

2.0 ALTERNATIVES

2.1 Introduction

A range of alternatives were considered for replacing the Tropic Ditch that could be used to reduce the amount of salinity reaching the Paria River. This chapter describes the alternatives considered and analyzed.

2.2 No Action Alternative

The No Action Alternative would be the continued use and maintenance of the historic Tropic Ditch. There would be no changes to the ditch alignment or structures. If no action is taken to improve the Tropic Ditch conveyance system, the calculated 1829 tons of salt would continue to reach the Colorado River. The ditch would continue to lose water due to seepage at 1060 acre-feet/year (Reclamation Salinity Loading Analysis, 2004). Maintenance costs of the ditch would continue to rise as sedimentation and vegetation growth increases in the ditch. The Company would continue to lose, on average, 600 acre-feet per year of irrigation water due to sluicing sediment from the ditch that has been washed into it due to severe rain storms. Agricultural productivity in the area would continue to be hindered by the reduced water supply.

2.3 Action Alternative

The Proposed Action to reduce the amount of salt reaching the Paria River and ultimately the Colorado River is to replace the ditch with a buried pipeline ranging from 18 to 30 inches in diameter. This action would eliminate 1829 tons of salt per year from reaching the river along with reducing water losses due to evaporation and seepage (Reclamation Salinity Loading Analysis, 2004). This action would increase the amount of irrigation water by approximately 40% which in turn increases the agricultural productivity of the area. It would also greatly decrease the maintenance required on the irrigation system.

The following section describes the proposed pipeline alignment with three alternative alignments through the Tropic Valley that are similar in scope and impacts but differ in the final placement of the pipeline. All three of the alternative alignments follow the same route for the first 10,000 ft and the final 5,000 ft and would be buried at least three feet in the ground. Any one of these alternatives would ultimately constitute the action alternative depending on right of way acquisition. The environmental consequences of the three alternatives have been evaluated and determined to be similar (See Figure 3: Pipeline Alignment Alternatives).

The proposed buried pipeline begins at the outlet of an existing culvert that crosses under Highway 12 near the Mossy Cave Trailhead within Bryce Canyon National Park. At this point water would be diverted into a pipeline that would follow the existing ditch for about 500 feet. The proposed alignment would run east following an old cattle trail between the Paria River wash and the historic ditch. After approximately 2,400 feet the alignment drops into the wash for approximately 1,200 feet and follows an old irrigation maintenance road before leaving Bryce Canyon National Park. After leaving the Park,

the pipeline would parallel the ditch for approximately another 750 feet. Then the proposed pipeline alignment would follow the ditch alignment to the existing turnout for the first pond. At this point the alignment would follow the north edge of the Paria River wash for about 450 feet. The alignment would then cross the river and be routed down the east side of the Highway until the proposed alignment splits into the three proposed alternative routes through the Tropic Valley. Further down the valley the alignments merge again to go around the south side of the Backbone below the existing ditch until reaching the second pond.

The origin of the three alternative alignments is on the east side of Highway 12 approximately at mile marker 19 on Highway 12. Alternative 1 parallels the highway right-of-way south to the dirt road at approximately 1250 North Center where it then turns east and eventually crosses the Paria River. The pipeline follows this road for approximately 2,700 feet where it then begins traveling in a southeasterly direction for approximately 1,200 feet until reaching the point where all three alignments again converge. Alternative 2 travels directly east from the origin of the three alternative alignments for approximately 1,500 feet until reaching an existing dirt road. It then parallels the road alignment on the west side until intersecting Alternative 1 approximately 2,800 feet to the south. Alternative 2 then turns to the east and follows the same alignment as Alternative 1. Like Alternative 2, Alternative 3 also heads east from the origin of the three alternative alignments. Instead of following the dirt road to the south, it continues east for approximately another 1,700 feet where it then turns and travels in a southerly direction for approximately 3,500 feet to the point where all three alignments again converge. The total lengths of the different alternatives are listed in Table 2.1.

Table 2.1 Entire Length Comparison of the Three Alternatives

Alternative 1	Alternative 2	Alternative 3
21,470 ft	21,110 ft	21,380 ft

A final alternative will be selected once all of the private property easement issues have been resolved. Tropic and East Fork Irrigation Company has easements for the existing ditch alignment. These easements may be used where the proposed alignments coincide. New easements would need to be obtained from land owners, whether public or private, where the existing ditch alignment and the proposed alignment deviate. A fifty foot wide easement would be needed during construction, except within Bryce Canyon National Park, a 30 foot wide construction easement with a fifty by 100 hundred foot turnaround easement every 1,000 feet would be used in order to minimize impacts. A comparison of the maximum acreage impacted by construction activities for each alternative is listed in Table 2.2. A thirty foot permanent easement would also need to be acquired for continual operation and maintenance of the pipeline.

