

COST ANALYSIS:

BRIDGE CREEK, SITE 79-2

HEAVY EQUIPMENT PHASE

February 29, 1980

COST SUMMARY

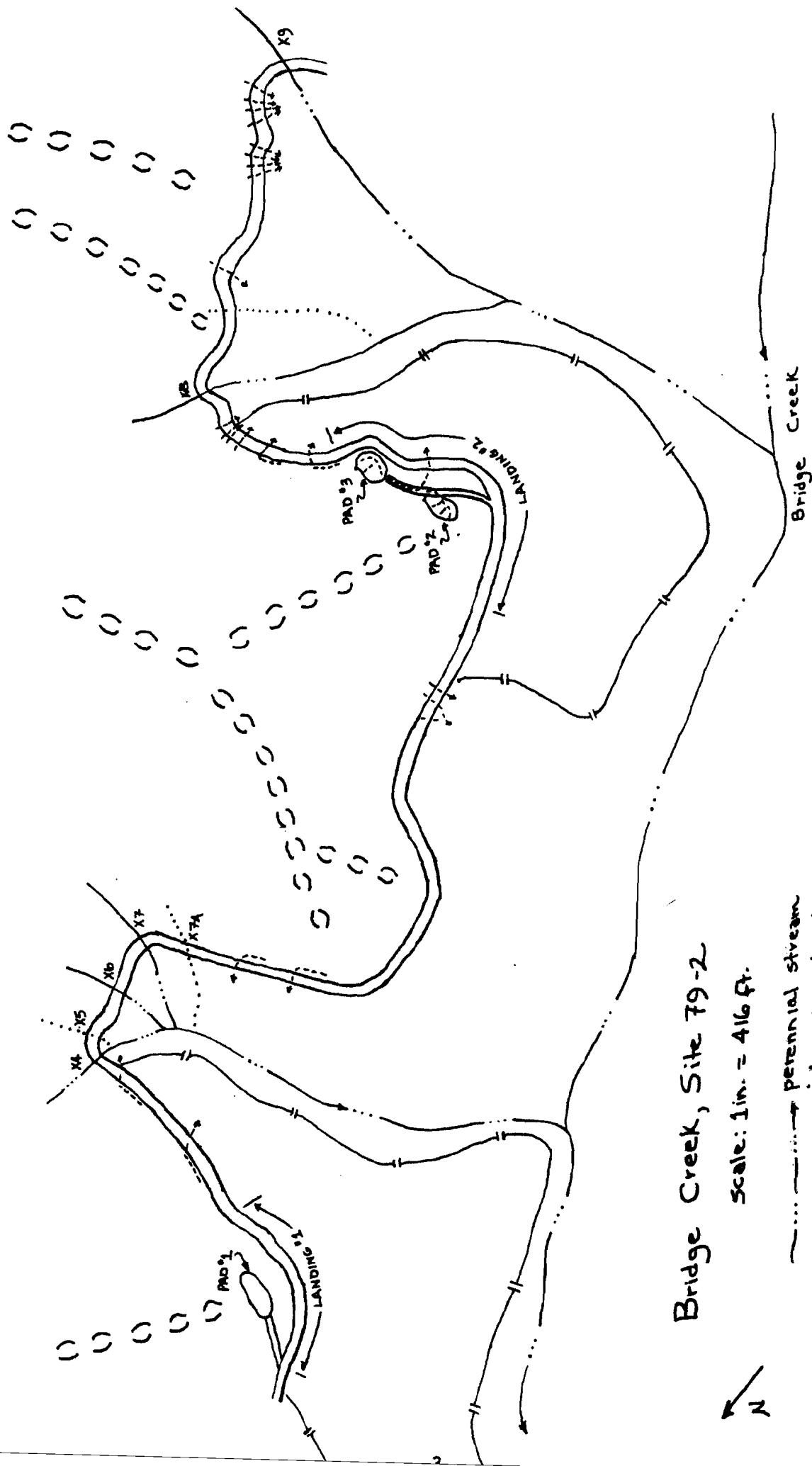
Includes heavy equipment costs for this phase of rehabilitation in Bridge Creek: Site 79-2, M-7-5-1 Road. Standby costs are included.

