SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

GLENWOOD SPRINGS
118 W. 6TH, SUITE 200
GLENWOOD SPRINGS, CO 81601
970-945-1004
FX: 970-945-5948

ASPEN
P.O. BOX 2155
ASPEN, CO 81612
970-925-6727
FX: 970-925-4157

CRESTED BUTTE
P.O. BOX 3088
CRESTED BUTTE, CO 81224
970-349-5355
FX: 970-349-5358

February 11, 2010

Scott Garncarz
CDPHE Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246-1530
scott.garncarz@state.co.us

RE: Amendment 1, Preliminary Engineering Report
City of Salida Galleries Water Tank

Dear Mr. Garncarz:

I am including Amendment 1 to the Preliminary Engineering Report (PER) for the City of Salida Galleries Water Tank Rehabilitation Project, originally submitted on March 23, 2009.

A comprehensive condition assessment of this tank last summer revealed the need to address water leakage from the tank. This Amendment to our PER addresses that additional need.

Do not hesitate to contact me should you have any further questions or require further information.

Respectfully submitted,

COLORADO LICENSED
GERALD EDWARD BURGESS
38250
PROFESSIONAL ENGINEER

2/11/10

Gerald E. Burgess, PE
SCHMUESER GORDON MEYER, INC.

Amendment 1
Preliminary Engineering Report
for the City of Salida

Galleries Water Tank Rehabilitation Project

February 11, 2010

Prepared by

SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

1.0 Executive Summary

The work of this Preliminary Engineering Report is being amended to include the installation of an interior water tank liner system in addition to the replacement of the failed roofing material for the South Arkansas Gallery System (Galleries) Water Tank in the City of Salida Colorado (the City). The Gallery Water System consists of an infiltration gallery, chlorination system and a 1.25 million gallon water tank. Water from this tank is pumped into the City's distribution system. The City would like to implement this project as soon as possible.

The water tank is a cast in place rectangular shaped concrete tank. The tank is partially buried with the upper 4 feet exposed. The roof structure is pre-cast structural twin tees. The exterior dimensions of the tank are 210 feet by 157 feet. The structural twin tees are located side by side with an approximate 1 inch gap between members.

In July of 2009 SGM completed an interior condition assessment of this tank. This condition assessment in addition to numerous inspections and observations by City Staff identified additional needs.

The new work consists of installing a liner system within the water tank. This is necessary due to cracks and problems sealing said cracks.

Our amended proposal is to seal the cracks on the interior of the structure and to install a synthetic liner system meeting NSF and AWWA requirements for a potable water system.

This project will protect Public Health and Safety by eliminating the potential for contamination to enter this potable water system and will eliminate an estimated 2.5M gallons of water leaking from the tank annually.

2.0 Planning Conditions (same as original PER, and not reproduced here)

3.0 Description of Existing Facilities (same as original PER, and not reproduced here)

4.0 Project Purpose and Need

4.1 Health and Compliance

Currently all of the City of Salida's water systems are in compliance with the "Colorado Primary Drinking Water Regulations". The failed condition of the roof structure over the Galleries water tank places this portion of the system at risk for contamination. Likewise, the leaking of the tank wastes treated water and could lead to groundwater infiltration. Groundwater could enter the tank if the groundwater table were to become higher than the water elevation in the tank itself. However, this has never posed a problem in the past.

4.2 Security

A formal vulnerability assessment has not been completed. A cursory site evaluation has lead to the determination that the security fencing around the Gallery Water System needs to be upgraded and is part of the original PER. There are no other apparent security concerns, or vulnerabilities at the site.

4.3 Operation and Maintenance

The Gallery water system as a whole functions very well. The priority concern at this site is the condition of the roof of the water tank and issues related to interior cracking and leaking and minor

concrete repairs. The tank does undergo a condition assessment on a yearly basis. System controls are adequate.

4.4 Growth

Please refer to section 2.3 of the original PER for future growth projections and trends. This project is not about serving future growth; rather, it is about repair and rehabilitation of existing facilities.

5.0 Assessment of Alternatives

5.1 Description (Crack sealing and Interior Liner systems)

For this project we looked at various National Sanitation Foundation (NSF) approved techniques to repair the interior cracking. Systems considered included:

- C.I.M. Industries, Inc. interior coatings (or equal)
- Crack sealing utilizing Sika Corporation or C.I.M. products
- Interior tank lining with a NSF approved 45 mil polypropylene liner
- Replace the tank with a new above ground steel tank
- Do Nothing Alternative (accept leakage as a cost of operating the tank and ignore water contamination risk)

5.2 Design Criteria

The design criteria for this amended engineering report are to provide a sealed and leak proof water tank to the City of Salida. The selected alternative should provide at least 25 years of service life while also providing the best value to the City in regards to cost, durability and future maintenance.

