

Evaluation Criteria and Selection Process for HB1437 Water Replacement Strategies

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1.0 Introduction

The purpose of this Technical Memorandum (TM) is to present the development and definition of the evaluation criteria and selection process for the identified House Bill (HB) 1437 water replacement strategies. This task included input from team members and the public on issues of potential interest for selection of the evaluation criteria and comparison of water replacement strategies. The adopted evaluation criteria and selection process became the basis for selecting “no net loss” implementation alternatives.

The scope of this effort has evolved as the consideration of various alternatives has been discussed on multiple occasions with the project team, various stakeholders, and the public. Additional input was also obtained through other communication avenues such as direct correspondence and Web site feedback. The list of alternatives considered for evaluation began with the first 15 included in the list below, which was based on documents provided to the Agricultural Water Conservation Fund (AWCF) Advisory Committee prior to the start of this project. Three additional strategies were identified during the public meetings and added to the list.

Water Replacement Strategies

1. Balancing Reservoirs in an LCRA Irrigation District
2. Automated Check Structures and Control Systems in the Garwood Irrigation District
3. Laser Land Leveling to Conserve Water in LCRA Irrigation Districts¹
4. Groundwater Development in the Garwood Irrigation District
5. Conjunctive Use of Groundwater in the Garwood Irrigation District
6. Groundwater Development in the Lakeside Irrigation District
7. Groundwater Development in the Gulf Coast Irrigation District
8. Groundwater from Alcoa
9. Brushy Creek Return Flow
10. San Bernard Reservoir
11. Allen’s Creek Reservoir
12. Urban Irrigation Control System
13. Adjoining Basin Irrigation Water Rights
14. Purchase Colorado River Irrigation Water Rights
15. Reduced Irrigation for Second Crop
16. Capture of Municipal Stormwater
17. Desalination

18. Canal Lining

Notes:

1. The “base case” analyzed in relation to Laser Land Leveling to Conserve Water in LCRA Irrigation Districts included the assumption that the cost for implementation would be divided as follows: 50 percent funded by the Environmental Quality Incentives Program (EQIP), 20 percent funded by farmers, and 30 percent funded by AWCF.

1.1 Risk/External Factors

Numerous contracts and organizational agreements exist that have an effect on the potential for water to be delivered, conserved, or returned to the Colorado River Basin through the HB1437 program. These issues are summarized below.

A Definitive Agreement that exists between the San Antonio Water System (SAWS) and LCRA is the basis for the LCRA-SAWS Water Project. In Section 1.7 of the Agreement, entitled “LCRA Agreement to Withhold Water Reservation and Delivery,” the following is included: “It is expressly understood that all of the demand reduction measures and the supply development projects identified in the Region K SB-1 Plan as having the potential to result in 330,000 acre feet of water per year are exclusively available to meet the goals of this Definitive Agreement, except to the extent that water associated with any of the measures or projects becomes Released Water under this Definitive Agreement.” The Agreement goes on to say, however, that alternatives agreeable to both parties may be jointly implemented.

An amendment to this agreement allowed LCRA some flexibility to implement agricultural water conservation strategies, at least on an interim basis, to address other water development concerns. Some of the potential water replacement strategies included in the evaluation presented in this TM were also included in the Regional Water Supply Planning effort. The parties involved with implementation of HB1437, i.e., LCRA and the Brazos River Authority (BRA), may need to participate in discussions with SAWS to ensure SAWS staff agrees that the selected strategies comply with the terms of the agreement and amendment.

Another factor to consider is the duration of the agreement between LCRA and BRA defining the terms of the process to replace the water transferred to Williamson County. Currently, this agreement is through the year 2050. Several of the water replacement strategies presented in this TM are capital-intensive, and the associated debt service would extend beyond 2050 if the 2050 water demands were to be met. Additionally, BRA has the right to end the contract in 2010 if they so choose, halting the implementation of any chosen water replacement strategies after only 5 years. This would greatly limit the types of water replacement strategies available to meet the requirements of HB1437.

There are also certain limitations related to use and management of water resources in the Garwood Irrigation District. LCRA staff must ensure the requirements of this contract are met by the selected water replacement strategy. Since the Garwood District was not owned by LCRA at the time of the initial Region K Water Supply Plan, district improvements were not included in the water conservation strategies. As a result, these potential improvements were not included in the preliminary LCRA-SAWS Water Project agreement. The final

agreement now includes the Garwood District and other agricultural conservation measures not originally included in the regional plan.

