

## **APPENDIX C1**

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### **Action Alternative Cost Estimates**



# Appendix C1: Action Alternative Cost Estimates

This appendix presents the cost estimates prepared for the action alternatives that are evaluated in this EIS. No detailed hydraulic design or engineering analysis was conducted during this early stage of project development. The sizes of major irrigation conveyance features, material types, construction quantities, and appurtenances (river diversion facilities, cleanouts, pressure control systems, and outlet controls) are based on preliminary analysis and conceptual engineering examination for each alternative. Unit costs are based on the experience of the project team and their involvement with other projects in Utah and around the country.

Because of the preliminary nature of the analysis, the costs estimates include major assumptions and contingencies. Costs are presented as a range to account for currently unknown conditions within the project area. Final design would be conducted for the alternative selected as the preferred alternative in NRCS's Record of Decision, which will be prepared after public comments are received on the Final EIS. Final design will include more-detailed surveys for existing conditions such as soil properties, major utility conflicts, and the exact elevations of features such as roadway bridges and existing storm drain inlets. Final engineering could also include value engineering to optimize the size and exact location of conveyance features and constructability reviews. Both of these actions could change the material quantities, unit cost, and other assumptions presented in this appendix.

The costs for each alternative are presented below. Costs are grouped by the major segments of each alternative. The additional construction-related items and engineering assistance that need to be included to determine a total project cost are also summarized below.

## C1.1 Purple Alternative

As presented in Chapter 3, Alternatives, this alternative would divert LN Canal water using the LHPS Canal POD just below Second Dam in Logan Canyon. The following segments are defined from the POD:

- **Logan Canyon Segment** – Once the water is diverted, it would be conveyed within the LHPS Canal alignment to the Logan Golf & County Club (golf course).
- **Valley Segment** – From the golf course, the water would be conveyed to Lundstrom Park in Logan.
- **Pressure Pipe Segment** – At the park, the LN Canal water would be taken from the LHPS Canal and conveyed west to the LN Canal. At this point, most of the water would be discharged directly into the existing LN Canal for delivery to downstream

shareholders. The rest of the water would be directed in a pressure pipe in the LN Canal to about 400 North.

### C1.1.1 Logan Canyon Segment

Combining LN Canal irrigation water with LHPS Canal irrigation water requires increasing the capacity of the conveyance facility. This section presents the major features and construction considerations for the Logan Canyon Segment of the Purple Alternative.

**Modified Point of Diversion.** The existing LHPS Canal POD might need to be modified to divert more water than it has historically.

**Excavation and Material Disposal.** With the LHPS Canal set high on the hillside in many locations, access for heavy equipment is limited, which makes excavation more difficult compared to excavation in flat, open areas. This item includes material removal, hauling, and landfilling at the City of Logan construction and demolition debris landfill.

**Box Culvert.** The existing canal would be demolished and replaced with about 8,500 feet of 6-foot-wide by 6-foot-high precast reinforced concrete box culvert to enclose the canal, protect it from rocks falling from above, and reduce the drowning risks from unauthorized pedestrian access. Because the LHPS Canal alignment meanders, special prefabricated angled culvert sections or prefabricated mitered (angled) joints are included to navigate the curves of the canal.

**Culvert Bedding and Imported Fill Material.** The box culvert would be set on top of imported bedding material to ensure that culvert sections fit together more easily. Once the box is installed, the space on the sides of the box would be filled and the top of the box covered with soil. Soil would need to be imported from offsite because soil excavation within the LHPS Canal would be limited.

The costs for the major construction items listed above, and miscellaneous features such as subgrade drainage, revegetation, and fencing, are listed in Table C1-1. The estimated construction cost for this segment is about \$7.1 million.

### C1.1.2 Valley Segment

This section presents the major features and construction considerations for the Valley Segment of the Purple Alternative.

**Box Culvert.** The existing canal would be demolished and replaced with about 4,100 feet of 12-foot-wide by 5-foot-high precast reinforced concrete box culvert. Special prefabricated angled culvert sections or prefabricated mitered (angled) joints are also assumed in this segment to navigate the curves of the canal. The cost estimates assume that concrete access/clean-out structures are required along the box culvert about every 2,000 feet.

**Excavation and Material Disposal.** As described above for the Logan Canyon Segment, this item includes material removal, hauling, and landfilling at the City of Logan construction and

demolition debris landfill. The unit cost for this item was reduced to 75% of the excavation and material disposal unit cost for the Logan Canyon Segment because the LHPS Canal in this segment is within a flatter area with easier access and more access points.

***Excavation, Compacted Backfill, and Regrading.*** To reduce roadway crossing impacts, to accommodate storm drainage discharges, to provide storm drainage conveyance capacity on top of the box, and to stay within the existing canal/maintenance road area as much as possible, the bottom of the box culvert was set below the bottom the existing LHPS Canal. About half of the 12-foot-wide by 5-foot-high box would be below the existing canal flow line. This excavation would be in addition to the removal of existing canal features. In addition to excavation, this item includes soil stockpiling and regrading to create the final shape of the enclosed canal.

***Culvert Bedding and Backfill Material.*** The box culvert would be set on top of imported bedding material to ensure that culvert sections fit together more easily. Once the box is installed, the space on the sides of the box would be filled and the top of the box covered with soil. Soil would likely be available from the excavation of the LHPS Canal.

***Roadway Repair.*** Based on a preliminary evaluation, the top of the box culvert might require the bridge at Cedar Heights Drive to be replaced. The cost estimates assume that the roadway could cross on top of the box and bridge replacement would be necessary. However, the roadway asphalt would have to be replaced.

***LN Canal Pipeline.*** A small, 6-inch-diameter, high-density polyethylene (HDPE) pipeline running from the LN Canal POD to the Laub Diversion is included in this segment. This pipeline supplies LN Canal shareholders in the area around the eastern part of Canyon Road.

The costs for the major construction items listed above, and miscellaneous features such as reconnecting irrigation diversion, subgrade drainage, revegetation, and fencing, are listed in Table C1-1. The estimated construction cost for this segment is about \$4.2 million.

### **C1.1.3 Pressure Pipe Segment**

This section presents the major features and construction considerations for the Pressure Pipe Segment of the Purple Alternative.