Figure 3: Alignment Alternatives Map

Table 2.2 Maximum Impacted Acreage of the Three Alternatives

Alternative 1	Alternative 2	Alternative 3
24.54 Acres	24.23 Acres	24.64 Acres

Under the Action Alternative approximately 29,000 feet of the Tropic Ditch would be abandoned and left in its current state. Of these 29,000 feet, less than 2,500 feet would be used for the Proposed Action thus leaving 26,500 feet of open ditch within the project area to continue to provide habitat for wildlife within the surrounding area. It is expected that this habitat would be sustained by water collected in the ditch from storm runoff and natural springs in the area.

2.3.1 Pipeline Construction Procedures

2.3.1.1 Construction Sequence

Construction of the pipeline likely would occur in the following sequence:

- Flagging of the construction zone within the Park
- Mobilization of the construction equipment
- Excavation of the trench
- Pipe bedding preparation
- Haul pipe to construction site
- Fuse the pipe
- Place pipe within the trench
- Backfill around pipe and compact backfill
- Clean up and restore areas disturbed by construction
- Plant and reseed disturbed areas to provide for revegetation

2.3.1.2 Trench Excavation

A trench approximately five feet deep and approximately four feet wide would be excavated to provide for the installation of the pipe. Excavation would be performed with the use of an appropriately sized trackhoe to minimize impacts to the surrounding habitat. It is expected that a trackhoe with a footprint of 11 feet by 15 feet would be adequate for construction within the Park. All excavated material would be stockpiled to the side of the trench to be used as backfill once the pipe was installed. Top soil would be separated from other material in order to preserve it to be placed as the last layer.

During excavation of the trench, every effort would be taken to minimize impacts to the native vegetation. Trees and shrubbery would be avoided when possible. It is expected that despite the best efforts of the contractor, some native trees and shrubbery may be removed. Impacts would be reduced within the Park by using a thirty foot construction easement with a fifty foot wide by one hundred foot long turn around easement every thousand feet.

2.3.1.3 Pipe and Appurtenance Installation

The pipe would be transported by flatbed truck from the manufacturer to the staging areas. From the staging areas it would either be transported by loader to the work site or fused into longer sections and drug with a trackhoe to the work site. Efforts would be made to fuse the pipe in the fewest locations possible within the Park to decrease disturbance. The Tropic Wash, proposed pipeline alignment, and maintained roads would be used to transport the pipe to the work site. Each 50 foot section of pipe would be fused together with a pipe fuser and then placed in the prepared trench by trackhoe.

The crew, trench excavation, pipe installation, and finish grading, would all progress along the pipeline alignment from day to day. The crew's equipment would move along the alignment with them. Transportation vehicles would be used to transport the crew to and from the construction site to reduce the disturbance caused by the construction equipment. Each transportation vehicle would carry multiple crew members to minimize the number of vehicles. Pipe would be stockpiled at the staging areas and delivered to the alignment as it is needed.

At various points that would be determined during design, construction would be required to install either drain valves at low spots or air-vacuum valves at high spots. The drain valves would be located at low spots to allow any excess water that is in the pipeline at the end of the irrigation season to slowly drain from the pipe. These drains may be directed and day lighted into natural drainages or the wash. The air-vacuum valves are typically installed right on top of the pipe to vent air during pipe filling or allow air into the pipe while it drains.

After installing the pipe, backfill would be carefully placed around the pipe in layers of native material excavated from the trench. The preserved top soil would be placed last to minimize impacts. Backfill would be mechanically compacted with a vibratory compactor, wheel compactor or trackhoe attachment. Spoil in work areas would be spread evenly to blend with the natural topography and maintain local drainage patterns. Stockpiled topsoil then would be spread evenly over previously vegetated areas and reseeded with native vegetation species.

Any excess spoil material that can not be used as cover over the trench would be hauled from the site and disposed of either in a prior designated dump area in the Tropic area or on property currently owned by the Tropic and East Fork Irrigation Company. This includes all excess vegetation or trees removed during the construction clearing process.

