

SUMMARY REPORT

EROSION CONTROL REHABILITATION OF
THE M-6-1 ROAD, BRIDGE CREEK
UNIT 86-4

BY

GREGORY J. BUNDROS

JANUARY, 1989

REDWOOD N. P.
LIBRARY
South Operations Center

TABLE OF CONTENTS

	<u>PAGE</u>
Introduction.....	1
Unit Description.....	1
Timber Harvest and Erosion History.....	6
Erosion Control Rehabilitation Work.....	6
Preparatory Work.....	6
Heavy Equipment Work.....	9
Labor Intensive Work.....	16
Summary.....	16
Appendix A (Abstract of Bid).....	17

LIST OF MAPS AND TABLES

	<u>PAGE</u>
Map A. Unit Location.....	2
Map B. Topography.....	3
Table 1. Rehabilitation Work Cost Summary.....	4
Map C. Logging History.....	7
Map D. Erosion Control Treatments.....	8
Table 2. A Comparison of Contract vs. HERE Heavy Equipment Cost.....	10
Table 3. Haul Road Crossing Costs.....	11
Table 4. Exported Outslope Excavation Cost.....	12
Table 5. Drain and Ditch Cost.....	13
Table 6. Miscellaneous Cost.....	14
Table 7. Summary of Average Labor Cost.....	15

INTRODUCTION

Rehabilitation Unit 86-4 is located approximately eight miles upstream from Orick in the Bridge Creek watershed. It contains 60 acres and 0.8 mile of rocked, logging haul road, the M-6-1 Road (Maps A and B). Heavy equipment work for this road corridor was performed under the fixed-price contract IFB 8480-86-04. Heavy equipment work for the hillslope work was performed by rental agreement and is described in the summary report for Unit 86-5; M-4 ¹/₂ and M-5 Roads, Johnson, 1988.

The total rehabilitation cost including all preparatory work was \$99,400. Of this total, heavy equipment and labor intensive erosion control work accounted for \$82,138, or 83% of the total project cost. A total of 22,532 yds³ were excavated from various worksites. Torgensen and Talbott from White City, Oregon were awarded this contract for \$76,564. Surveys, design, and contract preparation required a total of 610 person-hours, totalling \$6,417 (Table 1).