***Water-Control Structures and Diversion Pipeline.*** From the LHPS Canal, LN Canal water would be diverted into a 42-inch-diameter HDPE pipeline to flow west to the LN Canal. The pressure pipe would run under Lundstrom Park and city streets for about 6,400 feet to the LN Canal at about 1500 North. LHPS Canal water would be discharged from a water-control structure to the existing LHPS Canal for downstream shareholders. Pipeline construction would require cutting roadway, trenching for the pipe, and replacing roadway asphalt.

***Discharge Structure.*** Near the LN Canal, an energy-dissipating structure and pressure-reducing valves would discharge most of the irrigation water into the LN Canal.

**Pressure Pipe.** Some of the water would remain in a pressurized, 10-inch-diameter HDPE pipe running south within the LN Canal. The length of this section of pipeline would be about 5,100 feet. The pipe would be installed in the canal maintenance road or below the bottom of the existing pipeline. There would be several roadway crossings. The cost estimates assume that the pipeline would be bored past two roadway crossings.

The costs for the construction items listed above and the miscellaneous features such as flow meters, air vents, and connections requiring individual pressure-reducing valves are listed in Table C1-1. The total estimated cost for this segment is about \$1.6 million.

#### **C1.1.4 Property Purchases and Easements**

The Purple Alternative includes purchasing and demolishing structures on 14 properties along the north side of Canyon Road in Logan between about 750 East and 1100 East. NRCS is including the purchase of the structures to reduce the future risk to life and property. This purchase is consistent with the objective of the EWPP, which requires NRCS to implement recovery measures that “relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed” (7 CFR 624.2). Temporary construction easements (TCEs) are also included in this category. TCEs are areas outside the ultimate canal configuration that are needed for hauling, material stockpile and staging areas, and utility connections. As shown in Table C1-1, the total cost for property acquisition and structure demolition is about \$2.7 million.

#### **C1.1.5 Additional Construction-Related Items and Contingency**

Additional construction-related items include contractor mobilization, environmental permitting and compliance monitoring, minor utility relocations, and a construction contingency. The cost for these items is estimated by applying a percentage to the total construction materials, installation, and property purchases subtotal cost. The assumed percentages are included in Table C1-1. The additional construction-related items subtotal for the Purple Alternative is about \$3.5 million.

#### **C1.1.6 Engineering and Construction Management**

Costs for engineering and construction management include topographical surveys, geotechnical investigations and seismic analysis, final engineering analysis, final design plan production, bid document preparation, contractor procurement, and construction management. The cost for these items is also estimated by applying a percentage to the total construction estimate. These percentages are shown in Table C1-1. The total cost for this category is about \$1.2 million.

## C1.2 Orange Alternative

As presented in Chapter 3, Alternatives, the Orange Alternative would divert LN Canal water using the LHPS Canal POD just below Second Dam in Logan Canyon. The following segments are defined from the POD:

- **Logan Canyon Segment** – Same as for the Purple Alternative.
- **Valley Segment** – From the golf course, the water would be conveyed to about 3100 North in North Logan. This alternative includes an option to terminate the combined flows at about 2900 North.
- **Pressure Pipe Segment** – The LN Canal water would be taken from the LHPS Canal and conveyed west to the LN Canal. At this point, some of the water would be discharged directly into the existing LN Canal for delivery to downstream shareholders. The rest of the water would remain in a pressure pipe in the LN Canal to about 400 North.

### C1.2.1 Logan Canyon Segment

The features and cost (\$7.1 million) for this segment are the same as for the Purple Alternative.

### C1.2.2 Valley Segment

This section presents the major features and construction considerations for the Valley Segment of the Orange Alternative. The features are the same as for the Purple Alternative. The cost differences result from the additional length of canal improvements and pressure pipe segments for the Orange Alternative.

**Box Culvert.** The existing canal would be demolished and replaced with about 18,600 feet of 12-foot-wide by 5-foot-high precast reinforced concrete box culvert. This is about four times the length of the Purple Alternative (4,100 feet). The additional length of this alternative requires more access/cleanout structures, excavation and material disposal, culvert bedding, and general earthwork. The estimated quantities and unit costs for these items are listed in in Table C1-2.

**Roadway Repairs.** Based on a preliminary design, the top of the box culvert might conflict with four road bridges: Cedar Heights Drive, 1770 East, 1800 East, and Cottonwood Lane.

The costs for the major construction items listed above, and miscellaneous features such as reconnecting irrigation diversion, subgrade drainage, revegetation, and fencing, are listed in Table C1-2. The estimated cost for this 18,600-foot segment is about \$18.2 million.

The Orange Alternative's 2900 North option would require less box culvert construction (17,000 feet) and would cost about \$16.8 million for this segment. Table C1-3 includes detailed cost estimates for this option.

### C1.2.3 Pressure Pipe Segment

The following paragraphs present the major features and construction considerations for the Pressure Pipe Segment of the Orange Alternative.

***Inlet Structure and Diversion Pipeline.*** From the LHPS Canal, LN Canal water would be diverted into a 36-inch-diameter HDPE pipe to flow west to the LN Canal. For the 3100 North option, the pressure pipe would run under the city streets for about 3,000 feet to the LN Canal. LHPS Canal water would be discharged to the existing LHPS Canal for downstream shareholders. Construction would require cutting roadway, trenching for the pipe, and replacing roadway asphalt.

***Pressure Pipe.*** Some of the water would remain in a pressurized, 26-inch-diameter HDPE pipe running south for about 12,900 feet. The pressure pipe would transition to a 10-inch-diameter HDPE pipe for about 5,100 feet. These pipelines would be installed in the canal maintenance road or below the bottom of the existing pipeline. There would be several roadway crossings. The cost estimates assume that the pipeline would be bored past seven of the 14 roadway crossings.

The costs for the construction items listed above and the miscellaneous features such as flow meters, air vents, and connections requiring individual pressure-reducing valves are listed in Table C1-2. The total estimated cost for the Pressure Pipe Segment is about \$1.9 million.

The Orange Alternative's 2900 North option would require less pipeline construction (2,500 feet of 36-inch-diameter HDPE pipe and 11,300 feet of 26-inch-diameter HPDE pipe). Because it is in open fields, less roadway trenching and asphalt repair (200 feet) would be required. The estimated cost for this segment would be about \$1.5 million. Table C1-3 includes the costs for the 2900 North option.

### C1.2.4 Property Purchases and Easements

The Orange Alternative includes purchasing and demolishing structures on 14 properties along the north side of Canyon Road in Logan between about 750 East and 1100 East and an assumed number of TCEs. The estimated cost for property purchases and an assumed number of TCEs is about \$3.0 million for the Orange Alternative, as shown in Tables C1-2 and C1-3.