Timber salvage	\$ 26,441.38
Landing removal:	
End-hauling of slash	\$ 54,593.33
Outsloping	\$ 16,391.85
Stream crossing excavation	\$ 36,519.55
Rocking of stream crossings	\$ 5,139.64
M-7-5-1 Road outsloping	\$ 10,939.00
Yarder pad outsloping	\$ 3,363.00
Road maintenance	\$ 529.50
Miscellaneous costs	\$ 3,474.23
Equipment transportation	\$ 1,920.10
Total	<u>\$159,311.58</u>

EQUIPMENT LIST

Contractor (operator)	Equipment	Cost/Hour
Carl Kjer	22B Bucyrus Erie Crane with operator and oiler.	\$85.00
Diamond Logging Co. (David Renner)	D6 CAT crawler tractor with winch and operator.	\$54.30
	CAT 950 loader with operator	\$47.80
	CAT 12 road grader	\$35.30*
	10 cu. yd. dump truck (#1)	\$29.51*
Keith Parker	Case 580B extendahoe	\$32.50
	10 cu. yd. dump truck (#2)	\$29.51*
	10 cu. yd. dump truck (#3)	\$29.51
Hal Reardon (Clyde Redl)	CAT D5 crawler tractor with winch	\$45.00
Nichols Trucking (Marvin McGaughey)	10 cu. yd. dump truck (#4)	\$29.51
Dennis Thatcher	10 cu. yd. dump truck (#5)	\$29.51
Dale Lesina	10 cu. yd. dump truck (#6)	\$29.51
Wayne Hooper	4,000 gal. water truck	\$30.00
Tom Coy	CAT D8 crawler tractor with winch	\$80.00
Larry Albercrumbi	Short logger truck	\$29.51
Jerry Carmichael	D8 CAT crawler tractor with winch	\$45.00

* paid engine operating time only



Bridge Creek, Site 79-2

Scale: 1 in. = 416 ft.

perennial stream

..... intermittent stream

--- 4 cross-rod drain

(((ridge line

—||— cable unit boundary

3/88

INTRODUCTION

This cost analysis is based on information contained in Table 1. This table is a compilation of field notes and memory, and describes work tasks for each piece of equipment on a daily basis. Numbers listed below each piece of equipment are the number of hours recorded for payment. Numbers contained in parenthesis are the number of hours a piece of equipment actually worked that day. Standby time; i.e., the time equipment is available to work but is actually idle, is the difference between those two numbers. When no number appears in parenthesis, the equipment is credited for a full 10 hour day.

ABBREVIATIONS AND SYMBOLS USED IN REMARKS COLUMN, TABLE 1

eh	-	extendahoe
Xing	-	stream crossing
XRD	-	cross-road drain
T.O.	-	tanoak
d.t.	-	dump truck
	-	culvert

ABBREVIATIONS USED IN TABLE 1

A number preceeding a letter(s)-	number of hours worked
A number following a letter(s)-	work site I.D. number
CL	- clear landing of debris
OL	- outslope landing
X	- stream crossing
R	- road removal work
RX	- rocking stream crossing
XRD	- cross-road drain
C	- culvert
S	- timber salvage
P	- yarder pad
M	- miscellaneous
Road designation	- clearing of inboard ditch

COST BREAKDOWN

Timber Salvage

Includes the removal and transportation of approximately 90,000 board-feet of felled timber (mostly Redwood) from the hillslope above stream crossing #9, and an additional 50,000 board-feet (Douglas-fir and redwood mix) from stream crossings and along the M-7-5-1 Road. Approximately 30,000 board-feet of tanoak was also salvaged and transported to the G-Line deck.

TABLE 2a. REDWOOD AND DOUGLAS-FIR SALVAGE COSTS

Equipment	Hours	Cost/Hour	Cost
D5	46½	\$45.00	\$ 2092.50
D8	88	\$80.00	\$ 7040.00
D8	40	\$45.00	\$ 1800.00
Loader	60	\$47.80	\$ 2868.00
Log truck	80	\$29.51	\$ 2360.80
Total			<u>\$16,161.30</u>

TABLE 2b. TAN OAK SALVAGE COSTS

Equipment	Hours	Cost/Hour	Cost
D5	80	\$45.00	\$ 3600.00
D6	30	\$54.30	\$ 1629.00
Loader	40	\$47.80	\$ 1912.00
Grader	7	\$35.30	\$ 247.10
Dump #1	70	\$29.51	\$ 2065.70
Dump #2	9	\$29.51	\$ 265.59
Dump #3	9	\$29.51	\$ 265.59
Dump #4	10	\$29.51	\$ 295.10
Total			<u>\$10,280.08</u>

COST BREAKDOWN (cont'd.)

