CHERRY CREEK RESERVOIR DESTRATIFICATION SYSTEM

OPERATION AND MAINTENANCE ANNUAL REPORT 2025

Prepared by:

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CHERRY CREEK BASIN WATER QUALITY AUTHORITY
RESERVOIR DESTRATIFICATION SYSTEM
OPERATION AND MAINTENANCE
ANNUAL REPORT
2025

INTRODUCTION

In 2008, Cherry Creek Basin Water Quality Authority (CCBWQA) installed a Reservoir Destratification System (RDS) in the Cherry Creek Reservoir that is operated on a seasonal basis. The RDS includes a 450 KW oil-free air compressor housed in a cinderblock building located near the marina that feeds air to a system of HDPE pipes with 116 air diffusers in the bottom of the reservoir. The purpose of the RDS is to mix the water column to reduce thermal stratification of the reservoir, which may occur between April and October. Cherry Creek Reservoir is considered polymictic, meaning it mixes multiple times during the growing season. When thermal stratification of the reservoir occurs, typically on hot, windless summer days, low dissolved oxygen concentrations at the bottom of the reservoir lead to internal nutrient loading, which increases productivity (algal growth). Additionally, cyanobacteria have a buoyancy advantage over other algal types under stratified reservoir conditions and artificial mixing can limit growth of undesirable species causing harmful algal blooms.

The RDS is managed, operated, and maintained by CCBWQA through these contractors:

- Ricardo (Rick) Goncalves, PE, RG and Associates, LLC (RGA), Operations and Maintenance Manager for the RDS, rick@rgengineers.com, (303) 901-2367
- Ingersol Rand, Inc., Compressor System Maintenance, Jeff Handley, jeff.handley@irco.com, (303) 345-4407
- Foster Dirt and Construction, Inc., Aeration System Maintenance, Justin Foster, fosterdirt@gmail.com, (970) 567-3361

RDS OPERATIONS POLICY

The RDS is operated following the Cherry Creek Reservoir Destratification System Operations Policy, which was adopted by the CCBWQA Board on July 19, 2021 and was reviewed by the TAC on September 2, 2021, and by the Board on January 20, 2022.

The RDS Systems Operations Policy specifies operations from mid-April through at least the end of September.

SYSTEM OPERATION

The RDS operated reasonably trouble-free in 2025 from April 8 to October 18, with only 71 hours of down time due to a blown fuse problem on the main power supply, and not a problem with the RDS system itself. Down time in 2025 was greater than 2024, but much less than the 9 days of down time in 2022. Implementation of the remote monitoring system (RMS) was highly instrumental in reducing down time, with almost immediate notification of system shutdown. The operating log of the system is contained in the Appendix for more information.

The end-of-season system shutdown was delayed from its usual end of September/early October time until October 18 to mitigate a cyanobacteria bloom from unseasonably late warm temperatures.

REPAIRS TO THE SYSTEM

The RDS needed several repairs to the aeration and compressor systems in 2025 including 7 aeration head repairs, one mainline leak repair, and a power supply fuse failure at the compressor building which caused the 71-hour shutdown in June described above. Notification by the RMS and communication from Cherry Creek State Park employees and CCBWQA contractors who noticed that the aeration system wasn't working correctly or at all was instrumental in the coordination of prompt system repair by CCBWQA's RDS Operations and Maintenance manager. Communication from Cherry Creek State Park employees being such a well-working notification network prompted the development of a formalized RDS Fact Sheet which summarizes what the RDS is, how it operates, what normal and abnormal conditions look like, and who to contact with questions or in the case of abnormal conditions. The RDS Fact Sheet will be posted and distributed around the park and marina and available to park employees. A copy of the RDS Fact Sheet is contained in the Appendix.

The 7 aeration head repairs needed were a result of ruptured short rubber aerator connection hoses. All but one of the ruptures occurred in the eastern more shallow areas of the reservoir, where a lot of boating occurs. It's likely that the violent, oscillating currents from boat wakes, especially wake-boarding boats, exacerbated by the abnormally low reservoir water levels in the 2025 summer, over-worked those connections resulting in failure and rupture. With low water levels expected again in 2026, a connection hose replacement program is recommended.

The mainline leak repair was located about 50 feet from the distribution manholes and was likely caused by chafing and wave action against the riprap on the face of the dam.