Following is an excerpt from Section 1.3 of the LCRA SAWS Agreement (March 1, 2002):

1.3.A. Feasibility Studies. The Feasibility Studies shall include, without limitation, the following:

*(1) Current Demand Reduction and Conservation. The LCRA, with input from SAWS, shall initiate a series of comprehensive analyses to determine how best to reduce through conservation the volume of water historically diverted from the Colorado River by major agricultural operations in the Lower Colorado River Basin, including but not limited to, the **GARWOOD**, LAKESIDE, and GULF COAST irrigation districts (collectively, the "Agricultural Users"), as well as other conservation measures not proposed in the Region K SB-1 Plan (the "Conservation Studies"). The Conservation Studies may include, without limitation, analyses of: (i) supporting agricultural research to develop alternatives to rice production and to develop new strains of high yield, low water consumption rice, (ii) engineering technical improvements in the Agricultural Users' irrigation canals and water distribution systems, and (iii) developing various other agricultural technologies to reduce the Agricultural Users' water consumption. The goal of the Conservation Studies shall be to determine the feasibility of implementing water conservation and reduction of demand to the extent that will result in a decrease of approximately 118,000 acre-feet per year in the Agricultural Users' historical water consumption from the Colorado River. This estimated 118,000 acre-feet per year is included in the overall goal of 330,000 acre-feet per year of water. The Conservation Studies should, at a minimum, identify the estimated requirements, costs, and time required to implement each project.*

2.0 Selection Criteria

The project team, including LCRA, CH2M HILL, and the LBJ School of Public Affairs, developed an initial set of criteria that could be applied to evaluate each water replacement strategy as well as to compare strategies. The initial criteria were presented in the first round of public meetings, where attendees responded to the criteria by expressing opinions on relative importance and by recommending additional criteria for consideration. Certain key issues were repeatedly stressed by a variety of interests, including the lower basin interests, the upper basin interests, and water customers. These issues were stressed both during the first round of public meetings and in written comments submitted by individuals or groups representing diverse interests.

Additionally, two issues were identified relative to the terms of the contract between LCRA and BRA. These issues were 1) the uncertainty of the expected demands, and 2) the possibility that the LCRA/BRA agreement for the water transfer may be subject to cancellation in 2010.

Due to the relative importance of the key issues repeated during the public involvement process, the project team decided to use a two-tiered screening process, with the primary screening criteria consisting of six items developed from those issues of greatest concern. The secondary screening criteria consisted of ten items of concern. Figure 1 presents a flow

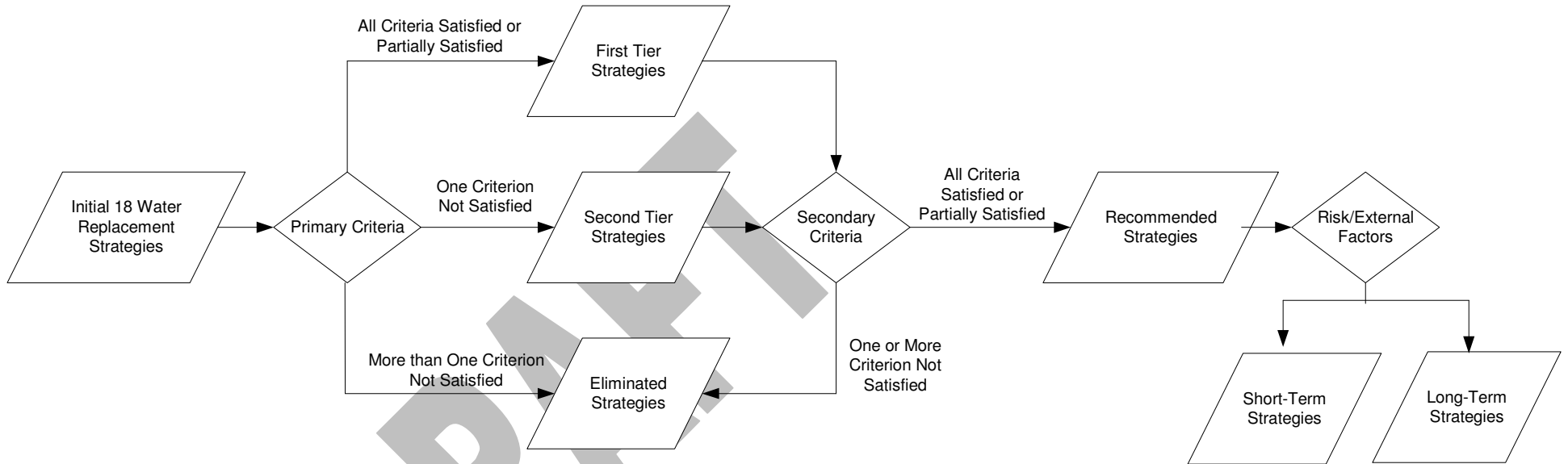
chart that illustrates the implementation of a two-tiered screening process. The implementation of this process is described in Section 3.0, but introduced here to give perspective to the use of the two-tiered, Primary and Secondary Screening Criteria.