Landing Removal - Debris Removal and End-Hauling

Includes removal of slash and debris from two landings, end-hauling and road maintenance (M-7-5-1 Road to G-Line Deck).

TABLE 3a. DEBRIS REMOVAL AND END-HAULING COSTS

Equipment	Hours	Cost/Hour	Cost
Crane, clamshell	167	\$85.00	\$14,195.00
D6	137	\$54.30	\$ 7,439.10
Loader	87	\$47.80	\$ 4,158.60
Grader	56	\$35.30	\$ 1,976.80
Dump #1	121½	\$29.51	\$ 3,585.47
Dump #2	162	\$29.51	\$ 4,780.62
Dump #3	147	\$29.51	\$ 4,337.97
Dump #4	167	\$29.51	\$ 4,928.17
Dump #5	100	\$29.51	\$ 2,951.00
Dump #6	60	\$29.51	\$ 1,770.60
Water truck	149	\$30.00	\$ 4,470.00
Total			<u>\$54,593.33</u>

COST BREAKDOWN (cont'd.)

Landing Removal - Outsloping

Includes the outsloping of two landings which are clear of slash and debris.

TABLE 3b. OUTSLOPING COSTS

Equipment	Hours	Cost/Hour	Cost
Crane, dragline	99½	\$85.00	\$ 8,457.50
D6	84½	\$54.30	\$ 4,588.35
Loader	70	\$47.80	\$ 3,346.00
		Total	<u>\$16,391.85</u>

COST BREAKDOWN (cont'd.)

Stream Crossing Excavations

Includes excavating and end-hauling fill material from stream crossings on the M-7-5-1 Road.

TABLE 4a. STREAM CROSSING #9

Equipment	Hour	Cost/Hour	Cost
Crane	43	\$85.00	\$ 3,655.00
D6	33	\$54.30	\$ 1,791.90
Loader	43	\$47.80	\$ 2,055.40
Grader	6	\$35.30	\$ 211.80
Extendahoe	10	\$32.50	\$ 325.00
Dump #1	3	\$29.51	\$ 88.53
Dump #2	27½	\$29.51	\$ 811.53
Dump #3	43	\$29.51	\$ 1,268.93
Dump #4	43	\$29.51	\$ 1,268.93
Water Truck	4	\$30.00	\$ 120.00
Excavated fill = 3500 cu. yds. Total			<u>\$11,597.02</u>

COST BREAKDOWN (cont'd.)

Stream Crossing Excavations (cont'd.)

TABLE 4b. STREAM CROSSING #8

Equipment	Hours	Cost/Hour	Cost
Crane	22	\$85.00	\$ 1,870.00
D6	5	\$54.30	\$ 271.50
Grader	1	\$35.30	\$ 35.30
Extendahoe	5	\$32.50	\$ 162.50
Dump #1	10	\$29.51	\$ 295.10
Dump #3	28	\$29.51	\$ 826.28
Dump #4	30	\$29.51	\$ 885.30
Excavated fill $\approx$ 2100 cu. yds.			Total <u>\$ 4,345.98</u>

TABLE 4c. STREAM CROSSING #7A

Equipment	Hours	Cost/Hour	Cost
Crane	12	\$85.00	\$ 1,020.00
D6	5	\$54.30	\$ 271.50
Excavated fill $\approx$ 1400 cu. yds.			Total <u>\$ 1,291.50</u>

TABLE 4d. STREAM CROSSING #7

Equipment	Hours	Cost/Hour	Cost
Crane	33	\$85.00	\$ 2,805.00
D6	20	\$54.30	\$ 1,086.00
Grader	8	\$35.30	\$ 282.40
Loader	50	\$47.80	\$ 2,390.00
Extendahoe	4	\$32.50	\$ 130.00
Dump #1	33	\$29.51	\$ 973.83
Dump #2	34	\$29.51	\$ 1,003.34
Excavated fill $\approx$ 3000 cu. yds.			Total <u>\$ 8,670.57</u>

COST BREAKDOWN (cont'd.)