Following construction, manpower would be provided by the Tropic and East Fork Irrigation Company to inspect the pipeline alignment within the Park to insure that restoration goals are met. Weed control would be performed during the inspection times and would include either mechanical or herbicide treatments. Herbicide treatments within the Park require a separate approval process through the Park. Monitoring and treatment would continue until there are two successive years without human intervention.

2.3.1.4 Tropic Wash Crossings

Existing drainage crossings of the Tropic Wash would be maintained during construction. Since it is not proposed to excavate into the existing invert of the Ditch, the existing drainage crossings should not require replacement.

Concrete collars a few feet long would be poured around the pipe in sections where the pipe is in the Tropic Wash. This would be done to prevent the pipe from rising to the surface under conditions where the surrounding soil is water logged.

2.3.1.5 Quality Control Procedures

After backfilling and all construction work are completed, the contractor would ensure quality control of construction through visual inspection and hydrostatic testing. Each segment or reach of pipe would be filled with water and pressurized for hydro testing through contractor-supplied pumps to ensure that the system operates to design specifications. If the pipe leaks or breaks, it would be repaired and re-tested until it meets specifications. After testing a segment, the water may be pumped into the next segment for testing.

The National Park Service would provide oversight during construction in the Park to ensure that construction parameters are being met while minimizing impacts to the resources.

2.3.2 Construction Staging Areas

Three construction staging areas have been surveyed and found to have no cultural or natural resources within them. These areas are identified in Figure 2. The staging areas would be used to stockpile the pipe, equipment and construction vehicles. If additional staging areas are needed, the contractor must demonstrate to Reclamation that those areas have been surveyed before use to ensure no impacts to culture or natural resources.

2.3.3 Operation and Maintenance

Operation of the Ditch once piped would remain essentially unchanged, and maintenance would be reduced significantly as a result. Operation would occur primarily from April 15 to October 15. Long term maintenance requirements and needs would be addressed in the right of way permits related to the project which would be developed in such a way to minimize impacts to the resources.

2.3.4 Land Disturbance

The proposed pipeline alignment, described in Section 2.3, is approximately four miles long and would require a maximum construction width of fifty feet. Construction activities would be confined to this fifty foot width, except within the Park where it would be reduced to thirty feet and the turnaround areas previously described to be located at about 1,000 foot intervals. Within the Park, the construction zone boundaries would be flagged and turn around areas designated with the help of Park personnel to minimize resource impacts during construction.

2.3.5 Transportation Requirements

Construction transportation requirements of the Proposed Action include a maximum of 20 round trips per day to the construction site within the Park. Construction transportation routes for the project include Highway 12, the Tropic Wash, pipeline alignment and other maintained roads. Figure 4 identifies the location of access points and transportation routes to the proposed pipeline alignment within and near the Park. These transportation routes would be chosen because they are currently used as vehicle access to the wash off of Highway 12, are already disturbed, and would be within the proposed pipeline alignment. Transportation to the project would follow the same routes to minimize disturbance to the biologic soil crust and vegetation and trips would be kept to a minimum. No vehicles other than the heavy equipment and those necessary to the construction activities would be allowed within the off-road construction zone.

2.3.6 Standard Operating Procedures

Standard Operating Procedures (SOPs) would be followed (except for unforeseen conditions that would require modifications) during construction, operation and maintenance of the Proposed Action to avoid or minimize adverse impacts on people and natural resources. A preconstruction meeting with the NPS, Reclamation, the contractor and the Tropic Irrigation Company's representative would be held prior to starting work. Weekly meetings would be held to assess the progress of the work within the Park. All construction vehicles and equipment would be washed prior to entering the Park to reduce the spread of noxious weeds. The SOPs and features of the Proposed Action have been formulated to avoid or minimize adverse impacts. Chapter 3 presents the impact analysis for resources after SOPs have been successfully implemented.

Actions related to restoration of the construction site and rehabilitation of certain sections of the historic ditch (i.e. removal of any hardware, monitoring for invasive weeds, and potential restoration of springs) within Bryce Canyon will be coordinated with the park, although the contractor and/or the irrigation company are responsible for completing the restoration work. Specifics of restoration will be outlined in the Standard Operating Procedures and/or right-of-way easements. Specifics of restoration procedures include the determination of what native vegetation is appropriate for the different construction zones, reseeding rates, landscaping, revegetation, and exotic weed removal. These documents will include success criteria for restoration of disturbed areas. Monitoring and treatment will continue until the success criteria are met for two successive years without human intervention. These actions will insure that disturbed areas are returned to a natural state as appropriate.