2.1 Primary Screening Criteria

The following six decision criteria were developed for the initial, or primary, screening of the water replacement strategies:

1. **Phased Implementation:** Evaluation of whether a water replacement strategy could be phased. This criterion was selected to evaluate whether a water replacement strategy could be constructed or implemented in phases, to reflect the phased increase in volume transferred to Williamson County.
2. **Accelerated Implementation:** Evaluation of whether full implementation of a water replacement strategy could be accelerated to occur in less than five years. The purpose of this criterion was to address the possibility that either demand may increase faster than projected, or the agreement for water transfer could be cancelled prior to implementing major components of the replacement strategies. If the strategy in question could be implemented in less than five years, then accelerating implementation of the strategy would prevent initiation of a project that could not be completed prior to potential contract termination.
3. **Sustainable Yield:** Evaluation of whether a water replacement strategy's sustainable yield was at least equal to or potentially greater than the Williamson County demand. The intention of this criterion was to determine whether the volume of water replaced at some future time might differ from the volume replaced when a strategy would initially be implemented. A decline in available replacement water would reduce the effectiveness of the strategy and require a supplemental strategy to satisfy the full water replacement requirement.
4. **Permit or Third Party Approval Required:** Evaluation of whether a permit or third party approval would be required. This criterion was selected to determine whether permits or third party agreements would be needed, as either could delay or prevent implementation of the water replacement strategy.
5. **Conservation Charge:** Evaluation of the conservation charge estimate. The intention of this criterion was to compare the cost per acre-foot required to implement each water replacement strategy. The Project Team assumed the LCRA Board of Directors would set the appropriate conservation rate, and that the conservation rate would include capital, operation, maintenance, monitoring, and reporting costs associated with each water replacement strategy.
6. **Meets "No Net Loss" Definition:** Evaluation of whether the water replacement strategy satisfies the definition of "no net loss" as proposed for adoption by the LCRA Board of Directors.

FIGURE 1
 Water Replacement Strategy Selection Process
Evaluation and Selection Criteria for HB1437 Water Replacement Strategies



There are minor differences between these primary screening criteria and the criteria that were most emphasized by the stakeholders. However, they are closely related. The relationships will be identified below.

- Cost was of significant concern to the customers, so the conservation charge was included as an initial screening criterion. If the potential conservation charge were estimated to be greater than 100 percent, then the water replacement strategy would be identified as not satisfying the cost criterion. The basis for the cost estimates and for the conservation charge calculations are addressed in the parallel TM: *Estimates of the Conservation Charge for HB1437 Water Replacement Strategies*.
- Multiple interests stressed phased implementation as a means to limit development of major infrastructure or programs, particularly considering the uncertainty associated with future Williamson County demand. As a counter-position, there was also concern or interest in strategies that could be implemented on an accelerated schedule in case the demand increased faster than expected. The study team was also concerned about the possibility of contract termination as early as 2010, leaving only five years to implement a water replacement strategy. In this case, it may be necessary to accelerate implementation of a specific strategy to ensure completion under the contract. This issue was addressed with the criterion entitled Accelerated Implementation.

2.2 Secondary Screening Criteria

The following ten decision criteria were developed for the secondary screening of the water replacement strategies:

1. **Volume of Water Produced**—i.e., does the strategy provide enough water to match the full, projected Williamson County demand of 25,000 acre-feet per year?
2. **Reliability**—i.e., does the strategy provide water in wet and dry years?
3. **Water Quality**—i.e., is the water obtained from this strategy appropriate for the intended use or is it at least similar to the existing water quality?
4. **Risk**—i.e., will the successful implementation of the strategy be subject to external factors beyond the control of the project? For example, the willingness of operators, farmers, or residential irrigators to change some of their current practices, or the willingness of external funding source to provide funding.
5. **Environmental Impact**—i.e., will implementation of the strategy cause damage to instream and/or estuary plants or animals?
6. **Location of Water**—i.e., is the water source close to the users?
7. **Timing**—i.e., will the water be delivered close to the time of need?
8. **Lake Water Levels**—i.e., will the strategy deplete the Highland Lakes?
9. **Equity**—i.e., will some users benefit? Will some users suffer?

