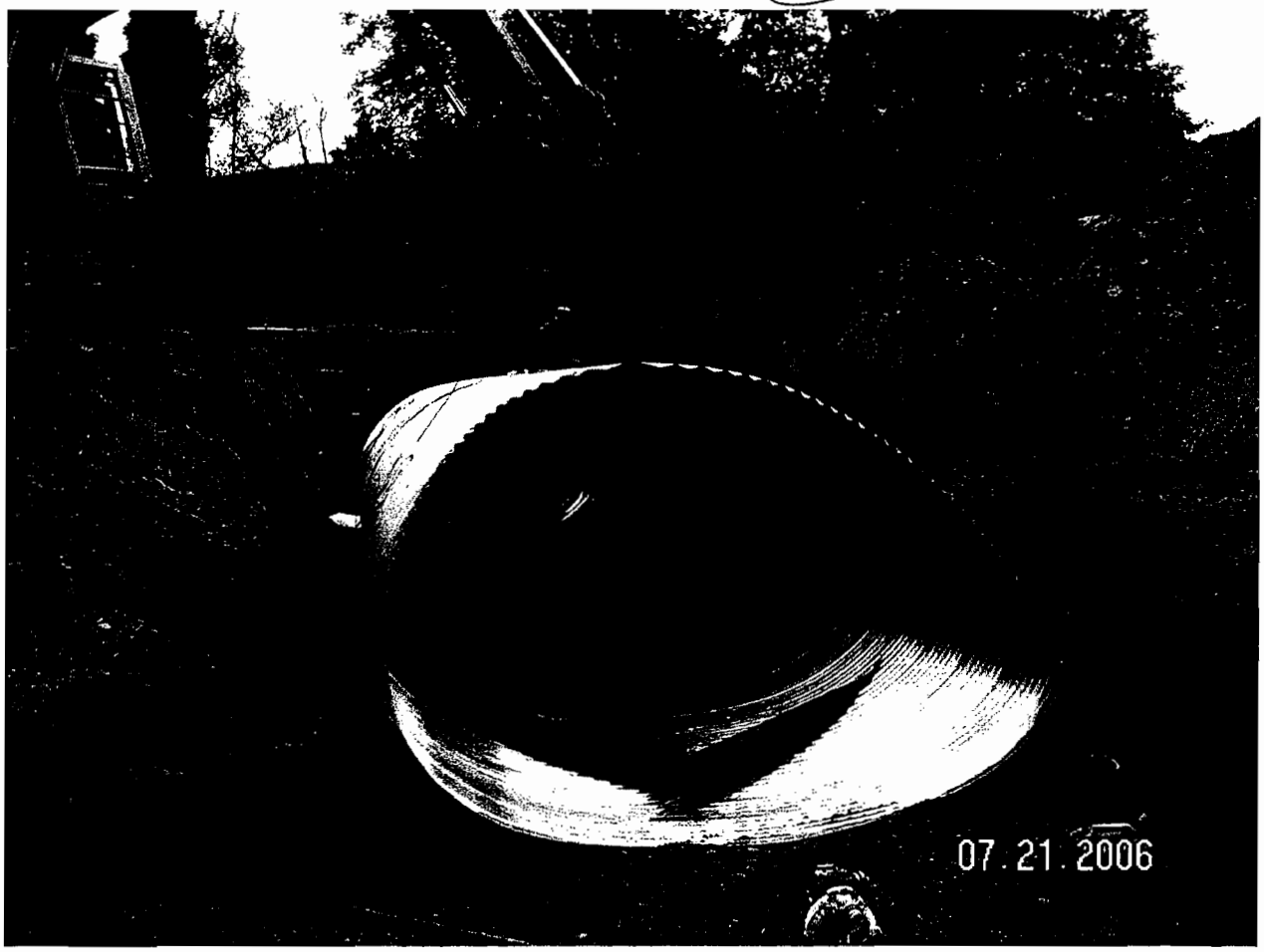
PROJECT COMPLETION REPORT

Dodge Canyon Culvert Replacement Project

(OWEB Grant Agreements #205-162 & #206-284)



Installation of Large Arch Culvert (July 2006)