2.4 Alternatives Considered but Eliminated from Further Analysis

Other alternatives were considered at the onset of this project but were eliminated from consideration. A discussion of each of these alternatives follows.

2.4.1 Piping in Existing Ditch Alignment

Placing the pipeline along the existing ditch would eliminate the need for obtaining additional easements. It would also simplify the design of the pipeline. Drain valves would not be needed because a more constant downward slope would be provided, which

Figure 4: Construction Route Map

eliminates the low spots in the pipeline that would occur under the action alternative. The number of air-vacuum valves would be reduced due to a slower velocity and the existing ditch slope already allows for the conveyance of water. The landowner issues that are involved with the three alignments described above would not exist. However, this alignment would be nearly 8,000 feet longer than Alternative 1 which is the longest of the three alignments mentioned above. It would also require a larger diameter pipe to meet the flow requirements since the slope of the ditch is less than the slope of the other alternatives. Having a flatter slope reduces the velocity of flow thus requiring a larger cross sectional area to pass the same volume of water. These two factors, length and diameter, would increase the pipe and labor costs for this alternative. Because the existing ditch follows the land contours there would be more fittings involved in the construction of this pipeline in order to follow the meanders. Access to the site would be more difficult and the existing ditch would be impacted greatly by this alternative. This alternative would disturb more than 10 percent of the historic ditch requiring a much more extensive analysis since it is listed on the National Historic Register. This alignment would also increase impacts to wildlife and habit by drying up more wet areas and eliminating more open water. This alignment was eliminated as a viable option due to the increased costs and the adverse effects it would have on the historic Tropic Ditch, wildlife and habitat.

2.4.2 Lining the Existing Ditch

Lining the existing ditch would reduce the seepage loss from the ditch and would reduce the salt loading although evaporation would still occur. It is a less expensive alternative than installing a pipeline and maintenance costs would be lowered due to the reduction of vegetation growth. It would still require some maintenance since the ditch would continue to fill with sediment after storm events. It would provide open water for wildlife but would eliminate the existing habitat within the ditch. Like the “Piping in Existing Ditch Alignment” this alternative would disturb more than 10 percent of the ditch length and require more extensive analysis as a change to a cultural resource. This option was eliminated since it would not reduce as much seepage as a pipeline. It was also eliminated due to the adverse effect it would have on the historic Tropic Ditch and existing habitat.

2.4.3 Wash Corridor Alignment

The alternative of installing the pipeline entirely within the Paria River wash starting at the point where the ditch crosses under Highway 12 at the Mossy Cave Trailhead to the Tropic Valley was also considered. This alternative would reduce seepage as effectively as the proposed alternative. This alternative would allow for easy access throughout construction and after for maintenance purposes as long as these activities are performed during times of no runoff. Many of the impacts would be mitigated during the next runoff since approximately half of the construction activities would occur within the wash. This alternative would reduce the amount of seepage and salt loading just as the action alternatives would. The benefits of leaving the ditch in its current state would be preserved, it would maintain its historic characteristics, and continual habitat and open wet areas would remain. This alternative was eliminated due to the increased potential for scouring of the fill material around the pipe exposing it and increasing the potential

for damage. This increased potential for damage could have adverse effects to the purpose of the project to convey agricultural water. The potential risk of not being able access the pipe for maintenance activities during times of runoff was considered to be too great.

2.4.4 Highway Corridor Alignment

The Highway Corridor Alignment differs from the Action Alternative in that this alignment would be within the Highway 12 corridor. The pipeline would parallel Highway 12 through Bryce Canyon National Park and the Tropic Valley until approximately 1250 North Center Street, Tropic. There it would leave the highway corridor and travel east to the second pond. This alternative would eliminate the need for access points and would provide ease during construction since it would parallel maintained roads through out the majority of the alignment. Fewer easements would need to be obtained from private landowners for this alignment alternative since it would follow Highway 12 most of the way. The benefits of leaving the ditch in its current state would be preserved, it would maintain its historic characteristics, and continual habitat and open wet areas would remain. This alternative would reduce the amount of seepage and salt loading just as the action alternatives would. The reason that this alternative was eliminated was that within Bryce Canyon National Park there would not be enough room within the Highway corridor to allow for the installation of a pipeline. The highway parallels the Paria River wash which leaves little room for the pipeline.