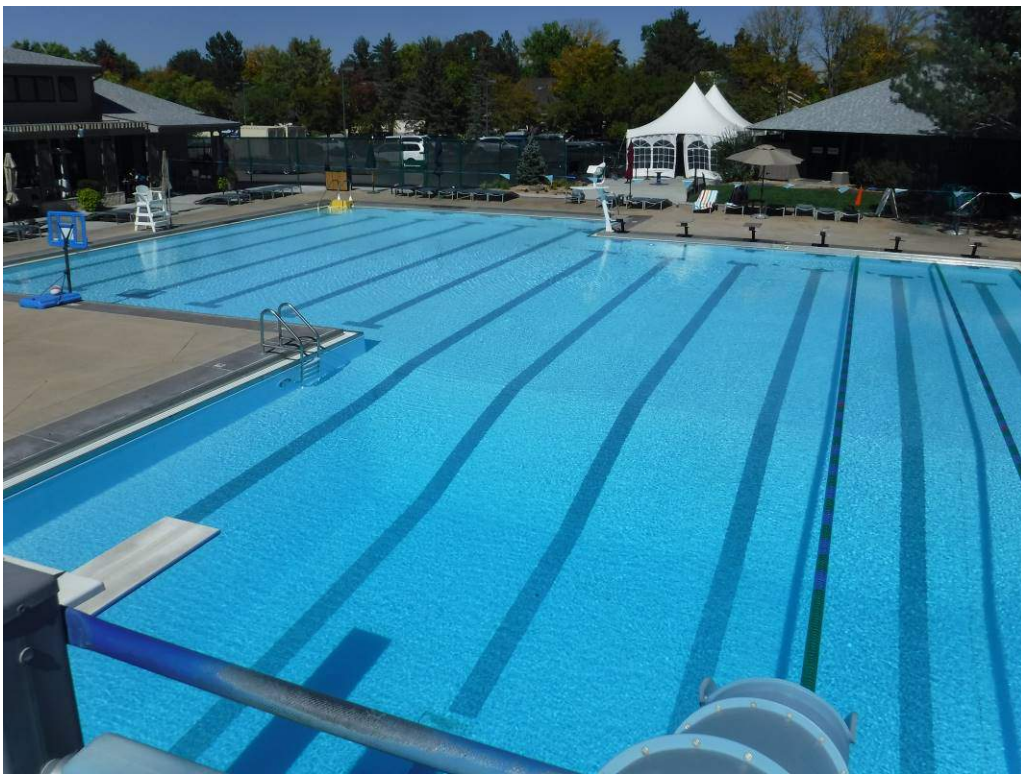


BOULDER COUNTRY CLUB

Boulder, Colorado



Swimming Pool Audit



Counsilman • Hunsaker
AQUATICS FOR LIFE

November 2020

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EXECUTIVE SUMMARY

Boulder Country Club initially reached out to Counsilman-Hunsaker regarding a potential replacement of specific pool equipment. During an initial site visit and meeting with staff, it was suggested by Counsilman-Hunsaker that a swimming pool audit to help provide a clearer direction moving forward with improvements to the pools.

Boulder Country Club commissioned Counsilman-Hunsaker to provide a swimming pool audit in September 2020. Boulder Country Club operates three pools at the facility: an indoor lap pool, a spa, an outdoor lap pool, and an outdoor wading pool. This audit focuses on the two outdoor pools.

The purpose of the swimming pool audit is to identify items of potential concern, identify items that are substandard in the pools, identify items that do not satisfy the current administrative code, identify items not to current aquatic industry design standards, or equipment not operating as designed, to assist in defining a course of action regarding the future of the pools. In addition, an opinion of probable construction costs is provided for the aquatics recommendations provided by Counsilman-Hunsaker.

The initial visit to the Boulder Country Club facility was completed by Counsilman-Hunsaker on August 25th, 2020. An audit site visit to the Boulder Country Club pools was completed on September 29th, 2020. This report is based on discussions with staff, visual inspections during the site visits, and pool information provided to Counsilman-Hunsaker.

Outdoor Lap Pool and Wading Pool

The outdoor aquatic area at Boulder Country Club is approximately 55 years old. The existing outdoor lap pool is “z” shaped while the wading pool is hexagonal. The lap pool has six (6) 25-meter competitive swim lanes, six (6) 60’ lap lanes, and an approximate surface area of 6,085 sq. feet. The wading pool is hexagonal with an inner wall side measurement of 18’-0” and an approximate surface area of 842 sq. feet. The depth of the lap pool is 3’ to 10’ and the wading pool has two depths: 10” and 1’-8”.

The Recreation pool has a springboard and a drop slide located at the deep end.

Both pools have their own independent mechanical systems. Both systems utilize horizontal high-rate sand filtration, sodium hypochlorite (liquid chlorine) sanitizer feed, and muriatic acid pH buffer feed.

Recent renovations that have occurred at Boulder Country Club Outdoor Pools include renovations of all wading pool equipment (2014-2018) and the lap pool recirculation pump and chemical controller in 2014.

Both pools and their respective recirculation systems have items that do not meet current administrative code requirements and modern aquatics industry design standards. The following list summarizes the conditions identified in the report. The list does not identify every condition noted in the report:

Lap Pool and Wading Pool Deficiencies

- The lap pool is losing water at an approximate rate of 1,630 gallons per day.
- The deck is heaving and shifting around the lap pool.
- The PVC liner within the lap pool is not watertight, and has reached the end of its life.
- The wading pool concrete structure has some cracking, and the surrounding perimeter wall has crumbled previously.
- The structural integrity of the stainless-steel gutter is compromised and may be causing water loss in the lap pool.
- The stainless-steel gutter in the lap pool is not level, which causes significant issues with proper perimeter overflow.
- Operating water level for the lap pool is above the overflow lip of the gutter, rendering the skimming action of the gutter system useless.
- The surge tank is not in operation and float valves are not used. This prevents the water level in the lap pool from equalizing when a large quantity of bathers enter or exit the pool simultaneously.
- The wading pool does not have a perimeter overflow system (such as a gutter or group of skimmers) to effectively skim the water surface.
- The sumps in the deep end of the lap pool are not VGB compliant.
- The main drain piping underneath the lap pool floor may be cast-iron. Staff to confirm when the pool is drained.
- The grating in the wing wall of the wading pool is not VGB compliant.
- Floor inlets are not used at the lap pool as required by administrative code.
- Several depth and “no diving” markers are incorrect or missing at both pools.
- A contrasting safety band is not provided at 5’ water depth for the lap pool.
- Four (4) underwater lights are not operational.
- The underwater lights that are provided do not meet code compliance for brightness within the lap pool.
- Neither pool is ADA-compliant.
- The water depths underneath the starting blocks do not meet the minimums stated by USA Swimming for teaching racing starts.
- The starting blocks are aging and are in poor condition.
- Proper code-compliant water depths are not provided for springboard diving at the deep end of the pool.
- Proper piping, supports, valves, and labeling are not provided for the two pool recirculation systems.

- The pool flow meters are not installed correctly and are also outdated.
- Proper support is not provided to all pool mechanical equipment.
- Gauges and Variable Frequency Drives (VFDs) are not provided for the recirculation pumps.
- The filter tanks for the lap pool are ineffective and have reached the end of their useful life.
- Filter backwash water is currently sent to storm instead of sanitary, which violates local code.
- The water chemistry controllers are aging and will reach the end of their life soon.
- Rigid pipe encasement is not provided for the chemical feed lines to either pool.
- Neither pool utilizes an automatic water level controller – both pools rely on manual water fill.
- The lap pool heater is drastically undersized for use in the shoulder-seasons, and it has reached the end of its useful life.
- Schedule 80 CPVC material is not provided for the influent/effluent heater lines at either pool.
- Pool bonding in accordance with National Electric Code (NEC) Article 680 needs to be verified.
- The electrical outlets within the mechanical room are not GFI protected.
- The upper wood decking in the pool mechanical room is supported by very corroded angle iron and precariously placed column jacks – this poses a serious hazard to pool operators.

Department of Health Rules and Regulations

Swimming pools are built to satisfy the existing standards at the time of construction or renovation. The Colorado Department of Public Health standards have changed over the years. The most recent change is currently developing, and the Colorado Department of Public Health will be adopting the Model Aquatic Health Code (MAHC) by reference. The items identified in this report refer to items that do not meet the current requirements for pools built today. Pools are required to meet current codes when newly constructed or renovated and until such time may be considered to be “grandfathered”. The items identified as not meeting the current code would need to be addressed if a major renovation or replacement occurs. This needs to be confirmed with the local department of health.

Thus, the administrative code issues noted in the report do not necessarily indicate that the Boulder Country Club has been operating the pools in an unsafe manner. The Colorado Department of Public Health monitors the aquatic facilities and reports deficiencies that the owner is required to address at that time.

The following rules and regulations were used for this report:

- Colorado Department of Public Health and Environment – Swimming Pools and Mineral Baths 5 CCR 1003-5
- Model Aquatic Health Code (MAHC)
- General Aquatic Industry Standards

Items that do not satisfy this regulation are referenced in the report as “administrative code” or “aquatic industry standards”.