prepared by

Lee Russell

Elk Creek Watershed Council

March 2006

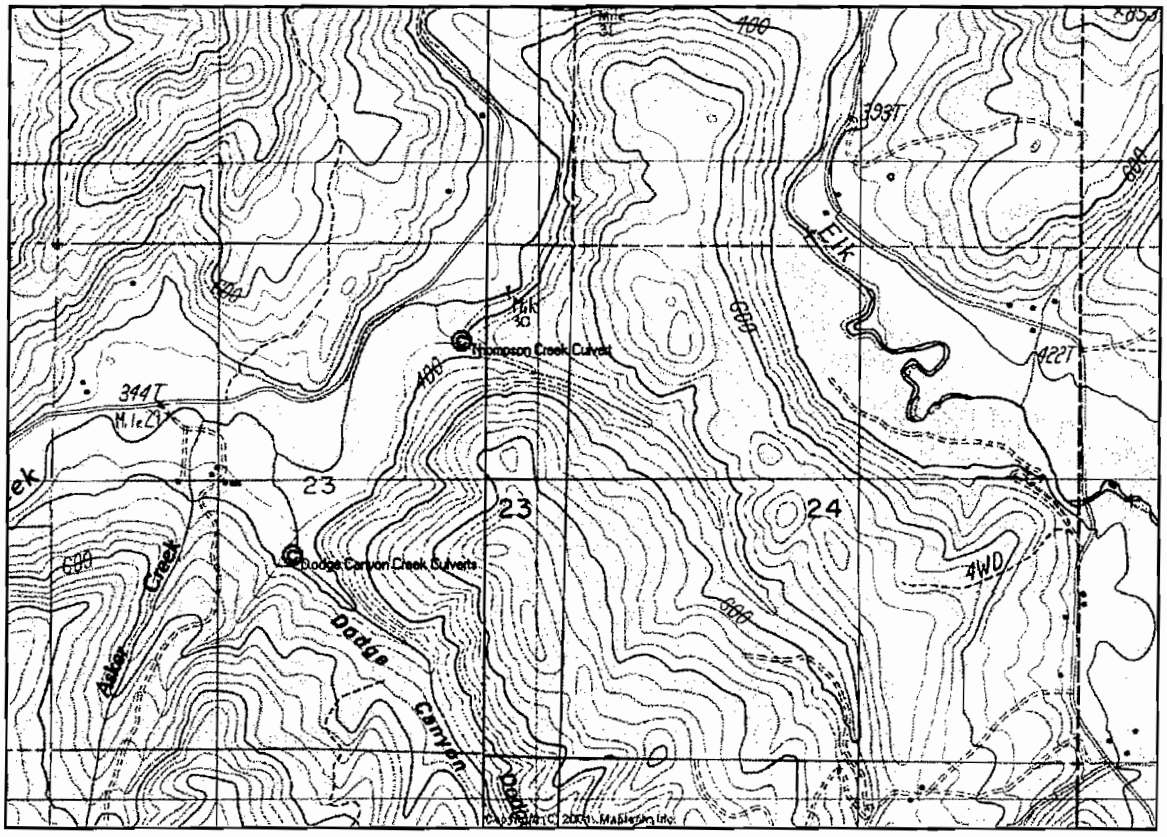
DODGE CANYO CULVERT REPLACEMENT ROJECT SITE

Landowner:

Martin Thompson
2198 Boswell Road
Yoncalla, OR 97499
(541) 849-2556

Topographic Map:

T22S, R5W, WM, Section 23



Dodge Canyon Creek: 142" x 91" x 86-foot pipe arch installed on main creek.
Two (2) 96" open-bottom half-pipes installed on tributary.

Thompson Creek: 128" x 83" x 48-foot pipe arch installed on main creek.

PROJECT NARRATIVE

Background:

In early 2004, the Elk Creek Watershed Council identified a perched, undersized, 60" steel culvert that was blocking fish passage into more than a mile of Coho, Steelhead, and Cutthroat Trout habitat on private land on Dodge Canyon Creek, a tributary of Elk Creek. The Council approached the landowner and obtained permission to begin seeking funding to replace the barrier. Members of the Watershed Council conducted a preliminary survey of the site and decided that two (2) small, undersized culverts on a side tributary should be replaced at the same time. These two culverts were blocking almost ½ mile of additional habitat.

The Council then contacted the Roseburg District BLM, and the Sunkist Fruit Growers, who owned and managed the timberlands along the creek above the barriers. They all agreed to work together to develop a project to replace the culverts. Members of the Watershed Council conducted a preliminary survey of the site, and made some estimates of the costs. Jake Winn, the BLM Restoration Coordinator, helped the Council prepare a grant application for Title II funds to implement the project. The Sunkist Fruit Growers agreed to help with the costs of replacing the two smaller culverts with larger pipes.

In the meantime, another partial barrier to adults, and a complete barrier to juveniles, was identified on another tributary about ½ mile up Elk Creek (Thompson Creek). This 60" steel culvert was blocking access to more than 1½ miles of habitat. The Watershed Council hired a local consultant to write an application for OWEB funding to replace this culvert. By replacing all these culverts at one time, with a single contractor, the Council hoped to save money.

In the summer of 2004, the BLM advisory committee approved $56,500 of Title II funds for the project. In early 2005, OWEB approved a grant for $22,350.

Project Design:

In February 2005, the Elk Creek Council hired a coordinator. This provided the stimulus to move the project ahead. The Council engaged Don Porior, a licensed engineer familiar with watershed restoration projects, to survey the site, prepare design drawings, and provide engineering estimates. The final designs and costs were quite different from the preliminary estimates upon which the two funding grants had been based. In discussions with our local ODFW Biologist, it was determined that the small tributary, with two undersized 24" steel culverts, was indeed a "fish bearing" stream. This necessitated a crossing with a natural bottom, and a width similar to the existing channel, rather than merely replacing the culverts with larger pipes as was called for in the preliminary plans. The "final" designs called for the following structures:

- Culvert #1: 142" x 91" Pipe Arch; 86 feet long, with rock collectors; embedded with 2' of Class 3 rip rap and stream gravels.

- Culvert #2: 9( )pen-bottom arch; 48 feet long; s( )n 2' foundation of Class 3 rip rap and stream gravels.
- Culvert #3: 96" open-bottom arch; 56 feet long; set on 2' foundation of Class 3 rip rap and stream gravels.
- Culvert #4: 128" x 83" Pipe Arch; 48 feet long ,with rock collectors; embedded with 2' of Class 3 rip rap and stream gravels.

