

SUMMARY OF EROSION-CONTROL REHABILITATION WORK

UNIT 81-5

Y-2 ROAD I.F.B. CONTRACT

By

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INTRODUCTION

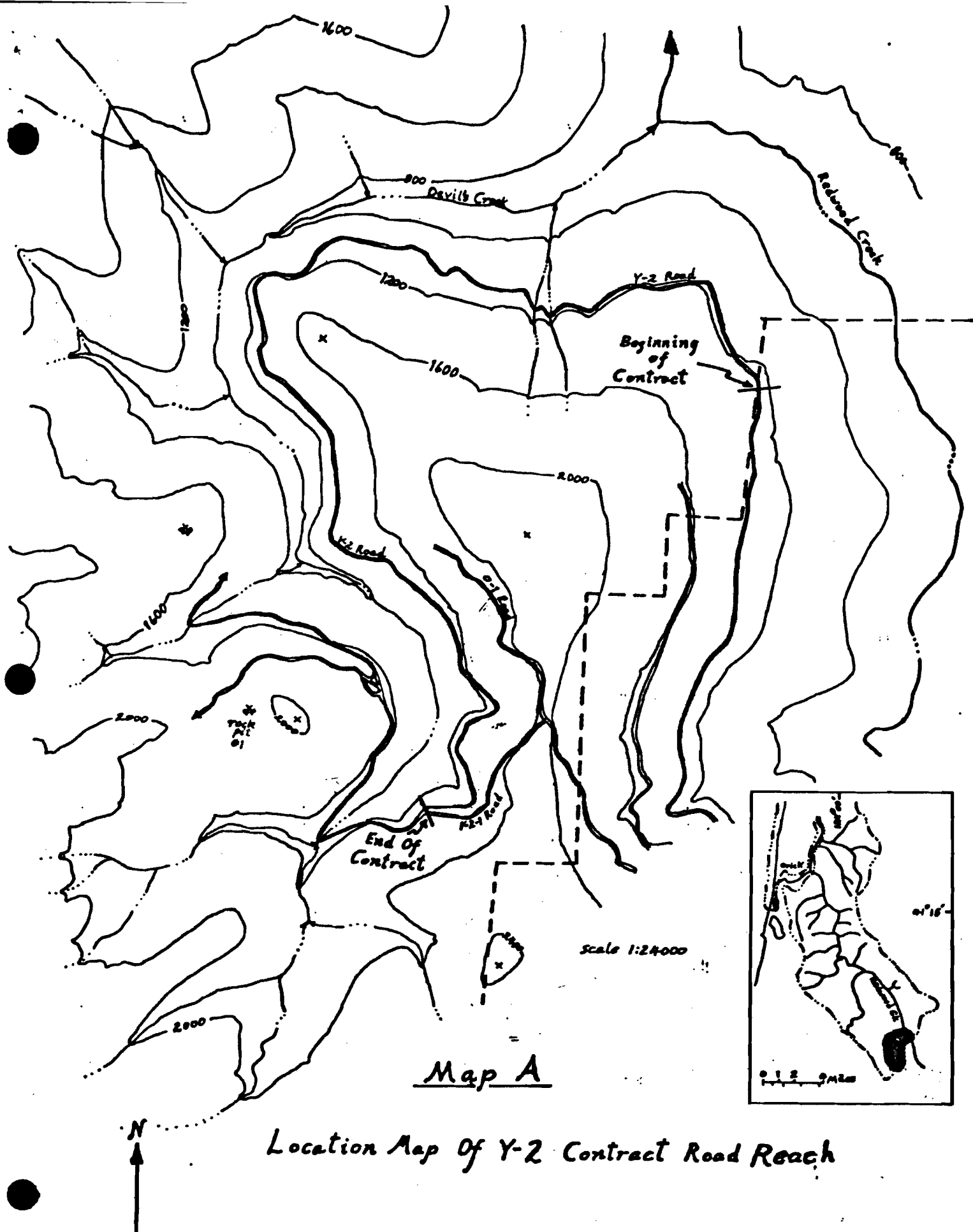
SITE DESCRIPTION

Devil's Creek is the southernmost watershed in the park, draining over 3200 acres on the west side of Redwood Creek (see Map A). The portion of the Y-2 Road and slope which was considered as the limits of the rehabilitation site initially were those portions above and below the Y-2 Road on the right bank of Devil's Creek, beginning at the park boundary on the east and following the right bank of Devil's Creek upstream to the point where it is crossed by the Y-2 Road.

The relief of the area is 2012 feet, varying from 320 feet at the juncture of Devil's and Redwood Creeks, to 2332 feet at the peak of the promontory around which the Y-2 Road is built. Slopes range from 10 percent to over 90 percent, averaging 53 percent. The slope immediately beneath much of the Y-2 Road, however, ranges from 60 percent to 90 percent. The hydraulic area of this section of the watershed is 1600 acres. The initial reconnaissance, which covered all this area, indicated that the only real problems existed along the Y-2 Road itself, rather than on the adjacent slopes. Most of the problems along the Y-2 Road were incipient or potential in nature. This stands in stark contrast to the typical rehabilitation site where most problems are already well developed and some problem locations are situated on roads while others are well up on the slopes. The only exception to this was upslope of the first 1.5 miles of the Y-2 Road. This area had already been rehabilitated by an R.F.P. contract the previous year. For this reason, the mapping efforts were restricted to the roadway itself. This situation was indeed fortunate, as the development of adequate surveying and drafting techniques and format required much of the time normally spent in mapping.