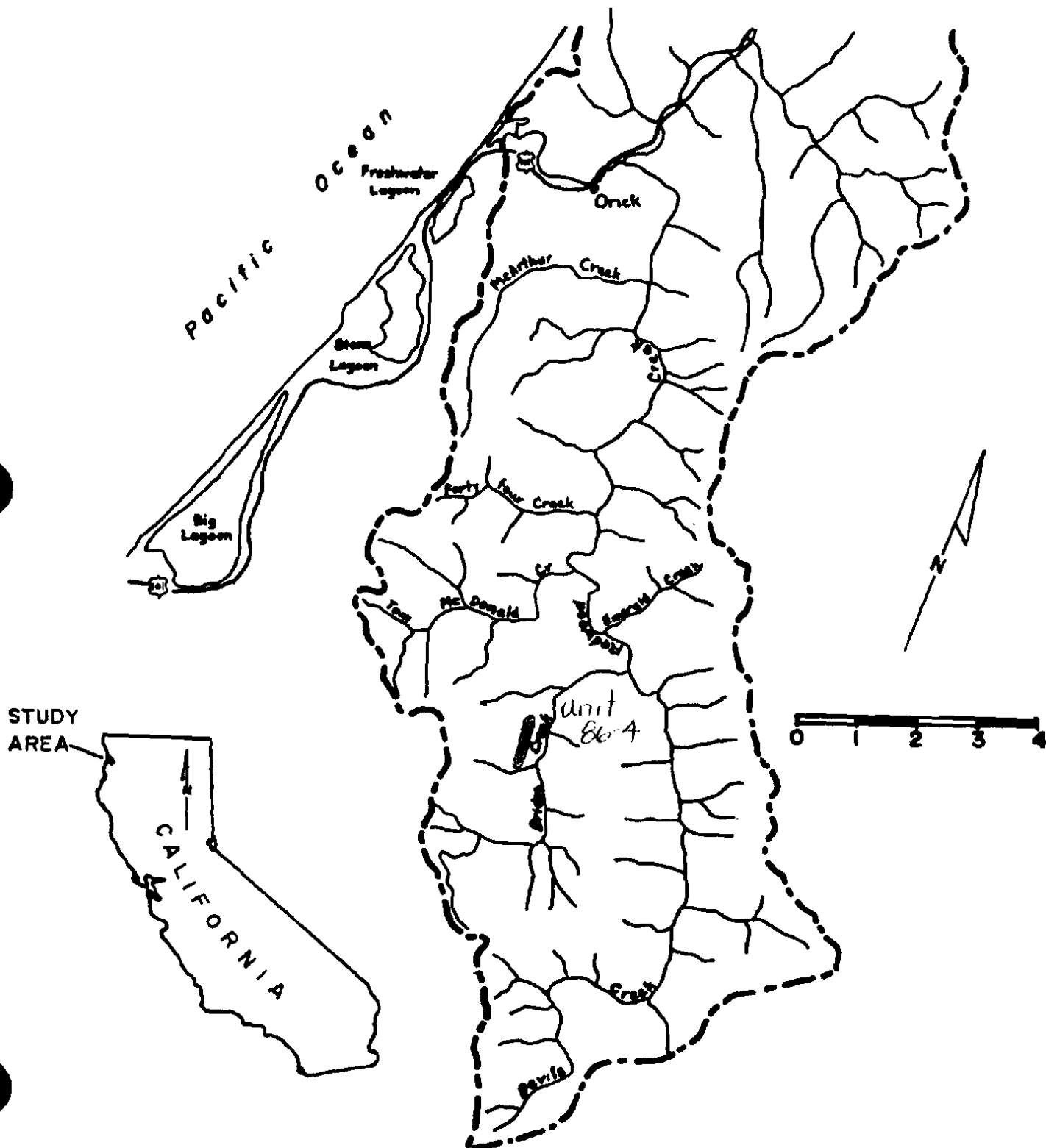
Description of Unit

Unit 86-4 occupies the lower quarter of the hillslope. Total relief is 500 ft. with elevations ranging from 900 ft. at the M-6-1 Road to 1400 ft. at the M-Line. Hillslope gradients average 40%, but easily exceed 50% within drainages.

The unit is drained by one intermittent, second-order stream, one perennial second-order stream and four intermittent, first-order streams. For the second-order streams, drainage areas range from 146-321 acres, respectively. The first-order streams drain an average of 30 acres. In general, streams are moderately (25%-35%) steep and incised. With the exception of the one perennial stream, organic debris appears to have been the primary channel armor.

Typical of west-side tributary basins, this rehabilitation unit lies within the Redwood Creek schist. Meta volcanic blocks exist within the southern portions of this unit where a rock pit had been developed for road surfacing. Sheared or highly weathered bedrock is found in the southernmost drainage. The soils are dominated by the fairly deep, well drained Ahpah and Coppercreek soils. The less frequent Elfcreek and Devils Creek soils are found in the southernmost streams. The interested reader is referred to the soils reports by Popenoe and Martin, 1985, "Soils on the M-6 Road Rehabilitation Unit."

