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# Stakeholder Forum Meeting #3

Utah Department of Environmental Quality

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April 14, 2004

# Jordan Valley Water Conservancy District

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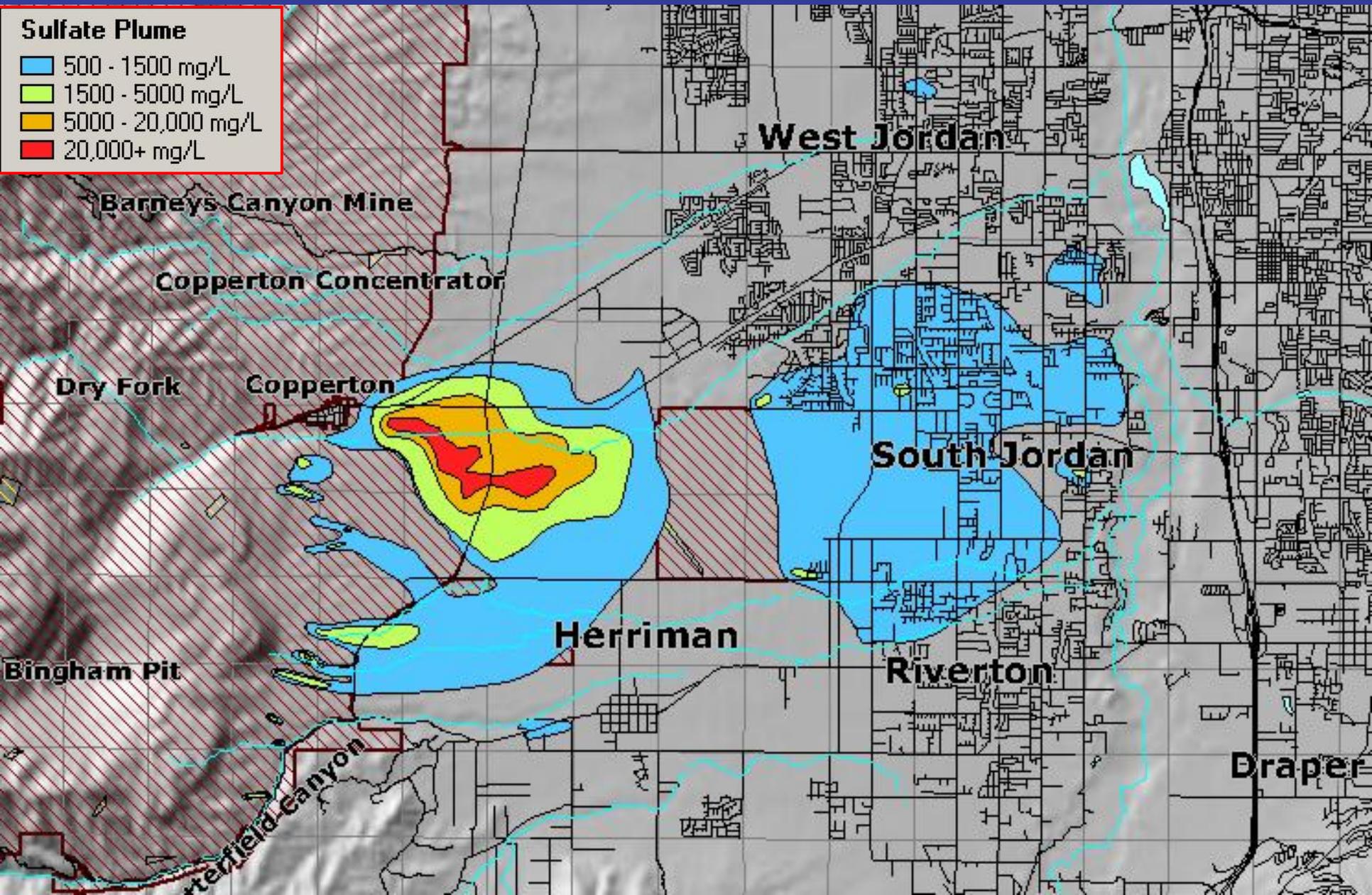
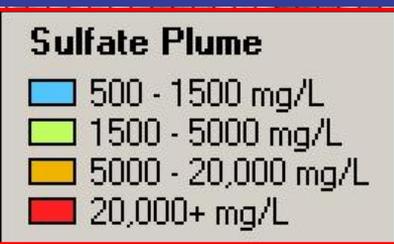
## Southwest Groundwater Remediation and Treatment Project

### Reverse Osmosis By-Product Disposal Cost Estimates

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April 14, 2004

# ZONE A AND ZONE B SULFATE PLUMES



# RO By-product Disposal Alternative A No Action by Jordan Valley

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- Jordan Valley withdraws the Joint Proposal
- Jordan Valley withdraws its \$23 million
- Jordan Valley withdraws use of its water rights (\$15 million value)
- Jordan Valley withdraws use of its water transmission system
- Kennecott's \$19 million and water rights (\$12 million value)?
- Joint Proposal Value: \$131 million+

**Decision by JWCD or Kennecott**

# RO By-product Disposal Alternative B Discharge to Jordan River

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- Permit to discharge to Jordan River issued in August 2003
- Public concerns expressed regarding environmental impacts
- Jordan Valley's Board of Trustees considered the concerns expressed

**Jordan Valley's Board of Trustees withdrew  
Jordan River discharge permit**

# RO By-product Disposal Alternative C Deep Well Injection

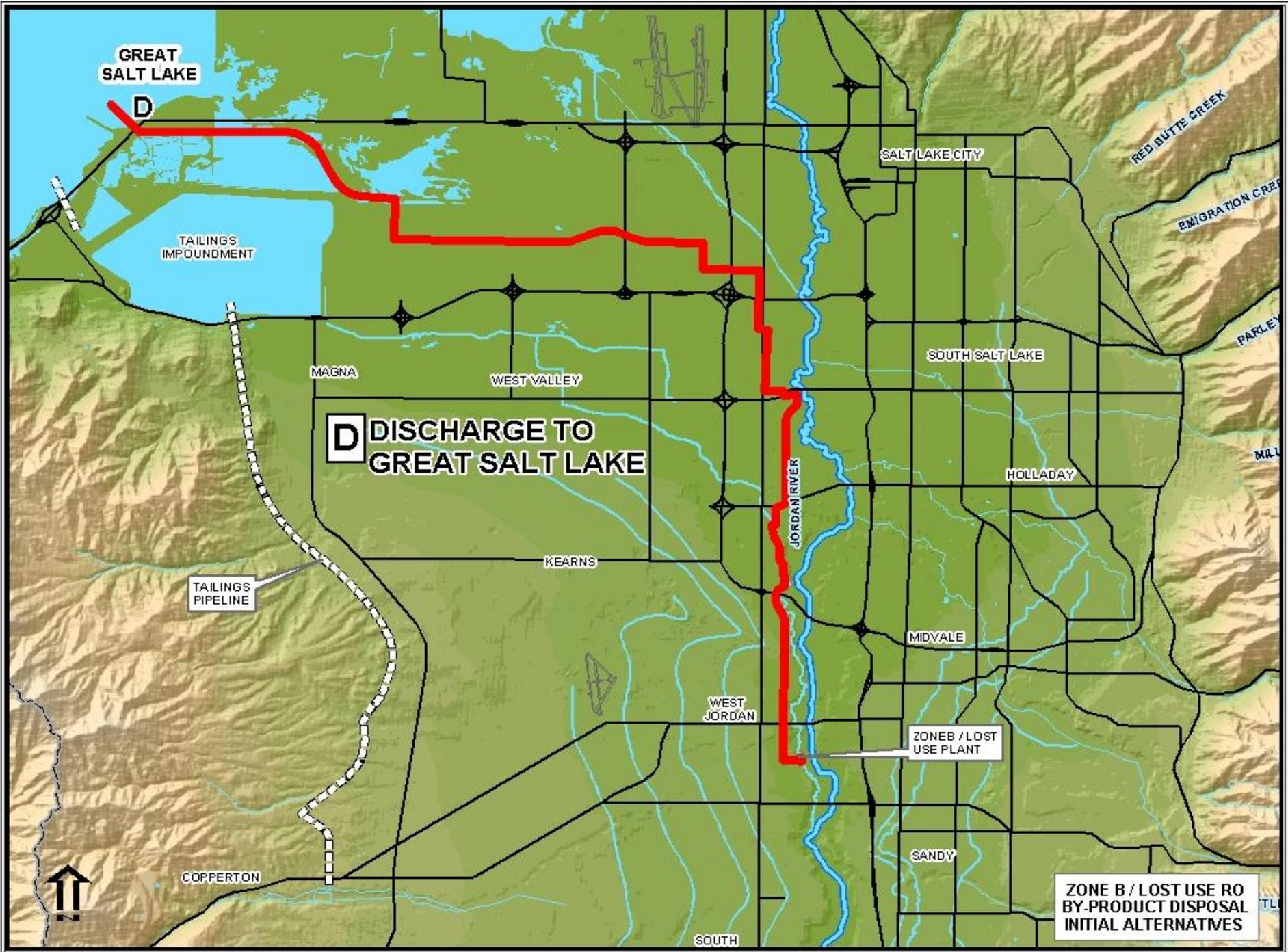
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- Deep well drilled near Zone B plant
- Well drilled at least 5,000 feet deep
- Vertical hydraulic connectivity

# RO By-product Disposal Alternative D Discharge to Great Salt Lake

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- Pump by-product from West Jordan to Great Salt Lake (GSL) in 24 mile pipeline
- Construct a new discharge pipeline (10") into Great Salt Lake
- Discharge into south arm of GSL east of Saltair





## TECHNICAL MEMORANDUM

MEMO No: 3

SUBJECT: Cost Estimate for Disposal of Reverse Osmosis By-product  
**Alternative D** - Discharge to Great Salt Lake

TO: Stakeholder Forum

COPIES: Richard Bay, JWCD  
Paula Doughty, KUCC  
Douglas Bacon, UDEQ

FROM: Mark Atencio

DATE: April 13, 2004

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### EXECUTIVE SUMMARY

This alternative consists of pumping the Zone B and Lost Use RO by-product to the south arm of the Great Salt Lake in a 23.7 mile long, 10-inch diameter pipeline using three pump stations. The net present value cost for disposal of Zone B and Lost Use RO by-product is \$9.3 million. This includes a capital cost of \$9.7 million and an operation cost of \$20,000 per year.