The power supply fuse failure at the compressor building was prompted upon a restart of the compressor after the routine June maintenance event. With no backup fuses on hand, new fuses had to be located and purchased to replace the blown ones. Because this shutdown occurred during the height of summer, a phased restart of the compressor was done to minimize possible anoxic water at the bottom of the reservoir from mixing suddenly with and compromising the aerobic water in the upper aquatic zones of the reservoir and creating an inadvertent fish-kill in the process.

On July 2, the compressor shut down automatically due to excessive compressor oil temperature. This occurred because during routine June maintenance, the Ingersoll Rand maintenance crew failed to blow out the collected dust on the oil cooler. After the July 2 shutdown¸ the IR crew blew out the oil cooler and restarted the compressor. The system was down for less than a day. The RDS system itself was not damaged.

MAINTENANCE ON THE SYSTEM

Ingersoll Rand performed routine maintenance on the system in February, June, and October, in accordance with the PerformanceCare maintenance contract with CCBWQA. IR also performed the intermediate maintenance program to clean the compressor oil coolers of accumulated dust in April and August.

The final scheduled maintenance event was performed between August 14 and 19 by Foster Dirt and Construction. Foster Dirt replaced B&RW in 2024 due to Blair Wacha's desire to retire and transition the business to Justin Foster of Foster Dirt and Construction. Blair stayed on the team, however, to assist and lend his expertise to the Foster Dirt team and was on the team during the 2025 inspection. During this final maintenance, a few cam levers, cam pins, and flow regulators were replaced due to corrosion on the old parts. The flow regulators were cleaned, but, in general, there were fewer issues than last year. The greatest note was the wear and tear on the hoses caused by boat anchors, which has prompted a program to inspect and replace some of the airlines. A complete log of the performed maintenance can be found in the Appendix.

2025 ELECTRICAL USAGE AND CHARGES

The total energy cost of the RDS increased by 32% from 2024 to 2025, with energy cost at $58,553.93 in 2024 and $76,309.94 in 2025. The increase may be result of an increase in total system operational days from 2024 to 2025, the consistently lower reservoir water levels in 2025 compared to 2024, and the number of aerator head breaks in 2025.

The 2025 operating season was longer than 2024 by 23 days. In 2024 the system operated from April 16 to October 3 (170 days), whereas in 2025 the system operated from April 8 to October 18 (193 days). In 2024, the system was shut down for one day; in 2025 the system was shut down for three days. This accounts for a 12.4% increase in total operating days from 2024 to 2025.

The increase in energy cost may also be attributed to the consistently low water levels in the reservoir and the aerator head breaks. Further investigation is recommended on how the compressor can be controlled to reduce power usage based on the reservoir water levels.

