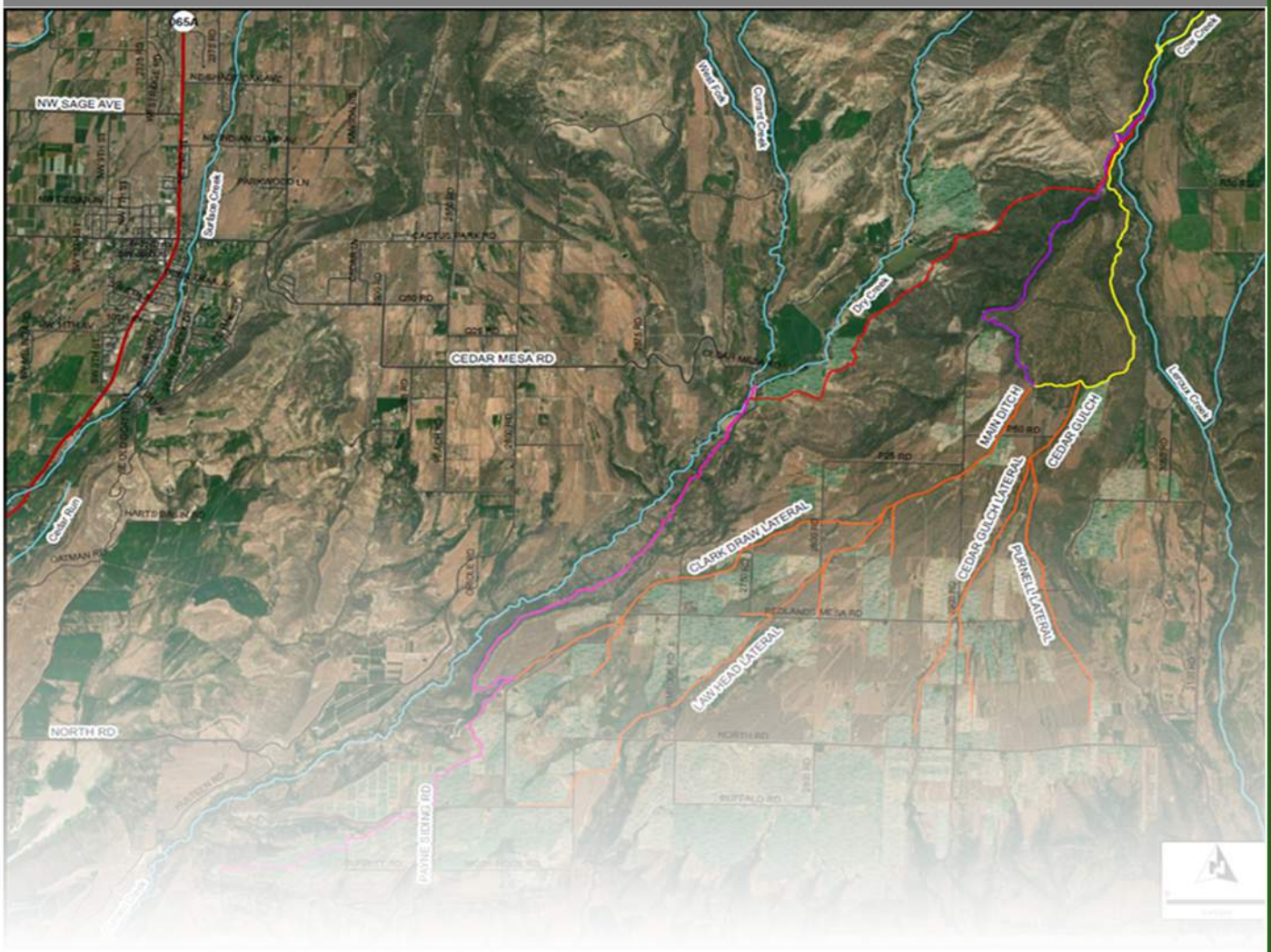
Overland/Redlands
Master Plan Study



Prepared For:
Overland Ditch & Reservoir Company
Redlands Mesa Water Users Association
Durkee Ditch Company

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Applegate Group, Inc.
Water Resource Advisors for the West
www.applegategroup.com
303-452-6611

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INTRODUCTION

The purpose of the study is to determine the feasibility and cost of improvements to the irrigation water delivery systems to Redlands Mesa near Cedaredge, CO including the Overland Ditch, Stull Ditch and the Durkee Ditch. This master planning will investigate improvements that will aid in system efficiency and satisfy the U.S. Bureau of Reclamation (Bureau, USBR) Salinity Control Program requirements. This study is funded through a grant provided by the Colorado River District (CRD).

OVERVIEW

The Redlands Mesa Water Users Association (RMWUA) delivers water to shareholders on Redlands Mesa in conjunction with the Overland Ditch and Reservoir Company (ODRC), Stull Ditch Company and Durkee Ditch Company. The coordination and delivery of shares to shareholders is primarily handled by RMWUA while the delivery of water to the Mesa is handled by the Overland and Stull ditch companies. The types of shares that shareholders may hold are described below (see Appendix D for more information):

- Overland Shares: Decreed spring runoff from associated drainages above the Overland ditch as well as shares delivered from Overland Reservoir in the late season.
- RMWUA B-2 (Early Water) Shares: Decreed spring runoff water from Leroux Creek, ends when flows in Leroux Creek drop below 61.35 cubic feet per second (cfs), typically in June.
- RMWUA B-1 (Late Water) Shares: RMWUA owns shares in the Leroux Creek Water Users Association (LCWUA) who own dozens of reservoirs in the Leroux Creek drainage basin. This water is delivered in late season to Redlands Mesa based on a prorated or call basis, depending on flows in the creek and storage in reservoirs.
- Durkee Ditch shares are separate from Redlands or Overland shares as Durkee diverts from Currant Creek and Dry Creek and not Leroux Creek

Both RMWUA and ODRC conducted water management planning activities in the late 2000's. A water management plan was generated for each entity and attached in Appendix E. The plans lay out the history, organizational structure, water rights and administration, irrigation deliveries and efficiency of the systems. This study need not replicate the above-mentioned, well-documented aspects of the systems contained in these studies. Instead, this study will reference the water management plans (WMPs) for that which is relevant to the feasibility of piped improvements to the system. In some circumstances, updated information from the 15 years since these studies were published will be presented to represent today's system more accurately. It is recommended that those without familiarity of the Redlands irrigation system read the water managements plans for a more detailed system overview.

An overview map of the entire delivery system is shown in Figure 1 below:

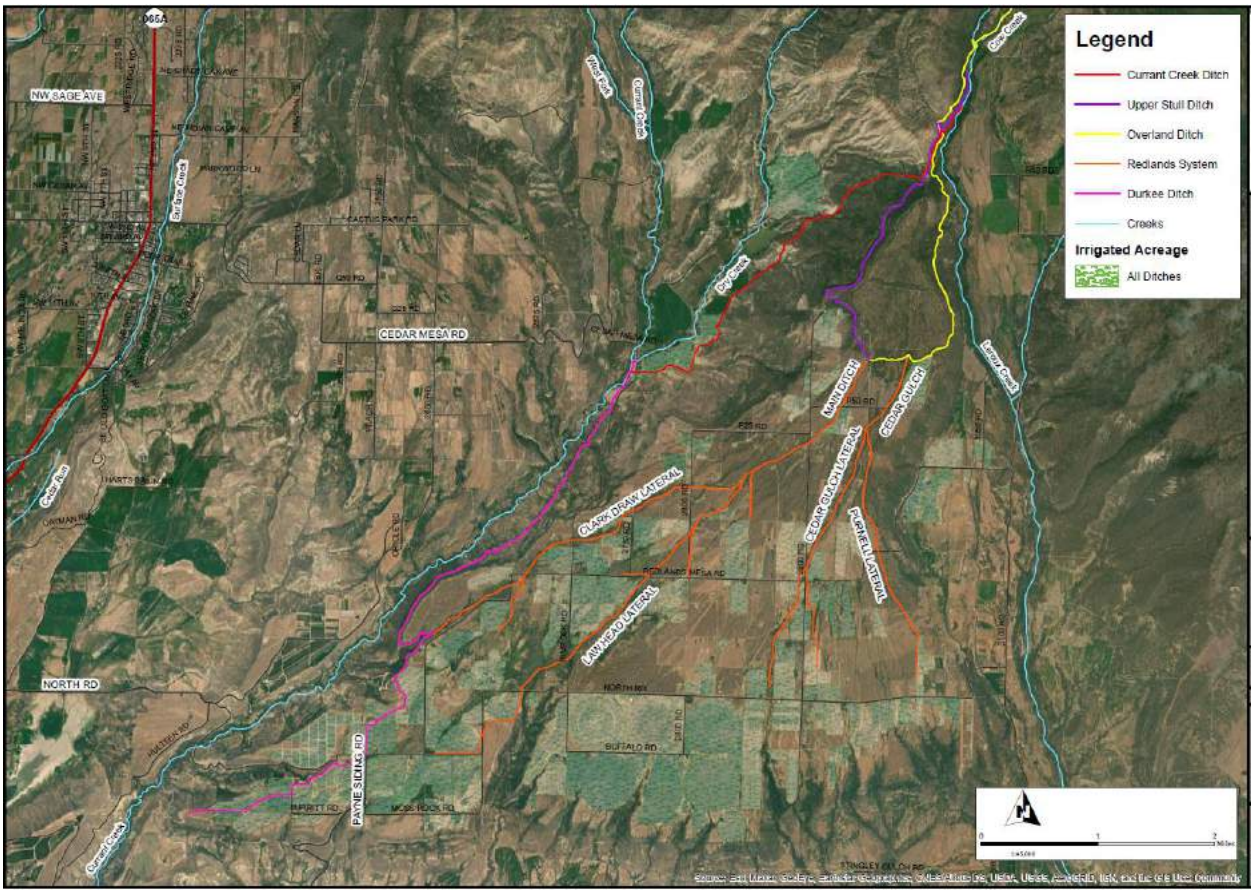


FIGURE 1 SYSTEM OVERVIEW

IRRIGATED AREA & EFFICIENCY

Data from the Colorado Department of Natural Resources (DNR) from 2020 shows an irrigated acreage of 3986 acres on all of Redlands Mesa, including lands associated with the Overland, Stull and Durkee Ditch. Hay and pasture crops make up the bulk of the area though about 350 acres of orchard and vineyard are irrigated. Sprinkler systems, including a number of large pivots, make up almost 43% of the irrigated area with flood and furrow irrigation practices the majority at 57%. Because late season water is reliant on reservoir storage and carriage losses along the large canals can be significant, efficient use of on farm water is crucial to maintain yields. With an average irrigated parcel size of 19 acres and generally consistent, low gradient terrain devoid of steep hills or sharp gullies, the fields are well suited for sprinkler irrigation.

A rough overall system efficiency was determined by averaging the sum of total diversions from each ditch over the last 20 years and dividing by the total acreage served. 21,800 AF/yr over 3986 acres is 5.5ft of water per acre. Assuming an average crop irrigation requirement of 2.5 feet per acre results in a system efficiency of about 46%. This aligns closely with the findings of the WMPs which found overall system efficiencies of 47-57% in a normal irrigation year.

The WMPs identified carriage losses averaging 25-30% throughout the irrigation season with higher losses up to 45% in July-September when stored late season water is delivered. This represents a tremendous opportunity for delivery efficiency gains since eliminating carriage losses for stored water ensures that each stored unit of water arrives at the farm headgate during the hottest months

of the year. Users could distribute their shares more evenly through the season knowing that what is called for will be delivered with less losses. Anecdotally, users at the end of the system sometimes must order up to six times as much water as desired to make up for shrinkage losses (e.g. 6cfs call to see 1cfs at the farm headgate).

This study will first present analysis on combining and improving the water delivery infrastructure for the Overland Ditch, Stull Ditch and Redlands Mesa water users. Since these diversions occur on Leroux Creek and deliver water to the same irrigated area, combining the flows into one diversion and one piped alignment to the top of the delivery area will be explored. The potential of combining the Currant Creek Ditch, which diverts from Leroux near the Overland and Stull headgates but delivers water over the saddle to the Dry Creek drainage area, will be briefly considered. The Durkee Ditch, diverting primarily from Currant Creek and Dry Creek and delivering irrigation water to the lower elevation portions on the southwest of Redlands Mesa, will be analyzed separately. Interactions between the systems will be discussed as needed.

OVERLAND, STULL, CURRANT CREEK AND REDLANDS MESA WATER USERS ASSOCIATION

DELIVERY SYSTEM OVERVIEW

The Overland Ditch provides irrigation water primarily from Overland Reservoir and Leroux Creek to Redlands Mesa. The feeder ditch from the Reservoir travels almost 30 miles in both dug ditch and natural drainages, including Cow Creek, until eventually crossing Leroux Creek and joining with diverted flows from Leroux. A headgate and spill structure on Cow Creek just before its junction with Leroux Creek diverts water through a flume and then across a 48" steel trestle pipe above Leroux Creek from east to west. The diversion from Leroux passes through a headgate and spill structure before joining with the Cow Creek flows upstream of another headgate and spill structure. The combined flows then are measured with an 8-ft Parshall flume with remote telemetry capability before traveling about 3.7 miles around the east side of the large hill above Redlands Mesa until reaching the main box at the top of Redlands Mesa, the Moore Box.

FIGURE 2: OVERLAND 8-FT PARSHALL FLUME WITH TELEMTERY

The Stull Ditch diverts irrigation water from Leroux Creek to Redlands Mesa. The diversion, headgate and spill structure and measuring flume are downstream of Overland's diversion on Leroux and the ditch follows a similar alignment towards the Mesa. At Grassy Gulch, the Overland Ditch flows underneath the Stull which crosses over a low saddle dividing the Dry Creek drainage from Leroux Creek. It traverses around the west side of the large hill above Redlands Mesa until rejoining the Overland at the Moore Box with a total travel distance of for a total of about 4.4 miles. Approximately 2,200ft of the Stull ditch is currently piped with 48", 54" or 60" corrugated metal pipe (CMP) in various states of deterioration.

The Currant Creek Ditch diverts water from Leroux Creek just downstream of the Stull diversion and follows the terrain below the Stull ditch. The Overland passes under it at Grassy Gulch and then flow from the Currant Creek Ditch passes under the Stull Ditch and into the Dry Creek drainage. Figure 2 below shows the existing configuration of these ditches.

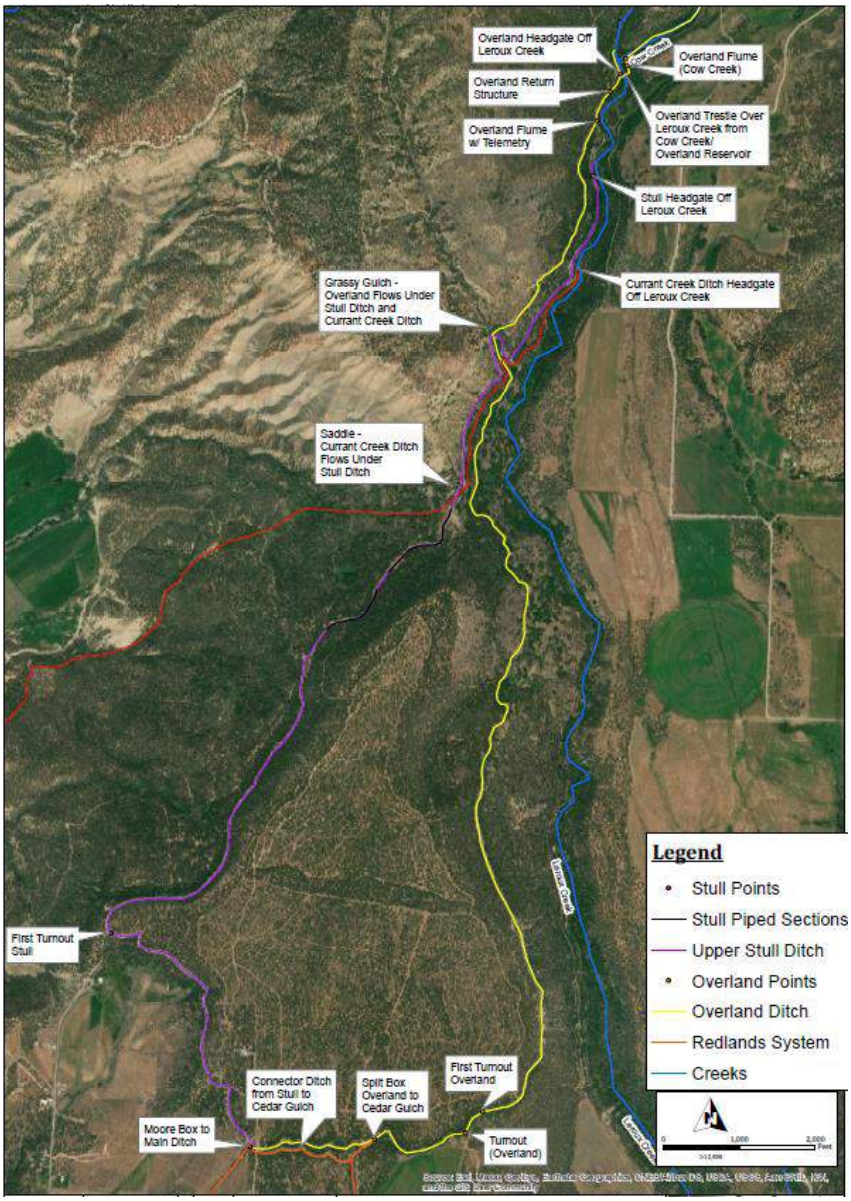


FIGURE 3 UPPER SYSTEM MAP

The distribution area consists of several main laterals including the Cedar Gulch Lateral, the Lawhead Lateral and the Clark Draw Lateral. Distribution is achieved through adjustable split boxes that divide water proportionally based on flow conditions in the ditches, i.e. early water runoff conditions or late water "call" periods. The ditch rider sets these boxes twice a week to ensure appropriate delivery of shares to users. The mapped alignments and points shown in Figure 3 below are maintained and operated by the RMWUA.

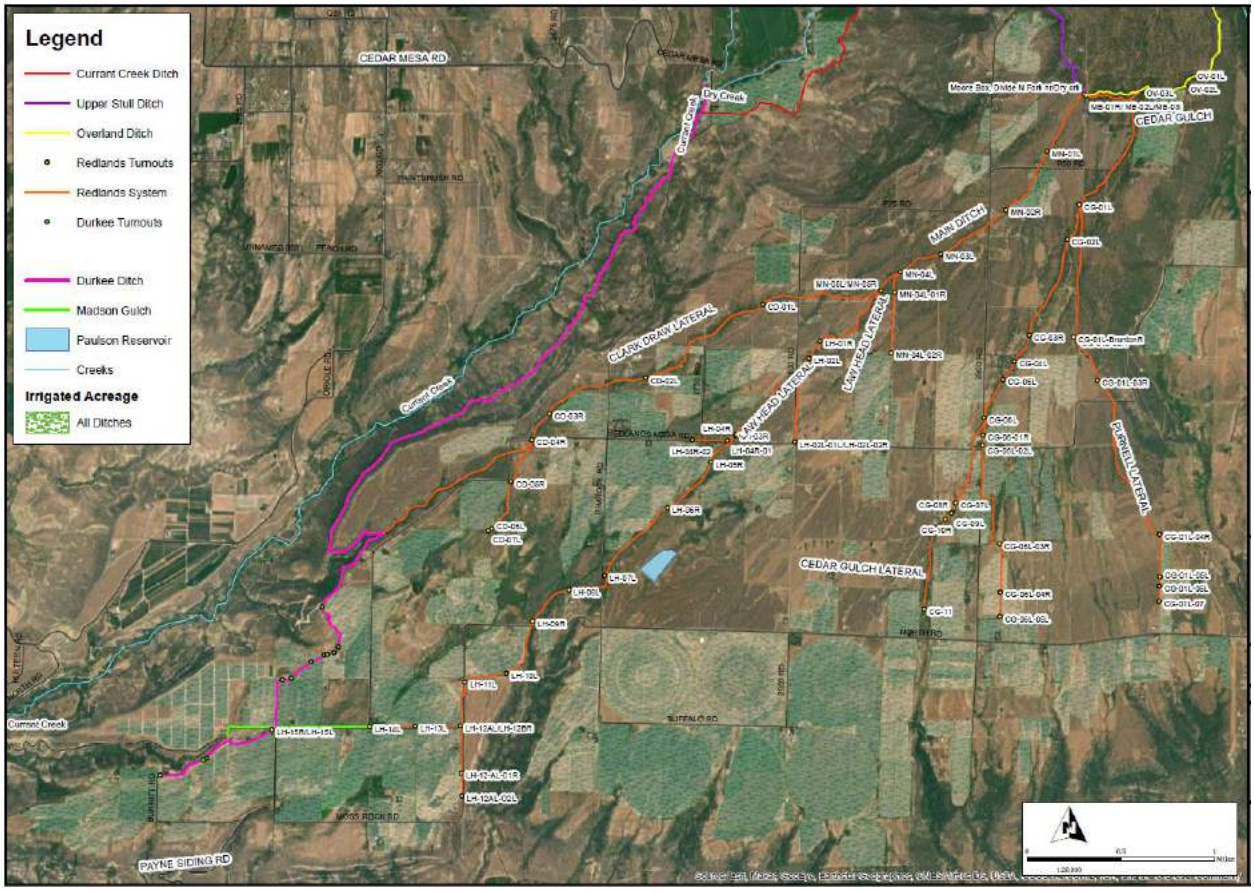


FIGURE 4 DELIVERY AREA OVERVIEW MAP

The Delivery Area Topographical Map included in Appendix B shows the distribution system in the context of topography with contours every 20ft and darker lines every 100ft elevation. These show an appreciable amount of fall within the system as the irrigation water is delivered to end users.