Budgetary constraints necessitated limiting the contract work to the first 4.18 miles of the Y-2 Road, though initially it had been planned to include the 0-1, Y-2-1, and the remainder of the Y-2 (from the Y-2 to the Y-2-1 intersection down to the crossing of Devil's Creek). The 4.18 mile reach of Y-2 chosen for the contract (see Map A) included most of the areas with incipient or potential failures, while access remained open to the remaining road portions for future work. The Y-2 is a young road (constructed in 1977), thus significant erosional problems have not had a chance to develop, despite the fact that the road often crosses very steep slopes. It was hoped that early intervention would prevent the development of significant erosional problems. The Y-2 was a primary haul road topped with from 1.1 feet to over 2 feet of gravel.

There were 19 stream crossings and two major landings in the 4.18 mile contract road reach. The landings were provided with drains. Thirteen of the stream crossings were fully excavated, while the remaining six (all minor) were given an experimental "deep dish" prescription (explained later on). While most of the road required only to be ripped and crossroad drained, the remaining 1.33 miles was across very steep terrain and had to be outsloped. Secondary treatments of stream crossing excavations were minimal, consisting primarily of strawing the banks. Almost no rocking was done since the crossings were designed to accomodate peak flows at a shallow flow depth, as explained later in this report.



Location Map Of Y-2 Contract Road Reach

Y-2 LOGGING HISTORY

Within the Y-2 project area (see map B), by 1970 only two roads existed on the ridge that divides Panther Creek from Devil's Creek basin. Both of these roads entered from Panther Creek basin. Lowest on the slope above Redwood Creek, the 1320 Road was built by Simpson Timber Company before 1961 to allow selective harvesting of old growth timber adjacent to Redwood Creek and on the slope above the road. The O-2 Road was built by Louisiana Pacific Corporation to allow selective cutting on the ridgetop in 1958.

However, between 1970 and 1978, several roads were built from Devil's Creek and roads were extended from Panther Creek to allow accelerated timber harvest in the area. By 1972, the O-2-1 was built, the O-3 was partially built, and much of the slope had been harvested by tractor-clearcut method. Also, cutblocks above the 1320 and O-2 Roads were reentered and clearcut. By 1974, the Y-2 was extended from Devil's Creek and the Y-2-1 was built upslope, linking the Y-2 with the O-lines in Panther Creek basin. Concurrently, the O-3 was extended, and by 1975 was linked with the Y-2 Road. As roads were built and extended, access to the slopes allowed systematic tractor clearcutting of most of the area. Only a few areas were left unlogged by 1978, most notably that land between Devil's Creek and the Y-2/O-3 Road.

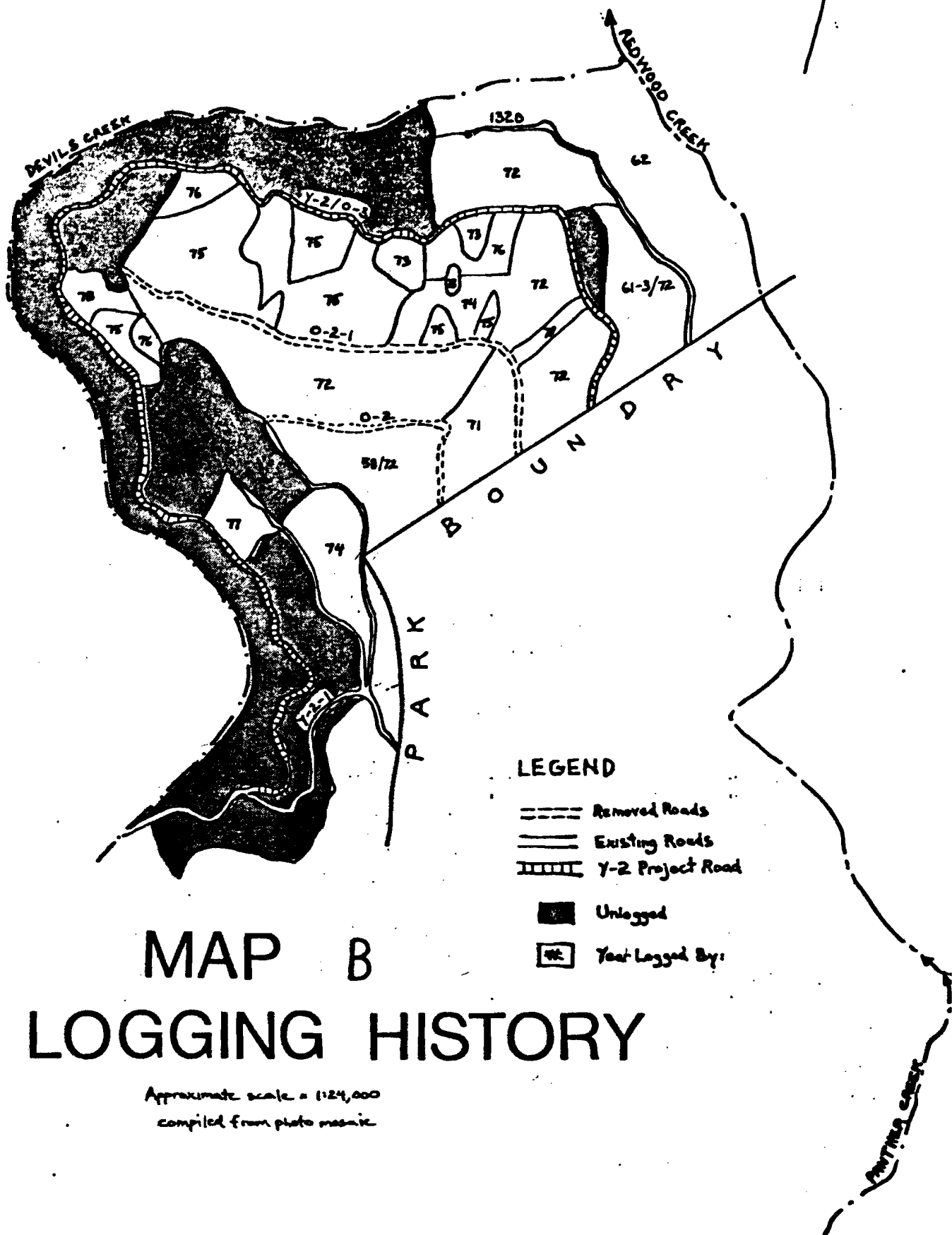
In 1980, the O-2 and O-2-1 Roads and slopes within the park limits were rehabilitated. The completion of the Y-2 project leaves the 1320 and the Y-2-1 Roads still intact.