Additional Funding:

With the changes in designs, and some increases in costs since the original estimates were made, the engineer's estimates showed the project to be under funded. To keep from having to reduce the scope of the project, in October 2005, the Elk Creek Council revised the project budget, and based on the engineer's estimates, applied to OWEB for an additional $82,000 in funding.

Contracts and Bids:

While we waited to see if OWEB would approve the request, the Council went ahead with the project. The coordinator worked with the engineer to develop a contract specifying the work to be done. The contract was modified from one used by the BLM for its large construction projects. Included in the contract were requirements that a 100% performance bond be posted, and that proof of insurance (both liability and worker's compensation) be provided. This contract, along with the engineering drawings, several photos, and other documents, were copied to disks and sent to construction contractors in the area. Prospective bidders were invited to attend a "show me" visit to the site in February 2006. Bids were opened on March 20, 2006. Since we still did not know if we would get the additional funding to construct the project as designed, we set up the bid schedule with each culvert as a separate bid item, and included an amendment that allowed us to modify or remove items depending on available funds. Fortunately, the OWEB grant request was approved in April 2006.

The bid items in the contract included the costs for the culverts. After reviewing the bids, it appeared that we could save some additional money if we purchased the pipes ourselves directly from the supplier. This also reduced the bonding requirements for the contractor, since the cost of the culverts was nearly half the total cost.

In May the Watershed Council awarded the contract to Rundell, Inc. of Drain, a local construction contractor. The Watershed Council ordered the new pipes from Pacific Corrugated Pipe of Eugene. This company had worked extensively with Don Porior in the past to develop the design for the rock collectors which were installed inside the culvert at the factory, and were familiar with all the aspects of Don's designs. The Council also contracted with Don to inspect the project at critical points during the construction, and to endorse the final approval.

Construction:

The contract specified that construction would be completed between July 1st and September 15th, the "in stream work period." Prior to July 1st, the contractor delivered the culverts to the site, and stockpiled much of the rock which would be needed. The contractor also engaged Don Porior to do the construction staking. This was done on June 29th.

Soon after the first of July, the contractor began work on Culvert #1. the stream flow was diverted into a ditch which carried the water into the small tributary just above Culvert #2. Several problems were encountered when the old culvert was removed. First, beneath the old culvert was a layer of soft, wet serpentine clay. This necessitated digging down another two feet, installing geotextile fabric, and refilling with foundation rock. The other problem was the high water table. While the foundation was being dug, water kept seeping in. A sump hole was dug at the inlet end of the trench, and a pump was set up to pump out the water. This helped, but the bottom was still wet and muddy. The water also caused the sides of the trench to collapse so that the dirt needed to be removed and the final trench was wider than necessary. The addition of the foundation rock provided a solid base to set the large pipe.

Culvert #1 was a large arch, twelve (12) feet wide and almost eight (8) feet high. At eighty-six (86) feet long, it was shipped in four sections. Each section was lowered into the trench with a large excavator. As each section was set in place, a neoprene gasket was placed around the joint where it connected to the previous section, and the two sections were secured with a steel band consisting of three pieces bolted together. When all four sections were bolted together, the placement was checked against the construction stakes.

Since the trench was wider than necessary, plywood forms were placed along the sides of the pipe. Concrete trucks then delivered a "low strength slurry mix" which was poured under the haunches of the pipe to a depth of two (2) feet. This mix was specified by the engineer, and was basically a "one sack" concrete mix. When delivered, it looked like sand and water, and I questioned whether it would set up, but it worked just fine. While the mix was being poured, the bucket of the excavator was set down on the top of the pipe to keep it from "floating" as the concrete was poured under it. Gently tapping the bottom of the culvert from the inside with a power tamper, caused the concrete mix to settle uniformly under the pipe.

After the concrete had set, the trench was back filled with dirt and compacted with a power tamper. The bottom of the culvert was then embedded with two (2) feet of class 3 rip rap and river gravels. A small tractor with a bucket was able to drive into the culvert and place the rock. The river gravels were "washed in" with a water hose to settle the fines, and to prevent the stream from completely submerging into the rock during low flows. The banks were shaped and rip rap was placed around the inlet and the outlet.

Construction on Culvert #4, the other large arch began next. The stream was diverted through a trench around the site, and the old culvert was removed.

There was rock and s[illegible] soil under this one, so the added [illegible]undation rock was not necessary. The bed was leveled with crushed rock. This pipe was forty-eight (48) feet long, and was delivered in two (2) sections. The sections were lowered into the trench with the excavator, and connected with steel bands.

After the culvert was in place, the slurry mix was poured around the sides of the pipe to a depth of two (2) feet. Again, the mix was allowed to settle under the pipe by gently moving the power tamper along the bottom.

This culvert was only 83" high so the tractor could not drive into it to place the embedded rock. Instead, the contractor rented a small, hand operated machine on a track with a hydraulic bucket. This machine was about four (4) feet long and three (3) feet wide with rubber tracks on the bottom, and a small bucket on the front. It was about three (3) feet tall, with handles on the back where the operator could stand and control it. The tracks allowed it to move forward and backward and to turn, and there were controls to move the bucket up or down, or to rotate it to dump the contents. It worked well for getting the embedded rock into the culvert, but tight turns on the rough rock surface caused a track to come off. The machine had to be lifted out with the excavator, but the track was put back on fairly easily.