Stream Crossing Excavations (cont'd.)

TABLE 4e. STREAM CROSSING #6

Equipment	Hours	Cost/Hour	Cost
Crane	48	\$85.00	\$ 4,080.00
D6	21	\$54.30	\$ 1,140.30
Loader	46	\$47.80	\$ 2,198.80
Grader	5	\$35.30	\$ 176.50
Extendahoe	5	\$32.50	\$ 162.50
Dump #1	34	\$29.51	\$ 1,003.34
Dump #2	34	\$29.51	<u>\$ 1,003.34</u>
Excavated fill $\approx$ 2200 cu. yds.		Total	<u>\$ 9,764.78</u>

TABLE 4f. STREAM CROSSING #5

Equipment	Hours	Cost/Hour	Cost
Extendahoe	6	\$32.50	\$ 195.00
Excavated fill $\approx$ 50 cu. yds.		Total	<u>\$ 195.00</u>

TABLE 4g. STREAM CROSSING #4

Equipment	Hours	Cost/Hour	Cost
Crane	4	\$85.00	\$ 340.00
D6	4	\$54.30	\$ 217.20
Extendahoe	3	\$32.50	<u>\$ 97.50</u>
Excavated fill $\approx$ 600 cu. yds.		Total	<u>\$ 654.70</u>

COST BREAKDOWN (cont'd.)

Rocking of Stream Crossings

Includes quarrying, transporting and placing rock into excavated stream crossings.

TABLE 5a. STREAM CROSSING #8

Equipment	Hours	Cost/Hour	Cost
Crane, clamshell	9	\$85.00	\$ 765.00
Loader	15	\$47.80	\$ 717.00
Dump #1	20	\$29.51	\$ 590.20
Rock Volume $\approx$ 80 cu. yds.		Total	<u>\$2,072.20</u>

TABLE 5b. STREAM CROSSING #6

Equipment	Hours	Cost/Hour	Cost
Crane, clamshell	8	\$85.00	\$ 680.00
Loader	25	\$47.80	\$1,195.00
Dump #3	10	\$29.51	\$ 295.10
Dump #4	14	\$29.51	\$ 413.14
Rock Volume $\approx$ 65 cu. yds.		Total	<u>\$2,583.24</u>

TABLE 5c. STREAM CROSSING #5

Equipment	Hours	Cost/Hour	Cost
Extendahoe	5	\$32.50	\$ 163.00
Rock Volume $\approx$ 5 cu. yds.		Total	<u>\$ 163.00</u>

TABLE 5d. STREAM CROSSING #4

Equipment	Hours	Cost/Hour	Cost
Loader	4	\$47.80	\$ 191.20
Extendahoe	4	\$32.50	\$ 130.00
Rock Volume $\approx$ 10 cu. yds.		Total	<u>\$ 321.20</u>

COST BREAKDOWN (cont'd.)

M-7-5-1 Road Outsloping

Includes outsloping approximately 1.2 miles of road surface and placement of cross-road drains.

TABLE 6. ROAD OUTSLOPING

Equipment	Hours	Cost/Hour	Cost
Crane	21	\$85.00	\$1,785.00
D6	80	\$54.30	\$4,344.00
Extendahoe	148	\$32.50	<u>\$4,810.00</u>
Total			<u>\$10,939.00</u>

Yarder Pad Outsloping

Includes the outsloping of yarder pads #1-#3 and roads which provide access to the pads, and the placement of drains on pads #2 and #3.

TABLE 7. YARDER PADS

Equipment	Hours	Cost/Hour	Cost
D6	35	\$54.30	\$1,900.50
Extendahoe	45	\$32.50	<u>\$1,462.50</u>
Total			<u>\$3,363.00</u>

COST BREAKDOWN (cont'd.)

Road Maintenance

Includes the clearing of inboard ditches along the M-7-5-1 and M-7-5-2 Roads.

Grader 15 hours @ \$35.30/hour = \$529.50

Miscellaneous Costs

Includes transportation of check dam material to stream crossings, salvaged culverts to the G-Line Deck, and the distribution of straw bales along the M-7-5-1 Road.