Summary

The Boulder Country Club swimming pool has served its membership for around 55 years. The lap pool has surpassed the typical life expectancy of 50 years for a high-quality swimming pool. **Due to the existing conditions noted previously and further on in the report, the pool needs a replacement as soon as possible.** Councilman-Hunsaker recommends that any capital intended for the outdoor pools be allocated to a replacement project budget from this point forward.

Within the report, C-H has provided some recommendations that can be used as temporary solutions (if absolutely necessary) to give the pool one or two more seasons, but “band-aid” fixes will continue to increase in price and decrease in effectiveness. Both pools do not meet administrative code in several different areas. If any major repairs are to take place, all code violations must be remedied; this is because the pool will lose its “grandfather” status during renovation.

Aside from the lap pool structural issues, the pool has a PVC liner that is approaching the end of its life. The surge tank is not active, and proper skimming action is not occurring due to operating water levels within the pool. Main drain sumps in the deep end of the pool do not meet necessary VGB dimensions. Cast-iron piping may be existing beneath the pool floor and could be compromised due to age and corrosion. Current lap pool inlets do not meet code, and the pool is not ADA compliant. The deep end water depths are not code-compliant for diving, and the water depth at the starting blocks is not deep enough for teaching starts. Backwash water is currently routed to storm, which is against local code. In addition, filtration and heating are needing replacement.

The wading pool does not provide a proper skimming system, UV disinfection system, and an ADA means of access. Wading pools are required to have a sloped entry by the Americans with Disabilities Act (ADA). The drain located within the wing wall is not VGB compliant. Staff has mentioned the wading pool structure cracking and crumbling. The wading pool is outdated and does not include any interactive water features for children.

In summary, the replacement recommendation outlined throughout this report is to provide a new concrete pool shell for the lap pool in order to achieve compliance for the 1-meter diving. This depth adjustment will also allow for starting blocks to be installed at the deep end. The lap swimming area width could be extended slightly to 45’ to meet the aquatic industry standard for a 6-lane lap pool. If desired, the pool length could be adjusted to 75’ for yards swimming. PVC piping could be replaced beneath the pool, and floor inlets could be added to provide more efficient water recirculation. The water loss problem could be resolved with the replacement of this piping, the gutter system, and the pool structure. A concrete rollout-style gutter could be added as an update to the perimeter overflow system. The gutter deck drain system could be replaced with trench drains in the pool deck. A battery powered swim lift would be added for ADA compliance, and another means of access such as a concrete stair or ramp entry could be permanently installed. New springboards, dive stands, ladders, guard chairs, and starting blocks would be supplied. All pool mechanical equipment and piping would be replaced in order to meet administrative code.

The wading pool would be completely replaced with a modern youth pool. Code-compliant piping, pumps, controllers, filtration, heating, and chemical treatment (including UV system) would be provided. A perimeter overflow system would be added, such as skimmers or an overflow gutter. A zero-depth entry would allow for ADA accessibility. Interactive play features and ground sprays could be selected by the club for installation within and around the pool.

OUTDOOR LAP POOL GENERAL INFORMATION

Description: An irregular “Z” shaped pool, with six (6) 25-meter competition lanes, six (6) 60-foot lap lanes, diving board, and drop slide.

Perimeter Overflow: A stainless steel, rollout-style perimeter overflow gutter with inlet pressure tube and integrated deck drainage.

Finish: PVC Liner

Length: Varies, 97’-2” Overall

Width: Varies, 85’-0” Overall

Surface area: ~6,085 sq. feet

Perimeter: ~364’-4”

Water depth: Varies from 3’ to 10’

Pool volume (calculated): ~244,287 gallons

Design Flow Rate: ~722 gpm

Turnover: ~5.64 hours



WADING POOL GENERAL INFORMATION

Description: A hexagonal-shaped, shallow-water pool with a wing wall dividing two (2) separate water depths.

Perimeter Overflow: None

Finish: Vinyl Liner

Side-to-Side: ~31'-2"

Surface Area: ~842 sq. feet

Perimeter: ~108'

Water Depth: 10" and 1'-8"

Pool Volume (calculated): ~8,748 gallons

Design Flow Rate: ~108gpm

Turnover: ~1.35 hours



POOL CONDITIONS AND RECOMMENDATIONS

Description of Recommendations

The following recommendations listed in the report are sorted into two separate categories. Recommendations in **BLACK** are considered “band-aid” fixes that will attempt to preserve the pools for the next 1 or 2 seasons prior to the pools being replaced. **Completion of all of black items does NOT mean that the pool systems are 100% code-compliant. Achieving 100% code compliance strictly through renovations and repairs to the existing pool systems would approach (or surpass) the price to completely replace the pools.**

Recommendations in **RED** are updates to the pool designs that would be made in conjunction with a full replacement, and this would bring the pools to 100% code-compliance.

Out-of-Scope Recommendations

There are some recommendations included in this report that do not fall within the traditional Aquatics scope of work, and these areas are not listed in the contract between Boulder Country Club and Counsilman-Hunsaker. **These recommendations should be discussed and confirmed with a design professional of that particular trade.** Due to some of the included recommendations being outside of the Aquatics Scope, an opinion of probable cost was not provided for these items.



POOL STRUCTURE & FINISH

LAP POOL

The lap pool was originally constructed in the mid 1960's, and since then it has had several major renovations and modifications. Generally, high-grade pool vessels have a lifespan of approximately 50 years. Currently, the lap pool structure is approximately 55 years old.

Staff has reported water loss in the vessel of approximately .43 inches (1.1 centimeters) every 24 hours. This results in approximately 1,630 gallons per day of water loss. This water may be escaping to adjacent soils supporting the pool structure, and this hypothesis is supported by the shifting in the pool structure in comparison to the surrounding pool deck.

C-H specification calls for a daily loss of .1% of the total volume (excluding evaporation) for a vessel to be considered "watertight". In this case, that would be ~247 gallons.

A Renosys PVC Pool Membrane liner is used at the lap pool, and it was installed in 2003. The liner is showing its age, and it is quickly approaching the end of its useful life. Many patches can be seen around the pool, and bubbling is occurring which means water is getting beneath the liner.

The sealant at the expansion joint of the pool is in fair condition.

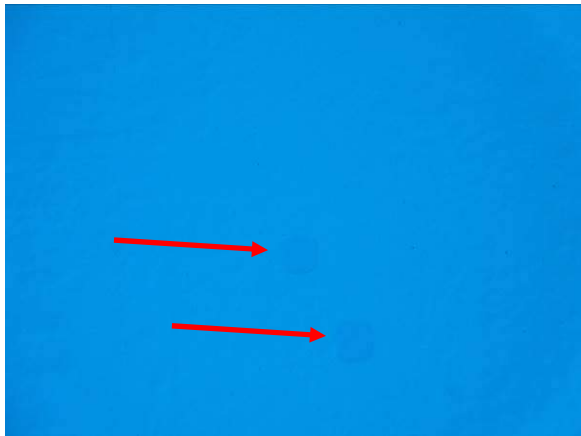


WADING POOL

Staff has reported that the wading pool concrete structure has been cracking, and the perimeter wall of the pool had crumbled.

A new Renosys PVC liner was installed in the past 2 years and is in good condition. It has not been confirmed whether the wading pool is still experiencing water loss after this installation.

The sealant at the expansion joint of the pool is in fair condition in most locations.





RECOMMENDATIONS

Provide leak detection testing services at the lap pool vessel and the gutter vessel individually. Provide ground penetrating radar testing, Schmidt hammer testing, and core samples in order to determine the condition of the concrete structure. Refer to Appendix A for recommendations regarding leak detection testing and structural testing. Identify any areas where water loss is occurring and repair.

Replace the aging liner at the lap pool.

Perform a water tightness test on the wading pool structure to confirm if water loss is occurring. If it is occurring, how much? Refer to Appendix B for specifications and details regarding a water tightness test.

In lieu of (or in addition to) all the repairs above, replace the outdoor lap pool and outdoor wading pool structures at the facility. Construct each vessel in accordance American Concrete Institute (ACI) 350 standards to ensure water tightness prior to the application of any pool finishes. Provide a proprietary quartz aggregate finish at all the pools.





PERIMETER OVERFLOW SYSTEM **LAP POOL**

A stainless steel, rollout-style overflow gutter was added to the lap pool in 2003. The gutter has an integrated pressure tube for water return to the pool, and an integrated perimeter deck drain feature at the interface between the pool and the deck. The stainless-steel gutter is in poor condition and it is compromised structurally.

During the C-H audit visit to site, there were 3 areas where filtered water was spurting from the pressure tube system. These compromises are obvious; this leads us to believe there may be several other unseen areas that may be causing water loss from the pool to either the integrated deck drainage systems, or the soils surrounding the pool vessel.



Staff indicated that the gutter is not level. This was also visually seen during the site visit: when splashing was not occurring, some areas of the overflow gutter lip were below the water line while other sections were dry to the touch. A level gutter is required by MAHC (tolerance of +/- 1/16") and Colorado Pool Code (level within 3/10") in order to provide consistent surface skimming for all areas of the pool.