SURVEYING AND PRESCRIPTION TECHNIQUES USED

The work on the Y-2 rehabilitation site was essentially limited to the road. Each worksite was located by its distance in hundreds of feet from the beginning of the contract road reach, as measured along the road centerline. "Station laths" were set up every 100 feet and the number of the station was marked on a lath set there. For example, a lath reading "Sta. 43 + 00" is a station (location) 4,300 feet from the beginning of the contract road reach. Similarly, R/X 43 + 50 is a stream crossing (R/X) centered at Station 43 + 50. This convention makes it possible to precisely locate any site with a minimum of verbiage.

Simple surveying techniques were used for preparing the contract so as to minimize the preparation time required. The basic tools were: compass, hand level, clinometer, tape, and stadia rod. An accuracy level of ± 0.1 foot was maintained for all rod readings, while compass shots were kept within ± 1 degree.

Standard basic surveying procedures were used. For stream crossings, a longitudinal profile was shot first, then from four to seven cross sections were made normal to the profile centerline, using either tagline or hand level and rod. Turning points were kept to a minimum to avoid compounding errors. From this information, a plan view (scale 1":20'), longitudinal profile and cross sections (both at 1":10') were drafted up on clearprint. The final channel grade was drawn using the longitudinal profile as a guide to where the original channel lay. The required vertical cut to channel centerline (ϕ) grade was then determined for each cross section by direct measurement from the longitudinal profile. The desired channel width was determined by successive approximation based on the estimate 25 yr. T_r peak flow such that the channel was wide enough



MAP B LOGGING HISTORY

Approximate scale = 1:24,000
compiled from photo mosaic

to accomodate this flow at a depth of between 6" and 1'. With the depth to grade and channel width in hand, the channel bottom was drawn for each cross sectional profile. The channel sides could then be drawn in on the cross sections by connecting the channel bottom to the present ground surface at an acceptable slope. Channel sideslopes were assigned gradients of from 1.7:1 ($= 58.8\% = 30.5^\circ$) to 4:1 ($= 25\% = 14.0^\circ$), depending on local requirements. The limits of excavation could then be drawn in on the plan view. The volume to be excavated was then determined using a double-end-area calculation. The fill area cross sections were then drawn up and the fill grade assigned so as to accomodate the entire fill.

Road cross sections for the outsloped road reaches were surveyed in normal to the road and no further apart than 100 feet, using the same surveying methods referred to above. These were drafted up at a 1"=10' scale. Successively higher station numbered cross sections were drafted in from left to right across the page, with the rows of cross sections proceeding down the page, in the same sequence as in normal reading. Outsloping cuts and fills were assigned for each cross section such that the portion cut from the outboard edge of the road could be placed against the cutbank to produce a uniform grade from the top of the fill to the bottom of the cut. Outslope grades ranged from 3:1 to 9:1, and averaged 4:1. Excavated volumes were calculated by double end area.

Areas with springs which were in a road outsloping reach were given a "Total Outslope" to avoid placing fill on top of the springs. The cut for the total outslope began at the IBD and proceeded outward at a low gradient (usually 7:1). The resulting spoil was endhauled to the next normal outslope road section and incorporated in that section's outsloping prescriptions, much the same as was done for the stream crossing fill sites. In all cases the average endhaul distance and total volume of endhauled material were specified. These total-outslope reaches were merely incorporated in the total bid for road outsloping rather than being bid as a separate item.

There were several very small road crossings which simply did not deserve the meticulous surveying, drafting, and prescription work of the major stream crossings, but which were too large to be handled as cross road drains. These were handled using a simple "deep dish" prescription format. This consisted of making a normal road cross section along the deep dish centerline, then drafting it up in much the same manner as the outsloped road cross sections. The finished channel grade was usually assigned as 25 percent, beginning at the IBD bottom and ending on the fill slope. Since the deep dishes were basically similar to each other, an average volume was determined (275 yd³) and used for each deep dish. The fill was placed locally such that natural drainage was not impaired. This prescription format proved quite useful, since these small crossings could be given a full prescription using only a fraction of a page, much like a road outsloping cross section, rather than taking up a full page like a normal haul road stream crossing prescription would. In use, however, there proved to be a lack of grade control. In particular, the excavations were not deep enough and the point where the channel bottom emerged from the fill slope was not specifically specified. Methods have since been developed which handle these problems yet retain the advantages.