86-4: M-6-1 ROAD WATERSHED REHABILITATION UNIT



86-4: M-6-1 ROAD
WATERSHED REHABILITATION UNIT

SCALE 1:24000

0 2000 4000

MAP B: TOPOGRAPHY

Unit boundary

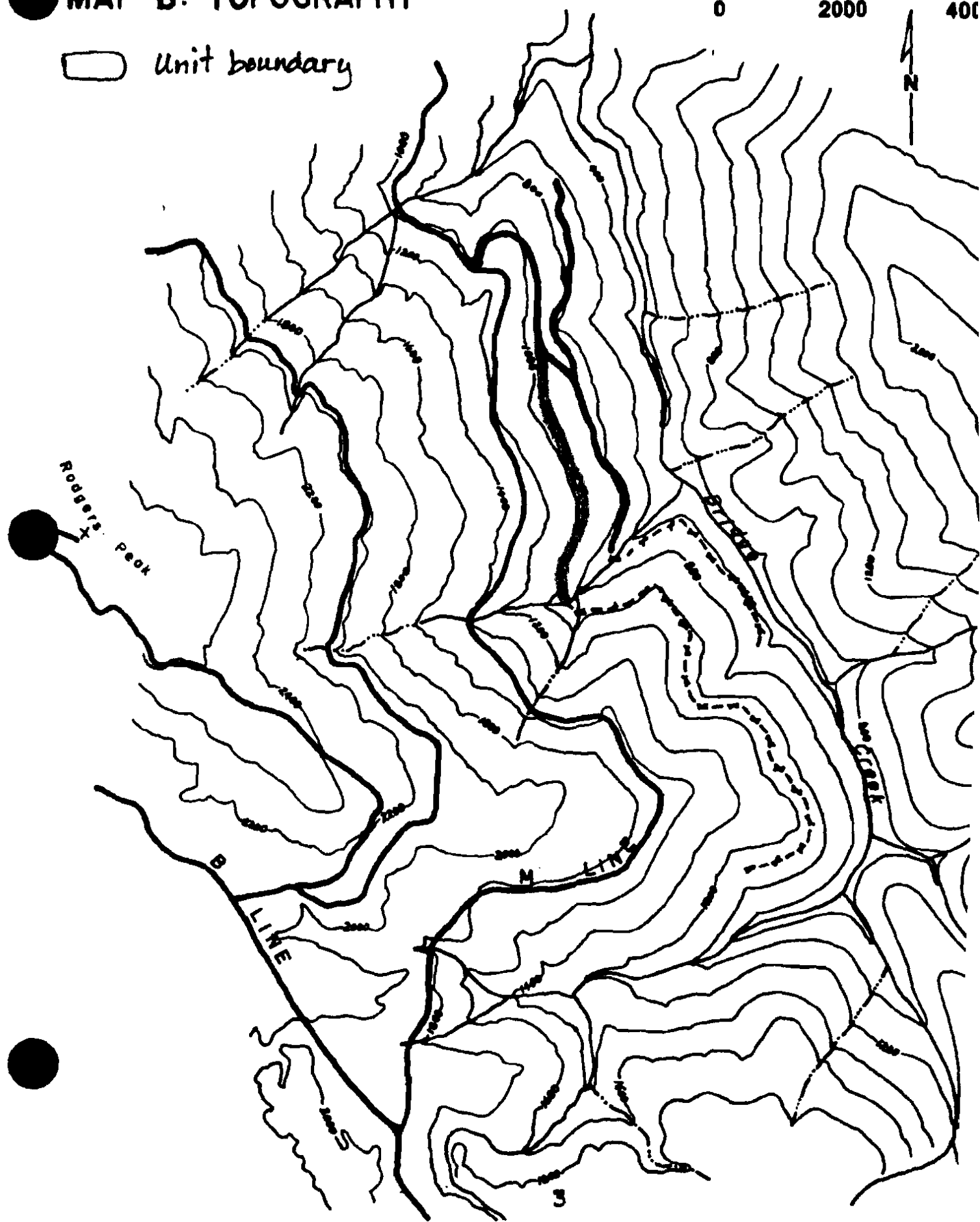


Table 1

REHABILITATION WORK COST SUMMARY

Unit 86-4; M-6-1 Road

Treatment	Total Quantity	Total Cost	Average Unit cost
HEAVY EQUIPMENT WORK¹:			
<u>Primary Treatments</u>			
Haul road crossing	11,221 yd ³	\$27,521	\$2.45/yd ³
Exported out slopes	11,021 yd ³	\$32,647	\$2.96/yd ³
Drains & inboard ditches	-.-	\$ 1,296	-.-
<u>Secondary Treatments</u>			
Rock armor ²	100 yd ³	\$ 2,000	\$ 20/yd ³
<u>Miscellaneous Costs</u>			
see Table 6	-.-	\$12,100	-.-
Total Heavy Equipment Work		<u>\$75,564³</u>	
LABOR INTENSIVE WORK:			
<u>Primary Treatments-</u> none			
<u>Secondary Treatment</u>			
Straw mulch ⁴	358 bales	\$5,381	\$15.03/bale
<u>Miscellaneous</u>			
Brush worksites	103 p.h.	\$1,193	-.-
Total Labor Intensive Cost		<u>\$6,574</u>	

Table 1 (cont'd)
REHABILITATION WORK COST SUMMARY

Unit 86-4; M-6-1 Road

Treatment	Total Quantity	Total Cost	Average Unit cost
TECHNICAL WORK:			
<u>Evaluation</u>			
Mapping	370 p-hrs.	\$3,930	-. -
Prescriptions	170 p-hrs.	1,830	-. -
Surveying	320 p-hrs.	3,360	-. -
Contract prep.	210 p-hrs.	2,187	-. -
Post work surveys	80 p-hrs.	870	-. -
<u>Supervision of Work</u>			
Heavy equipment-COR	310 p-hrs.	3,720	-. -
<u>Documentation</u>			
Photos	50 p-hrs.	525	-. -
Report	70 p-hrs.	<u>840</u>	-. -
Total Technical Work = \$17,262			

TOTAL PROJECT COST = \$99,400

¹Heavy equipment work was performed under fixed price contract IFB-8480-86-04.

²This item includes quarrying and transporting rock to worksites.
It does not include rock placement into completed channel excavations.

³Bid item 5 (\$1,000) required the contractor to deliver straw bales to each worksite. The total contract cost was \$76,564.

⁴Price includes material, delivery, placement and spreading.

TIMBER HARVEST AND EROSION HISTORY

The M-6-1 Road was constructed in 1969. Road construction was concurrent with timber harvest and, by the end of 1971, the entire hillslope between the M-6-1 Road and M-Line had been cut (Map C). These tractor yarded units were seed-tree leave cuts, and were re-entered within two years of initial entry. As was typical for this era, tractor use was indiscriminate with little concern for soil and water resources. Numerous skid trail stream crossings had been constructed across stream channels.

The largest and most active sediment source on this unit was a shallow translational landslide, located immediately north of RX2 (Map D). This spur ridge had been utilized as a landing during timber harvest and as a waste disposal site following the major storm events. In 1983, signs of incipient failure had developed and, by 1986, an estimated 500 yds³ (roughly 8% of total volume) had failed into a major tributary to Bridge Creek. The haul road crossings, in particular RX's 1, 2, 5 and 6, represented the most significant potential sediment sources. The aerial photographs taken immediately following the March, 1972 flood event clearly document that a vast quantity of sediment had eroded from the hillslopes above the M-6-1 Road. As a result of increased sediment loads and flood discharges, the culverts at RX's 1, 2, and 5 plugged causing the fill contained within these crossing to completely erode. Crossings 3 and 6 were completely buried in sediment allowing these streams to divert and erode adjacent road segments and hillslope areas.

