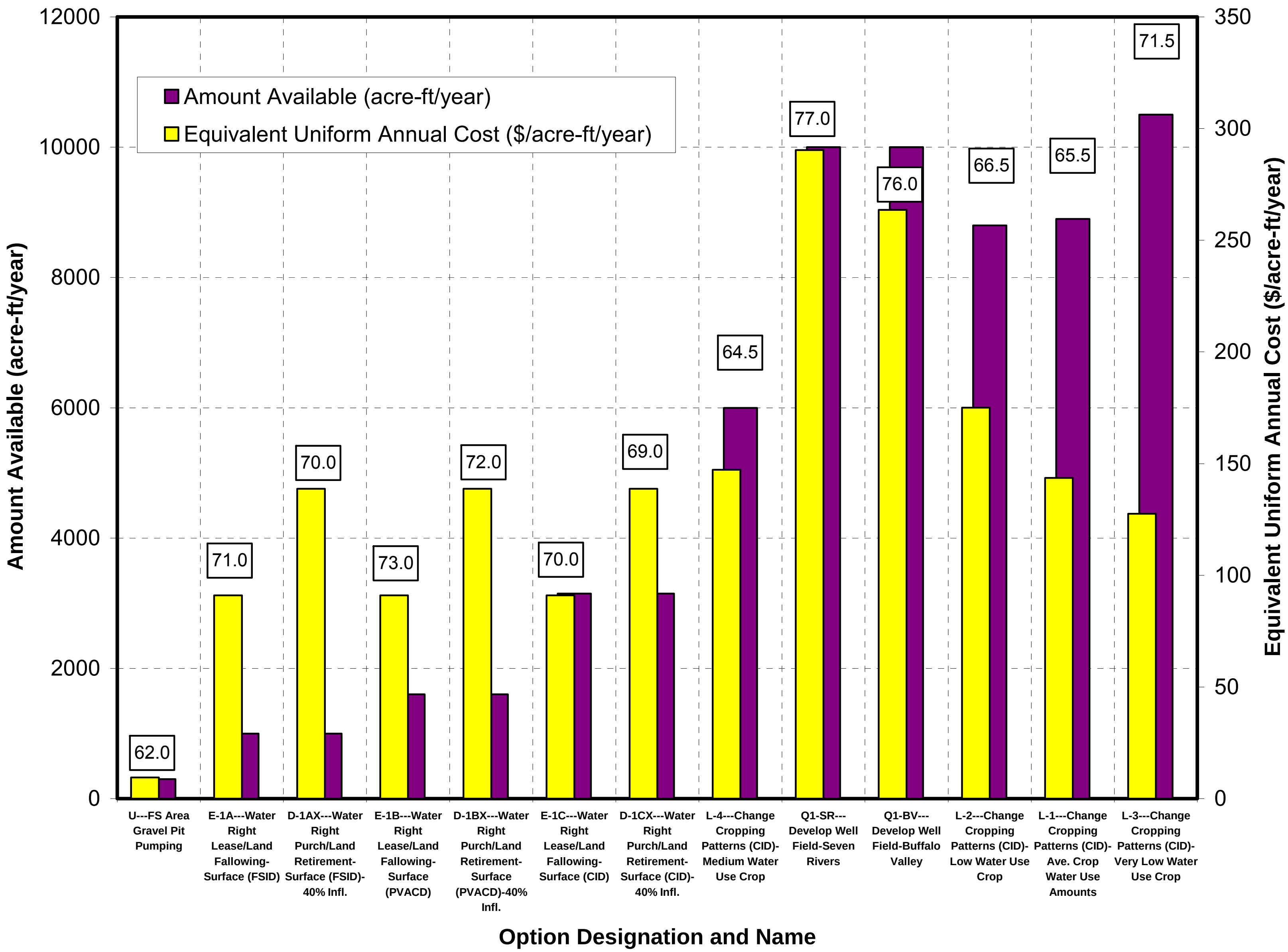

Figure 13. Equally Weighted "A" List - Depicted Graphically with Equivalent Uniform Annual Cost, Amount Available, and Score.

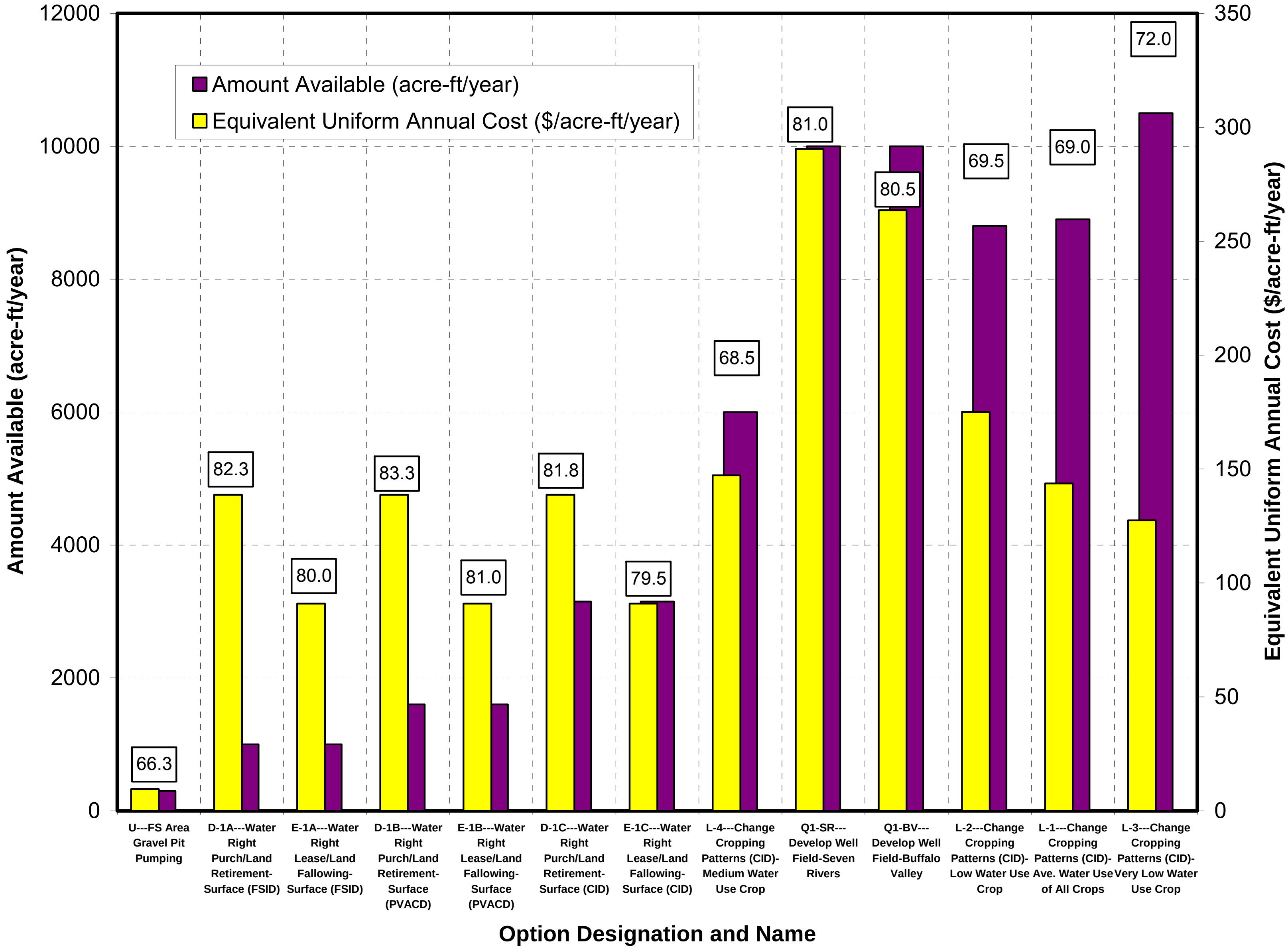

Figure 14. "A" List for Average Offsets - Depicted Graphically with Equivalent Uniform Annual Cost, Amount Available, and Score.

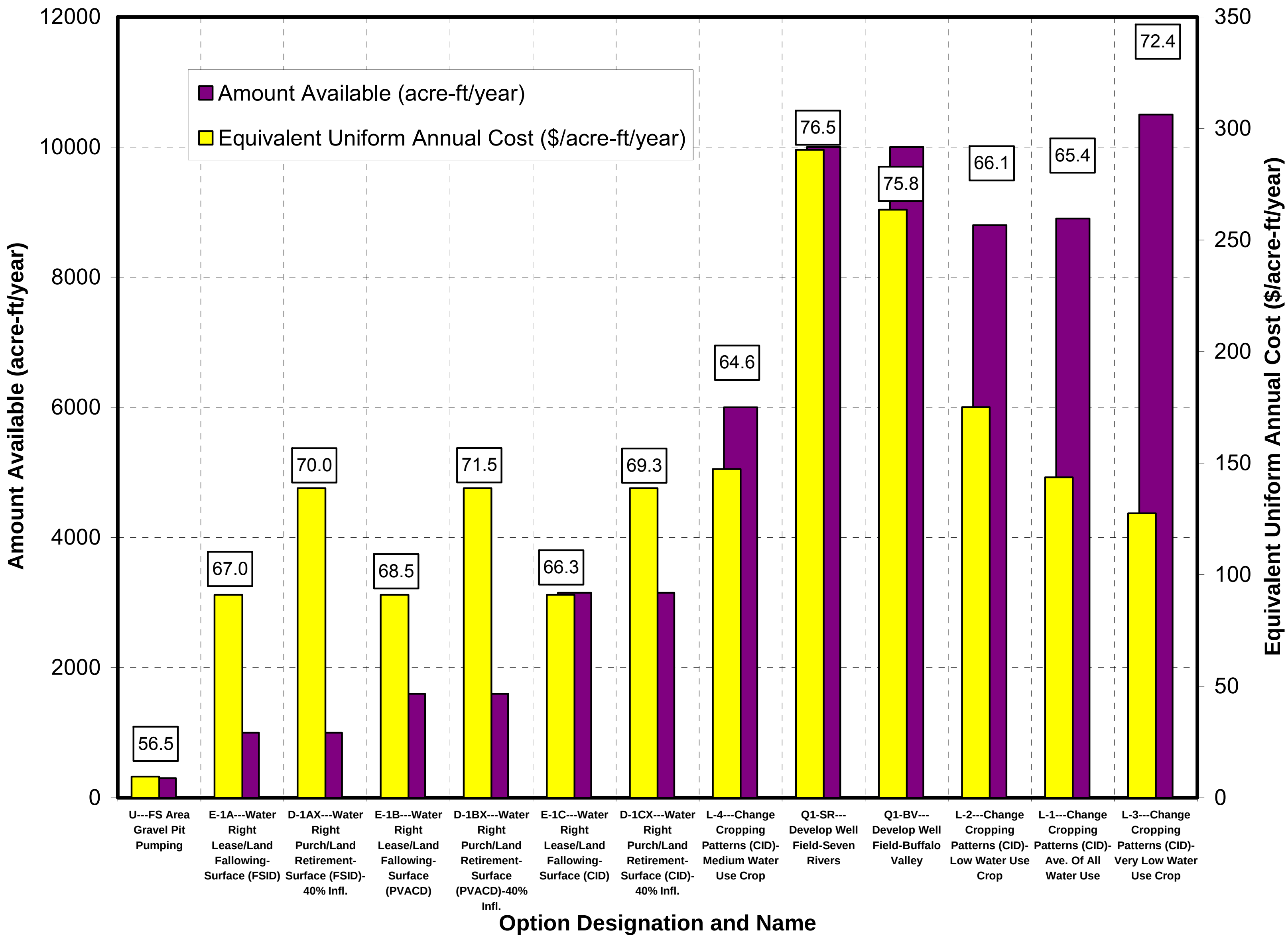

Figure 15. "A" List for Maximum Offsets - Depicted Graphically with Equivalent Uniform Annual Cost, Amount Available, and Score.

6.4. Remaining Offset Options – "B" List

Those Offset Options that were not on the "A" list were ranked and listed on the "B" list. These options were not considered likely to be timely in providing offset water for depletions in the near term but may be viable in the long term. There may be offset options on the "B**" list that can become viable offsets with additional research and development.** Indeed, many of the "B" list options are cost effective if they can be shown to provide the needed water supplies. Tables 21, 22 and 23 indicate the "B" list for un-weighted options and weighted options for average and maximum depletions.