### BACKGROUND

Mining activities in southwestern Salt lake Valley have created groundwater contamination, with elevated sulfate concentrations. A 1995 federal Consent Decree negotiated by Jordan Valley Water Conservancy District (JWCD), Kennecott Utah Copper Corporation (KUCC) and Utah Department of Environmental Quality (UDEQ), established a natural resource damage Trust Fund which was paid by KUCC. The Consent Decree established purposes for use of the Trust Fund as:

- remediating the aquifer
- containing the contamination plumes; and
- restoring the beneficial use by producing municipal quality water through treatment.

Dr. Dianne R. Nielson, Executive Director of UDEQ, has been appointed as Trustee of the Trust Fund and of projects to accomplish the Consent Decree purposes.

JVWCD and KUCC have submitted a Joint Proposal project to the Trustee to accomplish the Consent Decree purposes. The Joint Proposal involves one reverse osmosis (RO) treatment plant and facilities to treat western Zone A deep groundwater; and one RO plant to treat eastern Zone B deep groundwater and Lost Use shallow groundwater. The Trustee held a public information and public comment period during August through November 2003.

As a result of the public comments, JVWCD withdrew its Zone B/Lost Use RO by-product water discharge permit to the Jordan River and renewed efforts to find a better disposal alternative. The Trustee established a Stakeholder Forum for southwest groundwater remediation issues in early 2004. JVWCD has sought input from the Stakeholders Forum as it considers various alternatives for disposal of Zone B/Lost Use RO by-product water.

Zone B/Lost Use by-product water is projected to have the following characteristics:

	<b>Flow Rate</b>	<b>TDS Concentration</b>	<b>Selenium Concentration</b>
	<b>(cfs)</b>	<b>(mg/L)</b>	<b>(µg/L)</b>
Zone B	1.24	8,300	25
Lost Use	0.51	8,200	47
<b>Total</b>	<b>1.75</b>		
<b>Common Range</b>		<b>8,200 -8,300</b>	<b>32-47</b>

## **PURPOSE**

The purpose of this memo is to describe the net present value cost of disposing of Zone B and Lost Use RO by-product to the Great Salt Lake in a pipeline from the Zone B Lost Use Treatment Plant in West Jordan to the south arm of Great Salt Lake near Salt Air.

## **AUTHOR'S CREDENTIALS**

I am a registered professional engineer specializing in the area of water resources. I have completed Bachelor and Master of Science degrees in civil engineering. Following graduation I have been working at Jordan Valley Water Conservancy District as a civil engineer. My current title is senior engineer, in which I fill project management and supervisory roles. I have been studying and investigating various membrane and TDS reduction treatments for eight years. I have completed a number of well drilling and construction projects. I have completed three years of pilot testing using various membrane and reverse osmosis. I have been filling the role of a technical engineer for

the District on the Southwest Groundwater Remediation and Treatment Project since 1999.

## **DESCRIPTION OF ALTERNATIVE**

See the attached Drawing for a visual representation of the alternative.

This alternative consists of a 23.7 mile long, 10-inch diameter PVC pipeline constructed from the Zone B Lost Use Reverse Osmosis (RO) Plant in West Jordan to the Great Salt Lake near Salt Air. Discharge into the lake would be through a new outfall pipeline. Three pump stations would be required; one the RO plant, the second at 7 to 8 miles from the plant, and the third at 15 to 16 miles from the plant.

## **SCALING CONCERNS**

The RO by-product contains a high concentration of salts, consisting mostly of calcium sulfate (gypsum) and calcium carbonate (calcite IE Timpanogos Cave). The solutions are super-saturated and on the verge of precipitating. This means that if the fluid were to stop moving a scale would start to form on the interior of the pipeline. In the RO plant an antiscalant chemical prevents scale formation; however, the chemical does not last for more than approximately 24 hours.

The formation of scale or precipitation of salts is the same process that occurs in the Great Salt Lake as the tributaries to the lake bring in salts into the lake. In this case the salts are concentrated due to evaporation until the point that saturation is reached and the salts form particles (precipitation) and settle to the bottom. In order to prevent this type of scaling from occurring in the pipeline the RO by-product needs to be kept in continuous operation or drained.

## **PIPELINE MATERIAL**

Polyvinyl chloride (PVC) was selected as material of choice after considering ductile iron, steel, high density polypropylene (HDPE), and PVC. This took into account the actual internal diameter of the various types of pipeline, the working pressure of the pipelines, the hydraulic characteristics of the pipeline materials (friction factor) and the construction cost. Each pipeline material option was evaluated in a large spreadsheet. A copy of this spreadsheet is attached to this memo. The limitations of the pipeline material options considered affected the number and cost of pump stations required, the pressure loss required to be overcome by a pump, pipeline construction cost, and pump station operating cost.

## **PIPELINE DIAMETER**

Six-inch, 8-inch, 10-inch, and 12-inch diameter pipelines were evaluated in the spreadsheet identified above. The size of the pipeline options evaluated affected the pressure loss (smaller pipe = higher pressure loss), the detention time in the pipeline (larger pipe = longer time in transit), pipeline construction cost, and pump station operating cost.

## **PIPELINE ALIGNMENT**

Multiple alignments were considered for this alternative. First, an alignment extending westward, then northward was considered. Second a northern then westward alignment was evaluated. The two alignments were of comparable length. Due to the topography the first alignment required additional pumping to move the fluid uphill, then downhill towards Great Salt Lake. Both alignments utilized property owned by Kennecott Utah Copper Corporation (KUCC) along the east and north sides of its tailings impoundment in the northwest section of Salt Lake County.

## **SELECTION OF PREFERRED PIPELINE OPTION**

Selection of the preferred pipeline option took into account the concerns with scaling and the effects of pipeline material, diameter, and alignment on the capital and operating cost.

The alignment selected for this alternative utilizes public right-of-way and private property, most of which is owned by KUCC. The alignment generally follows an elevation contour line to the north along 1300 West and then to the west along 1300 South to the KUCC tailings impoundment. The alignment then extends to the north and west until reaching Great Salt Lake. This alignment allows for utilizing existing right-of-way corridors. This alignment stays at almost the same elevation along its length. The alignment also avoids increasing in elevation, thereby avoiding additional pumping cost and making it easier to drain the pipeline with a backup pump in the event of a power failure.

Selection of the a 10-inch diameter PVC pipeline with three pump stations allows for the concerns expressed in this memo to be met will obtaining the lowest capital and net present value cost.

## **REQUIRED FACILITIES**

- 23.7 mile long, 10-inch diameter PVC pipeline
- 3 pump stations

- Outfall pipeline

## **LEGALITY**

The legality of this alternative was considered. A review of existing information indicated that a permit for discharge of RO by-product to GSL could be issued which would be protective of Great Salt Lake.

The water quality of the RO by-product was compared against standards for the Jordan River. All of the water quality parameters of the by-product were below the Jordan River standards, with the exception of total dissolved solids (TDS) and selenium. Comparing the TDS of the by-product (8,300) to Great Salt Lake (100,000 plus) it was apparent that TDS in the by-product would not be a concern. In order to understand if the selenium concentration in the by-product would be a concern I researched the files of the Utah State Division of Water Quality. Although selenium is an essential trace element, it has the potential to cause harm to humans or wildlife at very high concentrations. There is an existing permit for a discharge from KUCC to Great Salt Lake with a 54 µg/L (ppb) selenium limitation. The files of the Division contained substantial documentation of the methods used to derive this limitation. The limit required by the Division was based on limiting selenium absorption by algae in Great Salt Lake, which algae are consumed by brine shrimp, which shrimp are then consumed by waterfowl. By limiting selenium accumulation in Great Salt Lake algae the Division of Water Quality is able to prevent reproductive failure in waterfowl that consume Great Salt Lake brine shrimp.

The files also contained concerns expressed by others regarding the permit limitations and responses to these concerns. The issue of selenium has been well researched and a permit limit was already established. The conclusion of my research was that a selenium permit limit for discharge into Great Salt Lake on a firm basis was already established. Comparing the RO by-product selenium concentration of 32-47 µg/L against an existing permit limitation of 54 µg/L indicates that Zone B and Lost Use RO by-product will meet a limit for discharge to Great Salt Lake.

## **ASSUMPTIONS**

- Pump Efficiency: 85%
- Motor Efficiency: 90%
- Pump Station Capital Cost: \$500,000 each
- NPV interest rate: 4%
- 25 feet wide easement cost: \$14.35/ foot (\$50,000/acre)
- Pipeline in roadways installation cost: \$47.40/ft
- Pipeline in open areas installation cost: \$23.45
- Pipeline costs from two contractors and MWH Engineers

- RO plant operates 330 days per year
- Power Cost \$0.055/kW hr

### **COST ESTIMATE**

The cost estimate for this alternative took into account the size of the pipeline, number of pump stations, pumping costs, length of pipeline, length of pipeline in roadways, length of pipeline in open areas, easement acquisition costs, dewatering costs, and engineering costs. The net present value cost for disposal of Zone B and Lost Use RO by-product is \$9.3 million. This includes a capital cost of \$9.7 million and an operation cost of \$20,000 per year.