WATER RIGHTS, DIVERSIONS, AND DESIGN FLOW

The design flow for the combined RMWUA/ODRC system takes into consideration both historic maximum diversions as well as decreed water rights. The Stull Ditch's original decree was for 10.8cfs in 1908. However, the Paonia Project allowed for an extension of the ditch to carry RMWUA water and was expanded to accommodate an additional 44cfs in 1962. The ditch is also used for winter stock water in the amount of 2-3cfs. The Overland Ditch is decreed from 1914 to carry a combined maximum of 75cfs from all of the tributaries it traverses on its ~30 mile path to Redlands Mesa. The sum total of both Overland and Stull is therefore 130cfs.

In order to analyze peak flows to Redlands Mesa, daily diversion data from the Colorado DNR for both the Overland Ditch and Stull Ditch was obtained. The daily diversions were summed to yield combined peak flows. These values from the 20 years from 2003-2022 are shown in Figure 5 below.

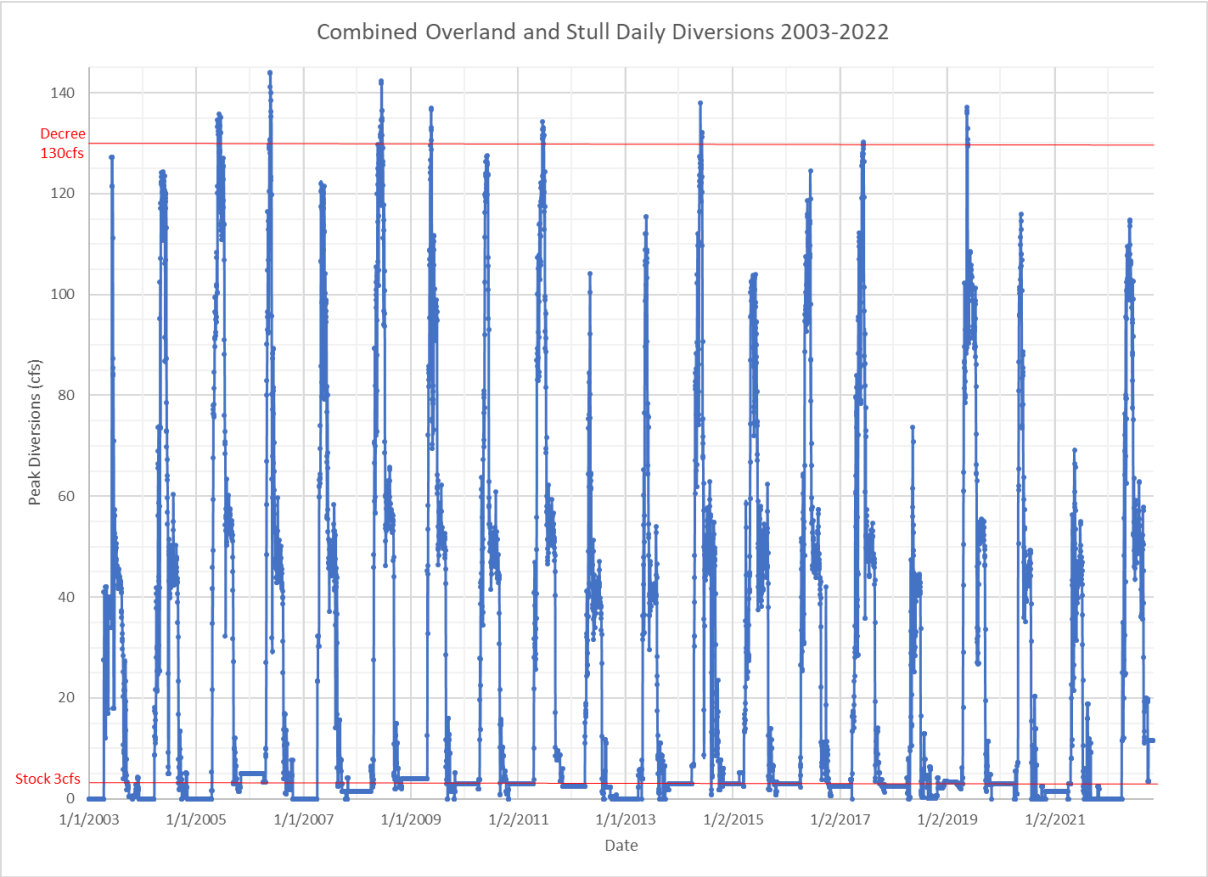


FIGURE 5 COMBINED OVERLAND AND STULL DAILY DIVERSIONS

It is worth noting that the combined decreed flow of 130cfs has never been exceeded by more than 10%. The data was analyzed further to determine average maximum peak flows and the frequency of flows above thresholds of interest. Table 1 below compares the combined flows with the Stull and Overland individually.

The average maximum daily diversion over the last 20 years can be compared with the average over the last 10 years and against the max decree. While the combined flow maximum on average is below 130cfs on both a 10-year and 20-year timeframe, it is interesting to note that the Overland peak flow on average has declined significantly since 2013. The last 10 years also had fewer days on average where the combined flows exceeded the combined decree, with 3 days/year compared to the 20 year average of 7 days/year. Also, only 4 of the last 10 years had days where combined flows exceeded the decree whereas 12 of the last 20 did. These differences can be attributed both to management of the water by the water commissioner and ditch companies as well as recent hydrology. Current available science points towards a drying trend in Western Colorado. That is to say, the hydrology of the next 50 years is much more likely to look like the 2013-2022 period than before 2013.

TABLE 1 FLOW EXCEEDANCE OF STULL, OVERLAND AND COMBINED

Ditch	Decree Max Flow (cfs)	2003-2022 20-yr Average Maximum Daily Diversion (cfs)	2003-2022 20-yr Average Number of Days Per Year Above Decree (days/365)	2003-2022 Percentage of Years Diversion Exceeded Decree At Least Once	2013-2022 10-yr Average Maximum Daily Diversion (cfs)	2013-2022 10-yr Average Number of Days Per Year Above Decree (days/365)	2013-2022 Percentage of Years Diversion Exceeded Decree At Least Once
Combined: Stull + Overland	130	121	7	60%	112	3	40%
Stull	49	47	3	25%	48	5	40%
Overland	75	80	12	65%	70	3	40%

Assuming the 10-15% carriage losses across the miles these ditches traverse to arrive at the Moore Box, 130cfs total diversion at the flumes currently equate to 111-117cfs at the top of the delivery area. Piping the 4.3-mile alignment to the Moore Box would eliminate carriage losses and therefore a design flow of 117cfs is appropriate for a maximum flow condition. However, the full 120cfs decreed flow will be modeled as well.

Currant Creek Ditch has the #2 Priority diversion on Leroux Creek amounting to 7cfs along with Priority 13 for an additional 2cfs. They also divert 1.5cfs of winter stock water. They also own some "Project water" or LCWUA shares delivered through their ditch, which brings their total peak flow to 18cfs. If the Currant Creek Ditch water were to be conveyed in the same pipe with the Overland and Stull, the maximum design flow would increase by 18cfs to 148cfs from the diversion on Leroux Creek to the Currant Creek turnout at the saddle.

RMWUA administers water across its system very effectively using Excel spreadsheets based on shares allocated to each shareholder. Design flows at and past each turnout were determined based on the percentage allocation of each user during peak "early water" runoff flows using the design flow of 130cfs to Redlands Mesa.

HYDRAULIC ANALYSIS & FEASIBILITY LEVEL DESIGN

Analysis was divided into two components: the upper system from Leroux Creek to the Moore Box, and the delivery area from the Moore Box downstream to the extent of RMWUA maintained laterals. Publicly available LiDAR data collected from Colorado's Hazard Mapping Portal was used to determine the slope and topography of the system. This was supplemented with survey data collected by Applegate engineers in July and October 2022. The survey corroborated the accuracy of the LiDAR for feasibility level analysis.

UPPER SYSTEM

Profiles of the Overland and Stull ditch alignments from Leroux Creek to the Moore Box were generated using GIS tools and the LiDAR data. The profiles and topography were examined and analyzed to determine the most efficient, cost effective and constructible combined pipeline alignment.

The proposed alignment would divert water for the combined ditches from Leroux Creek at the existing Overland diversion and take advantage of the existing infrastructure on both sides of the Leroux Creek including the headgate with spillway, flume, and trestle on the Cow Creek side. A one-dimensional hydraulic model of the Overland channel downstream of the Leroux Creek diversion to the existing flume, including the two headgate and return structures, was built and analyzed. The structures in their current configuration would overtop the concrete spillway at the upstream structure with only 90cfs from Leroux Creek. Some regrading below the first return structure is recommended due to sediment deposits creating a mound over time. Also, the shallow slopes between the second return structure and flume indicate that improvements to the flow regime in that section would greatly benefit the functionality of the gates and flume. As the figure below shows, the channel capacity cannot be expanded by widening the canal due to a steep slope on the uphill side and an already narrow road on the other bank. The model was adjusted to consider shotcrete liner for 430LF in this section and then recomputed. With the improved flows, the water surface was lowered along the length of the channel. However, the full 148cfs from Leroux Creek would necessitate adding 6" to the concrete spillway of the first structure to an elevation above 7255.0 feet. Therefore, the improvements needed from Leroux Creek to the flume would include the aforementioned shotcrete lining for 430LF and some additional concrete work on the spillway of the first return structure.

FIGURE 6 OVERLAND CHANNEL ABOVE FLUME

The existing 8ft Parshall flume with telemetry is fully functional and could be used to measure the combined flows and transmit the recorded data since the current configuration would be able read high flows to over 120cfs. Immediately downstream of the flume is an existing 4x4 road that drops down to the Stull alignment. The proposed new alignment would include a pipe entrance structure with a trashrack immediately downstream of the flume and the new pipe alignment would follow near the existing road from the Overland down to the Stull alignment.

The Stull alignment was chosen for the majority of the proposed combined alignment for multiple reasons. The topography above and below the Stull Ditch is generally less steep than the Overland from Leroux Creek to Grassy Gulch which aids constructability and long-term stability. Also, at one point, the Overland ditch falls rapidly through a small canyon with large rock outcroppings which could add tremendous expense to the construction. Lastly, there is approximately 50ft of fall available between the Overland flume and Stull alignment that would serve to "push" water through a pressure pipe to the Moore Box. The hydraulics will be discussed in detail later in this study, but this fall and configuration will allow the pipe to be downsized and much more cost effective.

Another cost savings in the proposed combined alignment includes an inverted siphon across Grassy Gulch. This siphon would shorten the new alignment by 750ft and save the associated costs for

materials and construction. The proposed alignment would again follow the existing Stull alignment to the saddle between the Leroux Creek and Dry Creek drainages. If the Currant Creek Ditch flow was included, a turnout would be installed at this point.

The pipeline would proceed west around the hill to the Moore Box. Again, as compared to the Overland Ditch alignment which wraps around to the east, the Stull Ditch alignment was selected because there would be relatively less rock encountered in excavation, less steep terrain on either side of the ditch and the alignment is less prone to unstable geologic conditions. From Grassy Gulch to the Moore Box, the Stull alignment is also about 700ft shorter.

The profile of the proposed combined alignment is shown below in Figure 7 and maps depicting the alignments and associated infrastructure are found in Appendix A and B, respectively.

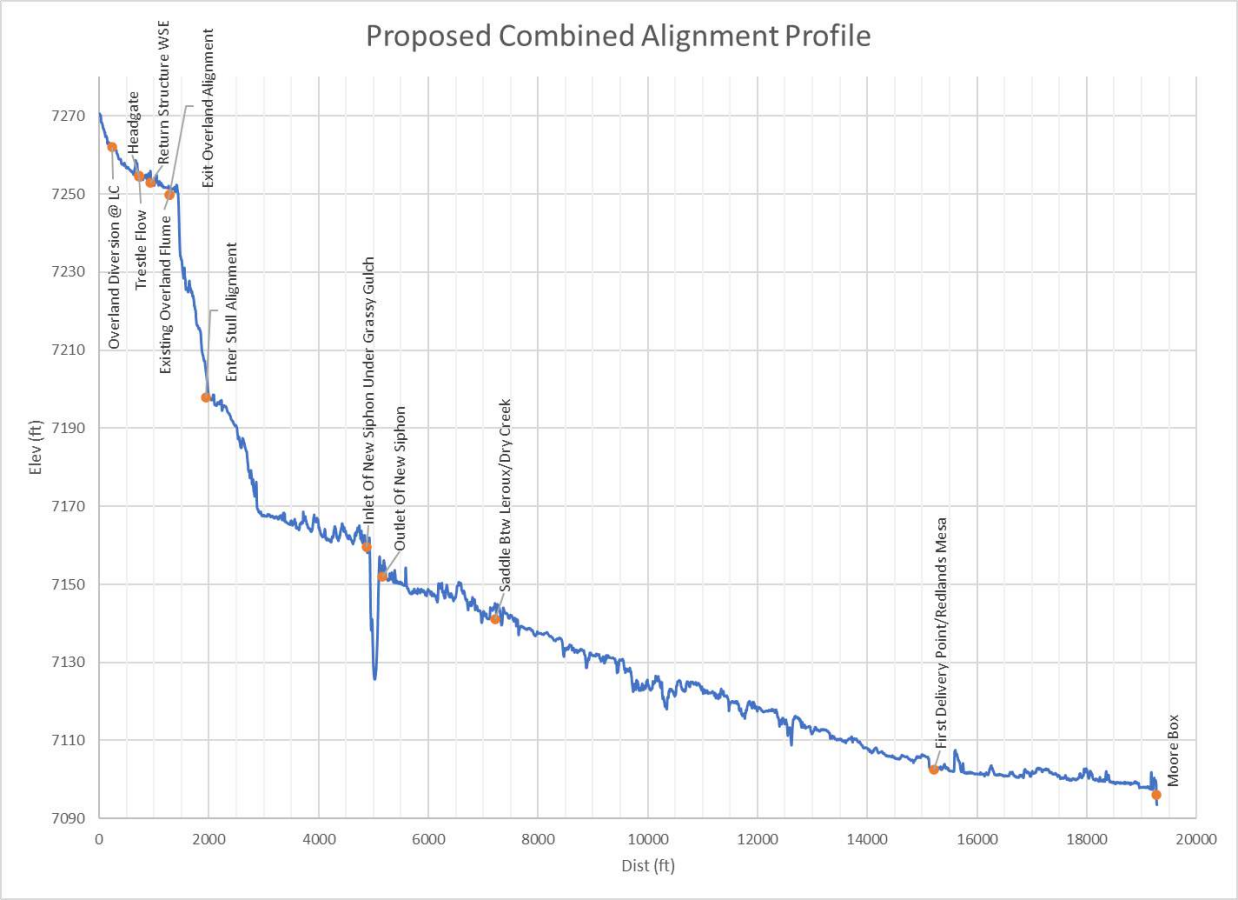


FIGURE 7 PROPOSED COMBINED ALIGNMENT

Hydraulic analysis was conducted to aid in selecting proposed pipe types and sizes that would carry the design flow. While open channel pipe would need to be sized based on slopes of sections of the alignment, with larger pipe sizes needed for shallower slopes, a pressurized pipe from downstream of the flume to the Moore Box would allow the 22,900LF pipe to flow full along the entire alignment during peak flows. Only one or two turnouts would occur along the alignment: one for the Currant Creek Ditch if that company decides to cooperate with RMWUA and ODRC and one for the first Stull user above the Moore Box. A design velocity between 10-15 feet per second (fps) would be appropriate. The ideal pipe type and size would minimize hydraulic disturbances such as elbows,

withstand the pressure under a static condition, and yield a maximum velocity below 15fps. Crucially, the friction losses in the pipe at peak flow could not exceed the 155ft of elevation fall available in alignment. 48" diameter high density polyethylene (HDPE) pipe rated at 50 psi (DR41) meets those criteria. This pipe would have a velocity of 13.1fps at the design flow of 148cfs with a total friction loss of 131.5ft along the entire alignment. The velocities would be slowed down near the Moore Box by enlarging the pipe to 63" HDPE for the final 100ft or so of the alignment. HDPE could be fused into 500-1000ft lengths and bent around most of the curves of the alignment without need for more than a few elbows. Though constructability would be more challenging than PVC pipe in some ways, the cost and time of saving of the pipe itself and the lack of elbows and thrust blocking would more than make up for the difficulty of dragging the pipe into place.

In terms of pressure rating, the proposed pipe would break to atmospheric pressure in a new concrete structure that would replace the Moore Box. This would ensure that pressures inside the pipeline would never exceed the 50psi rating of the DR41 HDPE pipe as the hydraulic grade line of the profile shows about 30psi maximum head physically attainable in the pipeline. Water would enter the structure into a headbox that would further calm the water. A weir wall would be cast into the structure and would serve to set the required minimum water level in the headbox necessary to deliver water to the first two Overland turnouts as well as Cedar Gulch and the first lateral on the Main Ditch. Deliveries to these laterals would be set with slide gates in the headbox and water would be measured with flow meters. All excess flow would pass over the weir wall and into the Main Ditch.

In order for the system to operate properly under a combined scenario where Overland is abandoned, the first two turnouts on the Overland system, named OV-1 and OV-2, must still be served by the system. Because they are higher in elevation than the Moore Box, a pipe with sufficient head to push the design flows for those turnouts would need to be designed and installed. Preliminary hydraulic calculations show an 18" would carry the flows for about 3,300LF to OV-1 and 2. Almost all of the Overland alignment (and most of the Currant Creek ditch above the saddle) would need to be abandoned and reclaimed by seeding. This could include dozing the ditch bank into the ditch and making a relatively flat surface on which seed could be applied. Other assumptions for operation include leaving the first 300ft of the Stull ditch, which includes the headgate, flume and return, intact. A pipe with valve could connect to the 48" main pipe. Since the Stull diversion structure is designed to sweep the creek, flows under about 80cfs could more easily be diverted there.

Upper System Alternatives Due to Easement Complications

Both ditches traverse Bureau of Land Management (BLM) property for a significant portion of their alignments. Consultation with BLM was initiated to discuss easements for the ditches and the potential to combine the Overland flow into the Stull alignment. Unfortunately, this would "require a new ROW (right-of-way) issued under the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA ROW issuance would be subject to ROW processing fees and annual rent payments to the BLM" (email from Jana Moe, BLM, March 20, 2023). This would entail abandoning the historic, prescriptive easements the ditches hold to carry water across BLM land. Since this is not in the best interest of the ditch companies, alternatives that would retain the historic easement were explored further.

Both the Stull and Overland ditches were analyzed separately to carry their maximum decreed flows of 55cfs and 75cfs respectively. 36" DR32.5 HDPE pipe could carry each ditches' max flow if they were

piped separately in their own alignment. No siphon was assumed on the Stull ditch to avoid any new easement with the BLM. The Overland Pipe would start just before a large drop in elevation upstream of Grassy Gulch. New structures at the end of the pipelines, including the Moore Box, would be designed to deliver flows as they are currently.

Finally, options were explored in which only the Stull or only the Overland ditch was piped. Overland would need a larger 42" pipe to carry flows through the majority of the season. The Stull ditch would then only carry water at high combined flows above 120cfs. Alternatively, the Stull could be piped with 36" pipe and Overland would run at high flows above 60cfs combined. Since this could only about half the total combined flows, piping Stull only was not explored in detail. Either options, however, would still eliminate the issue of seepage during project water delivery while minimizing the total project cost and construction effort.

DELIVERY AREA

Hydraulic analysis for the delivery area commenced after identifying which laterals would be worth piping. Since much of the system conveys water through natural draws or gulches, the topography was examined for constructability. For the most part, the draws carrying irrigation water, namely Cedar Gulch, Clark Draw and Lawhead Gulch, are steeply sided and heavily wooded, making construction of a pipeline challenging. Because the Bureau of Reclamation generally does not assign salt loading to natural drainages, these are the least cost effective parts of the system to line or pipe.

The topography on Redlands Mesa lends itself towards gravity pressurization of laterals and turnouts. We therefore modeled several laterals or sections of laterals as pressure pipe systems to enable on-farm efficiency improvements. Publicly available LiDAR data was used in conjunction with turnout locations provided by the Delta Conservation District to determine elevations at each turnout. Share data provided by the RMWUA in an excel spreadsheet divided 75cfs from Overland and 45cfs of project water in the Stull Ditch through the system to determine flow rates at each turnout. The 10cfs for the native Stull ditch flow was also assigned to the appropriate shareholders with turnouts towards the end of the Lawhead lateral. These design flows were inputs to EPANET 2.2 models created for each lateral to verify pipe sizing. Pipe velocities were generally kept below 5fps with a maximum of 6fps (less than the 7fps recommend in Ram Dhan Khalsa's "Butterfly Valves in Agricultural Pipeline Irrigation Systems"). The resulting pipe sizes are represented visually in the Proposed Delivery Area map in Appendix B.

Modeled pressures in pipelines and in turnouts were considered for determining pipe pressure classification as well as additional costs for high pressure turnouts. All pressure systems were assumed to have a screening and spill structure at the inlet to ensure clean enough water for operability of valves downstream and an overflow in the case that supply of water exceeded system demand.

The Purnell Lateral would consist of pipe sizes ranging from 18"-10" in diameter for a total piped length of 12,060LF. Turnout pressures would range from 30-55psi. Two pressure reducing valves (PRVs) would be needed along the alignment as the tremendous amount of fall in the system would otherwise cause the pressures to exceed the pipe pressure rating and prevent turnout valves from operating properly.