10. Reduced Reliance on Surface Water in Agricultural Irrigation—i.e., will the strategy reduce the irrigation districts’ need for Highland Lakes water in accordance with the provisions of HB1437?

3.0 Selection Process

This section describes the two-tiered selection process shown in Figure 1. Each of the water replacement strategies was first reviewed relative to the five primary criteria. From this process, three levels of strategies were defined: first tier strategies, second tier strategies, and those strategies eliminated from further consideration. First tier strategies are those strategies in which all decision criteria were satisfied or partially satisfied. Second tier strategies are those strategies that did not satisfy one criterion, but satisfied or partially satisfied the remaining criteria. The remaining strategies were eliminated from consideration as they did not satisfy two or more decision criteria.

After the original list of water replacement strategies was reduced through application of the primary screening criteria, the secondary screening criteria were then applied to the remaining strategies. Those remaining strategies that did not satisfy one or more of the secondary criterion were removed from further consideration. The remaining strategies that satisfied or partially satisfied all secondary criteria became a recommended strategy.

4.0 Selection Results

4.1 Primary Screening Criteria

Table 1 presents the results of applying each of the primary screening criteria to each of the original water replacement strategies. The details regarding evaluation of each water replacement strategy according to the primary and secondary screening criteria are provided in the Fact Sheets included in Attachment A.

TABLE 1
Evaluation of Strategies Using Primary Screening Criteria

ID	Water Replacement Strategy	Conservation Charge Estimate (%)	Phased Implementation	Accelerated Implementation	Sustainable Yield	No Permit or Third Party Approval Required	Meets “No Net Loss” Definition
1	Balancing Reservoirs in an LCRA Irrigation District	34% (●)	⊙	●	●	⊙	⊙
2	Automated Check Structures and Control Systems in the Garwood Irrigation District	27% (●)	⊙	●	●	⊙	⊙

TABLE 1
Evaluation of Strategies Using Primary Screening Criteria

ID	Water Replacement Strategy	Conservation Charge Estimate (%)	Phased Implementation	Accelerated Implementation	Sustainable Yield	No Permit or Third Party Approval Required	Meets "No Net Loss" Definition
3	Laser Land Leveling to Conserve Water in LCRA Irrigation Districts	29% (●)	●	●	⊙	⊙	●
4	Groundwater Development in the Garwood Irrigation District	71% (●)	●	●	⊙	○	●
5	Conjunctive Use of Groundwater in the Garwood Irrigation District	50% (●)	●	●	●	⊙	⊙
6	Groundwater Development in the Lakeside Irrigation District	50% (●)	●	●	⊙	⊙	●
7	Groundwater Development in the Gulf Coast Irrigation District	63% (●)	●	●	⊙	○	●
8	Groundwater from Alcoa	>100% (○)	⊙	●	⊙	○	⊙
9	Brushy Creek Return Flow	71% (●)	⊙	○	○	○	●
10	San Bernard Reservoir	>100% (○)	○	○	●	○	●
11	Allen's Creek Reservoir	>100% (○)	○	○	○	○	⊙
12	Urban Irrigation Control System	>100% (○)	●	●	⊙	○	●
13	Adjoining Basin Irrigation Water Rights	>100% (○)	⊙	⊙	⊙	○	●
14	Purchase Colorado River Irrigation Water Rights	85% (●)	●	●	●	○	●
15	Reduced Irrigation for Second Crop	23% (●)	●	●	●	⊙	⊙

TABLE 1
Evaluation of Strategies Using Primary Screening Criteria

ID	Water Replacement Strategy	Conservation Charge Estimate (%)	Phased Implementation	Accelerated Implementation	Sustainable Yield	No Permit or Third Party Approval Required	Meets "No Net Loss" Definition
16	Capture of Municipal Stormwater	N/A	●	○	○	○	●
17	Desalination	>100% (○)	○	○	●	○	●
18	Canal Lining	>100% (○)	●	●	●	●	●

Satisfies Criterion ●

Partially Satisfies Criterion ◐

Does Not Satisfy Criterion ○

Table 1 illustrates that six water replacement strategies met the definition of a First Tier Strategy, two strategies were identified as Second Tier Strategies, and ten strategies were eliminated from further consideration.