After the embedded rock and river gravels were placed in the bottom, the engineer staked out a four (4) foot by three (3) foot rock weir across the channel just downstream from the culvert's outlet. This was the grade control to assure that the water level inside the culvert was correct. The contractor built the weir with rip rap and filled the spaces with smaller rock. The banks around the inlet and outlet were shaped with the excavator and protected with a layer of rip rap.

The two culverts on the side tributary (#2 and #3) were replaced with eight (8) foot "half pipes." This design is one that Don Porior has been perfecting over the past few years. Basically, this design is a round, steel culvert which is cut in half. Two (2) foot wide corrugated steel plates are then welded to the cut edge to form a flat footing. Each culvert was delivered to the site in two pieces. Flanges were welded on to allow the sections to be bolted together. All the welding, and drilling the bolt holes in the flanges, was done at the Pacific Corrugated Pipe yard so that the sections would fit together quickly and easily in the field.

The flow from the tributary was diverted through a trench with a section of pipe under the road. The trenches for the structures were dug with the excavator according to specifications in the designs. The bottom of the trenches was lined with geotextile fabric, with ample amounts extending up the sides of the trench. A two (2) foot layer of large rocks, with the spaces filled with crushed rock, was built up on top of the fabric. The top of this foundation layer was rough and irregular, with the tops of the larger rocks sticking up. A layer of washed river gravel was washed into the spaces on top. Next, the sides of the foundation, where the footings would rest, were smoothed with finer gravel and topped with a layer of concrete mix. The sections of culvert were placed with the footings on the layer of concrete and bolted together. The geotextile fabric was folded

across the top of the foundation, across the steel footing pipe, and part way up the side of the culvert. The trench was then backfilled and tamped to the existing road grade. The sides were shaped, and the ends protected with a layer of rip rap. Finally, a grade control weir was constructed in the main channel, below the outlets of culverts #1 and #2, with large rocks.

The final tasks were to rock the roadway, and to seed the entire area with grass seed. Construction was complete on August 28, 2006.

Maintenance:

The landowner will maintain the structures for a minimum of ten (10) years. The Elk Creek Watershed Council will periodically inspect the project area.

Monitoring:

The Elk Creek Watershed Council will take photos of the project for at least two years following project completion. The ODFW will conduct fish presence and spawning surveys to document fish usage for two years.

Conclusions:

There were several lessons learned during the implementation of this project:

- Purchasing the Culverts Separately: Some savings were achieved by purchasing the culverts separately, rather than including them in the bid items of the construction contract. This created more work for the Watershed Council Coordinator, but there was still a sizable savings. Since the cost of the culverts was almost half the total cost of the construction contract, removing these costs also reduced the amount of the bond that the contractor was required to post. The only liability was that the Watershed Council, rather than the contractor, assumed responsibility for any damages to the culverts during shipping.
- Ordering the Culverts: Another advantage of purchasing the culverts separately was the ability to place the order at the same time that bids were being solicited. It took several months before the half pipes could be constructed and delivered; much more time than was expected. This had to do with delays in the fabrication and placement of the footing pads. Fortunately, the fabrication was completed in time to avoid delays in the construction schedule.
- Design of the Open-bottom Half-pipes: The open-bottom half-pipe design proved to be a good solution for the replacement of small culverts on fish-bearing streams. Construction is fairly simple and straight forward, and can be done quickly once the techniques are developed. The resulting structure has a natural bottom, with embedded "shadow rocks" which help juvenile fish passing through, and is easily designed to match the existing active channel width. The main disadvantage is the cost. To maintain the structural strength required to satisfy the engineers at the fabrication yard, the footing pads had to be made of corrugated steel which is difficult to weld to the pipe,

and therefore cost. Don Porior is considering alternative footing designs which will hopefully bring the costs down considerably.

- Project Management and Inspection: It proved to be a real advantage that the Elk Creek Watershed Council Coordinator (the Project Manager) was so involved in developing the contract for the project. His familiarity with the details of the construction kept the need for inspections by the engineer to a minimum, saving a great deal of money. Most questions during construction were resolved by the Project Manager; the engineer made final inspections as each bid item was completed. In the future, the Watershed Council will try to find funding for more surveying instruments so that even more of the technical aspects of their restoration projects can be completed by Council personnel.

PROJECT BUDGET

OWEB Funds:

Grant #205-162:		
Project Design & Engineering:	$	1,500
Project Management:	$	500
Contracted Services/Supplies:	$	18,500
Grant Administration:	$	2,000
	$	22,500
Grant #206-284:		
Project Design & Engineering:	$	500
Project Management:	$	3,563
Mileage:	$	193
Contracted Services/Supplies:	$	75,350
Grant Administration:	$	2,500
	$	82,106
Total OWEB Funds:	**$**	**104,606**

