



## Reclaimed Water Reuse Study

*Final Report - February 2016*



**SUNRISE ENGINEERING, INC.**

2152 S. Vineyard, Suite 123

Mesa, Arizona 85210

Tel: (480) 768-8600 Fax: (480) 768-8609

**Engineer's Opinion of Probable Cost \*****Project:** Reclaimed Water Re-Use Study**Option 1 - Onsite Groundwater Injection****Owner:** City of Kingman**Prepared By:** JV

No.	Item Description - Construction	QTY	Unit	Unit Price	Total
<b>New 18-inch Diameter Injection Well Conceptual Design</b>					
1	Site Work (Includes all clearing and grubbing, grading and backfilling)	1	LS	\$8,000	\$8,000
2	10" C900 PVC Waterline (includes waterline, valves, bends, tees, appurtenances, trenching and backfill)	40	LF	\$150	\$6,000
3	New 12-inch Injection Well (includes drilling, casing, perforations, column pipe and appurtenances)	1	LS	\$650,000	\$650,000
4	Concrete Vault	1	LS	\$16,000	\$16,000
5	Flow Meter @ WWTP	1	EA	\$6,000	\$6,000
6	Backflow Preventer @ WWTP	1	EA	\$15,000	\$15,000
7	Electrical	1	LS	\$25,000	\$25,000
<b>Sub-Total A</b>					<b>\$726,000</b>
25% Contingency					\$182,000
Professional Engineering Services					\$88,000
Construction Administration					\$59,000
<b>GRAND TOTAL A</b>					<b>\$1,055,000</b>

\*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.



# SUNRISE ENGINEERING, INC.

2152 S. Vineyard, Suite 123

Mesa, Arizona 85210

Tel: (480) 768-8600 Fax: (480) 768-8609

## Engineer's Opinion of Probable Cost \*

Project: Reclaimed Water Re-Use Study

Option 2 - Airport Industrial Park Reuse

Owner: City of Kingman

Prepared By: JV

No.	Item Description - Construction	QTY	Unit	Unit Price	Total
<b>Airport Industrial Park Distribution</b>					
1	Site Work (Includes all clearing and grubbing, grading and backfilling)	1	LS	\$15,000	\$15,000
2	8" C900 PVC Waterline (includes waterline, valves, bends, tees, appurtenances, trenching and backfill)	22,636	LF	\$65	\$1,500,000
3	6" C900 PVC Service Lines (includes waterline, valves, bends, tees, appurtenances, trenching and	53,120	LF	\$55	\$3,000,000
4	Jack and Bore Reuse Line Under Highway 66	1	LS	\$300,000	\$300,000
5	Jack and Bore Reuse Line Under BNSF Railroad	1	LS	\$150,000	\$150,000
6	Pump Station to Fill Storage Tank (includes two 750 GPM pumps, valves, bends, appurtenances and	1	LS	\$150,000	\$150,000
7	Booster Station (includes two 300 GPM pumps, valves, bends, appurtenances and concrete pad)	1	LS	\$150,000	\$150,000
8	Flow Meter @ WWTP	1	EA	\$6,000	\$6,000
9	Water Meter For Industrial Park	63	EA	\$1,190	\$75,000
10	Backflow Preventer @ WWTP	2	EA	\$15,000	\$30,000
11	288,000 Gallon Steel Water Storage Tank, coating (interior/exterior) & Foundation	1	LS	\$300,000	\$300,000
12	Remove and Replace Existing Asphalt, Concrete, Curb and Gutter	1	LS	\$1,240,000	\$1,240,000
13	Electrical & SCADA	1	LS	\$300,000	\$300,000
<b>Sub-Total A</b>					<b>\$7,216,000</b>
15% Contingency					\$1,804,000
Professional Engineering Services					\$866,000
Construction Administration					\$578,000
<b>GRAND TOTAL A</b>					<b>\$10,464,000</b>
<b>Well #1 Injection</b>					
14	Retrofit Well #1 (includes all demo items, re-installation and connection)	1	LS	\$200,000	\$200,000
<b>Sub-Total B</b>					<b>\$200,000</b>
15% Contingency					\$50,000
Engineering Design Services					\$24,000
Construction Administration					\$16,000
<b>GRAND TOTAL B</b>					<b>\$290,000</b>
<b>GRAND TOTAL A+B</b>					<b>\$10,754,000</b>

\*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.