Cross road drains (XRD) were surveyed only as to station number, length and grade. Their locations were marked in the field with a flag at each end bearing an inscription such as "XRD 43 + 20" (cross road drain at station 43 + 20).

The stream crossings and outsloped road reaches were slope staked. Slope stakes are stakes with coded inscriptions on them which tell the contractor how deep to fill or dig, as well as the direction, steepness, and length of the finished slope. These stakes greatly expedite heavy equipment work since they show the limits that the finished excavation will have. Most excavation in the park is done without grade stakes, so the actual limits of excavation are not known prior to beginning work. It is difficult and expensive to readjust a sideslope which proves to be too steep. The result is usually less than optimal, producing a convex-up profile for both the banks and the channel itself. The use of grade stakes produces cleanly cut excavations with straight bank and stream profiles. In addition, the volume of excavation is known beforehand, and the fill site can be given an optimal layout as well. If the fill will exceed the fill site's capacity, the hydrologist has a realistic estimate of the volume to be endhailed, thus permitting the hauling to begin as soon as excavation is begun. This avoids truck traffic bottlenecks, since fewer can be used and over a longer time. A final benefit is that slope stakes make it possible to quickly check the grade of work in progress. All slope stake information is taken by direct measurement from the finished plan sheets. Slope stakes are essential for clear communication in contract work and are extremely valuable even with hourly rental equipment. The only restriction is that the heavy equipment operators must be familiar with the slope stakes. This is usually no problem.

EROSIONAL FEATURES

Types of Features

With the exception of that portion handled by the 1980 Devil's Creek R.F.P. contract, the erosional inventory of the Y-2 Road and slope is very limited. With a couple of notable exceptions, all significant erosion is limited to the roadway itself, in the form of incipient fill failures along the steeper hill-slope sections.

Erosional History

Only two sites exhibit mass movement features, and these both appear to predate the logging and road building. The first is a compound (multiple scarp) slump extending for around 300 feet upslope of the road at station 130 + 00. Much of the timber at the location was unharvested and yet very few trees are standing. The second major feature is a debris torrent shoot at station 167 + 92 which extends from just above the road down to Devil's Creek. Although this feature predates the road which crosses its head, it is still potentially active. All logging in the project area was by tractor in patch cuts, mostly above the Y-2. The lack of consequent erosional problems is due to the proximity of the drainage divide and the recency of the cutting. None of the streams crossing the Y-2 show evidence of debris torrent activity.

Sediment Sources

The reason for the high priority of the Y-2 project obviously had nothing to do with its erosional history, but rather with the potential of the road to become a major sediment source. All the fill failures (F.F.) shown on Map C were incipient, showing small scarps and cracks stretching down the road sometimes for hundreds of feet. Almost all of these were separated from Devil's Creek by a buffer of old growth. Since both the old growth and the creek itself are to be protected, those road stretches were all outsloped.

The second most imminent potential sediment source consisted of the stream crossings. Most of these were made across steep gradient, deeply incised channels creating a perfect set-up for debris torrents if a culvert should have become clogged. Most of the culverts were of adequate size and protected by trash racks, but few were placed along the original channel grade line. If left unattended for several seasons, they would probably have failed during the next major storm event, scouring their channels to bedrock and greatly overloading the channel of Devil's Creek.

Devil's Creek is presently in a state of equilibrium and is one of the park's most beautiful channels. The sediment contributed to the stream from the previously mentioned debris avalanche at station 167 + 92 has all been carried away, leaving only a pile of logs bridging the stream.

EROSION CONTROL REHABILITATION WORK

Initial reconnaissance of the Y-2 Road and slope indicated a distinct lack of major erosion problems away from the road itself. The majority of the mapping time was spent delineating the various erosional problems which were developing on the Y-2 haul road. Mapping began in early January and was completed by the end of February.

Work on the Y-2 site was to be done by contract. Since this type of contract (Heavy Equipment Rehabilitation I.F.B.) had not been used before in the park, much time was spent developing surveying and presentation methods which would yield a succinct, precisely prescribed contract that would be simple to administer. All stream crossings, deep dishes, fill sites, and outsloped road reaches were surveyed, drawn up in plan, cross section, and/or profile (as appropriate). Prescriptions were layed out on the drawings and grade stake information was derived. Finally, the grade stakes were placed in the field. This process continued through to the end of August.

The equipment pieces used by the contractor (Jack Naylor) were a Caterpillar D-8 tractor with rippers, and a track-mounted backhoe (trac-hoe).

The Y-2 site was unusual in that very little of the potential erosion had occurred yet, in spite of the fact that over half the road length traversed very steep (> 60 percent) slopes (see Map D). However, road fill failures were developing along virtually the entire steep portion. Since Devil's Creek is

one of the few streams in the park that runs through mostly old growth redwood, it was important to stop the development of these failures before they could damage the resource.

Although no stream crossings within the contract reach were failing, the potential still existed and failure would have produced disastrous effects downstream. No significant potential for stream diversion existed, since all drainages are well incised and the Y-2 road is essentially level throughout the contract reach.

The main focal points of the project were threefold: a) to outslope all road reaches on steep slopes which had potential for fill failures; b) to excavate all stream crossings and use the fill to outslope nearby stable road reaches; c) rip and cross-road drain all stable road reaches so as to provide good drainage and diminished flow concentration.

Excluding the salary costs of R.N.P. employees and incidental costs (see Table 1), the overall contract cost was \$84,686.32, of which approximately \$3,000 went for labor and approximately \$400 for secondary treatments and \$928 for log salvage. The remaining \$80,358.32 was spent for primary treatments (i.e. excavation).