See the attached spreadsheet for details and calculations of the cost estimate.

SOUTHWEST GROUNDWATER REVERSE OSMOSIS BY-PRODUCT DISPOSAL OPTIONS											
Alternative D Discharge to GSL											
Alt. No.	Disposal Alternative	Project Yield (AF/yr)	Pipeline Material	Pipeline Actual Inside Diameter (Inches)	Zone A Yield (AF/yr)	Zone B Yield (AF/yr)	Zone B Production Rate (cfs)	Lost Use Yield (AF/yr)	Lost Use Production Rate (cfs)	Future Shallow Wells Yield (AF/yr)	Future Shallow Wells Production Rate (cfs)
D	Discharge to Great Salt Lake	9300	PVC C-909	10.27	3500	3500	5.35	2300	3.51	0	0
By-product Flow Rate (cfs)	Number of Pipelines (#)	Pressure Rating (psi)	Pipeline Hazen Williams C-factor	Pipeline in Roadways Length (ft)	Roadway Pipeline Unit Cost (\$/ft)	Pipeline In Open Field Length (ft)	Open Pipeline Unit Cost (\$/ft)	Total Pipeline Length (ft)	Total Pipeline Length (miles)	Dewatering Length (ft)	Dewatering Unit Cost (\$/ft)
1.74	1	200	120	90,290	47.40	34,850	23.45	125,140	23.70	42,770	2.00
Pipeline Boring & Additional Costs (\$)	Easement Length Required (ft)	Easement Cost (\$)	Total Pipeline Cost (\$mill)	Velocity (ft/sec)	Detention Time OK? (hrs)	Max Head Loss between Pump Stations (ft)	Max Distance between Pump Stations (ft)	Max Distance between Pump Stations (miles)	Calculated Number of Pump Stations (ft)	Actual Number of Pump Stations (ft)	Total Pump Station Cost (\$mill)
0	1,850	26,548	5.209	3.03	11.5	416	103,407	19.6	1.2	2	1.000
Total Const Cost (\$mill)	Eng Cost (\$mill)	20% Contingency (\$mill)	Total Capital Cost (\$mill)	Discharge Hydraulic Gradeline (ft)	Static Pump Lift (ft)	Head Loss (ft)	Total Pump Lift (ft)	Pump Size (HP)	Annual Pumping Cost (\$)	NPV of Pumping Costs (\$mill)	Total NPV Cost (\$mill)
6.209	0.931	2.142	<b>9.283</b>	4,215	-267	503	236	61	<b>19,986</b>	<b>0.396</b>	<b>9.678</b>

# RO By-product Disposal Alternative D Discharge to Great Salt Lake

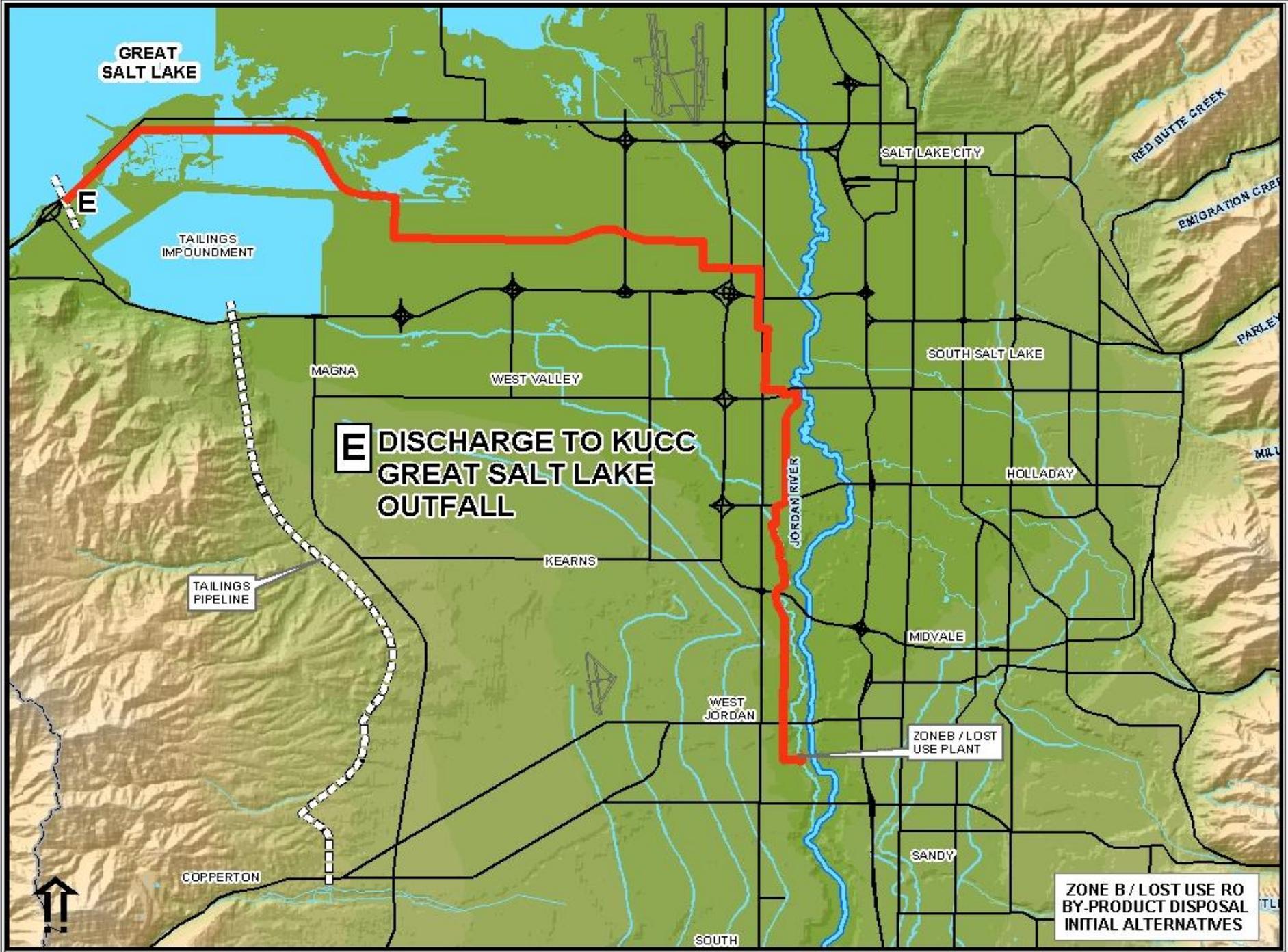
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- Capital Cost \$9.3 million
- Operating Cost \$20,000 per year
- Net Present Value \$9.7 million

# RO By-product Disposal Alternative E Discharge to KUCC GSL Outfall

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- Pump by-product from West Jordan to GSL in a 27 mile pipeline (10")
- Discharge by-product into existing KUCC GSL outfall



**GREAT SALT LAKE**

**E**

TAILINGS IMPOUNDMENT

**E DISCHARGE TO KUCC GREAT SALT LAKE OUTFALL**

TAILINGS PIPELINE

COPPERTON

SALT LAKE CITY

SOUTH SALT LAKE

HOLLADAY

KEARNS

MIDVALE

WEST JORDAN

ZONE B / LOST USE PLANT

SANDY

SOUTH

RED BUTTE CREEK

EMIGRATION CREEK

PARLEY

MILL

**ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES**

# RO By-product Disposal Alternative E Discharge to KUCC GSL Outfall

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- Capital Cost \$9.9 million
- Operating Cost \$25,000 per year
- Net Present Value \$10.4 million