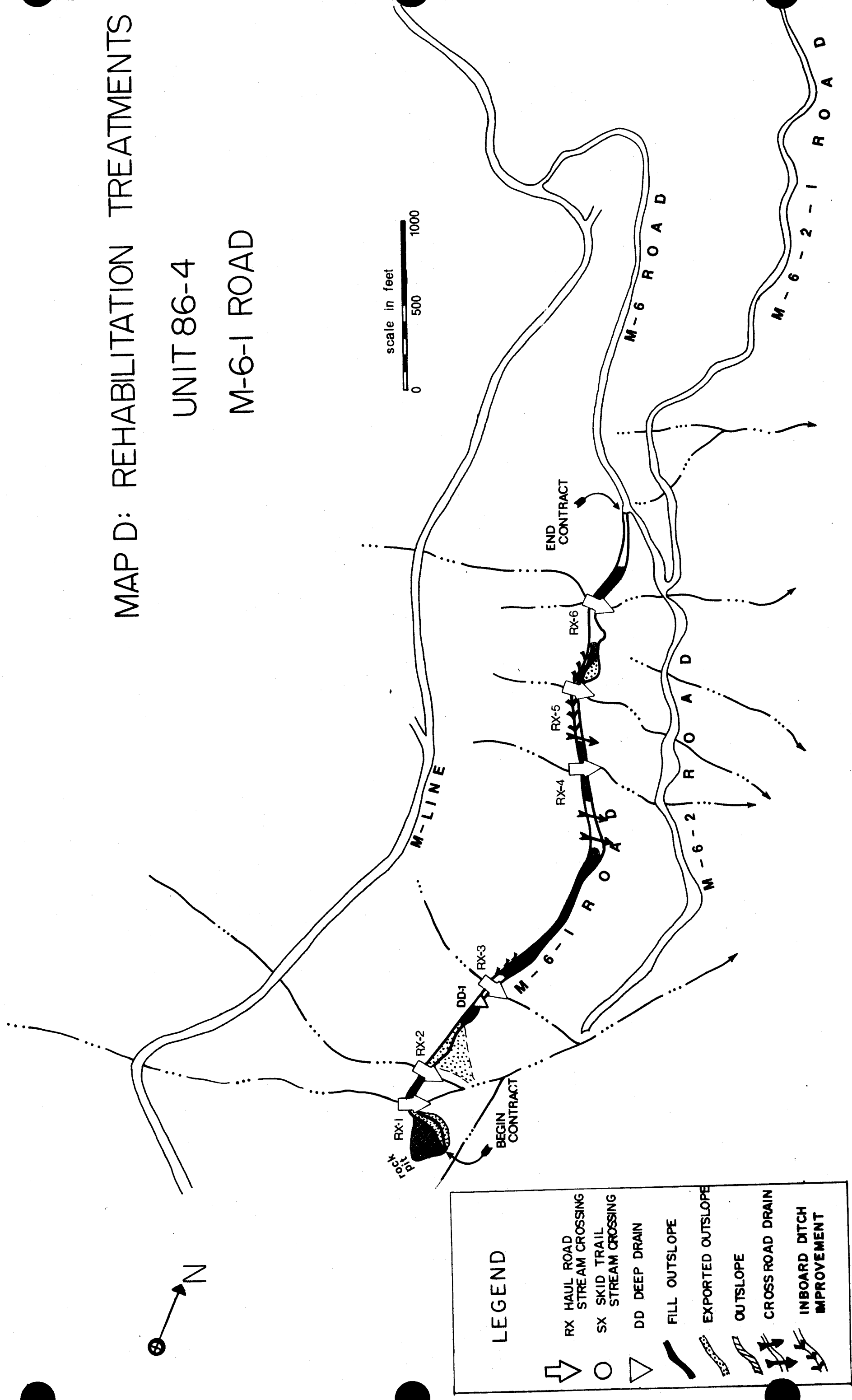
EROSION CONTROL REHABILITATION WORK

Preparatory Work

The entire M-6 Road network including 300 acres and 3.1 miles of road was mapped between December, 1985 and February, 1986, requiring nearly 40 person-days to complete. The entire mapping cost is assigned to this unit because the majority of mapping was performed on the hillslopes which were treated within the boundaries of this unit. Other costs associated with treatment prescription, surveys and design, and contract preparation are summarized in Table 1. The contract was submitted on May 8 and awarded on August 20, 1986. The "Abstract of Bids Data" can be found in Appendix A. Greg Bundros was the project supervisor for this unit.

MAP D: REHABILITATION TREATMENTS

UNIT 86-4
M-6-I ROAD



Heavy Equipment Work

Work began on August 25, and was completed on October 11, 1986. Allen Torgersen and Dan Talbott were the primary contractors for this work. A total of 23,532 yds³ of fill was excavated from various worksites. Of this total, haul road stream crossings accounted for 11,221 yds³ and unstable road reaches accounted for 11,021 yds³. The following is a list of equipment and operators utilized on this project:

<u>Equipment</u>	<u>Operators</u>
Case 1080 excavator (1 ¹ / ₄ yd ³)	Allen Torgersen
Case 1150 B crawler with winch	Dan Talbott
Michigan 110-11B self loading scraper	Loren Anderson
Case 690 B excavator (³ / ₄ yd ³)	Larry Lambert
D8 with winch	Paul Johnson

Originally, the contractor planned to utilize only the first three pieces of equipment listed above. As the contractor was inexperienced with this type of work and could not operate his (leased) excavator under these types of conditions, he quickly realized the need for a larger dozer and an experienced excavator operator. Johnson and Lambert were hired to fill this need. Even the most experienced contractor would have been challenged by this work. RX's 1 and 2 and EOS 9+50 were deep and steep excavations. Compounding the situation was the fact that the primary fillsite was downstation from these worksites.

Utilizing the actual hours worked to completed all work tasks, Table 2 compares contract cost with heavy equipment cost had this work been performed under rental agreement. The Heavy Equipment Rental Equivalent (HERE) values are somewhat inflated because of the contractor's inexperience and inappropriate application of equipment. Luckily, the landslide excavation (EOS 9+50) was performed efficiently. It utilized appropriate equipment and generated the most representative cost. The scraper excavated and endhauled this entire job. The operator was well experienced. At most other worksites, however, the Case 1080 excavator operated at a fraction of its production potential, and inflated the HERE values for this work. This applies specifically to RX's 1-3 and EOS @ Sta's 0+00, 1+60, 9+50 and 35+12. Tables 3-6 summarize and detail specific costs for individual worksites.