The relative proportions of the above costs reflect an attempt to minimize secondary treatments, the cost of which had previously grown to be roughly equal to that of the primary treatments, on the 1980 Maneze Creek site. Analysis of the Maneze Creek cost data indicated that the money for secondary treatment might be better spent by doing a more intensive primary treatment. In order to obviate the need for secondary treatment, the channels were excavated as near to original grade as possible (using the surveyed longitudinal profile as a guide) with the channel dug wide enough to preclude a flow depth of greater than one foot in response to a 25 year return interval storm. Peak flows for these calculations were estimated using the rational method (setting $K = .4$), and assuming a flow velocity of from 3-7 fps. In theory, if the flow is spread out on a wide enough area, then its depth and velocity are low, thus no secondary treatments are necessary.

HEAVY EQUIPMENT PHASE

The contract was drawn up without any specifications as to the equipment to be used or the sequencing of the worksites other than to require access by motorcycle to the most distant unfinished site. The idea was to keep the contract price low by being as unrestrictive as possible. The contractor chose to use only a Caterpillar D-8 bulldozer, with rippers, and a John Deere track-mounted backhoe. With this extremely limited equipment, plus very experienced operators, he was able to do even the most demanding jobs. Mr. Naylor's basic approach was to rip the fill area (if any) and then complete all excavation with the D-8 alone. The track-hoe was used only to manicure the finished excavation's channel shape or to reach in and excavate those few places where the D-8 could not maneuver. The only exception to this was in the road outslipping, where the D-8 left a thin, tall wall of unexcavated material at the extreme outboard edge of the road. The track-hoe would follow along behind the D-8, pulling down this wall then the D-8 would go back intermittently and smooth the loose earth to grade, until it caught up again with the track-hoe. This process would continue until the end of the outsloped road reach.

Table 1. SUMMARY COSTS OF EROSION-CONTROL REHABILITATION WORK, SITE 81-5

	Task	RNP Employees (1 Hydr.+2 PST)	Contract Heavy Equipment (est. portion)	Contract Labor (est. portion)	Total Task Cost	Task % of Total Cost	Phase Totals	Phase %
Contract Prep. Phase	Mapping	\$8,297.89 ✓			\$8,297.89	6	\$37,340.51 ✓	28
	Prescriptions	\$29,042.62 ✓			\$29,042.62	22		
Contract Admin. Phase	Primary Treatments	\$6,223.42* ✓	\$80,358.32		\$86,581.74	65		
	Secondary Treatments		~\$400.00	~\$3,000.00 ✓	\$3,400.00	3	\$90,909.74	68
	Log Salvage		\$928.00		\$928.00	0.7		
Post Contract Phase	Cleanup (P.P., checkups, etc.)	\$2,074.48 ✓			\$2,074.48	2	\$3,976.08 ✓	3
	Report Preparation	\$1,901.60 ✓			\$1,901.60	1		
Materials Provided By. R.N.P.	Straw (14,000 lbs.)				\$530.00	0.4	\$730.00 ✓	.6
	Stream Diversions				\$200.00	0.2		
TOTALS		\$47,540.01 ✓	\$81,686.32**	\$3,000.00				
GRAND TOTAL					\$132,956.33			

*Represents RNP employee salary during contract Admin. Phase.

**Includes an estimated \$12,686.32 direct profit (gross) by contractor.

Work progressed, generally, from the lower numbered stations to the higher numbered ones, but often there was as much as a half mile of road with jobs at various degrees of completeness. Except for three days of rest, the contract work continued unabated, (whether or not R.N.P. personnel were present) seven days a week for 10 to 14 hours per day. This made it impossible to keep track of the exact sequence of work or the number of hours each piece of equipment worked on any given site (we were gone on the weekend and left the site by 4 p.m. each day, arriving at 9 a.m. the following workday, while the equipment worked from dawn till dark. For this reason, no attempt is made herein to show either the number of equipment hours per worksite or the specific sequence of work.

Table 2 shows the average costs of the various heavy equipment treatments. The costs listed include the small amount of secondary treatment and labor costs (approximately three percent). These costs cannot be separated from the primary treatment costs because a single bid price was received for all work at each worksite. At any rate the work was prescribed in such a manner as to minimize secondary costs almost to the vanishing point. The move-in and move-out costs were borne by the contractor and these costs are also included in the primary treatment costs.

The only item in Table 2 which shows any real degree of price variation is the haul road stream crossings. Table 3 delineates these variations. The five "medium" crossings (R/Xs hereafter) are between 200 and 500 yd³ in size, while the four "large" R/Xs are between 500 and 1000 yd³. Crossings larger than 1000 yd³ are handled individually. Generally speaking, the larger crossings were bid at a higher price per yard than the smaller ones. The price per cubic yard is comparable to that paid by the hydrologists on the four other sites done this year (but with directed, rental equipment).

The prescriptions worked well, overall. The grade staking of all cut and fill work was particularly helpful not only to the heavy equipment operators in knowing where to begin cutting (and how deep and on what slope to cut) but also to the R.N.P. staff in checking the excavations and fills for finished grade. Several time-saving innovations have been incorporated into the grade staking for next year's work which were a direct result of this year's experience in their use. Although the coming years work (Y-Line Road) will be done with rented equipment, grade stakes will again be used throughout and the resulting unit costs will be compared with those from the other sites to determine the relative efficiency of grade staking versus the usual technique. This type of comparison was not possible this year, since obviously both the grade staking and the work-by-contract affected the resulting unit costs.