First Tier Strategies

1. Balancing Reservoirs in an LCRA Irrigation District
2. Automated Check Structures and Control Systems in the Garwood Irrigation District
3. Laser Land Leveling to Conserve Water in LCRA Irrigation Districts
5. Conjunctive Use of Groundwater in the Garwood Irrigation District
6. Groundwater Development in the Lakeside Irrigation District
15. Reduced Irrigation for Second Crop

Second Tier Strategies

4. Groundwater Development in the Garwood Irrigation District
7. Groundwater Development in the Gulf Coast Irrigation District
14. Purchase Colorado River Irrigation Water Rights

Strategies Eliminated from Further Consideration

8. Groundwater from Alcoa
9. Brushy Creek Return Flow
10. San Bernard Reservoir
11. Allen's Creek Reservoir
12. Urban Irrigation Control System
13. Adjoining Basin Irrigation Water Rights
16. Capture of Municipal Stormwater
17. Desalination
18. Canal Lining

4.2 Secondary Screening Criteria

The results obtained from application of the secondary screening criteria to the first and second tier strategies are shown in Tables 2 and 3. The details regarding evaluation of each water replacement strategy according to the primary and secondary screening criteria are provided in the Fact Sheets included in Attachment A.

4.3 Summary of Screening Results

Therefore, based on feedback from the public meetings and the analysis provided in the fact sheets that is reflected in Tables 2 and 3, strategies 4, 6, and 7 were eliminated based on failure to satisfy the "Equity" criterion, and strategy 14 was eliminated based on its failure to reduce reliance of surface water on agricultural irrigation. Therefore, the following water replacement strategies are selected for further consideration.

1. Balancing Reservoirs in an LCRA Irrigation District
2. Automated Check Structures and Control Systems in the Garwood Irrigation District
3. Laser Land Leveling to Conserve Water in LCRA Irrigation Districts
5. Conjunctive Use of Groundwater in the Garwood Irrigation District
15. Reduced Irrigation for Second Crop
- X. A combination of the five remaining strategies

With each of these options, farmers are able to farm the same acreage they were farming prior to the water transfer. Lake levels remain relatively unchanged. Water rights holders are unaffected. Recreational water use is unaltered, and LCRA will continue to meet instream flow and estuary requirements through implementation of its Water Management Plan.

TABLE 2
First Tier Strategies Evaluated by Secondary Screening Criteria

ID	Water Replacement Strategy	Volume of Water Produced (acre-feet)	Reliability	Water Quality	Risk	Environmental Impact	Location of Water	Timing	Lake Water Levels	Equity	Reduced Reliance on Surface Water in Agricultural Irrigation
1	Balancing Reservoirs in an LCRA Irrigation District	12,000	●	●	●	⊙	●	●	●	●	●
2	Automated Check Structures and Control Systems in the Garwood Irrigation District	12,000	●	●	●	●	●	●	●	●	●
3	Laser Land Leveling to Conserve Water in LCRA Irrigation Districts	25,000	●	●	⊙	●	●	●	●	●	●
5	Conjunctive Use of Groundwater in the Garwood Irrigation District	11,400	●	●	⊙	●	●	●	●	⊙	⊙
6	Groundwater Development in the Lakeside Irrigation District	25,000	●	●	⊙	⊙	●	●	●	○	●
15	Reduced Irrigation for Second Crop	25,000	●	●	●	●	●	●	●	●	⊙

Satisfies Criterion ●
Partially Satisfies Criterion ⊙
Does Not Satisfy Criterion ○

TABLE 3
Second Tier Strategies Evaluated by Secondary Screening Criteria

ID	Water Replacement Strategy	Volume of Water Produced (acre-feet)	Reliability	Water Quality	Risk	Environmental Impact	Location of Water	Timing	Lake Water Levels	Equity	Reduced Reliance of Agriculture on Surface Water
4	Groundwater Development in the Garwood Irrigation District	25,000	●	●	⊙	⊙	●	●	●	○	●
7	Groundwater Development in the Gulf Coast Irrigation District	25,000	●	●	⊙	⊙	●	●	●	○	●
14	Purchase Colorado River Irrigation Water Rights	25,000	●	●	●	●	●	●	●	●	○

Satisfies Criterion ●
Partially Satisfies Criterion ⊙
Does Not Satisfy Criterion ○

5.0 Implementation Alternatives for Selected Strategies

Once the initial strategies had been reduced to the six recommended strategies given above, the project team investigated alternative methods of implementation besides the “base case” initially described and evaluated in the Fact Sheets. These options can be divided into two categories: long-term and short-term. The following discussion describes the alternative implementation options that were evaluated further.

