Introduction

Problem Statement
Demand for water exceeds supply throughout much of the western United States. As a result, some parched areas have adjudicated their water rights or have voluntarily adopted policies to cap local water withdrawals in order to prevent water use from exceeding available supply. These legal and policy constraints often force a shortage of water and limit future development.

Objective
Instream Exchange (IE) is a venture created to resolve this shortage by securing and marketing water in constrained basins. IE accomplishes this goal by (1) selecting the basins with the greatest market potential, (2) performing a market feasibility analysis, and (3) creating a business plan to secure and market water in the chosen basin. IE has developed the methodology to select the basins with the highest market potential. The purpose of this methodology is to assess the current demand and supply for water in the context of the legal framework that governs the acquisition and transfer of water within the basin.

Approach
During the group project process, IE evaluated seven basins and ultimately selected a pilot groundwater basin for a market feasibility analysis. Through this analysis, Instream Exchange has determined that there is a high demand for water and has identified a legally viable source of supply. In addition, IE has demonstrated that the legal framework of the pilot basin will support the development of new supply, the transfer of water, and the creation of pumping credits to support water demand in the basin.

Background
Restrictions on water use necessitate innovative solutions to meet increasing water demands. While some areas have resorted to water conservation programs, massive infrastructure projects, or water importation as tools, Instream Exchange (IE) proposes to use market mechanisms to effectively meet water demand. With the goal of providing water to constrained basins through private enterprise, Instream Exchange partnered with Clay Landry of WestWater Research, a leading water valuation and brokerage firm, to identify seven basins to investigate for market potential. Instream Exchange then developed the selection matrix, which is a systematic method for analyzing various basins to identify the basins that are most amenable to a private market. The matrix is organized into demand, supply and legal categories. Each of these categories includes granular questions that address details such as the market price of water, the potential buyers and sellers, and the legal nuances of transferring water rights and creating mitigation credits. Using the selection matrix, IE identified a pilot basin based on its strong potential to support a private,
market-based solution. The pilot basin has a high market price for water, sufficient future demand, lack of competition, and a viable legal structure.

IE performed a full market feasibility analysis on the pilot basin to determine if and how a private market could increase water supply in the basin. Ultimately, the feasibility analysis addresses two water-related concerns in the basin. First, the basin has a legal cap of 30,500 acre-feet per year (AFY) on withdrawal amount, which potentially limits growth and economic development in the region. Rights to groundwater in the basin are not only limited, but they are fully appropriated, which forces new water users to acquire water from a current user. In addition, the resource-strapped pilot city needs a permanent solution for its treated wastewater, which is currently being discharged into ponds next to the treatment facility. The wastewater cannot be discharge into the nearby surface water, nor is it legally authorized to recharge the basin.

**Process & Methodology**

With the goal of using a private enterprise to address water constraints, we created Instream Exchange, LLC (IE). The mission of Instream Exchange is to secure water in constrained basins in order to meet current and future demand.

Our approach to launching IE is as follows:

1. Determine which basins are worth assessing. Instream Exchange partnered with Clay Landry from WestWater Research, who provided seven initial basins.
2. Evaluate the seven initial basins on the basis of demand, supply and legal framework in order to identify the three most promising basins. Instream Exchange identified the three most promising basins, referred to as Market 1, Market 2 and Market 3.
3. Develop the methodology to compare and rank the business opportunity in the three remaining basins. Instream Exchange developed a selection matrix.
4. Utilize the selection matrix to identify the basin with the highest market potential. Instream Exchange identified the pilot basin.
5. Investigate the market feasibility of the basin to determine how IE will secure or create new water. Instream Exchange determined that the pilot basin would likely support a water market supplied by treated effluent from the City’s Water Recycling Facility.
6. If the basin is feasible from a market standpoint, determine feasibility for launching a new venture in this market and develop a business model. Pending.
7. Create and execute a business plan for the chosen basin. Pending.
8. Initiate first market in pilot basin and determine which steps are repeatable in other basins. Pending.
9. Apply business model to similar basins. Pending.

As part of step 2, IE screened and evaluated seven basins utilizing the following criteria: (1) the current and future demand for water in the basin; (2) the supply options to meet the demand for water; (3) the legal and regulatory framework of water rights and transfers in the basin. IE chose three basins to further examine using the selection matrix; the results of this research are presented in Table 1. While all three basins exhibited a high value of water, developable sources of new supply, a cap on future withdrawals and a workable legal setting, no basin was a clear choice for a feasibility analysis. All basins have some flaws and some unknowns. Market 3 has legal issues in the form of regulatory uncertainty; Market 2 has caps on the size of the developable market, as well as significant competition both from a non-profit and a for-profit water bank. Ultimately, IE selected the pilot basin for three...
key reasons: there is a developable source of new water supply; no current competition in the basin exists; and the basin adjudication, along with regional water regulations, is written in a manner that is open to creating new sources of water supply. In addition, IE has a relationship with key stakeholders via our WestWater partnership.

