

Existing Conditions Analysis and Recommendations

Aquatic Components of the Silverton Community Pool

October 09, 2016

Prepared for:
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Introduction

The purpose of this evaluation is to review the present condition of the pool and mechanical system for the existing Silverton Community Pool. The evaluation consisted of visual examination of the pool and associated mechanical equipment.

The report summarizes the present condition of the equipment and addresses immediate and future concerns. Recommendations are provided; and each recommendation is given a level of priority and an estimated cost range.

Methodology

The Pool Company (TPC) and Water Technology Inc. (WTI) visited the site of the pool on July 07, 2016 to meet with; the City Manager, Public Works staff and YMCA operation staff to hear and understand their operational experience of the pool mechanisms, observe and photograph the existing aquatic components, and document the current conditions of the pool and related mechanical equipment. TPC/WTI performed a visual inspection of the aquatic components, without destruction of any structures or disassembly of any equipment. At the time of the site visit, the pool was filled and the pool systems were operable and the pool was open for community use. One of the concerns that was expressed during our conversations is the challenge that the pool or pool systems seem to be leaking water into the ground surrounding the pool. The following report provides observations and professional opinions and does not validate the structural integrity or system performance of the components involved.

Pool Description

The pool is a concrete outdoor, stretch six lane lap pool of rectangular shape built in 1938 with WPA funding and opened in 1940. Prior to that time it resided in the waterway next to the pool. Over the decades the pool has been in service, there have been multiple renovations and upgrades to this important community asset. The pool slopes from a depth of approximately 0 feet at the south end zero depth entry to the north side 9 feet, and holds approximately 188,000 gallons of water. The pool is approximately 45 feet wide and 128 feet long. The pool has a movable bulkhead that is predominantly positioned in the short course yard configuration with a shallow water intermediate zone together with a zero depth entry with stairs into the deeper water portion of the pool. The pool appears to have a painted finish. The mechanical equipment chemical storage is currently housed in the mechanical room of the adjacent community changing room building. There is a submerged pump vault and two displacement tanks. The displacement tank located adjacent to the creek is in very rough shape. Deck equipment includes several lifeguard chairs/stations, pool ladders, and a small water slide.

The pool is currently filtered using two pressure horizontal sand filters and a gas fired pool heater. Disinfection is completed using a pool water analyzer to feed calcium hypochlorite feeder, and pH is balanced using carbon dioxide gas injections.

The swimming pool is very well maintained and has been a community quality of life asset for many generations. The swimming pool is approaching 77 years old which is past most pools service life cycle expectations. Any renovation must keep this reality in focus so as not to make a large investment that might be compromised by some other limiting factor. The site where the swimming pool is centrally located, however the side is confined by the river on one side and residences on the other side. There are two realistic long term solutions:

Option A: Replace the existing pool, pool mechanical and HVAC mechanical systems in the same location to reuse the existing entrance building and natatorium enclosure.

Option B: Relocate the pool complex to another location in the community and return this area to a park setting.

Option A would be the most cost effective solution unless the community is considering a recreation center which would then be best to combine the pool amenities with the dryland recreation components for best practices and cost recovery.

Existing Conditions

Each of the major pool system components and pool elements and their existing conditions based on WTI's professional opinion are documented below. The following table outlines the existing equipment performance.

Pool Surface Area	Pool Volume	Observed Flow Rate	Turn Over Time	Filter Area	Filter Rate	Heater Size
5,580 sf	188,000 g	611 gpm	5hr 7 min	40 sf total	15.3 gpm/sf	2,340,000 BTU

Filtration System

The filter is a dual horizontal sand filter located in the pool mechanical room. The Stark horizontal fiberglass sand filters are model number SS 72 and provide 20 sf of filter each for a total of 40 sf. These filters include an automatic backwash system that has been easy to use.



Stark Horizontal Fiberglass Sand Filters

Recommendation:

- 1) Annually at the end of the summer season use a filter cleaner to remove accumulated oils and debris from filter media
- 2) Every 5 to 7 year replace the sand filter media.

Circulation Piping

The circulation piping that can be visually inspected in the pool equipment room is mixed materials, including PVC, CPVC and copper. The majority of the PVC varies between schedule 40 and schedule 60. There are multiple valves that range from gear or handle operated butterfly valves to true union ball valves on pic sizes 2 inch and smaller. The plumbing appears to adequately support but is not compliant with seismic bracing. All poly tubing should be placed in conduits for protection.