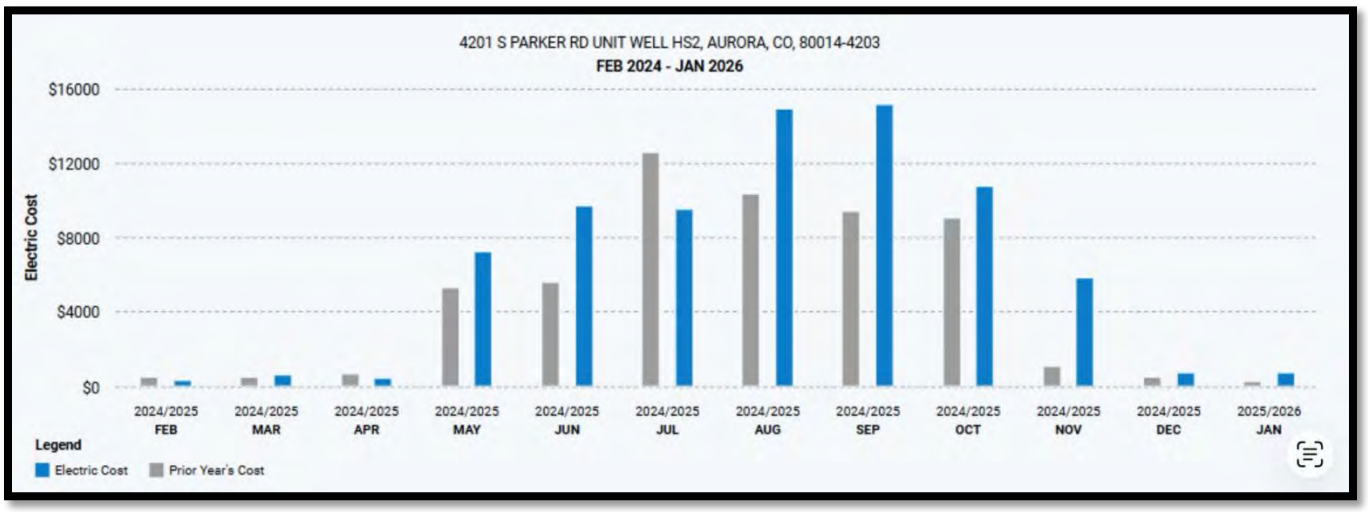
2024 RDS System Usage and Costs

	February	March	April	May	June	July	August	September	October	November	December	January	Total
Billing Period	1/5-2/6	2/6-3/6	3/6-4/4	4/4-5/3	5/3-6/5	6/5-7/3	7/3-8/2	8/2-9/3	9/3-10/2	10/2-10/30	10/30-12/1	12/1-1/1/25	
Total Electric Usage kWh	840	800	960	21,040	23,960	46,640	36,840	33,680	32,320	2,040	1,024	991	201,135
Total Electric Charges $	$563.82	$555.22	$713.28	$5,565.90	$5,878.66	$13,142.85	$10,822.64	$9,819.72	$9,446.98	$1,170.15	$552.15	$322.56	$58,553.93

2025 RDS System Usage and Costs

	February	March	April	May	June	July	August	September	October	November	December	January	Total
Billing Period	1/1-2/6	2/2-3/4	3/4-4/2	4/2-5/1	5/1-6/2	6/2-7/1	7/1-7/31	7/31-9/1	9/1-9/30	9/30-10/29	10/30-12/1	12/1-1/1/26	
Total Electric Usage kWh	1,024	939	855	28,739	39,884	31,766	50,645	51,504	36,578	22,100	963	937	265,934
Total Electric Charges $	$322.46	$657.25	$458.33	$7,275.03	$9,748.84	$9,579.34	$14,933.65	$15,180.34	$10,811.20	$5,831.52	$758.61	$753.37	$76,309.94

Graph of 2024 vs. 2025 Power Usage



RDS EFFECT ON WATER QUALITY

The primary goal of the RDS is to improve overall water quality and chlorophyll-a concentrations within Cherry Creek Reservoir. Many cyanobacteria regulate their position in the water column using gas vesicles, allowing them to rise toward the surface for photosynthesis and sink to deeper waters to access nutrients which can promote bloom formation under calm conditions.

Although the shallow depth of the reservoir limits the system's ability to substantially reduce overall chlorophyll-a concentrations, the artificial mixing likely helps suppress cyanobacteria bloom intensity and shorten bloom persistence by disrupting regulated buoyancy. By promoting vertical mixing, the RDS also likely benefits the reservoir fishery and overall water quality by helping maintain more uniform dissolved oxygen conditions and limiting the localized impacts of algal blooms.

Upgrades completed in 2022 allow the system to operate throughout the entire season, rather than shutting down during mid-summer when water temperatures are highest and bloom potential is greatest. Continued late-season operation may help extend the effects on cyanobacteria blooms on water quality and potential impacts to the fishery, especially during warm, dry fall conditions.

Detailed information on chlorophyll-a concentrations and phytoplankton dynamics can be found in the current WY Annual Monitoring Report and are highlighted in the CCBWQA Annual Report on Activities.

OVERALL HEALTH OF THE SYSTEM

Generally, the RDS is in sound condition, especially since the compressor was replaced in January of 2020. The life of the system should be upwards of 20 to 30 years, with the compressor being the most sensitive to wear and tear. The compressor is the only active part of the system and is only five years into its life span. The aerators and piping are passive parts, meaning they have no moving parts, and in the opinion of Foster Dirt, the aeration system is a "Cadillac" system, and should have at least another four to nine years of life left. The problems with the aeration system are from corrosion of the stainless-steel parts, less in 2025 than 2024, wear and tear on the air hoses from boat anchors, and rupturing of the air hose connectors to aerator heads due to low reservoir water levels and wake-boat wake turbulence. While the system may have another four to nine years, some of the parts, especially the air hoses, may need to be replaced during that time period.

OVERALL COST OF OPERATIONS, MAINTENANCE, AND UTILITIES

In 2025 the RDS operated with overall expenditures well within budget. The RDS budget is split into three line items in the CCBWQA 2025 budget under the Pollution Abatement Fund: PRF Reservoir Destratification Service Plan, RDS Rehabilitation, and RDS Utilities.