Table 2

A COMPARISON OF CONTRACT
VS. HERE HEAVY EQUIPMENT COST
Unit 86-4; M-6-1 Road

Treatment	Number of Worksites	Total Quantity	<u>Total Costs</u>		Government Savings(+) or Losses(-)	<u>Average Unit Costs</u>	
			Contract	HERE ¹		Contract	HERE
Haul Road Crossings	6	11,221 yd ³	\$27,521	\$28,280	+ 759	\$2.45/yd ³	\$2.52/yd ³
Exported Outsoles	5	11,021 yd ³	32,647	22,525	-10,122	\$2.96/yd ³	\$2.04/yd ³
Rock Armor	3	100 yd ³	2,000	915	- 1,085	\$ 20/yd ³	\$9.15/yd ³
Drains and Inboard Ditches	5	-. -	1,296	1,225	- 71	-. -	-. -
Straw	-. -	358 bales	1,000	1,500	+ 500	\$3.58 per bale	\$4.47 per bale
Move In/Out	-. -	-. -	8,000	3,000	- 5,000	-. -	-. -
Miscellaneous	-. -	-. -	4,100	8,697	+ 4,597	-. -	-. -
TOTALS			\$76,564	\$66,142	-\$10,422²		

¹Heavy Equipment Rental Equivalent using the following rental rates: 1080 excavator @ \$100/hr.; 1150 dozer @ \$60/hr.; 11B scraper @ \$75/hr.; D8 @ \$100/hr.; 690 excavator @ \$90/hr.

²This is the minimum amount of money that could have been saved on heavy equipment had this work been performed by rental agreement instead of by contract. Contract preparation cost totalled \$5,424.00.

HAUL ROAD CROSSING EXCAVATION COSTS

Unit 86-4; M-6-1 Road

Worksite	Actual Equipment Hours:					-----HERE ¹ -----		Unit Price (\$/yd ³)	Excavation Rate (yd ³ /pc-hr)	Average Distance to Fillsite (ft.)
	1080	1150	11B	D8	690	Cost (\$)	Volume (yd ³)			
RX1 @ 3+55 ²	10	7	7	32	12	6,225	2,100	2.96	31	200
RX2 @ 5+73 ³	13	25	10	54	26	11,290	4,110	2.75	32	420
RX3 @ 12+47	12	2	1	29	12	5,375	2,471	2.17	44	250
RX4 @ 25+66 ⁴	0	8	0	2	6	1,220	560	2.18	35	80
RX5 @ 31+80	3	6	2	1	0	910	240	3.79	20	90
RX6 @ 36+80 ⁵	0	10	4	11	14	3,260	1,740	1.87	45	140
TOTALS	38	58	24	129	70	\$28,280	11,221yd³	\$2.52/yd³	35yd³/pc-hr.	

¹Heavy Equipment Rental Equivalent utilizing the following rate: 1080 excavator @ \$ 100/hr.: 1150 dozer @ \$60/hr.: 11B scraper @ \$75/hr.: D8 dozer @ \$100/hr.: 690 excavator @ \$90/hr.

²Excavator placed rock found in fill into completed stream channel as excavation progressed. Sidebank steepness to this major, flowing stream exceeded 60%.

³A deep, steep, and wet crossing excavation, interrupted twice due to rainfall.

⁴The 1150 and 690 each spent approximately 1 1/2 hrs. placing 30yd³ of rock in this unusually steep stream excavation.

⁵The 1150 and 690 each spent 1hr. placing 30yd³ of rock into the completed stream excavation.

Table 4

EXPORTED OUTSLOPE EXCAVATION COSTS
Unit 86-4; M-6-1 Road

Worksite	Actual Equipment Hours:					-----HERE ¹ -----		Unit Price (\$/yd ³)	Excavation Rate (yd ³ /pc-hr)	Average Distance to Fillsite (ft.)	Vol ft. of Road (yd ³ /ft.)
	1080	1150	11B	D8	690	Cost (\$)	Volume (yd ³)				
EOS @ 0+00 ²	14	4	0	1	0	1,740	810	2.15	43	150	6.3
EOS @ 1+60 ²	8	0	0	13	0	2,100	1,050	2.00	50	200	7.5
EOS @ 2+71 ³	2	21	23	0	0	3,185	2,010	1.58	44	175	19.0
EOS @ 9+50 ⁴	26	93	88	0	0	14,780	6,751	2.19	33	800	21.1
EOS @ 35+12 ⁴	2	2	0	4	0	720	400	1.80	50	80	4.1
TOTALS	52	120	111	18	0	\$22,525	11,021yd ³	\$2.04/yd ³	37yd ³ /pc-hr.		

¹Heavy Equipment Rental Equivalent using the following rental rates: 1080 excavator @ \$100/hr.; 1150 dozer @ \$60/hr.; 11B scraper @ \$75/hr.; D8 @ \$100/hr.; 690 excavator @ \$90/hr. Road surfaces averaged 27 ft. wide.

²Steep, uphill push into rock pit fillsite. No unusual ground conditions within worksite.