### C1.2.5 Additional Construction-Related Items and Contingency

The additional construction-related items are the same as those listed for the Purple Alternative. Because percentages are applied to a larger construction materials, installation, and property cost, the additional construction-related items subtotal for the Orange Alternative is about \$6.8 million (Table C1-2).

As shown in Table C1-3, the additional construction and contingencies subtotal for the 2900 North option would be about \$6.4 million.

## C1.2.6 Engineering and Construction Management

Engineering and construction management items are the same as those for the Purple Alternative. Similar to the additional construction items, percentages are applied to the total construction estimate. Because the total length and construction costs for the Orange Alternative are greater than for the Purple Alternative, the cost under this category is also estimated to be more (about \$2.4 million total). The engineering and construction-management subtotal cost for the 2900 North option would be about \$2.3 million.

Tables C1-2 and C1-3 present the costs for 3100 North and 2900 North options, respectively.

## C1.3 Blue Alternative

Unlike the other action alternatives, the Blue Alternative would divert only LN Canal water using a modified LN Canal POD just below First Dam. Once the water is diverted, it would be conveyed along the existing LN Canal alignment in a pipeline. The pipeline would discharge directly into the existing LN Canal at 400 North for use by downstream shareholders.

The Blue Alternative has only one segment: reconstruct the existing canal in a pipeline along the LN Canal alignment from the POD to 400 North. This alternative is different from the Purple and Orange Alternatives in that the Blue Alternative includes measures to stabilize the conveyance pipeline along parts of the Logan Bluff area. Therefore, the costs are described for two main construction categories: irrigation conveyance and slope-stabilization measures. The cost estimate also includes the same additional construction-related items and contingencies and engineering and construction management categories as for the other action alternatives.

### C1.3.1 Irrigation Conveyance

This section presents the irrigation conveyance features and construction considerations for the Blue Alternative.

***Improved Diversion and Pipeline.*** The cost estimates assume that the existing LN Canal POD would need to be modified to divert water into a pipeline system. The cost estimate assumed that about 9,000 feet of 72-inch-diameter steel pipe would be used to convey LN Canal water to 400 North. Because steel pipe is flexible, a large trench would need to be excavated, pipe bedding material imported, and the excavated soil backfilled and compacted to give the pipe additional strength.

***Utility Relocations.*** The cost estimate assumes a cost to relocate utilities (culinary water and natural gas) within Canyon Road in order for the pipeline to cross the road. There is also a large sewer line in Logan Canyon. The cost estimates assume that impacts to the sewer line can be avoided.

**Construction Dewatering.** To account for a reported high groundwater table under Canyon Road, the cost estimates for the Blue Alternative include dewatering costs.

As shown in Table C1-4, the estimated pipeline construction costs are about \$7.6 million.

### C1.3.2 Slope-Stabilization Measures

This section presents the slope-stabilization measures for the Blue Alternative. As stated in Section 1.1.2.1, Emergency Watershed Protection Program, EWPP funds cannot be used to solve problems that existed prior to the natural disaster. For the Blue Alternative, this means that the funds could not be used to stabilize the hillside beyond what is needed to construct and stabilize the new pipeline.

Two zones were determined based on topography, landslide history, geology or soil characteristics, and available documentation. These zones (Zone 1 and Zone 2) are described in Section 3.2.4.2, Structural Features and Control Measures. The following paragraphs describe the major slope-stabilization features.

**Drilled Shaft Foundations.** These foundations would protect the pipeline against landslide movements originating at or below the elevation of the pipeline. The foundations would run vertically into stable geologic layers. The cost estimates assume about 75 drilled shaft foundations (36-inch diameter) on a 20-foot spacing, drilled to a depth of about 75 feet, to support 1,500 linear feet of pipe (Zone 1 exclusive of Zone 2). About 5,600 total linear feet of reinforced concrete drilled shaft foundations were estimated.

**Horizontal Tie-Back Anchors.** To provide additional horizontal stability, horizontal tie-backs are included with each foundation. These tie-backs would be made of high-strength steel and would each be about 100 feet long.

**Mass Soil Buttress.** The cost estimates assume that a soil buttress would be constructed below the pipeline for about 2,900 linear feet (Zone 2). The mass of this soil would retain the land mass and reduce the risk of a slope failure that originates below the pipeline. The wall would consist of about 130,000 cubic yards of granular fill (gravels) placed about 40 feet from the toe of the existing hillside and sloping upward at a ratio of 1.5 to 1 (horizontal to vertical).

**Subsurface Horizontal Drains.** Subsurface horizontal drains would be drilled into the uphill slope within Zones 1 and 2 to collect and control water and increase the stability of the structural controls. The drains would extend for enough distance to reach the point where gravels contact the underlying finer-grained sands and would convey groundwater to a drainage channel described below. Horizontal drains would be placed in about 90 locations (50-foot spacing). At each location, an array of five or six horizontal drains would be installed about 50 feet into the bluff in a fan pattern.

**Runoff-Conveyance Channel.** Precipitation runoff from the hillside and the groundwater collected by the horizontal drains would need to be collected and conveyed in an open

channel. This channel would run almost the entire length of the pipeline. The cost estimates assume that 8,000 feet of new ditch would be constructed.

As shown in Table C1-4, the estimated construction costs for the deep drilled shaft foundations and soil buttress and related features are about \$6.6 million.

### **C1.3.3 Property Purchases and Easements**

Because of the close proximity of residential structures to the base of the existing unstable slope, this alternative recommends that these structures be acquired and the residents relocated. Therefore, the cost estimates include costs for about 14 property acquisitions. The unit cost is based on an average property cost shown in Table C1-4. The actual cost for each property would be based on an appraisal conducted before the properties are acquired. Property acquisition costs and relocation assistance was estimated to total about \$2.6 million.

### **C1.3.4 Additional Construction-Related Items and Contingency**

The additional construction-related items are the same as those for the Purple Alternative. However, a higher construction contingency (25% of the materials and installation subtotal) was assumed compared to the other alternatives (15%) because of the unknown location of geologic features. This uncertainty also leads to uncertainty in material quantities and unit costs. The additional construction-related items subtotal for the Blue Alternative is about \$5.5 million (Table C1-4).