The "deep dish" prescription was used for small crossings, where a fully surveyed (R/X - type) approach was unwarranted. However, the results were not satisfactory in most cases, since the control over the lower end of the channel excavation was not adequate. The result was that often the excavation was not deep enough to prevent severe downcutting. In this next years deep dishes, the upper and lower ends of deep dishes are specifically prescribed and a method has been developed to accurately predict the resulting excavated volume. This should result in a quick, simple prescription format which is suitable for contracts or rental equipment and which yields excellent control of the final end-product.

Table 2. SUMMARY OF AVERAGE COSTS OF HEAVY EQUIPMENT TREATMENTS

Treatment	Equipment	# of Worksites	Total Quantity	Total Cost	Avg. Cost/ Worksite	Avg. Cost/ Quantity	Cost Range/ Quantity
Haul Road Xings	D-8 (rip), Track-hoe	13	13,049 yd ³	\$53,277.72 ✓	\$1,004.00	\$3.98/yd ³	\$3.50-\$7.24 /yd ³
Pull Culv.**	Track-hoe	5	5 culv.	\$500.00	\$100.00	\$100.00 ea.	all=\$100.00
XRD	D-8 (rip), Track-hoe	93	4,334 ft.	\$5,634.20 ✓	\$60.58	\$1.30/1.ft.	all=\$1.30/1.ft.
Outslope Road****	D-8 (rip), Track-hoe	N/A	4.8 Acres 7000 ft. 9333 yd ³	\$14,700.00 ✓	N/A	\$2.10/1.ft. \$1.58/yd ³	all=\$2.10/1.ft. or \$1.58/yd ³
Ripping Roads	D-8 (rip)	N/A	4.19 mi.	\$4,191.40 ✓	N/A	\$1003.20/mi.	all=\$1003.20/mi
Log Salvage**	Track-hoe, Truck	N/A	4.64 MBF	\$928.00	N/A	\$200.00/MBF	all=\$200/MBF
Landing Drains	D-8 (rip)	2	819 ft. 958 yd ³	\$1,440.00	\$720.00	\$1.76/1.ft. \$1.50/yd ³	all=\$1.76/1.ft. \$1.50/yd ³
Deep Dishes	D-8 (rip), Track-hoe	6	1375 yd ³	\$4,015.00	\$669.17	\$292./yd ³	all=\$2.92/yd ³
TOTAL TREATMENT COST =				\$84,686.32****			

*Most culverts were pulled as parts of other bids. Only specifically bid culverts are separated out.

**Cost includes transport to #1 rock pit.

***Mean outslope = 4:1 = 25%.

****Due to the nature of the contract, secondary and labor costs cannot be separated out from the total treatment cost, but constitute approximately 3% of the total.

Table 3. HAUL ROAD CROSSINGS COSTS

Type or Location of Worksite	# of Worksites	Range of Fill Vol. Removed	Equipment	Avg. Cost/ Worksite	Range in Cost	Avg. Cost/ yd ³	Range Cost/ yd ³
Medium*	5	270-470 yd ³	D-8 (rip) Track-hoe	\$1,218.40	\$945.00- \$1,750.00	\$3.57	\$3.50-\$3.72
Large*	4	556-857 yd ³	D-8 (rip) Track-hoe	\$3,154.60	\$1,946.00- \$5,500.00	\$4.52	\$3.49-\$7.24
R/X 46 + 13	--	1,060 yd ³	D-8 (rip) Track-hoe	\$4,375.00	--	\$4.12	--
R/X 48 + 50	--	4,442 yd ³	D-8 (rip) Track-hoe	\$18,000.00	--	\$4.05	--
R/X 76 + 61	--	1,322 yd ³	D-8 (rip) Track-hoe	\$5,288.00	--	\$4.00	--
R/X 133 + 77	--	1,726 yd ³	D-8 (rip) Track-hoe	\$6,904.00	--	\$4.00	--

*Size classes are: small <200 yd³ ≤ medium <500 yd³ ≤ large <1000 yd³ ≤ v. large.

Mr. Naylor's use of only a large ripping cat and a track-hoe proved much more versatile than expected. In many cases, an hydraulic excavator would have done the job more efficiently, but in no case did the lack of one prove detrimental to the finished product. This would not have been the case had the narrow, rocked channel prescriptions of previous years been used. The use of broad, flat channel bottoms (for flow-depth control) made it possible to get by with less equipment.

DISCUSSION AND CONCLUSION

The Y-2 site was done as an I.F.B. (Invitation For Bid) contract in order to determine the suitability and cost effectiveness of the contract approach to a site-type which will be the norm within a couple of years. The Y-2 rehabilitation site had little if any significant off-road erosion problems to deal with. The main focus was to alleviate potential problems associated with the roadway itself. This type of site will become increasingly common in the future, as most of the areas in the park with treatable off-road problems have already been dealt with.

No great savings were attained this year by using the I.F.B. contract format, relative to the cost of using directed rental equipment. However, Mr. Naylor's bid of \$84,686.32 was roughly \$30,000 higher than the (next) lowest bid. This apparent low bidder backed out due to some math errors he found in his bid makeup, but if his bid had been properly put together, it would still have been at least \$20,000 cheaper than Mr. Naylor's. It is probably that we will see a tendency toward lower priced bidding next time such a contract goes out. The method may yet prove to be the cheapest overall approach to a simple road-prescription type of rehabilitation site.