The Cedar Gulch Branch A Lateral would consist of pipe sizes ranging from 16”-10” in diameter for a total piped length of 6,260LF. The pipe for the first ~2,300LF could be upsized (24-20” diameter) to include flows to turnout CG07 currently on the main Cedar Gulch to the west about 750ft across 2900 Rd. This turnout could be split off in a separate pipeline at a future date to provide pressurization there. Without this, only the last turnout would have significant pressure available at about 69psi.

The Clark Draw Lateral splits from the main ditch and is carried about 2700LF in a “dug ditch” until flows enter the natural drainage of the Clark Draw. Maintenance issues and seepage losses could be avoided by piping this section and because the ditch is manmade prism, salt credit would be available to make the improvements more cost effective. 16” diam. open channel pipe could carry the entire flow of this lateral from the main ditch to the Clark Draw. Flows exit the draw shortly after the “Durkee Dump” which sends shares from Redlands/Overland down to the Durkee Ditch. The lower half of the Clark Draw Lateral was modeled as a pressure system. To gain appreciable pressure for turnouts on the lateral, the piping would need to start from 930LF before it exits the draw. Pipe sizes range from 24” to 18” pipe and turnouts would have pressures of 11-33psi available. The majority of the shares are delivered to the end of the lateral so 85% of the shares able to take advantage of the pressure would have 32psi or more at their headgate.

The Lower Lawhead Lateral has significant potential for pressurization for shareholders both with and without sprinklers systems at present. Piping from the split from the natural drainage east of Rimrock Rd would allow 10 turnouts to achieve pressures ranging from 17 to 64psi. About 14,200LF of ditch would be piped with sizes ranging from 36” to 10” in diameter. A large 18” PRV would be necessary about midway through the system. Unfortunately, several of the laterals the RMWUA maintain in this area were not recorded by the USBR and would not receive salt credit for piping. Combined with the relatively higher flowrates associated with Stull shares necessitating larger pipe sizes, piping this lateral would be one of the least cost effective using Salinity funds.

An existing storage vessel, Paulson Reservoir, could also provide buffer storage as part of a pressurized system. Decreed for 66.1 ac-ft decreed with a total height 18.8ft, the dam is generally in sound condition. The 12” CMP outlet pipe is deteriorating and the gate may need some rehabilitation, but otherwise, the reservoir is in good order. Ideally, the system would be able to draw directly from the reservoir on-demand to allow the reservoir to fluctuate naturally with supply and demand. However, significant financial and technical barriers, such as a screening or filtration system at the reservoir intake of the pipeline and the complete replacement of the existing outlet pipe, ruled out the feasibility of this option. Paulson could still be used as buffer storage if excess flows were routed through it in times of lower demand and flows released during high demand or after the irrigation delivery has ended. A 12” pipe could split off the Lawhead Lateral above the reservoir to bring water into it and the existing 12” outlet could be replaced with a cast-in-place pipe (CIPP) and piped below the dam to the main lateral pipe intake structure. This amounts to about 2,700LF of 12” diameter pipe.

Lastly, the entire Cedar Gulch Lateral was assigned a significant amount of salt credit as the USBR did not consider it a natural drainage. Therefore, we analyzed a pipe option that would bypass the upper section of Cedar Gulch oriented due south from the Moore Box to the split of Cedar Gulch with Purnell. Because of the steep slope, a relatively small 28” diameter pipe can carry the entire 51cfs flow for the lateral. A new easement would need to be obtained from adjacent landowners, but the potential cost

savings is worth the investigation of legal feasibility. This will be discussed in cost evaluation for the upper section.

COST EVALUATION

An engineer's opinion of probable cost was prepared for both the upper system and the laterals in the delivery area. Materials costs were based on recent budgetary level pipe quotes from local suppliers or materials purchased within the last 6 months. Construction costs were based on recent bids for similar projects with factors to adjust based on differences in scope and scale. Design, NEPA and other costs were based on actual funds spent on recent similar projects. A summary of the total costs is shown in the tables below. Appendix C contains detailed cost estimates. These estimates assume that Salinity Control funds will be used to fund the project; therefore, costs for habitat mitigation, NEPA permitting and cultural resource studies were included in the estimates.

The costs for piping the Stull and Overland ditches separately was not as favorable from a salt loading perspective. However, adding in two smaller, cost-effective components, namely the Cedar Gulch 28" cutoff pipe and the Purnell Lateral, could bring the cost of salt per ton down significantly. Therefore, these were added into two of the four options for the upper system which were evaluated and compared.

UPPER SYSTEM

TABLE 2 UPPER SYSTEM COST ESTIMATE SUMMARY

RMWUA/ODRC

Salinity Control - 2023 FOA Application

Option	Description	Cost
1a	Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches	$ 5,212,817
1b	Upper Section - Leroux Creek to Moore Box - Combine without Currant Creek	$ 5,162,655
2	Overland and Redlands Separate Pipes with Cedar Gulch + Purnell	$ 7,725,226
3	Overland 42" with Cedar Gulch and Purnell	$ 5,430,263

DELIVERY AREA

TABLE 3 LOWER SYSTEM COST ESTIMATE SUMMARY

RMWUA/ODRC

Salinity Control - 2023

Lateral	Turnouts Pressurized	Cost	Section Length (LF)	Cost/ft
Purnell	7	$ 1,083,411	12,060	$ 90
Cedar Gulch Branch A	3	$ 539,560	6,265	$ 86
Clark Draw	4	$ 730,722	6,760	$ 108
Lower Lawhead	10	$ 2,263,819	14,260	$ 159
TOTAL	24	$ 4,617,512	39,345	$ 117

FUNDING PLAN & SALINITY PROGRAM CONSIDERATIONS

Salt loads for various sections of the Overland, Stull, and Currant Creek ditches as well as the RMWUA laterals were obtained from the Bureau of Reclamation in February 2023. The salt loading of the upper section including the Overland, Stull and Currant Creek Ditch is 3,081 tons/year. The lower section salt loading for the analyzed laterals is 1,513 tons/year. The annual salt load can be used with the engineers' opinion of probable cost to calculate the amortized cost per ton assuming a 50-year lifespan of the project. The upper section combined option is very cost effective at $64.20. Other options for the upper system that would retain the historic easements are significantly less favorable in terms of cost effectiveness. The laterals varied in their assigned salt loads and therefore had widely variable degrees of cost effectiveness from a salt perspective. See the comparison tables below.

TABLE 4 UPPER SYSTEM COST ESTIMATE SUMMARY WITH SALT LOADS

RMWUA/ODRC

Salinity Control - 2023 FOA Application — 0.03795

Option	Description	Cost	Salt Load	$/ton	Buy down	New $/ton
1a	Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches	$ 5,212,817	3,081	$ 64.20		
1b	Upper Section - Leroux Creek to Moore Box - Combine without Currant Creek	$ 5,162,655	2,760	$ 70.98		
2	Overland and Redlands Separate Pipes with Cedar Gulch + Purnell	$ 7,725,226	3,579	$ 81.91	$ 670,000	$ 74.80
3	Overland 42" with Cedar Gulch and Purnell	$ 5,430,263	2,234	$ 92.24	$ 1,020,000	$ 74.92

TABLE 5 LOWER SYSTEM COST ESTIMATE SUMMARY WITH SALT LOADS

RMWUA/ODRC

Salinity Control - 2023 — amortization factor 0.03795

Lateral	Turnouts Pressurized	Cost	Section Length (LF)	Cost/ft	Salt Load (tons/yr)	$/ton
Purnell	7	$ 1,083,411	12,060	$ 90	659	$ 62.39
Cedar Gulch Branch A	3	$ 539,560	6,265	$ 86	224	$ 91.41
Clark Draw	4	$ 730,722	6,760	$ 108	364	$ 76.18
Lower Lawhead	10	$ 2,263,819	14,260	$ 159	266	$ 322.98
TOTAL	24	$ 4,617,512	39,345	$ 117	1513	$ 115.82

During the 2019 USBR Salinity Program Funding Opportunity Announcement (FOA) funding cycle, the maximum amount funded was approximately $69 per ton and the weighted average was about $59/ton. Due to inflation and particularly pipe and fuel cost increases, the 2023 funding cycle will most likely have a significantly higher target. While unknown at this time, it is our professional opinion that the weighted average will be closer to $65-75/ton.

Additional funding sources could be secured to "buy down" and make the project more cost effective for salt reduction in the eyes of the Bureau. The most likely source of significant additional funding at this time is a low interest loan from the CWCB which currently has an interest rate of 1.8 percent and a term of 30 years. The annual payment on a $100,000 loan would be $4,343. Buy down amounts

to bring upper system alternatives below $75/ton are listed. While cost savings in the proposed cost estimate can be discussed, any upper system option in which the historic easement would be retained will require significant buy down to attain a favorable application for the Salinity Program.

However, cost effectiveness accounted for only 35% of the evaluations ranking, with "Enable on farm salinity control" (i.e. pressurized system) accounting for another 30%. Generally, to secure credit for this category, the project would need to provide 35 psi at the user turnout or an explanation how a lower pressure would be utilized to improve on farm irrigation. The pressure generated by the Purnell and Lower Lawhead lateral would exceed 35 psi and therefore piping these laterals would score points in this area. The remaining items were approximately 10% each: Project plan; Operations and management plan; Performance if you previously received a Reclamation grant; and Meeting U.S. Department of Interior goals. Applegate will assist in drafting these plans as part of the grant application.

In previous FOA's, the Bureau has given credit to applicants who have a preliminary plan for habitat replacement. We highly recommend meeting with an experienced habitat consultant to explore feasible conceptual level habitat projects. A letter of commitment from a landowner willing to work with the companies on a habitat project if the Bureau awarded Salinity funds would increase the chances of success.

Other grants such as the Water Supply Reserve Fund, USBR Water Smart program, Colorado River District and others could contribute some funds but not likely to the extent of the Salinity Control Program or a CWCB loan. For the Lower Lawhead, the USBR Water Smart program would be the most likely source of funding. This program funds projects that increase efficiency, add pressure, multiple stakeholders, etc. Up to 50% of the total project would be funded through this program so matching funds from State or other grants or loans would be required.

DURKEE DITCH

Durkee Ditch diverts water from both Currant Creek and Dry Creek just above the confluence of the two creeks approximately 4.5 miles east of Cedaredge, CO. The alignment travels 4.7 miles until the first turnout on Redlands Mesa. Another 1.3 miles of ditch are maintained on the mesa with a total of 11 turnouts dividing 500 shares. The ditch provides irrigation water to approximately 500 acres of land with crops including, grass hay, alfalfa, orchards and vineyards. An overview map of the Durkee Ditch is available in Appendix B.

A field visit by Applegate engineers was conducted on September 7th, 2022 to ascertain the goals of the ditch company and to observe the condition of existing infrastructure and ditch alignment. Board president Wyatt Wilson led the tour. The infrastructure at the top of the system includes a culvert under Rimrock Road from Dry Creek, a diversion and headgate from Currant Creek followed by a trestle over Currant Creek, a headgate and return structure and a Parshall flume.

During the visit, the headgate on Currant Creek was effectively diverting the entire flow of the creek. The headgate structure consists of relatively intact concrete with a deteriorating wooden gate with a steel frame. The flow enters a CMP and the traverses across a steel trestle with steel supports that is rusting but functional. The return structure receives the combined flows from Dry Creek and Currant Creek and regulates the flow into Durkee Ditch while spilling the remainder back to Currant Creek. The concrete structure appears to have had three walls recently replaced. The two gates are also wooden with steel frames and they seem to be robust and in good working condition.

IMAGE 1 & 2: HEADGATE FROM CURRANT CREEK AND 4FT PARSHALL FLUME

The 4-ft Parshall flume about 200ft downstream of the return structure was recently placed and is functioning properly. About 200ft downstream of the flume, the Currant Creek Ditch enters the Durkee Ditch with a 12" pipe delivering 6.25 shares of Currant Creek Ditch and any accumulated tailwater. The Durkee Ditch immediately flows through a trashrack and concrete structure into 2,000 Feet of 36" N-12 (ADS) pipe. This was recently installed and does not need to be replaced at this time.

The ditch exits the ADS pipe and flows in an open, earthen channel for approximately 1.6 miles. The canal is lined with grasses and willows with a wide bank and road bench. The ditch then enters another concrete pipe inlet structure with trashrack. The 36" ADS pipe and structure at the inlet were likely not backfilled properly as it is evident that the pipe deflected when backfilled causing the end cast into the concrete to crack. This minor defect could be patched and another 30 years or more of life can be expected from the structure and pipe since they were installed about 20 years ago. 1500LF of piped ditch leads to another concrete structure that transitions to 1500LF of CMP pipe. This pipe is in worse condition with less cover, deformed in places and rusted badly; it is recommended for replacement.

IMAGE 3: REPRESENTATIVE DITCH AND BANK SECTION

The ditch then traverses another 1.8 miles of open channel until it reaches Redlands Mesa. The first turnout is about 1500LF after that. The remaining 1.3 miles is primarily open ditch with one ~1300ft piped section. It is worth noting that the ~3800LF section of ditch from where it crosses North Road to the last turnout (on Burritt Road) is shared maintenance with RMWUA. Turnouts on the system are generally concrete structures with proportional splits.

WATER RIGHTS, DIVERSIONS, AND DESIGN FLOW

The Durkee Ditch has several water rights including Priority #4 on Currant Creek for 5cfs from 1908. A second adjudication from 1908 adds another 4.75cfs at Priority #10 for a total of 9.75cfs in senior rights. A junior right for 11.75cfs was decreed in 1937. The ditch also holds rights for 3cfs of stock water and 0.5cfs for tailwater and springs that enter the ditch along its alignment. Total irrigation rights equal 22cfs.

Daily diversion data from the Colorado DNR from 2000 to 2022 was obtained and analyzed. The average peak diversion during that period was around 9.5cfs with a few exceptions closer to 13cfs in only two of the 22 years. A graphical representation of these historical flows can be found in

Appendix A. During the field visit, the highwater mark on the 4ft measuring flume was observed at about 0.65ft which equates to about 8cfs. This coincides well with the historic data from the State records as the ditch has diverted more than 8cfs in all but two of the last 22 years.

Based on the historical diversions data and conversations with the board president, a design flow of 12cfs was selected.

HYDRAULIC ANALYSIS & FEASIBILITY LEVEL DESIGN

Publicly available LiDAR data collected from Colorado's Hazard Mapping Portal was used to determine the slope and topography of the Durkee Ditch. A profile of the ditch alignment from the headgates to the last turnout was generated using GIS tools and the LiDAR data. The profile and topography were analyzed to determine pipe sizes and types that would lead to the most efficient and cost-effective project.

UPPER SYSTEM

For the upper system from the first pipe inlet structure to the first turnout on the mesa, the slope is generally consistent and shallow with only 40ft of fall in almost 25,000LF for an average slope of 0.0016ft/ft. Hydraulic analysis showed that the same diameter pipe, ID=24", would be required in either a pressure or open channel scenario. With almost 3500LF of recently installed 36" ADS pipe already in place, open channel pipe would allow this existing pipe to be utilized whereas operating the ditch as a pressure pipe would not. Therefore, an open channel flow condition with minimum ID of 24" pipe was selected. The 36" ADS would remain and existing structures modified to tie in the new pipe. However, the 36" CMP should be replaced based on current degradation and a much shorter remaining operational life.

The ditch has many curves and bends throughout its alignment with a wide bench consisting of silty soils that were deposited as sediment in the ditch and removed during cleaning operations over many years. While PVC and other bell and spigot pipes would require a tremendous amount of elbows to stay within the ditch easement, 26" DR 32.5 HDPE pipe (with an ID of 24") could bend to a radius of 87ft without damaging the pipe. A total of 6-8 elbows will still be needed to negotiate tighter bends along the alignment. Compared to hundreds of elbows required by other pipe types, the cost and constructability of HDPE is advantageous. The wide bench would also make HDPE installation easier as there would be room to drag 500-1000ft fused sections along the alignment and be lowered into place. Therefore, 26" HDPE pipe was selected for the upper section.

Another consideration to account for would be the several springs and tailwater inflows occurring in the upper alignment. Screened inlets could be placed on top of the pipeline to allow the collection of these minor flows. Finally, an inverted siphon at the Clark Draw would shortcut ~1650ft of existing ditch; the siphon pipe would be 250ft long and drop 45ft before rising back up to the alignment. This option could save ~1400LF of pipe material and installation cost. However, the draw is very steep with slopes between 2.5:1 and 3:1 which could be challenging for constructability though contractors have successfully constructed siphons in the past on these types of slopes.

The ditch currently receives Redlands Mesa Water Users shares from the Clark Draw amounting to a maximum of 2.53cfs. A 12-18" PVC pipe could carry those flows from the Clark Draw along the existing Durkee alignment for about 700LF to join the Durkee flow at the outfall of the siphon. A

profile of the proposed upper alignment and improvements is included in Appendix A, while maps are included in Appendix B.

Delivery Area

While the conveyance for the upper system is the main challenge and priority for the ditch company, the lower system was modeled as a pressurized delivery system for the sake of the master planning analysis. One challenge is how to include water delivered to Durkee shareholders through the lower Lawhead lateral of the Redlands Mesa system. If the lower Durkee were pressurized, the Redlands water could not flow freely into the pipe where it meets the Durkee at North Rd and Payne Siding. Therefore, it was assumed these shares would be delivered through the Clark Draw and into the Durkee system. A screening and spill structure on the upstream end would allow the pressure pipe to overflow if needed. A small draw just upstream of Turnout #2 was identified as the best location based on observations and Board input. A long, narrow regulating reservoir could be created by widening the ditch for several hundred feet above Turnout #2. This would serve as both a settling basin and buffer capacity for the fluctuations between supply and demand.

Hydraulic calculations to determine pipe sizes used flow rates based on shares delivered at each turnout (provided by the Delta Conservation District). Pipe sizes were selected to ensure a maximum velocity of 5fps in the pipeline. HDPE pipe was selected based on price and continuity with the upper system. About 1280LF of 18" PVC pipe installed around 2018 currently exists north of North Rd but would not carry the desired flows and would need to be replaced.

If additional RMWUA shares currently delivered further downstream on the ditch through the Lawhead lateral were included in a pressurized system, 18" PVC pipe would be needed to carry flows from the Clark Draw to the Durkee pipe and 30" HDPE would be needed for the Durkee ditch from the siphon outlet to Turnout #2. We recommend using these pipe sizes if piping the upper system to leave room for future pressurization. All costs and maps reflect the additional capacity.

An EPANET 2.2 model was created to model pressures in the pipeline at turnouts under max flow and static conditions. Static pressures would not exceed 63psi, the rated pressure of DR 32.5 pipe, at the end of the system, so this pressure class is justified. A map of the delivery area featuring proposed pipe sizes, turnout locations and working pressures during max flow at the turnouts is included in Appendix B. A profile generated from the LiDAR with turnouts and working pressures is included in Appendix A.

COST EVALUATION

An engineer's opinion of probable cost was prepared for the upper system, both with and without the siphon option, and the whole system including piping the delivery area. Materials costs were based on recent budgetary level pipe quotes from local suppliers. Construction costs were based on recent bids for similar projects with factors to adjust based on differences in scope and scale. Design, NEPA and other costs were based on actual funds spent on recent similar projects. A summary of the total costs is shown in the table below. Appendix C contains detailed cost estimates. These estimates assume that Salinity Control funds will be used to fund the project; therefore, costs for habitat mitigation, NEPA permitting and cultural resource studies were included in the estimates.

Durkee Ditch Piping			
Engineer's Opinion of Probable Cost		Upper Section Only Siphon Option	Upper and Lower Sections
Category	**Description**	**Cost**	**Cost**
Project Design	Coordination, site visits, survey, engineering design, construction plans, bidding services	$ 83,101	$ 130,907
NEPA & Habitat	NEPA compliance documents, cultural resource study & mitigation, habitat replacement analysis and site installation	$ 137,116	$ 201,140
Materials	All HDPE DR32.5 and other pipe, valves and other appurtenances	$ 888,072	$ 1,156,588
Construction Contractor	Mobilization and bonding, pipeline installation incl. turnouts and structures, final reclamation	$ 1,189,454	$ 1,752,448
Construction Management	Construction Coordination and site observation, QA/QC, design modfications, payment applications/change orders	$ 83,101	$ 130,907
SUBTOTAL - Construction Costs	Sum of Materials, Construction Contractor and Management	$ 2,160,627	$ 3,039,943
TOTAL COST	Sum of all categories	**$ 2,380,844**	**$ 3,371,989**

FUNDING PLAN & SALINITY PROGRAM CONSIDERATIONS

Salt loads for various sections of the Durkee Ditch were obtained from the Bureau of Reclamation in February 2023. The total salt loading of the entire ditch is 1,504 tons/year. The annual salt load was used with the three engineers' opinion of probable cost to calculate the amortized costs per ton assuming a 50-year lifespan of the project. The costs per ton for the three options are shown in the table below:

	Upper Section Only Siphon Option	Upper and Lower Sections
TOTAL COST	$ 2,380,844	$ 3,371,989
Salt Reduction Cost Efficiency ($/ton)	$ 81.92	$ 91.22

During the 2019 USBR Salinity Program Funding Opportunity Announcement (FOA) funding cycle, the maximum amount funded was approximately $69 per ton and the weighted average was about $59/ton. Due to recent rapid inflation, the 2023 funding cycle will most likely have a significantly higher target. While unknown at this time, it is our professional opinion that the weighted average will be closer to $70-80/ton.

However, in 2019 cost effectiveness accounted for only 35% of the evaluations ranking, with "Enable on farm salinity control" (i.e. pressurized system) accounting for another 30%. Generally, to secure credit for this category, the project would need to provide 35 psi at the user turnouts or an explanation how a lower pressure would be utilized to improve on farm irrigation. For the Upper Section Only options, no pressurization would be available. Even if the entire system were piped, the pressure generated at only the last three turnouts would be above 35 psi. If those landowners were committed to using the pressure for on-farm improvements, the application could score some points. The remaining items were approximately 10% each: Project plan; Operations and management plan; Performance if you previously received a Reclamation grant; and Meeting U.S. Department of Interior goals. Applegate will assist in drafting these plans as part of the grant application.