CCBWQA budgeted $75,400 in 2025 for the PRF Reservoir Destratification Service Plan and RDS Rehabilitation. These line items cover system operations and management activities by RGA, routine maintenance on the compressor by Ingersol Rand, yearly maintenance on the aeration system by Foster Dirt, and repairs and replacements on the aeration system by Foster Dirt. Actual expenditures for these two line items in 2025 totaled $62,209. The 2026 budget remained the same at $75,400 and recommendations listed below are accounted for.

CCBWQA budgeted $75,000 in 2025 for RDS Utilities. As discussed in the 2025 Electrical Usage and Charges section above, actual expenditures for utilities in 2025 totaled $76,310, 32% greater than the $58,554 total for 2024. While the over-budget amount of $1,310 does not in itself appear to be overly concerning, it is the increase in usage and cost from 2024 to 2025 that gives us cause for further investigation. At the top of the list of possible causes is the unusually low water levels of the reservoir throughout the year. The 2026 budget increased slightly from $75,000 in 2025 to $75,800 in 2026 and includes the cost of investigating and implementing compressor control measures to reduce the power needs of the compressor during low reservoir levels. The 2026 budget is being conservative in assuming that conditions in 2026 may dictate a similar generation of power needs and costs as was experienced in 2025, without complete resolution of the causes.

RECOMMENDATIONS

The following recommendations are provided for consideration to improve system operation in 2026.

- Develop an operating plan to adjust the compressor output to compensate for lower-than-normal reservoir water levels to reduce excessive energy consumption. Look for any trends that may point to developing issues or concerns with the compressor.
    - $2,500

- Replace 45 feet of air hose near aerator #105.
    - $2,000

- Test the non-aeration head mainlines.
    - $2,000

- Replace all aerator head connection hoses and add new hose connectors.
    - $7,000

- Purchase spare parts or have the available budget for aerator maintenance later in the year
    - 25 cam pins
    - 50 cam levers
    - 20 plastic protective cones
    - 200 linear ft +/- hydraulic hose, each size 1” & 1 ¼
    - $10,000

Recommendations accounted for in the CCBWQA 2026 Budget.

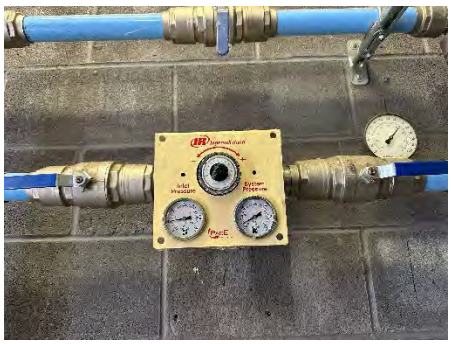
Appendices

SUMMARY of 2025 OPERATIONS DETAILS, REPAIRS and MAINTENANCE

Ricardo (Rick) Goncalves, PE, RG and Associates, LLC (RGA), Operations and Maintenance Manager for the RDS, rick@rgengineers.com, (303) 901-2367

April 8-

- I arrived at 2:12 at the compressor building to de-winterize the system and to do a startup test to check for system integrity.
- After verifying startup procedures with Ingersoll Rand, I started the compressor with no issues and adjusted the outlet pressure to 40 psi.
- I walked to the distribution manholes to check for correct pressures and any indications of any leaks out in the system.
- I did find a leak in the mainline about 50 feet from the distribution manholes.
- Called Justin Foster to get him to come out and fix the leak.
- All pressures were normal at the compressor building and at the manholes.
- I toured the aerator field by boat with Erin Stewart and her companion to check for any broken aerators.
- Finding no aerator issues, I returned to the compressor building to shut it up and let the system continue running, for Justin to be able to find the mainline break and to let all the accumulated water in the aeration lines get fully blown out, as the aeration plumes appeared a bit weak.
- Set the pressure to 50 psi and left at 5:20 pm.



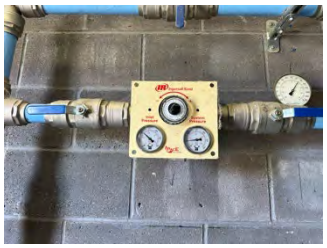
Pressure ramping up to 40 psi

Leak detected near distribution manholes

Compressor running at normal operating pressure

April 15-

- Arrived at 9:50 am.
- System was running well. Adjusted the pressure from 50 to 55 psi.
- Checked the distribution manholes for consistent pressure-all ok.
- The repaired mainline leak was still leaking small bubbles, so called Justin Foster to come out to repair the leak completely.
- Took the boat out to verify the system layout and that the heads were all operating well.
- The aerators in the reservoir were all operating well with full and normal air plumes.
- Stopped by again at the compressor building at 6:00 pm to check that the pressure was at 55 psi. It was. Left at 6:15 pm.