Overall, the Y-2 site work was a success, especially considering the first time use of both an I.F.B. contract and grade-staked cut and fill. The problems that did develop (lack of adequate grade control of deep dishes, and excessive preparation time for finished drafted prescription) have been solved in this next year's work (Y-Line site). The contract for the following year should be rapid and easy to produce and administer.

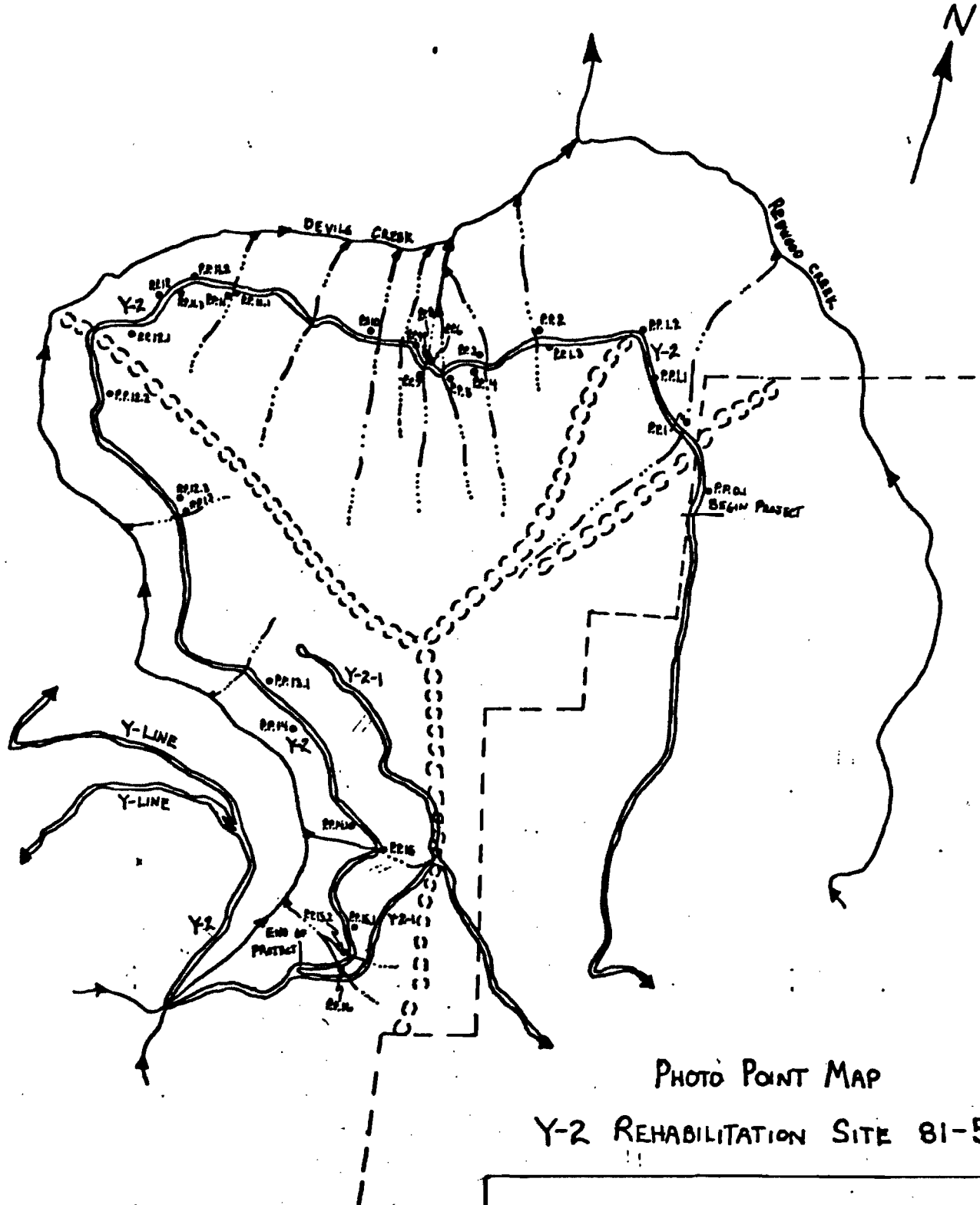


PHOTO POINT MAP
Y-2 REHABILITATION SITE 81-5

- KEY**
Scale = 1:24000
- P.P. PHOTO POINT LOCATION AND NUMBER
 - == MAJOR HAUL ROAD
 - ooo RIDGE
 - PERENNIAL STREAM
 - - - - - INTERMITTENT STREAM

Site: Y-2 (81-5)

Method/Time:

Category/Number: *Pulling Culverts*

Reconstructed: yes ☒ no

In Outslough Areas

Percent Gone: 0

Access:

Access: Note: all other contact numbers are sent via XRPD

Cost includes hauling to Reel pit #1 (2.3 miles away)

Purpose of work (circle one)

1. Fill Removal

(2) Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

HE Excavation

Jute/Curllex

Mulch/Seed

Other: 2, 11 C, 14

Other:

L.F. Outslope

Predicted Runoff (25yr)
(k l/month)

[illegible]

MEASUREMENTS: Area ft² Volume yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD.

FINISHED CHANNEL: ft ft ft² % / %
(width) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls _____ ft².

Rocks	yds	Avg. Depth (Rx)	ft.
-------	-----	-----------------	-----

Check Dam Boards CD Size EH / SW # Boards/CD .