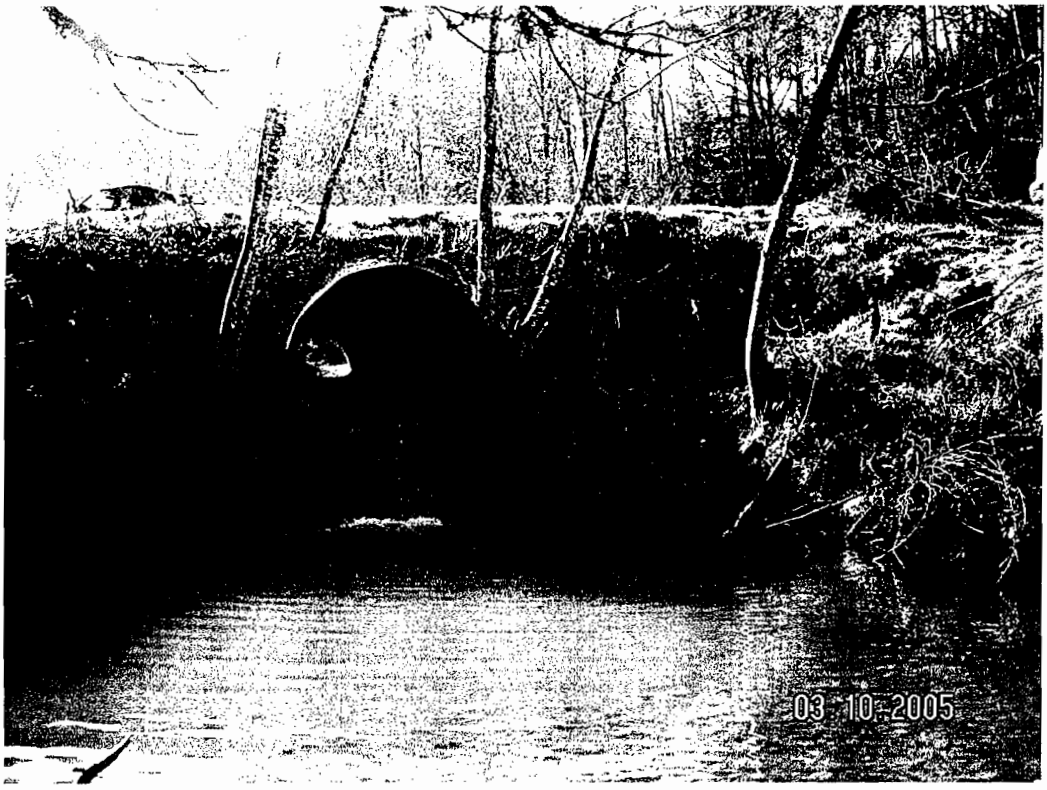
Other Cash Funds:

Roseburg District BLM (Title II):	$	56,500
Elk Creek Watershed Council: (Grant writing; design)	$	1,755
Total "Other" Funds:	$	58,255

In-kind Contributions:

Elk Creek Watershed Council: (Public education)	$	750
Elk Creek Watershed Council: (Monitoring)	$	375
Roseburg District BLM: (Grant writing)	$	400
ODFW: (Monitoring)	$	900
Total In-kind:	$	2,425
Total Project Cost:	**$**	**165,286**

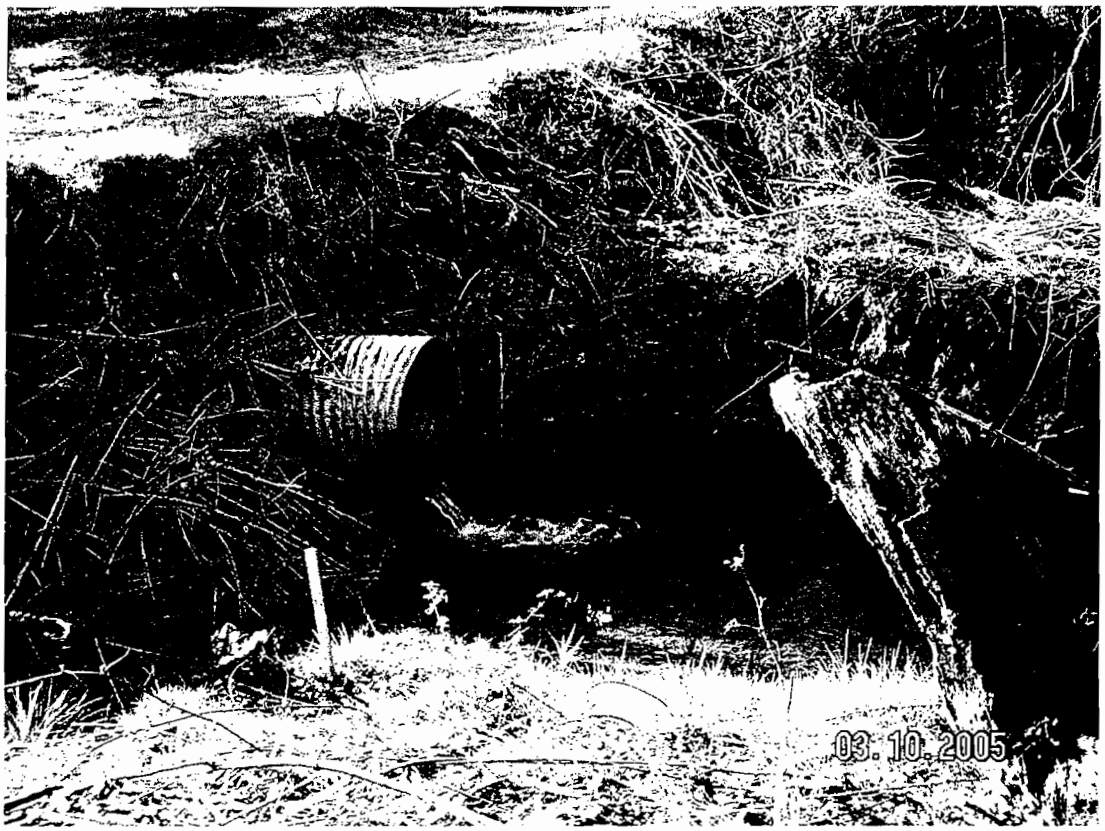
PROJECT PHOTOS



Dodge Canyon Creek – Culvert #1 (March 2005)