TABLE 8. MISCELLANEOUS COSTS

Equipment	Hours	Cost/Hour	Cost
Loader	10	\$47.80	\$ 478.00
Dump #1	44½	\$29.51	\$1,313.19
Extendahoe	25	\$32.50	\$ 812.50
Dump #2	9½	\$29.51	\$ 280.34
Dump #4	20	\$29.51	\$ 590.20
Total			<u>\$3,474.23</u>

COST BREAKDOWN (cont'd.)

Equipment Transportation Costs

Crane	1½ trips @ \$150.00/trip	= \$ 225.00
D6 Tractor	1½ trips @ \$150.00/trip	= \$ 225.00
Loader	1 trip @ \$150.00/trip	= \$ 150.00
Grader	1 trip @ \$150.00/trip	= \$ 150.00
Extendahoe	2 hours move-in/out @ \$32.50/hr	= \$ 65.00
Dump #3	2 hours move-in/out @ \$29.51/hr	= \$ 59.02
D5 Tractor	1 trip @ \$150.00/trip	= \$ 150.00
Dump #4	2 hours move-in/out @ \$29.51/hr	= \$ 59.02
Dump #5	2 hours move-in/out @ \$29.51/hr	= \$ 59.02
Dump #6	2 hours move-in/out @ \$29.51/hr	= \$ 59.02
Water Truck	2 hours move-in/out @ \$30.00/hr	= \$ 60.00
D8 Tractor	2 trips @ \$150.00/trip	= \$ 300.00
Log Truck	2 hour move-in/out @ \$29.51/hr	= \$ 59.02
D8 Tractor	2 trips @ \$150.00/trip	= <u>\$ 300.00</u>
Total		<u><u>\$1920.10</u></u>

COST ANALYSIS

Timber Salvage (refer to Tables 2a-b)

Approximately 140,000 board-feet (b.f.) of commercial timber (75% redwood, 25% Douglas-fir) and 30,000 b.f. of tan oak was salvaged from this rehabilitation unit at a cost of \$26,441.38. Approximately 65% of the commercial timber was salvaged from the hillslope above stream crossing #9. The remainder was salvaged from stream crossings and along the M-7-5-1 Road. The tan oak was salvaged from yarder landings and along the road. Redwood and Douglas-fir salvage costs amount to \$16,161.30, or \$115.43 per thousand board-feet. Tan oak salvage costs amount to \$10,280.08, or \$342.67 per thousand board-feet.

The disproportionate costs of commercial timber salvage vs tan oak salvage can be explained by the following points:

1. The D5 operator and two choker-setters were left unsupervised for two weeks.
2. It takes many more tan oak logs to equal the volume found in a single old growth redwood or Douglas-fir log.

Salvage operations along the M-7-5-1 Road were cost-effective. A tractor (D6-D8) can easily travel along the road, spot and winch logs to the road surface. Logs remain on the road surface until a truck is available to transport logs to a storage site. The salvage operation from the hillslope above crossing #9 was a different story. Access to the hillslope was extremely limited. Logs were winched downslope (40%-60% slopes) and were as far as 400 feet away from the tractor. Rigging had to be set and re-set to maneuver logs down the slope. In general, this was a very time-consuming yarding method. A portable, high lead tower may have been better suited for the job.

Landing Removal (refer to Tables 3a-b)

Two log landings totalling .45 mile were cleared of debris and outsloped at a total cost of \$70,985.18. Of this total cost, \$54,593.33 (77%) was spent on removing logs and woody debris from the landings using a clamshell, loading this material into dump trucks, and end-hauling it to the G-Line Deck. Outsloping the landings resulted in a cost of \$16,391.85 (23%), and was performed with a dragline. Landing removal accounts for 45% of the total equipment costs for this unit.

Both landings contained an enormous amount of logs (mostly tan oak) and woody debris. The decision to end-haul this material was based on: (1) the burial of such a large amount of organics may have spurred future slumping with the decomposition of the organics, and (2) both landings were to be used as storage areas for the vast amount of fill which was to be removed

COST ANALYSIS (cont'd.)