During the initial Boulder CC visit prior to the audit, the standard operating water level was higher than the overflow lip in all sections of the pool. This entirely negates the surface skimming effect of the system required by administrative code for operating a pool.



Fiberglass gutter grating appeared to be properly fastened and in fair condition; staff reports that this grating was replaced in 2018.

A surge tank was observed for the lap pool in the space between the mechanical room and the deep end. However, it is not in operation, and float valves are not present. A surge tank is crucial to making sure water level stays consistent in a gutter pool when bathers enter or exit.



WADING POOL

A perimeter overflow or skimmer system is not provided for the wading pool. Proper surface skimming of the pool water is not completed as required by administrative code.

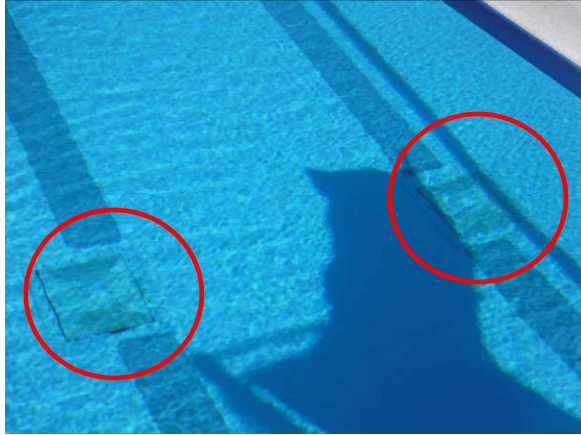
RECOMMENDATIONS

Weld and repair the compromised areas of the stainless steel gutter pressure tube system.

In conjunction with a pool replacement, replace the perimeter overflow system in its entirety at both pools.

In conjunction with a pool replacement, provide a surge tank and float valves for any pool system that is utilizing a perimeter overflow gutter rather than skimmers.





MAIN DRAINS

LAP POOL

There are two (2) main drains located at the deepest portion of the lap pool. According to drawings and documentation provided by staff, these are 18" x 18" x 18" sumps that are covered by MLD-GOD-1818 grates manufactured by Lawson Aquatics.

The grates are rated for a maximum flow of 816 gpm, which is greater than the 722 gpm flow rate of the pool. The grates in this pool were last replaced in October of 2018, which indicates these grates are not expired.

The sumps, however, are not certified VGB compliant and were installed prior to VGB being enacted by the Federal Government. 1.5 suction pipe diameters must be provided between the top of the suction pipe within the sump and the bottom of the grating covering the sump. In this case the suction pipe is 8", and the required 1.5 diameter dimension of 12" is not met.

At the time of the visit, it could not be confirmed that the hydrostatic relief valves located within the sumps are operational – staff to confirm.

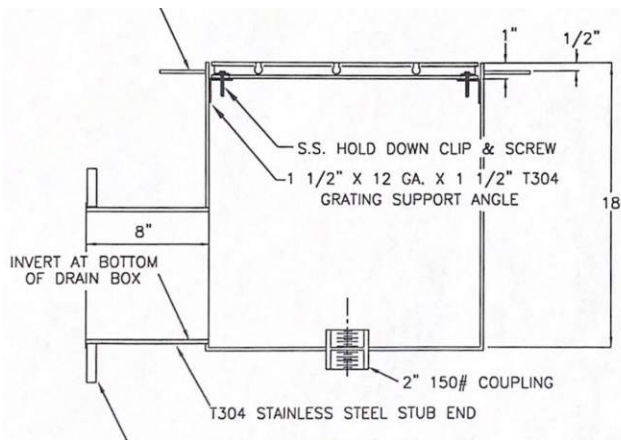


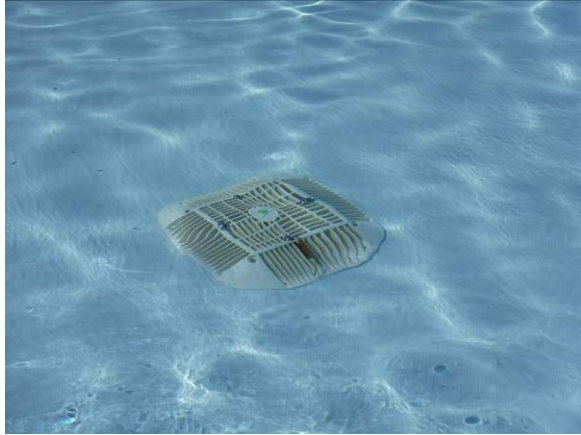
WADING POOL

There are three (3) wading pool suction outlets: two (2) are located within the pool floor, and one (1) is located within the wing wall of the pool.

The pool floor drains are Aquastar Grates, model 914xxx. They were recently replaced in 2019 and do not expire anytime soon. With an overall flow rate of approximately 108gpm in the pool, these grates are acceptable.

The suction outlet located within the wing wall is an abnormally sized metallic grating. This outlet is not considered VGB compliant. However, since two (2) other suction outlets exist in each individual pool area, the pool would still be considered VGB compliant if this wing wall outlet was removed.





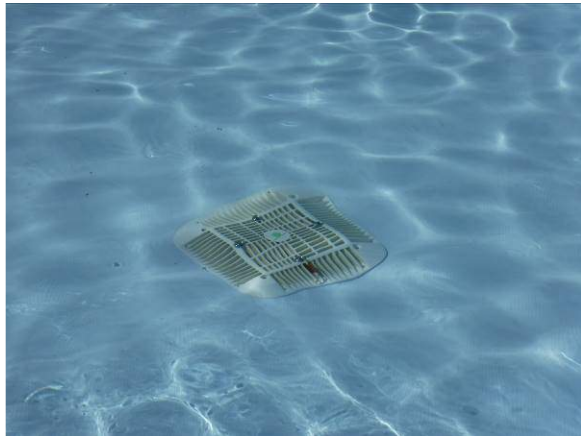
RECOMMENDATIONS

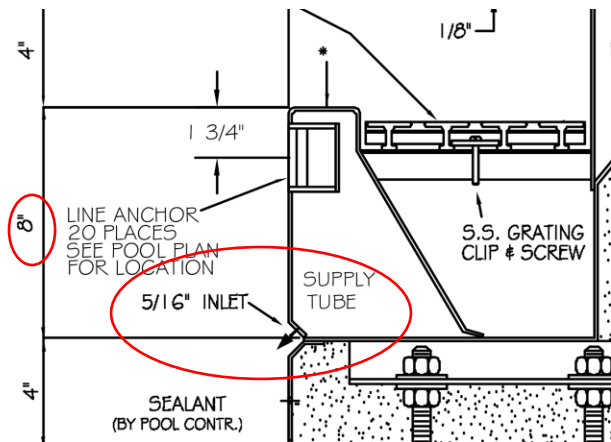
Confirm that existing hydrostatic relief valves are in-place and operational.

Increase the depth of the drain sumps in the lap pool to meet VGB compliance.

Disconnect piping to the wing wall suction outlet in the wading pool, or plug the suction outlet entirely.

In conjunction with a major pool replacement, provide prefabricated sumps and piping outlets that are certified as VGB compliant.





POOL INLETS

LAP POOL

Filtered water is introduced into the lap pool through a pressure tube system that is integrated into the perimeter overflow gutter. Inlets are dispersed around the entirety of the pool, as required by administrative code. Inlets are located 8" below water level, and Colorado Pool Code requires all inlets to be submerged a minimum of 12" below water level.

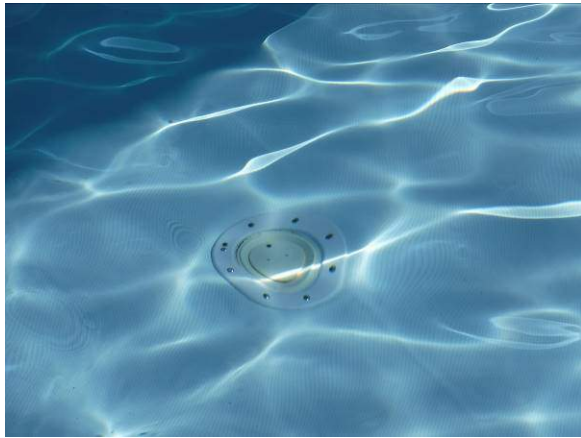
Model Aquatic Health Code (MAHC) requires floor inlets for all pools that are wider than 50', as this helps with proper mixing of chemically treated water within the pool.

WADING POOL

ABS adjustable floor inlets are installed at the wading pool and are dispersed evenly around the entirety of the pool as required by all administrative codes.

RECOMMENDATIONS

In conjunction with a pool replacement, replace the existing lap pool stainless steel pressure tube system with a floor inlet system to promote proper mixing of the pool water.