Example mixed PVC circulation piping material

Recommendation:

- 3) Brace all piping to align with seismic code requirements.
- 4) Replace all poly piping, install in conduit and ensure the compression fittings are mechanically sound



Mixed piping CPVC and Copper at Heater

Circulation Pump

The circulation pump appears to be in good operational condition. The pump is a Sta-Rite model C 20 HP located in a pump vault for increased efficiency. There was some corrosion noticed on the motor and volute of the pump. Also, the pump has a variable output control, this VFD provides the pool pump motor with a soft start protection that appears to be installed in 2010.



Recommendation:

- 5) Replace circulation pump with new high efficiency pump and motor.

Pump Strainer


The pump hair and debris strainer is integrated to the pump. Both the strainer and baskets appear to be in good condition with some surface oxidation.



Pool Water Heating System

The pool is heated with a pool water heater with an integrated heat exchanger. The heater is a Ray Pak Hi Delta heater 2,340,000 BTU maximum output with a 78% efficiency rating, supplied by the building boiler system. The heater is of a recent vintage and appears to be in good operational condition.



	NATL. BD. 214893	<p>POOL HEATER</p> <p>FOR EITHER DIRECT VENT INSTALLATION OR FOR INSTALLATION USING INDOOR COMBUSTION AIR</p> <p>FOR EITHER INDOOR OR OUTDOOR INSTALLATION AS SHOWN BELOW</p> <p>MIN. CLEARANCES FROM COMBUSTIBLE CONSTRUCTION</p> <table border="1"> <tr> <td colspan="2">INDOOR ALCOVE</td> <td colspan="2">OUTDOOR</td> </tr> <tr> <td>RIGHT SIDE</td> <td>1"</td> <td>RIGHT SIDE</td> <td>36"</td> </tr> <tr> <td>LEFT SIDE</td> <td>1"</td> <td>LEFT SIDE</td> <td>36"</td> </tr> <tr> <td>BACK</td> <td>1"</td> <td>BACK</td> <td>12"</td> </tr> <tr> <td>TOP</td> <td>1"</td> <td>TOP UNOBSTRUCTED</td> <td></td> </tr> </table>	INDOOR ALCOVE		OUTDOOR		RIGHT SIDE	1"	RIGHT SIDE	36"	LEFT SIDE	1"	LEFT SIDE	36"	BACK	1"	BACK	12"	TOP	1"	TOP UNOBSTRUCTED	
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ACCEPTED FOR USE CITY OF NEW YORK DEPARTMENT OF BUILDINGS MEAF 250-99-E Vol II																						
ANS Z21.56*CSA 4 7-2001 POOL HEATER MIN THERMAL EFFICIENCY 78 PERCENT																						
p/n 901619																						
<p>FOR SERVICING, PROVIDE AT LEAST 24" OF UNOBSTRUCTED CLEARANCE IN FRONT OF UNIT</p> <p>FOR INSTALLATION ON COMBUSTIBLE FLOORING</p> <p>DO NOT INSTALL THIS APPLIANCE UNDER AN OVERHANG LESS THAN 3 FT FROM THE TOP OF THIS APPLIANCE THE AREA UNDER THE OVERHANG MUST BE OPEN ON 3 SIDES</p> <table border="1"> <tr> <td>MAX PERMISSIBLE GAS SUPPLY PRESSURE</td> <td>NAT 14" W.C.</td> <td>LPG 14" W.C.</td> </tr> <tr> <td>MIN PERMISSIBLE DYNAMIC GAS SUPPLY PRESSURE FOR PURPOSE OF INPUT ADJUSTMENT</td> <td>7" W.C.</td> <td>12" W.C.</td> </tr> <tr> <td>MANIFOLD PRESSURE</td> <td>3.5" W.C.</td> <td>10.5" W.C.</td> </tr> </table> <p>ELECTRICAL RATING 120/24V 60 HZ LESS THAN 12 AMPERES</p>		MAX PERMISSIBLE GAS SUPPLY PRESSURE	NAT 14" W.C.	LPG 14" W.C.	MIN PERMISSIBLE DYNAMIC GAS SUPPLY PRESSURE FOR PURPOSE OF INPUT ADJUSTMENT	7" W.C.	12" W.C.	MANIFOLD PRESSURE	3.5" W.C.	10.5" W.C.												
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<p>Complies with SCAQMD Rule 1146.2 when installed and operated according to the manufacturer's instructions.</p>																						

Recommendation:

6) Remove all combustible items from heater and ensure that there is free air flow around heater cabinet.