Table 21 "B" List – Equally Weighted Ranking of Water Offset Options

Rank	Desig-nation	Option Name/Description	Amount Available (acre-ft / year)	Combined Total Score (unitless)	EUAC ($/acre-ft/year)
1	W	Water imprt. From Salt Bas. or Capitan Reef	20,000	74.0	620
2	D-2A	Water Right Purch Shallow (Roswell Area)	7,000	72.0	67
3	D-2AX	Water Right Purch Shallow (Roswell Area)	7,000	72.0	94
4	E-2A	Water Right Lease Shallow (Roswell Area)	7,000	71.0	69
5	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	22,000	70.0	-1164
6	N-6	Range and (Upper) Watershed Management-no cost	25,400	70.0	-378
7	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	22,000	70.0	-236
8	D-3A	Water Right Purch Artesian (Roswell Area)	7,000	70.0	84
9	D-3AX	Water Right Purch Artesian (Roswell Area)	7,000	69.0	118
10	F-1	Rip. Veg. Control-Salt Cedar	12,500	68.0	27
11	E-3A	Water Right Lease Artesian (Roswell Area)	7,000	68.0	106
12	F-2	Veg. Control-Kochia Eradication	3,600	67.0	13
13	E-2B	Water Right Lease Shallow (CID)	400	66.5	69
14	A-5	Canal Refurbishing (CID)	10,000	66.0	44
15	N-5	Range and (Upper) Watershed Management-average cost	25,400	66.0	482
16	K-1	Desalinization-Lower Limit Cost	10,000	66.0	652
17	D-2B	Water Right Purch Shallow (CID)	400	65.5	67
18	D-3B	Water Right Purch Reef (CID)	400	65.5	84
19	D-2BX	Water Right Purch Shallow (CID)	400	65.5	94
20	D-3BX	Water Right Purch Reef (CID)	400	65.5	118
21	I	Import Canadian River Water	20,000	65.5	285
22	A-3	On Farm Conservation (CID)	4,000	65.0	50
23	Y-2	Oil Field Production Well Waste Water-High FW TDS	9,030	65.0	1687
24	E-3B	Water Right Lease Reef (CID)	400	64.5	106
25	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	22,000	64.0	862
26	K-2	Desalinization-Upper Limit Cost	10,000	64.0	1639
27	V	Kaiser Channel Lining	990	63.0	180
28	Y-1	Oil Field Production Well Waste Water-Low FW TDS	8,815	63.0	3188
29	T-1	Evaporation Suppression-Old Methods	17,500	62.3	100
30	A-4	Canal Refurbishing (FSID)	9,000	62.0	3
31	N-1	Rng. And Watershed Management-Upper Limit	13,271	62.0	6
32	N-2	Rng. And Watershed Management-Average	7,300	62.0	10.1
33	Z	Renegotiate Compact-Forbearance	18,500	62.0	145

Table 21 "B" List – Equally Weighted Ranking of Water Offset Options

34	N-4	Range and (Upper) Watershed Management-high cost	25,400	62.0	1134
35	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	22,000	62.0	1484
36	O	Cloud Seeding	43,000	61.0	1
37	A-1	On Farm Conservation (FSID)	5,400	60.0	96
38	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	22,000	60.0	2222
39	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	22,000	60.0	3082
40	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	22,000	60.0	7026
41	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	22,000	60.0	7884
42	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	22,000	60.0	8965
43	T-1C	Evaporation Suppression-Old Methods (Brantley)	6,500	59.0	100
44	F-3	Replace Russian Olive trees with Cottonwood trees	4,000	58.0	51
45	S	Additional Metering	6,250	66.0	55
46	N-3	Range And Watershed Management-Lower Limit	1,296	56.0	57
47	A-2	On Farm Conservation (PVACD)	8,000	54.0	216
48	T-1B	Evaporation Suppression-Old Methods (Sumner)	6,100	51.0	100
49	T-1A	Evaporation Suppression-Old Methods (Santa Rosa)	4,900	49.0	100
50	T-2	Evaporation Suppression-New Research	17,500	47.3	3
51	T-2C	Evaporation Suppression-New Methods (Brantley)	6,500	44.0	3
52	T-2B	Evaporation Suppression-New Methods (Sumner)	6,100	36.0	3
53	T-2A	Evaporation Suppression-New Methods (Santa Rosa)	4,900	32.0	3

Table 22. Average Offset - "B" List Water Offset Options

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	D-2A	Water Right Purch/Land Ret.-Shallow GW (PVACD)	77.8	67
2	D-2AX	Water Right Purch/Land Ret.-Shallow GW (PVACD)	77.8	94
3	D-3BX	Water Right Purch/Land Ret.-Reef GW (CID)	75.3	118
4	D-3AX	Water Right Purch/Land Ret.-Artesian GW (PVACD)	75.0	118
5	D-3A	Water Right Purch/Land Ret.-Artesian GW (PVACD)	74.8	84
6	D-2B	Water Right Purch/Land Ret.-Shallow GW (CID)	74.5	67
7	E-2A	Water Right Lease/Land Flw.-Shallow GW (PVACD)	74.5	69
8	D-3B	Water Right Purch/Land Ret.-Reef GW (CID)	74.5	84
9	D-2BX	Water Right Purch/Land Ret.-Shallow GW (CID)	74.5	94
10	E-2B	Water Right Lease/Land Flw.-Shallow GW (CID)	74.3	69
11	E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	73.3	106
12	E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	72.0	106
13	Y-2	Oil Field Production Well Waste Water-High FW TDS	71.0	1687
14	W	Water imprt. From Salt Bas. or Cap. Reef	70.5	620
15	K-1	Desalinization-Lower Limit Cost	70.0	652
16	Y-1	Oil Field Production Well Waste Water-Low FW TDS	70.0	3188
17	A-3	On Farm Conservation-CID	69.5	50
18	A-5	Canal Refurbishing-CID	69.3	44
19	F-2	Veg. Control-Kochia Eradication	69.0	13
20	K-2	Desalinization-Upper Limit Cost	69.0	1639
21	F-1	Rip. Veg. Control-Salt Cedar	68.0	27
22	V	Kaiser Channel Lining	66.3	180

Table 22. Average Offset - "B" List Water Offset Options

23	N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	65.0	-378
24	A-4	Canal Refurbishing-FSID	65.0	3
25	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	64.5	-1164
26	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	64.5	-236
27	I	Import Canadian River Water	64.5	285
28	A-1	On Farm Conservation-FSID	64.0	96
29	Z	Renegotiate Compact-Forbearance	63.5	145
30	N-5	Rng. and (Upper) Watershed Mng.-Average Cost	63.0	482
31	O	Cloud Seeding	62.0	1
32	N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	62.0	10
33	F-3	Replace Russian Olive trees with Cottonwood trees	61.5	51
34	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	61.5	862
35	N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	61.0	1134
36	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	60.5	1484
37	T-1	Evap. Suppresion-Old Methods (All Major)	60.2	100
38	N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	60.0	6
39	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Ind. Elec. Sale)	59.5	2222
40	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	59.5	3082
41	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	59.5	7026
42	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	59.5	7884
43	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	59.5	8965
44	S	Additional Metering	70.3	16
45	N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	59.0	57
46	T-1C	Evap. Suppresion-Old Methods (Brantley)	58.5	100
47	A-2	On Farm Conservation-PVACD	55.0	216
48	T-1B	Evap. Suppresion-Old Methods (Sumner)	54.5	100
49	T-1A	Evap. Suppresion-Old Methods (Santa Rosa)	53.5	100
50	T-2	Evap. Suppresion-New Rsrch. (All Major)	33.7	3
51	T-2C	Evap. Suppresion-New Rsrch. (Brantley)	32.0	3
52	T-2B	Evap. Suppresion-New Rsrch. (Sumner)	28.0	3
53	T-2A	Evap. Suppresion-New Rsrch. (Santa Rosa)	26.0	3

Table 23. Maximum Offset - "B" List WOOG Options

Rank	Desig-nation	Option Name	Combined Total Score	EUAC ($/acre-ft)
1	W	Water imprt. From Salt Bas. or Cap. Reef	75.5	620
2	D-2A	Water Right Purch/Land Ret.-Shallow GW (PVACD)	74.0	67
3	D-2AX	Water Right Purch/Land Ret.-Shallow GW (PVACD)	74.0	94
4	X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	72.5	-1164
5	N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	72.5	-378
6	X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector ES)	72.5	-236
7	D-3A	Water Right Purch/Land Ret.-Artesian GW (PVACD)	72.5	84
8	D-3AX	Water Right Purch/Land Ret.-Artesian GW (PVACD)	71.8	118
9	E-2A	Water Right Lease/Land Flw.-Shallow GW (PVACD)	69.5	69
10	N-5	Rng. and (Upper) Watershed Mng.-Average Cost	69.5	482
11	I	Import Canadian River Water	69.1	285

Table 23. Maximum Offset - "B" List WOOG Options

12	Z	Renegotiate Compact-Forebearance	69.0	145
13	F-1	Rip. Veg. Control-Salt Cedar	68.5	27
14	A-5	Canal Refurbishing-CID	68.3	44
15	X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	68.0	862
16	A-3	On Farm Conservation-CID	67.5	50
17	E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	67.3	106
18	K-1	Desalinization-Lower Limit Cost	67.0	652
19	D-2B	Water Right Purch/Land Ret.-Shallow GW (CID)	66.6	67
20	D-3B	Water Right Purch/Land Ret.-Reef GW (CID)	66.6	84
21	D-2BX	Water Right Purch/Land Ret.-Shallow GW (CID)	66.6	94
22	D-3BX	Water Right Purch/Land Ret.-Reef GW (CID)	66.6	118
23	F-2	Veg. Control-Kochia Eradication	66.5	13
24	N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	66.5	1134
25	X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	66.5	1484
26	Y-2	Oil Field Production Well Waste Water-High FW TDS	66.3	1687
27	K-2	Desalinization-Upper Limit Cost	65.5	1639
28	A-4	Canal Refurbishing-FSID	65.3	3
29	X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	65.0	2222
30	X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	65.0	3082
31	X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	65.0	7026
32	X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	65.0	7884
33	X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	65.0	8965
34	V	Kaiser Channel Lining	64.8	180
35	Y-1	Oil Field Production Well Waste Water-Low FW TDS	64.8	3188
36	N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	64.0	6
37	N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	64.0	10
38	A-1	On Farm Conservation-FSID	63.8	96
39	E-2B	Water Right Lease/Land Flw.-Shallow GW (CID)	63.6	69
40	T-1	Evap. Suppresion-Old Methods (All Major)	63.0	100
41	E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	62.1	106
42	F-3	Replace Russian Olive trees with Cottonwood trees	61.0	51
43	S	Additional Metering	67.0	16
44	O	Cloud Seeding	60.8	1
45	A-2	On Farm Conservation-PVACD	59.3	216
46	T-1C	Evap. Suppresion-Old Methods (Brantley)	58.0	100
47	N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	57.0	57
48	T-1B	Evap. Suppresion-Old Methods (Sumner)	52.0	100
49	T-1A	Evap. Suppresion-Old Methods (Santa Rosa)	50.5	100
50	T-2	Evap. Suppresion-New Rsrch. (All Major)	44.2	3
51	T-2C	Evap. Suppresion-New Rsrch. (Brantley)	39.3	3
52	T-2B	Evap. Suppresion-New Rsrch. (Sumner)	33.3	3
53	T-2A	Evap. Suppresion-New Rsrch. (Santa Rosa)	27.8	3

6.5 Example Coupling of Offset Options with Alternatives

Selection of appropriate WOOG options to offset depletions is left to those who are charged with implementing this EIS, but two approaches are suggested here to effectively utilize WOOG results. Possible approaches to implement these options include selection of the highest ranked options that sum incrementally to the amount needed, or in the alternative, selection of a portion of options with the highest WOOG ranking.

6.5.1 Selection by Incremental Amount

The first perspective would be to minimize the securing of water in excess of offset needs through incremental acquisitions of offset amounts. The offset demands are directly taken from Table 14, indicating depletions associated with various EIS Alternatives. Using the “Acme Variable” alternative as an example, the offset demands are estimated to be 3,000 acre-ft/year for the average and an additional 2,900 acre-ft/year to be able to offset the maximum. The following example uses only escalated water right purchase prices (the “X” options) from the A-list and various other A-list options. The example also uses ranking scores from the equally weighted A-list (See table 18 and figure 13). Minimizing water acquisitions leads to selection of the following sequence of decisions to offset an average net depletion of 3,000 acre feet/year:

1) The first option selected is the one with the highest score with an amount available less than the average offset demand, “E-1B---Water Right Lease Surface – Roswell Area”; this option provides an effective offset of 1,300 acre-ft/year, leaving 1,700 acre-ft/year to still be offset.
2) The next option selected is “D-1BX---Water Right Purchase Surface – Roswell Area, which provides another 1,300 acre-ft/year, leaving 400 acre-ft/year to still be offset.
3) The third highest ranking option with offset amounts less than 400 acre-ft/year is “E-1A---Water Right Lease Surface - FSID”, which provides another 300 acre-ft/year, leaving 100 acre-ft/year to be offset.
4) The last option selected for offsetting the average demand is the option with least effective offset amount of all the remaining options (in order to minimize the amount of effective offset acquisition), “U – FSID Gravel Pit Pumping”; this option provides 200 acre-ft/year, creating 100 acre-ft/year of surplus.

The maximum required variable offset demands follow the same selection process, but now only 2,800 acre-ft is needed to meet the maximum demand since there was a surplus generated in offsetting the average demand. As a result of selecting offsets to meet the average depletions of the “Acme Variable” alternative, four options have now been consumed from the “A” list of offset options. These options cannot be selected for meeting the maximum offset demand. Again, using the rule of selecting the highest scoring option that is less than or equal to (or nearest greater than in this example) the remaining 2,800 acre-ft yields two options: “D-1AX- Water Right Purchase - FSID” and “D-1CX---Water Right Lease Surface – CID”. Since the FSID purchase won’t cover the entire needed offset amount but the CID lease will, it is logical to only choose the CID lease option for 3,150 acre-ft/year of effective offset. This option will provide 350 acre-ft/year more than required, which will be excess to the total offset requirement. Note that suitability of options to meet either average or maximum offset demands wasn’t considered.

The last remaining step is to establish a total annual maximum cost for the alternative. Table 24 lists the example offsets for the “Acme Variable” alternative and their annual costs. Also shown is the annual cost sum, which represents the maximum cost for this alternative (occurring some years).

Table 24 Hypothetical Coupling of Offset Options by Amount Available with the "Acme Variable" Alternative.

Offset Option	Demand Type	Adjusted EUAC ($/acre-ft/year)	Effective Offset Amount (acre-ft/year)	Maximum Total Annual Cost ($/year)
E-1B---Water Right Lease Surface – Roswell Area	Avg.	165	1,300	214,500
D-1BX---Water Right Purchase Surface – Roswell Area	Avg.	252	1,300	327,600
E-1A---Water Right Lease Surface - FSID	Avg.	396	300	118,800
U---Fort Sumner Area Gravel Pit Pumping	Avg.	13	200	2,600
D-1CX---Water Right Lease Surface - CID	Max.	91	3,150	286,650
Final EUAC, Total Amount, and Max. Annual Cost:	N/A	**152**	**6,250**	**950,150**

Economic commitment in excess of requirement [1], (6,250 – 5,900) x $152 = $53,200

[1] Assuming maximum offset demand occurs; this would be a minimum excess commitment.

6.5.2 Selection by Rank

Instead of minimizing the offset option amounts, another possibility for coupling offset options is scaling back the highest ranking options that provide more than adequate available amounts. Again using the same “Acme Variable” alternative, the respective annual average and additional maximum offset demands are 3,000 and 2,900 acre-ft. For the selection by rank approach, the option with the highest score is the preferred option. If the option does not meet the demand, then it is aggregated with the option that has the next highest score. Examples of average and maximum offset using the principle of “selection by rank” follow.