In previous FOA's, the Bureau has given credit to applicants who have a preliminary plan for habitat replacement. We highly recommend meeting with an experienced habitat consultant to explore feasible conceptual level habitat projects. A letter of commitment from a landowner to work with the ditch company on a habitat project if the Bureau awarded Salinity Funds would increase the chances of success in the grant application.

According to the cost estimates, even the most cost-effective option for this project may need to have additional funding sources secured to "buy down" the cost of the project. This would allow the salt reduction to be more cost effective in the eyes of the Bureau leading to a more likely award of Salinity funds. The most likely sources of significant additional funding at this time would be State grants or loans. The Water Supply Reserve Fund currently has additional funding due to severance taxes and the local Gunnison Basin Roundtable has been incentivized to spend the money in their accounts. The state matching Aging Infrastructure fund can supplement the Roundtable funds with additional money for the project from a separate pool but available through the same grant program. Alternatively, a low interest loan from the CWCB currently has an interest rate of 1.8 percent and a term of 30 years. The annual payment on a $100,000 loan would be $4,343. The equivalent amortized cost of $75/ton would require an additional $200,000 in funding for the "Upper Section Only Siphon Option." Alternatively, cost savings in the proposed cost estimate can be refined through a variety of means, including soliciting quotes from local contractors for per foot costs of pipe installation.

Other grants such as the USBR Water Smart program, Colorado River District and others could contribute funds to this project but not to the extent of the Salinity Control Program or a CWCB grant or loan. Other grants typically require multi-benefits such as stream or ecosystem benefits, water savings, telemetry or automation, or the enabling of on-farm efficiency. A straightforward open channel piping project such as this one may qualify for limited funding from the above mentioned sources depending on the availability of funding at the time of request.

CONCLUSIONS & RECOMMENDATIONS

This study evaluated the feasibility of piping the Overland, Redlands, Durkee ditches using funds available through the USBR Salinity Control Program. It was concluded the most cost-efficient solution for the Overland and Redlands system would be to combine the two ditches in a single pipeline. Funding through the Salinity Control Program would likely be able to provide 100 percent of the funding required. According to conversations with BLM staff, however, this option would require the surrender of the existing perpetual easements associated with the canals and a new 30-year renewable lease would be required. Piping the ditches separately would cost significantly more and likely require an additional funding source to supplement Salinity Control Program funding.

The Durkee Ditch does not have any complicating factors such as easement issues, however, additional funding is likely needed to supplement funding from the Salinity Control Program.

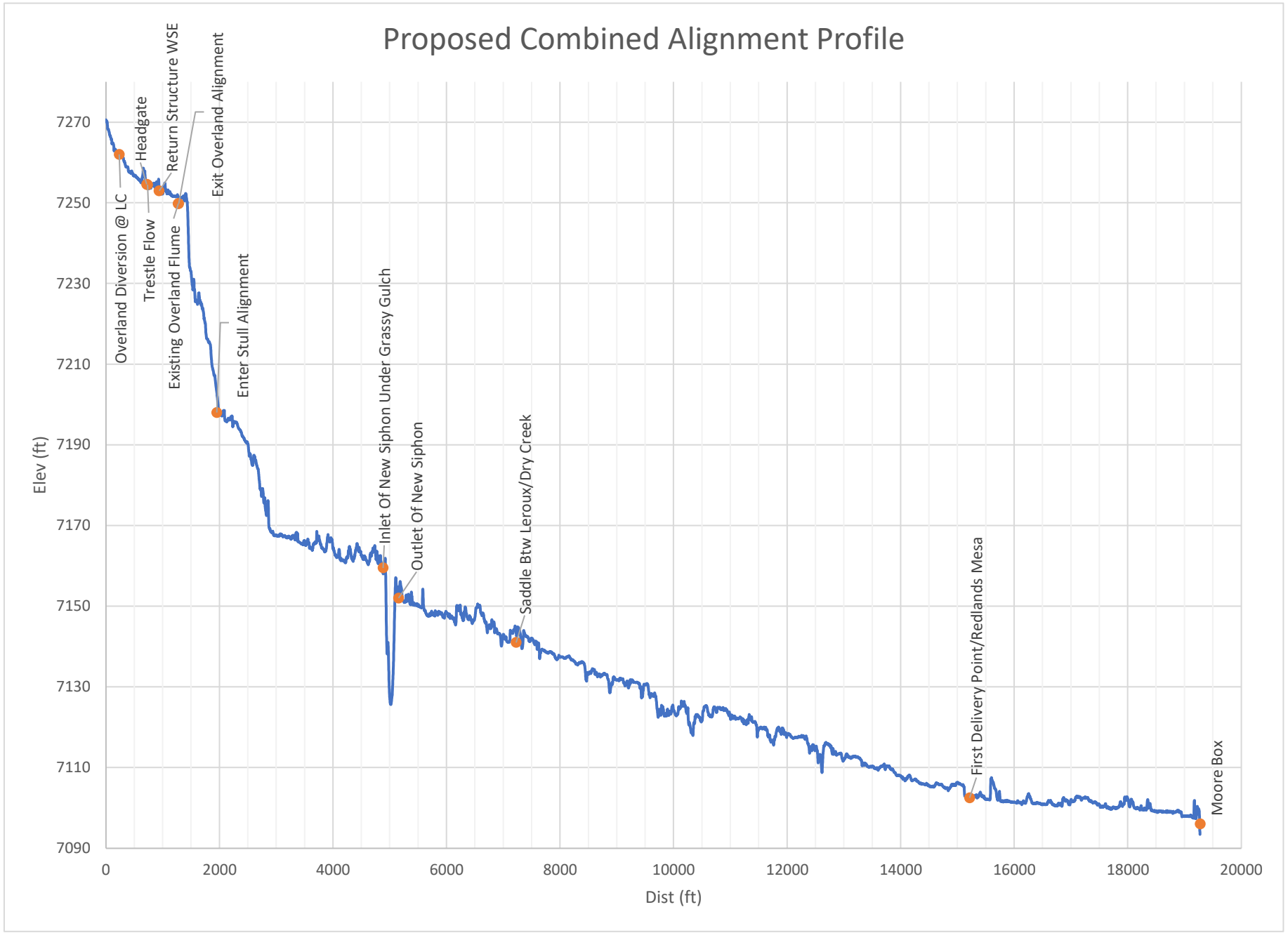
For the Board of Overland Ditch & Reservoir Company and the Redlands Mesa Water Users Association to proceed, we would recommend the following next steps:

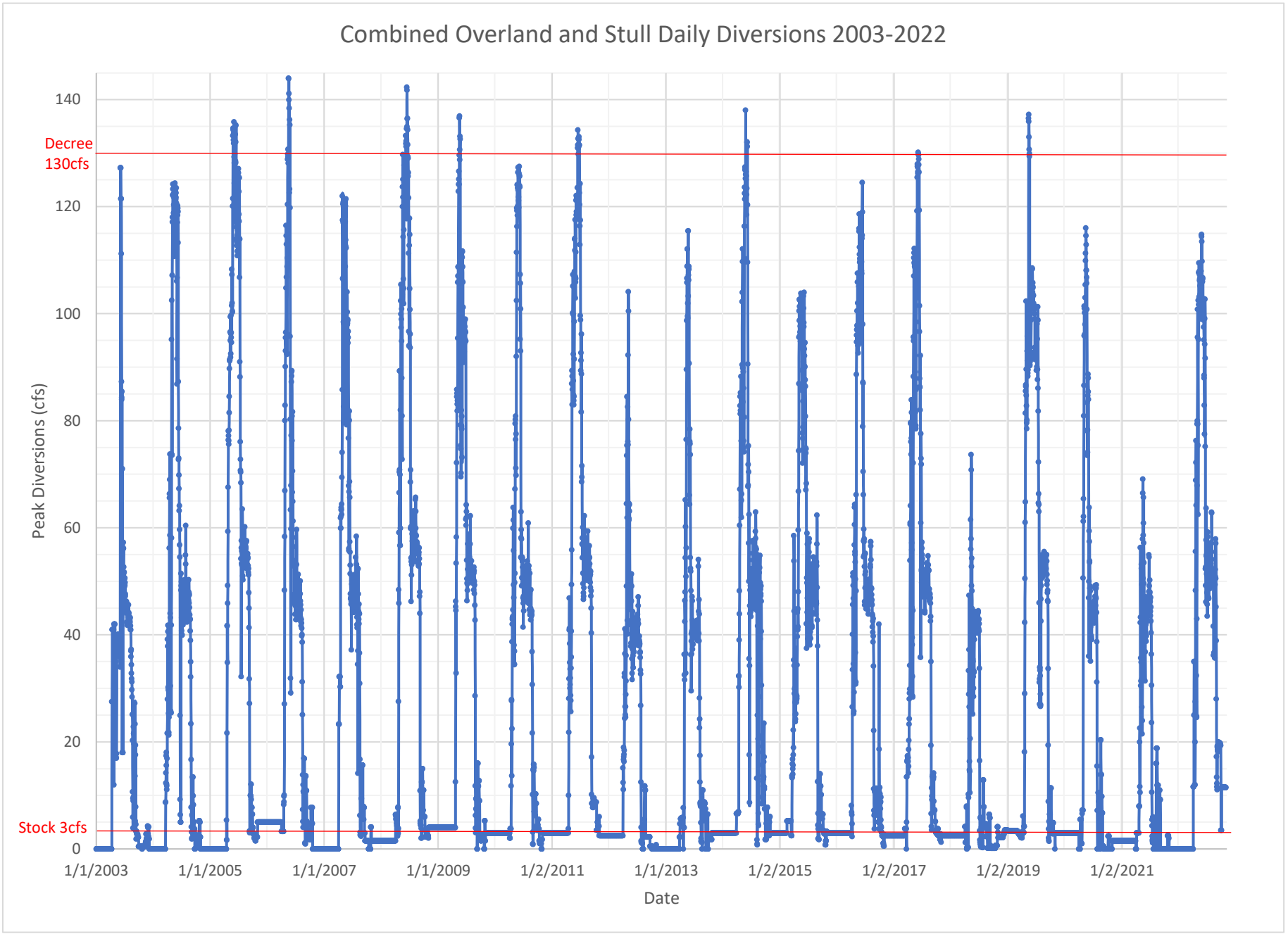
- Board discussion around cost savings or additional funding sources for the project
- Coordination of meeting with CPW and an experienced habitat consultant to discuss preliminary habitat replacement options
- Discussion among shareholders of potential efficiency upgrades from a new on-demand, low pressure pipeline system, including garnering interest in surge irrigation systems
- Refinement of the cost estimate, including site visits with local shotcrete contractors and general contractors
- Perform a survey of the canal slopes north of the highway to confirm the slopes assumed in this study for the shotcrete lining sections.

For the Board of the Durkee Ditch to proceed, we would recommend the following next steps:

- Explore new easement with landowner for siphon option
- Board and/or shareholder discussion around the level of interest in pressurization of the ditch at the turnouts in the delivery area
- Meet with an experienced habitat consultant to discuss preliminary habitat replacement options
- Obtain budgetary level quotes of per foot pipe install costs from local contractors to help refine and justify lower costs in the grant application
- Wait until the guidelines for this Salinity funding cycle are released in May to determine the relative importance of pressurization in the evaluation criteria for the grant
- Pursue state funding prior to upcoming USBR Salinity Grant cycle.

Appendix A – Project Figures


Proposed Combined Alignment Profile
Elev (ft)
7270
7250
7230
7210
7190
7170
7150
7130
7110
7090
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Dist (ft)
Overland Diversion @ LC
Headgate
Trestle Flow
Return Structure WSE
Existing Overland Flume
Exit Overland Alignment
Enter Stull Alignment
Inlet Of New Siphon Under Grassy Gulch
Outlet Of New Siphon
Saddle Btw Leroux/Dry Creek
First Delivery Point/Redlands Mesa
Moore Box


Combined Overland and Stull Daily Diversions 2003-2022
Peak Diversions (cfs)
140
120
100
80
60
40
20
0
Decree
130cfs
Stock 3cfs
1/1/2003
1/1/2005
1/1/2007
1/1/2009
1/2/2011
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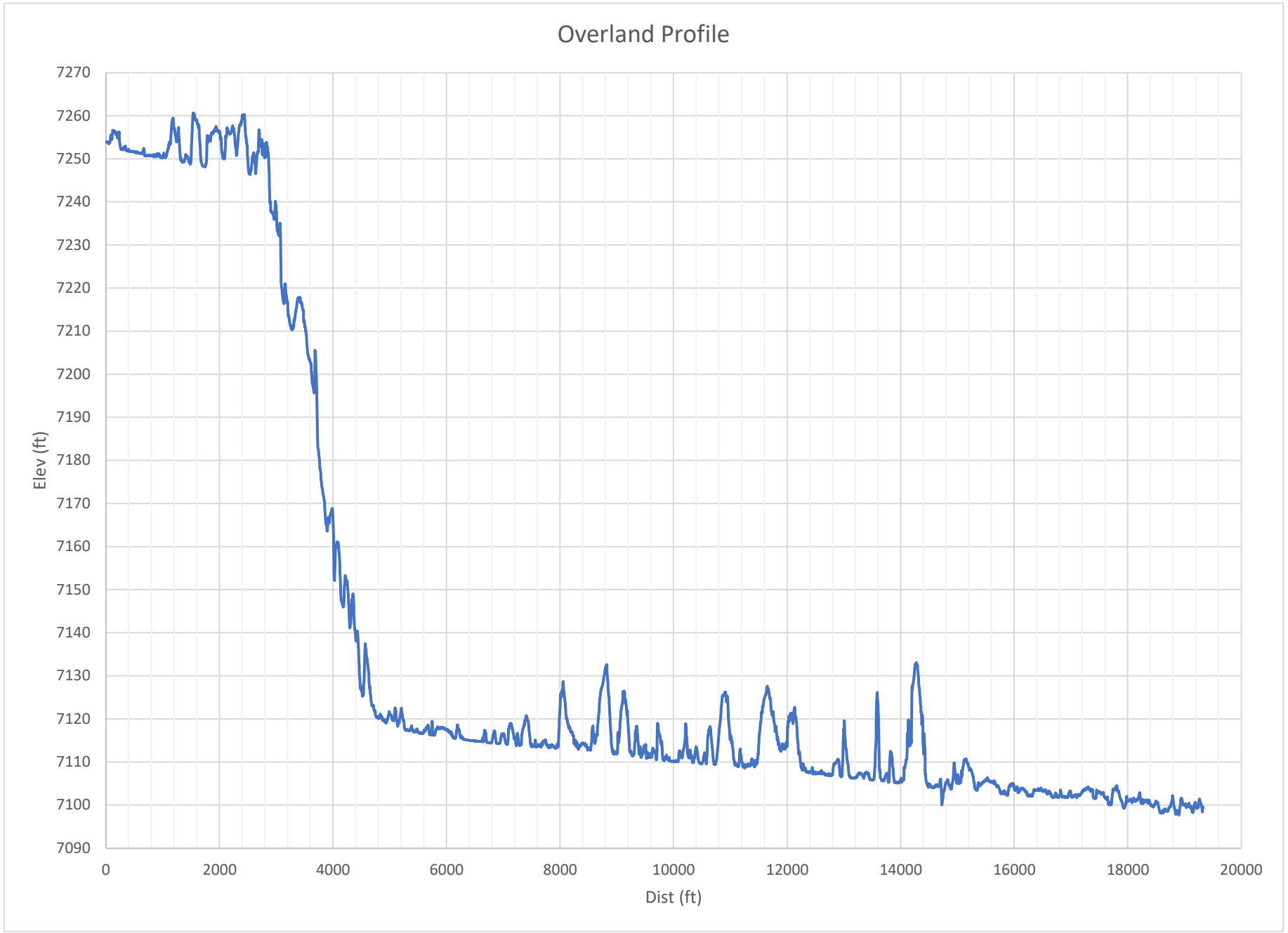
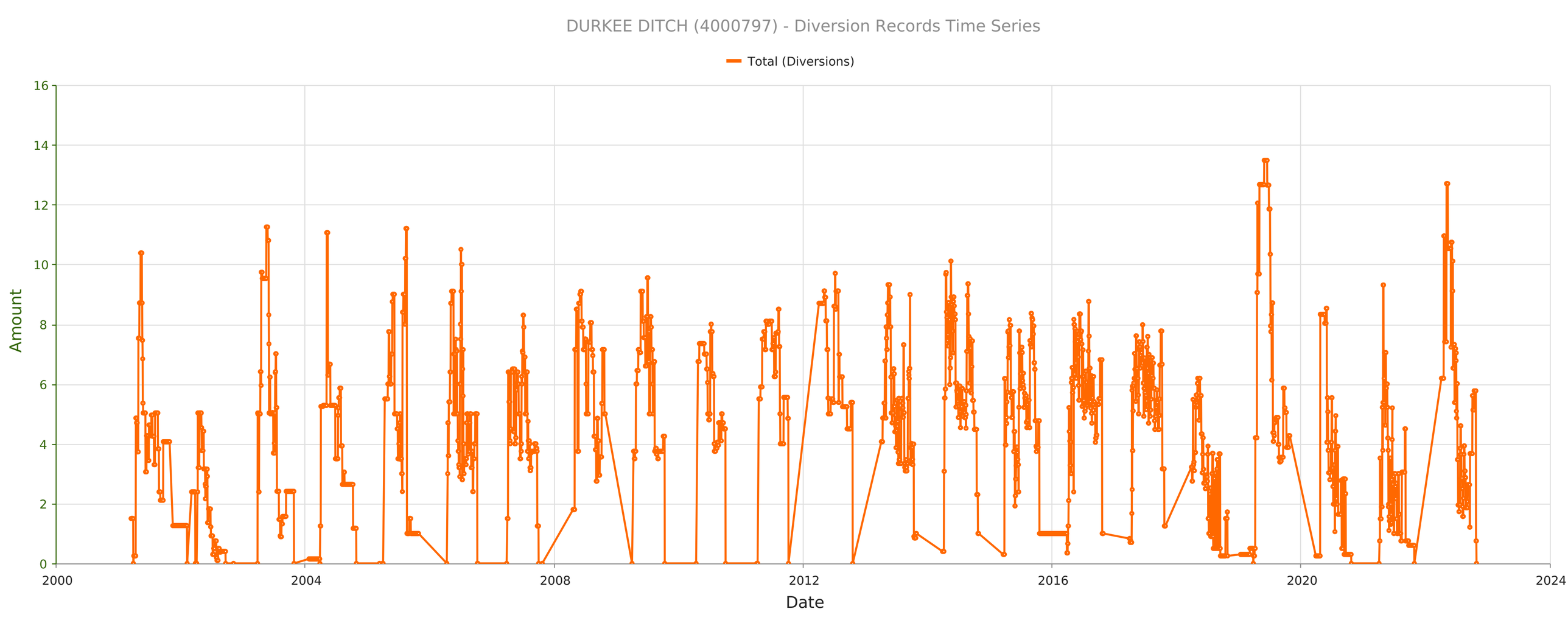
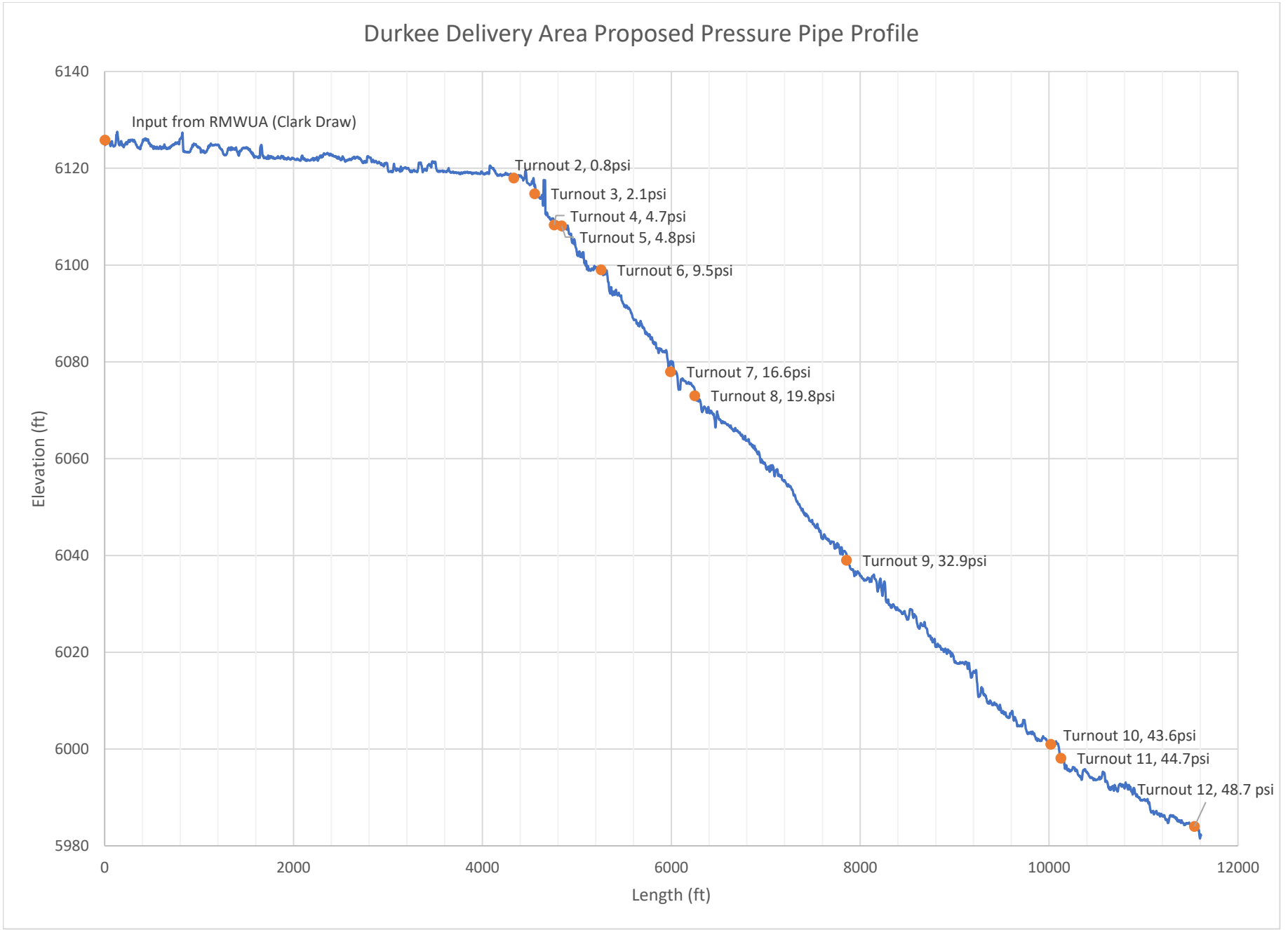
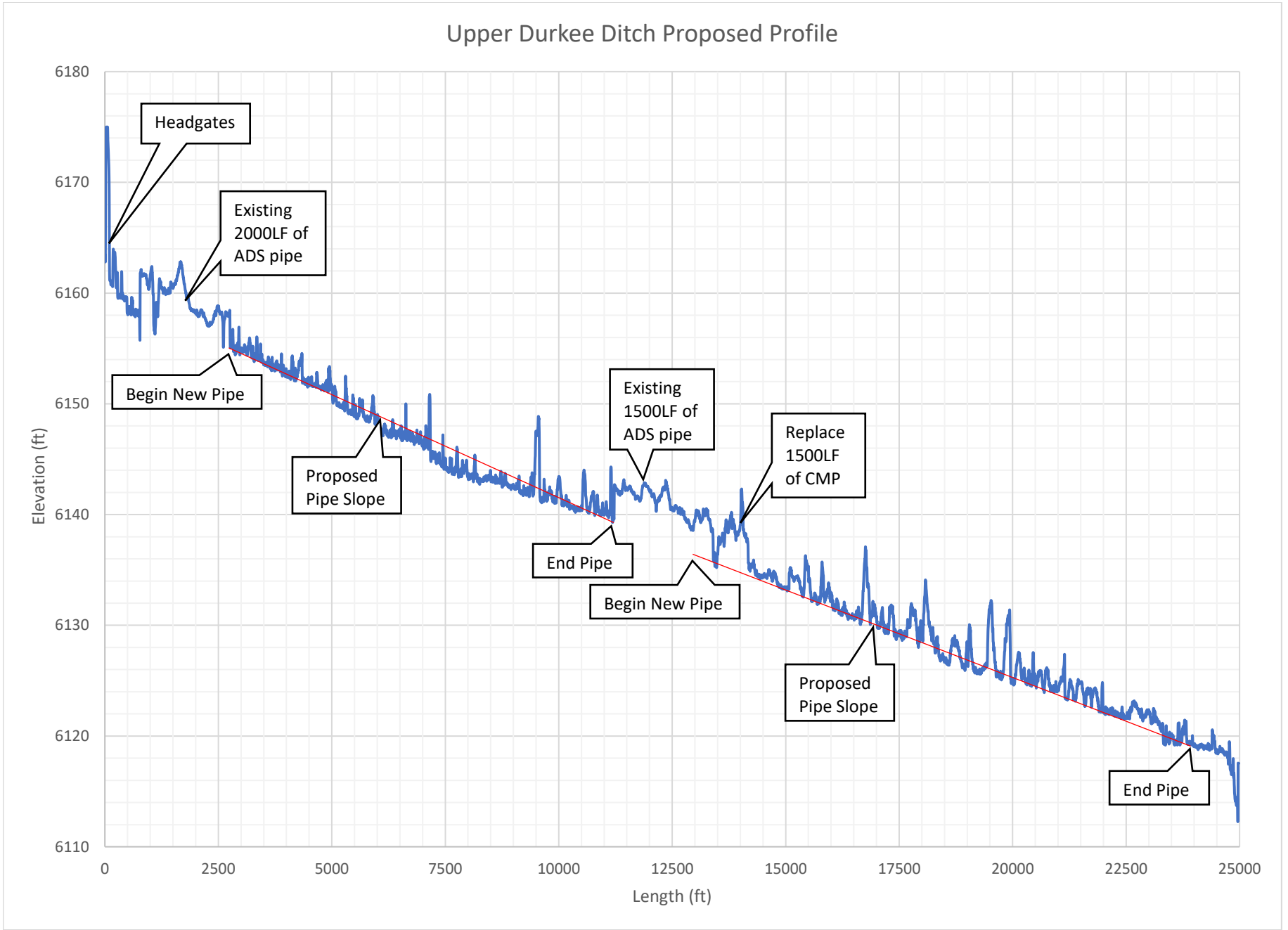
1/2/2015
1/2/2017
1/2/2019
1/2/2021
Date