Starting pressure at 50 psi

Compressor running normally

Pressure reset to 55 psi

May 28- Delivered parts to the RDS building. Checked to see that compressor was running normally and it was.

Compressor running normally at 100 psi

June 9- Got notified by Jeff Handley that when the IR technicians had restarted the compressor after doing their normally scheduled June maintenance, that all the fuses had blown in the main power fuse box and that they were working on getting replacement fuses as quickly as possible.

June 12- Notified that the fuses had been replaced and the technicians had left the system running. After discussions with staff about phasing the restart to prevent anoxic water from mixing with the rest of the water column, it was decided that I shut the compressor down at 5:00 that day, then restart it at 10:00 am the next day.

June 13- Restarted the compressor slightly later than planned at 12:30 pm.

Compressor restarted and running at 55 psi

July 2- Notified by Erin Stewart that there were no aeration plumes in the reservoir. After checking the IR website, which showed that the compressor was off, I called Jeff Handley, who got technicians out there rapidly and got the compressor restarted that same day. He related that the problem was that the oil coolers hadn't been cleaned along with the regular maintenance in June.

July 22-23- I was notified by Michelle Seubert that there were some aerators that were "virtual geysers", indicating a serious break. On checking the compressor status on-line, I noticed that the compressor was running at only at 57 psi, 57% of normal 100 psi, so I contacted Jeff Handley. He directed me to increase the back pressure on the system, which I did on-site, thereby reducing air flow until the pressure was at least 75 psi, 75% of normal. He said that running anything less than 75 psi would not be good for the compressor. Foster Dirt was notified and the aeration heads were fixed the next day, after which I had Justin Foster readjust the compressor back up to the normal 100 psi.

Compressor showing only 57 psi

August 5-7- Notified by Erin of three broken aerator heads on August 5. Foster dirt repaired them the next day.

Normal aerator plume

Examples of broken aerator heads

August 14-19- Yearly maintenance inspection performed by Foster Dirt and Construction, LLC, cleaning, disassembly, inspection and reassembly, of all 115 aerator heads in the Cherry Creek Reservoir. The specific cleaning and repair details are attached as an Excel file in the Appendix of this report.

- Generally, lake bottom chemistry may be significantly different across the lake. Rubber components seem to deteriorate more rapidly in the 1000 feet near the dam, where a black, soft muddy bottom exists. Stainless steel parts deteriorate more in the cleaner bottom areas on the south and west portions of the basin.
- The heads and their stainless steel components generally showed about the same amount of corrosion as last year's inspection. Few pins and cams were replaced compared to many previous years.
- Hoses generally showed more deterioration than the past few years, especially the softer nylon reinforced riser hoses. A number of those showing fatigue or failure were replaced. In fact, all of the aerator heads that were repaired this year were due to ruptured rubber riser hoses.

An example of a ruptured aerator hose

- Corrosion, probably due to electrolysis, is continuing to be noticeable in machined stainless steel parts, a few to the point of requiring replacement to properly seal. It is also showing up on stainless steel clamps used for hose to fitting attachments.
- Damage to the hydraulic lines that make up the aeration system is becoming apparent due to fatigue and aging of the system. This is becoming more evident with age of the system. One area in particular, immediately west of head 105 was apparently raked by a boat anchor in a generally western direction, causing tears to the outer layer of rubber hose and rusting of the outer layer of steel reinforcement. The damaged area was about 45+ feet in length and 1 inch diameter.
- More details are included in the full report contained in the Appendix to this report.

August 28-29- Notified by Erin that there was another broken head. Foster Dirt was notified to effect the repair and it was done the next day.

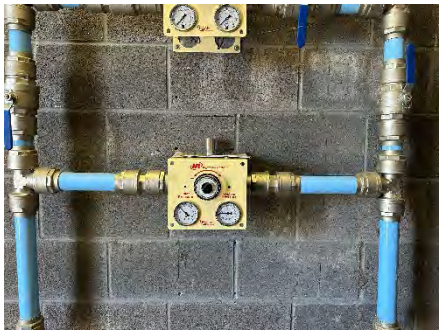
September 9-10- Notified by Erin again of a broken aerator head and it was repaired the next day.