### **C1.3.5 Engineering and Construction Management**

Engineering and construction-management items are the same as those for the Purple Alternative. However, this alternative assumed a higher percentage (4% of the materials, installation, and property subtotal) compared to the other alternatives (1.5%) to support a thorough geologic evaluation. A detailed subsurface survey will be needed to determine the exact location and elevation of each geologic formation and to define the exact limits of each zone for the geotechnical and final engineering designs. The estimated cost for this category is about \$1.8 million (Table C1-4).



Table C1-1. Purple (1500 North) Alternative Cost Estimate

HDR Engineering  
Prepared by: Terry Warner  
11/22/2010

Reviewed by: Norman Wagner  
11/28/2010

| Item   | Quantity | Units           | Unit Price      | Total Cost          |
|--|----------|-----------------|-----------------|---------------------|
| <b>Irrigation Conveyance, Logan Canyon Segment (8,500 feet)</b>    |          |                 |                 |                     |
| Reconfigure LHPS point of diversion                                | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000          |
| Channel Excavation and Material Disposal                           | 5,000    | yd3             | \$ 50.00        | \$ 250,000          |
| Culvert Bedding Material (crushed stone)                           | 3,299    | yd3             | \$ 40.00        | \$ 131,973          |
| Compacted Fill   | 11,963   | yd3             | \$ 30.00        | \$ 358,889          |
| Geotextile (8 oz, non-woven)                                       | 59,388   | ft2             | \$ 0.20         | \$ 11,878           |
| Subdrainage Piping (plastic pipe)                                  | 8,500    | Feet            | \$ 20.00        | \$ 170,000          |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 1        | Each            | \$ 20,000.00    | \$ 20,000           |
| Hydraulic Structures (sluice gate, 72"x72")                        | 1        | Each            | \$ 60,000.00    | \$ 60,000           |
| Box Culvert (6' x 6' precast), Installed                           | 8,500    | Feet            | \$ 700.00       | \$ 5,950,000        |
| Restoration (reseeding)  | 5.8      | Acre            | \$ 2,000.00     | \$ 11,686           |
| Fencing/Gates  | 1        | Each            | \$ 6,000.00     | \$ 6,000            |
|  |          |                 | <b>Subtotal</b> | <b>\$ 7,070,426</b> |
| <b>Irrigation Conveyance, Valley Segment (4,100 feet)</b>          |          |                 |                 |                     |
| Channel Excavation and Material Disposal                           | 5,000    | yd3             | \$ 37.50        | \$ 187,500          |
| Culvert Bedding Material (crushed stone)                           | 1,602    | yd3             | \$ 30.00        | \$ 48,067           |
| Excavation, Compacted Backfill, and Regrading                      | 33,138   | yd3             | \$ 10.00        | \$ 331,382          |
| Geotextile (8 oz, non-woven)                                       | 49,200   | ft2             | \$ 0.20         | \$ 9,840            |
| Subdrainage piping (plastic pipe)                                  | 4,100    | Feet            | \$ 20.00        | \$ 82,000           |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 2        | Each            | \$ 20,000.00    | \$ 40,000           |
| Hydraulic Gates  | -        | Each            | \$ 60,000.00    | \$ -                |
| Box Culvert (12' x 5' precast), Installed                          | 4,100    | Feet            | \$ 800.00       | \$ 3,280,000        |
| Roadway Conflict Repairs   | 1        | Each            | \$ 100,000.00   | \$ 100,000          |
| Replace Gates/Modify Stormdrain Pipes                              | 16       | Each            | \$ 2,000.00     | \$ 32,000           |
| 6" Diameter HPDE Pipe (from LNC POD to Laub)                       | 3,168    | Feet            | \$ 20.00        | \$ 63,360           |
| Restoration (reseeding)  | 2.8      | Acre            | \$ 2,000.00     | \$ 5,675            |
| Fencing/Gates  | 3        | Each            | \$ 6,000.00     | \$ 18,000           |
|  |          |                 | <b>Subtotal</b> | <b>\$ 4,197,823</b> |
| <b>Irrigation Conveyance, Pressure Pipe Segments (11,470 feet)</b> |          |                 |                 |                     |
| Inlet Structure  | 1        | lump            | \$ 75,000.00    | \$ 75,000           |
| Flow Meter   | 1        | lump            | \$ 20,000.00    | \$ 20,000           |
| 42" Diameter HDPE pipe   | 6,370    | Feet            | \$ 80.00        | \$ 509,600          |
| Trench Backfill, Replace Asphalt                                   | 4,370    | Feet            | \$ 150.00       | \$ 655,500          |
| Energy Dissipating Structure/Valve                                 | 1        | lump            | 100,000         | \$ 100,000          |
| 10" Diameter HDPE pipe   | 5,100    | Feet            | \$ 30.00        | \$ 153,000          |
| Trenching and backfilling (Open Field and LN Canal Embankment)     | 5,100    | Feet            | \$ 4.00         | \$ 20,400           |
| Roadway Crossings (Jack and Bore)                                  | 2        | each            | \$ 5,000.00     | \$ 10,000           |
| Misc Excavation, Debris Removal, and Material Disposal             | 750      | yd <sup>3</sup> | \$ 20.00        | \$ 15,000           |
| Pressure Reducing Valves 2" (service for individual users)         | 20       | each            | \$ 300.00       | \$ 6,000            |
| Air Vets (Average for 36" to 10" vents)                            | 7        | each            | \$ 2,500.00     | \$ 17,500           |
| "Blow off Structure", End of Line                                  | 1        | each            | \$ 2,000.00     | \$ 2,000            |
|  |          |                 | <b>Subtotal</b> | <b>\$ 1,584,000</b> |



Table C1-1. Purple (1500 North) Alternative Cost Estimate

HDR Engineering

Prepared by: Terry Warner

11/22/2010

Reviewed by: Norman Wagner

11/28/2010

**Summary of Materials and Installation Cost (Page 1)**

|   |             |                   |
|---|-------------|-------------------|
| Irrigation Conveyance, Logan Canyon Segment (8,500 feet)    | Subtotal \$ | 7,070,426         |
| Irrigation Conveyance, Valley Segment (4,100 feet)          | Subtotal \$ | 4,197,823         |
| Irrigation Conveyance, Pressure Pipe Segments (11,470 feet) | Subtotal \$ | 1,584,000         |
| <b>Materials &amp; Installation Subtotal</b>                | <b>\$</b>   | <b>12,852,249</b> |