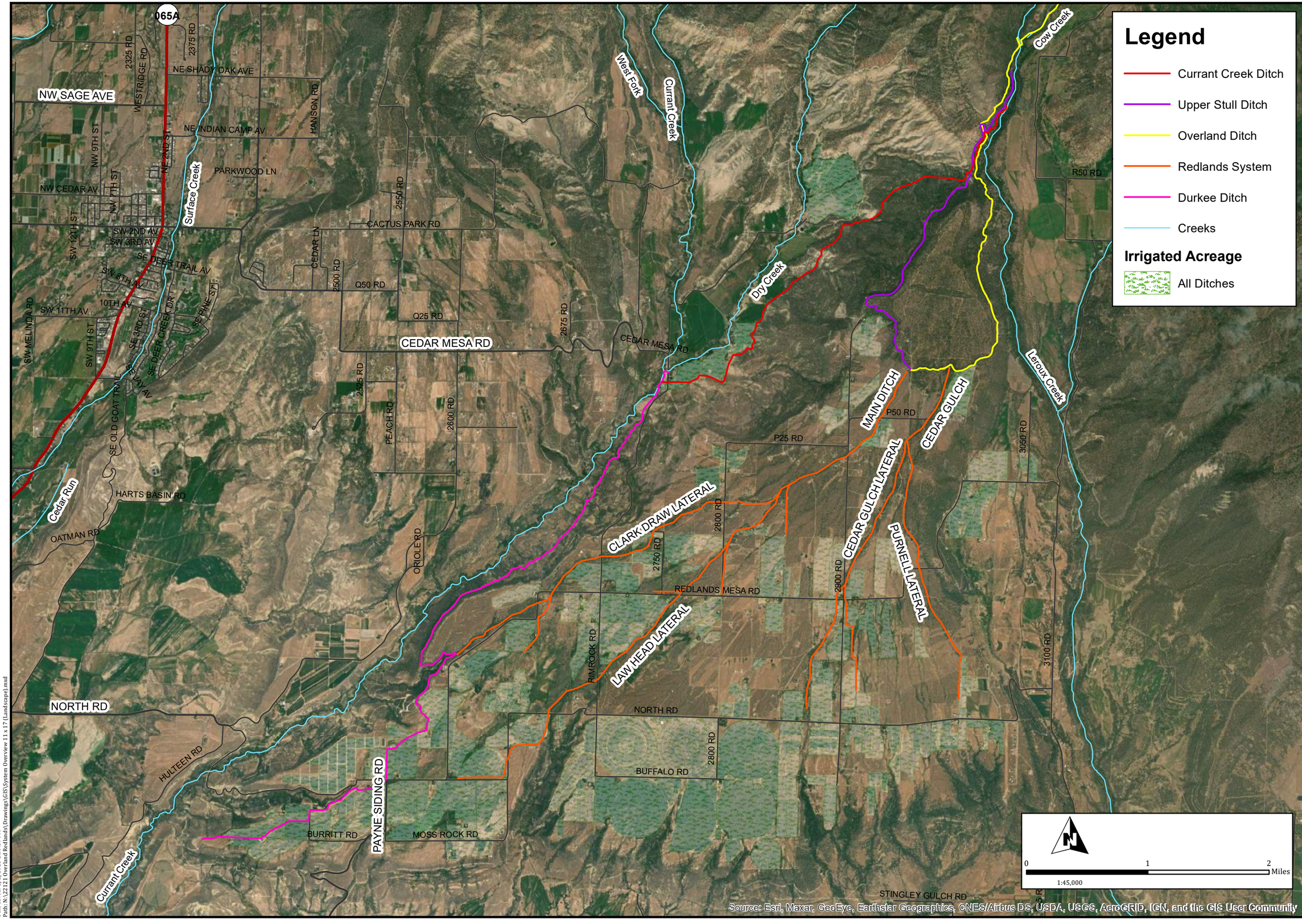

Overland Profile
Elev (ft)
7270
7260
7250
7240
7230
7220
7210
7200
7190
7180
7170
7160
7150
7140
7130
7120
7110
7100
7090
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Dist (ft)


DURKEE DITCH (4000797) - Diversion Records Time Series
Total (Diversions)
Amount
Date
0
2
4
6
8
10
12
14
16
2000
2004
2008
2012
2016
2020
2024


Durkee Delivery Area Proposed Pressure Pipe Profile
Elevation (ft)
6140
6120
6100
6080
6060
6040
6020
6000
5980
0
2000
4000
6000
8000
10000
12000
Length (ft)
Input from RMWUA (Clark Draw)
Turnout 2, 0.8psi
Turnout 3, 2.1psi
Turnout 4, 4.7psi
Turnout 5, 4.8psi
Turnout 6, 9.5psi
Turnout 7, 16.6psi
Turnout 8, 19.8psi
Turnout 9, 32.9psi
Turnout 10, 43.6psi
Turnout 11, 44.7psi
Turnout 12, 48.7 psi


Upper Durkee Ditch Proposed Profile
Elevation (ft)
6180
6170
6160
6150
6140
6130
6120
6110
0
2500
5000
7500
10000
12500
15000
17500
20000
22500
25000
Length (ft)
Headgates
Existing 2000LF of ADS pipe
Begin New Pipe
Proposed Pipe Slope
End Pipe
Existing 1500LF of ADS pipe
Begin New Pipe
Replace 1500LF of CMP
Proposed Pipe Slope
End Pipe

Appendix B– Maps



Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
Phone: (303) 452-6611
Fax: (303) 452-2759
www.Applegategroup.com
e-mail: info@applegategroup.com

OVERLAND AND REDLANDS MESA SYSTEM OVERVIEW

Including Durkee Ditch and Currant Creek Ditch

No.	Rev. Date	Revision Description

Date: 21 Feb 2023
Job #: 22-126
Drawn By: SRM

Figure: 1
Of: 5

Date Saved: 2/2/2023 2:30:19 PM
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Date Saved: 4/27/2023 6:27:25 PM
Path: N:\22121 Overland Redlands\Drawings\GIS\Upper System 11 x 17 (Profile).mxd

Overland Headgate Off Leroux Creek

Cow Creek

Overland Flume (Cow Creek)

Overland Return Structure

Overland Trestle Over Leroux Creek from Cow Creek/ Overland Reservoir

Overland Flume w/ Telemetry

Stull Headgate Off Leroux Creek

Grassy Gulch - Overland Flows Under Stull Ditch and Currant Creek Ditch

Currant Creek Ditch Headgate Off Leroux Creek

Saddle - Currant Creek Ditch Flows Under Stull Ditch

Leroux Creek

First Turnout Stull

Connector Ditch from Stull to Cedar Gulch

Split Box Overland to Cedar Gulch

First Turnout Overland

Moore Box to Main Ditch

Turnout 2 (Overland)

Legend

- Stull Points
- Stull Piped Sections
- Upper Stull Ditch
- Overland Points
- Overland Ditch
- Redlands System
- Creeks

N

0 1,000 2,000 Feet

1:12,500

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure: 2 Of: 5

Date: 26 Apr 2023

Job #: 22-121

Drawn By: SRM

No.	Rev. Date	Revision Description

OVERLAND REDLANDS MESA SYSTEM

Upper System Overview

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com

Date Saved: 4/27/2023 6:41:53 PM
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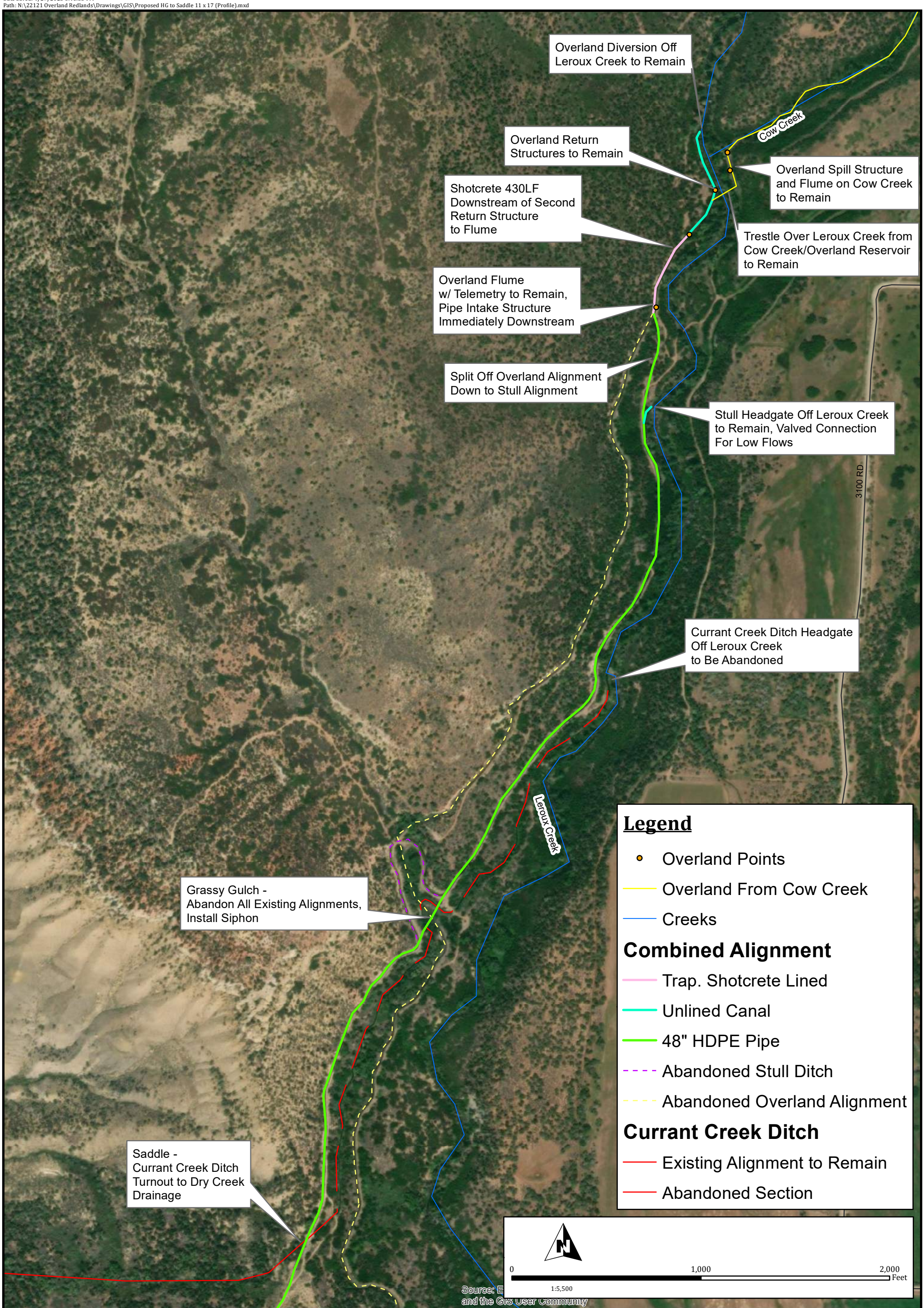


Figure: 3 Of: 5

Date: 26 Apr 2023

Job #: 22-121

Drawn By: SRM

No.	Rev. Date	Revision Description

PROPOSED OVERLAND REDLANDS MESA COMBINED SYSTEM

Headgate To Saddle

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com

Date Saved: 4/27/2023 7:01:02 PM
Path: N:\22121 Overland Redlands\Drawings\GIS\Proposed Saddle to Moore Box 11 x 17 (Profile)v2.mxd

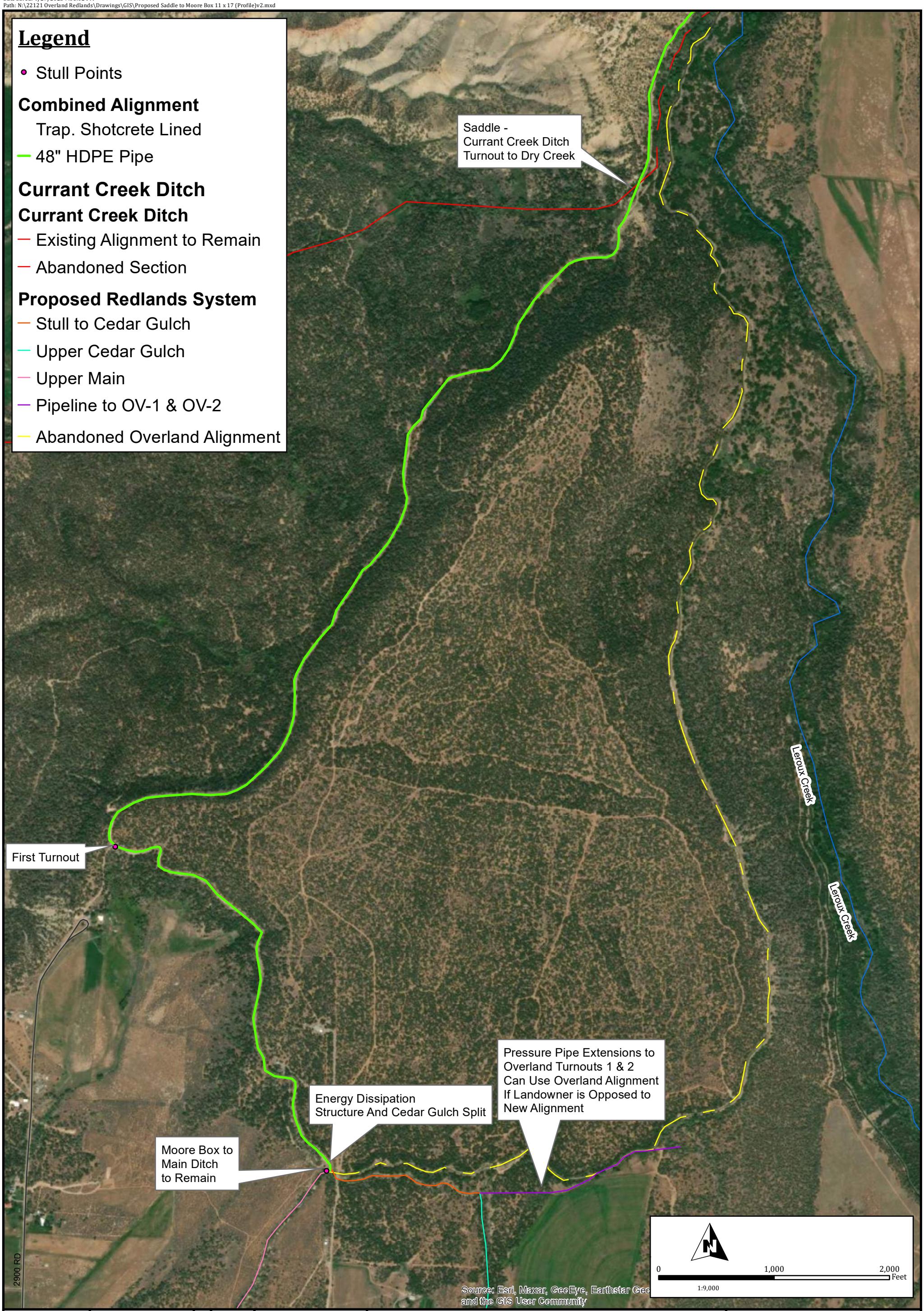


Figure: 4 Of: 5

Date: 26 Apr 2023

Job #: 22-121

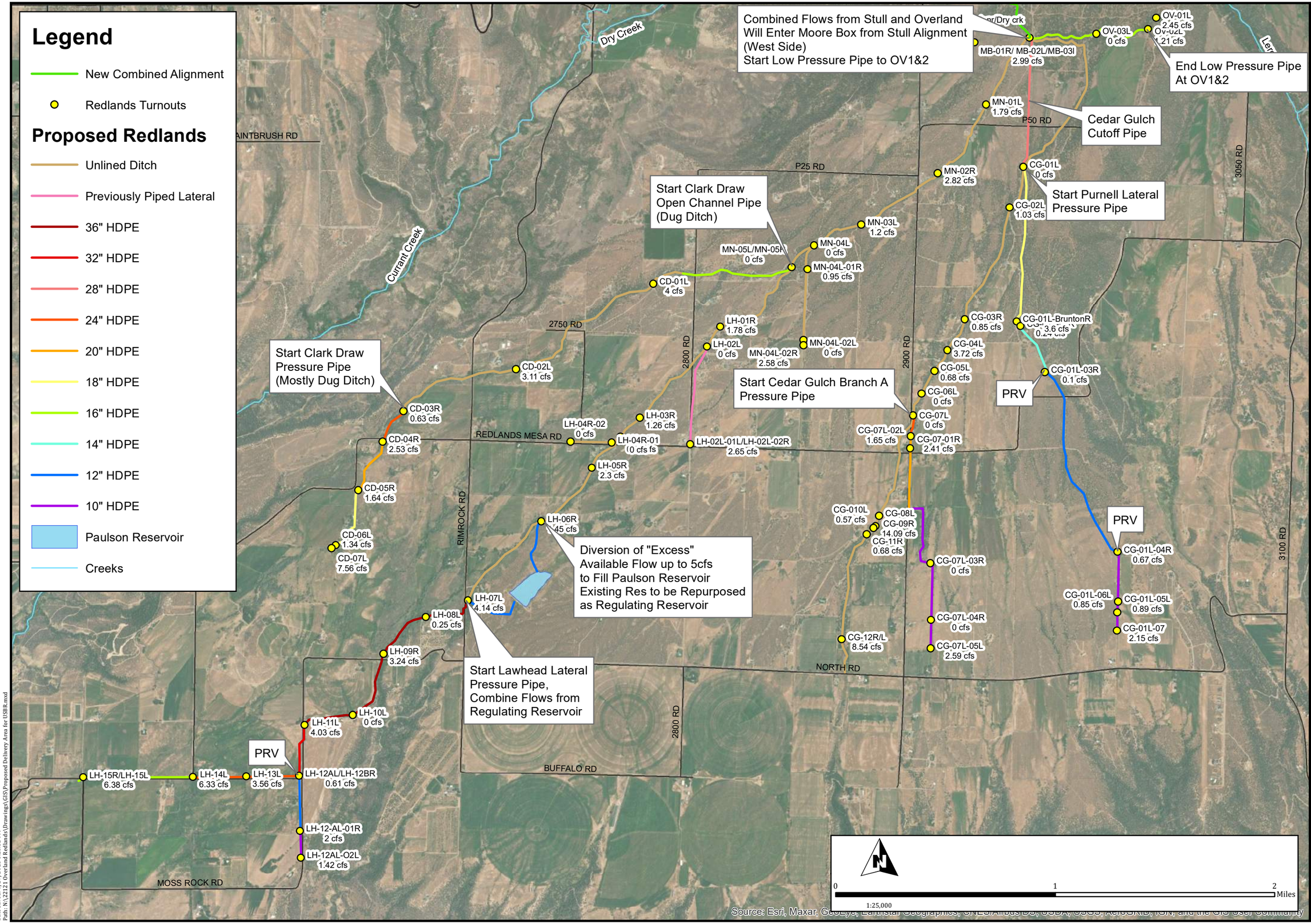
Drawn By: SRM

No.	Rev. Date	Revision Description

PROPOSED OVERLAND REDLANDS MESA COMBINED SYSTEM

Saddle to Moore Box

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com



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Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
Phone: (303) 452-6611
Fax: (303) 452-2759
www.Applegategroup.com
e-mail: info@applegategroup.com