September 24-26- Notified by Erin of a broken aerator head and it was repaired on the 26th.

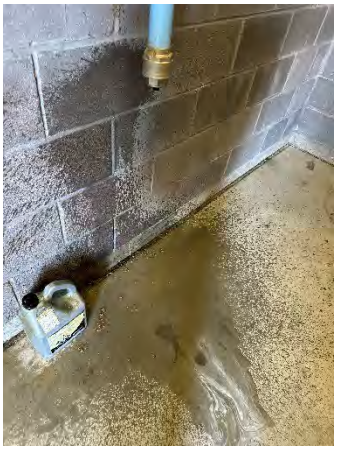
October 9- Discussed with Jane to allow the compressor to run an extra week before shut down, due to the unseasonably warm temperatures and the blooming cyanobacteria.

October 10- Notified by Erin of another broken aerator head. It was repaired the next day.

October 18- The compressor was shut down for the year in accordance with Authority Policy at 9:51 am and all the water accumulations blown or drained out.



Photos showing compressor and system operating normally upon arrival on October 18, 2025



Photos showing accumulated water blown off and the compressor at "off" status

Foster Dirt Report from 2025 Annual Maintenance

Rick Goncalves, August 22, 2025

Our maintenance & inspection crew spent 4 days between August 14th – 19th, cleaning, disassembly, inspection and reassembly, of all 115 aerator heads in the Cherry Creek Reservoir Basin. The specific cleaning and repair details are attached as an Excel file.
In general, we determined or performed the following:

- Generally, lake bottom chemistry may be significantly different across the lake. Rubber components seem to deteriorate more rapidly in the 1000 feet near the dam, where a black, soft muddy bottom exists. Stainless steel parts deteriorate more in the cleaner bottom areas on the south and west portions of the basin.
- The heads and their stainless steel components generally showed about the same amount of corrosion as last year's inspection. Few pins and cams were replaced compared to many previous years.
- Hoses generally showed more deterioration than the past few years, especially the softer nylon reinforced riser hoses. We replaced a number of those showing fatigue or failure.
- Corrosion, probably due to electrolysis, is continuing to be noticeable in machined stainless steel parts, a few to the point of requiring replacement to properly seal. It is also showing up on stainless steel clamps used for hose to fitting attachments.
- This is mostly repetition of last year's report. Damage to the hydraulic lines that make up the aeration system is becoming apparent due to fatigue and aging of the system. This is becoming more and more evident. One area in particular, immediately west of head 105 was apparently raked by a boat anchor in a generally western direction, causing tears to the outer layer of rubber hose and rusting of the outer layer of steel reinforcement. The damaged area was about 45+ feet in length and 1 inch diameter.

- I suggest replacing this area of line prior to start up next year. It is also recommended to have about 200 feet of 1" diameter and 300 feet of 1 ¼" diameter hose available for general repairs next year..
- Another area of extreme hydraulic hose wear is near the distribution manholes near shoreline. Three failures have now been repaired in 2025, and more will occur in the near future. Wave action moves hoses across the riprap causing excessive wear to the hoses. Since lake levels vary widely there is a large area of all five zones that nearing failure doe to this excessive wear. These 1 ¼" hoses should be replaced from the manhole to a point 5 feet, vertically, below the minimum pool level, approximately 80 feet on each line. This is in addition to required hose for repair mentioned above. On zone 200, there is not enough slack in the line to make another repair, requiring removal of hose.
- Our normal maintenance includes pulling the heads to the surface, gives the opportunity to view the hose condition in a very limited area. Consideration should be given to pulling up and inspecting all the hose condition in the entire system, which includes over 6 miles of hoses, within the next 5 years. These early signs of fatiguing, likely mean that boat anchor damage in the future is more likely, and failures more common in upcoming years.