| Item  | Quantity | Units           | Unit Price  | Total Cost           |
|---|----------|-----------------|---|----------------------|
| <b>Property Purchases &amp; Easements</b>         |          |                 |   |                      |
| Property Acquisition                              | 14       | Each            | \$ 157,000.00   | \$ 2,198,000         |
| Structure Demolition                              | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Relocation Assistance                             | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Temporary Construction Easements                  | 10       | Each            | \$ 25,000.00  | \$ 250,000           |
|   |          |                 | <b>Property Subtotal</b>  | <b>\$ 2,728,000</b>  |
|   |          |                 | <b>Materials &amp; Installation Subtotal</b>                        | <b>\$ 12,852,249</b> |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 15,580,249</b> |
| <b>Additional Construction Items</b>              |          |                 |   |                      |
| Contractor Mobilization                           |          | % of Subtotal A | 5.0%  | \$ 779,012           |
| Environmental Permits and Compliance Monitoring   |          | % of Subtotal A | 0.5%  | \$ 77,901            |
| Minor Utility Relocations                         |          | % of Subtotal A | 2.0%  | \$ 311,605           |
| Construction Contingency                          |          | % of Subtotal A | 15.0%   | \$ 2,337,037         |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 3,505,556</b>  |
| <b>Engineering</b>                                |          |                 |   |                      |
| Survey/Geotechnical Investigations/Seismic Design |          | % of Subtotal A | 1.5%  | \$ 233,704           |
| Final Engineering Design & Plan Production        |          | % of Subtotal A | 5.0%  | \$ 779,012           |
| Bid Documents and Contractor Procurement          |          | % of Subtotal A | 0.5%  | \$ 77,901            |
| Construction Management (CM)                      |          | % of Subtotal A | 1.0%  | \$ 155,802           |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 1,246,420</b>  |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 15,580,249</b> |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 3,505,556</b>  |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 1,246,420</b>  |
|   |          |                 | <b>Grand Total (2010\$)</b>   | <b>\$ 20,332,225</b> |
|   |          |                 | <b>Range (0% to +10%, Rounded)</b>                                  | <b>\$ 20,400,000</b> |
|   |          |                 |   | <b>\$ 22,400,000</b> |



Table C1-2. Orange (3100 North Option) Cost Estimate

HDR Engineering  
Prepared by: Terry Warner, P.E.  
11/22/2010

Reviewed by: Norman Wagner  
11/28/2010

| Item   | Quantity | Units           | Unit Price      | Total Cost           |
|--|----------|-----------------|-----------------|----------------------|
| <b>Irrigation Conveyance, Logan Canyon Segment (8,500 feet)</b>    |          |                 |                 |                      |
| Reconfigure LHPS point of diversion                                | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000           |
| Channel Excavation and Material Disposal                           | 5,000    | yd <sup>3</sup> | \$ 50.00        | \$ 250,000           |
| Culvert Bedding Material (crushed stone)                           | 3,299    | yd <sup>3</sup> | \$ 40.00        | \$ 131,973           |
| Compacted Fill   | 11,963   | yd <sup>3</sup> | \$ 30.00        | \$ 358,889           |
| Geotextile (8 oz, non-woven)                                       | 59,388   | ft <sup>2</sup> | \$ 0.20         | \$ 11,878            |
| Subdrainage Piping (plastic pipe)                                  | 8,500    | Feet            | \$ 20.00        | \$ 170,000           |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 1        | Each            | \$ 20,000.00    | \$ 20,000            |
| Hydraulic Structures (sluice gate, 72"x72")                        | 1        | Each            | \$ 60,000.00    | \$ 60,000            |
| Box Culvert (6' x 6' precast), Installed                           | 8,500    | Feet            | \$ 700.00       | \$ 5,950,000         |
| Restoration (reseeding)  | 5.8      | Acre            | \$ 2,000.00     | \$ 11,686            |
| Fencing/Gates  | 1        | Each            | \$ 6,000.00     | \$ 6,000             |
|  |          |                 | <b>Subtotal</b> | <b>\$ 7,070,426</b>  |
| <b>Irrigation Conveyance, Valley Segment (18,600 feet)</b>         |          |                 |                 |                      |
| Channel Excavation and Material Disposal                           | 10,000   | yd <sup>3</sup> | \$ 37.50        | \$ 375,000           |
| Culvert Bedding Material (crushed stone)                           | 12,389   | yd <sup>3</sup> | \$ 30.00        | \$ 371,680           |
| Excavation, Compacted Backfill, and Regrading                      | 124,000  | yd <sup>3</sup> | \$ 10.00        | \$ 1,240,000         |
| Geotextile (8 oz, non-woven)                                       | 223,008  | ft <sup>2</sup> | \$ 0.20         | \$ 44,602            |
| Subdrainage piping (plastic pipe)                                  | 18,600   | Feet            | \$ 20.00        | \$ 372,000           |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 10       | Each            | \$ 20,000.00    | \$ 200,000           |
| Hydraulic Gates  | 1        | Each            | \$ 60,000.00    | \$ 60,000            |
| Box Culvert (12' x 5' precast), Installed                          | 18,600   | Feet            | \$ 800.00       | \$ 14,880,000        |
| Roadway Conflict Repairs   | 4        | Each            | \$ 100,000.00   | \$ 400,000           |
| Replace Gates/Modify Stormdrain Outlets                            | 80       | Each            | \$ 2,000.00     | \$ 160,000           |
| 6" Diameter HPDE Pipe (from LNC POD to Laub)                       | 3,168    | Feet            | \$ 20.00        | \$ 63,360            |
| Restoration (reseeding, assumed 30 foot wide disturbance)          | 12.8     | Acre            | \$ 2,000.00     | \$ 25,598            |
| Fencing/Gates  | 5        | Each            | \$ 6,000.00     | \$ 30,000            |
|  |          |                 | <b>Subtotal</b> | <b>\$ 18,222,239</b> |
| <b>Irrigation Conveyance, Pressure Pipe Segments (20,300 feet)</b> |          |                 |                 |                      |
| Inlet Structure  | 1        | lump            | \$ 75,000.00    | \$ 75,000            |
| Flow Meter   | 1        | lump            | \$ 20,000.00    | \$ 20,000            |
| 36" Diameter HDPE pipe   | 3,000    | Feet            | \$ 72.00        | \$ 216,000           |
| Trench, Backfill, Roadway Asphalt                                  | 2,640    | Feet            | \$ 150.00       | \$ 396,000           |
| Energy Dissipating Structure/Valve                                 | 1        | lump            | \$ 100,000.00   | \$ 100,000           |
| 26" Diameter HDPE pipe   | 12,900   | Feet            | \$ 65.00        | \$ 838,500           |
| 10" Diameter HDPE pipe   | 5,100    | Feet            | \$ 30.00        | \$ 153,000           |
| Trenching and Backfilling (Open Fields and LN Canal)               | 17,660   | Feet            | \$ 4.00         | \$ 70,640            |
| Roadway Crossings (Jack and Bore)                                  | 7        | Each            | \$ 5,000.00     | \$ 35,000            |
| Misc Excavation, Debris Removal, and Material Disposal             | 1,000    | yd <sup>3</sup> | \$ 20.00        | \$ 20,000            |
| Pressure Reducing Valves 2" (individual users)                     | 50       | each            | \$ 300.00       | \$ 15,000            |
| Air Vets (Average for 36" to 10" vents)                            | 7        | each            | \$ 2,500.00     | \$ 17,500            |
| "Blow off Structure" (End of Line)                                 | 1        | each            | \$ 2,000.00     | \$ 2,000             |
|  |          |                 | <b>Subtotal</b> | <b>\$ 1,958,640</b>  |