5.1 Long-Term Implementation Alternatives

The main objective of the agreement between LCRA and BRA is to provide a method of water development that can replace the ultimate water demand projected for the Williamson County customers in 2050, or 25,000 acre-feet. As mentioned earlier, however, BRA has the option to end the contract period in 2010. If BRA did indeed end this contract in 2010 but still intended to meet the requirements of the Agreement and the definition of “no net loss” based on their projected 2050 demand, infrastructure to deliver 25,000 acre-feet per year would need to be in place by 2010. Therefore, for the recommended water replacement strategies in which this was possible, a conservation charge for a full, expedited implementation was estimated. These strategies included Balancing Reservoirs in an LCRA Irrigation District, Automated Check Structures and Control Systems in the Garwood Irrigation District, and Laser Land Leveling to Conserve Water in LCRA Irrigation Districts. The following table presents estimates of the conservation charge if these strategies were to be fully implemented on an expedited schedule.

TABLE 4
Conservation Charge Estimates for Full, Expedited Implementation of
Three of the Recommended Water Replacement Strategies

Water Replacement Strategy	Estimated Conservation Charge
Balancing Reservoirs in an LCRA Irrigation District	55%
Automated Check Structures and Control Systems in the Garwood Irrigation District	44%
Laser Land Leveling to Conserve Water in LCRA Irrigation Districts	Over 100%

Water replacement strategy number 3, Laser Land Leveling to Conserve Water in LCRA Irrigation Districts, includes an assumption that Environmental Quality Incentives Program (EQIP) funding will continue. This assumption cannot be relied upon for the full implementation period. Therefore, the project team also estimated conservation charges for alternate funding implementation options. The following table presents these estimates.

TABLE 5
Conservation Charge Estimates for Laser Land Leveling to Conserve Water in LCRA Irrigation Districts
Assuming EQIP Funding Is Not Available

Percent Funded by Farmer	Percent Funded by AWCf	Implementation Schedule	Conservation Charge
20%	80%	Phased	53%
50%	50%	Phased	37%
20%	80%	Expedited	Over 100%
50%	50%	Expedited	Over 100%

5.2 Short-Term Implementation Alternatives

The potential exists for BRA to terminate the water agreement with LCRA in 2010 and only implement a strategy that will deliver the volume of water projected as the Williamson County demand at that time, or 1,900 acre-feet per year. Therefore, for the recommended water replacement strategies in which short-term implementation was an alternative, a conservation charge was estimated for the five-year implementation period. These strategies included Automated Check Structures and Control Systems in the Garwood Irrigation District and Laser Land Leveling to Conserve Water in LCRA Irrigation Districts. The following table presents the conservation charge estimates.

TABLE 6
Conservation Charge Estimates for Partial Implementation of Two of the Recommended Water Replacement Strategies

Water Replacement Strategy	Estimated Conservation Charge
Automated Check Structures and Control Systems in the Garwood Irrigation District	29%
Laser Land Leveling to Conserve Water in LCRA Irrigation Districts	10%

Within such a short implementation period, ensuring the physical facilities required for replacement of the transferred water on a yearly basis as defined by “no net loss” could be difficult. Therefore, an existing, supplementary well in the Lakeside Irrigation District could also be employed to balance short-term implementation shortages resulting from these physical implementation constraints with the total Williamson County demand. The following table presents estimates of the conservation charge if the two water replacement strategies included in Table 6 included a supplementary well.

TABLE 7
Conservation Charge Estimates for Partial Implementation of Two of the Recommended Water Replacement Strategies Including a Supplementary Well

Water Replacement Strategy	Estimated Conservation Charge
Automated Check Structures and Control Systems in the Garwood Irrigation District	32%
Laser Land Leveling to Conserve Water in LCRA Irrigation Districts	10%

Finally, as EQIP funding cannot be ensured for implementation of the laser land leveling strategy, the project team also estimated conservation charges for partial implementation of this strategy using alternative funding options as well as the Lakeside supplementary well. The following table presents these estimates.