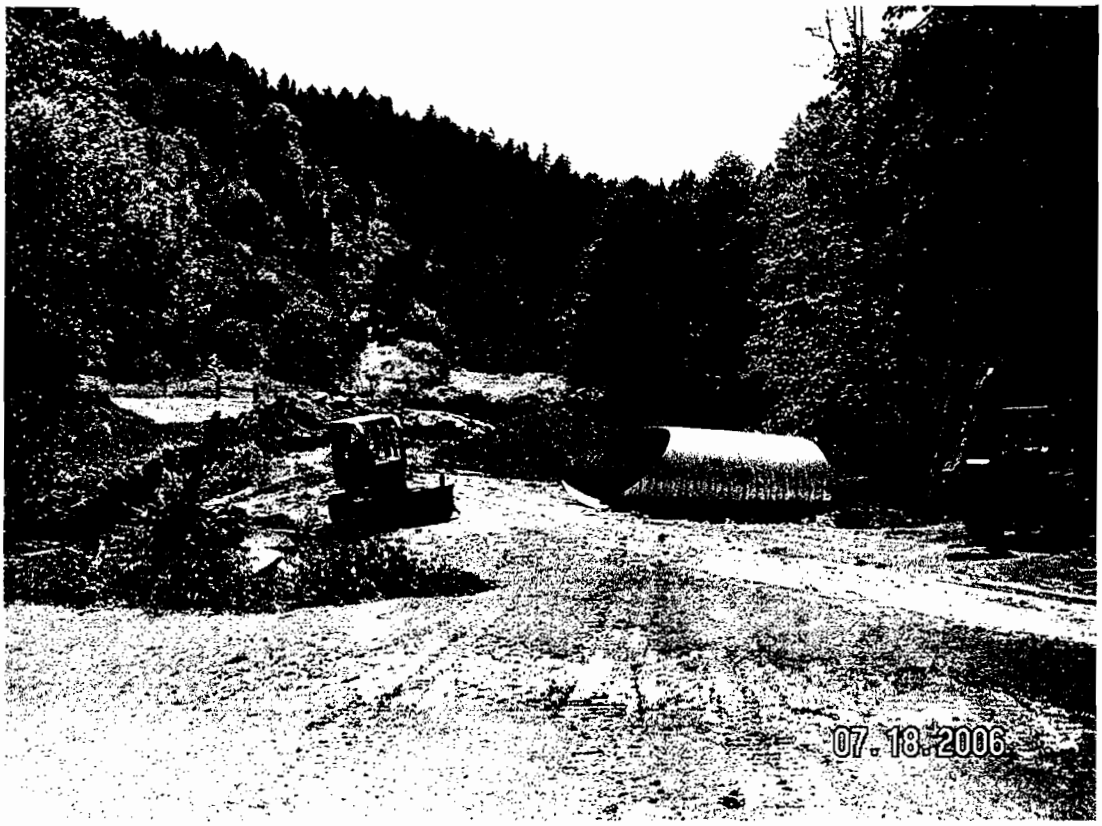
Dodge Canyon Creek – Culvert #2 (March 2005)

Dodge Canyon Creek – Culvert #3 (March 2005)



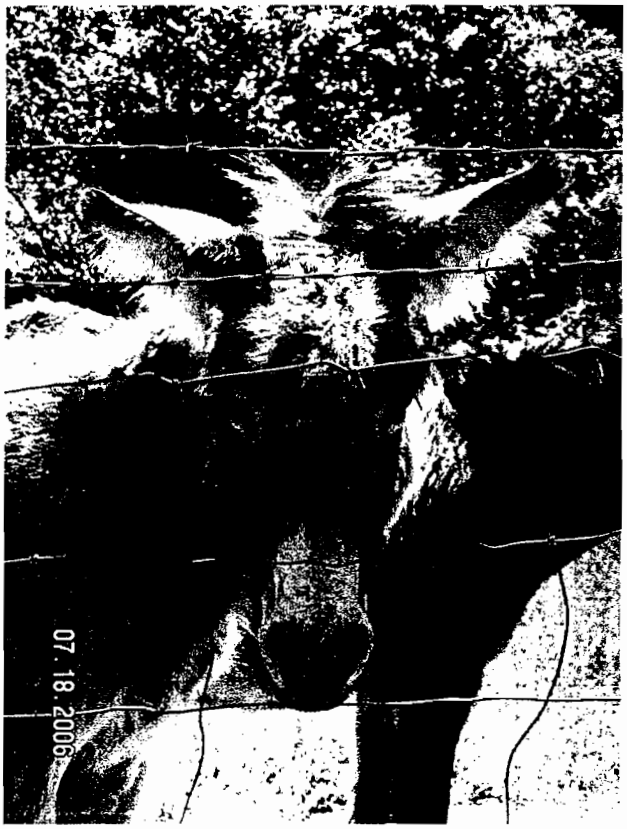
Dodge Canyon Creek - Culvert #4 (March 2005)

Don Porior – Surveying the Site (June 2006)