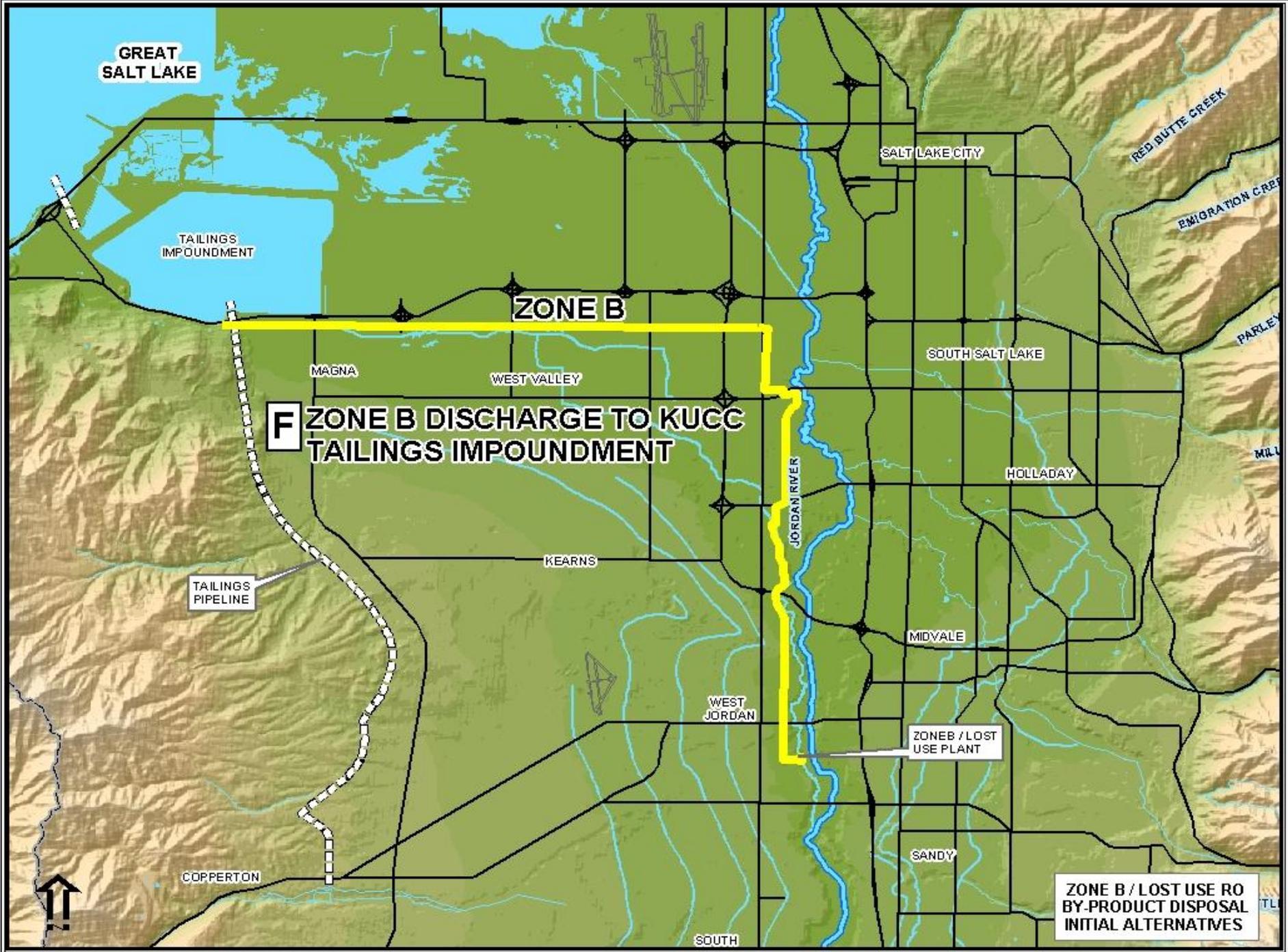
# RO By-product Disposal Alternative F

## Discharge to KUCC Tailings Impoundment

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- Pump by-product from West Jordan to Magna in a 20 mile pipeline (10")
- Pump by-product up 400 feet into KUCC Tailings Impoundment
- Nutrient (phosphorus) levels in Lost Use by-product will enhance algal blooms in Tailings Impoundment

**Zone B Only**



GREAT SALT LAKE

TAILINGS IMPOUNDMENT

ZONE B

**F** ZONE B DISCHARGE TO KUCC TAILINGS IMPOUNDMENT

TAILINGS PIPELINE

ZONE B / LOST USE PLANT

ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES



# RO By-product Disposal Alternative F

## Discharge to KUCC Tailings Impoundment

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- Capital Cost \$ 7.7 million
- Operating Cost \$ 25,000 per year
- Net Present Value \$ 8.2 million

# RO By-product Disposal Alternative G Evaporation

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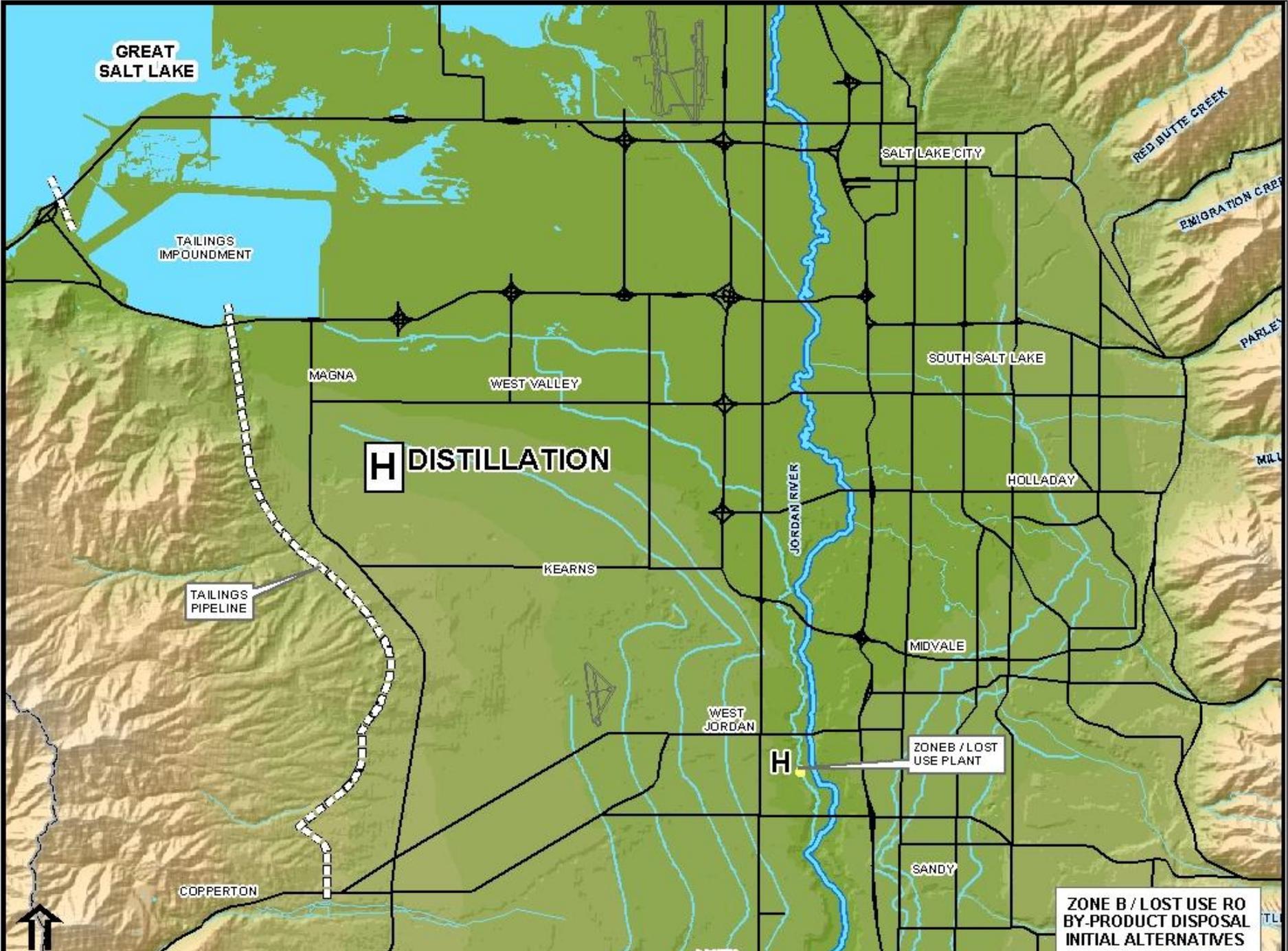
- 2,450 acre feet per year divided by 3 feet of evaporation per year equals 820 acres of evaporation pond surface area
- Addition of 20% for dikes and maintenance roads equals 980 acres

**Alternative Eliminated**

# RO By-product Disposal Alternative H Distillation

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- Heat by-product to boiling – capture steam
- Dispose of solid salts
  - Municipal landfill (**Acceptable**)
  - KUCC tailings impoundment (**Prohibits reclamation**)
  - re-use of salts (**Selenium removal required**)