The highest scoring option for average offset is “Q1-SR---Develop Well Field – Seven Rivers” which can provide 6,700 acre-ft/year of offset water supplies. This is more than is needed for the average depletion for “Acme Variable. All of the average net depletion will be satisfied by Q1-SR with 3,700 acre-ft/year excess to that requirement. The remainder of the capacity, 3,000 acre-ft/year, will also offset the maximum variable demand with 100 acre-ft/year of surplus. Table 25 presents a hypothetical example of coupling offset options with alternatives through selection by rank.

Table 25 Hypothetical Coupling of Offset Options by Amount Available with the "Acme Variable" Alternative.

Offset Option	Demand Type	Adjusted EUAC [1] ($/acre-ft/year)	Maximum Amount Available to CID Farmers (acre-ft/year)	Maximum Total Annual Cost ($/year)
Q1-SR---Develop Well Field - Seven Rivers	Avg./Max.	433	6,700	$2,901,100
Final EUAC, Total Amount, and Max. Annual Cost:	N/A	**433**	**6,700**	**$2,901,100**

It is apparent that many different selection processes could be followed yielding different results each time. Another appropriate method, which is not presented here, would be selecting options by the adjusted EUAC. This method would also tend to minimize water acquisitions.

7. Additional Water Acquisition for Flow Augmentation

The WOOG's scope initially focused on the offset of depletions to the Carlsbad Project Supply due to reoperation of Sumner Dam for the benefit of the PBNS. A subsequent issue addressed by the WOOG was the acquisition of additional water supplies for the PBNS. Additional water acquisition is defined as new water added to the Pecos River system, obtained for the purpose of providing instream flows for the PBNS. Additional water acquisition is required when re-operation of Sumner Dam is not adequate to provide instream habitat for the PBNS.

7.1. Distinction between Additional Water Acquisition and Offset of Carlsbad Project Supply

A distinction is made between offset water for replenishing depletions to Carlsbad Project Supply and water that is additionally acquired for augmenting instream flows, since the two modes of acquisition can have different effects on CID supply. Bypassing Carlsbad Project Supply through Sumner Dam for the PBNS is a *conjunctive* use of the surface water right. Part of the water is benefiting the shiner, while part of the water makes it to Brantley for use as irrigation water. In the process, some of the supply is depleted since it wasn't released with the high efficiency of a block release. Conversely, additional water acquisition may have, depending on the season and the additional acquisition amount, an *incidental benefit* to Carlsbad Project Supply. If water is solely purchased for the benefit of augmenting flows for the PBNS, some of that water will likely become Carlsbad Project Supply, thus augmenting its supply.

7.2. Additional Water Acquisition Options

Additional water acquisition options were formulated by revisiting the list of water offset options and determining which of those options could be applied upstream of the PBNS critical habitat. In addition, WOOG members developed additional acquisition options. Some of the options presented may not be practical in the scope of this NEPA process since public meetings and public information were not addressed upstream of Santa Rosa, NM. Additional water acquisition options, along with those that may not be feasible due to their location, are identified in Table 26.

Table 26. Possible Additional Water Acquisition Options Above Sumner Dam

Option Designation	Option Name	Description
A	Water Right Purchase	Water right purchase in CID, FSID, Near FSID, Puerto de Luna, Anton Chico, Villanueva╫, or the Gallinas Tributary╫.
B	Water Right Lease	Water right lease in CID, FSID, Near FSID, Puerto de Luna, Anton Chico, Villanueva╫, or the Gallinas Tributary╫.
C	On Farm Conservation	On-farm conservation in CID, FSID, Near FSID, Puerto de Luna, Anton Chico, Villanueva╫, or the Gallinas Tributary╫. Requires agreements with water purveyor for release of saved water
D	Cropping Pattern Changes	Cropping pattern changes in CID, FSID, Near FSID, Puerto de Luna, Anton Chico, Villanueva╫, or the Gallinas Tributary╫. Requires agreements with land owners for payments in lieu of crop revenues and release of saved water

Table 26. Possible Additional Water Acquisition Options Above Sumner Dam

Option Designation	Option Name	Description
E	Riparian Vegetation Control (upstream of upper critical habitat)	Eradicate and control exotic vegetation growth, such as Salt Cedar and Russian Olive, in the riparian corridor upstream of the upper critical habitat.
F	Import Canadian River Water	Import Canadian River water by building a trans-basin diversion between Conchas and Santa Rosa. Water would be supplied by saved irrigation losses from lining the Arch-Hurley canal Requires contract with district for transport of saved water from Canadian Basin
G	Range and Watershed Management	Eradicate mesquite and juniper from adjacent range and tributary areas to river to increase tributary flows and river base flows. Also, thin upland forest areas (in the Sangre de Cristos) to increase stream flow from Pecos headwaters.
H	Evaporation Suppression	Suppress evaporation on the two major reservoirs upstream of the upper critical habitat (Sumner and Santa Rosa).
I	Fort Sumner Area—Gravel Pit Pumping	Pump water from abandoned gravel pits in the Fort Sumner area to the river.
J	Fort Sumner Well Field	Develop a well field in the Ft. Sumner Area and pump water to the river.

╫ Does not fall within defined affected environment.

8. WOOG Documentation Matrix for Additional Water Acquisition to Augment Pecos River Flows

The documentation matrix for additional water acquisition options is shown as Table A.4 in Appendix A. For the most part, similarly related forms of acquisition and offset are derived from the numerical sources used for offset options. Options located in the affected environment upstream of Santa Rosa are listed in the matrix, but were not evaluated in the detail as other Additional Water Acquisition Options.

8.1. Additional Water Acquisition Options Redundant with Carlsbad Project Supply Offset Options

Redundant water acquisition options are offset options that would work to provide water upstream of the upper critical habitat by exchange for CID's supply. Because these options require the use of CID's supply, they are redundant with the analysis performed for offset options. Possible water right transfers or changes in the purpose or place of use may facilitate the implementation of such redundant offset options, without further offset of CID water rights.

8.2. Research and Investigation for Additional Water Acquisition Options

Additional water acquisition options were largely developed from offset options analyzed earlier. Options developed independent of the offset analysis were documented similarly to the offset options.

8.2.1. Additional Water Acquisition Options – Documentation Matrix Parameter Summary

Documentation parameters for additional water acquisition options are identical to those used for offset options. Please refer to section 3.2 for a description of those documented parameters.

8.2.2. Additional Water Acquisition Report Research

Also identical to the offset investigation process, report research for additional water acquisition was completed. In some cases, previously researched values from WOOG offset reports were used. These sources were documented in the WOOG documentation matrix for additional water acquisition.

8.2.3. Subsets of Additional Water Acquisition Options

A few subsets are noted in each major category of additional water acquisition options. Similar to the offset options, some additional water acquisition options contain multiple input parameters, such as differing irrigated acreages depending on the district in question. These options were divided into subsets to facilitate the evaluation of the different input parameters. A brief description of direct water acquisition options containing sub-categories and why they were divided follows:

- **Water Right Purchase (A):** Water right purchase options contain two tiers of sub-categories. The first tier is options that have projected prices based on time regression of prices from the 1990's. The second tier are options that are additionally inflated (after the time regression); these options are indicated with an "X" following their designation. Also, water right purchase options are divided by district. Since it is anticipated that only surface water rights will be available, with the exception of the "Near FSID" subcategory, groundwater acquisition options in the listed districts were not considered as they were for the offset options.
- **Water Right Lease (B):** Water right lease options are divided by district, with the exception of the "Near FSID" subcategory, which is not part of the FSID and has groundwater rights instead of surface water rights.
- **On Farm Conservation (C):** Differing irrigation districts have different proximities to the upper critical habitat and also have different amounts available based on irrigated acreage.
- **Cropping Pattern Changes (D):** Cropping patterns have two-tiered sub-categories. Cropping pattern changes vary by irrigation district (number suffixes of 1, 2, 3, 4, and 5) and additionally vary by input parameters from three different replacement crops or the average cost of all three replacement crops (letter suffixes—A, B, C, and D).
- **Riparian Vegetation Control (E):** Two subsets studied including removing Salt Cedar and replacing Russian Olive trees with Cottonwood trees.
- **Range and Watershed Management:** This additional water acquisition option was split into two tiers of sub-categories. The first tier distinguished range and watershed management in the lower watershed, such as management of vegetation in the adjacent uplands to the Pecos River, from upper watershed management, which is the management of the forest in the headwaters of the Pecos River. The second tier of divisions depends on the sub-category for the first tier. Lower watershed management was split into the range indicated by the researcher for salvage (upper, lower, and average amounts available) and upper watershed management was split into the range of costs associated with it (upper limit costs, lower limit costs, and average costs).
- **Evaporation Suppression:** This option was also divided into two tiers of sub-categories. The first tier divided new evaporation suppression methods from old evaporation suppression methods, which varied in cost. Additional sub-categories were then created for the aggregate of the two reservoirs upstream of the critical habitat, and also for Santa Rosa and Sumner individually.

8.2.4. Quantitative Data in the Additional Water Acquisition Option Forms

Documentation of quantitative data in the additional water acquisition option forms is identical to the documentation for offsets described in Section 3.4.

9. WOOG Ranking Matrix for Additional Water Acquisition to Augment Pecos River Flows

The WOOG Ranking Matrix for Additional Water Acquisition is shown as Table B-2 in Appendix B. The ranking matrix is nearly identical to the one used for evaluating water offset with the exception of three criteria changes which are described in the next section.

9.1. Quantitative Parameters and Ranking Criteria for Additional Water Acquisition Options

Two quantitative ranking criteria changes were implemented to the ranking matrix to modify it so it could be used to evaluate direct water acquisition for the PBNS. Supply flexibility, amount available and proximity were all modified to apply to the effectiveness of providing water for the PBNS. The remainder of the criteria applies to direct water acquisition without changes. Ranking criteria for two quantitative parameters were modified. Those modifications are shown in Tables 27 and 28.

Table 27. Amount Available Ranking Criteria Table-Modified for PBNS Additional Water Acquisition

Greater than or equal to acre-ft/year:	
5	5000
4	4000
3	3000
2	2000
1	1000
0	100

Table 28. Proximity Ranking Criteria Table-Modified for PBNS Additional Water Acquisition

Based on where on the river the water would be realized or where the outfall would be located if the offset source is not adjacent to the river. Additional criteria addresses affected compact calculations.	
Rank	Description/Other Conditions
5	Upstream of Crockett Draw and Downstream of Dunlap Gage
4	Upstream of Dunlap Gage and Downstream of Taiban Gage
3	Upstream of Taiban Gage and Downstream of Sumner Dam
2	Upstream of Sumner Dam-Not Subject to Compact
1	Upstream of Sumner Dam-Subject to Compact -or- Upstream of Santa Rosa-Not Subject to Compact
0	Upstream of Santa Rosa-Subject to Compact

9.2 Qualitative Parameters and Ranking Criteria for Additional Water Acquisition Options

One of the qualitative parameters was modified for adaptation to additional water acquisition. The supply flexibility criteria were revised to reflect additional water acquisition for the PBNS. As with the quantitative parameters, the remaining qualitative parameters were not modified and applied to additional water acquisition options just as they did to WOOG options. Table 29 shows the modified supply flexibility criteria table.

Table 29. Supply Flexibility Ranking Criteria Table-Modified for PBNS Additional Water Acquisition

Based (seasonally) on when water is available for bypass.	
5	Provides bypass water on demand or allows storage of such water (any time of year)
2.5	Provides bypass water on demand in summer and spring
0	Provides bypass water in off seasons (winter and fall) only

9.3 Ranking for Additional Water Acquisition Options

Ranking of additional water acquisition options is accomplished in an identical manner as ranking for offset options as presented in Section 4.3, with the exception of the WOOG trial run through the option ranking.

9.4 Preferred Additional Water Acquisition Options – "A" and "B" Lists

As with the Offset Options, the Additional Water Acquisition Options were divided into "A" and "B" lists to indicate the timing of the available water. For Additional Water Acquisition Options in which the time to implement the option and time to realize water from that option was determined to be less than three years, the option was included on the "A" list. All other options were included on the "B" list. Table 30 itemizes the "A" list for Additional Water Acquisition Options and Table 31 itemizes the "B" list.

Table 30. Additional Water Acquisition Options - "A" List

Designation	Option Name	Amount Available (acre-feet/year)	Combined Total Score	EUAC[1] ($/acre-ft)
A-1	Surface Water Right Purchase-CID	3,150	75.5	99
A-2	Surface Water Right Purchase-FSID	1,000	73.5	99
A-1X	Surface Water Right Purchase-CID (additional 40% inflation)[2]	3,150	73.5	139
B-1	Surface Water Right Lease-CID	3,150	71.5	91
A-2X	Surface Water Right Purchase-FSID (additional 40% inflation)[2]	1,000	71.5	139
B-2	Surface Water Right Lease-FSID	1,000	70.5	91
I	Fort Sumner Gravel Pit Pumping	300	63.5	10
J-2	Fort Sumner Well Field-Pump Crop Pattern Savings	1,384	62.0	150
J-1	Fort Sumner Well Field-Groundwater Purchase and Conservation Savings	500	61.0	164
D-1C	Change Cropping Pattern-CID (Small Grain)	15,000	60.0	128
D-1A	Change Cropping Pattern-CID (Average of All Crops)	12,750	60	144
D-1D	Change Cropping Pattern-CID (Corn)	8,500	60.0	147
D-1B	Change Cropping Pattern-CID (Cotton)	12,500	59	158
D-2	Change Cropping Patterns-FSID (Small Grain)	3,375	59	158
A-4	Water Right Purchase-Puerto de Luna	110	57.5	99
A-4X	Water Right Purchase-Puerto de Luna (additional 40% inflation)[2]	110	55.5	139
B-4	Water Right Lease-Pureto de Luna	110	54.5	91
D-4	Change Cropping Patterns-Pureto de Luna (Small Grain)	360	47.5	168