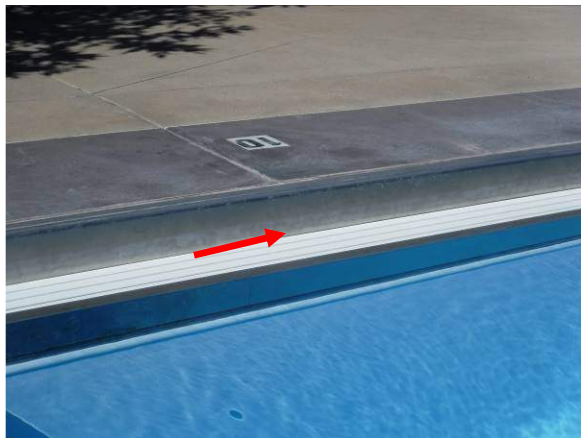
POOL MARKINGS

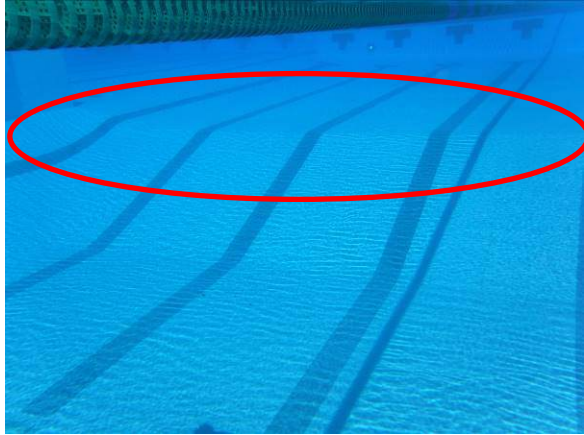
LAP POOL

Depth markers and “No Diving” signs were observed around the pool perimeter. Markers are located at the deepest and shallowest point of the pool per code, and on all sides of the pool. There are 20 depth marker locations spread about the 364’ of pool perimeter. This comes out to an interval of a depth marker for every 18’, which meets administrative code.

However, depth markers are not located at the slope break to the deep end as required by MAHC. Some depth markers are only present on the deck and not on the vertical wall of the pool, which violates code. All of the markers do not have “FT” and “IN” designations in 4” height as required by MAHC; and text for the “No Diving” signage must be 4” in height as well. “No Diving” signage must be provided with all depth markers (vertical and horizontal) for all pool depths 5’ and shallower.

The pool does not include a contrasting 4” band at the 5’ water depth moving towards the deep end, and cup anchors are not supplied for a safety rope which is required by administrative code. Contrasting floor markers and wall targets for lap swimming were installed in 2013 according to staff. They are discoloring, and some are beginning to peel away from the pool liner.





WADING POOL

“No Diving” signage was not observed on the horizontal or vertical perimeter faces of the wading pool as required by administrative code. Depth markers are located on the vertical walls of each side of the pool with 4” number/letter heights in accordance with all applicable codes. However, horizontal depth markers are not provided on the perimeter wall of the wading pool as required by code.

RECOMMENDATIONS

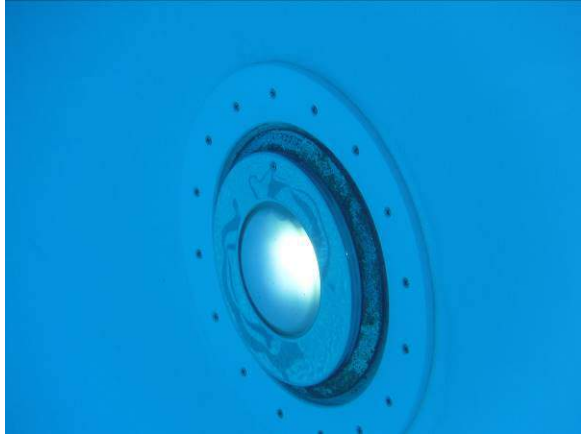
Add a 4” width contrasting band at the 5’ water depth drop-off at the lap pool. Provide a safety rope with this contrasting band.



Replace floor markers and wall targets for competitive swimming.

Add or modify depth markers and “No Diving” signage to meet all applicable codes.





UNDERWATER LIGHTS

Underwater lights were installed at the lap pool in 2003. There are a total of twelve (12) lights and niches, connecting to six (6) junction boxes that are spread throughout the pool area. These junction boxes are tied to electrical outlets around the pool deck. Four (4) of the lights are not operational: two (2) on the shallow western wall, and two (2) on the deep western wall. Staff has not attempted to replace the bulbs.

With twelve (12) underwater lights operational, the pool does not meet the 8.0 lumens/ft² requirement set forth by MAHC. It could not be confirmed during the site visit if the circuits for underwater lights are GFCI protected, as required by code. Staff to confirm.



RECOMMENDATIONS

Verify that all metallic items within 5' of the pool structure are properly bonded with an 8AWG copper wire in accordance with NEC Article 680.

With the help of a licensed/certified electrician, check for continuity in the circuit dedicated to the underwater lights. Once proper bonding and continuity are confirmed, replace the underwater light fixtures and their associated wiring. Staff to confirm that all underwater light circuits are GFCI protected.

In conjunction with a major pool replacement or renovation, provide adequate underwater lighting to meet Model Aquatic Health Code requirements.





INGRESS/EGRESS & RAIL GOODS

LAP POOL

Around the perimeter of the pool, 6 sets of pool ladder anchors and a stair entry are provided. Since the pool is a total perimeter of 364' and an entry/exit is required every 75', this pool meets the administrative code requirements.

Stainless steel removable ladders were observed in a storage area adjacent to the pool deck, and they appear to be in good/fair condition. Wedge anchors for ladders are installed in the deck and appear to be in fair condition. However, some anchors were missing tightening hardware, or hardware adjustment is prevented by the deck finish. Stanchions for backstroke flags are present, and appear to be in good condition.



Since the pool perimeter is in excess of 300 lineal feet, two (2) means of ADA access are required: a primary and a secondary. The removable stair entry installed at the shallow end of the lap pool appears to be in good condition. While this stair entry can be counted as a secondary means of ADA Access to the pool, it is not considered a primary. A primary means of ADA access entails a ramp or an ADA lift.

WADING POOL

The wading pool is surrounded by a curb perimeter wall that is approximately 1' above deck level. A zero-depth entry is required for a wading pool to be considered ADA accessible.

According to staff, a guard rail used to be installed between the two (2) wading pool sections. Since then, the guard rail posts were cut down and capped to place a winterizing cover at the pool.





RECOMMENDATIONS

Ensure that ladders are in place during open/recreational swim. They can be removed as needed for lap or competitive swimming. Install tightening hardware within the wedge anchors on deck, and securely fasten all deck-mounted ladders in place to ensure reliable use.

In order to achieve ADA compliance, install an ADA lift at the lap pool.

Remove the capped guard railings and associated anchors from the wading pool.

In conjunction with a major replacement, construct a wading pool that includes a zero-depth entry for ADA compliance, and provide necessary ingress/egress as required by code at the lap pool.





STARTING BLOCKS & OTHER EQUIPMENT

There are 6 starting blocks located at the lap pool. The platforms show their age and are in poor condition. The intermediate steps to the tops of the platforms are undersized, and the non-slip in those areas have delaminated completely. Non-slip surfaces on the tops have begun to delaminate. Some of the protective coating is beginning to flake off the frames.

Some of these platforms are located at water depths as shallow as 4'. While this is an acceptable water depth for competition, this depth is not suitable for teaching racing starts per USA Swimming.



4" diameter lane lines and accompanying reels were observed on-site; they appeared to be in fair condition. Backstroke flags that were observed on-site appear to be in poor condition and require replacement. A portable basketball hoop (good condition) is placed at the shallow end.

RECOMMENDATIONS

Replace the starting platforms and backstroke flags.

In conjunction with a pool replacement, locate the starting blocks in water depth of 6' -7" or greater in order to meet required depths for teaching racing starts.





DIVING & WATERSLIDE

There is a diving board and a drop slide located in the deep end of the lap pool. The dive stand is custom fabricated and is in fair/poor condition. There are signs of staining, and portions of what appears to be a cast-in-place anchor are protruding through the slab face. The board itself appears to be an SR Smith board. Portions of the top are delaminating to a smooth surface, which can be a hazard to divers.

Dimensions were taken for the lap pool diving well, and the water depths do not meet minimums called for by administrative code. Refer to Appendix C for an illustration of the lap pool diving well sections.



The drop slide for the lap pool shows slight signs of discoloration and a few select spots beginning to rust. However, the slide flume pieces are intact, and the structure appears to be in fair condition.

RECOMMENDATIONS

Remove the diving board and close off the dive stand until depths are compliant with administrative code.

In conjunction with pool replacement, replace the dive stand with a commercial-grade dive stand and spring board (Duraflex) and replace the drop slide structure.





LIFEGUARD CHAIRS, EQUIPMENT, & SIGNAGE

Three (3) permanent guard chairs and one (1) portable guard chair are in place at the lap pool. The permanent chairs appear to be in fair condition. Some of the chairs are beginning to discolor, non-slip treads are beginning to fade, and footboards have some slight cracking on the underside. Staining is occurring at the base plates of the chairs. The portable chair appears to be in good condition and has some pool rules posted on the back.

Safety equipment such as ring buoys, reaching poles, and spineboards are placed adjacent to the pool in accordance with MAHC. Staff to verify the presence of first aid kits and rescue tubes. Pool cleaning equipment such as leaf nets, pool vacuums, and robotic vacuums were observed.

Hazardous chemical signage (as well as pool rules) are posted within the facility in accordance with administrative code. Water testing results and pool procedures were posted in the mechanical rooms. However, a laminated pool piping/valve schematic was not posted in the mechanical room per MAHC.