PROPOSED REDLANDS MESA DELIVERY AREA

Piped Sections with Pipe Sizes

No.	Rev. Date	Revision Description

Date: 14 Mar 2023
Job #: 22-126
Drawn By: SRM

Figure: 5
Of: 5

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Q25 RD
2675 RD
CEDAR MESA RD
2525 RD
MCPHERSON RD
PEACH RD
PAINTBRUSH RD
UNNAMED 0031
ORIOLE RD
2750 RD
REDLANDS MESA RD
RIMROCK RD
2600 RD
Currant Creek
PAYNE SIDING RD
NORTH RD
BURRITT RD
MOSS ROCK RD

Headgate Off Currant Creek

Headgate and Spill Structure for Combined Intake From Currant Creek and Dry Creek

4-ft Parshall Flume

Intake From Currant Creek Ditch, Trashrack and Pipe Intake Structure

~2000ft 36" Diam N-12 Pipe

1500LF 36" Diam N-12 Pipe

1500LF 36" Diam Deteriorating CMP

Redlands "Durkee Dump" Shares Delivered thru Clark Draw

Madson Gulch Overflow (Future Pipe by Delta County))

Turnout 2 Demarcates Upper Durkee from Lower Durkee/Delivery Area

Madson Gulch Inflow Datalogger County Maintained

Joint Maintenance Redlands Mesa/Durkee This Section

Last Split Box/Spill Structure Privately Maintained Laterals Downstream Spill Excess to Currant Creek

Legend

- Durkee Ditch
- Durkee Structures
- Durkee Piped Sections
- Redlands Turnouts
- Redlands System
- Currant Creek Ditch
- Madson Gulch
- Creeks

0 1,000 2,000 Feet
1:20,000

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, U... and the GIS User Community

Figure: 1 Of: 4

Date: 23 Feb 2023
Job #: 22-121
Drawn By: SRM

No.	Rev. Date	Revision Description

DURKEE DITCH

Overview

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com

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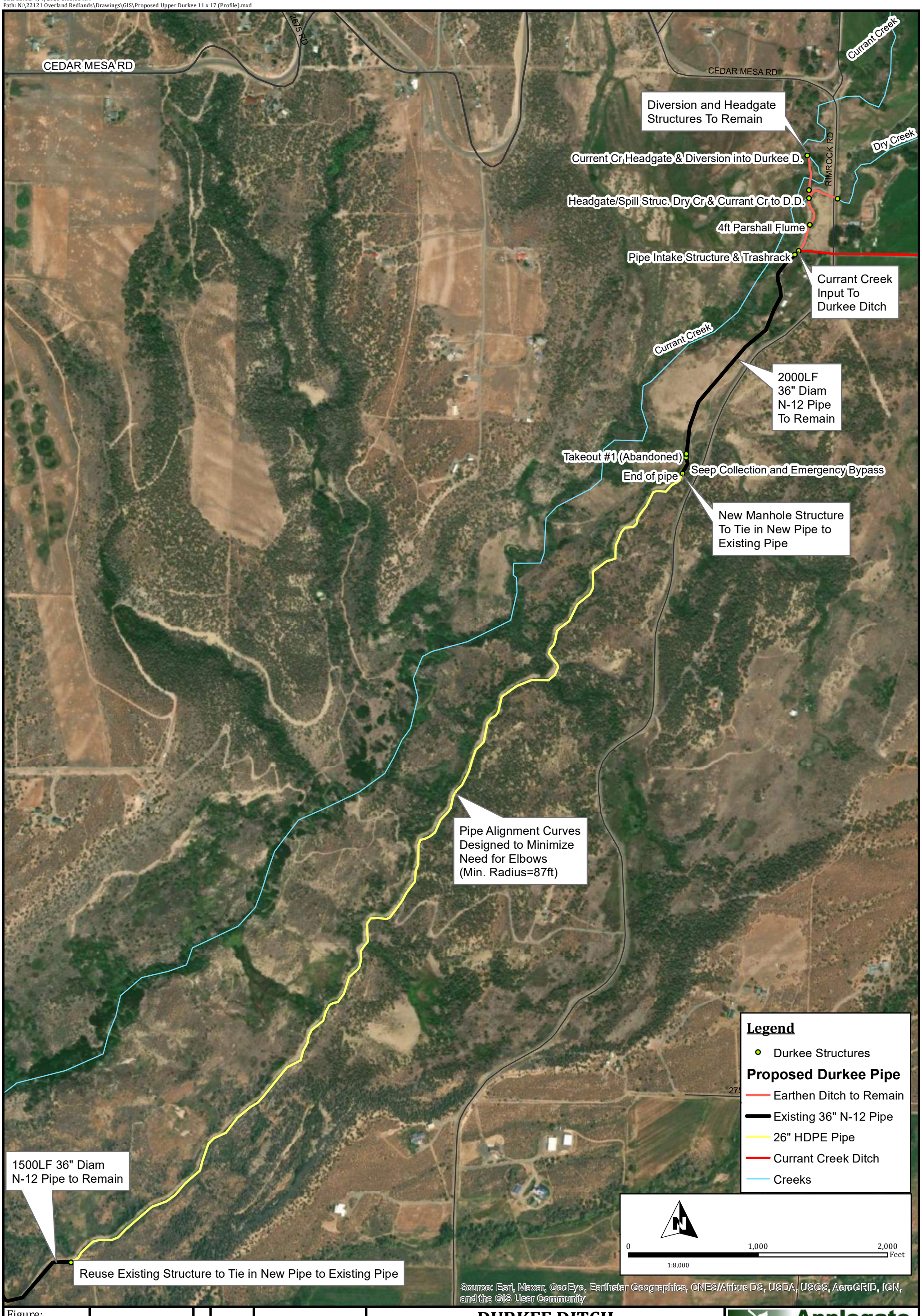

Figure: 2 Of: 4	Date: 4 April 2023 Job #: 22-121 Drawn By: SRM	No.	Rev. Date	Revision Description	**DURKEE DITCH** Proposed Upper Durkee Ditch Headgates and Upper Section

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
Phone: (303) 452-6611
Fax: (303) 452-2759
www.ApplegateGroup.com
e-mail: info@applegategroup.com

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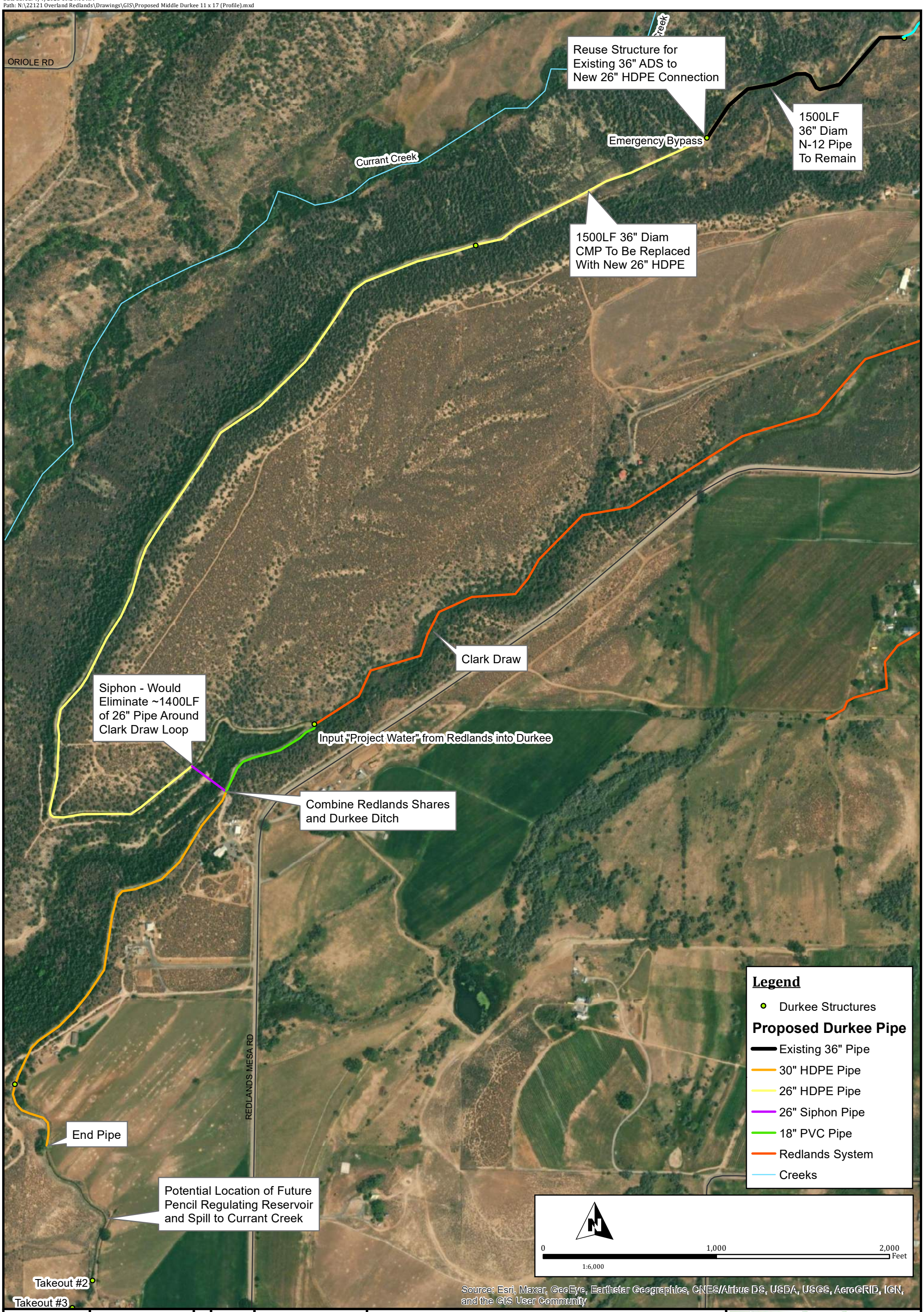

Figure: 3 Of: 4

Date: 4 April 2023

Job #: 22-121

Drawn By: SRM

No.	Rev. Date	Revision Description

DURKEE DITCH

Proposed Upper Durkee Ditch to Turnout #2

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com

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Currant Creek

Potential Location of Future Pencil Regulating Reservoir and Spill to Currant Creek

Takeout #2
Takeout #3
Takeout #5, 4.8psi
Takeout #4, 4.7psi
Takeout #6, 9.5psi
Takeout #7, 16.6psi
Takeout #8, 19.8psi

Madson Gulch Overflow (Future Pipe)

NORTH RD

Takeout #9, 32.9psi

Privatly Maintained Laterals After Turnout #12

Joint Maintenance Redlands Mesa/Durkee This Section

Takeout #10, 43.6psi
Takeout #11, 44.7psi
Takeout #12, 48.7psi

BURRITT RD

PAYNE SIDING RD

PAYNE SIDI

MOSS ROCK RD

Legend

- Durkee Structures

Proposed Durkee Pipe

- 30" HDPE Pipe
- 28" HDPE Pipe
- 26" HDPE Pipe
- 24" HDPE Pipe
- 20" HDPE Pipe
- Madson Gulch
- Creeks

0 1,000 2,000 Feet

1:6,000

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure: 4 Of: 4

Date: 23 Feb 2023

Job #: 22-121

Drawn By: SRM

No.	Rev. Date	Revision Description

DURKEE DITCH

Proposed Lower Durkee Ditch Working Pressures at Turnouts

Applegate Group, Inc.
Water Resource Advisors for the West
1490 West 121st Ave., Ste 100
Denver, CO 80234-2728
www.ApplegateGroup.com
Phone: (303) 452-6611
Fax: (303) 452-2759
e-mail: info@applegategroup.com

Appendix C – Cost Estimates

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Option 1: Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	4.0%			$ 182,918	$ 182,918	$ 182,918	% of Construction Costs
2	NEPA Compliance	49,895		$ 1.03	$ 51,391	$ 51,391	$ 51,391	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	49,895		$ 0.49	$ 24,448	$ 24,448	$ 24,448	Past Proj. Avg $/ft
	SUBTOTAL				$ 258,757	$ 258,757	$ 258,757	
4	Mobilization & Bonding	9.9%			$ 192,953	$ 192,953	$ 192,953	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	63" HDPE DR 41 Pipe	700	LF	$ 215.07	$ 150,549	$ 150,549	$ 150,549	B&Q quote 1/2023 + 10%
6	48" HDPE DR 41 Pipe	17,195	LF	$ 124.85	$ 2,146,748	$ 2,146,748	$ 2,146,748	B&Q quote 1/2023 + 10%
7	18" HDPE DR 32.5 Pipe	3,300	LF	$ 24.17	$ 79,761	$ 79,761	$ 79,761	B&Q quote 1/2023 + 10%
8	HDPE Fittings	10	EA	$ 2,500	$ 25,000	$ 25,000	$ 25,000	Avg B&Q quote 1/19/2023
9	48"x36" HDPE Wye Fitting	1	EA	$ 10,000	$ 10,000	$ 10,000	$ 10,000	Cattlemans
10	Geotextile	1,100	SY	$ 2	$ 1,973	$ 1,973	$ 1,973	GVIC 550 8/2022 +10%
11	PVC Liner	1,100	SY	$ 5	$ 5,361	$ 5,361	$ 5,361	GVIC 550 8/2022 +10%
12	Pressurized valves	3	EA	$ 1,200	$ 3,600	$ 3,600	$ 3,600	NRLR bid + 10%
13	Pressurized valve For Currant Creek	1	EA	$ 8,000	$ 8,000	$ 8,000	$ 8,000	NRLR bid + 10%
	CONSTRUCTION							
14	Project Incidentals (Survey, Permits, Erosion Control, Fencing, Demo)	1	LS	$ 141,225	$ 141,225	$ 141,225	$ 141,225	NR bid 1/23 + Fruitland bid 11/20
15	Existing Structure Demo & Removal	1	LS	$ 31,570	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to size of structures
16	12 ft Bottom Width - Canal Prep + Liner Install	430	LF	$ 34.00	$ 14,620	$ 14,620	$ 14,620	Fruitland bid 11/2020
17	12ft Bottom Width - Shotcrete	94	CY	$ 600.00	$ 56,291	$ 56,291	$ 56,291	Fruitland bid 11/2020+10%
18	63" Pipe Installation	700	LF	$ 81.58	$ 57,103	$ 57,103	$ 57,103	Needlerock bid 1/2023
19	48" Pipe Installation	17,195	LF	$ 74.16	$ 1,275,146	$ 1,275,146	$ 1,275,146	Needlerock bid 1/2023
20	18" pipe installation	3,300	LF	$ 36.32	$ 119,849	$ 119,849	$ 119,849	Needlerock bid 1/2023
21	Pressurized Turnout w/meter	3	EA	$ 9,378	$ 28,134	$ 28,134	$ 28,134	Needlerock bid 1/2023
22	Currant Creek Turnout w/meter&telemetry	1	EA	$ 18,756	$ 18,756	$ 18,756	$ 18,756	Needlerock bid 1/2023
23	Air/Vac	15	EA	$ 1,406	$ 20,668	$ 20,668	$ 20,668	Needlerock bid 1/2023
24	Grading Abandoned Canal	28,270	LF	$ 2.50	$ 70,675	$ 70,675	$ 70,675	FMC 2019
25	Reclamation & Seeding	49,895	LF	$ 0.18	$ 8,981	$ 8,981	$ 8,981	FIC SW seed + ATV seed spreader
26	Flume Replacement	2	EA	$ 12,000	$ 24,000	$ 24,000	$ 24,000	Eng Est
27	Concrete Pipe Intake Structure & Trashrack	2	EA	$ 17,000	$ 34,000	$ 34,000	$ 34,000	Eng Est based on recent concrete costs
28	New Moore Box	30	CY	$ 1,600	$ 48,000	$ 48,000	$ 48,000	Eng Est based on recent concrete costs
	SUBTOTAL				$ 4,572,962	$ 4,572,962	$ 4,572,962	
29	CONSTRUCTION MANAGEMENT	3.0%			$ 137,189	$ 137,189	$ 137,189	Consultant Estimate
	TOTAL CONSTRUCTION COSTS				$ 4,710,151	$ 4,710,151	$ 4,710,151	
30	HABITAT REPLACEMENT	5.0%			$ 235,508	$ 235,508	$ 235,508	5% of Const Costs

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Option 1: Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches

31	SINGLE AUDIT	3		$ 2,800	$ 8,400	$ 8,400		$ 8,400	Past project costs
	SUBTOTAL				$ 243,908	$ 243,908		$ 243,908	
	TOTAL				$ 5,212,817	$ 5,212,817		$ 5,212,817	

Currant creek savings

amortization factor	0.03795	salt without CC	2760
amortized cost	$ 197,826	total	$ 5,162,655
tons of salt	3081	amo	$ 195,922.76
cost/ton	$ 64.20	cost/ton	$ 70.98