GREAT SALT LAKE

TAILINGS IMPOUNDMENT

MAGNA

WEST VALLEY

**H** DISTILLATION

KEARNS

TAILINGS PIPELINE

COPPERTON

SALT LAKE CITY

SOUTH SALT LAKE

HOLLADAY

MIDVALE

WEST JORDAN

**H**

ZONE B / LOST USE PLANT

SANDY

SOUTH

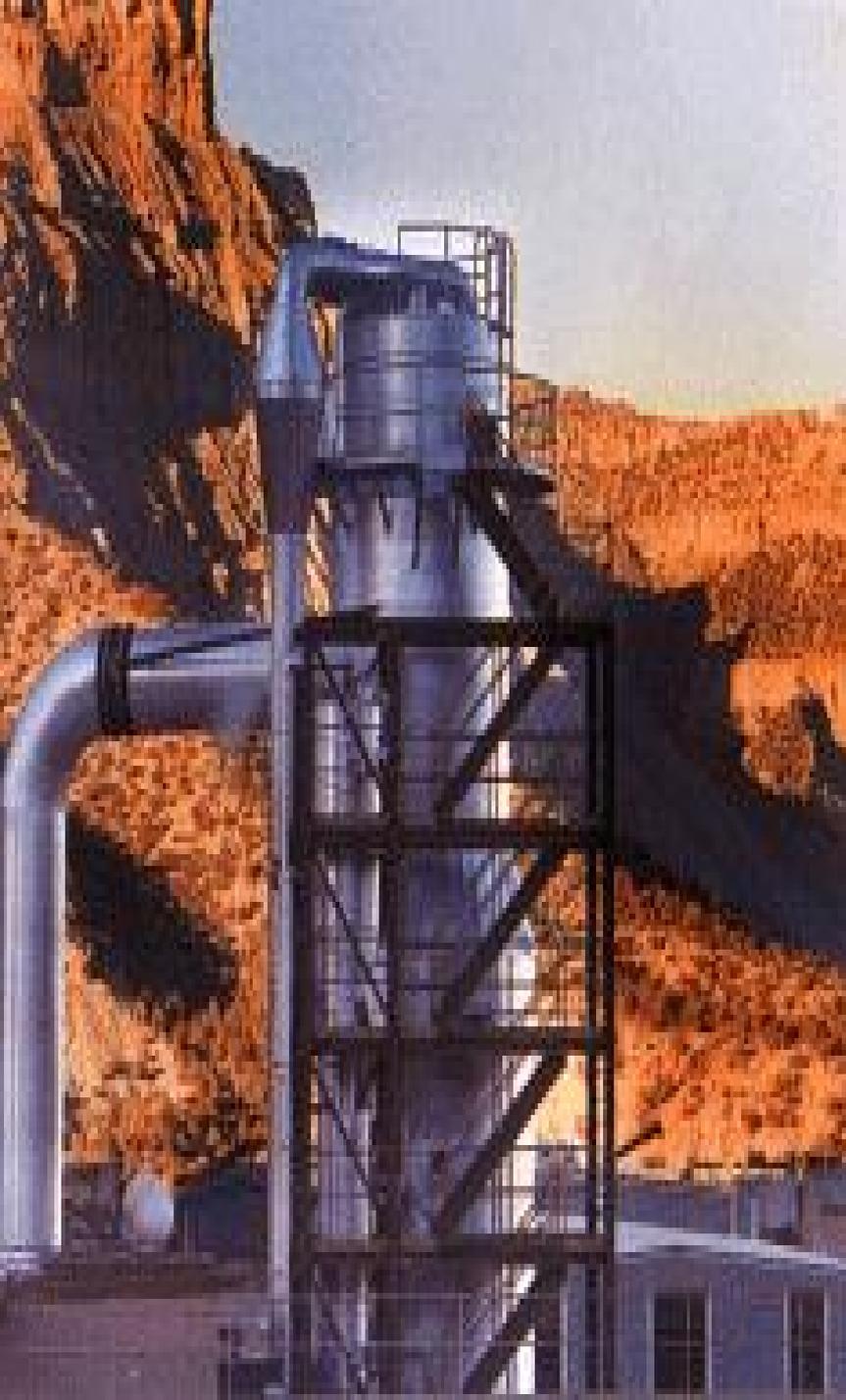
RED BUTTE CREEK

EMIGRATION CREEK

PARLEY

MILL

ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES





# RO By-product Disposal Alternative H Distillation

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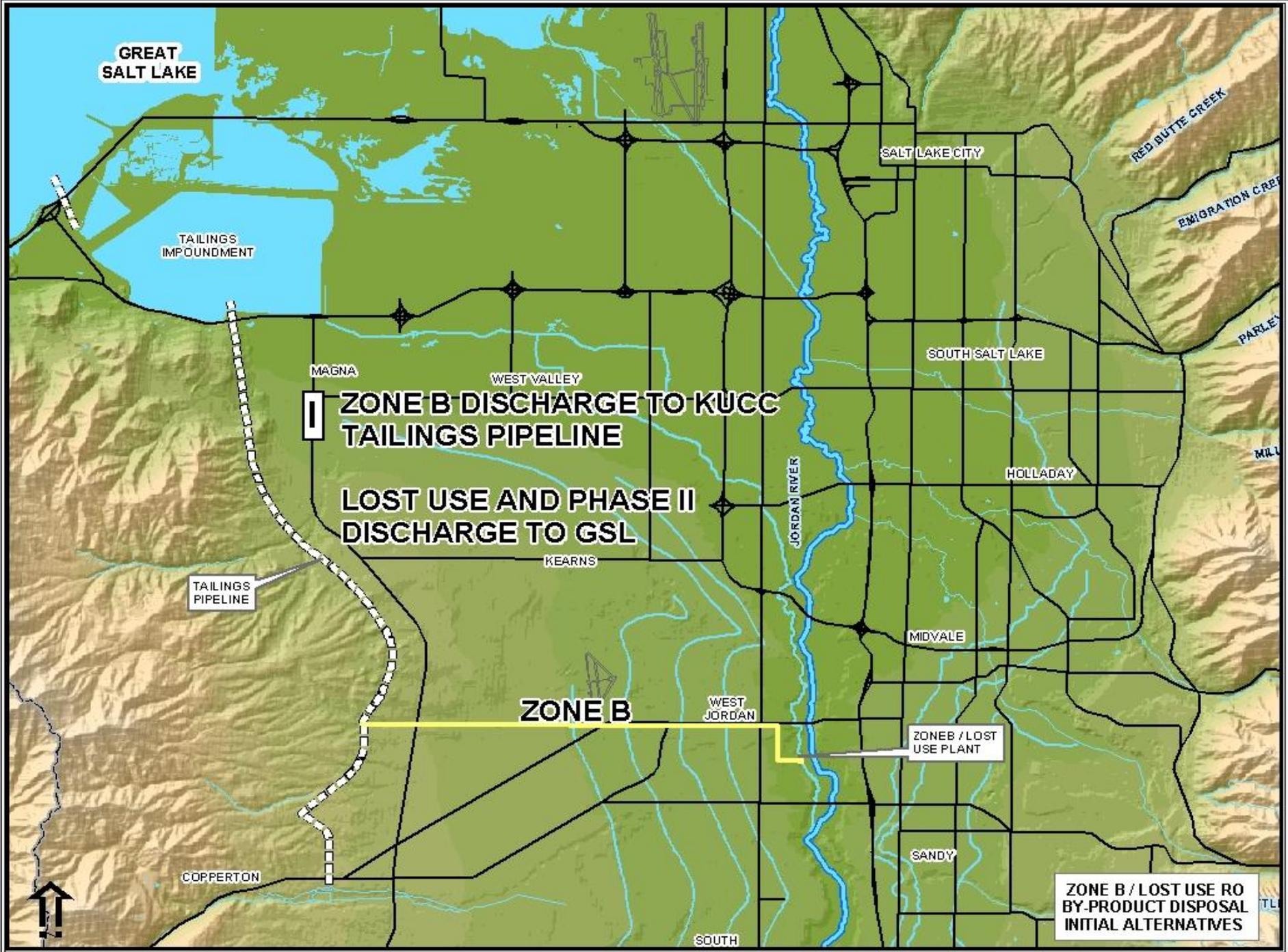
- Capital Cost \$22.1 million
- Operating Cost \$3,200,000  
per year
- Net Present Value \$93.9 million

# RO By-product Disposal Alternative I Zone B to KUCC Tailings Pipeline

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- Pump by-product 9 miles west along 7800 South to KUCC tailings pipeline (8")
- Discharge by-product into tailings pipeline
- 520 psi (1200 feet) pump lift required

**Zone B Only**



**GREAT SALT LAKE**

TAILINGS IMPOUNDMENT

MAGNA

WEST VALLEY

**ZONE B DISCHARGE TO KUCC TAILINGS PIPELINE**

**LOST USE AND PHASE II DISCHARGE TO GSL**

KEARNS

TAILINGS PIPELINE

SALT LAKE CITY

SOUTH SALT LAKE

HOLLADAY

MIDVALE

**ZONE B**

WEST JORDAN

ZONE B / LOST USE PLANT

COPPERTON

SANDY

SOUTH

**ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES**

# RO By-product Disposal Alternative I Zone B to KUCC Tailings Pipeline

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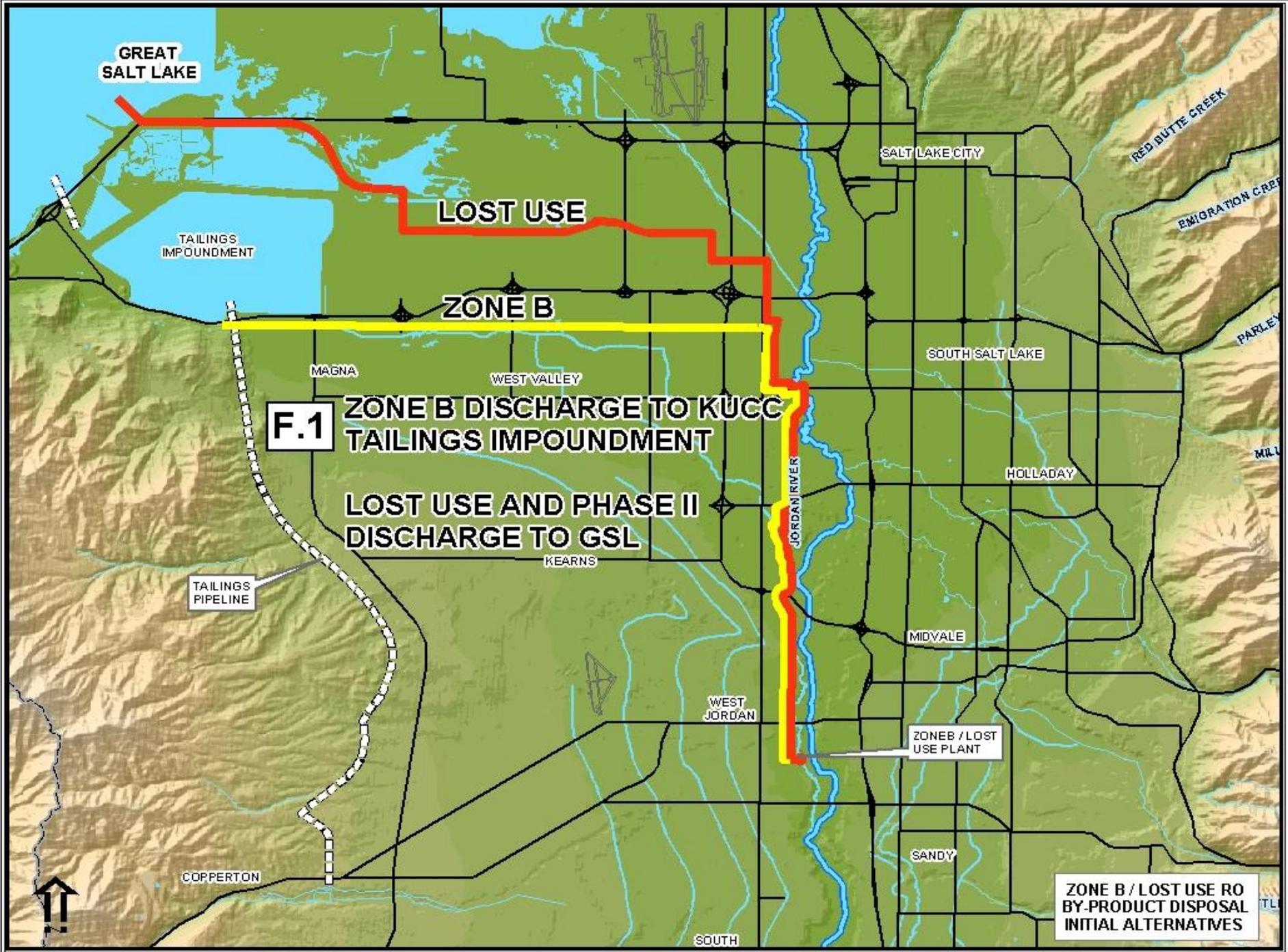
- Capital Cost \$ 5.6 million
- Operating Cost \$ 72,000 per year
- Net Present Value \$ 7.0 million