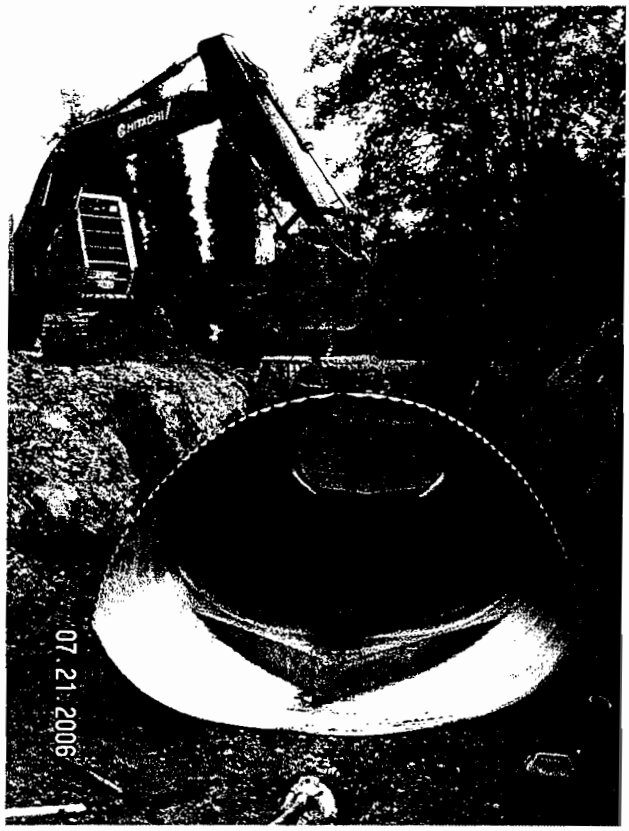


Excavation of Culvert #1

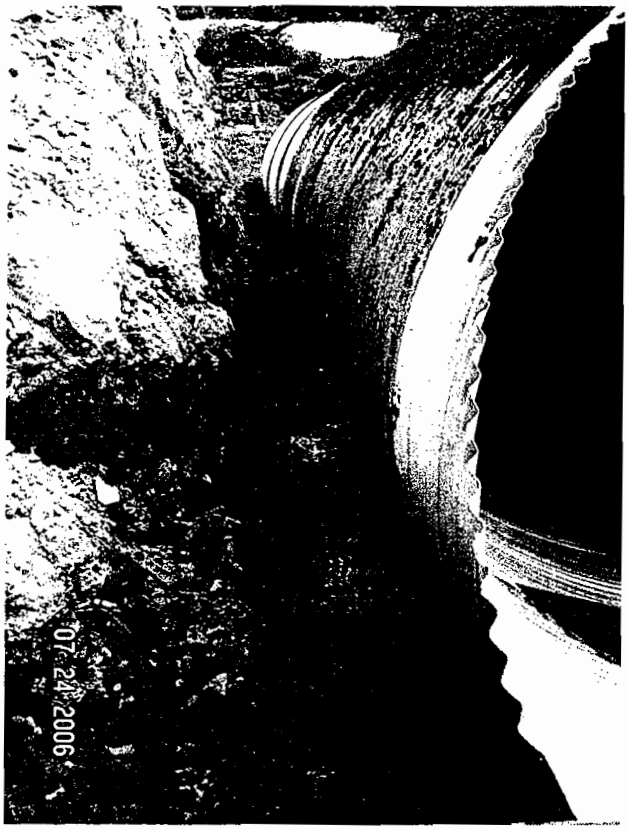
Culvert #1 – Serpentine "Bottom" & Crumbling Sides



"Spectators"