Table 31. Additional Water Acquisition Options - "B" List

Designation	Option Name	Amount Available (af/year)	Combined Total Score	EUAC[1] ($/acre-ft)
C-1	On-Farm Conservation-CID	4,000	66.5	50
F	Import Canadian River Water	20,000	65	285
C-2	On-Farm Conservation-FSID	2,225	62	116
A-3	Groundwater Purchase-FSPA	235	60.5	67
A-3X	Groundwater Purchase-FSPA (additional 40% inflation)[2]	235	60.5	94
C-4	On-Farm Conservation-Puerto de Luna	1,620	57.5	42
B-3	Groundwater Right Lease-FSPA	235	57.5	69
A-5	Water Right Purchase-Above Santa Rosa	330	57.5	99
K	Renegotiate Compact-forbearance	18,500	57	145
G-1	Range and Lower Watershed Management (adjacent river upland)	13,271	56.5	6
G-2	Range and Lower Watershed Management (adjacent river upland)	7,300	56.5	10
C-3	On-Farm Conservation-FSPA	272	55.5	10
E-1	Riparian Vegetation Control (Salt Cedar)	3,125	55.5	27
A-5X	Groundwater Purchase-Above Santa Rosa (additional 40% inflation)[2]	330	55.5	139
E-2	Riparian Vegetation Control (Replace Russian Olive trees with Cottonwood trees)	4,000	54.5	51
B-5	Water Right Lease-Above Santa Rosa	330	53.5	91
C-5	On-Farm Conservation-Above Santa Rosa	330	52.5	184
G-6	Range and Lower Watershed Management (adjacent river upland)	12,700	51.5	-378
H-1	Evaporation Suppression (old methods)-Santa Rosa and Sumner	11,000	49.5	100
D-3	Change Cropping Patterns-FSPA (Small Grains)	1,388	48.5	108
H-3	Evaporation Suppression (old methods)-Sumner	6,100	47.5	100
G-3	Range and Lower Watershed Management (adjacent river upland)	1,296	46.5	57
D-5	Change Cropping Patterns-Above Santa Rosa (Small Grains)	315	46.5	147
G-5	Range and Lower Watershed Management (forest thinning)	12,700	45.5	482
G-4	Range and Lower Watershed Management (forest thinning)	12,700	45.5	1134
H-2	Evaporation Suppression (old methods)-Santa Rosa	4,900	44.5	100
H-4	Evaporation Suppression (new methods)-Santa Rosa and Sumner	11,000	36.5	3
H-6	Evaporation Suppression (new methods)-Sumner	6,100	36.5	6
H-5	Evaporation Suppression (new methods)-Santa Rosa	4,900	34.5	7

10. Recommendations on use of Offset and Additional Water Acquisition Options

Recommendations on the use of Offset Options or Additional Water Acquisition Options are provided to NEPA decision makers to guide selection of options that fulfill the purpose of the EIS. Development of "A" and "B" lists segregated the options into offsets or additional water sources that can reasonably be instituted within a time frame of three years. The "A" lists are those options that are reasonably likely to provide the needed water supplies within a three year period, and the "B" lists are those options that may provide the needed water supplies, but not within a three-year period. It was felt that in order for the USBR to implement offsets and additional acquisitions in a timely manner at the conclusion of this EIS, options should be implementable within three years.

Rankings within the "A" list are suggested preferences but do not preclude the decision maker from selecting any of the "A" options. It is the WOOG's opinion that options with very low unit costs (even those on the "B" lists) should be considered for ongoing research and development as means of securing the needed water supplies at the least cost. These options may not provide the assurances or timeliness required in the short term, but may provide long-term solutions that do not require implementation of options with major resource commitments. Long-term programs to control vegetation, import water supplies and even conduct cloud seeding operations are all worthy of ongoing investment and research. If any of these options were to prove effective, the dollar savings could be significant. It is also apparent that the commitment of resources should be tempered with the unknown quantities of water required for the PBNS and the possibility that offset options and additional water supplies could be less in the future. Water right purchases and the corresponding drying of lands to balance depletions is a time honored method of securing water supplies, but requires a transfer of water away from irrigated agriculture. Offsets and Additional Acquisitions in amounts that likely will change in the future may be better fulfilled through leases in the short term, so that water not needed for these purposes may be returned to original uses without major economic dislocations or permanent transfers.

However, WOOG analyses clearly identify the purchase or lease of existing water rights as options for offset or additional acquisitions that remain viable with fairly predicable short-term results. Even more effective at supplying water (but less cost effective) are options to develop well fields that pump water to the river. These options should be developed concurrently with the state's implementation of the Consensus Plan, if possible, to avoid competition for limited resources and take advantage of economies of scale.

11. References

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Appendix A

WOOG Documentation and Ranking Matrices

Table A.1. WOOG Documentation Matrix for Offset of Carlsbad Water Supply

WOOG PARAMETER DOCUMENTATION MATRIX

Last Updated by: **TBS 05/06/04**

Color Legend

- -Base Parameter from report/investigation/or derived from alternative source
- -Parameter estimated by Stockton
- -Original costs annualized with 5.875% planning rate to reflect time value of money by Stockton
- -Options eliminated
- -Subjective parameter-not determined in this matrix.
- -Need more information.
- -Parameter estimated by Soice

Ranking Criteria (Administrative/Documentation Form)

1) Equivalent Uniform Annual Cost (EUAC) of Water: Measured in $/acre-ft (annualized on yearly basis-using planning rate of 5.875%, end of period payments, and project life)
2) Timing: Not a quantitative value in this matrix-will be saved for ranking matrix.
3) Salvage Risk: Not a quantitative value in this matrix-will be saved for ranking matrix.
4) Political, Social, Legal, and Institutional Risk: Not a quantitative value in this matrix-will be saved for ranking matrix.
5) Amount available: Acre-ft per year available.
6) Proximity to CID: Measured in river miles from Rio Grande Confluence. * indicates some or majority of salvage water is subject to PR compact (above Sumner).
7) Sustainability: Not a quantitative value in this matrix-will be saved for ranking matrix.
8) Time to implement: Number of years to resolve all legal, infrastructure, and financial issues; water becomes available in river.
9) Time to realize: Number of years between end of time to implement before additional water becomes available to CID.

Cost Administration and Time Value of Money Categories

A) Willing seller: Options that do not meet this requisite will not be consisdered, water must be able to be purchased or realized to be considered as an alternative.
B) Upfront capital cost: Initial cost at start of project (year 0).
C)Operation, Maintenance, and Replacement: Operation and maintenance costs, replacement automatic by definition of EUAC.
D) Project Life: How long the project will last and function before it needs replaced.
E) Total Present Value: Present worth of annual O,M,&R in year 0 (using project life and 5.875% planning rate) plus upfront capital cost.

NOTES:
[1]Mean river mile for majority of control/replacement (e.g. Sumner to Brantley for salt cedar or Sumner to Acme for Russian Olive).
[2]Water subject to Pecos River Interstate Compact
[3]Original "amount available" values broken up using (sum of) monthly reservoir estimates (by reservoir) from RiverWare Model.
[4]Treatment costs ($3050/acre-ft[Y-1] and $1342/acre-ft[Y-2]) are included in final per acre-ft number (not included in other capital cost columns)
[5]Values were inflated an additional 40% from original linear regression values predicted in Soice's report to account for ISC water right buy up.
[6]Option uses 40% inflated water right purchase numbers