Parts required for continuing operation next year(s):

- 50 cam levers. The new ones do not fit most of the existing stainless steel risers currently used in the basin.
- Pin & cam samples left on shelves of compressor building for sizing. One riser similar the what exists is also there.
- 200 lin ft =/- hydraulic hose, size 1" & 700 lin ft of 1 ¼" hose, specs stamped on existing hose

Thank you for the work opportunity, and feel free to call with questions,

Justin Foster, 970-567-3361

2025 repairs to Cherry Creek Aeration System

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Band Clamp Thickness (new .025") / End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
101	x	clean						38.507	51.918		adjust riser position, tighten fittings, excessive algae build up
102	x	clean						38.479	51.897		
103	x	replace						38.447	51.882		adjust riser position
104	x	clean						38.416	51.868		replace lower stainless steel fitting
105	x	clean						38.374	51.877		damage to main hose from dragged anchor, repair tee connect
106	x	clean						38.357	51.897		
107	x	clean						38.330	51.931		
108	x	clean						38.322	51.954		blow off
109	x	clean						38.367	51.823		
110	x	clean						38.339	51.829		
111	x	clean						38.323	51.840		
112	x	clean						38.298	51.866		replace upper stainless steel fitting
113	x	clean						38.274	51.883		blow off
114	x	clean						38.350	51.791		replace lower stainless steel fitting & riser hose
115	x	clean						38.337	51.745		
116	x	clean						38.333	51.715		
117	x	clean		1				38.329	51.673		
118	x	clean						38.323	51.629		moved by boat anchor
119	x	clean						38.316	51.589		moved by boat anchor
120	x	clean						38.311	51.554		moved by boat anchor, blow off
121								38.478	52.001		adjust riser position
122								38.452	52.042		adjust riser position
123								38.431	52.076		
124											

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
201	x	Clean						38.543	51.832		ctitical shoreline breaks
202	x	Clean						38.513	51.814		replaced plastic cone
203	x	Clean						38.485	51.791		
204	x	Clean						38.460	51.769		
205	x	Clean						38.434	51.742		
206	x	Clean						38.410	51.714		
207	x	Clean						38.388	51.671		
208	x	Clean						38.362	51.607		
209	x	Clean						38.345	51.554		
210	x	Clean						38.333	51.484		
211	x	Clean						38.331	51.423		
212	x	Clean						38.357	51.296		
213	x	Clean						38.388	51.245		
214	x	Clean						38.430	51.189		
215	x	Clean						38.470	51.138		
216	x	Clean						38.514	51.097		very difficult to clean
217	x	Clean						38.551	51.063		
218	x	Clean					new head	38.594	51.012		blow off

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
301	x	Clean						38.426	51.578		
302	x	Clean						38.450	51.530		
303	x	Clean						38.476	51.478		
304	x	Clean						38.436	51.435		
305	x	Clean		1	1 lower			38.410	51.412		blow off
306	x	Clean						38.490	51.435		
307	x	Clean						38.472	51.389		
308	x	Clean						38.433	51.357		
309	x	Clean						38.400	51.324'		blow off
310	x	Clean						38.513	51.370		
311	x	Clean						38.489	51.318		
312	x	Clean						38.450	51.288		blow off
313	x	Clean						38.539	51.325		
314	x	Clean						38.569	51.280		
315	x	Clean						38.600	51.225		
316	x	Clean						38.629	51.174		blow off

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 15 psi)	Notes
401	x	Clean						38.529	51.632		
402	x	Clean						38.536	51.598		
403	x	Clean						38.554	51.555		
404	x	Clean						38.579	51.509		
405	x	Clean						38.606	51.459		
406	x	Clean						38.634	51.405		adjust head position
407	x	Clean						38.661	51.345		
408	x	Clean						38.687	51.296		low air flow, fines in line
409	x	Clean						38.710	51.249		adjust head position, low air flow, fines in line
410	x	Clean						38.740	51.192		adjust head position, low air flow, fines in line
411	x	Clean						38.767	51.145		low air flow, fines in line, blow off
412	x	Clean						38.492	51.572		
413	x	Clean	1		1 upper			38.505	51.547		
414	x	Clean						38.529	51.490		
415	x	Clean						38.546	51.456		
416	x	Clean						38.576	51.393		
417	x	Clean						38.605	51.340		
418	x	Clean						38.630	51.292		
419	x	Clean						38.658	51.235		
420	x	Clean					regulator	38.688	51.178		
421	x	Clean						51.138	51.138		
422	x	Clean						38.539	51.677		
423	x	Clean					ss riser pipe	38.558	51.619		
424	x	Clean						38.584	51.568		filters difficult to clean, packed with silty substance, blow out
425	x	Clean						38.609	51.520		filters difficult to clean, packed with silty substance, blow out
426	x	Clean						38.637	51.464		filters difficult to clean, packed with silty substance, blow out
427	x	Clean						38.663	51.412		filters difficult to clean, packed with silty substance, blow out
428	x	Clean						38.691	51.359		filters difficult to clean, packed with silty substance, blow out
429	x	Replace						38.717	51.305		filters difficult to clean, packed with silty substance, blow out
430	x	Replace					ss riser pipe	38.743	51.252		filters difficult to clean, packed with silty substance, blow out
431	x	Replace						51.252	51.201		filters difficult to clean, packed with silty substance, blow out