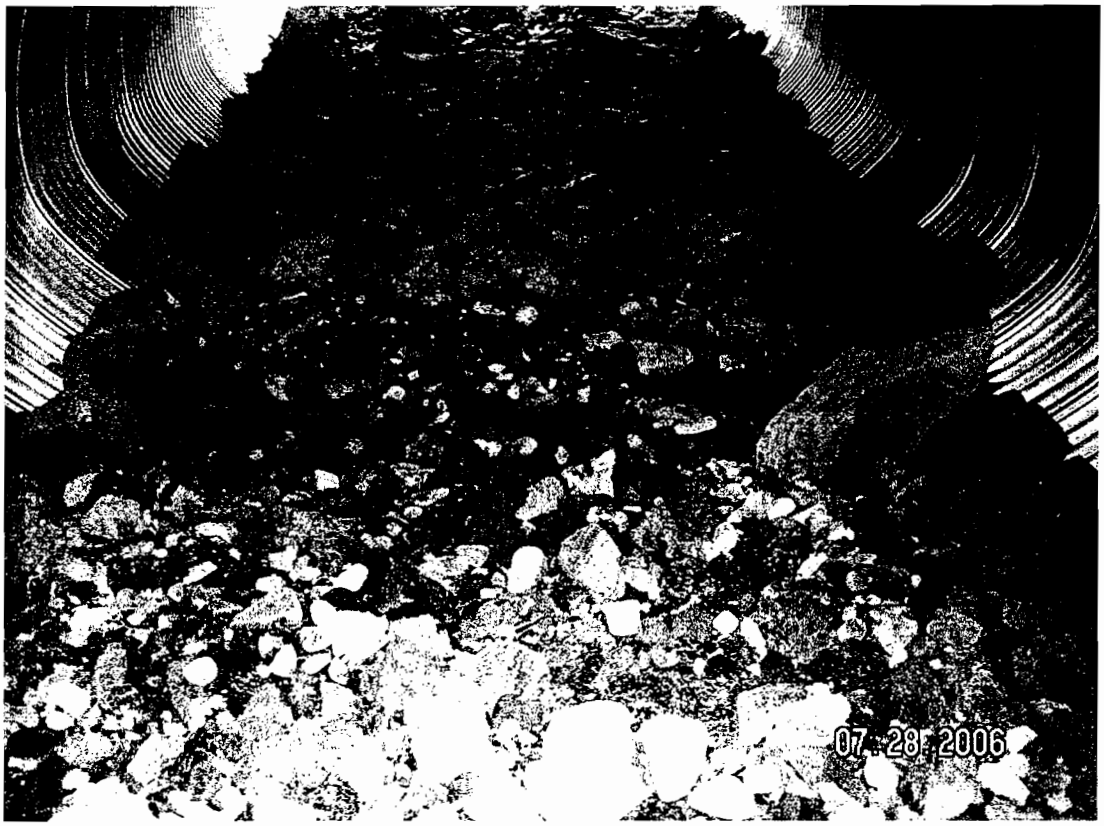


Culvert #1 – Bolting the Sections Together



Culvert #1 – Slurry Mix under the Haunches

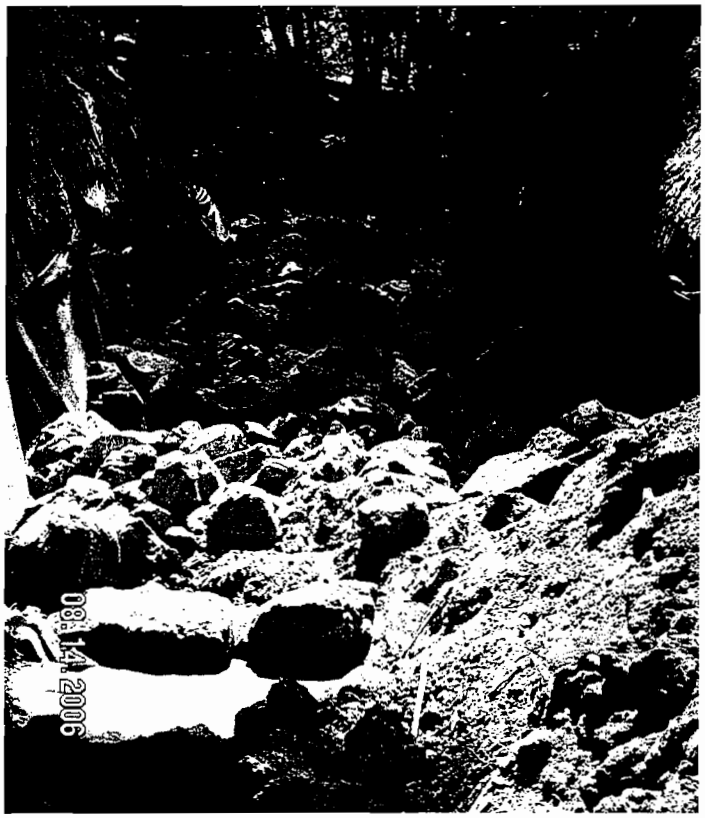
Culvert #1 – Placing the Embedded Rock



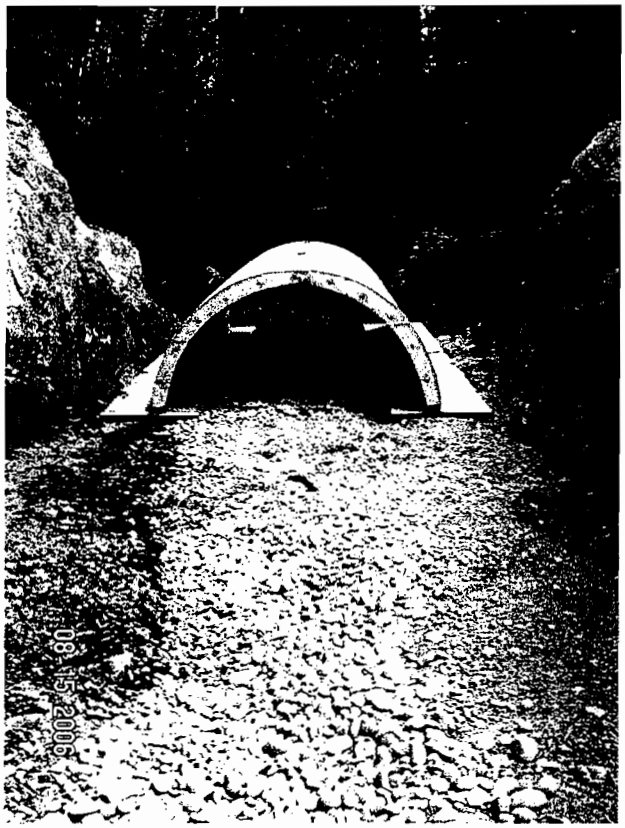
Culvert #1 – Embedded Rock

Culvert #4 – Bolting Sections Together

Culvert #4 – Placing the Embedded Rock



Culvert #3 – Building the Foundation



Culvert #3 – First Section on Rock Foundation

Culvert #2 – Finished Streambed

Project Site – Roadway over Culverts #1 and #2

Culvert #1 – November 2006

Culvert #2 – November 2006

Culvert #3 – November 2006

Culvert #4 – November 2006