Table 1. Selection matrix results for the three potential basins. Market 1 is IE’s pilot basin

<table>
<thead>
<tr>
<th>Basin</th>
<th>Demand</th>
<th>Supply</th>
<th>Legal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rapid Urban Expansion</td>
<td>High Value of Water</td>
<td>Transactions</td>
</tr>
</tbody>
</table>

Results from Pilot Market Feasibility Analysis

Through the feasibility analysis, Instream Exchange found sufficient demand for water in the pilot basin and a source for supplying new water. The basin is adjudicated, and pumping allocations are therefore limited and fully appropriated. Consequently, any new water user must find new supply, either by purchasing underutilized pumping allocations, or by paying an in-lieu fee to the City in exchange for City water (which is also limited by the adjudication). Therefore, IE sought to quantify demand for water, as this demand is the basis for a feasible market solution to water scarcity. Sources of demand include the pilot city, the adjacent city and possibly out-of-basin users from a nearby saline aquifer. The current market price of water averages $5,990/AF, which indicates that water has a high value in this market. The effluent from the wastewater treatment facility is a developable, legally viable new supply because after further treatment the water could be recharged into the basin or piped to crop fields for irrigation use. Both of these options provide additional water to the basin, either by effectively increasing the yield of the basin, or by providing irrigation water in-lieu of pumping. The Court Judgment that governs groundwater in the pilot basin allows for transfers and the creation of a storage water program based on artificial recharge, making IE’s solution legally achievable.
**Demand for water in the basin**
As shown in Table 2 below, the value of water in the pilot basin is high based on recent transactions.

<table>
<thead>
<tr>
<th>Lowest Price</th>
<th>Highest Price</th>
<th>Mean Price</th>
</tr>
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<tbody>
<tr>
<td>$5,583</td>
<td>$10,000</td>
<td>$5,990</td>
</tr>
</tbody>
</table>

Table 2. Value of water (per acre-foot) in the basin, as determined by recent historical transactions and in-lieu fees paid to the City

**Potential sources of new water supply in the basin**
As shown in Table 3 below, IE determined that all potential sources of supply are expensive, and often limited. The inability for the pilot basin to meet any new demand is a critical aspect of the basin that will allow IE to implement a successful private market solution.

<table>
<thead>
<tr>
<th>Supply Source</th>
<th>Cost / Acre-Foot</th>
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<tbody>
<tr>
<td>City in lieu fees</td>
<td>$6,746</td>
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<tr>
<td>Existing pumping rights (mean market rate)</td>
<td>$6,721</td>
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<tr>
<td>Conservation of water</td>
<td>$8,148</td>
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<tr>
<td>Surface water recharge</td>
<td>$11,091</td>
</tr>
</tbody>
</table>

Table 3. Alternative water supply options in the pilot basin. Cost per AF is for a permanent sale of water rights

**Instream Exchange’s solution for the pilot market**
IE intends to create a new supply that is more substantial and cost-effective than the options shown in Table 3 by acquiring effluent from the city’s wastewater treatment plant. IE will create a partnership with the Water Recycling Facility to (1) establish ownership of treated effluent, (2) apply additional treatment, and (3) distribute the water to our clients via surface piping or groundwater recharge. In the instance of groundwater recharge, IE will establish a storage water program under the Court Judgment that governs water use in the basin, and will be able to sell pumping credits (i.e. rights to the recharged water) to meet new water demand.

**Conclusions**
Through the market feasibility analysis, Instream Exchange has determined that its mission—to secure new water in constrained basins in order to meet demand—is relevant and legally feasible in the pilot basin. Instream Exchange has determined that the basin is a prime candidate for a market solution that addresses water constraints and also wastewater issues. Instream Exchange has found that a demand for new water in the basin exists, that IE could use effluent to create new pumping credits in the basin and that the legal and regulatory environment supports IE’s proposal for generating the additional credits. In addition, this proposed solution provides a long-term plan for utilizing wastewater, instead of simply disposing of it.

Instream Exchange intends to lease or purchase the effluent, treat it to standards sufficient for irrigation and recharge, and provide usable water to meet demand within the basin.