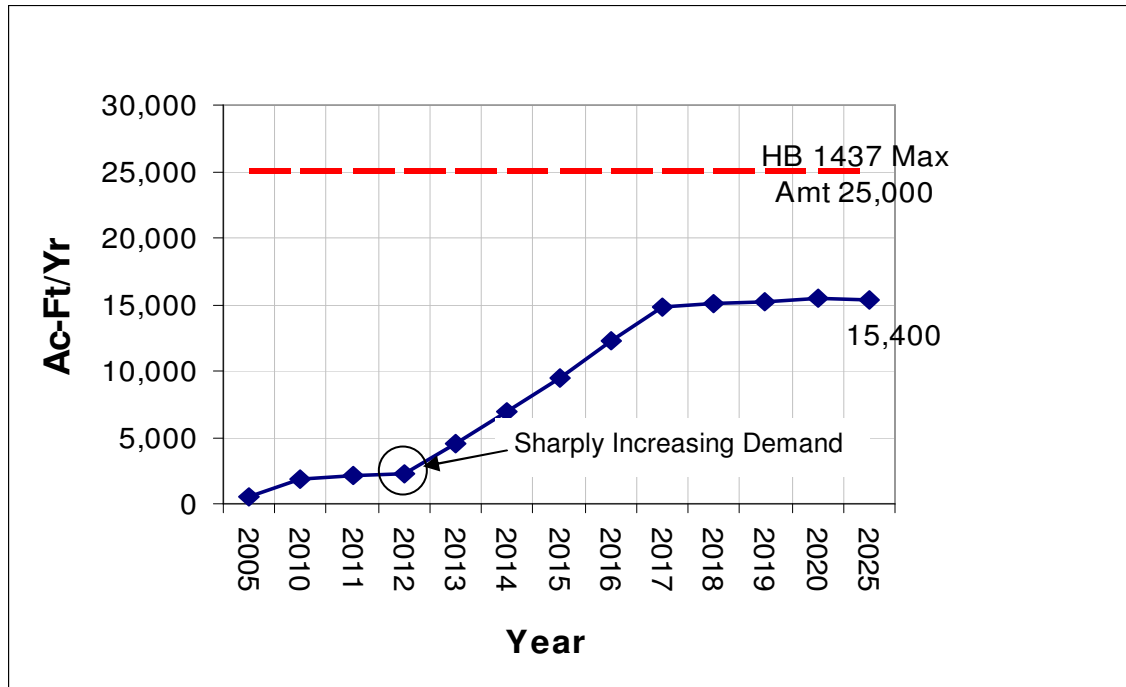
TABLE 8
Conservation Charge Estimates for Laser Land Leveling to Conserve Water in LCRA Irrigation Districts Assuming EQIP Funding Is Not Available for Partial Implementation

Percent Funded by Farmer	Percent Funded by AWCF	Supplementary Well Included?	Conservation Charge
20%	80%	Yes	35%
20%	80%	No	17%
50%	50%	Yes	20%
50%	50%	No	10%

After considering these short-term alternatives the project team began to focus primarily on alternatives that could be completed with the time that supplemental funding from an outside source such as EQIP would be available. In addition

Initial evaluations also limited consideration of the Williamson County demand to only the demand that was projected by the BRA to develop by 2010, which is 1,900 acre-feet/year. While it is expected that the projections for water demand in Williamson County are more reliable for the first few years than they may be further into the future. There is also expected to be a sharp increase in Williamson demand after 2012 (Figure 2). Therefore, it was decided that the short-term demand projections should consider demand through 2012, or 2,260 acre-feet per year. In case the contract with BRA for water service to Williamson County is extended beyond 2012, then the water demand is projected to increase to 5,000 acre-feet the following year. If some factor of safety is not applied to the demand prior to that point in time then it may be very difficult to more than double the amount of water conservation in place in the irrigation areas. With a 50 percent factor of safety included to further enhance reliability of short-term strategies the target water development volume can be rounded to 3,500 acre-feet per year.

FIGURE 2
Projected Williamson County Water Demand



Based on this demand issue, two short-term strategies were formulated to achieve 3,500 acre-feet per year of conservation savings. In both approaches laser leveling is used and the area to be laser-leveled to conserve water is based on the estimate that each acre laser leveled is likely to save an average of 0.75 acre feet of irrigation water per year.