RECOMMENDATIONS

Replace various permanent lifeguard chair parts as needed.

Print, laminate, and post a piping and valve schematic for both pools within the equipment room. Staff to confirm the presence of a first aid kit and guard tubes.





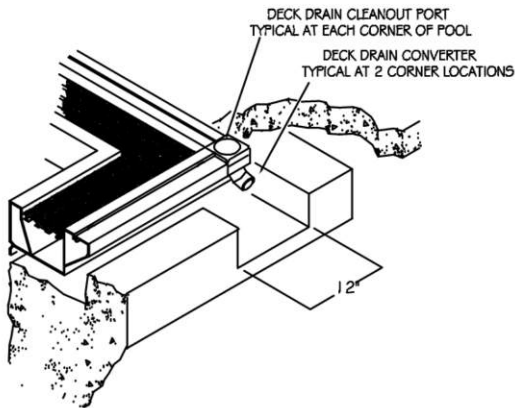
DECKS & DRAINAGE

LAP POOL

Drainage for the deck surrounding the lap pool is integrated into the stainless-steel gutter system that was installed in 2003, and portions of the pool deck slope to this system. There are two converters (with cleanout ports) for these deck drains located at corners of the pools. Each of these two connect to a 2" PVC line. Staff has mentioned that they feel these drainage lines are undersized, and water from this system may be escaping to surrounding soils.

Deck space exceeds the minimum requirements around the entirety of the pool except for the deep end which does not meet MAHC perimeter deck requirements. All decks include a slip resistant finish in accordance with administrative code, but some select areas are beginning to lose slip-resistance.

Hose bibbs are provided in various spots around the pool deck for cleaning purposes.



WADING POOL

The wading pool utilizes area drains around the perimeter of the pool. All deck areas slope to these drains.

Deck space and slip resistance meet administrative code requirements, but some select areas are beginning to lose slip resistance.

Hose bibbs are provided in various spots around the pool deck for cleaning purposes.

RECOMMENDATIONS

In conjunction with a pool deck replacement or a major pool replacement/renovation, request that the Architect and Civil Engineer install a standalone trench drain system rated for commercial pool-use around the perimeter deck.



POOL MECHANICAL CONDITIONS AND RECOMMENDATIONS

Description of Recommendations

The following recommendations listed in the report are sorted into two separate categories. Recommendations in **BLACK** are considered “band-aid” fixes that will attempt to preserve the pools for the next few seasons prior to the pools being replaced. **Completion of all of black items does NOT mean that the pool systems are 100% code-compliant. Achieving 100% code compliance strictly through renovations and repairs to the existing pool systems would approach (or surpass) the price to completely replace the pools.**

Recommendations in **RED** are updates to the pool designs that would be made in conjunction with a full replacement, and this would bring the pools to 100% code-compliance.

Out-of-Scope Recommendations

There are some recommendations included in this report that do not fall within the traditional Aquatics scope of work, and these areas are not listed in the contract between Boulder Country Club and Counsilman-Hunsaker. **These recommendations should be discussed and confirmed with a design professional of that particular trade.** Due to some of the included recommendations being outside of the Aquatics Scope, an opinion of probable cost was not provided for these items.



PIPING, SUPPORTS, & VALVES

LAP POOL

A mixture of Schedule 40 and Schedule 80 PVC piping is supplied for the lap pool recirculation system. It could not be verified whether the existing main drain piping below the pool floor is a cast iron material, or if it was replaced with PVC during main drain sump modifications in 2003. Staff to confirm. Current aquatic industry standard calls for all exposed mechanical room piping to be made of PVC Schedule 80 material.

Supports for all the lap pool piping are in poor condition. Serious signs of corrosion are present, and the piping is not properly supported at appropriate intervals.



The piping does not include flow arrow indicators, and some piping does not include proper color coding as described by administrative code. Metallic hardware is corroding.

Various piping is undersized and exceeds the maximum velocity requirements set forth by code. This piping includes: the filter backwash line, supply line back to the pool inlets, gutter drain converter lines, and pump discharge piping. A set of unnecessary 4" pressure piping is provided on the discharge side of the pump. In some areas there are erratic fittings or changes in pipe sizes.

All metallic valves show signs of corrosion. Valves are not tagged and labeled per MAHC.



An impact flow meter is provided downstream of the filters; it is not operating correctly, and it is not installed according to manufacturer instructions. Aquatics industry standard calls for the installation of a Signet Magmeter to accurately measure flow rate, and connecting this to the chemical controller and/or recirculation pump VFD (if included).

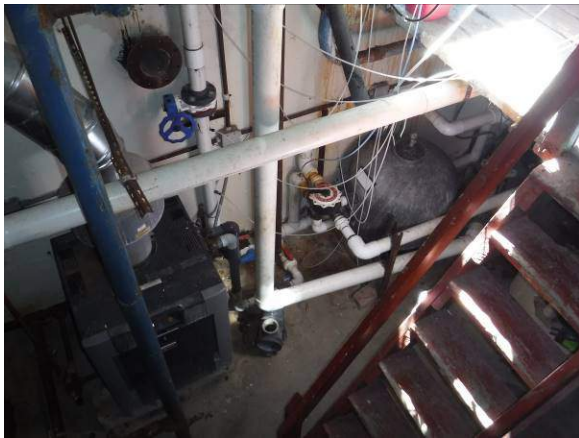


WADING POOL

The majority of the wading pool piping is made of a PVC Schedule 40 material. Aquatics industry standard is for all piping to be made of a PVC Schedule 80 material.

Severe corrosion is present for the wading pool piping supports, and supports are not located at appropriate intervals to properly support the pool piping.

Piping is not labeled with directional arrows or color coding as required by administrative code. All piping for this system is sized correctly in accordance with code.



Valves appear to be in fair condition, but they are not tagged as required by MAHC.

An impact flow meter is provided but is not installed according to manufacturer instructions. Aquatics industry standard calls for the installation of a Signet Magmeter to accurately measure flow rate, and connecting this to the chemical controller and/or recirculation pump VFD (if included).

RECOMMENDATIONS

When the pool is drained, staff should confirm if main drain piping beneath the pool floor is a cast-iron material.

Replace all pool piping, fittings, and valves with Schedule 80 PVC material. Ensure that all piping is properly supported with epoxy-coated galvanized steel supports and labeled with color-coded directional flow arrows. Remove all unnecessary piping.

Provide tags for all valves in accordance with MAHC. In conjunction with a major pool replacement/renovation, install a Signet Magmeter on each pool recirculation system for accurate flow readings.





PUMPS, MOTORS, & VFDs

LAP POOL

The lap pool recirculation pump is a Marlow Series 530SC pump, with a Baldor 15 HP 1760 RPM motor. The pump was installed in 2014 and appears to be in fair operating condition. There are large amounts of staining and corrosion on the exterior of both the pump and the motor. Both the pump and motor are not properly anchored to the housekeeping pad that is provided.

A compound gauge is not installed on the pump intake port and a pressure gauge is not installed on the pump discharge as required by administrative code. A MerMade reducing strainer is installed on the suction side of the pump and is in fair condition. On the discharge side of the pump, a reducer fitting is not provided to increase pipe sizing per aquatic industry standards.

According to shop drawings provided by staff, a flow rate of 722 gpm is provided by the lap pool pump. This equates to a turnover of approximately 5.64 hours, which meets the administrative code requirement of 6 hours.

A Variable Frequency Drive (VFD) is not provided for the pump per aquatic industry standards. Staff to confirm that the motor is properly bonded with the pool in accordance with NEC Article 680.





WADING POOL

A Pentair Whisperflo XFE-12 3 HP pump/motor is provided for the wading pool. This pump was installed in 2015 and appears to be in fair condition aside from some surface staining and chipping. The pump is not properly anchored on a housekeeping pad per aquatic industry standard.

A compound gauge is not installed on the pump intake port and a pressure gauge is not installed on the pump discharge as required by administrative code.

Staff provided a flow rate of 108 gpm for the wading pool system, equating to a turnover of approximately 1.35 hours. This exceeds the maximum turnover time of 1 hour required by administrative code.

A Variable Frequency Drive (VFD) is not provided for the pump per aquatic industry standards. Staff to confirm that the motor is properly bonded with the pool in accordance with NEC Article 680.

RECOMMENDATIONS

Properly support and anchor all pumps, motors and strainers with housekeeping pads.

Install vacuum gauges and compound gauges for all pumps.

Confirm that all motors are properly bonded with their respective pool structures per NEC Article 680.

Increase the flow rate through the wading pool recirculation pump to a minimum of 146 gpm. If flow cannot be increased to meet a turnover of 1 hour, replace the pump.

In conjunction with a major pool replacement/renovation, install a VFD with every pool to save energy and maintain a more consistent system flow rate.





FILTRATION & BACKWASH

LAP POOL

Two (2) large, horizontal, stainless steel, high rate sand filters are installed on a pad in the upper level pool mechanical area. These filters are manufactured by HydroKleen, a niche California filtration business that closed their doors 1 or 2 years ago. C-H did some research on these filters and discovered that they have some inherent design flaws – the larger the tanks get, the more pronounced these flaws are. These tanks and their media have reached the end of their useful life and require replacement.