# RO By-product Disposal Alternative F.1

## Zone B to KUCC Tailings Impoundment Lost Use to Great Salt Lake

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- Pump Zone B by-product Tailings Impoundment to Magna in a 20 mile pipeline (8")
- Pump by-product up 400 feet into KUCC Tailings Impoundment
- Pump Lost Use by-product to GSL in a 24 mile pipeline (6")



# RO By-product Disposal

## Alternative F.1

### Zone B to KUCC Tailings Impoundment Lost Use to Great Salt Lake

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- Capital Cost \$ 15.0 million
- Operating Cost \$ 33,000 per year
- Net Present Value \$ 15.6 million

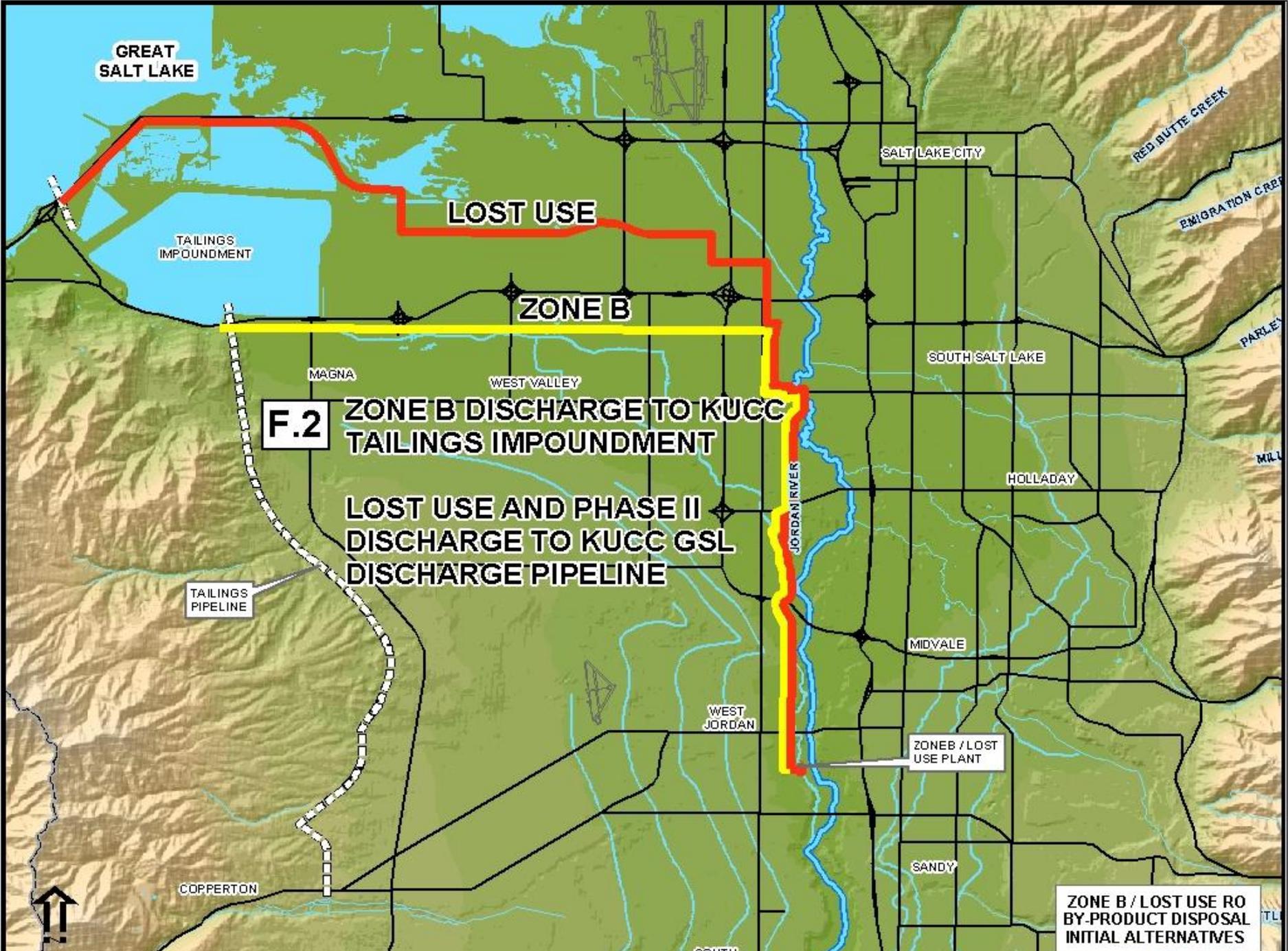
# RO By-product Disposal

## Alternative F.2

### Zone B to KUCC Tailings Impoundment Lost Use to KUCC GSL Outfall

---

- Pump Zone B by-product Tailings Impoundment to Magna in a 20 mile pipeline (8")
- Pump by-product up 400 feet into KUCC Tailings Impoundment
- Pump Lost Use by-product to KUCC GSL Outfall in a 27 mile pipeline (6")



GREAT SALT LAKE

LOST USE

ZONE B

**F.2** ZONE B DISCHARGE TO KUCC TAILINGS IMPOUNDMENT

LOST USE AND PHASE II DISCHARGE TO KUCC GSL DISCHARGE PIPELINE

TAILINGS PIPELINE

JORDAN RIVER

ZONE B / LOST USE PLANT

ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES



# RO By-product Disposal

## Alternative F.2

### Zone B to KUCC Tailings Impoundment Lost Use to KUCC GSL Outfall

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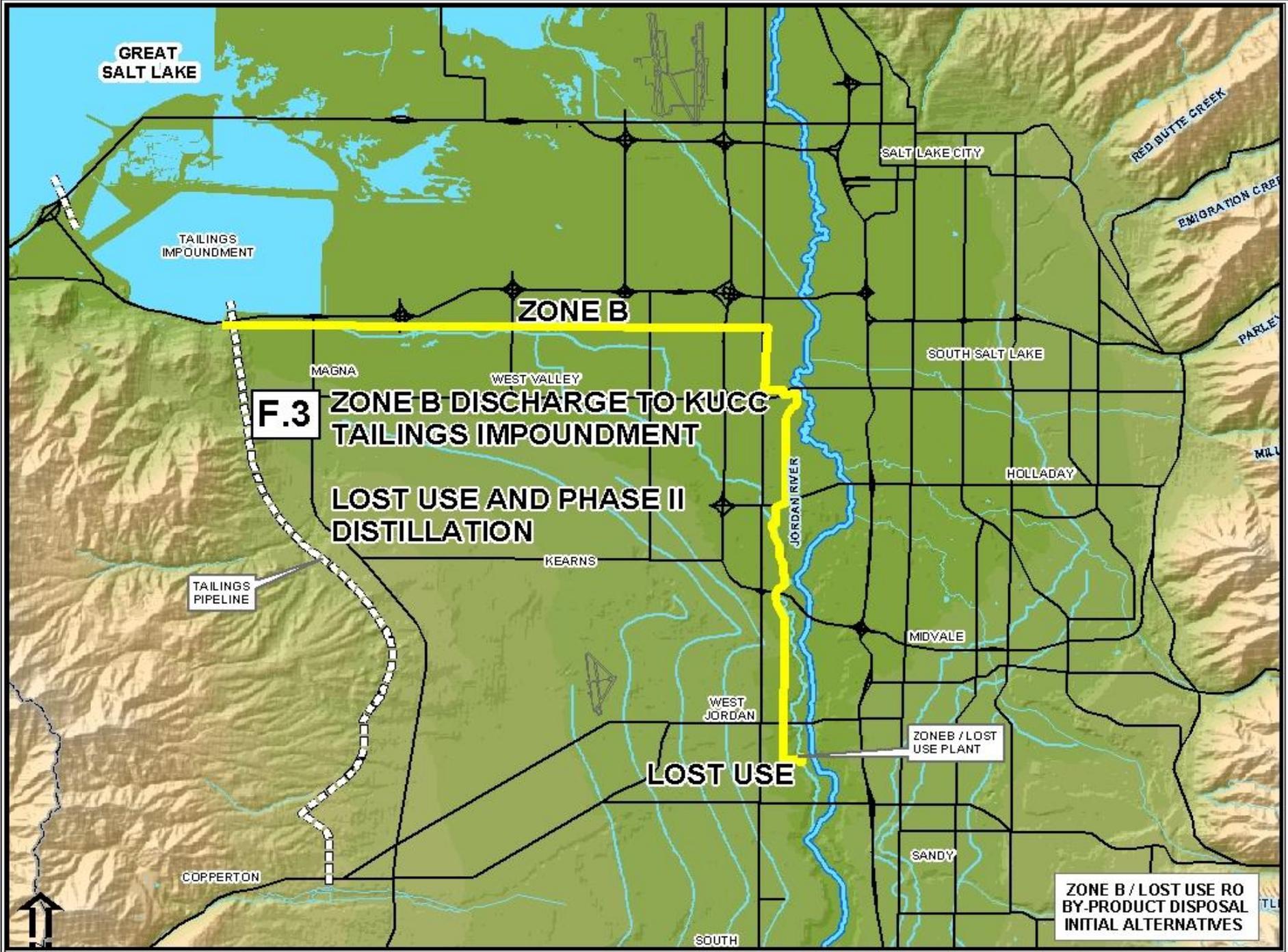
- Capital Cost \$ 15.4 million
- Operating Cost \$ 34,000 per year
- Net Present Value \$ 16.1 million