³Short, easy carry by scraper into rock pit fillsite. Scraper repeatedly broke its loading mechanism due to the high concentration and large size rocks within this material. For the two scraper endhaul worksites, the 1150 dozer supports the scraper 100% of time.

⁴Long carry fillsites; unusually deep, steep cuts through very reasonable (dry, workable) materials.

Table 5

DRAIN AND DITCH COSTS
Unit 86-4; M-6-1 Road

Worksite	Actual Equipment Hours:					Contract Cost (\$)	Cost (\$)	-----HERE ¹ -----	
	1080	1150	11B	D8	690			Quantity	Unit Cost
Cross roads drains	0	0	0	0	.5	200	45	40ft.	\$1.12/ft.
Deep drains	4	.5	0	1.5	0	568	580	290yd ³	\$2.00/yd ³
Culvert	1	0	0	0	0	150	100	1 Job	-. -
Inbord ditch improvents	5	0	0	0	0	378	500	520ft.	\$0.96/ft.
TOTALS						\$1,296	\$1,225	-. -	-. -

¹Heavy Equipment Rental Equivalent using the following rental rates: 1080 excavator @ \$100/hr.; 1150 dozer @ \$60/hr.; 11B scraper @ \$75./hr.; D8 @ \$100/hr.; 690 excavator @ \$90/hr.

Table 6

MISCELLANEOUS COST
Unit 86-4; M-6-1 Road

Category	Cost	
	Contract (\$)	Here ¹ (\$)
Move in/out	\$8,000	\$3,000
Recordkeeping	2,500	-0-
Contingencies ²	1,600	8,697
TOTAL MISCELLANEOUS COST	\$12,100	\$11,697

¹Heavy Equipment Rental Equivalent using the following rental rates: 1080 excavator @ \$100/hr.; 1150 dozer @ \$60/hr.; 11B scraper @ \$75/hr.; D8 @ \$100/hr.; 690 excavator @ \$90/hr.

²Contingencies include paid breaks, discussion time with equipment operators and allows for a small amount of standby cost. Using Here rates contingencies for this unit totalled \$19,790. Of this total, paid breaks, discussions, and standby accounted for \$6550 (33%), \$1100 (6%), and \$12,140 (61%), respectively. The 11B scraper experienced the greatest amount of downtime, totalling 44 hrs.

Table 7

SUMMARY OF AVERAGE LABOR COSTS
Unit 86-4; M-6-1 Road

Treatments	Type of Labor	Person Hours	Avg. Cost Per Hour	Total Cost	Quantity	Avg. Unit Cost
<u>Primary Treatments - none</u>						
<u>Secondary Treatments</u>						
Straw	-. -	-. -	-. -	\$1138	358 bales	\$3.18/bale
Deliver straw	RNP	20 p.h.	\$11.58/hr	232	358 bales	-. -
Place straw	contract	-. -	-. -	1000	358 bales	\$2.79/bale
Spread straw	RNP	260 p.h.	11.58	3011	358 bales	\$8.41/bale
Total Straw=				5,381		\$15.03/bale
<u>Miscellaneous</u>						
Brush worksites	RNP	103 p.h	\$11.58/hr	\$1,193	-. -	-. -
TOTAL LABOR COSTS=				<u>\$6574.00</u>		

Labor Intensive Work

Labor intensive work was performed entirely by the Redwood National Park labor crew. During the winter month RNP labor crews brushed survey lines to assist with contract development. Concurrent with heavy equipment work, they spread straw onto the completed worksites. The total labor cost for this unit was \$6,574 or 7% of the total project cost. Their work and costs are summarized in Table 7.

SUMMARY

For the first time since Redwood National Park started contracting heavy equipment work, we saw the unpleasant short-comings to awarding such a contract to the lowest bidder. Although forewarned during the pre-award meeting of inappropriate equipment selection, the contractor chose to proceed with the contract. Luckily, the contractor quickly realized his underestimation of this work and hired local owner/operators to perform the most difficult tasks. We were extremely grateful to Paul Johnson and Larry Lambert for their excellent work.

This was also the first time that a scraper had been utilized on a rehabilitation project. It was a novel and appropriate approach to excavating and endhauling the landslide material. Unfortunately, it was the wrong type of scraper. A small to medium size, push-type scrapper would have been more appropriate than the self loading (paddle wheel) type. The self loading type is designed to handle river bed or unconsolidated, fine grained material. This scraper experienced recurring breakdown because of the type of material it was forced to handle.

Based upon actual equipment hours, roughly \$10,000 could have been saved had this work been performed by equipment rental agreement. In addition to this savings, roughly one-half of the survey and design costs (\$2115) and all of the contract preparation cost (\$2187) could also have been saved for a total saving of \$14,302. When considering the personnel time (410 person-hours) associated with the latter two costs, another 300 acre rehabilitation unit could have been mapped in detail. The contract did, however, eliminate the need of orchestrating and supervising the equipment work for a very difficult unit.

APPENDIX A

ABSTRACT OF OFFERS - CONSTRUCTION

1. SOLICITATION NUMBER
IFB-8480-86-0

2. DATE ISSUED
June 25, 1986

3. DATE OPENED
July 24, 1986

OF 2 PAGES

4. ISSUING OFFICE

Redwood National Park
1111 Second Street
Crescent City, California 95531

RECEIVED
R.N.P.-O.O.C.

I CERTIFY that I have opened, read, and recorded on this abstract all offers received in response to this solicitation.