5.3 Environmental Impacts

There are no impacts on floodplains, wetlands, wildlife habitat or cultural resources related to this project. We will be working on the interior of the water tank and utilizing existing access roads.

5.4 Land Requirements

All the work of this project will be within the existing footprint of the Galleries water system and within the existing boundary. The site is currently owned by the City.

5.5 Construction Problems

We expect no construction problems associated with this project. The “taking off line” of this water tank will not pose a problem to the operations of this system. This is routinely done for maintenance purposes; however, the construction timeline does take into consideration peak water demand time.

5.6 Operational Aspects

This project requires no additional staffing and does not impose other requirements to the operation.

5.7 Cost Estimates

Table 1– Galleries Water Tank Leak repair alternatives

Salida Gallery Water Tank - Water Leak Proofing Alternatives Interior dimensions 210 ft x 157 ft x 8 ft (sidewalls to protect)						
Material Type	Unit cost	Units	Quantity	Opinion of Probable Cost	Estimating Contingency (10%)	Total Alternative Est. Cost
C.I.M. interior coatings	$8.50	S.F.	39,418.00	$335,053.00	$33,505.30	$374,058.30
Crack sealing Sika or C.I.M. products	$13.00	L.F.	8,981.00	$116,753.00	$11,675.30	$133,928.30
Interior tank lining NSF 61- 45 mil polypropylene liner	$6.75	S.F.	39,418.00	$266,071.50	$26,607.15	$298,178.65
Replace tank - above ground steel	$0.75	Gallon	1,250,000.00	$937,500.00	$93,750.00	$1,036,750.00
				Estimated Cost		Total Project
Project Manual/Cont. Documents/Const. Admin	1	L.S.	1.00	$5,500.00		

5.8 Advantages/Disadvantages

- *Interior epoxy coatings:*
  C.I.M. Industries Inc., and others, make NSF 61 approved coatings for the interior of potable water tanks. These products have a good track record of success. The C.I.M. products, similar to other spray and trowel applied coating systems come with a 5 year warranty.
    - Advantages for this alternative would include a relatively simple repair procedure should future maintenance activities damage the coating.
    - Disadvantages include initial cost and a short warranty period.

- *Crack sealing utilizing Sika Corporation or C.I.M. products:*
  The galleries water tank has a concrete floor (210 ft x 157 ft). This floor has approximately 7,180 linear feet of concrete control joints and an estimated 1800 linear feet of misc. concrete cracks. Although crack sealing products could be utilized and could be successful, the City is apprehensive of this option. Over the past 10 years the City has attempted numerous crack sealing operations that have not been successful.
    - Advantages for this alternative include lowest initial cost of the alternatives and relatively simply installation procedures.
    - Disadvantages include that this process has been tried unsuccessfully by the City numerous times. Also, the crack seal products only have a 1 year warranty. Crack sealing would be a continual maintenance problem.

- *Interior tank lining with a NSF approved 45 mil polypropylene or PVC liner:*
  We have found a number of synthetic liner systems that could work inside this tank. Both Polypropylene and Polyvinyl Chloride (PVC) liners in either 45 or 60 mil thicknesses would be suitable. Both are N.S.F./Ansi Standard 61 approved. Both have up to 20 year warranties. Our project estimate is based on a PVC liner system.
    - Advantages for this alternative include long warranty period and proven track record of success. Lower initial cost than the steel replacement tank option. Completely isolates all cracks from the potable water thereby eliminating leaking or potential infiltration. Existing tank life is extended out at least an additional 20 years.
    - Disadvantages include a somewhat complicated repair process should the liner be damaged due to maintenance activities in the future.

- *Replace the tank with a new above ground steel tank:*
  For this alternative we analyzed the installation of an above ground steel tank to replace the concrete partially buried tank. We considered a glass lined tank but for cost comparison purposes elected to evaluate a less costly painted steel tank.
  - Advantages for this alternative are that a new tank can come with an extended warranty greater than 20 years. Also, being a new tank we would expect zero leakage and very low maintenance effort and costs. Tank life is 50 (plus) years.
  - Disadvantages include the high initial cost.