Landing Removal (cont'd.)

from stream crossings. However, in retrospect, an alternate approach to landing removal, and storage of debris and stream crossing fill material should have been developed. The grader, dump trucks and water truck - all end-hauling components - account for \$28,800.63, or 53% of debris removal costs. Both loader and D6 tractor experienced a lot of standby time during the landing removal phase (refer to Table 1), and an alternate approach to landing removal would have kept both pieces of equipment busy, thereby minimizing their standby time and increasing the cost-effectiveness of equipment application.

Stream Crossing Excavations (refer to Tables 4a-g)

A total of 7 stream crossings were excavated on the M-7-5-1 Road. Major crossings; i.e., containing ≥ 1000 cu. yds., required end-hauling excavated fill to dump sites. Approximately 10,200 cu. yds. of fill was excavated and end-hauled from 5 major crossings at a cost of \$35,669.85, or \$7,134 per stream crossing. Another 650 cu. yds. was excavated (not end-hauled) from 2 minor stream crossings at a cost of \$849.70. With the exception of the loader (refer to Table 1), all equipment applications were cost-effective.

Rocking of Stream Channels (refer to Tables 5a-d)

Four stream crossings were rocked immediately following excavation at a total cost of \$5,139.64. Stream crossings #6 and #8 (major crossings) required approximately 145 cu. yds. of large rock (12 in. - 36 in. diameter) at an average cost of \$2,327.72 per stream crossing. Minor stream crossings #4 and #5 required approximately 15 cu. yds. of rock (8 in. - 16 in. diameter) at an average cost of \$242.10 per stream crossing. The difference in cost between placing rock in major and minor crossings is attributable to the size of rock placed in the crossing, and the equipment used to place the rock - crane with clamshell vs. extendahoe.

In terms of equipment application and utilization, this phase of rehabilitation was extremely effective. Dust, rock, and machinery were flying everywhere! However, the real question of cost-effectiveness hinges on one question: does the placement of rock in freshly-excavated channels prevent downcutting in those channels and promote streambank stability? In the long run, I feel optimistic that it will. However, with the first runoff events of the winter season, lateral channel migration, downcutting, and the undermining of large rock was observed in every rocked stream crossing. It appears that every rock-lined channel will go through an initial adjustment period, during which time rocks will shake, rattle and roll until firmly bedded in the streambed. The shifting of rocks in the channel will at times cause deflection points which may remove the toe of streambanks during high runoff events and promote lateral channel migration and streambank instabilities.

From a hydraulic standpoint, rock stream channels appear more desirable than check dams to prevent channel downcutting and promote channel and streambank

COST ANALYSIS (cont'd.)

Rocking of Stream Channels (cont'd.)

stability. Rock channels encourage higher roughness coefficients and a more dispersed flow/velocity distribution in the channel. The wetted perimeter in a rock channel will also be maintained and not decrease with time. Hydraulic jumps, which are very common in checkdammed channels, are less likely to occur in a rock channel. It has been observed that splash erosion and back eddies, resulting from hydraulic jumps, can be very instrumental in undermining check dams by undercutting a streambank immediately below a check dam. Finally, rock channels are more aesthetically pleasing and do not require the maintenance that check dams may require.

M-7-5-1 Road Outsloping (refer to Table 6)

Approximately 1.2 miles of road was outsloped at a total cost of \$10,939.00. The D-6 tractor and extendahoe performed approximately 98% of the road outsloping and placed all cross-road drains. The crane concentrated on pulling back large concentrations of sidecast material for the purpose of aligning streams and removing culverts placed deep in the road prism. The D6-extendahoe combination removed approximately 1.18 miles of road at a cost of \$9,154.00, or \$7,757.63 per mile.

Yarder Pad Outsloping (refer to Table 7)

Three yarder pads were ripped and outsloped by a D6 tractor and extendahoe at a cost of \$3,363.00, or \$1,121.00 per pad. A drain system was developed on yarder pads #2 and #3 (refer to sketch map) to drain intermittent springs. In addition, approximately .20 mile of road accessing the yarder pads was outsloped.

The cost-effectiveness of this phase is very poor. Equipment was not able to retrieve most of the sidecast material coming off the yarder pads. In addition, the gullies and rills coming off the pads were not addressed. These features continue to capture and transport surface generated runoff and are concentrating runoff on the old road surface below the pads. A more cost-effective approach would have utilized the crane to not only pull back the yarder pads, but also to erase rills and gullies from the fill slope. A crane could tackle at least one yarder pad per day and would have cost approximately \$850.00 per pad. Also, all springs (intermittent and low yield) could have been buried, thus eliminating the drain systems entirely. What's the old saying about hindsight vs. foresight?