Chemical Control

The chemical systems of the pool are governed by a Chemtrol PC 3000 automatic chemical controller. This controller complies with current code regarding operation and measurement of the disinfectant and pH levels of the water. However, a more updated model of controller would provide the operator with more dynamic control and deeper insight.



Disinfection System

The pool's primary disinfection system uses a calcium hypochlorite feeder. The feeder has a booster pump and a venturi feed system. It is reported that this has been a very effective sanitizing unit.



Location of Versa Chlor cal hypo feeder

PH Balance System

The pool is balanced using carbon dioxide injection. The large gas tank is stored in storage room with an exterior door and a long feed line is run from the storage location to the mechanical room.

There is also a venturi feed with mixer installed in the system for efficient pH control. The mixer and tank lid appear in working order.



Compressed carbon dioxide storage cylinder



CO2 Venturi Feed System

Chemical Storage

It appears that all bulk chemical storage occurs off site and that only chemicals required for weekly use are present on site.

Chemical Safety Signage

Chemical signage/placards, and Material Safety Data Sheets were not observed at the facility. Make sure that all placards are placed on exterior doors. There is a current MSDS sheet for all chemicals used or stored on site in the desk drawers.



Pool Vessel

The pool vessel/shell contains several significant cracks on the bottom of the pool and there is some concern regarding the caulked construction joints. Water loss has been reported, however, the water sealing ability of the pool is questionable. When an underwater dye test was performed on these cracks and joints, there were a couple of areas that could have been seeping water but no significant water loss was experienced. There are numerous layers of paint and other film layers that have been applied to the pool shell that can hinder the discovery of leaking pool structure.

There is a report that there has been a tar like substance that has been observed at the construction joints of the pool and pool wall and floor intersection. When we did some underwater exploration there were several areas where this was observed and several others that had been patched with what appeared to be a two part epoxy. The source of this tar like substance can be the result of several items. In pools of this vintage, often times a tar like substance was used to seal joints prior to the wide spread use of caulking. Another potential source for this could be the use of a bentonite like water stop that is applied to construction joints. If this material is not installed properly the hydrophilic action causes it to expand into the pool. None of these scenarios are desired or simple to resolve without considerable structural work or the installation of a PVC membrane system.

Recommendation:

- 7) Perform a leak detection test to verify waterproof integrity of the pool vessel.

Pool Finish

Painted pool finish is in moderately good condition. Scum and staining is present, particularly at the water line. Paint requires periodic reapplication and cleaning of often difficult. Paint as a pool finish has a service life of approximately 2 to 5 years and then needs to be repainted. After approximately 4 recoating procedures, the entire surface needs to be removed, patched and then a fresh coat of paint needs to be installed.

Recommendations:

- 8) Once any modifications have been accomplished, remove all existing paint and replace painted finish with a new epoxy painted finish or use a special aggregate pool finish.
- 9) Consider the installation of a PVC membrane to cover construction joints and water proof cracks.

Pool Gutters

The pool has a freeform perimeter gutter which is designed to capture the surface water around the pool perimeter. The gutter is an old style configuration that does not have significant water capture ability like modern gutter systems. There has been a recent refurbishing of the gutter with the installation of tile around the top perimeter. The gutter appears to be in a level condition around the perimeter of the pool to facilitate uniform water capture

The existing pool gutter is not a high performance gutter. Consideration should be given to replace the perimeter gutter with a deck level gutter that would do a better job of wave and turbulence mitigation.

Recommendation:

- 10) Replace existing gutter with new, deck level, concrete or stainless steel gutter with grating flush with the pool deck and water level

Pool Surge Tanks

The pool has an unusual configuration with two surge tanks. There is the original surge tank that is located on the west side of the pool that is most likely a resident from the original pool construction from 1940. There is another surge tank located under the floor of the pool equipment room that was constructed with the new pool building was constructed in 2004 with the latest update of the pool piping and equipment rejuvenation.

The original surge tank is in poor condition. There is evidence that there is significant degradation of the concrete. This would potentially cause a source for leaking around old abandoned piping. When reviewing the tank from the surface there is evidence that there are abandoned metal pipe penetrations that could be the source of water loss. This need to be evaluated in greater detail to determine if this is the source for the pool water loss. If this is the area where water loss is occurring, it is recommended to either replace the surge tank with one surge tank or line the original surge tank with an imperious water proof material.