<----------------------- RANKING CRITERIA -- <COST ADMINISTRATION AND TIME VALUE OF MONEY>

ID	Description	Lead Reviewer(s) Base Unit---->	1) EUAC of Water ($/af/year)	2) Tim.	3) Sal. Risk	4) Pol. Risk	5) Amt. Avail. (af/yr)	6) Close to CID? (r. mi.)	7) Sust.	8) Time to Impl. (years)	9) Time to Real. (years)	A) Upfront Capital Cost $ in year 0	B) O,M, & R $/year n	C) Proj. Life (years)	Total Cost (PV) $ in year 0	Parameter Comments
A-1	On Farm Conservation-FSID	Brummer	96				5400	683		5	0	6,000,000	0	20	6,000,000	Annual cost based on $1000/irrigated acre (upfront capital) for salvage of 1.5 acre-ft/acre and 6000 irrigated acres
A-2	On Farm Conservation-PVACD	Brummer	216				8000	562		5	0	20,000,000	0	20	20,000,000	Annual cost based on $1000/irrigated acre (upfront capital) for salvage of 0.4 acre-ft/acre and 20000 irrigated acres
A-3	On Farm Conservation-CID	Brummer	50				4000	469		5	0	0	200,000	20	2,317,445	Annual cost based on $10/irrigated acre*year for salvage of 0.2 acre-ft/acre and 20000 irrigated acres
A-4	Canal Refurbishing-FSID	Brummer	3.01				9000	683		5	0	205,000	14,350	50	435,189	Annual O&M estimated at 7% original capital cost.
A-5	Canal Refurbishing-CID	Brummer	44				10000	469		5	0	3,360,000	235,200	50	7,132,858	Annual O&M estimated at 7% original capital cost. Assumes only relining some areas.
B	Drain Construction	Soice		TRUNCATED												Option has problems with water rights and also has one time only use for very small amount.
C-1	Hernandez Idea-10 cfs	Shomaker		TRUNCATED												Option was forwarded to Alternative Development Group for Review
C-2	Hernandez Idea-25 cfs	Shomaker		TRUNCATED												Option was forwarded to Alternative Development Group for Review
C-3	Hernandez Idea-50 cfs	Shomaker		TRUNCATED												Option was forwarded to Alternative Development Group for Review
C-4	Hernandez Idea-90 cfs	Shomaker		TRUNCATED												Option was forwarded to Alternative Development Group for Review
D-1A	Water Right Purch. Surface (FSID)	Soice	99				1000	683		2	0	1,687	N/A	Infinite	1,687,000	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-1B	Water Right Purch. Surface (PVACD)	Soice	99				1600	562		2	0	1,687	N/A	Infinite	2,699,200	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-1C	Water Right Purch. Surface (CID)	Soice	99				3150	469		2	0	1,687	N/A	Infinite	5,314,050	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-2A	Water Right Purch.-Shallow GW (PVACD)	Soice	67				7000	562		2	0	1,147	N/A	Infinite	8,029,000	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-2B	Water Right Purch.-Shallow GW (CID)	Soice	67				400	469		2	0	1,147	N/A	Infinite	458,800	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-3A	Water Right Purch.-Artesian GW (PVACD)	Soice	84				7000	562		2	0	1,434	N/A	Infinite	10,038,000	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-3B	Water Right Purch.-Reef GW (CID)	Soice	84				400	469		2	0	1,434	N/A	Infinite	573,600	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
D-1AX	Water Right Purch. Surface (FSID)[5]	Soice	139				1000	683		2	0	2,362	N/A	Infinite	2,361,800	Same as D-1A, except cost numbers have additional 40% inflation value.
D-1BX	Water Right Purch. Surface (PVACD)[5]	Soice	139				1600	562		2	0	2,362	N/A	Infinite	3,778,880	Same as D-1B, except cost numbers have additional 40% inflation value.
D-1CX	Water Right Purch. Surface (CID)[5]	Soice	139				3150	469		2	0	2,362	N/A	Infinite	7,439,670	Same as D-1C, except cost numbers have additional 40% inflation value.
D-2AX	Water Right Purch.-Shallow GW (PVACD)[5]	Soice	94				7000	562		2	0	1,606	N/A	Infinite	11,240,600	Same as D-2A, except cost numbers have additional 40% inflation value.
D-2BX	Water Right Purch.-Shallow GW (CID)[5]	Soice	94				400	469		2	0	1,606	N/A	Infinite	642,320	Same as D-2B, except cost numbers have additional 40% inflation value.
D-3AX	Water Right Purch.-Artesian GW (PVACD)[5]	Soice	118				7000	562		2	0	2,008	N/A	Infinite	14,053,200	Same as D-3A, except cost numbers have additional 40% inflation value.
D-3BX	Water Right Purch.-Reef GW (CID)[5]	Soice	118				400	469		2	0	2,008	N/A	Infinite	803,040	Same as D-3B, except cost numbers have additional 40% inflation value.
E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	Rocha	91				1000	683		2	0	91,000	91,000	5	384,632	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
E-1B	Water Right Lease/Land Fallowing-Surface (PVACD)	Rocha	91				1600	562		2	0	145,600	145,600	5	615,411	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
E-1C	Water Right Lease/Land Fallowing-Surface (CID)	Rocha	91				3150	469		2	0	286,650	286,650	5	1,211,591	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
E-2A	Water Right Lease/Land Flw.-Shlw. GW (PVACD)	Rocha	69				7000	562		2	0	483,000	483,000	5	2,041,509	Numbers based on 5 year existing BOR leases, upfront capital cost assumes yearly payments.
E-2B	Water Right Lease/Land Fallowing-Shallow GW (CID)	Rocha	69				400	469		2	0	27,600	27,600	5	116,658	Numbers based on 5 year existing BOR leases, upfront capital cost assumes yearly payments.
E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	Rocha	106				7000	562		2	0	742,000	742,000	5	3,136,231	Numbers based on 5 year existing BOR leases, upfront capital cost assumes yearly payments.
E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	Rocha	106				400	469		2	0	42,400	42,400	5	179,213	Numbers based on 5 year existing BOR leases, upfront capital cost assumes yearly payments.
F-1	Rip. Veg. Control-Salt Cedar	Brummer	27				12500	594 [1]		2	5	3,000,000	80,000	20	3,926,978	Assumes 25% reveg. and aerial herbicide application, 5 yr. to implement (time for herbicide to kill plant).
F-2	Veg. Control-Kochia Eradication	Brummer	13				3600	503		1	8	0	48,000	1	45,336	Uses wet and normal year salvage number, Dry year=$40/af
F-3	Replace RO with CW	Brummer	51				4000	648 [1]		2	5	3,000,000	8,000	40	3,122,292	Assumes 1000 acres replaceable
G	Acequia Improvements	Sidlow	28	TRUNCATED			250	720 [2]				110,650	N/A	50	110,650	Option is being built anyway.
H	Pump Supplemental Wells	Rhoton	23				10000	469		5	0	1,837,500	76,400	20	2,722,764	
I	Import Canadian River Water	Soice	285				20000	750		9	0	59,800,000	1,794,000	40	87,223,898	Rough estimate, doesn't include cost of ROW, lift stat., O&M, etc. Assumed 3% orig. cost for O&M
J	Res. Entitlement Storage Flexibility	Stockton	80				3500	469		5	0	4,500,000	0	50	4,500,000	Lowers Santa Rosa Conservation Storage by 10,000 AF and Raises Brantley by 10,000 AF.
K-1	Desalinization-Lower Limit Cost	Brummer	652				10000	586		9	0	8,236,000	5,930,000	30	90,964,930	Feed water is brackish (10000 ppm). See option form for other assumptions.
K-2	Desalinization-Upper Limist Cost	Brummer	1639				10000	586		9	0	8,236,000	15,800,000	30	228,660,468	Feed water is 35000 ppm. See option form for other assumptions.
L-1	Change Cropping Patterns (CID)-Ave. All Crops	Brummer	144				12750	469		2	0	1,831,650	N/A	1	1,831,650	Average of 3 crop types
L-2	Change Cropping Patterns (CID)-Cotton	Brummer	175				12500	469		2	0	2,188,250	N/A	1	2,188,250	
L-3	Change Cropping Patterns (CID)-Small Grain	Brummer	128				15000	469		2	0	1,912,800	N/A	1	1,912,800	
L-4	Change Cropping Patterns (CID)-Corn	Brummer	147				8500	469		2	0	1,252,100	N/A	1	1,252,100	
M	Lower Groundwater Levels	Stockton		TRUNCATED												Option's water savings are insignificant and near impossible to realize.
N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	Smith	6				13271	646		5	7.5	855,360	0	20	855,360	For adjacent (river) removal of mesquite in uplands from Taiban to Acme. Upper limit salvage value
N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	Smith	10				7300	646		5	7.5	855,360	0	20	855,360	For adjacent (river) removal of mesquite in uplands from Taiban to Acme. Average salvage value
N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	Smith	57				1296	646		5	7.5	855,360	0	20	855,360	For adjacent (river) removal of mesquite in uplands from Taiban to Acme. Lower limit salvage value
N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	Springer	1134				25400	blw.586		5	10	462,000,000	0	50	462,000,000	Highest estimated cost ($2000/acre); 231000 acres thinned
N-5	Rng. and (Upper) Watershed Mng.-Average Cost	Springer	482				25400	blw.586		5	10	196,350,000	0	50	196,350,000	Most probable cost according to land managers; 231000 acres thinned
N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	Springer	-378				25400	blw.586		5	10	-154,000,000	0	50	-154,000,000	Commercial sales from thinning (numbers based on small Cloudcroft project); 231000 acres thinned
O	Cloud Seeding	Springer	0.98				43000	758 [2]		2	0	0	44,720	1	42,238	Assumes $.052/acre of drainage area seeded. Assumes conc. point for drain area upstream of Sumner.
P	GW recharge/conjunctive use	Shomaker		TRUNCATED												Identical to well field development since amount must be offset every year.
Q1-SR	Develop Well Field-Seven Rivers	Sims	290				10000	479		2	0	22,335,166	1,303,402	30	40,518,817	Adds cost of artesian and shallow water right purchase (10000 af each) [D-3].
Q1-BV	Develop Well Field-Buffalo Valley	Sims	264				10000	479		2	0	18,593,052	1,303,402	30	36,776,703	Adds cost of artesian and shallow water right lease (10000 af each)
R	Rio Hondo Flood Control	Sidlow		TRUNCATED												Option is being built anyway.
S	Additional Metering (mostly PVACD)	Stockton	55				6250	586		1	1	2,800,000	163,000	40	5,291,692	Source: Lower Pecos Valley Regional Water Plan, pgs 235-236. Costs are for study--does not include lobbying.
T-1	Evaporation Suppresion-Old Methods (All Major)	Shomaker	100				17500	709 [2]		2	0	1,750,000	N/A	1	1,750,000	
T-1A	Evaporation Suppresion-Old Methods (Santa Rosa)[3]	Shomaker	100				4900	758 [2]		2	0	490,000	N/A	1	490,000	Location apportionment for amount based on RiverWare monthly evap estimates.
T-1B	Evaporation Suppresion-Old Methods (Sumner)[3]	Shomaker	100				6100	709 [2]		2	0	610,000	N/A	1	610,000	Location apportionment for amount based on RiverWare monthly evap estimates.
T-1C	Evaporation Suppresion-Old Methods (Brantley)[3]	Shomaker	100				6500	479		2	0	650,000	N/A	1	650,000	Location apportionment for amount based on RiverWare monthly evap estimates.
T-2	Evaporation Suppresion-New Rsrch. (All Major)	Shomaker	3.25				17500	709 [2]		10	0	56,875	N/A	1	56,875	
T-2A	Evaporation Suppresion-New Rsrch. (Santa Rosa)[3]	Shomaker	3.25				4900	758 [2]		10	0	15,925	N/A	1	15,925	Location apportionment for amount based on RiverWare monthly evap estimates.
T-2B	Evaporation Suppresion-New Rsrch. (Sumner)[3]	Shomaker	3.25				6100	709 [2]		10	0	19,825	N/A	1	19,825	Location apportionment for amount based on RiverWare monthly evap estimates.
T-2C	Evaporation Suppresion-New Rsrch. (Brantley)[3]	Shomaker	3.25				6500	479		10	0	21,125	N/A	1	21,125	Location apportionment for amount based on RiverWare monthly evap estimates.
U	FS Area Gravel Pit Pumping	Stockton	10				300	683		2	0	11,500	1,862	20	33,075	O&M includes maintenance and labor for 1 month of operation--does not include elec. hookup or ROW costs.
V	Kaiser Channel Lining	Stockton	180				9900	503		10	0	14,672,800	733,640	30	24,907,750	
W	Water Imprt. From Salt Bas. or Cap. Reef	Springer	620				20000	479		9	0	144,152,000	2,967,000	40	189,506,908	
X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	Springer	7884				22000	586		10	0	472,100,000	142,562,350	40	2,651,372,734	For comparison with desalination option
X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	Springer	8965				22000	586		10	0	472,100,000	166,340,125	40	3,014,850,586	For comparison with desalination option
X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	Springer	7026				22000	586		10	0	472,100,000	123,690,248	40	2,362,885,221	For comparison with desalination option
X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	Springer	2222				22000	586		10	0	472,100,000	17,996,702	40	747,205,744	Industrial sale of electric compareable with wholesale; gas transmission costs are omitted.
X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	Springer	3082				22000	586		10	0	472,100,000	36,928,003	40	1,036,598,194	Industrial sale of electric compareable with wholesale; gas transmission costs are omitted.
X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	Springer	1484				22000	586		10	0	472,100,000	1,756,485	40	498,950,423	Industrial sale of electric compareable with wholesale; gas transmission costs are omitted.
X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale	Springer	-236				22000	586		10	0	472,100,000	-36,074,705	40	-79,354,295	Sales price optimistic without cost of electric distribution system; gas transmission costs are omitted.
X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	Springer	862				22000	586		10	0	472,100,000	-11,930,402	40	289,726,465	Sales price optimistic without cost of electric distribution system; gas transmission costs are omitted.
X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	Springer	-1164				22000	586		10	0	472,100,000	-56,494,025	40	-391,493,279	Sales price optimistic without cost of electric distribution system; gas transmission costs are omitted.
Y-1	Oil Field Production Well Waste Water-Example 1[4]	Sims	3188				8815	479		5	0	30,781,000	5,878,000	10	74,300,958	Uses cheapest delivery option-final number includes tax credit of $1000/acre-ft delivered to Pecos River
Y-2	Oil Field Production Well Waste Water-Example 2[4]	Sims	1687				9030	479		5	0	31,599,000	7,879,000	10	89,934,106	Uses cheapest delivery option-final number includes tax credit of $1000/acre-ft delivered to Pecos River

Table A.2. Stockton’s Ranking Matrix for Offset of Carlsbad Water Supply

WOOG CARLSBAD PROJECT RANKING MATRIX

Tetra Tech, Inc.
Updated: 4/11/04

Ranking Criteria (Translated to 0-5 scale)	Weight
1) Cost (EUAC)	Initial weight of 1
2) Timing	Initial weight of 1
3) Salvage Risk	Initial weight of 1
4) Political, Legal, Social, and Institutional Risk	Initial weight of 1
5) Amount available	Initial weight of 1
6) Proximity to CID	Initial weight of 1
7) Sustainability	Initial weight of 1
8) Time to implement	Initial weight of 1
9) Time to physically realize (measured from end of time to implement)	Initial weight of 1
10) Positive cooncidental benefit for Pecos Bluntnose Shiner	Initial weight of 1
11) Stateline Effects	Initial weight of 1

Legend:
- Ranked by WOOG Group on 04/02/03
- Ranked by Stockton
- Option Eliminated
- Revised rank 11/19/03

RANKING CRITERIA as 0-5 SCALE

ID	Description	1) Cost	2) Timing	3)Salvage Risk	4) Pol. Risk	5) Amt. Available	6) Close to CID?	7) Sust.	8) Time to Impl.	9) Time to Realize	10) State Benefit?	EUAC ($/acre-ft)	Total Score
	WEIGHT----->	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
A-1	On Farm Conservation-FSID	4	3	4	0	2	3	4	3	5	2.5	96	30.5
A-2	On Farm Conservation-PVACD	3	3	4	0	2	4	4	3	2	2.5	216	27.5
A-3	On Farm Conservation-CID	5	3	4	0	2	5	4	3	5	0	50	31.0
A-4	Canal Refurbishing-FSID	5	3	4	0	2	3	4	3	5	2.5	3	31.5
A-5	Canal Refurbishing-CID	5	3	4	0	3	5	4	3	5	0	44	32.0
B	Drain Construction		OPTION	ELIMINATED									
C-1	Hernandez Idea-10 cfs		OPTION FORWARDED TO ALTERNATIVE DEVELOPMENT GROUP										
C-2	Hernandez Idea-25 cfs		OPTION FORWARDED TO ALTERNATIVE DEVELOPMENT GROUP										
C-3	Hernandez Idea-50 cfs		OPTION FORWARDED TO ALTERNATIVE DEVELOPMENT GROUP										
C-4	Hernandez Idea-90 cfs		OPTION FORWARDED TO ALTERNATIVE DEVELOPMENT GROUP										
D-1A	Water Right Purch/Land Retirement-Surface (FSID)	4	1	5	4	1	3	5	4	5	2.5	99	34.5
D-1B	Water Right Purch/Land Retirement-Surface (PVACD)	4	1	5	4	1	4	5	4	5	2.5	99	35.5
D-1C	Water Right Purch/Land Retirement-Surface (CID)	4	1	5	4	1	5	5	4	5	0	99	34.0
D-2A	Water Right Purch/Land Ret.-Shallow GW (PVACD)	4	3	4	4	2	4	5	4	3	2.5	67	35.5
D-2B	Water Right Purch/Land Ret.-Shallow GW (CID)	4	1	4	4	0	5	5	4	3	2.5	67	32.5
D-3A	Water Right Purch/Land Ret.-Artesian GW (PVACD)	4	3	4	4	2	4	5	4	2	2.5	84	34.5
D-3B	Water Right Purch/Land Ret.-Reef GW (CID)	4	1	4	4	0	5	5	4	3	2.5	84	32.5
D-1AX	Water Right Purch/Land Retirement-Surface (FSID)-40% Infl.	3	1	5	4	1	3	5	4	5	2.5	139	33.5
D-1BX	Water Right Purch/Land Retirement-Surface (PVACD)-40% Infl.	3	1	5	4	1	4	5	4	5	2.5	139	34.5
D-1CX	Water Right Purch/Land Retirement-Surface (CID)-40% Infl.	3	1	5	4	1	5	5	4	5	0	139	33.0
D-2AX	Water Right Purch/Land Ret.-Shallow GW (PVACD)-40% Infl.	4	3	4	4	2	4	5	4	3	2.5	94	35.5
D-2BX	Water Right Purch/Land Ret.-Shallow GW (CID)-40% Infl.	4	1	4	4	0	5	5	4	3	2.5	94	32.5
D-3AX	Water Right Purch/Land Ret.-Artesian GW (PVACD)-40% Infl.	3	3	5	4	2	4	5	4	2	2.5	118	34.5
D-3BX	Water Right Purch/Land Ret.-Reef GW (CID)-40% Infl.	3	1	5	4	0	5	5	4	3	2.5	118	32.5
E-1A	Water Right Lease/Land Fallowing-Surface (FSID)	4	1	5	5	1	3	3	4	5	2.5	91	33.5
E-1B	Water Right Lease/Land Fallowing-Surface (PVACD)	4	1	5	5	1	4	3	4	5	2.5	91	34.5
E-1C	Water Right Lease/Land Fallowing-Surface (CID)	4	1	5	5	1	5	3	4	5	0	91	33.0
E-2A	Water Right Lease/Land Flw.-Shallow GW (PVACD)	4	3	4	5	2	4	3	4	3	2.5	69	34.5
E-2B	Water Right Lease/Land Flw.-Shallow GW (CID)	4	1	4	5	0	5	3	4	5	2.5	69	33.5
E-3A	Water Right Lease/Land Flw.-Artesian GW (PVACD)	3	3	4	5	2	4	3	4	2	2.5	106	32.5
E-3B	Water Right Lease/Land Fallowing-Reef GW (CID)	3	1	4	5	0	5	3	4	5	2.5	106	32.5
F-1	Rip. Veg. Control-Salt Cedar	5	3	0	4	3	3	4	4	3	2.5	27	31.5
F-2	Veg. Control-Kochia Eradication	5	3	1	4	1	4	3	5	3	2.5	13	31.5
F-3	Replace RO with CW	4	3	0	4	1	3	4	4	3	2.5	51	28.5
G	Acequia Improvements		OPTION	ELIMINATED									
H	Pump Supplemental Wells	5	3	1	0	3	5	0	3	5	0	23	25.0
I	Import Canadian River Water	3	5	5	0	5	2	4	0	5	2.5	285	31.5
J	Res. Entitlement Storage Flexibility	4	0	4	2	1	5	5	3	5	0	80	29.0
K-1	Desalinization-Lower Limit Cost	2	3	5	2	3	4	4	0	5	2.5	652	30.5
K-2	Desalinization-Upper Limit Cost	1	3	5	2	3	4	4	0	5	2.5	1,639	29.5
L-1	Change Cropping Patterns (CID)-Ave. All Crops	3	3	4	0	3	5	3	4	5	0	144	30.0
L-2	Change Cropping Patterns (CID)-Cotton	3	3	4	0	3	5	3	4	5	0	175	30.0
L-3	Change Cropping Patterns (CID)-Small Grain	3	5	4	0	4	5	3	4	5	0	128	33.0
L-4	Change Cropping Patterns (CID)-Corn	3	3	4	0	2	5	3	4	5	0	147	29.0
M	Lower Groundwater Levels		OPTION	ELIMINATED									
N-1	Rng. and (Lower) Watershed Mng.-Upper Limit Slvg.	5	3	1	4	3	3	4	3	1	2.5	6	29.5
N-2	Rng. and (Lower) Watershed Mng.-Average Slvg.	5	3	1	4	2	3	4	3	3	2.5	10	30.5
N-3	Rng. and (Lower) Watershed Mng.-Lower Limit Slvg.	4	1	1	4	1	3	4	3	3	2.5	57	26.5
N-4	Rng. and (Upper) Watershed Mng.-Upper Limit Cost	1	5	1	4	5	4	4	3	3	2.5	1,134	32.5
N-5	Rng. and (Upper) Watershed Mng.-Average Cost	3	5	1	4	5	4	4	3	3	2.5	482	34.5
N-6	Rng. and (Upper) Watershed Mng.-Lower Limit Cost	5	5	1	4	5	4	4	3	3	2.5	-378	36.5
O	Cloud Seeding	5	4	0	2	5	1	2	4	5	2.5	1	30.5
P	GW recharge/conjunctive use		OPTION REDUNDANT TO THOSE STUDIED UNDER DESIGNATION Q										
Q1-SR	Develop Well Field-Seven Rivers	3	3	5	5	3	5	4	4	5	2.5	290	39.5
Q1-BV	Develop Well Field-Buffalo Valley	3	3	5	5	3	5	4	4	5	2.5	264	39.5
R	Rio Hondo Flood Control		OPTION	ELIMINATED									
S	Additional Metering	4	2	1	1	2	4	5	4	3	2.5	55	28.5
T-1	Evap. Suppresion-Old Methods (All Major)	4	4	2	0	4	2.3	3	4	5	2.5	100	30.8
T-1A	Evap. Suppresion-Old Methods (Santa Rosa)	4	2	2	0	1	1	3	4	5	2.5	100	24.5
T-1B	Evap. Suppresion-Old Methods (Sumner)	4	2	2	0	2	1	3	4	5	2.5	100	25.5
T-1C	Evap. Suppresion-Old Methods (Brantley)	4	2	2	0	2	5	3	4	5	2.5	100	29.5
T-2	Evap. Suppresion-New Rsrch. (All Major)	5	4	0	0	4	2.3	0	0	5	2.5	3	22.8
T-2A	Evap. Suppresion-New Rsrch. (Santa Rosa)	5	0	0	0	1	1	0	0	5	2.5	3	14.5
T-2B	Evap. Suppresion-New Rsrch. (Sumner)	5	2	0	0	2	1	0	0	5	2.5	3	17.5
T-2C	Evap. Suppresion-New Rsrch. (Brantley)	5	2	0	0	2	5	0	0	5	2.5	3	21.5
U	FS Area Gravel Pit Pumping	5	0	3	4	0	3	4	4	5	2.5	10	30.5
V	Kaiser Channel Lining	3	2	5	0	2	5	4	0	5	2.5	180	28.5
W	Water imprt. From Salt Bas. or Cap. Reef	2	5	5	0	5	5	4	1	5	5	620	37.0
X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	0	5	5	0	5	4	4	0	5	2.5	7,884	30.5
X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	0	5	5	0	5	4	4	0	5	2.5	8,965	30.5
X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	0	5	5	0	5	4	4	0	5	2.5	7,026	30.5
X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	0	5	5	0	5	4	4	0	5	2.5	2,222	30.5
X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	0	5	5	0	5	4	4	0	5	2.5	3,082	30.5
X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	1	5	5	0	5	4	4	0	5	2.5	1,484	31.5
X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale)	5	5	5	0	5	4	4	0	5	2.5	-236	35.5
X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	2	5	5	0	5	4	4	0	5	2.5	862	32.5
X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	5	5	5	0	5	4	4	0	5	2.5	-1,164	35.5
Y-1	Oil Field Production Well Waste Water-Low FW TDS	0	3	5	2	2	5	4	3	5	2.5	3,188	31.5
Y-2	Oil Field Production Well Waste Water-High FW TDS	1	3	5	2	2	5	4	3	5	2.5	1,687	32.5
Z	Renegotiate Compact-Forebearance	3	5	5	0	4	2.5	5	0	5	2.5	145	32.0