- *Do Nothing Alternative (accept leakage as a cost of operating the tank and ignore water contamination risk):*
  This alternative has been considered but rejected. Doing nothing will lead to excessive leaking and the eventual failure of the tank, not to mention the potential health risk.

6.0 Selected Alternative

6.1 Justification of Selected Alternative

The alternative determined to provide the best value to the City is the synthetic interior tank lining system. Either the PVC or polypropylene liner system will be suitable. To assist with this determination we created a “decision matrix” as shown below. The decision matrix utilized the decision criteria developed by our team. The decision criterion was weighted in two manners. Analysis “A” placed equal weight on all criteria. Analysis “B” weighted the criteria based on criteria importance to the City.

City of Salida - Galleries Water Tank
Water Tank Leak Proofing Alternatives Analysis

Decision Criteria (in priority order)

1	Provides the most Public Health and Safety Benefit
2	Most Cost Effective (lowest initial cost)
3	Most durable and least likely to cause continued water loss
4	Lowest yearly maintenance efffort required
5	Addresses deferred maintenance backlog

For our analysis, the lower the total alternative score, the more total value provided by that alternative

Analysis A Design Criterias

	1	2	3	4	5	
Weighting Factor	1	1	1	1	1	**Alternative**
Alternatives	**Rank**	**Rank**	**Rank**	**Rank**	**Rank**	**Score**
C.I.M. interior coatings	3	3	3	3	1	**13**
Crack Sealing	4	1	4	4	2	**15**
Interior Tank synthetic liner	2	2	2	1	1	**8**
Replace with new steel tank	1	4	1	2	1	**9**

For analysis "A" we assumed all criteria had the same weight.

Analysis B Design Criterias

	1	2	3	4	5	
Weighting Factor	1	2	3	4	5	**Alternative**
Alternatives	**Rank**	**Rank**	**Rank**	**Rank**	**Rank**	**Score**
C.I.M. interior coatings	3	3	3	3	1	**35**
Crack Sealing	4	1	4	4	2	**44**
Interior Tank synthetic liner	2	2	2	1	1	**21**
Replace with new steel tank	1	4	1	2	1	**25**

For analysis "B" we weighted the criteria based on criteria priority as set by the City

Note* For this analysis we tried to avoid "ties", however criteria 5 and 6 did have alternatives that equally addressed the criteria.

Based on discussions with the City and this decision matrix, the liner system was selected.

6.2 Technical Description

This product consists of factory-made sheets that are applied on the job site using standard installation techniques for sheet membrane systems. For the Salida water tank we will specify a mechanically held system. The new liner will become the primary containment with the tank becoming the secondary containment. The liner system shall meet the following specifications (NSF/ANSI Standard "61" Approved) at minimum:

• Specific Gravity	ASTM D 1505	1.27
• Durometer (A-scale)	ASTM D 676	76
• Tensile Strength (PSI)	ASTM D 683	2200 (minimum)
• Elongation, %	ASTM D 683	400 (minimum)
• 100% Modulus, PSI		
• Elongation (PSI)	ASTM D 683	930 (minimum)
• Low Temperature Impact, C	ASTM D 1043	-26
• Volatility (%)	Activated Carbon 24 hours, 87°C	1.7
• Water Absorption (%)	ASTM D	0.25

6.3 Costs

For financing information please refer to section 3.5 of the original PER. This project requires no staffing, training, materials, electricity, lab expenses, residual disposal, or compliance monitoring. There will also be no replacement costs or a projected increase in the total average monthly user charges. The 20-year cash flow is projected to be sufficient.

The cost estimate was based on research into comparable project costs for both PVC and Polypropylene potable water tank lining systems.

6.4 Project Implementation

The following is a workable timeline for the bid document prep and construction of the Galleries water tank rehab. This timeline was set to avoid shutting this tank down during peak demand times of the year.

Public Meeting Held: (Yes, already provided with original PER)

Final Preliminary engineering report (30 day review period)	January 16, 2009
Design approval package (60 day review period)	June 3, 2009
Addendum to Preliminary Engineering Report	February 12, 2010
Advertisement for Bids, Phase I	February 17-24, 2010
Award Contract for Phase I	March 16, 2010
Start Construction – Phase I (roof)	March 22, 2010
Complete Construction – Phase I (roof)	April 30, 2010
Advertisement for Bids, Phase II	September 1-8, 2010
Award Contract for Phase II	September 21, 2010
Start Construction – Phase II (tank liner)	October 4, 2010
Complete Construction – Phas II (tank liner)	November 30, 2010