It was also observed that this appears to be some river bank deterioration between the surge tank and the river. When the bank was observed from the opposite side of the river looking towards the pool water could be observed and heard emanating from the river bank and trickling into the river. This could have a most destabilizing geo-technical impact sometime in the future if the source of this water is the pool.



Location of original surge tank



Image of original surge tank showing abandoned plumbing in floor and modulation valve.



Image of original surge tank with wall degradation.

The surge tank under the floor in the mechanical room appears to be where pool gutter water is first deposited. This water is chlorinated and then sent to the original surge tank where a modulating float valve attempts to control the flow distribution from the main drain and gutter levels. This new surge tank was entered and it was observed that there is a significant amount of calcium deposited in this tank that has precipitated out of the water from the chlorination system that enters this tank. This should be cleaned out to prevent future problems. This surge tank is also the place where the water level of the pool is controlled and fresh water supplied to the pool.

During our site observation we tested the water static water loss by turning off the water level control unit. It was observed that the water levels in the surge tanks lowered and the gutter water level decreased. This was then reactivated. It was determined that there is significant pool water loss as illustrated in the following table:

Surge Tank	Size	Water Level Decrease in 20 Hours	Volume	Loss per Hour
Outdoor Chamber 1	87" by 42"	36"	570 gallons	29 gallons/hour
Outdoor Chamber 2	87" by 48"	36"	651 gallons	33 gallons/hour
Indoor	17' by 6'	18"	1,145 gallons	57 gallons/hour
Total Loss			2,366 gallons	119 gallons/hour 2,856 gallons/day

It was observed that the bank of the river adjacent to the pool that there is considerable water running through the stone strata and causing a weeping water wall into the creek. There was considerable water dripping from this area. The soils on the sidewalk area above this seepage seem to be settling and have been a concern for several years.

Recommendations:

- 11) Conduct testing on some trace chemical compound in the water for the pool and water seeping into the stream. Often it is simple to determine if the water seeping through the wall would be of a similar chemical nature by testing alkalinity, calcium hardness and even cyanuric acid levels.
- 12) If water test analysis and testing proves that the original surge tank is leaking, either line the existing surge tank or construct a new replacement surge tank to collect water from new gutter and main drain to eliminate any source of leaking.

Pool Drains

Pool water exits the pool and returns to the filtration system through three 24 by 24 main drain grates. The existing main drain appears to be compliant with the Virginian Graeme Baker Act (VGBA).



Main Drain Grate

Pool Returns

After filtration and treatment, pool water is returned to the pool through wall inlets in the deeper lap areas of the pool and through floor inlets in the zero depth entry. There are several of the wall inlets that appear to have been attempted to be plugged with epoxy putty. The inlets do not appear to be installed in a constant separation that would evenly distribute the water in the pool. Pressure testing should be accomplished to verify that the inlets and the piping are in sound mechanical condition. American Leak Detection has done some investigation to the main drains and surge tanks to identify leaks and repair. It was not observed if any work had been done to the inlet system in the pool.

Recommendations:

- 13) Conduct a full pressure test of all piping and at all wall fittings in pool to determine leaks.
- 14) If pool plumbing tests indicate a leak then install perimeter inlet system that has code compliant distances between inlets.
- 15) If pool plumbing is renovated, zone shallow area plumbing to increase flow rate in zero depth area where high organic loading is experienced.

Pool Deck

The pool deck and deck drainage system appear to be in reasonably good condition. It appears that the caulking joints are maintained and no areas of significant differential movement or separation was observed.



Pool deck

Pool Safety Equipment

The pool is operated by the Salem YMCA. The observed operation appears that the operator does a responsible job of staffing the pool and having the appropriate amount of rescue and safety equipment.

Pool Moveable Bulkhead

The swimming pool is equipped with a movable bulkhead that would provide the opportunity to diving the pool into a 25 yard short course or a 25 meter short course. Another application would be to place the bulkhead in a position to help maximize user programs with specific areas in the pool. It is reported that the bulkhead is challenging to move and

requires a significant amount of staff effort to accomplish location change. It would be extremely beneficial to either renovate the existing bulkhead or replace it with a more contemporary model.

Recommendation:

- 16) Renovate or replace the bulkhead to facility easier repositioning and safer operations

Pool Accessibility

The pool perimeter is over 300 lf which would require two accessible entries to comply with the ADA guidelines. There is a lift that is installed at the pool edge with would qualify as one accessible entry. The rails in the zero depth area do not extend to a deep enough water depth to comply as an accessible entry.