Table C1-2. Orange (3100 North Option) Cost Estimate

HDR Engineering

Prepared by: Terry Warner

11/22/2010

Reviewed by: Norman Wagner

11/28/2010

**Summary of Materials and Installation Cost (Page 1)**

|   |             |                   |
|---|-------------|-------------------|
| Irrigation Conveyance, Logan Canyon Segment (8,500 feet)    | Subtotal \$ | 7,070,426         |
| Irrigation Conveyance, Valley Segment (18,600 feet)         | Subtotal \$ | 18,222,239        |
| Irrigation Conveyance, Pressure Pipe Segments (20,300 feet) | Subtotal \$ | 1,958,640         |
| <b>Materials &amp; Installation Subtotal</b>                | <b>\$</b>   | <b>27,251,305</b> |

| Item  | Quantity | Units           | Unit Price  | Total Cost           |
|---|----------|-----------------|---|----------------------|
| <b>Property Purchases &amp; Easements</b>         |          |                 |   |                      |
| Property Acquisition                              | 14       | Each            | \$ 157,000.00   | \$ 2,198,000         |
| Structure Demolition                              | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Relocation Assistance                             | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Temporary Construction Easements                  | 20       | Each            | \$ 25,000.00  | \$ 500,000           |
|   |          |                 | <b>Property Subtotal</b>  | <b>\$ 2,978,000</b>  |
|   |          |                 | <b>Materials &amp; Installation Subtotal</b>                        | <b>\$ 27,251,305</b> |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 30,229,305</b> |
| <b>Additional Construction Items</b>              |          |                 |   |                      |
| Contractor Mobilization                           |          | % of Subtotal A | 5.0%  | \$ 1,511,465         |
| Environmental Permits and Compliance Monitoring   |          | % of Subtotal A | 0.5%  | \$ 151,147           |
| Minor Utility Relocations                         |          | % of Subtotal A | 2.0%  | \$ 604,586           |
| Construction Contingency                          |          | % of Subtotal A | 15.0%   | \$ 4,534,396         |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 6,801,594</b>  |
| <b>Engineering</b>                                |          |                 |   |                      |
| Survey/Geotechnical Investigations/Seismic Design |          | % of Subtotal A | 1.5%  | \$ 453,440           |
| Final Engineering Design & Plan Production        |          | % of Subtotal A | 5.0%  | \$ 1,511,465         |
| Bid Documents and Contractor Procurement          |          | % of Subtotal A | 0.5%  | \$ 151,147           |
| Construction Management (CM)                      |          | % of Subtotal A | 1.0%  | \$ 302,293           |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 2,418,344</b>  |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 30,229,305</b> |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 6,801,594</b>  |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 2,418,344</b>  |
|   |          |                 | <b>Grand Total (2010\$)</b>   | <b>\$ 39,449,243</b> |
|   |          |                 | <b>Range (0% to +10%, Rounded)</b>                                  | <b>\$ 39,500,000</b> |
|   |          |                 |   | <b>\$ 43,400,000</b> |