# RO By-product Disposal Alternative F.3

## Zone B to KUCC Tailings Impoundment Lost Use Distillation

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- Pump Zone B by-product from West Jordan to Magna in a 20 mile pipeline (8")
- Pump by-product up 400 feet into KUCC Tailings Impoundment
- Distillation of Lost Use by-product



# RO By-product Disposal Alternative F.3

## Zone B to KUCC Tailings Impoundment Lost Use Distillation

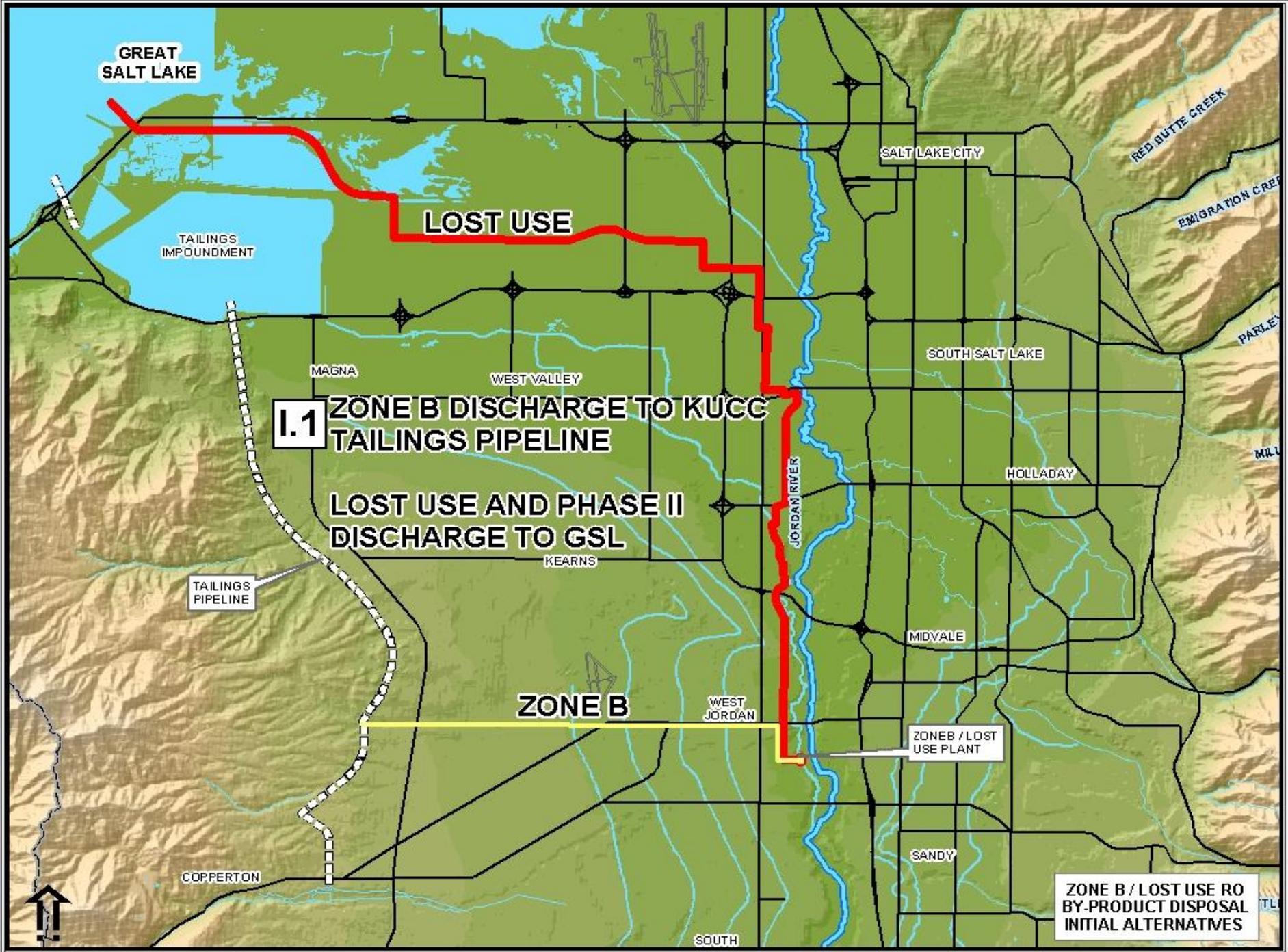
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- Capital Cost \$ 18.1 million
- Operating Cost \$ 1,125,000  
per year
- Net Present Value \$ 40.4 million

# RO By-product Disposal Alternative I.1 Zone B to KUCC Tailings Pipeline Lost Use to GSL

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- Pump Zone B by-product 9 miles west along 7800 South to KUCC tailings pipeline (8")
- Discharge by-product into tailings pipeline
- 520 psi (1200 feet) pump lift required
- Pump Lost Use by-product 24 miles to GSL (6")



GREAT SALT LAKE

TAILINGS IMPOUNDMENT

LOST USE

I.1 ZONE B DISCHARGE TO KUCC TAILINGS PIPELINE

LOST USE AND PHASE II DISCHARGE TO GSL

ZONE B

ZONE B / LOST USE PLANT

ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES

# RO By-product Disposal Alternative I.1 Zone B to KUCC Tailings Pipeline Lost Use to GSL

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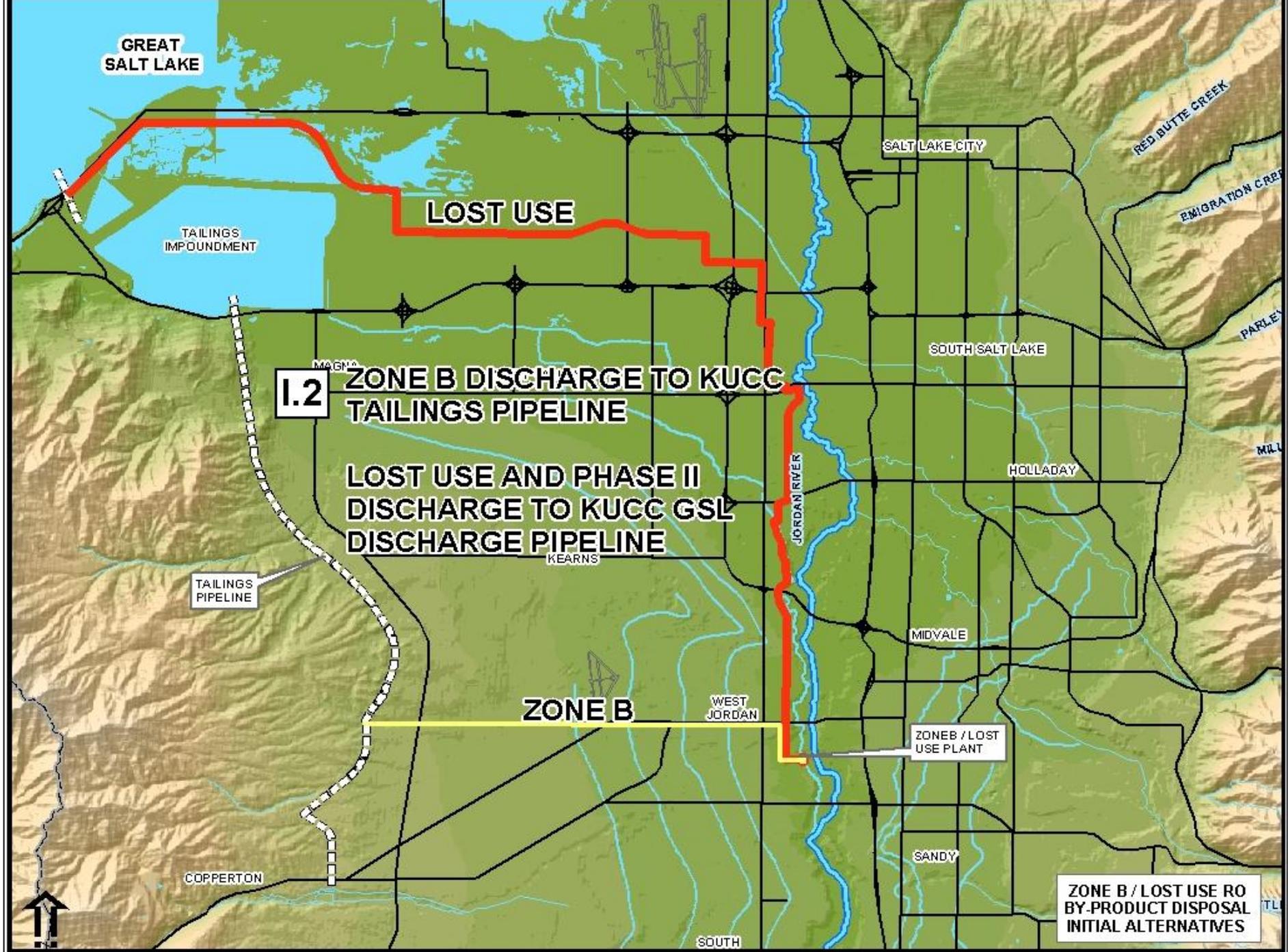
- Capital Cost \$ 11.6 million
- Operating Cost \$ 79,000 per year
- Net Present Value \$ 13.1 million