Table A.3. Soice's Ranking Matrix for Offset of Carlsbad Water Supply

WOOG CARLSBAD PROJECT RANKING MATRIX					RANKING CRITERIA as 0-5 SCALE; ranked by Phil Soice of Southwest Water Consultants										
		Lead	1) Cost	2) Timing	3) Sal Risk	4) Pol Risk	5) Amt.	6)Close to	7) Sustain	8) Time to	9) Time to	10) Benefit	EUAC	Total	Initial Cap
ID	Description	Reviewer(s)					Available	CID?		Implement	Realize	Stateline	per afy	Score	millions$
	WEIGHT----->		1	1	1	1	1	1	1	1	1	1		11	
A-1	On Farm Conservation-FSID	Brummer	4	3	1	1	2	3	5	3	5	2.5	96	29.5	6
A-2	On Farm Conservation-PVACD	Brummer	3	3	1	1	2	4	5	3	2	2.5	216	26.5	20
A-3	On Farm Conservation-CID	Brummer	5	3	5	1	2	5	5	3	5	0	50	34	0.0
A-4	Canal Refurbishing-FSID	Brummer	5	3	1	1	2	3	5	3	5	2.5	3	30.5	0.2
A-5	Canal Refurbishing-CID	Brummer	5	3	3	2	3	5	5	3	5	0	44	34	3
B	Drain Construction	Soice		OPTION ELIMINATED										0	
C-1	Hernandez Idea-10 cfs	Shomaker		OPTION ELIMINATED										0	
C-2	Hernandez Idea-25 cfs	Shomaker		OPTION ELIMINATED										0	
C-3	Hernandez Idea-50 cfs	Shomaker		OPTION ELIMINATED										0	
C-4	Hernandez Idea-90 cfs	Shomaker		OPTION ELIMINATED										0	
D-1A	Water Right Purch Sur FSID	Soice	4	3	5	5	1	3	5	4	5	2.5	99	37.5	2
D-1B	Water Right Purch Sur Roswell Area	Soice	4	3	5	5	1	4	5	4	5	2.5	99	38.5	3
D-1C	Water Right Purch Sur CID	Soice	4	3	5	5	1	5	5	4	5	0	99	37	5
D-2A	Water Right Purch Shallow PVACD	Soice	4	3	4	5	2	4	5	4	3	2.5	67	36.5	8
D-2B	Water Right Purch Shallow CID	Soice	4	3	4	5	0	5	5	4	3	0	67	33	0.5
D-3A	Water Right Purch Artesian PVACD	Soice	4	3	4	5	2	4	5	4	2	2.5	84	35.5	10
D-3B	Water Right Purch Reef CID	Soice	4	3	4	5	0	5	5	4	3	0	84	33	0.6
D-1AX	Water Right Purch Sur FSID	Soice	3	3	5	5	1	3	5	4	5	2.5	139	36.5	2
D-1BX	Water Right Purch Sur Roswell Area	Soice	3	3	5	5	1	4	5	4	5	2.5	139	37.5	4
D-1CX	Water Right Purch Sur CID	Soice	3	3	5	5	1	5	5	4	5	0	139	36	7
D-2AX	Water Right Purch Shallow PVACD	Soice	4	3	4	5	2	4	5	4	3	2.5	94	36.5	11
D-2BX	Water Right Purch Shallow CID	Soice	4	3	4	5	0	5	5	4	3	0	94	33	0.6
D-3AX	Water Right Purch Artesian PVACD	Soice	3	3	4	5	2	4	5	4	2	2.5	118	34.5	14
D-3BX	Water Right Purch Reef CID	Soice	4	3	4	5	0	5	5	4	3	0	118	33	0.8
E-1A	Water Right Lease Sur FSID	Rocha	4	3	5	5	1	3	4	5	5	2.5	91	37.5	0.1
E-1B	Water Right Lease Sur Roswell	Rocha	4	3	5	5	1	4	4	5	5	2.5	91	38.5	0.1
E-1C	Water Right Lease Sur CID	Rocha	4	3	5	5	1	5	4	5	5	0	91	37	0.3
E-2A	Water Right Lease Shallow PVACD	Rocha	4	3	4	5	2	4	4	5	3	2.5	69	36.5	0.5
E-2B	Water Right Lease Shallow CID	Rocha	4	3	4	5	0	5	4	5	3	0	69	33	0.03
E-3A	Water Right Lease Artesian PVACD	Rocha	3	3	4	5	2	4	4	5	3	2.5	106	35.5	0.7
E-3B	Water Right Lease Reef CID	Rocha	3	3	4	5	0	5	4	5	3	0	106	32	0.04
F-1	Rip. Veg. Control-Salt Cedar	Brummer	5	3	3	5	3	5	4	4	2	2.5	27	36.5	3
F-2	Veg. Control-Kochia Eradication	Brummer	5	3	3	4	1	5	4	5	3	2.5	13	35.5	0.05
F-3	Replace RO with CW	Brummer	4	3	3	3	1	3	4	4	2	2.5	51	29.5	3
G	Acequia Improvements	Sidlow		OPTION ELIMINATED										0	
H	Pump Supplemental Wells	Rhoton	5	3	3	0	3	5	3	2	5	0	23	29	2
I	Import Canadian River Water	Soice	3	3	3	1	5	2	4	3	5	5	285	34	60
J	Res. Entitlement Storage Flexibility	Stockton	4	0	4	2	1	5	5	3	5	0	80	29	5
K-1	Desalinization-Lower Limit Cost	Brummer	2	3	5	4	3	4	4	3	5	2.5	652	35.5	8
K-2	Desalinization-Upper Limit Cost	Brummer	1	3	5	4	3	4	4	3	5	2.5	1639	34.5	8
L-1	Change Cropping Patterns (CID)-Ave. All Crops	Brummer	3	3	4	1	3	5	4	5	5	2.5	144	35.5	2
L-2	Change Cropping Patterns (CID)-Cotton	Brummer	4	3	4	1	3	5	4	5	5	2.5	175	36.5	2
L-3	Change Cropping Patterns (CID)-Small Grain	Brummer	5	3	4	1	4	5	4	5	5	2.5	128	38.5	2
L-4	Change Cropping Patterns (CID)-Corn	Brummer	4	3	4	1	2	5	4	5	5	2.5	147	35.5	1.3
M	Lower Groundwater Levels	Stockton		OPTION ELIMINATED										0	
N-1	Rng. And Watershed Management-Upper Limit	Smith	5	3	3	4	3	4	4	3	1	2.5	6	32.5	0.9
N-2	Rng. And Watershed Management-Average	Smith	5	3	3	4	2	4	4	3	1	2.5	10	31.5	0.9
N-3	Rng. And Watershed Management-Lower Limit	Smith	4	3	3	4	1	4	4	3	1	2.5	57	29.5	0.9
N-4	Range and (Upper) Watershed Management-high cost	Springer	1	3	3	4	5	4	4	0	3	2.5	1134	29.5	462
N-5	Range and (Upper) Watershed Management-prob. cost	Springer	3	3	3	4	5	4	4	0	3	2.5	482	31.5	196
N-6	Range and (Upper) Watershed Management-no cost	Springer	5	3	3	4	5	4	4	0	3	2.5	-378	33.5	-154
O	Cloud Seeding	Springer	5	2	2	2	3	1	4	4	5	2.5	1	30.5	0.04
P	GW recharge/conjunctive use	Shomaker		OPTION ELIMINATED										0	
Q-1SR	Develop Well Field Seven Rivers	Sims	3	4	5	3	3	5	4	3	5	2.5	290	37.5	22
Q-2BV	Develop Well Field Buffalo Valley	Sims	3	4	5	3	3	4	4	3	5	2.5	264	36.5	19
R	Rio Hondo Flood Control	Sidlow		OPTION ELIMINATED										0	
S	Additional Metering	Soice	5	3	2	1	2	4	4	4	2	2.5	55	29.5	3
T-1	Evaporation Suppresion-Old Methods	Shomaker	4	3	2	0	4	5	3	3	5	2.5	100	31.5	2
T-1A	Evaporation Suppresion-Old Methods (Santa Rosa)	Shomaker	4	3	2	0	1	1	3	3	5	2.5	100	24.5	0.5
T-1B	Evaporation Suppresion-Old Methods (Sumner)	Shomaker	4	3	2	0	2	1	3	3	5	2.5	100	25.5	0.6
T-1C	Evaporation Suppresion-Old Methods (Brantley)	Shomaker	4	3	2	0	2	5	3	3	5	2.5	100	29.5	0.7
T-2	Evaporation Suppresion-New Research	Shomaker	5	3	0	0	4	5	0	0	5	2.5	3	24.5	0.06
T-2A	Evaporation Suppresion-New Methods (Santa Rosa)	Shomaker	5	3	0	0	1	1	0	0	5	2.5	3	17.5	0.02
T-2B	Evaporation Suppresion-New Methods (Sumner)	Shomaker	5	3	0	0	2	1	0	0	5	2.5	3	18.5	0.02
T-2C	Evaporation Suppresion-New Methods (Brantley)	Shomaker	5	3	0	0	2	5	0	0	5	2.5	3	22.5	0.02
U	FS Area Gravel Pit Pumping	Stockton	5	2	3	1	4	3	2	4	5	2.5	10	31.5	0.01
V	Kaiser Channel Lining	Stockton	3	3	4	2	2	5	5	3	5	2.5	180	34.5	15
W	Water imprt. From Salt Bas. or Cap. Reef	Springer	2	3	5	0	5	5	4	3	5	5	620	37	144
X-1	Dsl. Pwr. Plant-No Power Offset-2002 Cost of Gas	Springer	0	3	5	0	5	5	4	0	5	2.5	7884	29.5	472
X-2	Dsl. Pwr. Plant-No Power Offset-Past 3 -Yr. Cost of Gas	Springer	0	3	5	0	5	5	4	0	5	2.5	8965	29.5	472
X-3	Dsl. Pwr. Plant-No Power Offset-Past 10-Yr. COG	Springer	0	3	5	0	5	5	4	0	5	2.5	7026	29.5	472
X-4	Dsl. Pwr. Plant-2002 Energy Prices (Industrial Elec. Sale)	Springer	0	3	5	0	5	5	4	0	5	2.5	2222	29.5	472
X-5	Dsl. Pwr. Plant-Past 3-yr Energy Prices (Industrial ES)	Springer	0	3	5	0	5	5	4	0	5	2.5	3082	29.5	472
X-6	Dsl. Pwr. Plant-Past 10-yr Energy Prices (Industrial ES)	Springer	1	3	5	0	5	5	4	0	5	2.5	1484	30.5	472
X-7	Dsl. Pwr. Plant-2002 Energy Prices (All Sector Elec. Sale	Springer	5	3	5	0	5	5	4	0	5	2.5	-236	34.5	472
X-8	Dsl. Pwr. Plant-Past 3-yr Energy Prices (All Sector ES)	Springer	2	3	5	0	5	5	4	0	5	2.5	862	31.5	472
X-9	Dsl. Pwr. Plant-Past 10-yr Energy Prices (All Sector ES)	Springer	5	3	5	0	5	5	4	0	5	2.5	-1164	34.5	472
Y-1	Oil Field Production Well Waste Water-Low FW TDS	Sims	0	3	5	2	2	5	4	3	5	2.5	3188	31.5	31
Y-2	Oil Field Production Well Waste Water-High FW TDS	Sims	1	3	5	2	2	5	4	3	5	2.5	1687	32.5	32
Z	Renegotiate Compact-Forebearance	Springer	3	3	5	0	4	2.5	5	0	5	2.5	145	30	46