SIGNATURE

Jeffrey A. Vines

DATE SIGNED

7/25/86

5. PROJECT TITLE

Watershed Rehabilitation, M-6-1 road
in the Bridge Creek watershed

FEB 08 1989
GOVERNMENT ESTIMATE
(Check A, B or C and complete A, B or C.)

9. OFFERS

NO. 1

A. OFFEROR Barber Construc.
1872 Elm Avenue
McKinleyville, CA. 95521

NO. 2

A. OFFEROR WK Construction
P.O. Box 187
Miranda, CA. 95553

A. HIRED LABOR

B. REASONABLE CONTRACT
(Without Profit)

C. REASONABLE CONTRACT
(Including Profit)

B. BID SECURITY (Type and amount)

Bond \$16,000.00

B. BID SECURITY (Type and Amount)

Cashier Check \$22,229.00

C. ADDENDA ACKNOWLEDGED

Yes

C. ADDENDA ACKNOWLEDGED

Yes

6. NUMBER OF ADDENDA ISSUED

1

ITEM NO.	7B. DESCRIPTION OF OFFERED ITEM	7C. EST. QUANTITY	D. UNIT	E. UNIT PRICE	F. ESTIMATED AMOUNT	D. UNIT PRICE	E. ESTIMATED AMOUNT	D. UNIT PRICE	E. ESTIMATED AMOUNT
1	Move In		LS		\$ 1,500.00		\$1,000.00		\$2,000.00
2	Move Out		LS		1,500.00		1,000.00		2,000.00
3	All Recordkeeping (Daily Records)		LS		1,000.00		500.00		75.00
4	Miscellaneous Costs		LS		7,460.00		500.00		500.00
5	Straw Delivery & Placement		LS		1,500.00		1,000.00		350.00
6	Rock Development & Delivery		LS		2,095.00		1,500.00		550.00
7	00+00		LS		1,500.00		3,200.00		2,673.00
8	01+60		LS		1,600.00		3,100.00		2,971.50
9	02+71				1,600.00		4,400.00		5,929.50
10	09+50	6,870	CY	\$ 4.84	33,300.00	5.00	34,350.00	6.16	42,319.20
11	05+73	2,700	CY	6.11	16,500.00	2.75	7,425.00	6.72	18,144.00
12	03+55				4,800.00		5,700.00		14,511.00
	TOTAL BID SCHEDULE I		(base bid)		\$74,355.00		\$63,675.00		\$92,023.20

9. OFFERS (Continued)

[illegible]

ABSTRACT OF OFFERS - CONSTRUCTION

1. SOLICITATION NUMBER
IFB-8480-86-042. DATE ISSUED
June 25, 19863. DATE OPENED
July 24, 1986

PAGE 2 OF 2 PAGES

4. ISSUING OFFICE

Redwood National Park
1111 Second Street
Crescent City, California 95531

I CERTIFY that I have opened, read, and recorded on this abstract all offers received in response to this solicitation.

SIGNATURE

J. S. Vines

DATE SIGNED

7/25/86

5. PROJECT TITLE

Watershed Rehabilitation, M-5-1 road
in the Bridge Creek watershed8. GOVERNMENT ESTIMATE
(Check A, B or C and complete D, E and F.)

A. HIRED LABOR

B. REASONABLE CONTRACT
(Without Profit)C. REASONABLE CONTRACT
(Including Profit)

X

D. UNIT

E. UNIT
PRICEF. ESTIMATED
AMOUNTD. UNIT
PRICEE. ESTIMATED
AMOUNTD. UNIT
PRICEE. ESTIMATED
AMOUNT

6. NUMBER OF ADDENDA ISSUED

1

9. OFFERS

NO. 1

A. OFFEROR Barber Construct.
1872 Elm Avenue
McKinlayville, CA. 95521

B. BID SECURITY (Type and amount)

Bond \$16,000.00

C. ADDENDA ACKNOWLEDGED

Yes

NO. 2

A. OFFEROR WK Construction
P.O. Box 187
Miranda, CA. 95553

B. BID SECURITY (Type and Amount)

Cashier Check \$22,229.00

C. ADDENDA ACKNOWLEDGED

Yes

ITEM NO.	7B. DESCRIPTION OF OFFERED ITEM	7C. EST. QUANTITY	D. UNIT	E. UNIT PRICE	F. ESTIMATED AMOUNT	D. UNIT PRICE	E. ESTIMATED AMOUNT	D. UNIT PRICE	E. ESTIMATED AMOUNT
	BID SCHEDULE II (Additives)								
13	10+38				\$ 700		\$1,500.00		\$1,690.50
14	11+44				400		1,000.00		846.80
15	12+47	2,720	CY	\$ 2.20	6,000	3.00	8,160.00	\$2.66	7,235.20
16	19+50				50		300.00		27.20
17	25+66				2,600		1,200.00		1,932.00
18	27+25				128		200.00		60.00
19	28+30				200		600.00		59.50
20	31+80				900		720.00		844.80
21	32+12				700		1,200.00		1,088.00
22	31+80				100		350.00		28.90
23	36+80				3,500		5,000.00		5,307.00
	SUBTOTAL - BID SCHEDULE II (Additives)				15,278		20,230.00		19,119.90

9. OFFERS (red)

[illegible]

REHABILITATION UNIT 86-4 - SUMMARY

UNIT NAME: M-6-1 Road, Bridge Creek PROJECT LEADER: Bundros

LOCATION DESCRIPTION: T9N R1E S13 (Map A, pg 2) On the M-6-1 road, 8 miles upstream of Orick in the Bridge Creek watershed.