Tanks are anchored on a concrete pad and have influent/effluent gauges, consistent with current aquatic industry standards.



Currently, the lap pool system backwashes and drains to a retention tank in the lower level mechanical area, which routes to storm. This is not allowed by local codes and should be routed to sanitary. A retention tank was purchased for addressing this issue, and it can be seen in the pool storage area. The tank and the required sump pump have not been installed at this time. Additionally, a 6" air gap between the filter backwash line and the receiving retention tank is required by code.





WADING POOL

Two (2) small Baker Hydro HRV-30 sand filtration tanks are installed in the lower level mechanical room for use with the wading pool system. These NSF-approved tanks were installed in 2016 and appear to be in fair condition aside from some staining.

At the system flow rate of 108gpm, the wading pool has an applied filter rate of 11.0 gpm per sq. foot, which meets administrative code requirements for a maximum filtration rate of 15.0 gpm per sq. foot.

Pressure gauges are provided for the filters as required by code. However, the tank air relief valves are not piped to the nearest floor drain (or retention pit) per aquatic industry standards.

Currently, the wading pool system backwashes and drains to a retention tank in the lower level mechanical area, which routes to storm. This is not allowed by local codes and should be routed to sanitary. Additionally, a 6" air gap between the filter backwash line and the receiving retention tank is required by code.



RECOMMENDATIONS

Replace the lap pool HydroKleen filters with a new set of horizontal high rate sand filter tanks. These tanks should be manufactured by Neptune-Benson, Paragon/Stark, or Waterco. The tanks should also include linkage PVC Sch 80 face piping, automatic air relief, name plate, and influent/effluent gauges.

Ensure that air relief for all wading pool filter tanks is piped to the nearest floor drain or retention basin.

Install the in-ground backwash retention tank and use a sump pump to route backwash water to sanitary.

Alternatively (with any major pool replacement/renovation) consult with civil and plumbing engineers to route a new underground line to the closest sanitary main and include a concrete catch basin for receiving backwash and pool drainage water. Ensure that a 6" air gap is maintained for all filter backwash piping.





CHEMICAL TREATMENT

LAP POOL

The lap pool currently utilizes Sodium Hypochlorite as a sanitizing chemical, and muriatic acid as a pH buffer chemical. Both of these chemicals are fed from outdoor storage tanks on the upper level into the feed pumps within the pool mechanical space. Calcium Hypochlorite tablets are also on-hand for any required pool shocking.

Stenner peristaltic feed pumps are used to supply chemicals into the lap pool system. These chemical feed pumps are properly sized and appear to be in good condition. Chemicals are routed to/from the feed pumps with translucent poly tubing, and they are fed into the recirculation system downstream of the filters, heaters, and chemical controllers as required by code. However, the poly tubing is not secured within Schedule 80 PVC piping to prevent any accidental damage or leaks in the lines, as recommended by current industry standards.

A Polaris WaterMatic C660 chemistry controller is used to maintain water chemistry in the lap pool. The chemistry controller is aging but appears to be in good working order. Staff has reported that probes are cleaned on a regular basis to maintain accuracy. Flow cells are transparent and have a sample spigot as recommended by current industry standard.



WADING POOL

The wading pool uses the same systems and setups for sanitizer feed and pH buffer feed as the lap pool.

However, MAHC requires that any wading pool be equipped with a secondary disinfection system, which was not observed. An example of secondary disinfection is an Ultraviolet System.

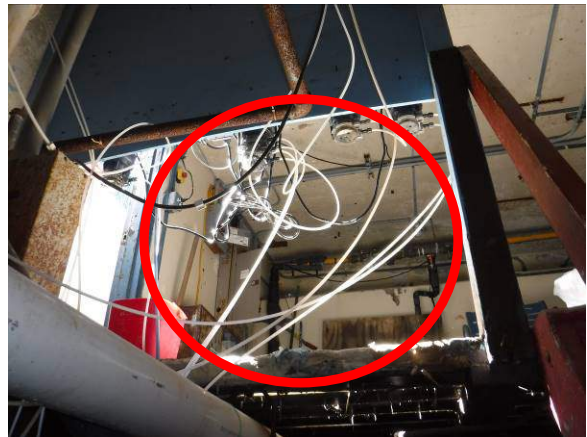




RECOMMENDATIONS

Encase all poly feed tubing in Schedule 80 PVC Pipe in order to prevent any damage or leaks to the piping.

In conjunction with any major pool replacement/renovation, provide a UV system for the wading pool. Additionally, provide new chemistry controllers for both pools that have the capability for connection with flow meter sensors and Fireman Cycle features.





MAKE-UP WATER

LAP POOL

Make up water is manually added to the lap pool via the water supply which can be accessed with valves that are located within the mechanical room space. The water flows and drops into the pool directly underneath the springboard via an air gap, in accordance with administrative code. Valves and piping used for this system show their age and require replacement soon.

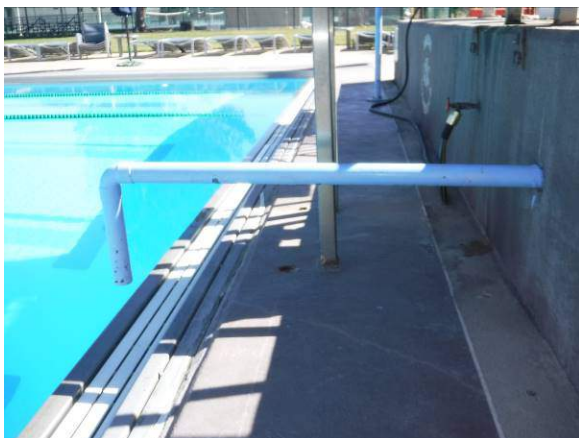
WADING POOL

Make-up water is manually added to the wading pool by a hose that is located on the pool deck.



RECOMMENDATIONS

In conjunction with a major pool replacement, provide water level control systems for both pools. An automatic makeup water system is required by Model Aquatic Health Code (MAHC) for the lap pool. However, installation of a system is recommended for both pools. This includes solenoid valves, sensors, and water level controller for each body of water. Lap Pool make-up water could be supplied within the surge tank, and make-up water for the Wading Pool could be supplied via direct fill on the suction side of the recirculation pump with an approved backflow prevention device.





POOL HEATING

LAP POOL

A Raypak Raytherm P1571 Natural Gas pool heater is provided for increasing and maintaining water temperature within the lap pool. According to information provided by staff, this heater was installed in 2003 and has reached the end of its life. Water temperature during site visit as well as reports by staff indicate that the heater cannot maintain water temperature as needed in shoulder seasons. Running some initial calculations based on water surface area as well as temperatures and wind speeds, a 1500 BTUH input heater is drastically undersized for pool operation in shoulder seasons.

Natural gas could be smelled around the heater at the time of the audit visit. Staff reports that minor gas leaks have been an issue previously; if leaks are still prevalent, this could be causing performance issues with the heater.

Influent and effluent heater lines are a Schedule 40 PVC material, and the water connections have some staining present.



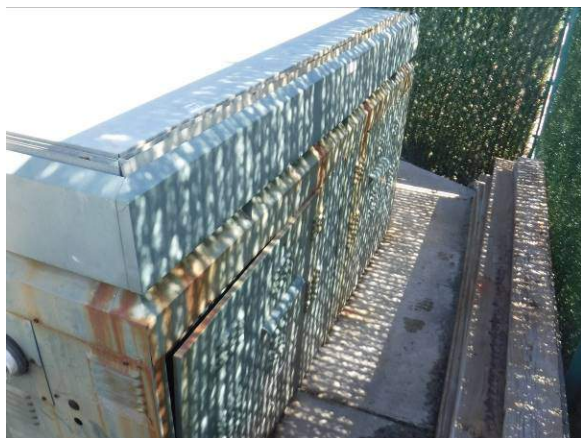
WADING POOL

A Raypak 406A High-Altitude pool heater is installed for use with the wading pool system. The heater was installed around 2014 according to staff and appears to be in fair condition aside from some surface staining. Initial calculations indicate that this heater is on the border of slightly undersized to adequately sized – staff indicate that this heater performs much better than its lap pool counterpart.

The gas line supplying for this heater shows signs of aging and corrosion.

Influent and effluent pool water lines are made of a combination of different PVC and CPVC materials, and thermometers are not present on the lines.

The heater is supported on a cinderblock and is not properly anchored. An emergency stop is provided for the heater in order to comply IECC C404.9.





RECOMMENDATIONS

Provide a new high-efficiency heating system at the lap pool that is suited for outdoors, high altitude, and shoulder-season use. Install the new lap pool heating system with CPVC influent/effluent piping.

Provide the existing wading pool heater with CPVC influent/effluent piping, new natural gas supply piping, thermometers, and a concrete housekeeping pad for proper anchoring.





ELECTRICAL

Electrical outlets that are present within the mechanical room do not include GFI protection. Aquatic industry standard calls for all pool mechanical room outlets to be GFI protected.