- In one approach, only laser land leveling will be implemented. This would require leveling 4,667 acres each year for three years, resulting in 14,000 acres leveled.
- In the alternate approach, a combination of laser leveling 2,000 acres each year for three years would conserve about 1,500 acre-feet per year, and automation of check structures with control systems in the Garwood District would be implemented to conserve 2,000 acre-feet per year.

Check structures in the Garwood Irrigation District can be automated more readily than those in the other districts, and estimates have been made that automation of eight check structures and control systems in a part of the Garwood Irrigation District may provide 2,000 acre-feet of conservation water savings.

In addition, the LCRA currently has existing wells in the Lakeside Irrigation District that could be used to provide supplemental water in the event that these short-term strategies produce insufficient yield. Initially, it is estimated that a maximum of only 600 acre-feet per year would be used from these wells.

Surcharge or conservation rates were calculated for these short-term alternate projects such that the AWCF would have a sufficient remainder upon contract termination to accomplish one cycle of maintenance leveling. Also, there is the objective of maintaining the conservation rate at approximately the same rate, 25%, as is currently charged. To

accomplish this for the combination alternative the initial contract period would need to be extended to 2012. Therefore, for equal consideration to be given to both strategies the laser leveling only option was also evaluated with a contract extension to 2012.

The results obtained in comparing the short-term costs are presented in Table 9 below.

TABLE 9
Conservation Charge Estimates for Two Short-Term Water Replacement Strategies Including a Supplementary Well

Water Replacement Strategy	Conservation Charge
Laser Land Leveling to Conserve Water in LCRA Irrigation Districts End Contract in 2012*	21%
Combination of laser land leveling and automated check structures in the Garwood Irrigation District End Contract in 2012*	25%
Maintenance Includes: Continuing groundwater mitigation costs, annual monitoring and reporting cost, and check structure O&M cost through 2016, which is the completion of the first maintenance leveling cycle.	
* Required to deliver 3,500 acre-feet per year.	

6.0 Selected Water Replacement Strategy

The selection processes, detailed strategy analyses, and risk factors described above were all performed to provide a baseline for the final alternative development. The alternative mentioned above as alternative "X", a combination of the strategies remaining after all screening was performed, will enable the parties involved to create a combination of the best attributes of more than one water replacement strategy. For example, the combination strategy of Laser Land Leveling to Conserve Water in LCRA Irrigation Districts and implementation of Automated Check Structures and Control Systems in the Garwood Irrigation District, with the contract period extended through 2012, appears to provide numerous benefits, including:

- This option can most easily be partially implemented in five years as the programs and technology are already in place,
- If BRA chooses to continue the contract period beyond 2012, full implementation can begin in a phased manner while still meeting each of the screening criteria.
- More than one option is included so that if conservation savings are not fully realized with one option, then not all funds and effort will have been expended on its implementation.
- Knowledge gained during the initial implementation of more than one option will be useful if the contract is extended beyond 2012.

The key reasons the other long-term strategies were not considered further are summarized below:

1. Balancing Reservoirs in an LCRA Irrigation District

- The amount of water available through this strategy is less than the 25,000 acre-feet per year water full demand forecast.
 - This strategy is not as easily implemented in an accelerated manner as others are.
2. Automated Check Structures and Control Systems in the Garwood Irrigation District
- The amount of water available through this strategy is less than the 25,000 acre-feet per year water demand forecast.
 - This strategy is not as easily implemented in an accelerated manner as others are.
3. Conjunctive Use of Groundwater in the Garwood Irrigation District
- The amount of water available through this strategy is less than the 25,000 acre-feet per year water demand forecast.
 - This strategy only fulfills the definition of “no net loss” during drought years, as this water is only available when the available surface water is less than that which would meet the needs of the irrigation district.
4. Reduced Irrigation for Second Crop
- This strategy only fulfills the definition of “no net loss” during non-drought years. As part of the current drought plan, a limitation on second crop production is imposed during drought years. Therefore, there would be no additional conservation of water during drought years as this strategy is already in place in those years.

Actual long term implementation may well include more than one strategy, so the new strategy “X - a combination of the five remaining strategies” acknowledges that it may be appropriate to implement elements of more than one strategy. Further evaluation of irrigation district improvements (e.g., balancing reservoirs and automated check structures and control systems) will continue and the knowledge obtained from these studies will supplement the information included in this evaluation. The existing wells in the Lakeside District would also provide an efficient means for obtaining water while strategy implementation begins and is further evaluated.

Attachment A

Fact Sheets