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches and Add Cedar Gulch

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	4.0%			$ 202,068	$ 202,068	$ 202,068	4.5% of Construction Costs
2	NEPA Compliance	53,051		$ 1.03	$ 54,642	$ 54,642	$ 54,642	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	53,051		$ 0.49	$ 25,995	$ 25,995	$ 25,995	Past Proj. Avg $/ft
	SUBTOTAL				$ 282,705	$ 282,705	$ 282,705	
4	Mobilization & Bonding	9.9%			$ 220,034	$ 220,034	$ 220,034	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	63" HDPE DR 41 Pipe	700	LF	$ 215.07	$ 150,549	$ 150,549	$ 150,549	B&Q quote 1/2023 + 10%
6	48" HDPE DR 41 Pipe	17,191	LF	$ 124.85	$ 2,146,260	$ 2,146,260	$ 2,146,260	B&Q quote 1/2023 + 10%
7	28" HDPE DR 32.5 Pipe	3,160	LF	$ 53.35	$ 168,586	$ 168,586	$ 168,586	B&Q quote 1/2023 + 10%
8	18" HDPE DR 32.5 Pipe	3,300	LF	$ 24.17	$ 79,761	$ 79,761	$ 79,761	B&Q quote 1/2023 + 10%
9	HDPE Fittings	10	EA	$ 2,500	$ 25,000	$ 25,000	$ 25,000	Avg B&Q quote 1/19/2023
10	48"x36" HDPE Wye Fitting	1	EA	$ 10,000	$ 10,000	$ 10,000	$ 10,000	Cattlemans
11	Geotextile	1,100	SY	$ 2	$ 1,973	$ 1,973	$ 1,973	GVIC 550 8/2022 +10%
12	PVC Liner	1,100	SY	$ 5	$ 5,361	$ 5,361	$ 5,361	GVIC 550 8/2022 +10%
13	36" Valve	1	EA	$ 10,000	$ 10,000	$ 10,000	$ 10,000	NRLR bid + 10%
14	Pressurized valves<12"	3	EA	$ 1,200	$ 3,600	$ 3,600	$ 3,600	NRLR bid + 10%
15	Pressurized valve For Currant Creek	1	EA	$ 8,000	$ 8,000	$ 8,000	$ 8,000	NRLR bid + 10%
	CONSTRUCTION							
15	Project Incidentals (Survey, Permits, Erosion Control, Fencing, Demo)	1	LS	$ 162,781	$ 162,781	$ 162,781	$ 162,781	NR bid 1/23 + Fruitland bid 11/20
16	Existing Structure Demo & Removal	1	LS	$ 31,570	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1
17	12 ft Bottom Width - Canal Prep + Liner Install	430	LF	$ 34.00	$ 14,620	$ 14,620	$ 14,620	Fruitland bid 11/2020
18	12ft Bottom Width - Shotcrete	94	CY	$ 605.00	$ 56,760	$ 56,760	$ 56,760	Fruitland bid 11/2020+10%
19	63" Pipe Installation	700	LF	$ 81.58	$ 57,103	$ 57,103	$ 57,103	Needlerock bid 1/2023
20	48" Pipe Installation	17,191	LF	$ 74.16	$ 1,274,857	$ 1,274,857	$ 1,274,857	Needlerock bid 1/2023
21	28" Pipe Installation	3,160	LF	$ 47.60	$ 150,416	$ 150,416	$ 150,416	Needlerock bid 1/2023
22	18" pipe installation	3,300	LF	$ 39.86	$ 131,541	$ 131,541	$ 131,541	Needlerock bid 1/2023
23	Pressurized Turnout w/meter	3	EA	$ 9,378	$ 28,133	$ 28,133	$ 28,133	Needlerock bid 1/2023
24	Currant Creek Turnout w/meter&telemetry	1	EA	$ 18,755	$ 18,755	$ 18,755	$ 18,755	Needlerock bid 1/2023
25	Air/Vac	17	EA	$ 1,406	$ 24,464	$ 24,464	$ 24,464	Needlerock bid 1/2023
26	Grading Abandoned Canal	28,270	LF	$ 4.50	$ 127,215	$ 127,215	$ 127,215	Fire Mtn
27	Reclamation & Seeding	53,051	LF	$ 0.18	$ 9,549	$ 9,549	$ 9,549	FIC SW seed + ATV seed spreader
28	Flume Replacement	2	EA	$ 12,000	$ 24,000	$ 24,000	$ 24,000	
29	Concrete Pipe Intake Structure & Trashrack	2	EA	$ 17,000	$ 34,000	$ 34,000	$ 34,000	
30	New Moore Box	30	CY	$ 1,600	$ 48,000	$ 48,000	$ 48,000	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Upper Section - Leroux Creek to Moore Box - Combine All Three Ditches and Add Cedar Gulch

31	CG Concrete Energy Diss. Structure	18	CY	$ 1,600	$ 28,800	$ 28,800	$ 28,800	
	SUBTOTAL				$ 5,051,688	$ 5,051,688	$ 5,022,888	
32	CONSTRUCTION MANAGEMENT	3.0%			$ 151,551	$ 151,551	$ 151,551	Consultant Estimate
	TOTAL CONSTRUCTION COSTS				$ 5,203,239	$ 5,203,239	$ 5,174,439	
33	HABITAT REPLACEMENT	5.0%			$ 260,162	$ 260,162	$ 260,162	5% of Const Costs
34	SINGLE AUDIT	3		$ 2,800	$ 8,400	$ 8,400	$ 8,400	Past project costs
	SUBTOTAL				$ 268,562	$ 268,562	$ 268,562	
	TOTAL				$ 5,754,505	$ 5,754,505	$ 5,725,705	

amortization factor	0.03795	Cedar Gulch Portion
amortized cost	$ 218,383	
tons of salt	3438	
cost/ton	$ 63.52	
Adding Purnell:		
Total Purnell cost	$ 1,083,411	
total combined cost	$ 6,837,917	
amortized cost	$ 259,499	
tons of salt	4097	
cost/ton	$ 63.33	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Redlands Only

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	3.0%			$ 80,003	$ 80,003	$ 80,003	4.5% of Construction Costs
2	NEPA Compliance	17,600		$ 1.03	$ 18,128	$ 18,128	$ 18,128	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	17,600		$ 0.49	$ 8,624	$ 8,624	$ 8,624	Past Proj. Avg $/ft
	SUBTOTAL				$ 106,755	$ 106,755	$ 106,755	
4	Mobilization & Bonding	9.9%			$ 120,267	$ 120,267	$ 120,267	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	48" HDPE DR 41 Pipe	800	LF	$ 124.85	$ 99,880	$ 99,880	$ 99,880	B&Q quote 1/2023 + 10%
6	36" HDPE DR 41 Pipe	16,800	LF	$ 70.23	$ 1,179,786	$ 1,179,786	$ 1,179,786	B&Q quote 1/2023 + 10%
7	HDPE DR 32.5 Fittings	18	EA	$ 2,500	$ 45,000	$ 45,000	$ 45,000	Avg B&Q quote 1/19/2023
8	Pressurized valves	2	EA	$ 3,500	$ 7,000	$ 7,000	$ 7,000	NRLR bid + 10%
	CONSTRUCTION							
9	Project Incidentals (Survey, Permits, Erosion Control, Fencing, Demo)	1	LS	$ 120,211	$ 120,211	$ 120,211	$ 120,211	NR bid 1/23 + Fruitland bid 11/20
10	Existing Structure Demo & Removal	1	LS	$ 31,570	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to size of structures
11	48" Pipe Installation	800	LF	$ 74.16	$ 59,328	$ 59,328	$ 59,328	Needlerock bid 1/2023
12	36" Pipe Installation	16,800	LF	$ 54.13	$ 909,384	$ 909,384	$ 909,384	Needlerock bid 1/2024
13	Pressurized Turnout w/meter	2	EA	$ 7,971	$ 15,942	$ 15,942	$ 15,942	Needlerock bid 1/2023
14	Air/Vac	13	EA	$ 1,406	$ 17,716	$ 17,716	$ 17,716	Needlerock bid 1/2023
15	Reclamation & Seeding	17,600	LF	$ 0.18	$ 3,168	$ 3,168	$ 3,168	FIC SW seed + ATV seed spreader
16	Pipe Concrete Intake Structure & Trashrack	1	EA	$ 17,500	$ 17,500	$ 17,500	$ 17,500	Eng Est based on recent concrete costs
17	Moore Box	1	EA	$ 40,000	$ 40,000	$ 40,000	$ 40,000	Eng Est based on recent concrete costs
	SUBTOTAL				$ 2,666,753	$ 2,666,753	$ 2,666,753	
18	CONSTRUCTION MANAGEMENT	4.0%			$ 106,670	$ 106,670	$ 106,670	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 2,773,423	$ 2,773,423	$ 2,773,423	
19	HABITAT REPLACEMENT	5.0%			$ 138,671	$ 138,671	$ 138,671	5% of Const Costs
20	SINGLE AUDIT	3		$ 2,800	$ 8,400	$ 8,400	$ 8,400	Past project costs
	SUBTOTAL				$ 147,071	$ 147,071	$ 147,071	
	TOTAL				$ 3,027,249	$ 3,027,249	$ 3,027,249	

amortization factor	0.03795	
amortized cost	$ 114,884	
tons of salt	1345	300ft less salt
cost/ton	$ 85.40	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Overland Only 36"

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	3.0%			$ 86,451	$ 86,451	$ 86,451	4.5% of Construction Costs
2	NEPA Compliance	16,500		$ 1.03	$ 16,995	$ 16,995	$ 16,995	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	16,500		$ 0.49	$ 8,085	$ 8,085	$ 8,085	Past Proj. Avg $/ft
	SUBTOTAL				$ 111,531	$ 111,531	$ 111,531	
4	Mobilization & Bonding	9.9%			$ 115,877	$ 115,877	$ 115,877	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	48" HDPE DR 32.5 Pipe	2,000	LF	$ 151.45	$ 302,891	$ 302,891	$ 302,891	B&Q quote 1/2023 + 10%
6	36" HDPE DR 32.5 Pipe	14,500	LF	$ 85.20	$ 1,235,471	$ 1,235,471	$ 1,235,471	B&Q quote 1/2023 + 10%
7	HDPE DR 32.5 Fittings	20	EA	$ 2,500	$ 50,000	$ 50,000	$ 50,000	Avg B&Q quote 1/19/2023
8	Pressurized valves	2	EA	$ 3,500	$ 7,000	$ 7,000	$ 7,000	NRLR bid + 10%
	CONSTRUCTION							
9	Project Incidentals (Survey, Permits, Erosion Control, Fencing, Demo)	1	LS	$ 112,698	$ 112,698	$ 112,698	$ 112,698	NR bid 1/23 + Fruitland bid 11/20
10	Existing Structure Demo & Removal	1	LS	$ 31,570	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to size of structures
11	48" Pipe Installation	2,000	LF	$ 74.16	$ 148,320	$ 148,320	$ 148,320	Needlerock bid 1/2023
12	36" Pipe Installation	14,500	LF	$ 54.13	$ 784,885	$ 784,885	$ 784,885	Needlerock bid 1/2024
13	Pressurized Turnout w/meter	2	EA	$ 7,971	$ 15,942	$ 15,942	$ 15,942	Needlerock bid 1/2023
14	Air/Vac	12	EA	$ 1,406	$ 16,591	$ 16,591	$ 16,591	Needlerock bid 1/2023
15	Reclamation & Seeding	16,500	LF	$ 0.18	$ 2,970	$ 2,970	$ 2,970	FIC SW seed + ATV seed spreader
16	Pipe Concrete Intake Structure & Trashrack	1	EA	$ 17,500	$ 17,500	$ 17,500	$ 17,500	
17	Conc Outlet/Divider @ CG	1	EA	$ 40,000	$ 40,000	$ 40,000	$ 40,000	
	SUBTOTAL				$ 2,881,715	$ 2,881,715	$ 2,841,715	
18	CONSTRUCTION MANAGEMENT	4.0%			$ 115,269	$ 115,269	$ 115,269	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 2,996,984	$ 2,996,984	$ 2,956,984	
19	HABITAT REPLACEMENT	5.0%			$ 149,849	$ 149,849	$ 149,849	5% of Const Costs
20	SINGLE AUDIT	3		$ 2,800	$ 8,400	$ 8,400	$ 8,400	Past project costs
	SUBTOTAL				$ 158,249	$ 158,249	$ 158,249	
	TOTAL				$ 3,266,764	$ 3,266,764	$ 3,226,764	

amortization factor	0.03795	
amortized cost	$ 123,974	
tons of salt	1218	about 85 percent of 1433 total for overland
cost/ton	$ 101.78	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Overland Only 42"

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	3.5%			$ 123,154	$ 123,154	$ 123,154	% of Construction Costs
2	NEPA Compliance	16,500		$ 1.03	$ 16,995	$ 16,995	$ 16,995	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	16,500		$ 0.49	$ 8,085	$ 8,085	$ 8,085	Past Proj. Avg $/ft
	SUBTOTAL				$ 148,234	$ 148,234	$ 148,234	
4	Mobilization & Bonding	9.9%			$ 133,132	$ 133,132	$ 133,132	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	48" HDPE DR 32.5 Pipe	2,000	LF	$ 151.45	$ 302,891	$ 302,891	$ 302,891	B&Q quote 1/2023 + 10%
6	42" HDPE DR 32.5 Pipe	14,500	LF	$ 115.92	$ 1,680,907	$ 1,680,907	$ 1,680,907	B&Q quote 1/2023 + 10%
7	HDPE DR 32.5 Fittings	20	EA	$ 2,500	$ 50,000	$ 50,000	$ 50,000	Avg B&Q quote 1/19/2023
8	Pressurized valves	2	EA	$ 3,500	$ 7,000	$ 7,000	$ 7,000	NRLR bid + 10%
	CONSTRUCTION							
9	Project Incidentals (Survey, Permits, Erosion Control, Fencing, Demo)	1	LS	$ 112,698	$ 112,698	$ 112,698	$ 112,698	NR bid 1/23 + Fruitland bid 11/20
10	Existing Structure Demo & Removal	1	LS	$ 31,570	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to size of structures
11	48" Pipe Installation	2,000	LF	$ 74.16	$ 148,320	$ 148,320	$ 148,320	Needlerock bid 1/2023
12	42" Pipe Installation	14,500	LF	$ 66.15	$ 959,175	$ 959,175	$ 959,175	Needlerock bid 1/2024
13	Pressurized Turnout w/meter	2	EA	$ 7,971	$ 15,942	$ 15,942	$ 15,942	Needlerock bid 1/2023
14	Air/Vac	12	EA	$ 1,406	$ 16,591	$ 16,591	$ 16,591	Needlerock bid 1/2023
15	Reclamation & Seeding	16,500	LF	$ 0.18	$ 2,970	$ 2,970	$ 2,970	FIC SW seed + ATV seed spreader
16	Pipe Concrete Intake Structure & Trashrack	1	EA	$ 17,500	$ 17,500	$ 17,500	$ 17,500	Eng Est based on recent concrete costs
17	Conc Outlet/Divider @ CG	1	EA	$ 40,000	$ 40,000	$ 40,000	$ 40,000	Eng Est based on recent concrete costs
	SUBTOTAL				$ 3,518,695	$ 3,518,695	$ 3,518,695	
18	CONSTRUCTION MANAGEMENT	4.0%			$ 140,748	$ 140,748	$ 140,748	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 3,659,443	$ 3,659,443	$ 3,659,443	
19	HABITAT REPLACEMENT	5.0%			$ 182,972	$ 182,972	$ 182,972	5% of Const Costs
20	SINGLE AUDIT	3		$ 2,800	$ 8,400	$ 8,400	$ 8,400	Past project costs
	SUBTOTAL				$ 191,372	$ 191,372	$ 191,372	
	TOTAL				$ 3,999,049	$ 3,999,049	$ 3,999,049	

amortization factor	0.03795	
amortized cost	$ 151,764	
tons of salt	1218	about 85 percent of 1433 total for overland
cost/ton	$ 124.60	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Purnell Lateral

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	5.0%			$ 46,297	$ 46,297	$ 46,297	4% of Construction Costs
2	NEPA Compliance	12,060		$ 1.03	$ 12,422	$ 12,422	$ 12,422	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	12,060		$ 0.49	$ 5,909	$ 5,909	$ 5,909	Past Proj. Avg $/ft
	SUBTOTAL				$ 64,628	$ 64,628	$ 64,628	
4	Mobilization & Bonding	9.9%			$ 60,330	$ 60,330	$ 60,330	Needlerock bid 1/2023 (10% max)
	MATERIALS							
5	18" HDPE DR 32.5 Pipe	3,800	LF	$ 24.17	$ 91,844	$ 91,844	$ 91,844	B&Q quote 1/2023 + 10%
6	14" HDPE DR 19 Pipe	1,500	LF	$ 26.10	$ 39,150	$ 39,150	$ 39,150	B&Q quote 1/2023 + 10%
7	12" HDPE DR 32.5 Pipe	4,850	LF	$ 13.61	$ 66,029	$ 66,029	$ 66,029	B&Q quote 1/2023 + 10%
8	10" HDPE DR 32.5 Pipe	1,910	LF	$ 11.41	$ 21,801	$ 21,801	$ 21,801	B&Q quote 1/2023 + 10%
9	HDPE DR 32.5 Fittings	9	EA	$ 1,500	$ 13,500	$ 13,500	$ 13,500	Avg B&Q quote 1/19/2023
10	Butterfly valves	12	EA	$ 1,283	$ 15,391	$ 15,391	$ 15,391	25 turnouts + 10 for addntl users x2
11	8" PRV	1	EA	$ 4,500	$ 4,500	$ 4,500	$ 4,500	East Lateral Feasibility 2021
12	6" PRV	1	EA	$ 4,000	$ 4,000	$ 4,000	$ 4,000	East Lateral Feasibility 2021
	CONSTRUCTION							
11	Project Incidentals (Survey, Permits, Erosion Control, Fencing)	1	LS	$ 82,369.80	$ 82,370	$ 82,370	$ 82,370	NR pipe bid 1/23 + Fruitland bids11/20
12	Existing Structure Demo & Removal	1	LS	$ 6,500	$ 6,500	$ 6,500	$ 6,500	NR bid 1/23 *1.1 due to # of structures
13	18" Pipe Installation	3,800	LF	$ 37.66	$ 143,108	$ 143,108	$ 143,108	Needlerock bid 1/2023
14	14" pipe installation	1,500	LF	$ 34.00	$ 51,000	$ 51,000	$ 51,000	Needlerock bid 1/2023
15	12" pipe installation	4,850	LF	$ 32.00	$ 155,200	$ 155,200	$ 155,200	Needlerock bid 1/2023
16	10" pipe installation	1,910	LF	$ 29.11	$ 55,600	$ 55,600	$ 55,600	Needlerock bid 1/2023
17	Reclamation & Seeding	12,060	LF	$ 0.18	$ 2,171	$ 2,171	$ 2,171	FIC SW seed + ATV seed spreader
18	Concrete/Screening Structure	1	EA	$ 17,000	$ 17,000	$ 17,000	$ 17,000	4x4 screen
19	PRV Install Incl. Vault	2	EA	$ 6,000	$ 12,000	$ 12,000	$ 12,000	8x4 vault
20	Pressurized Turnout w/meter	7	EA	$ 10,316	$ 72,211	$ 72,211	$ 72,211	Needlerock bid 1/2023
21	Air/Vac	9	EA	$ 1,406	$ 12,232	$ 12,232	$ 12,232	Needlerock bid 1/2023
	SUBTOTAL				$ 925,937	$ 925,937	$ 925,937	
37	CONSTRUCTION MANAGEMENT	4.5%			$ 41,667	$ 41,667	$ 41,667	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 967,604	$ 967,604	$ 967,604	
38	HABITAT REPLACEMENT	5.0%			$ 48,380	$ 48,380	$ 48,380	5% of Const Costs
39	SINGLE AUDIT	1		$ 2,800	$ 2,800	$ 2,800	$ 2,800	Past project costs
	SUBTOTAL				$ 51,180	$ 51,180	$ 51,180	
	TOTAL				$ 1,083,411	$ 1,083,411	$ 1,083,411	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Branch A Cedar Gulch Lateral

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	5.0%			$ 22,978	$ 22,978	$ 22,978	% of Construction Costs
2	NEPA Compliance	6,265		$ 1.03	$ 6,453	$ 6,453	$ 6,453	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	6,265		$ 0.49	$ 3,070	$ 3,070	$ 3,070	Past Proj. Avg $/ft
	SUBTOTAL				$ 32,501	$ 32,501	$ 32,501	
4	Mobilization & Bonding	9.9%			$ 32,334	$ 32,334	$ 32,334	Needlerock bid 1/2023 (10% max)
	MATERIALS							
8	16" HDPE DR 32.5 Pipe	550	LF	$ 24.17	$ 13,293	$ 13,293	$ 13,293	B&Q quote 1/2023 + 10%
9	12" HDPE DR 32.5 Pipe	315	LF	$ 13.61	$ 4,288	$ 4,288	$ 4,288	B&Q quote 1/2023 + 10%
10	10" HDPE DR 32.5 Pipe	2,900	LF	$ 11.41	$ 33,101	$ 33,101	$ 33,101	B&Q quote 1/2023 + 10%
11	10" HDPE DR 21 Pipe	2,500	LF	$ 13.21	$ 33,035	$ 33,035	$ 33,035	B&Q quote 1/2023 + 10%
12	HDPE DR 32.5 Fittings	7	EA	$ 1,500.00	$ 10,500	$ 10,500	$ 10,500	Avg B&Q quote 1/19/2023
13	Butterfly Valves	5	EA	$ 1,282.60	$ 6,413	$ 6,413	$ 6,413	25 turnouts + 10 for addntl users x2
	CONSTRUCTION							
14	Project Incidentals (Survey, Permits, Erosion Control, Fencing)	1	LS	$ 42,789.95	$ 42,790	$ 42,790	$ 42,790	NR pipe bid 1/23 + Fruitland bids11/20
15	Existing Structure Demo & Removal	1	LS	$ 31,570.00	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to # of structures
16	16" Pipe Installation	550	LF	$ 35.00	$ 19,250	$ 19,250	$ 19,250	Needlerock bid 1/2023
17	12" Pipe Installation	315	LF	$ 32.00	$ 10,080	$ 10,080	$ 10,080	Needlerock bid 1/2023
18	10" pipe installation	5,400	LF	$ 29.11	$ 157,194	$ 157,194	$ 157,194	Needlerock bid 1/2023
19	Reclamation & Seeding	6,265	LF	$ 0.18	$ 1,128	$ 1,128	$ 1,128	FIC SW seed + ATV seed spreader
20	Concrete/Screening Structure	1	EA	$ 17,000	$ 17,000	$ 17,000	$ 17,000	Needlerock bid 1/2023
21	Pressurized Turnout w/meter	4	EA	$ 10,316	$ 41,263	$ 41,263	$ 41,263	Needlerock bid 1/2023
22	Air/Vac	5	EA	$ 1,406	$ 6,327	$ 6,327	$ 6,327	Needlerock bid 1/2023
	SUBTOTAL				$ 459,567	$ 459,567	$ 459,567	
37	CONSTRUCTION MANAGEMENT	4.5%			$ 20,680	$ 20,680	$ 20,680	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 480,247	$ 480,247	$ 480,247	
38	HABITAT REPLACEMENT	5.0%			$ 24,012	$ 24,012	$ 24,012	5% of Const Costs
39	SINGLE AUDIT	1		$ 2,800	$ 2,800	$ 2,800	$ 2,800	Past project costs
	SUBTOTAL				$ 26,812	$ 26,812	$ 26,812	
	TOTAL				$ 539,560	$ 539,560	$ 539,560	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Lower Lawhead Lateral