**SUNRISE ENGINEERING, INC.**

2152 S. Vineyard, Suite 123

Mesa, Arizona 85210

Tel: (480) 768-8600 Fax: (480) 768-8609

**Engineer's Opinion of Probable Cost \***

**Project:** Reclaimed Water Re-Use Study

**Option 3 - Golf Course Reuse**

**Owner:** City of Kingman

**Prepared By:** JV

No.	Item Description - Construction	QTY	Unit	Unit Price	Total
<b>Golf Course Distribution</b>					
1	Site Work (Includes all clearing and grubbing, grading and backfilling)	1	LS	\$10,000	\$10,000
2	12" C-900 (DR 14) PVC Waterline (includes waterline, valves, bends, tees, appurtenances, trenching and backfill)	23,350	LF	\$80	\$1,900,000
3	12" DIP Waterline (includes waterline, valves, bends, tees, appurtenances, trenching and backfill)	25,000	LF	\$90	\$2,250,000
4	Jack and Bore Reuse Line Under Stockton Pass Rd	1	LS	\$120,000	\$120,000
5	Jack and Bore Reuse Line Under Interstate 40	1	LS	\$360,000	\$360,000
		1	LS	\$190,000	\$190,000
6	Booster Station (includes two 320 GPM pumps, two 680 GPM pumps valves, bends, appurtenances and concrete pad)				
7	Flow Meter @ WWTP	1	EA	\$6,000	\$6,000
8	Backflow Preventer (@WWTP, Golf Course, 3 Schools, 2 Parks and Fairgrounds)	7	EA	\$15,000	\$105,000
9	Pump Station @ Golf Course (includes two 700 GPM pumps, backflow preventer, valves, bends, appurtenances and concrete pad)	1	LS	\$160,000	\$160,000
10	Remove and Replace Existing Asphalt, Concrete, Curb and Gutter	1	LS	\$320,000	\$320,000
11	Electrical & SCADA	1	LS	\$275,000	\$275,000
<b>Sub-Total A</b>					<b>\$5,696,000</b>
25% Contingency					\$1,424,000
Professional Engineering Services					\$684,000
Construction Administration Services					\$456,000
<b>GRAND TOTAL</b>					<b>\$8,260,000</b>

\*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

## 5.0 CONCLUSION

### 5.1 Closing Summary

The City of Kingman's Hilltop Wastewater Treatment Facility has the capacity and is permitted to treat and reuse up to 1 MGD of Class A+ reclaimed water. However, currently the WWTF only treats the effluent to Class B+ standards and such effluent is discharged to the Mohave Wash and to wetlands to the northwest.

The City would like to utilize this reclaimed water and this study has analyzed the following three possible Options:

- Groundwater Injection
- Airport Industrial Park Reuse
- Golf Course, Schools and Parks Reuse

In order to determine which Option is best suited for the City, an analysis of each of the Options was performed. A brief summary of each of the Options and results of the analysis are as follows:

Table 5.1 – Summarized Comparison of Options

Item Description	Option 1	Option 2	Option 3
Project Type	Groundwater injection	Distribution line and groundwater injection	Distribution line
Areas Served	Basin aquifer	Airpark and Basin aquifer	Golf course, schools, parks and fairgrounds
Conceptual Design	Injection well onsite	Distribution line to Airpark with injection at Well #1	Distribution line to Golf Course
Capital Cost	\$1,055,000	\$10,754,000	\$8,260,000
First Yr O&M Costs	\$19,377	\$164,200	\$157,753
Rate Analysis	N/A	Increase non-residential reclaimed water rates by \$1,056 for Airpark business/property owners only	Increase to in-town residential water base rates by \$3.16 Citywide
Capital Savings	N/A	\$1,930,000	\$3,605,000
Benefits Analysis Score	120	95	129

### 5.2 Recommendations

A benefits analysis of all three Options was performed to weigh the pros and cons of each Option and help determine which of these would best serve the City's interests. A summary of all three options and their scores based upon their pros and cons is shown in Table 5.2 below.

Table 5.2 – Summarized Selection Criteria Scores

<b>Selection Criteria</b>	<b>Points Possible</b>	<b>Option 1 Score</b>	<b>Option 2 Score</b>	<b>Option 3 Score</b>
Capital Cost	30	30	5	10
Long Term O&M	30	30	5	5
Option Reduces Drinking Water System Requirements	30	0	8	30
Option has Community Economic Impact	30	0	30	20
Option is Flexible/Scalable	25	5	13	20
Option is Eligible for Green Funding	20	20	20	20
Option Negatively Affects Water User Base Rates	15	15	0	10
Option Recharges Groundwater	10	10	4	0
Ease/Cost of Permitting	5	5	2	2
Ease of Constructability	5	5	1	2
<b>Total</b>	<b>200</b>	<b>120</b>	<b>95</b>	<b>129</b>

In closing, this study has provided enough information to make an engineered recommendation to the City of Kingman as to which Option they should use to utilize their reclaimed water.

#### **Option 1 Recommendation**

If the City of Kingman would prefer a project with low capital costs, low long term O&M costs and provides groundwater recharging, Option 1 – Groundwater Injection is recommended.

This Option only provides groundwater injection and will be the easiest to construct. It also is the least expensive Option in this study and has the lowest O&M costs.

#### **Option 3 Recommendation**

If the City of Kingman would like to service multiple entities with reclaimed water, free up existing water infrastructure and has options for funding, Option 3 – Golf Course, Schools and Parks Reuse is recommended.

This option would use approximately 1 MGD of reclaimed water as irrigation water for the Cerbat Cliffs Golf Course with possible connections to the schools, parks and the Fairgrounds. Its capital and O&M costs are higher than Option 1, but it will qualify for WIFA funding and will provide capital savings by reducing the demands on the City's water system thereby freeing up water infrastructure. Also, water base rates Citywide would only need to rise slightly in order to fully fund this Option.

Option 3 is the most flexible/scalable Option in the study. It would pass the Airpark, multiple schools and parks, the fairgrounds and City wells that could be retrofitted for groundwater injection.

This Option could also positively impact the community economy as it has the possibility to attract new "green" businesses.