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
501	x	replace						38.607	51.716		
502	x	clean						38.647	51.651		
503	x	clean						38.684	51.581		
504	x	clean						38.708	51.535		
505	x	clean					riser hose	38.731	51.487		head moved by outside force
506	x	replace						38.755	51.440		
507	x	clean						38.775	51.390		
508	x	clean					riser hose	38.809	51.320		
509	x	clean					riser hose	38.831	51.272		
510	x	clean					riser hose	38.850	51.226		
511	x	clean						38.639	51.106		
512	x	clean						38.615	51.109		tighten hose clamps
513	x	clean						38.578	51.151		
514	x	clean					riser hose	38.556	51.187		
515	x	clean						38.531	51.233		
516	x	clean						38.505	51.274		
517	x	clean						38.573	51.678		
518	x	clean						38.589	51.634		
519	x	clean						38.610	51.586		
520	x	clean						38.640	51.530		
521	x	clean						38.662	51.486		
522	x	clean						38.692	51.426		
523	x	clean						38.721	51.367		
524	x	clean						38.741	51.322		
525	x	clean						38.772	51.267		
526	x	clean						38.798	51.213		
527	x	clean						38.822	51.165		

Cherry Creek Reservoir Destratification System (RDS) Fact Sheet

What is the RDS?

In 2008, Cherry Creek Basin Water Quality Authority (CCBWQA) installed a Reservoir Destratification System (RDS) in the Cherry Creek Reservoir that is operated on a seasonal basis. The RDS includes a compressor that feeds air to a system of HDPE pipes with 116 air diffusers in the bottom of the reservoir. The purpose of the RDS is to mix the water column to reduce thermal stratification of the reservoir, which may occur between April and October. Cherry Creek Reservoir is considered polymictic, meaning it mixes multiple times during the growing season. When thermal stratification of the reservoir occurs, typically on hot, windless summer days, low dissolved oxygen concentrations at the bottom of the reservoir lead to internal nutrient loading, which increases productivity (algal growth). Additionally, cyanobacteria have a buoyancy advantage over other algal types under stratified reservoir conditions and artificial mixing can limit growth of undesirable species causing harmful algal blooms.

Compressor Building – Southwest of the Marina

In-Reservoir Distribution System footprint – avoid boat anchors in this area.

How is the RDS operated?

The RDS is operational from mid-April through at least the end of September. Before start-up, the CCBWQA's System Operator visually verifies that ice is off the reservoir and confirms that the temperature in the compressor building is 38 degrees Fahrenheit or more. A written start-up and shut-down procedure are followed and documented. Routine system maintenance of the in-reservoir distribution system (air lines and diffusers) is conducted in late summer, with repairs occurring as needed.

CCBWQA maintains the system through contracts with an operations manager and maintenance contractors who provide routine and emergency system maintenance of the compressor and the in-reservoir distribution system (air lines and diffusers).

What does normal operation of the RDS look like?

Under normal operation, bubbles from the RDS rise gently to the water surface in a diffuse pattern.

Normal aeration plume appearing as bubbles distributed on the water surface.

What do abnormal conditions related to the RDS look like?

Broken aerator heads or breaks in the distribution lines may cause overly vigorous aeration plumes. Additionally, a total lack of aerator plumes showing on the surface of the reservoir during the normal operating season indicates that the compressor is not running and not working to destratify the reservoir. Boat anchors dropped within the footprint of the RDS distribution system can damage or break aerator lines when anchors are retrieved.

Two broken aerator heads showing overly vigorous aeration plumes

Broken main air distribution line near the distribution manifold

CCBWQA Contacts: In the case of abnormal conditions or if you have further questions about the RDS, please contact Rick Goncalves, CCBWQA Operations and Maintenance Manager (303) 901-2367 or rickg@rgengineers.com or Val Endyk, CCBWQA Administrative Assistant (303) 968-9098 or (303) 718-6636 or manager@ccbwqa.org.