# RO By-product Disposal Alternative 1.2

## Zone B to KUCC Tailings Pipeline Lost Use to KUCC GSL Outfall

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- Pump by-product 9 miles west along 7800 South to KUCC tailings pipeline (8")
- Discharge by-product into tailings pipeline
- 520 psi (1200 feet) pump lift required
- Pump Lost Use 27 miles to KUCC GSL Outfall (6")



**GREAT SALT LAKE**

TAILINGS IMPOUNDMENT

**LOST USE**

SALT LAKE CITY

RED BUTTE CREEK

EMIGRATION CREEK

PARLEY

**I.2**

**ZONE B DISCHARGE TO KUCC TAILINGS PIPELINE**

**LOST USE AND PHASE II DISCHARGE TO KUCC GSL DISCHARGE PIPELINE**

SOUTH SALT LAKE

HOLLADAY

TAILINGS PIPELINE

**ZONE B**

WEST JORDAN

MIDVALE

ZONE B / LOST USE PLANT

COPPERTON

SANDY

SOUTH

**ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES**

RO By-product Disposal  
Alternative 1.2  
Zone B to KUCC Tailings Pipeline  
Lost Use to KUCC GSL Outfall

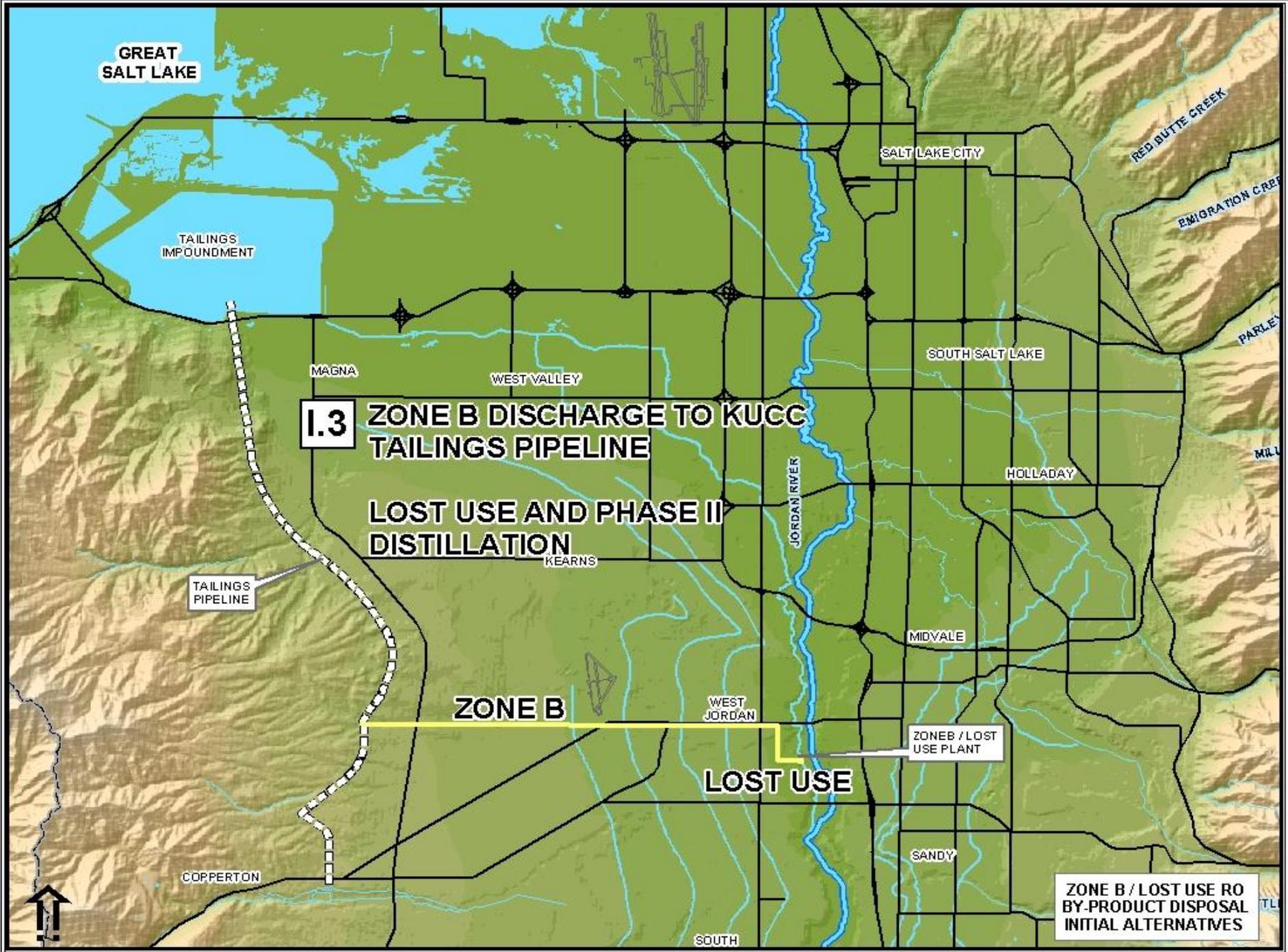
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- Capital Cost \$ 12.0 million
- Operating Cost \$ 81,000 per year
- Net Present Value \$ 13.6 million

# RO By-product Disposal Alternative 1.3 Zone B to KUCC Tailings Pipeline Lost Use Distillation

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- Pump Zone B by-product 9 miles west along 7800 South to KUCC tailings pipeline (8")
- Discharge by-product into tailings pipeline
- 520 psi (1200 feet) pump lift required
- Distillation of Lost Use by-product



GREAT SALT LAKE

TAILINGS IMPOUNDMENT

SALT LAKE CITY

RED BUTTE CREEK

EMIGRATION CREEK

PARLEY

**I.3** ZONE B DISCHARGE TO KUCC TAILINGS PIPELINE

LOST USE AND PHASE II DISTILLATION

SOUTH SALT LAKE

HOLLADAY

JORDAN RIVER

KEARNS

TAILINGS PIPELINE

MIDVALE

ZONE B

WEST JORDAN

ZONEB / LOST USE PLANT

LOST USE

COPPERTON

SANDY

SOUTH

ZONE B / LOST USE RO BY-PRODUCT DISPOSAL INITIAL ALTERNATIVES



# RO By-product Disposal Alternative 1.3 Zone B to KUCC Tailings Pipeline Lost Use Distillation

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- Capital Cost \$ 14.5 million
- Operating Cost \$ 1,172,000 per year
- Net Present Value \$ 37.7 million

# Cost Summary

ALTERNATIVE	To Jordan River (B)	To GSL (D)	To KUCC GSL Outfall (E)	Zone B to Tailings Impoundment (F) ZONE B ONLY	Distillation (H)	Zone B to Tailings Pipeline (I) ZONE B ONLY
Capital Cost (\$million)	\$4.6	\$9.3	\$9.9	\$7.7	\$22.1	\$5.6
Operating Cost (\$/year)	\$0	\$20,000	\$25,000	\$25,000	\$3,200,000	\$72,000
NPV Cost (\$million)	\$4.6	\$9.7	\$10.4	\$8.2	\$93.9	\$7.0
Additional Capital Cost (\$million) (a)	\$0	\$2.9	\$3.5	\$1.3	\$15.7	(\$.8)
Unit Cost (\$/acre feet)	\$157	\$201	\$207	\$209	\$928	\$195

(a) Additional capital cost is relative to \$6.4 million

# Cost Summary

ALTERNATIVE	Zone B to Tailings Impoundment  Lost Use to GSL (F.1)	Zone B to Tailings Impoundment  Lost Use to KUCC GSL Outfall (F.2)	Zone B to Tailings Impoundment  Lost Use Distillation (F.3)	Zone B to Tailings Pipeline  Lost Use to GSL (I.1)	Zone B to Tailings Pipeline  Lost Use to KUCC GSL Outfall (I.2)	Zone B to Tailings Pipeline  Lost Use Distillation (I.3)
Capital Cost (\$million)	\$15.0	\$15.4	\$18.1	\$11.6	\$12.0	\$14.5
Operating Cost (\$/year)	\$33,000	\$34,000	\$1,125,000	\$79,000	\$ 81,000	\$1,172,000
NPV Cost (\$million)	\$15.6	\$16.1	\$40.4	\$13.1	\$13.6	\$37.7
Additional Capital Cost (\$million)	\$8.6	\$9.0	\$35.3	\$5.2	\$5.6	\$31.3
Unit Cost (\$/acre feet)	\$252	\$256	\$466	\$231	\$235	\$443

(a) Additional capital cost is relative to \$6.4 million

# Jordan Valley Water Conservancy District

## “Unbundled” Water Rate

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- Water Supply
- Water Treatment
- Transmission
- Distribution
- Storage
- Capital
- Conservation
- Other

Current average wholesale rate: \$315/AF

# Jordan Valley Water Conservancy District Joint Proposal Funding

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Capital -	\$7.9 million
O, M & R -	\$15.4 million
Total -	\$23.3 million

# Jordan Valley Water Conservancy District Important Factors for Additional Funding

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1. Reasonable unit cost (not adversely impact water rates)
2. Additional capital not adversely impact Jordan Valley Water Conservancy District 10-year financial plan
3. Additional capital not displace Zone A water rate discount

# Conclusions

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- Not exceed \$210/AF
- Additional capital not exceed \$3 million