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	5.0%			$ 97,596	$ 97,596	$ 97,596	5% of Construction Costs
2	NEPA Compliance	14,260		$ 1.03	$ 14,688	$ 14,688	$ 14,688	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	14,260		$ 0.49	$ 6,987	$ 6,987	$ 6,987	Past Proj. Avg $/ft
	SUBTOTAL				$ 119,271	$ 119,271	$ 119,271	
4	Mobilization & Bonding	9.9%			$ 94,346	$ 94,346	$ 94,346	Needlerock bid 1/2023 (10% max)
	MATERIALS							
6	36" HDPE DR 41 Pipe	5,690	LF	$ 70.23	$ 399,582	$ 399,582	$ 399,582	B&Q quote 1/2023 + 10%
7	32" HDPE DR 32.5 Pipe	1,270	LF	$ 69.67	$ 88,481	$ 88,481	$ 88,481	B&Q quote 1/2023 + 10%
8	24" HDPE DR 32.5 Pipe	2,550	LF	$ 39.79	$ 101,465	$ 101,465	$ 101,465	B&Q quote 1/2023 + 10%
9	16" HDPE DR 21 Pipe	2,780	LF	$ 30.70	$ 85,343	$ 85,343	$ 85,343	B&Q quote 1/2023 + 10%
10	12" HDPE DR 32.5 Pipe	1,330	LF	$ 13.61	$ 18,107	$ 18,107	$ 18,107	B&Q quote 1/2023 + 10%
11	10" HDPE DR 32.5 Pipe	640	LF	$ 11.41	$ 7,305	$ 7,305	$ 7,305	B&Q quote 1/2023 + 10%
12	HDPE DR 32.5 Fittings	15	EA	$ 1,500.00	$ 22,500	$ 22,500	$ 22,500	Avg B&Q quote 1/19/2023
13	Butterfly Valves	17	EA	$ 1,282.60	$ 21,804	$ 21,804	$ 21,804	25 turnouts + 10 for addntl users x2
14	18" PRV	1	EA	$ 25,000.00	$ 25,000	$ 25,000	$ 25,000	
	CONSTRUCTION							
14	Project Incidentals (Survey, Permits, Erosion Control, Fencing)	1	LS	$ 97,395.80	$ 97,396	$ 97,396	$ 97,396	NR pipe bid 1/23 + Fruitland bids11/20
15	Existing Structure Demo & Removal	1	LS	$ 31,570.00	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to # of structures
16	36" Pipe Installation	5,690	LF	$ 54.13	$ 308,005	$ 308,005	$ 308,005	Needlerock bid 1/2023
17	32" Pipe Installation	1,270	LF	$ 47.80	$ 60,703	$ 60,703	$ 60,703	Needlerock bid 1/2023
18	24" Pipe Installation	2,550	LF	$ 41.85	$ 106,718	$ 106,718	$ 106,718	Needlerock bid 1/2023
19	16" pipe installation	2,780	LF	$ 36.32	$ 100,963	$ 100,963	$ 100,963	Needlerock bid 1/2023
20	12" pipe installation	1,330	LF	$ 32.00	$ 42,560	$ 42,560	$ 42,560	Needlerock bid 1/2023
21	10" pipe installation	640	LF	$ 29.11	$ 18,630	$ 18,630	$ 18,630	Needlerock bid 1/2023
22	Reclamation & Seeding	14,260	LF	$ 0.18	$ 2,567	$ 2,567	$ 2,567	FIC SW seed + ATV seed spreader
23	Concrete/Screening Structure	1	EA	$ 45,000	$ 45,000	$ 45,000	$ 45,000	Needlerock bid 1/2023
24	PRV Install	1	EA	$ 12,000	$ 12,000	$ 12,000	$ 12,000	Eng Est
25	Pressurized Turnout w/meter	10	EA	$ 11,254	$ 112,536	$ 112,536	$ 112,536	Needlerock bid 1/2023
26	Air/Vac	10	EA	$ 1,406	$ 14,341	$ 14,341	$ 14,341	Needlerock bid 1/2023
27	Paulson Rehabilitation	1	LS	$ 135,000	$ 135,000	$ 135,000	$ 135,000	Eng Est
	SUBTOTAL				$ 1,951,923	$ 1,951,923	$ 1,816,923	
37	CONSTRUCTION MANAGEMENT	4.5%			$ 87,837	$ 87,837	$ 87,837	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 2,039,760	$ 2,039,760	$ 1,904,760	
38	HABITAT REPLACEMENT	5.0%			$ 101,988	$ 101,988	$ 101,988	5% of Const Costs
39	SINGLE AUDIT	1		$ 2,800	$ 2,800	$ 2,800	$ 2,800	Past project costs

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Lower Lawhead Lateral

SUBTOTAL				$ 104,788	$ 104,788	$ 104,788	
TOTAL				$ 2,263,819	$ 2,263,819	$ 2,128,819	

APPENDIX C: COST ESTIMATE SHEET - Overland Redlands Feasibility Study

Clark Draw Lateral

Item No.		Number of Units	Units	Cost	Number of Units * Cost	Reclamation Funding	Total Project Funding	Basis of Cost Estimates
1	PROJECT DESIGN	4.5%			$ 28,272	$ 28,272	$ 28,272	4.5% of Construction Costs
2	NEPA Compliance	6,760		$ 1.03	$ 6,963	$ 6,963	$ 6,963	Past Proj. Avg $/ft
3	Cultural Res. Study & Mitigation	6,760		$ 0.49	$ 3,312	$ 3,312	$ 3,312	Past Proj. Avg $/ft
	SUBTOTAL				$ 38,547	$ 38,547	$ 38,547	
4	Mobilization & Bonding	9.9%			$ 39,652	$ 39,652	$ 39,652	Needlerock bid 1/2023 (10% max)
	MATERIALS							
8	24" HDPE DR 32.5 Pipe	930	LF	$ 39.79	$ 37,005	$ 37,005	$ 37,005	B&Q quote 1/2023 + 10%
9	20" HDPE DR 32.5 Pipe	1,380	LF	$ 28.05	$ 38,709	$ 38,709	$ 38,709	B&Q quote 1/2023 + 10%
10	18" HDPE DR 32.5 Pipe	1,740	LF	$ 24.17	$ 42,055	$ 42,055	$ 42,055	B&Q quote 1/2023 + 10%
11	16" HDPE DR 32.5 Pipe	2,710	LF	$ 20.19	$ 54,701	$ 54,701	$ 54,701	B&Q quote 1/2023 + 10%
12	HDPE DR 32.5 Fittings	7	EA	$ 1,500.00	$ 10,500	$ 10,500	$ 10,500	Avg B&Q quote 1/19/2023
13	Butterfly valves	4	EA	$ 1,282.60	$ 5,130	$ 5,130	$ 5,130	25 turnouts + 10 for addntl users x2
	CONSTRUCTION							
14	Project Incidentals (Survey, Permits, Erosion Control, Fencing)	1	LS	$ 46,170.80	$ 46,171	$ 46,171	$ 46,171	NR pipe bid 1/23 + Fruitland bids11/20
15	Existing Structure Demo & Removal	1	LS	$ 31,570.00	$ 31,570	$ 31,570	$ 31,570	NR bid 1/23 *1.1 due to # of structures
16	24" Pipe Installation	930	LF	$ 41.85	$ 38,921	$ 38,921	$ 38,921	Needlerock bid 1/2023
17	20" Pipe Installation	1,380	LF	$ 38.80	$ 53,544	$ 53,544	$ 53,544	Needlerock bid 1/2023
18	18" Pipe Installation	1,740	LF	$ 37.66	$ 65,528	$ 65,528	$ 65,528	Needlerock bid 1/2023
19	16" pipe installation	2,710	LF	$ 36.32	$ 98,421	$ 98,421	$ 98,421	Needlerock bid 1/2023
20	Reclamation & Seeding	6,760	LF	$ 0.18	$ 1,217	$ 1,217	$ 1,217	FIC SW seed + ATV seed spreader
21	Concrete/Screening Structure	1	EA	$ 17,000	$ 17,000	$ 17,000	$ 17,000	Needlerock bid 1/2023
22	Pressurized Turnout w/meter	4	EA	$ 10,315	$ 41,262	$ 41,262	$ 41,262	Needlerock bid 1/2023
23	Air/Vac	5	EA	$ 1,406	$ 6,889	$ 6,889	$ 6,889	Needlerock bid 1/2023
	SUBTOTAL				$ 628,275	$ 628,275	$ 628,275	
37	CONSTRUCTION MANAGEMENT	4.5%			$ 28,272	$ 28,272	$ 28,272	Consultant Estimate, complex project
	TOTAL CONSTRUCTION COSTS				$ 656,547	$ 656,547	$ 656,547	
38	HABITAT REPLACEMENT	5.0%			$ 32,827	$ 32,827	$ 32,827	5% of Const Costs
39	SINGLE AUDIT	1		$ 2,800	$ 2,800	$ 2,800	$ 2,800	Past project costs
	SUBTOTAL				$ 35,627	$ 35,627	$ 35,627	
	TOTAL				$ 730,722	$ 730,722	$ 730,722	

Appendix D– RMWUA Shares Primer

RMWUA Class B-1 Shares

Explanation of LCWUA Water Delivered by RMWUA

History of LCWUA (RMWUA) Class B-1 and B-2 Shares
The Paonia Project is composed of the Paonia Reservoir and the Fire Mountain Canal, completed in 1962. Prior to completion, some decrees on Leroux Creek were delivered to ditches that ran water onto Rogers Mesa. At the project's completion, owners of these legacy decrees had the option of trading some or all of their holdings into the LCWUA in exchange for shares of Fire Mountain stock.

The traded water holdings were moved upstream on Leroux Creek to irrigate lands above the Fire Mountain Canal, benefitting the new stockholders of the water. This was conducted through a complex decree: Civil Action No. 5091.

The water holdings traded in to LCWUA became available for subscription from landowners above the Fire Mountain Canal. This water constitutes LCWUA Class B-1 and B-2 shares. These are the same shares as RMWUA Class B-1 and B-2.

LCWUA (RMWUA) Shares
LCWUA (RMWUA) Class B-2 – This share class represents early season water which runs from junior decrees traded into the LCWUA and runs until Leroux Creek drops down to 61.35 CFS. 61.35 CFS initiates a change to "late season" in the water year. Once the late season commences, B-2 is shut off.

LCWUA (RMWUA) Class B-1 - These shares represent reservoir water derived from the Paonia Project. Delivery of these shares occurs in late season at the conclusion of B-2 delivery. Delivery occurs in either 3 or 4 day runs, on a call basis. One share basis is equal to one day of run at ½ CFS (0.99175 Acre Feet).

Class B-1 "Prorated" Water
LCWUA reservoirs are usually full in the early season. LCWUA also owns some of the flow in Leroux Creek. Available reservoir overflow plus the LCWUA Leroux flow is used first to fill early orders. All of this water must be turned into the ditch system, whether it is ordered or not.

For most years, there is more flow available than needed to fill orders for at least the first few turns of the season. The difference (excess available) becomes the "Pro-Rated" B-1 water, flowing early in the "late season". The duration of "Pro-Rated" water varies from year to year. In a very rare year, prorating may not be necessary.

This water is delivered by LCWUA to RMWUA whether it is called for or not. Water delivered to the RMWUA ditch system that is not ordered by RMWUA B-1 shareholders becomes "prorated" among all RMWUA B-1 shareholders. Their total annual B-1 allocation is reduced by this prorated amount.

When the flow in Leroux Creek drops to a point where there are more orders than available flow, water is turned from the reservoir system to make up the difference. At this point, "prorated" water concludes and late "by call only" B-1 water commences.

Class B-1 "Percentage"
The LCWUA board uses a number of factors to determine what percentage of the base 0.5 CFS/day/share allocation may actually be delivered to B-1 shareholders. Factors include, but are not limited to, amount of runoff, reservoir volume, transit loss, "prorate" water, etc. A poor precipitation year will result in a low percentage. A heavy precipitation year will result in a higher percentage.
"Percentage" example: A shareholder owns 40 shares of B-1 and the declared percentage is 75%, then the shareholder has 15 CFS/day/share basis of water in their account for that year. (40 shares x 0.75 x 0.5 CFS/day/share)

Class B-1 Delivery

B-1 shares may be called any time during the water year, after the conclusion of the B-2 "early" run. Delivery occurs in either 3 or 4 day runs, per the call schedule below. Call forms must be completed in their entirety. Forms are available at the metal collection boxes provided at:

- Redlands Mesa Grange - 27953 Redlands Mesa Rd
- Northwest Corner – 24991 Redlands Mesa Rd at North Rd intersection

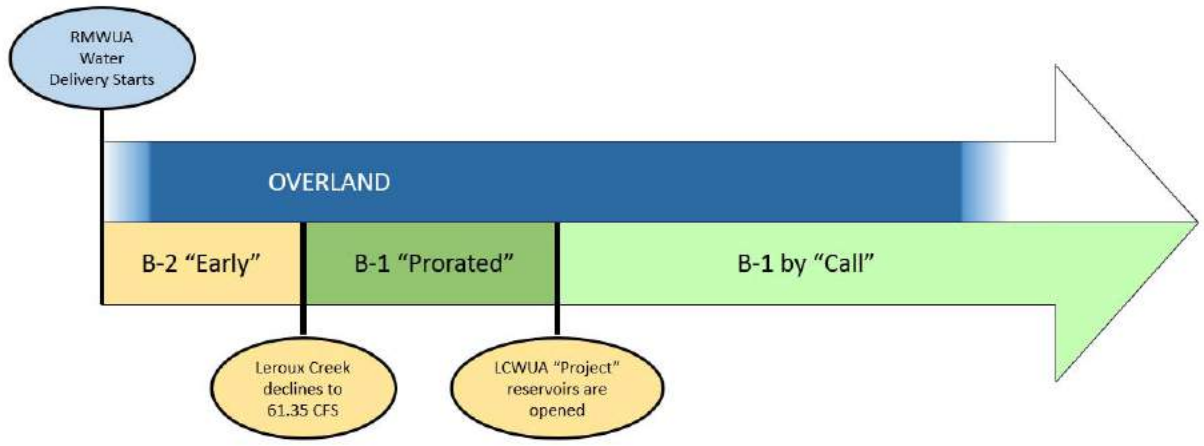
Completed Call Form Placed in Collection Box	Box will be Set
Wednesday by 6pm	Friday
Sunday by 6pm	Tuesday

One share has a base value equal to one day of run at ½ CFS. Calls can be made in CFS increments with a 1/8 CFS minimum. Calls may also be made in Acre Feet with a 1/4 Acre Foot minimum. 1/2 CFS/24 hours equals 0.99175 Acre Feet.

B-1 "Prorated" – B-1 water is automatically delivered during the "prorated" segment of the water year. Prorated water is automatically deducted from the shareholder's account.

B-1 Post-"Prorated" by Call – This water is only available by call.

Delivery of B-1 shares after the conclusion of the B-2 and Overland runs is <u>not guaranteed</u> due to shrinkage loss in dry ditches. Users are encouraged to pool deliveries with other shareholders to increase likelihood of delivery via a greater run volume.



RMWUA Water Year "Flow" Chart

Redlands Mesa Water Users Association - Water Delivery Policy

The Redlands Mesa Water Users Association (RMWUA) administers delivery of shareholder irrigation water to Redlands Mesa properties through a series of ditches and metering boxes.

Shares Associated with RMWUA Ditch System

RMWUA Class A-1 – This is an association membership share only. No water allocation is associated.

RMWUA Class B-1 – Commonly known as "Late/Project" water. Delivery of these shares is available upon request following the conclusion of B-2 share delivery. Delivery usually occurs in either 3 or 4 day runs, on a call basis. One share basis is equal to one day of run at ½ CFS. See separate "Class B-1" document for further explanation. Delivery after the conclusion of the B-2 and Overland runs is not guaranteed due to shrinkage loss in dry ditches. Users are encouraged to pool deliveries with other shareholders to increase likelihood of delivery via a greater run volume.

RMWUA Class B-2 – Known as "Early" water. Delivery of these shares starts at the commencement of the irrigation season (typically early April) and concludes when the spill-over/run-off source is exhausted. Amount delivered is based upon that season's water quantity available, divided by the number of shares held. Box metering width is computer generated, printed on a card, and monitored by the box setter.

Overland Ditch and Reservoir Company – Known as "Overland" water. Delivery of Overland shares commences in spring using decreed water, continuing when the Overland reservoir is opened, and ceases when the reservoir is exhausted. Amount delivered is based upon that season's water quantity available, divided by the number of shares held. Box metering width is computer generated, printed on a card and monitored by the box setter.

Other Shares – RMWUA has agreements to deliver other shares such as Pro-Rated, Stull, and Crater. These are unique situations that will require explanation and coordination from RMWUA staff.

Shareholder Responsibilities

RMWUA shareholders are responsible for monitoring the delivery of their water. The shareholder must initially open their box at the start of the delivery season when ready to accept water. The shareholder may open or close the box at any time they are allocated water to suit irrigation and farming operations. Boxes may never be opened further than the amount in inches indicated on the most recently issued box card.

The box card can be found at the metering box, placed by the box setter. Boxes found opened or modified to flow in excess of the authorized allocation may be closed and locked by RMWUA. The shareholder is solely responsible for water delivery downstream of the box.

RMWUA Class B-2 and Overland water delivery is provided automatically without "call". Delivery of owned or leased shares to other box locations served on the mesa may occur upon special request to RMWUA.

RMWUA Class B-1 is delivered automatically (prorated) and subsequently on call using provided call forms completed in their entirety. Call forms are available at the metal collection boxes provided at:

- Redlands Mesa Grange - 27953 Redlands Mesa Rd
- Northwest Corner – 24991 Redlands Mesa Rd at North Rd intersection

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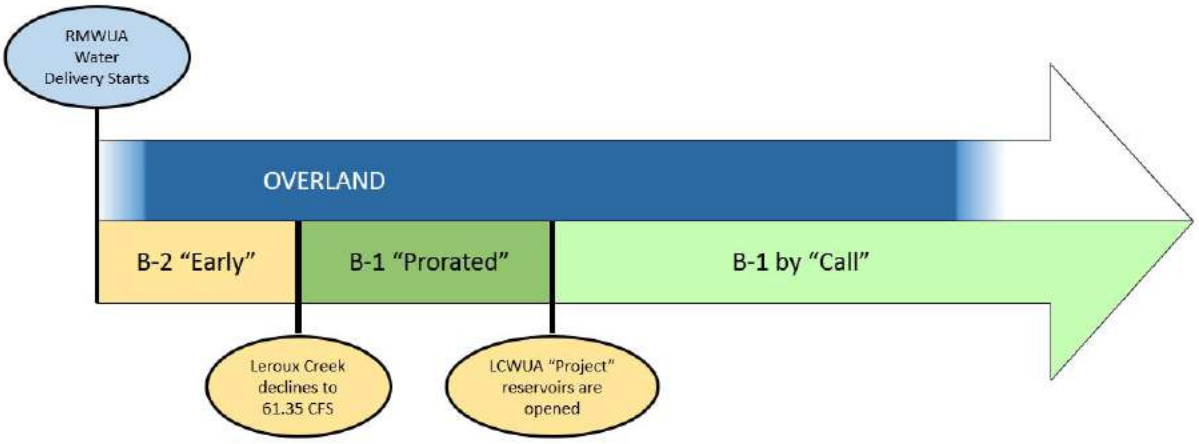
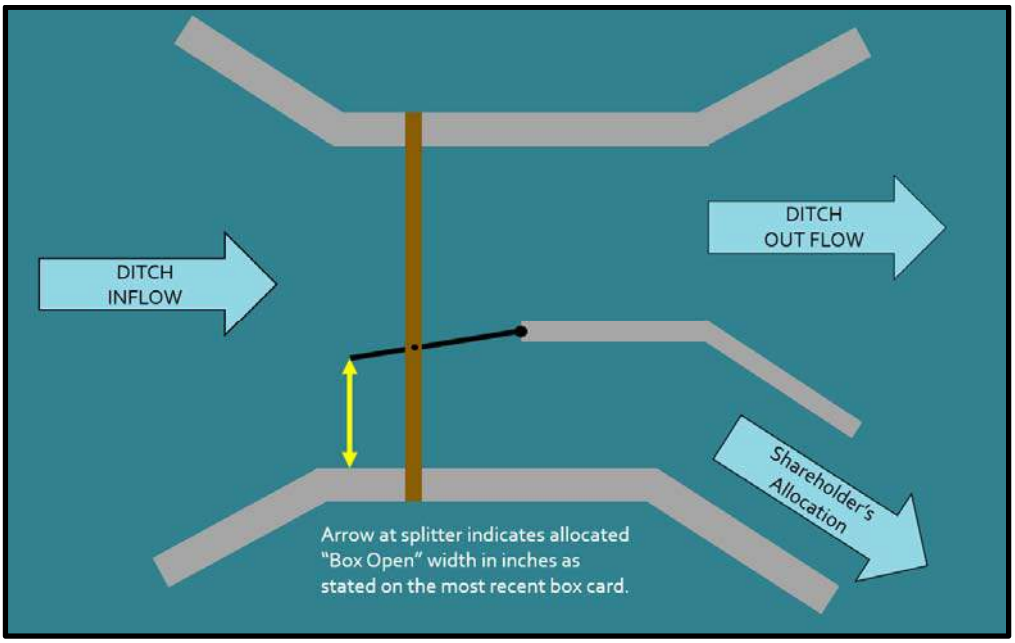


RMWUA Water Year "Flow" Chart



Typical Metering Box Configuration

Note: Multiple box configurations exist on the Mesa. Contact box setters for guidance on alternative box configurations.

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