Accessible lift and convenience ramp rails into pool

Recommendations:

- 17) Install an additional ADA compliant chair lift on the edge of the pool, and extend the star rails to a water depth of two feet.

Prioritization and Projected Costs

The Recommendations above, based on existing conditions observations, are listed below and labeled with a Purpose and Priority. The Purpose of a Recommendation is defined as one or more of the following:

- Safety – The Recommendation is based on the health and safety of patrons and staff.
- Compliance – The Recommendation is based on compliance with current code and/or standard industry practices.
- Operational – The Recommendation is based on operational efficiencies, ease of maintenance, or to improve the functionality of the system.

Each Recommendation is also given a rating of Priority to help indicate a degree of urgency for the needed repairs/changes. Priority ratings include First, Second, and Third.

- First – The Recommendation should be performed/provided immediately or within one year. First Priority items are issues of safety concern or items currently out of compliance with codes/regulations.
- Second – The Recommendation should be performed/provided within two or three years.
- Third – The Recommendation should be performed/provided with three to five years.

The following chart additionally indicates an estimated Rough Order of Magnitude construction cost opinion for each of the recommendations. Each estimate includes a low and high amount.

Recommendation	Purpose	Priority	ROM Cost Opinion Range	
1) Annually at the end of the summer season use a filter cleaner to remove accumulated oils and debris from filter media.	Operational	First	\$1,200.00	\$5,000.00
2) Every 5 to 7 year replace the sand filter media.	Operational	First	\$7,000.00	\$12,000.00
3) Brace all piping to align with seismic code requirements	Compliance	First	\$6,000.00	\$12,000.00
4) Replace all poly piping, install in conduit and ensure the compression fitting are mechanically sound	Operational	First	\$2,500.00	\$4,000.00
5) Replace circulation pump with new high efficiency pump and motor.	Operational	Second	\$8,000.00	\$14,000.00
6) Remove all combustible items from heater and ensure that there is free air flow around heater cabinet.	Operational	First		No Cost
7) Perform a leak detection test to verify waterproof integrity of the pool vessel.	Compliance	First	\$9,000.00	\$15,000.00
8) Once any modifications have been accomplished, remove all existing paint and replace painted finish with a new epoxy painted finish or use a special aggregate pool finish.	Compliance	First	\$72,000.00	\$125,000.00
9) Consider the installation of a PVC membrane to cover construction joints and water proof cracks.	Operational	Second	\$140,000.00	\$175,000.00

10) Replace existing gutter with new, deck level, concrete or stainless steel gutter with grating flush with the pool deck and water level

11) Conduct testing on some trace chemical compound in the water for the pool and water seeping into the stream. Often it is simple to determine if the water seeping through the wall would be of a similar chemical nature by testing alkalinity, calcium hardness and even cyanuric acid levels.

12) If water test analysis and testing proves that the original surge tank is leaking, either line the existing surge tank or construct a new replacement surge tank to collect water from new gutter and main drain to eliminate any source of leaking.

13) Conduct a full pressure test of all piping and at all wall fittings in pool to determine leaks.

14) If pool plumbing tests indicate a leak then install perimeter inlet system that has code compliant distances between inlets.

15) If pool plumbing is renovated, zone shallow area plumbing to increase flow rate in zero depth area where high organic loading is experienced.

16) Renovate or replace the bulkhead to facility easier repositioning and safer operations

17) Install an additional ADA compliant chair lift on the edge of the pool, and extend the star rails to a water depth of two feet.

Operational	Second	\$125,000.00	\$175,000.00
Operational	First	\$1,000.00	\$5,000.00
Compliance	First	\$25,000.00	\$35,000.00
Operational	First	\$6,000.00	\$12,000.00
Compliance	First	\$30,000.00	\$55,000.00
Operational	Second	\$15,000.00	\$20,000.00
Operational & Safety	First	\$22,000.00	\$95,000.00
Compliance	First	\$8,500.00	\$15,000.00

	ROM Cost Opinion Range	
	Low	High
Total of First Recommendations	\$190,200.00	\$380,000.00
Total of Second Recommendations	\$288,000.00	\$384,000.00
Total of All Recommendations	\$478,200.00	\$764,000.00
Complete Replacement of the Pool Vessel and Pool Mechanical System (includes work involved in the above Recommendations)	\$3,000,000.00	\$3,500,000.00