Table A.4. Additional Water Acquisition Documentation Matrix

WOOG ADDITIONAL WATER ACQUISITION PARAMETER DOCUMENTATION MATRIX

Last Updated by: **TBS 06/08/04**

Legend

- -Parameter estimated by Stockton.
- -Parameter estimated by Soice.
- -From original WOOG reports
- -Original costs annualized with 5.875% planning rate to reflect time value of money by Stockton
- -Subjective parameter-not determined in this matrix.
- -New research by WOOG member for fish water acquisition.
- -Additional information needed

Ranking Criteria (Administrative/Documentation Form)

1) Equivalent Uniform Annual Cost (EUAC) of Water: Measured in $/acre-ft (annualized on yearly basis-using planning rate of 5.875%, end of period payments, and project life).
2) Timing: Not a quantitative value in this matrix-will be saved for ranking matrix.
3) Salvage Risk: Not a quantitative value in this matrix-will be saved for ranking matrix.
4) Political, Social, Legal, and Institutional Risk: Not a quantitative value in this matrix-will be saved for ranking matrix.
5) Amount available: Acre-ft per year available.
6) Proximity to Upper Critical Habitat: Measured in river miles from Rio Grande Confluence. * indicates some or majority of salvage water is subject to PR compact (above Sumner).
7) Sustainability: Not a quantitative value in this matrix-will be saved for ranking matrix.
8) Time to implement: Number of years to resolve all legal, infrastructure, and financial issues; water becomes available in river.
9) Time to realize: Number of years between end of time to implement before additional water becomes available to CID.

Cost Administration and Time Value of Money Categories

A) Willing seller: Options that do not meet this requisite will not be considered, water must be able to be purchased or realized to be considered as an alternative.
B) Upfront capital cost: Initial cost at start of project (year 0).
C)Operation, Maintenance, and Replacement: Operation and maintenance costs, replacement automatic by definition of EUAC.
D) Project Life: How long the project will last and function before it needs replaced.
E) Total Present Value: Present worth of annual O,M,&R in year 0 (using project life and 5.875% planning rate) plus upfront capital cost.

NOTES:

[1]Mean river mile for majority of control/replacement (e.g. Santa Rosa to Crockett Draw for salt cedar and Russian Olive).
[2]Water subject to Pecos River Interstate Compact
[3]Original "amount available" values broken up using (sum of) monthly reservoir estimates (by reservoir) from RiverWare Model.
[4]Values were inflated an additional 40% from original linear regression values predicted in Soice's report to account for ISC water right buy up.

<---------------------- RANKING CRITERIA -- <COST ADMINISTRATION AND TIME VALUE OF MONEY>

ID	Description	Lead Reviewer(s Base Unit--	1) EUAC of Water ($/af/year)	2) Sup. Flex.	3) Sal. Risk	4) Pol. Risk	5) Amt. Avail. (af/yr)	6) Close to UCH? (r. mi.)	7) Sust.	8) Time to Impl. (years)	9) Time to Real. (years)	A) Upfront Capital Cost $ in year 0	B) O,M, & R $/year n	C) Proj. Life (years)	Total Cost (PV) $ in year 0	Parameter Comments
A-1	Surface Water Right Purchase-CID	Soice	99				3150	709		2	0	1,687	N/A	Infinite	5,314,050	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-2	Surface Water Right Purchase-FSID	Soice	99				1000	683		2	0	1,687	N/A	Infinite	1,687,000	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-3	Groundwater Right Purchase-FSPA	Soice	67				235	675		2	0	1,147	N/A	Infinite	269,545	Uses shallow aquifer water right prices.
A-4	Water Right Purchase-Puerto de Luna	Soice	99				110	720		2	0	1,687	N/A	Infinite	185,570	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-5	Water Right Purchase-Above Santa Rosa	Soice	99				330	>758		2	0	1,687	N/A	Infinite	556,710	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-1X	Surface Water Right Purchase-CID (add. 40% inflat.) [4]	Soice	139				3150	709		2	0	2,362	N/A	Infinite	7,439,670	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-2X	Surface Water Right Purchase-FSID (add. 40% inflat.) [4]	Soice	139				1000	683		2	0	2,362	N/A	Infinite	2,361,800	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-3X	Groundwater Right Purchase-FSPA (add. 40% inflat.) [4]	Soice	94				235	675		2	0	1,606	N/A	Infinite	377,363	Uses shallow aquifer water right prices.
A-4X	Water Right Purchase-Puerto de Luna (add. 40% inflat.) [4]	Soice	139				110	720		2	0	2,362	N/A	Infinite	259,798	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
A-5X	Water Right Purchase-Above Santa Rosa (add. 40% inflat.) [4]	Soice	139				330	>758		2	0	2,362	N/A	Infinite	779,394	Upfront capital cost per single af in year 0, EUAC is infinite an. series. Cost numbers inflated w/time series regression
B-1	Surface Water Right Lease-CID	Rocha	91				3150	709		2	0	0	286,650	5	1,211,591	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
B-2	Surface Water Right Lease-FSID	Rocha	91				1000	683		2	0	0	91,000	5	384,632	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
B-3	Groundwater Right Lease-FSPA	Rocha	69				235	675		2	0	0	16,215	5	68,536	Numbers based on 5 year existing BOR leases, upfront capital cost assumes yearly payments.
B-4	Water Right Lease-Puerto de Luna	Rocha	91				110	720		2	0	0	10,010	5	42,310	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
B-5	Water Right Lease-Above Santa Rosa	Rocha	91				330	>758		2	0	0	30,030	5	126,929	Numbers based on 5 year existing BOR leases for river pumpers, upfront capital cost assumes yearly payments.
C-1	On Farm Conservation-CID	Brummer	50				4000	709		5	0	0	200,000	20	2,317,445	Annual cost based on $10/irrigated acre*year for salvage of 0.2 acre-ft/acre and 20000 irrigated acres
C-2	On Farm Conservation-FSID	Brummer	116				2225	683		5	0	3,000,000	0	20	3,000,000	
C-3	On Farm Conservation-FSPA	Brummer	25				272	675		5	0	80,000	0	20	80,000	Assumes groundwater accrual to river for 25/acre-ft.
C-4	On Farm Conservation-Puerto de Luna	Brummer	42				1620	720		5	0	705,000	7,050	20	786,690	
C-5	On Farm Conservation-Above Santa Rosa	Brummer	184				1100	>758		5	0	2,100,000	21,000	20	2,343,332	
D-1A	Change Cropping Patterns-CID (Ave. All Crops)	Brummer	144				12750	709		2	0	1,831,650	N/A	1	1,831,650	Average of 3 crop types
D-1B	Change Cropping Patterns-CID (Cotton)	Brummer	175				12500	709		2	0	2,188,250	N/A	1	2,188,250	
D-1C	Change Cropping Patterns-CID (Small Grain)	Brummer	128				15000	709		2	0	1,912,800	N/A	1	1,912,800	
D-1D	Change Cropping Patterns-CID (Corn)	Brummer	147				8500	709		2	0	1,252,100	N/A	1	1,252,100	
D-2	Change Cropping Patterns-FSID (Small Grain)	Brummer	158				3375	683		2	0	532,500	N/A	1	532,500	
D-3	Change Cropping Patterns-FSPA (Small Grain)	Brummer	108				1388	675		2	0	150,000	N/A	1	150,000	
D-4	Change Cropping Patterns-Puerto de Luna (Small Grain)	Brummer	168				360	720		2	0	60,346	N/A	1	60,346	
D-5	Change Cropping Patterns-Above Santa Rosa (Small Grain)	Brummer	147				315	>758		2	0	46,305	N/A	1	46,305	
E-1	Riparian Veg. Control (Salt Cedar)	Brummer	27				3125	695 [1]		2	5	750,000	20,000	20	981,745	Uses approximate location centroid from Santa Rosa Reservoir to Atkins Ranch
E-2	Riparian Veg. Control (Replace RO with CW)	Brummer	51				4000	695 [1]		2	5	3,000,000	8,000	40	3,122,292	Assumes 1000 acres replaceable
F	Import Canadian River Water	Rocha	285				20000	750		9	0	59,800,000	1,794,000	40	87,223,898	Rough estimate, doesn't include cost of ROW, lift stat., O&M, etc. Assumed 3% orig. cost for O&M
G-1	Range and Lower Watershed Management (adj. river upland)	Smith	6				13271	646 [1]		5	7.5	855,360	0	20	855,360	Entire treatment area applies to Additional Water Acquisition Limits.
G-2	Range and Lower Watershed Management (adj. river upland)	Smith	10				7300	646 [1]		5	7.5	855,360	0	20	855,360	Entire treatment area applies to Additional Water Acquisition Limits.
G-3	Range and Lower Watershed Management (adj. river upland)	Smith	57				1296	646 [1]		5	7.5	855,360	0	20	855,360	Entire treatment area applies to Additional Water Acquisition Limits.
G-4	Range and Upper Watershed Management (forest thinning)	Springer	1134				12700	>758		5	10	231,000,000	0	50	231,000,000	Areas were reduced by %50 from WOOG #'s since thinning would only take place in Sangre de Cristos
G-5	Range and Upper Watershed Management (forest thinning)	Springer	482				12700	>758		5	10	98,175,000	0	50	98,175,000	Areas were reduced by %50 from WOOG #'s since thinning would only take place in Sangre de Cristos
G-6	Range and Upper Watershed Management (forest thinning)	Springer	-378				12700	>758		5	10	-77,000,000	0	50	-77,000,000	Areas were reduced by %50 from WOOG #'s since thinning would only take place in Sangre de Cristos
H-1	Evaporation Suppression (old meth.)-Santa Rosa and Sumner	Shomaker	100				11000	733 [1]		2	0	1,100,000	N/A	1	1,100,000	Proximity average of RM for both reservoirs.
H-2	Evaporation Suppression (old meth.)-Santa Rosa	Shomaker	100				4900 [3]	758		2	0	700,000	N/A	1	700,000	Location apportionment for amount based on RiverWare monthly evap estimates.
H-3	Evaporation Suppression (old meth.)-Sumner	Shomaker	100				6100 [3]	709		2	0	700,000	N/A	1	700,000	Location apportionment for amount based on RiverWare monthly evap estimates.
H-4	Evaporation Suppression (new meth.)-Santa Rosa and Sumner	Shomaker	3.25				11000	733 [1]		10	0	35,750	N/A	1	35,750	Proximity average of RM for both reservoirs.
H-5	Evaporation Suppression (new meth.)-Santa Rosa	Shomaker	7.29				4900 [3]	758		10	0	35,700	N/A	1	35,700	Location apportionment for amount based on RiverWare monthly evap estimates.
H-6	Evaporation Suppression (new meth.)-Sumner	Shomaker	5.85				6100 [3]	709		10	0	35,700	N/A	1	35,700	Location apportionment for amount based on RiverWare monthly evap estimates.
I	Fort Sumner Gravel Pit Pumping	Stockton	10				300	683		2	0	11,500	1,862	20	33,075	O&M includes maintenance and labor for 1 month of operation--does not include elec. hookup or ROW costs.
J-1	Fort Sumner Well Field-GW Purchase and Cons. Savings	Stockton	164				500	680		2	0	898,200	17,750	30	1,145,829	10 cfs capacity, can pump for 25 days at full capacity
J-2	Fort Sumner Well Field-Pump Crop Pattern Savings	Stockton	150				1384	680		2	0	455,000	174,872	30	2,894,625	10 cfs capacity, can pump for 69 days at full capacity
K	Renegotiate Compact--Forebearance	Springer	145				18500	Blw. Avl.		10	0	45,548,064		10000	45,548,064	See option form for all assumptions

Table A.5. Stockton's Additional Water Acquisition Ranking Matrix

WOOG ADDITIONAL WATER ACQUISITION RANKING MATRIX

Tetra Tech, Inc.
Last Updated by: **TBS 6/8/04**

Ranking Criteria (Translated to 0-5 scale)	**Weight**
1) Cost (EUAC)---same as CID ranking	Initial weight of 1
2) Timing---revised from CID ranking	Initial weight of 1
3) Salvage Risk---same as CID ranking	Initial weight of 1
4) Political, Legal, Social, and Institutional Risk---same as CID ranking	Initial weight of 1
5) Amount available---revised from CID ranking	Initial weight of 1
6) Proximity to Upper Critical Habitat---revised from CID ranking	Initial weight of 1
7) Sustainability---same as CID ranking	Initial weight of 1
8) Time to implement---same as CID ranking	Initial weight of 1
9) Time to physically realize (measured from end of time to implement)---same as CID ranking	Initial weight of 1
10) Stateline Effects---same as CID ranking	Initial weight of 1