Road Maintenance -- all necessary and cost-effective.

Miscellaneous costs (refer to Table 8)

These are "errand" or "go-for" costs and were necessary to the overall operation of the equipment phase. Tasks include loading and transporting salvaged culverts to the G-Line Deck, transporting redwood boards for check

COST ANALYSIS (cont'd.)

Miscellaneous Costs (cont'd.)

dams to rehabilitation units and work sites, transporting straw bales, grass seed and fertilizer to storage sites.

Equipment Transportation Costs - all necessary and cost-effective.

CONCLUSION

The least cost-effective application of equipment is the removal and out-sloping of log landings #1 and #2 and yarder pads #1-#3. Approximately \$29,000 could have been saved by developing an alternate plan to end-hauling slash and debris off of the rehabilitation unit. In the future, landing debris can be burned (if compatible with Park policy) during the rainy season, or somehow stored and then dispersed over the outsloped surface. In any case, end-hauling landing debris should be avoided. It is important that we treat both yarder landings and pads, but a less costly approach must be developed.

Major stream crossing excavations which utilize end-hauling techniques are expensive but cost-effective. Road cuts which traverse steep hillslopes in close proximity to perennial and intermittent stream channels will, in most cases, intercept and expose groundwater sources. The probability of intercepting groundwater along road cuts increases when dealing with poorly drained soils such as those found in Bridge Creek. The exposed groundwater complicates stream crossing excavations by not allowing the use of these "source areas" as storage for excavated fill. Therefore, assuming similar site conditions, fill material removed from major stream crossings will have to be end-hauled to a dry and stable bench or ridge location.

It is not necessary to fully outslope roads (i.e., retrieve all sidecast material) which are distant from stream channels. Instead, road surfaces can be ripped and outsloped just enough to eliminate the inboard ditch and prevent surface generated runoff from concentrating. A D5-D6 crawler tractor equipped with a hydraulic tilt blade (ideally, angle too) can cut down the outer edge of a road and sweep it against the cutbank of the road. This process can continue until the inboard ditch is fully buried and an outsloped surface attained. Ideally, the tractor is also equipped with hydraulic rippers to disaggregate-rip- the road prior to outsloping. Blade mounted chisle teeth, as used on this unit, should be avoided. The penetration depth is inadequate, approximately 10 to 12 inches. A small excavator (e.g., an extendahoe) can assist this operation by retrieving sidecast material not accessible to a tractor, excavate logs encountered during road removal, remove culverts, and excavate cross-road drains. Assuming no major stream crossings, an excavator-tractor team can treat approximately .20 mile per day at a cost of approximately \$5,000 per mile.

Standby cost amounts to \$21,827.18, or 14% of the total equipment costs. The loader and D6 tractor (Table 1) account for 94% (52% and 42% respectively) of the standby cost. There will always be a certain amount of standby cost with most projects. For example, major stream crossing excavations may require a tractor to be on-site to remove logs encountered during excavation, or help maneuver a crane into different positions. However, loader applications; i.e., cost-effective applications, are limited to log salvage, rock quarry work and earth-moving, all of which can be completed at an early stage of equipment work. Once complete, a loader can be terminated or paid according to engine operating time only. Another alternative is to have one loader available on the east side and one on the west side of the basin to "float" between rehabilitation units.

Approximately 1.7 miles of the M-7-5-1 Road is removed. Stream crossing excavations, drainage alignment, and road and landing treatments affect approximately 160 acres below the M-7-5-1 Road.

Gregory J. Bundros



Unit: 79-2 Date: 6-19-1979, PP10



Unit: 79-2 Date: 6-23-1981, PP10



Unit: 79-2 Date: 7-27-1982, PP10



Unit: 79-2 Date: 6-19-1979, PP11



Unit: 79-2 Date: 7-27-1982, PP11



Unit: 79-2 Date: 6-19-1979, PP18



Unit: 79-2 Date: 1-30-1980, PP18



Unit: 79-2 Date: 6-19-1979, PP24



Unit: 79-2 Date: 1-30-1980, PP24



Unit: 79-2 Date: 7-27-1982, PP24