TOTAL UNIT ACREAGE: 60 MILE OF ROAD TREATED: 0.8

TOTAL REHABILITATION PROJECT COST: \$99,400.00 (Table 1, pg 4)

GEOLOGY DESCRIPTION: Bedrock is predominately the Redwood Creek Schist unit of the Franciscan Assemblage. Meta-volcanic blocks are exposed in the southern portion of the unit. Bedrock is sheared and highly weathered.

GEOMORPHIC DESCRIPTION: (Map B, pg 3) Drainage: two-second order streams, one perennial and one intermittent, and four first order intermittent streams. Stream gradients are steep and incised (25% to 35%). Woody debris was the primary channel armor prior to disturbance.

SOIL DESCRIPTION: Fairly deep and well drained, Ahpah and Coppercreek soils (See Popenoe and Martin, 1985).

LAND USE/LOGGING HISTORY: (Map C, pg 7) The M-6-1 road was constructed in 1969. Timber harvest began in 1971 when the unit was tractor yarded and seed-tree-leave cut. The unit was re entered in 1973. Tractor use was indiscriminant, and numerous skid trail stream crossings were constructed.

EROSION FEATURES¹(pg 6): (Map D, pg) A shallow translational landslide just north of RX-2. Road crossings 1, 2 and 5 failed in the 1972 flood and they have subsequently re-filled with sediment. Road crossings 3 and 6 are completely buried and streams have diverted adjacent road sections.

REHABILITATION WORK SUMMARY¹(pg 4): Contract

1. Total Heavy Equipment Cost: \$75,564.00 (Table 2, pg 10)

Heavy Equipment Used: A Case 1080 excavator (1/4 cu. yd.), a Case 1150B crawler with a winch, a Michigan 110-110B self loading scraper, a Case 690B excavator (3/4 cu. yd.), and a D-8 with a winch were used.

#	Types of Treatment	Total Cost	Quantity	Unit Cost	Rate
6	Haul Rd Stream Xing Exc	\$27,521.00	11,221yd ³	\$2.45/yd ³	35yd ³ /PH
0	Skid Tr Stream Xing Exc	--	--yd ³	--/yd ³	--yd ³ /PH
1	Deep Drain Excavations	568.00	290yd ³	1.96/yd ³	48.33yd ³ /PH
	Export Outslope (dozer)				
793ft	Export Outslope (truck)	32,647.00	11,021yd ³	2.96/yd ³	37yd ³ /PH
	Export Outslope (scraper)				
ft	Domestic Outslope	--	--yd ³	--/yd ³	--yd ³ /PH
3	Cross Road Drains	200.00	40ft.	--/ft.	--ft./PH
	Ripping	--	--ft.	--/ft.	--ft./PH
	Other (miscellaneous)	4,100.00			

- II. Total Labor Intensive Cost: \$6,574.00 (Table 7, pg 15)

Labor Intensive Work Summary:

Brushing: Cost: \$1193 at \$11.58/hr.

Straw Mulch: Number of Bales 358
Total Acreage Covered
Total Cost \$5,381
Unit Cost \$15.03/bale

Other:

DISCUSSION¹(pg):

Inappropriate equipment selection caused initial problems. The contractor subsequently hired local operators to perform the most difficult tasks. Based upon actual equipment work time, approximately \$10,000 could have been saved if the work had been performed under rental agreement.

¹Detailed in report text.



Unit: 86-4 Date: 8-26-86, M-6-1 Michigan 110-110B Elevating Scraper, 50mm, (GB)



Unit: 86-4 Date: 9-29-86, M-6-1 Michigan 110-110B Slide from upper outcrop, 50mm, (GB)



Unit: 86-4 Date: 8-28-86, PP3C M-6-1 onto RX-1 from top 2+71, 50mm, (GB)



Unit: 86-4 Date: 10-28-1986, PP3D M-6-1 Rx-1 to Rx-2 from CP3 at 2+71, 50mm, (GJB+DLS)



Unit: 86-4 Date: 7-13-1986, PP3D, (JTCP)



Unit: 86-4 Date: 10-6-1986,PP5 M-6-1 RX-1 from stump below 1+60, 35mm, (GB)



Unit: 86-4 Date: 10-6-1986,PP5 M-6-1 RX-1 from stump below 1+60, 35mm, (GB)



Unit: 86-4 Date: 10-6-1986,PP5 M-6-1 RX-1 from stump below 1+60, 35mm, (GB)



Unit: 86-4 Date: 10-6-1986,PP5 M-6-1 RX-1 from stump below 1+60, 35mm, (GB+DLS)



Unit: 86-4 Date: 9-9-1986,PP21B M-6-1 RX-3, 50mm, (GB)



Unit: 86-4 Date: 10-28-1986, PP21B M-6-1 RX-3 from BM stump, 50mm, (GB+DLS)



Unit: 86-4 Date: 7-13-1986, PP21B, (JTCP)



Unit: 86-4 Date: 10-28-1986, PP27 M-6-1 RX-6 from CB above fillsite, 50mm, (GB+DLS)



Unit: 86-4 Date: 7-13-1986, PP27, (GB+DLS)