Table C1-3. Orange (2900 North Option) Cost Estimate

HDR Engineering  
Prepared by: Terry Warner, P.E.  
11/22/2010

Reviewed by: Norman Wagner  
11/28/2010

| Item   | Quantity | Units           | Unit Price      | Total Cost           |
|--|----------|-----------------|-----------------|----------------------|
| <b>Irrigation Conveyance, Logan Canyon Segment (8,500 feet)</b>    |          |                 |                 |                      |
| Reconfigure LHPS point of diversion                                | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000           |
| Channel Excavation and Material Disposal                           | 5,000    | yd <sup>3</sup> | \$ 50.00        | \$ 250,000           |
| Culvert Bedding Material (crushed stone)                           | 3,299    | yd <sup>3</sup> | \$ 40.00        | \$ 131,973           |
| Compacted Fill   | 11,963   | yd <sup>3</sup> | \$ 30.00        | \$ 358,889           |
| Geotextile (8 oz, non-woven)                                       | 59,388   | ft <sup>2</sup> | \$ 0.20         | \$ 11,878            |
| Subdrainage Piping (plastic pipe)                                  | 8,500    | Feet            | \$ 20.00        | \$ 170,000           |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 1        | Each            | \$ 20,000.00    | \$ 20,000            |
| Hydraulic Structures (sluice gate, 72"x72")                        | 1        | Each            | \$ 60,000.00    | \$ 60,000            |
| Box Culvert (6' x 6' precast), Installed                           | 8,500    | Feet            | \$ 700.00       | \$ 5,950,000         |
| Restoration (reseeding)  | 5.842975 | Acre            | \$ 2,000.00     | \$ 11,686            |
| Fencing/Gates  | 1        | Each            | \$ 6,000.00     | \$ 6,000             |
|  |          |                 | <b>Subtotal</b> | <b>\$ 7,070,426</b>  |
| <b>Irrigation Conveyance, Valley Segment (17,000 feet)</b>         |          |                 |                 |                      |
| Channel Excavation and Material Disposal                           | 10,000   | yd <sup>3</sup> | \$ 37.50        | \$ 375,000           |
| Culvert Bedding Material (crushed stone)                           | 11,333   | yd <sup>3</sup> | \$ 30.00        | \$ 340,000           |
| Excavation, Compacted Backfill, and Regrading                      | 117,800  | yd <sup>3</sup> | \$ 10.00        | \$ 1,178,000         |
| Geotextile (8 oz, non-woven)                                       | 204,000  | ft <sup>2</sup> | \$ 0.20         | \$ 40,800            |
| Subdrainage piping (plastic pipe)                                  | 17,000   | Feet            | \$ 20.00        | \$ 340,000           |
| Culvert Access/Cleanout Structure (Cast in Place)                  | 10       | Each            | \$ 20,000.00    | \$ 200,000           |
| Hydraulic Gates  | 1        | Each            | \$ 60,000.00    | \$ 60,000            |
| Box Culvert (12' x 5' precast), Installed                          | 17,000   | Feet            | \$ 800.00       | \$ 13,600,000        |
| Roadway Conflict Repairs   | 4        | Each            | \$ 100,000.00   | \$ 400,000           |
| Replace Gates/Modify Stormdrain Outlets                            | 80       | Each            | \$ 2,000.00     | \$ 160,000           |
| 6" Diameter HPDE Pipe (from LNC POD to Laub)                       | 3,168    | Feet            | \$ 20.00        | \$ 63,360            |
| Restoration (reseeding, assumed 30 foot wide disturbance)          | 12.8     | Acre            | \$ 2,000.00     | \$ 25,598            |
| Fencing/Gates  | 5        | Each            | \$ 6,000.00     | \$ 30,000            |
|  |          |                 | <b>Subtotal</b> | <b>\$ 16,812,758</b> |
| <b>Irrigation Conveyance, Pressure Pipe Segments (20,300 feet)</b> |          |                 |                 |                      |
| Inlet Structure  | 1        | lump            | \$ 75,000.00    | \$ 75,000            |
| Flow Meter   | 1        | lump            | \$ 20,000.00    | \$ 20,000            |
| 36" Diameter HDPE pipe   | 2,500    | Feet            | \$ 72.00        | \$ 180,000           |
| Trench, Backfill, Roadway Asphalt                                  | 200      | Feet            | \$ 150.00       | \$ 30,000            |
| Energy Dissipating Structure/Valve                                 | 1        | lump            | \$ 100,000.00   | \$ 100,000           |
| 26" Diameter HDPE pipe   | 11,300   | Feet            | \$ 65.00        | \$ 734,500           |
| 10" Diameter HDPE pipe   | 5,100    | Feet            | \$ 30.00        | \$ 153,000           |
| Trenching and Backfilling (Open Fields and LN Canal)               | 20,100   | Feet            | \$ 4.00         | \$ 80,400            |
| Roadway Crossings (Jack and Bore)                                  | 7        | Each            | \$ 5,000.00     | \$ 35,000            |
| Misc Excavation, Debris Removal, and Material Disposal             | 1,000    | yd <sup>3</sup> | \$ 20.00        | \$ 20,000            |
| Pressure Reducing Valves 2" (individual users)                     | 50       | each            | \$ 300.00       | \$ 15,000            |
| Air Vets (Average for 36" to 10" vents)                            | 7        | each            | \$ 2,500.00     | \$ 17,500            |
| "Blow off Structure" (End of Line)                                 | 1        | each            | \$ 2,000.00     | \$ 2,000             |
|  |          |                 | <b>Subtotal</b> | <b>\$ 1,462,400</b>  |



Table C1-3. Orange (2900 North Option) Cost Estimate

HDR Engineering

Prepared by: Terry Warner

11/22/2010

Reviewed by: Norman Wagner

11/28/2010

**Summary of Materials and Installation Cost (Page 1)**

|   |             |                   |
|---|-------------|-------------------|
| Irrigation Conveyance, Logan Canyon Segment (8,500 feet)    | Subtotal \$ | 7,070,426         |
| Irrigation Conveyance, Valley Segment (17,000 feet)         | Subtotal \$ | 16,812,758        |
| Irrigation Conveyance, Pressure Pipe Segments (20,300 feet) | Subtotal \$ | 1,462,400         |
| <b>Materials &amp; Installation Subtotal</b>                | <b>\$</b>   | <b>25,345,584</b> |

| Item  | Quantity | Units           | Unit Price  | Total Cost           |
|---|----------|-----------------|---|----------------------|
| <b>Property Purchases &amp; Easements</b>         |          |                 |   |                      |
| Property Acquisition                              | 14       | Each            | \$ 157,000.00   | \$ 2,198,000         |
| Structure Demolition                              | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Relocation Assistance                             | 14       | Each            | \$ 10,000.00  | \$ 140,000           |
| Temporary Construction Easements                  | 20       | Each            | \$ 25,000.00  | \$ 500,000           |
|   |          |                 | <b>Property Subtotal</b>  | <b>\$ 2,978,000</b>  |
|   |          |                 | <b>Materials &amp; Installation Subtotal</b>                        | <b>\$ 25,345,584</b> |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 28,323,584</b> |
| <b>Additional Construction Items</b>              |          |                 |   |                      |
| Contractor Mobilization                           |          | % of Subtotal A | 5.0%  | \$ 1,416,179         |
| Environmental Permits and Compliance Monitoring   |          | % of Subtotal A | 0.5%  | \$ 141,618           |
| Minor Utility Relocations                         |          | % of Subtotal A | 2.0%  | \$ 566,472           |
| Construction Contingency                          |          | % of Subtotal A | 15.0%   | \$ 4,248,538         |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 6,372,806</b>  |
| <b>Engineering</b>                                |          |                 |   |                      |
| Survey/Geotechnical Investigations/Seismic Design |          | % of Subtotal A | 1.5%  | \$ 424,854           |
| Final Engineering Design & Plan Production        |          | % of Subtotal A | 5.0%  | \$ 1,416,179         |
| Bid Documents and Contractor Procurement          |          | % of Subtotal A | 0.5%  | \$ 141,618           |
| Construction Management (CM)                      |          | % of Subtotal A | 1.0%  | \$ 283,236           |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 2,265,887</b>  |
|   |          |                 | <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> | <b>\$ 28,323,584</b> |
|   |          |                 | <b>Additional Construction Items, Subtotal B</b>                    | <b>\$ 6,372,806</b>  |
|   |          |                 | <b>Engineering, Subtotal C</b>                                      | <b>\$ 2,265,887</b>  |
|   |          |                 | <b>Grand Total (2010\$)</b>   | <b>\$ 36,962,277</b> |
|   |          |                 | <b>Range (0% to +10%, Rounded)</b>                                  | <b>\$ 37,000,000</b> |
|   |          |                 |   | <b>\$ 40,700,000</b> |