Several sections of conduit show serious signs of corrosion. Within the mechanical area, there are several exposed wires that are not protected by conduit. Each pool structure, all of its mechanical equipment, and metallic items located within 5' of the pool are required to be bonding in accordance with NEC Article 680. This could not be confirmed at the time of the audit visit.

RECOMMENDATIONS

Staff or an electrician should verify that both pool structures, their respective equipment, and their respective metallic items are bonded in accordance with NEC Article 680. This can be accomplished by using a multimeter to test for continuity between various items and the pool water.

Replace any corroded conduit and encase any loose wires in or around the mechanical room.

In conjunction with a major pool replacement/renovation, install all GFI electrical outlets within the mechanical room and out on the pool deck.





MISCELLANEOUS

The upper wood decking of the pool mechanical room is currently supported by a combination of severely corroded angle iron and precariously placed column jacks. This poses a serious hazard to all staff and anyone entering the pool mechanical space.

Some of the area drains within the lower level of the mechanical space are covered and clogged with debris, preventing proper drainage in a flooded scenario. Various debris can be seen around the mechanical room, including abandoned piping, PVC pipe fittings, metallic pipe fittings, hangers, etc.

RECOMMENDATIONS

Provide new decking and supports for the upper level mechanical areas to ensure the safety of pool operators.

General cleaning of the mechanical room area is required.



OPINION OF PROBABLE CONSTRUCTION COST

The following spreadsheet provides the Opinion of Probable Construction Cost to replace the pools as detailed previously in **RED** in the report recommendations. The opinion of probable construction cost does not include any bathhouses, pool decks, architectural and engineering design fees, or inflation until the items are addressed.

Opinion of Probable Construction Cost Lap Pool and Wading Pool Replacement

Counsillman Hunsaker

AQUATICS FOR LIFE

Boulder Country Club - Boulder, CO

*PRELIMINARY Opinion of Probable Construction Cost - Full Pool Replacements

10/30/2020

ITEM	COST	
Lap Pool		
Site Costs (Demo, Excavation, Drainage Fill)	\$342,063.57	
Structure (~6100SF, 5.5' Average Depth, Concrete ACI-350 with Stair Entry)	\$533,618.23	
Perimeter Overflow (Concrete Rollout-Style Gutter)	\$113,880.00	
Piping (Concrete Encased SCH 40 PVC beneath Pool, SCH 80 PVC in Mech Room)	\$137,706.32	
Mechanical Equipment (Liquid Chlorine, Acid, BECS Controller, Heating, VFDs)	\$307,821.84	
Finishes (Perimeter Tile Band, Vertical Tile Band, Aggregate Plaster Finish)	\$225,229.33	
Deck Equipment (ADA Lift, Starting Blocks, Duraflex 1-m Diving, Drop Slide)	\$204,176.47	
Loose Equipment (4" Lane Lines, 2 Storage Reels, Portable Guard Chairs)	\$13,411.76	
Maintenance Equipment	\$8,147.06	
Safety Equipment	\$3,882.35	
<i>Lap Pool Subtotal</i>		\$1,889,936.94
Wading Pool		
Site Costs (Demo, Excavation, Drainage Fill)	\$61,384.36	
Structure (~1300SF, 1' Average Depth, Concrete ACI-350 with Zero-Depth Entry)	\$112,819.20	
Perimeter Overflow (Concrete Deck-Level Gutter)	\$48,533.33	
Piping (Concrete Encased SCH 40 PVC beneath Pool, SCH 80 PVC in Mech Room)	\$19,812.54	
Mechanical Equipment (Liquid Chlorine, Acid, BECS Controller, Heating, VFDs, UV)	\$122,785.69	
Finishes (Perimeter Tile Band, Vertical Tile Band, Aggregate Plaster Finish)	\$42,310.67	
Deck Equipment & Play Features	\$109,117.65	
Maintenance Equipment	\$8,147.06	
Safety Equipment	\$3,105.88	
<i>Wading Pool Subtotal</i>		\$528,016.38
<i>Contingency (15%)</i>		\$362,693.00
TOTAL AQUATICS COST ESTIMATE (Inflation & general contractor mark-up not included)		\$2,780,646.32

The Consultant has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Soil conditions and structure methods can have large impact on project cost. Opinion of probable cost include typical structural design approaches, the consultant defers to the structural consultant for added cost if additional structure enforcement are dictated by project Geotechnical Report. Cost also are indicative of the typical General Contractor and Pool Contactor relationship. Specifics on constructor methods and associated cost will have to be study by outside firms. Opinions of probable cost are representative only of the Consultant's judgment as a design professional familiar with the construction industry. The Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

The opinion of probable construction costs is based on current 2020 prices. This report is based on information that was current as of October, 2020.

The following spreadsheet provides the Opinion of Probable Construction Cost to provide recommended short-term repairs to the existing pools as detailed previously in **BLACK** in the report recommendations. **Please note that completion of all of these repairs will NOT push the pool systems to 100% code-compliance.** The opinion of probable construction cost does not include any mechanical room, pool deck, architectural, civil, plumbing, or electrical recommendations, as this does not fall within our scope of work. Inflation until these items are addressed is not taken into account.

Opinion of Probable Construction Cost Existing Lap Pool and Wading Pool Repairs



Counsillman-Hunsaker

AQUATICS FOR LIFE

Boulder Country Club - Boulder, CO

Opinion of Probable Construction Cost - Existing Pool Repairs (Aquatics Scope)

11/2/2020

ITEM	COST	
Lap Pool		
Leak Detection Testing	\$3,000.00	
Swiss Hammer Testing	\$2,000.00	
Ground Penetrating Radar Testing	\$2,000.00	
Concrete Core Sampling	Contact Martin/Martin	
Replace the Pool Liner & Liner Markers	\$96,500.00	
Gutter Pressure Tube Welding Repairs	\$1,500.00	
Drain Sump and Drain Piping Modifications	\$75,000.00	
Revise Depth Markers and "No Diving" Signs	\$3,000.00	
Four (4) New Underwater Light Fixtures Replacement	\$2,500.00	
Installation of ADA Lift and Anchor	\$10,000.00	
Replace the Starting Blocks and Anchors	\$21,500.00	
New Backstroke Flags	\$300.00	
Various Lifeguard Chair Replacement Parts	\$1,500.00	
Replace Mechanical Room Piping, Fittings, Valves, and Supports (with Tags & Labels)	\$65,000.00	
Install Signet MagMeter	\$2,000.00	
Pump/Motor/Strainer Housekeeping Pads and Anchoring	\$3,000.00	
Pump Gauges & Snubbers	\$500.00	
New HR Sand Filtration System	\$75,000.00	
Install in-ground Retention Tank for Filter Backwash	\$10,000.00	
Encase all Chemical Feed Tubing in PVC Sch 80 Piping	\$750.00	
High-Efficiency Pool Heater Installation with CPVC Influent/Effluent Piping	\$80,000.00	
Lap Pool Subtotal		\$455,050.00
Wading Pool		
Plug the non-VGB Suction Outlet and Disconnect Piping (if possible)	\$200.00	
Paint 4" Tall Depth Markers and "No Diving" Signs on the Perimeter Wall	\$100.00	
Remove Capped Stainless Steel Posts from Anchors	\$500.00	
Replace Mechanical Room Piping, Fittings, Valves, and Supports (with Tags & Labels)	\$10,000.00	
Install Signet MagMeter	\$2,000.00	
Replace Pump (if required due to Flow Rate)	\$1,200.00	
Pump/Motor/Strainer Housekeeping Pads and Anchoring	\$3,000.00	
Pump Gauges & Snubbers	\$500.00	
Pipe Filter Air Relief to nearest Pit or Floor Drain with SCH 80 PVC	\$500.00	
Encase all Chemical Feed Tubing in PVC Sch 80 Piping	\$750.00	
Influent/Effluent CPVC Piping and Housekeeping Pad for Pool Heater	\$5,000.00	
Wading Pool Subtotal		\$23,750.00
Contingency (15%)		\$71,820.00
TOTAL AQUATICS COST ESTIMATE (Inflation & general contractor mark-up not included)		\$550,620.00

The Consultant has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Specifics on repairing methods and associated cost will have to be studied by outside firms. Opinions of probable repair costs are representative only of the Consultant's judgment as a design professional familiar with the construction industry. The Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

The preceding opinions of probable cost estimates are based upon a protocol in which a general contractor or swimming pool contractor executes all the tasks with its own labor and that of qualified subcontractors.

It is recognized that the Consultant or Owner have no control over the cost of labor, materials or equipment, over the Contractor's methods of determining bid prices, or over competitive bidding, market or negotiating conditions. Accordingly, the Consultant cannot, and does not, warrant or represent that bids or negotiated prices will not vary from the Owner's project budget or from any opinion of construction cost or evaluation prepared or agreed to by the Consultant.

APPENDIX A: LEAK & STRUCTURE TESTING RECOMMENDATIONS

Leak Testing

Leak testing can be performed to identify any leak sources within the pool and gutter vessels.

American Leak Detection of Northern Colorado
Firestone, CO 80504
(866) 545-5218

Pool Structure Testing

The pool structure testing may include any of the following: Schmidt Hammer Testing, Ground Penetrating Radar, Core Sample Investigation.