RANKING CRITERIA as 0-5 SCALE

ID	Description	1) Cost	2) Supply Flexibility	3)Salvage Risk	4) Pol. Risk	5) Amt. Available	6) Close to UCH?	7) Sust.	8) Time to Impl.	9) Time to Realize	10) State Benefit?	EUAC ($/acre-ft)	Total Score
	WEIGHT----->	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
A-1	Surface Water Right Purchase-CID	4	5	5	4	3	2	5	4	5	0	99	37.0
A-2	Surface Water Right Purchase-FSID	4	2.5	5	4	1	3	5	4	5	2.5	99	36.0
A-3	Groundwater Right Purchase-FSPA	4	0	4	4	0	4	5	4	3	2.5	67	30.5
A-4	Water Right Purchase-Puerto de Luna	4	2.5	5	2	0	2	5	4	5	2.5	99	32.0
A-5	Water Right Purchase-Above Santa Rosa	4	2.5	5	2	0	1	5	4	5	2.5	99	31.0
A-1X	Surface Water Right Purchase-CID (add. 40% inflat.) [4]	3	5	5	4	3	2	5	4	5	0	139	36.0
A-2X	Surface Water Right Purchase-FSID (add. 40% inflat.) [4]	3	2.5	5	4	1	3	5	4	5	2.5	139	35.0
A-3X	Groundwater Right Purchase-FSPA (add. 40% inflat.) [4]	4	0	4	4	0	4	5	4	3	2.5	94	30.5
A-4X	Water Right Purchase-Puerto de Luna (add. 40% inflat.) [4]	3	2.5	5	2	0	2	5	4	5	2.5	139	31.0
A-5X	Water Right Purchase-Above Santa Rosa (add. 40% inflat.) [4]	3	2.5	5	2	0	1	5	4	5	2.5	139	30.0
B-1	Surface Water Right Lease-CID	4	5	5	4	3	2	3	4	5	0	91	35.0
B-2	Surface Water Right Lease-FSID	4	2.5	5	4	1	3	3	4	5	2.5	91	34.0
B-3	Groundwater Right Lease-FSPA	4	0	4	4	0	4	3	4	3	2.5	69	28.5
B-4	Water Right Lease-Puerto de Luna	4	2.5	5	2	0	2	3	4	5	2.5	91	30.0
B-5	Water Right Lease-Above Santa Rosa	4	2.5	5	2	0	1	3	4	5	2.5	91	29.0
C-1	On Farm Conservation-CID	5	5	4	0	4	2	4	3	5	0	50	32.0
C-2	On Farm Conservation-FSID	3	2.5	4	0	2	3	4	3	5	2.5	116	29.0
C-3	On Farm Conservation-FSPA	5	0	4	0	0	4	4	3	3	2.5	25	25.5
C-4	On Farm Conservation-Puerto de Luna	5	2.5	4	0	1	2	4	3	5	2.5	42	29.0
C-5	On Farm Conservation-Above Santa Rosa	3	2.5	4	0	1	1	4	3	5	2.5	184	26.0
D-1A	Change Cropping Patterns-CID (Ave. All Crops)	3	5	4	0	5	2	3	4	5	0	144	31.0
D-1B	Change Cropping Patterns-CID (Cotton)	3	5	4	0	5	2	3	4	5	0	175	31.0
D-1C	Change Cropping Patterns-CID (Small Grain)	3	5	4	0	5	2	3	4	5	0	128	31.0
D-1D	Change Cropping Patterns-CID (Corn)	3	5	4	0	5	2	3	4	5	0	147	31.0
D-2	Change Cropping Patterns-FSID (Small Grain)	3	2.5	4	0	3	3	3	4	5	2.5	158	30.0
D-3	Change Cropping Patterns-FSPA (Small Grain)	3	0	4	0	1	4	3	4	3	2.5	108	24.5
D-4	Change Cropping Patterns-Puerto de Luna (Small Grain)	3	2.5	4	0	0	2	3	4	5	2.5	168	26.0
D-5	Change Cropping Patterns-Above Santa Rosa (Small Grain)	3	2.5	4	0	0	1	3	4	5	2.5	147	25.0
E-1	Riparian Veg. Control (Salt Cedar)	5	0	0	4	3	3	4	4	3	2.5	27	28.5
E-2	Riparian Veg. Control (Replace RO with CW)	4	0	0	4	4	3	4	4	3	2.5	51	28.5
F	Import Canadian River Water	3	5	5	0	5	2	4	0	5	2.5	285	31.5
G-1	Range and Lower Watershed Management (adj. river upland)	5	0	1	4	5	5	4	3	1	2.5	6	30.5
G-2	Range and Lower Watershed Management (adj. river upland)	5	0	1	4	5	5	4	3	1	2.5	10	30.5
G-3	Range and Lower Watershed Management (adj. river upland)	4	0	1	4	1	5	4	3	1	2.5	57	25.5
G-4	Range and Upper Watershed Management (forest thinning)	2	0	1	4	5	0	4	3	3	2.5	1,134	24.5
G-5	Range and Upper Watershed Management (forest thinning)	2	0	1	4	5	0	4	3	3	2.5	482	24.5
G-6	Range and Upper Watershed Management (forest thinning)	5	0	1	4	5	0	4	3	3	2.5	-378	27.5
H-1	Evaporation Suppression (old meth.)-Santa Rosa and Sumner	4	0	2	0	5	1	3	4	5	2.5	100	26.5
H-2	Evaporation Suppression (old meth.)-Santa Rosa	3	0	2	0	4	0	3	4	5	2.5	100	23.5
H-3	Evaporation Suppression (old meth.)-Sumner	3	0	2	0	5	1	3	4	5	2.5	100	25.5
H-4	Evaporation Suppression (new meth.)-Santa Rosa and Sumne	5	0	0	0	5	1	0	0	5	2.5	3	18.5
H-5	Evaporation Suppression (new meth.)-Santa Rosa	5	0	0	0	4	0	0	0	5	2.5	7	16.5
H-6	Evaporation Suppression (new meth.)-Sumner	5	0	0	0	5	1	0	0	5	2.5	6	18.5
I	Fort Sumner Gravel Pit Pumping	5	2.5	3	4	0	3	4	4	5	2.5	10	33.0
J-1	Fort Sumner Well Field-GW Purchase and Cons. Savings	3	5	4	0	0	3	4	4	5	2.5	164	30.5
J-2	Fort Sumner Well Field-Pump Crop Pattern Savings	3	5	4	0	1	3	3	4	5	2.5	150	30.5
K	Renegotiate Compact--Forebearance	3	2.5	3	0	5	2	5	0	5	2.5	145	28.0

Table A.6. Soice's Additional Water Acquisition Ranking Matrix

WOOG ADDITIONAL WATER ACQUISITION RANKING MATRIX **RANKING CRITERIA as 0-5 SCALE; ranked by Phil Soice of Southwest Water Consultants**

Updated:	6/8/2004	Lead	1) Cost	2) Supply	3) Sal Risk	4) Pol Risk	5) Amt.	6)Close to	7) Sustain	8) Time to	9) Time to	10) Benefit	EUAC	Total	Initial Cap
ID	Description	Reviewer(s)		Flexibility			Available	CID?		Implement	Realize	Stateline	per afy	Score	millions$
	WEIGHT----->		1	1	1	1	1	1	1	1	1	1			
A-1	Surface Water Right Purchase-CID	Soice	4	5	5	2	3	3	5	4	5	2.5	99	38.5	5.3
A-2	Surface Water Right Purchase-FSID	Soice	4	5	5	3	1	3	5	4	5	2.5	99	37.5	1.7
A-3	Groundwater Right Purchase-FSPA	Soice	4	2.5	4	3	0	3	5	4	2	2.5	67	30	0.3
A-4	Water Right Purchase-Puerto de Luna	Soice	4	2.5	5	0	0	1	5	3	5	0	99	25.5	0.2
A-5	Water Right Purchase-Above Santa Rosa	Soice	4	2.5	5	0	0	1	5	4	5	0	99	26.5	0.6
A-1X	Surface Water Right Purchase-CID (add. 40% inflat.) [4]	Soice	3	5	5	2	3	3	5	4	5	2.5	139	37.5	7.4
A-2X	Surface Water Right Purchase-FSID (add. 40% inflat.) [4]	Soice	3	5	5	3	1	3	5	4	5	2.5	139	36.5	2.4
A-3X	Groundwater Right Purchase-FSPA (add. 40% inflat.) [4]	Soice	4	2.5	4	3	0	3	5	4	2	2.5	94	30	0.4
A-4X	Water Right Purchase-Puerto de Luna (add. 40% inflat.) [4]	Soice	3	2.5	5	0	0	1	5	3	5	0	139	24.5	0.3
A-5X	Water Right Purchase-Above Santa Rosa (add. 40% inflat.) [4]	Soice	3	2.5	5	0	0	1	5	4	5	0	139	25.5	0.8
B-1	Surface Water Right Lease-CID	Rocha	4	5	5	2	3	3	4	4	5	2.5	91	37.5	1.2
B-2	Surface Water Right Lease-FSID	Rocha	4	5	5	3	1	3	4	4	5	2.5	91	36.5	0.4
B-3	Groundwater Right Lease-FSPA	Rocha	4	2.5	4	3	0	3	4	4	2	2.5	69	29	0.1
B-4	Water Right Lease-Puerto de Luna	Rocha	4	2.5	5	0	0	1	4	3	5	0	91	24.5	0.04
B-5	Water Right Lease-Above Santa Rosa	Rocha	4	2.5	5	0	0	1	4	3	5	0	91	24.5	0.1
C-1	On Farm Conservation-CID	Brummer	5	2.5	5	1	4	3	5	4	5	0	50	34.5	0.00
C-2	On Farm Conservation-FSID	Brummer	3	2.5	5	1	2	3	5	4	5	2.5	116	33	3.0
C-3	On Farm Conservation-FSPA	Brummer	5	2.5	3	3	0	3	5	4	2	2.5	25	30	0.1
C-4	On Farm Conservation-Puerto de Luna	Brummer	5	2.5	5	0	1	1	5	4	5	0	42	28.5	0.7
C-5	On Farm Conservation-Above Santa Rosa	Brummer	3	2.5	5	0	1	1	5	4	5	0	184	26.5	2.1
D-1A	Change Cropping Patterns-CID (Ave. All Crops)	Brummer	3	2.5	4	0	5	1	3	3	5	2.5	144	29	1.8
D-1B	Change Cropping Patterns-CID (Cotton)	Brummer	3	2.5	4	0	5	1	3	3	5	2.5	175	29	2.2
D-1C	Change Cropping Patterns-CID (Small Grain)	Brummer	3	2.5	4	0	5	1	3	3	5	2.5	128	29	1.9
D-1D	Change Cropping Patterns-CID (Corn)	Brummer	3	2.5	4	0	5	1	3	3	5	2.5	147	29	1.3
D-2	Change Cropping Patterns-FSID (Small Grain)	Brummer	3	2.5	4	0	5	1	3	3	5	2.5	158	29	0.5
D-3	Change Cropping Patterns-FSPA (Small Grain)	Brummer	3	2.5	4	0	1	3	3	3	2	2.5	108	24	0.2
D-4	Change Cropping Patterns-Puerto de Luna (Small Grain)	Brummer	3	2.5	4	0	0	1	3	3	5	0	168	21.5	0.1
D-5	Change Cropping Patterns-Above Santa Rosa (Small Grain)	Brummer	3	2.5	4	0	0	1	3	3	5	0	147	21.5	0.05
E-1	Riparian Veg. Control (Salt Cedar)	Brummer	5	0	3	5	3	1	4	4	2	0	27	27	0.8
E-2	Riparian Veg. Control (Replace RO with CW)	Brummer	4	0	3	4	4	1	4	4	2	0	51	26	3.0
F	Import Canadian River Water	Rocha	3	2.5	3	1	5	2	4	3	5	5	285	33.5	59.8
G-1	Range and Lower Watershed Management (adj. river upland)	Smith	5	0	3	4	5	1	4	3	1	0	6	26	0.9
G-2	Range and Lower Watershed Management (adj. river upland)	Smith	5	0	3	4	5	1	4	3	1	0	10	26	0.9
G-3	Range and Lower Watershed Management (adj. river upland)	Smith	4	0	3	4	1	1	4	3	1	0	57	21	0.9
G-4	Range and Upper Watershed Management (forest thinning)	Springer	2	0	1	3	5	0	4	3	3	0	1134	21	231.0
G-5	Range and Upper Watershed Management (forest thinning)	Springer	2	0	1	3	5	0	4	3	3	0	482	21	98.2
G-6	Range and Upper Watershed Management (forest thinning)	Springer	5	0	1	3	5	0	4	3	3	0	-378	24	-77.0
H-1	Evaporation Suppression (old meth.)-Santa Rosa and Sumner	Shomaker	4	0	2	0	5	1	3	3	5	0	100	23	1.1
H-2	Evaporation Suppression (old meth.)-Santa Rosa	Shomaker	3	0	2	0	4	1	3	3	5	0	100	21	0.7
H-3	Evaporation Suppression (old meth.)-Sumner	Shomaker	3	0	2	0	5	1	3	3	5	0	100	22	0.7
H-4	Evaporation Suppression (new meth.)-Santa Rosa and Sumner	Shomaker	5	0	0	0	5	1	0	2	5	0	3	18	0.04
H-5	Evaporation Suppression (new meth.)-Santa Rosa	Shomaker	5	0	0	0	5	1	0	2	5	0	7	18	0.04
H-6	Evaporation Suppression (new meth.)-Sumner	Shomaker	5	0	0	0	5	1	0	2	5	0	6	18	0.04
I	Fort Sumner Gravel Pit Pumping	Stockton	5	5	3	1	0	3	2	4	5	2.5	10	30.5	0.01
J-1	Fort Sumner Well Field-GW Purchase and Cons. Savings	Stockton	3	5	4	1	0	3	4	3	5	2.5	164	30.5	0.9
J-2	Fort Sumner Well Field-Pump Crop Pattern Savings	Stockton	3	5	4	1	1	3	4	3	5	2.5	150	31.5	0.5
K	Renegotiate Compact--Forebearance	Springer	3	2.5	4	0	5	2	5	0	5	2.5	145	29.0	46