Table C1-4. Blue (Reconstruct Alternative) Cost Estimate

HDR Engineering

Prepared by: Terry Warner (11/22/10)  
Nick Lafronz (12/1/10)Reviewed by: Norman Wagner  
11/28/2010

| Item   | Quantity | Units           | Unit Price      | Total Cost          |
|--|----------|-----------------|-----------------|---------------------|
| <b>Irrigation Conveyance, Logan Northern Canal</b>                   |          |                 |                 |                     |
| Reconstruct LN point of Diversion                                    | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000          |
| Channel Excavation and Material Disposal                             | 2,000    | yd <sup>3</sup> | \$ 37.50        | \$ 75,000           |
| Steel Pipe (72" welded steel)  | 9,000    | Feet            | \$ 700.00       | \$ 6,300,000        |
| Pipe Bedding Material (crushed stone)                                | 3,333    | yd <sup>3</sup> | \$ 30.00        | \$ 100,000          |
| Excavation, Compacted Backfill, and Regrading                        | 33,000   | yd <sup>3</sup> | \$ 20.00        | \$ 660,000          |
| 6" Diameter HPDE Pipe (from LNC POD to Laub)                         | 3,168    | Feet            | \$ 30.00        | \$ 95,040           |
| Outlet Structure/Energy Dissipator                                   | 1        | Lump Sum        | \$ 10,000.00    | \$ 10,000           |
| Canyon Road Crossing   | 100      | Feet            | \$ 500.00       | \$ 50,000           |
| Utility Relocations (water and natural gas)                          | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000          |
| Construction Dewatering (Canyon Road Crossing)                       | 1        | Lump Sum        | \$ 100,000.00   | \$ 100,000          |
|  |          |                 | <b>Subtotal</b> | <b>\$ 7,590,040</b> |
| <b>Slope Stabilization Measures</b>                                  |          |                 |                 |                     |
| Soil Buttress, Zone 2 (Imported Granular Fill for 2,900 Linear Feet) | 130,000  | yd <sup>3</sup> | \$ 20.00        | \$ 2,600,000        |
| Horizontal Subsurface Drains   | 27,000   | Feet            | \$ 22.00        | \$ 594,000          |
| Water Conveyance Ditch   | 8,000    | Feet            | \$ 30.00        | \$ 240,000          |
| Drilled Shafts, Zone 1 (36" Reinforced Concrete, 75 ft deep)         | 5,625    | Feet            | \$ 450.00       | \$ 2,531,250        |
| Horizontal Tie-Back Anchors (Zone 1, 100-foot horizontal length)     | 75       | Each            | \$ 6,000.00     | \$ 450,000          |
| Monitoring Equipment (Inclinometers, every 200 feet)                 | 15       | Each            | \$ 12,000.00    | \$ 174,000          |
| Monitoring Equipment (Monuments)                                     | 50       | Each            | \$ 200.00       | \$ 10,000           |
| Stormwater Diversion Berm (Top of Slope)                             | 2,222    | yd <sup>3</sup> | \$ 5.00         | \$ 11,111           |
|  |          |                 | <b>Subtotal</b> | <b>\$ 6,610,361</b> |
| <b>Property Purchases &amp; Easements</b>                            |          |                 |                 |                     |
| Property Acquisition   | 14       | Each            | \$ 157,000.00   | \$ 2,198,000        |
| Structure Demolition   | 14       | Each            | \$ 10,000.00    | \$ 140,000          |
| Relocation Assistance  | 14       | Each            | \$ 10,000.00    | \$ 140,000          |
| Temporary Construction Easements                                     | 5        | Each            | \$ 25,000.00    | \$ 125,000          |
|  |          |                 | <b>Subtotal</b> | <b>\$ 2,603,000</b> |



Table C1-4. Blue (Reconstruct Alternative) Cost Estimate

HDR Engineering

Prepared by: Terry Warner (11/22/10)

Nick Lafronz (12/1/10)

Reviewed by: Norman Wagner

11/28/2010

**Summary of Materials and Installation Cost (Page 1)**

|   |             |                      |
|---|-------------|----------------------|
| Irrigation Conveyance, Logan Northern Canal                         | Subtotal \$ | 7,590,040            |
| Slope Stabilization Measures  | Subtotal \$ | 6,610,361            |
| Property Purchases & Easements                                      | Subtotal \$ | 2,603,000            |
| <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> |             | <b>\$ 16,803,401</b> |

| Item  | Units           | Unit Price | Total Cost                         |
|---|-----------------|------------|------------------------------------|
| <b>Additional Construction Items</b>                                |                 |            |                                    |
| Contractor Mobilization   | % of Subtotal A | 5.0%       | \$ 840,170                         |
| Environmental Permits and Compliance Monitoring                     | % of Subtotal A | 0.5%       | \$ 84,017                          |
| Minor Utility Relocations   | % of Subtotal A | 2.0%       | \$ 336,068                         |
| Construction Contingency  | % of Subtotal A | 25.0%      | \$ 4,200,850                       |
| <b>Additional Construction Items, Subtotal B</b>                    |                 |            | <b>\$ 5,461,105</b>                |
| <hr/>   |                 |            |                                    |
| Item  | Units           | Unit Price | Total Cost                         |
| <b>Engineering</b>  |                 |            |                                    |
| Survey/Geotechnical Investigations/Seismic Design                   | % of Subtotal A | 4.0%       | \$ 672,136                         |
| Final Engineering Design & Plan Production                          | % of Subtotal A | 5.0%       | \$ 840,170                         |
| Bid Documents and Contractor Procurement                            | % of Subtotal A | 0.5%       | \$ 84,017                          |
| Construction Management (CM)  | % of Subtotal A | 1.0%       | \$ 168,034                         |
| <b>Engineering, Subtotal C</b>                                      |                 |            | <b>\$ 1,764,357</b>                |
| <b>Material, Installation, &amp; Property Purchases, Subtotal A</b> |                 |            | <b>\$ 16,803,401</b>               |
| <b>Additional Construction Items, Subtotal B</b>                    |                 |            | <b>\$ 5,461,105</b>                |
| <b>Engineering, Subtotal C</b>                                      |                 |            | <b>\$ 1,764,357</b>                |
| <b>Grand Total (2010\$)</b>   |                 |            | <b>\$ 24,028,864</b>               |
| <b>Range (0% to +10%, Rounded)</b>                                  |                 |            | <b>\$ 24,100,000 \$ 26,500,000</b> |