Martin/Martin Consulting Engineers – Investigative Department
12499 W Colfax Ave
Lakewood, CO 80215
(303) 431-6100

APPENDIX B: COUNSILMAN-HUNSAKER WATER TIGHTNESS TESTING - TYPICAL SPECIFICATION FOR CONSTRUCTION

3.01 WATER TIGHTNESS TEST

- A. The water tightness test described within the following section is in accordance with the Hydrostatic Tightness Testing of an Open Concrete Containment Structure as required by American Concrete Institute (ACI) 350.1-10 Section 2. Test reports are to be provided by the Contractor and shall include test locations within the structure, dates of testing, water level measurements, amounts of evaporation or precipitation, any measured volume corrections, retest results (if applicable), actions taken, and final results.
- B. This test applies to the pool(s), the spa(s), the surge tank(s), and the gutter system(s). The water tightness test shall be completed prior to the application of the pool finish.
- C. Water Tightness Test Procedure
 - 1. Preparation
 - a. Allow the concrete structure to set 28 days for curing purposes. Once the pool shell has gained sufficient strength to withstand the test load and after all the outlets have been securely sealed, the pool shall be filled with water.
 - 2. Fill: Fill and then isolate the pool(s), the spa(s), the surge tank(s), and the gutter system(s). The water tightness test shall begin after the vessel has been filled for a minimum of three (3) days. During the filling, all outlets shall be monitored for water tightness and all concrete joints shall be monitored for any visible leakage. If any visible leakage from the vessel is observed, the condition shall be corrected prior to the start of the test.
 - a. After the initial fill, all ground water shall be removed from the pool sight sump or the pool location de-watering system. This shall be completed prior to the start of the water tightness test. De-watering of the pool sight sump shall be maintained during the entire duration of the test.
 - 3. 24-hour Allowable Loss
 - a. Calculate the allowable water loss from the unlined vessel(s). This is .1% of the total vessel volume. For the example, the vessel has a volume of 200,000 gallons, the 24-hour allowable loss will be 200 gallons.

Vessel	Total Volume (Gallons)	24-hour Allowable loss (.1% or .001 of Total Volume)
EXAMPLE	200,000 gal	200 gal
Pool 1		
Pool 2		
Spa		
Pool 1 Surge Tank		
Pool 2 Surge Tank		
Pool 1 Gutter		

4. Measurement

- a. Measurements shall be taken at the pool(s), the spa(s), the surge tank(s), and the gutter system(s). Multiple test points with averaging are recommended for vessels which will be exposed to wind. Document the separate findings on the chart below. Repeat the measurements and document every 12 hours for a total of three (3) days. The General Contractor shall check the pool(s), the spa(s), the surge tank(s), and the gutter system(s) for water loss with the Architect or Owner's representative every 12 hours. The Contractor shall submit photo documentation of each measurement with the completed water tightness report. Example measurements are shown in the table below.

5. Evaporation/Precipitation Measurement Procedure

- a. Fill a floating, restrained, partially filled, calibrated, open pan with water and allow the container to float within the pool during the testing period. This will be used to measure evaporation and precipitation.

Vessel	12 hrs. passed	24 hrs. passed	Day 1 TOTAL	36 hrs. passed	48 hrs. passed	Day 2 TOTAL	60 hrs. passed	72 hrs. passed	Day 3 TOTAL
Example Pool	.021 ft	.010 ft	.031 ft	.016 ft	.019 ft	.035 ft	.012 ft	.017 ft	.039 ft
Example Pan	.008 ft	.006 ft	.014 ft	.008 ft	.007 ft	.015 ft	.009 ft	.007 ft	.016 ft
Pool 1									
Pool 2									
Spa									
Pool 1 Surge Tank									
Pool 2 Surge Tank									
Pool 1 Gutter									
Pool 2 Gutter									
Evaporation/ Precipitation Pan									

6. Calculate Daily Loss

- a. Calculate the total daily water loss for the vessel(s) and record in the table below. If a vessel has a daily water loss that is greater than the calculated 24-hour allowable loss, the vessel cannot be considered watertight.
 - 1) $\text{Daily Loss} = 7.481 \times \text{Structure Surface Area (SF)} \times [\text{Total Water Loss per Day (FT)} - \text{Evaporation per Day (FT)} + \text{Precipitation per Day (FT)}]$

- b. For the example, we have a body of water that is 200,000 gallon volume and 3,500 square feet of surface area. Measurements for this example body of water are recorded in the table above.

- 1) Day 1 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(0.031 ft water loss) – (.014 ft evaporation) + (0 ft precipitation)] = 445 gallons Day 1 loss
- 2) Day 2 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(0.035 ft water loss) – (.015 ft evaporation) + (0 ft precipitation)] = 524 gallons Day 2 loss
- 3) Day 3 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(0.039 ft water loss) – (.016 ft evaporation) + (0 ft precipitation)] = 602 gallons Day 3 loss

Vessel	Daily Water Loss Day 1 (Gal)	Daily Water Loss Day 2 (Gal)	Daily Water Loss Day 3 (Gal)	Allowable Loss (calculated above, Gal)	Any daily values higher than the Allowable Loss? (Y/N)
EXAMPLE	445 gal	524 gal	602 gal	200 gal	Y, not watertight
Pool 1					
Pool 2					
Spa					
Pool 1 Surge Tank					
Pool 2 Surge Tank					
Pool 1 Gutter					
Pool 2 Gutter					

7. Absorption

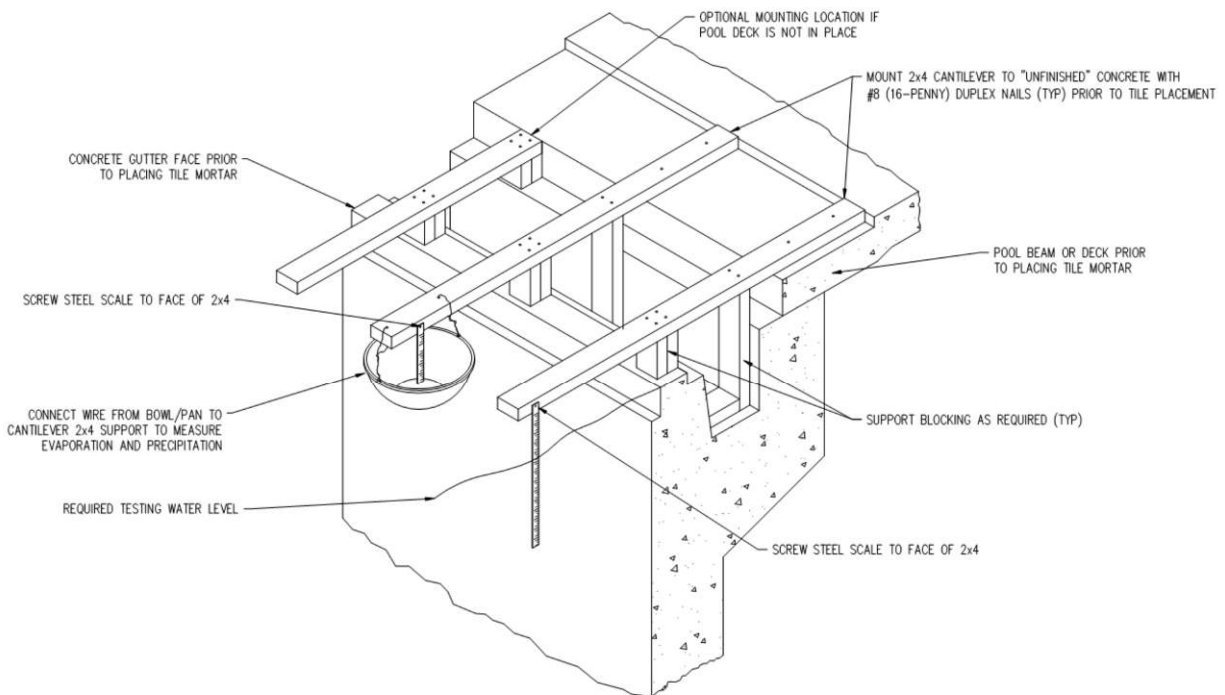
- a. Waiting 3 days after the initial water fill will allow the concrete to absorb water and shall be sufficient to minimize the effect of absorption on the test results.

8. Evaporation

- a. Evaporation shall not have a significant effect on natatoria that are completely enclosed with no air circulation during the water tightness test. However,

evaporation will have a significant effect on the water level in natatoria that has air movement across the water surface or are still partially uncovered.

9. If leaks are detected, repair the vessel and make watertight in accordance with these requirements.
10. With regard to this test, the curing requirements, the final fill and the cost of the water for two (2) complete fillings shall be borne by the Owner. Any subsequent fillings or partial fillings (more than 25%) of the pool shall be by the CONTRACTOR, at its own expense.



SUGGESTED WATER TESTING SET-UP – GUTTER POOLS

APPENDIX C: DIVING ENVELOPES – COMPARISON OF CODE MINIMUMS WITH THE EXISTING DIVING WELL DIMENSIONS

*****Note that the code profiles shown by dashed and dotted lines reflect a diving board height of one meter. The existing diving board is installed above that height.**