Straw Bales	No.	acre.	Other(specify)
-------------	-----	-------	----------------

GRAND TOTAL COST \$ 500.00

COMMENTS/SKETCHES (See Over):

(۱۷)

Site: Y-2 (81-5-)

Category/Number: one

Ripped: yes no

Site: Y-2(81-5)

Method/Time: _____

Category/Number: Cross R. & Drains
(2 types)

Reconstructed: yes ✓ no

Percent Gone: 0

Note: Access: XRD prices are warped because bid for w + w/o culvert were combined (unit price is high for pure XRD + low for XRD + culvert pull)

Purpose of work (circle one)
1. Fill Removal
② Drainage Improvement

EQUIPMENT WORK				LABOR: <u>①</u> = Contract I = In-House R = Redwoods United (circle one)		
TYPE	Unit	Quantity	# of	TREATMENT	PERSON	HOURS
Drain	HOURS	COST/HR	TOTAL COST		HOURS	
XRD w/o culvert pull	5' 13/10ft	372.4	48.25	78		
XRD w/culvert pull	5' 13/10ft	62	806	15		
TOTALS:				TOTALS:		
				WINTER MAINTENANCE		
TOTALS:				TOTALS:		

UNIT COSTS:

Check Dams
People Rocking
HE Rocking
HE Excavation
Jute/Curlex
Mulch/Seed
Other:
Other:

\$1.30 / L.F. Outslope XRD

Predicted Runoff (25yr) _____
(kilo m³/th)

MEASUREMENTS: Area ft² Volume yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD

FINISHED CHANNEL: ft ft ft² % / %
(widest) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls ft².

Rocks yds Avg. Depth (Rx) ft.

Check Dam Boards CD Size EH / SW # Boards/CD .

Straw Bales No. acre. Other(specify)

GRAND TOTAL COST \$ 5634.20
6344.20

COMMENTS/SKETCHES (See Over):

(18)

Site: Y-2(81-5)

Category/Number: XRD

Site: Y-2 (81-5)

Category/Number: Heavy Outslipping
of Roads

Reconstructed: yes ☒ no

Percent Gone: 0

Access:

Purpose of work (circle one)

① F: II Removal

2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

1.5819d HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

2.10/L.F. Outslope

Predicted Runoff (25y) —
(kmoeth)

[illegible]

MEASUREMENTS: Area 4.8 acres ^{1.33 yd³/ft} OS mean depth @ obs. elev. R.L. = 15'
(treated area): Volume 933.3 yd³ ^{4:1} Cut width = 15'
Road Length/Width 7000 / 30 ft. OS Slope % 25 WB/XRD .

FINISHED CHANNEL: ft ft ft² % / %
(width) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls ft2.

Rocks	yds	Avg. Depth (Rx)	ft.
-------	-----	-----------------	-----

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD
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Straw Bales	No.	acre.	Other(specify)

GRAND TOTAL COST	\$ 14,700
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COMMENTS/SKETCHES (See Over):

(1A)

Site: Y-2 (81-5-)

Category/Number: 0.

Site: Y-2 (81-5)

Method/Time:

Category/Number: Ripping Records

Reconstructed: yes ☒ no

Percent Gone: 0

Access: $\text{Cost} = \$190/\text{acre} \cdot \text{ft} = \$1003.20/\text{mile}$

$$22,060 \text{ ft} = 4.19 \text{ mi} = 4199.60$$

Purpose of work (circle one)

1. Fill Removal

② Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr)
(Kilometh)

EQUIPMENT WORK				LABOR: (C) = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
					P.	
				TOTALS:		
WINTER MAINTENANCE						
					/	
TOTALS:				TOTALS:	.	

MEASUREMENTS: Area ft² Volume yd³

(treated area): Road Length/Width ^{22,060} / 30 ft. OS Slope % _____ WB/XRD _____.

FINISHED CHANNEL: ft ft ft² % / %.

(width) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls _____ ft2.

[illegible]

Check Dam Boards CD Size EH / SW # Boards/CD

Straw Bales	No.	acre.	Other(specify)

GRAND TOTAL COST

\$4191.40

COMMENTS/SKETCHES (See Over):

(20)

Site: Y-2 (81-5)

Category/Number: Rip Road

Site: Y-2 (81-5)

Method/Time:

Category/Number: Log Salvage

Reconstructed: yes ☒ no

Percent Gone:

Access: Price includes delivery to #1 rock pit (average of 3 mi
haul)

Purpose of work (circle one)

① Fill Removal

2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

HE Excavation

Jute/Curlax

Mulch/Seed

\$200.00 Other: MBF 1.000

Other:

L.F. Outslope

Predicted Runoff (25y)_____
(klosmth)

[illegible]

MEASUREMENTS: Area ft² Volume yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD

FINISHED CHANNEL: ft ft ft² % / %
(width) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls ft2.

Rocks	yds	Avg. Depth (Rx)	ft.
-------	-----	-----------------	-----

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD
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Straw Bales	No.	acre.	Other(specify)
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GRAND TOTAL COST	\$ 928.00
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COMMENTS/SKETCHES (See Over):

(21)

Site: Y-2 (81-5-)

Category/Number: 180

Ripped: ☒ yes ☐ no

Site: Y-2 (81-5) R/X 2+20

Method/Time: _____

Category/Number: R/X 2+20

Reconstructed: ☐ yes ☐ no

Percent Gone: 0

Access: _____

EQUIPMENT WORK				LABOR: C = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS COST
				straw	?	?
TOTALS:				TOTALS:		
				WINTER MAINTENANCE		
TOTALS:				TOTALS:		

Purpose of work (circle one)
(1) Fill Removal
2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

7.24/gal HE Excavation

Jute/Curlex

Mulch/Seed

Other: _____

Other: _____

L.F. Outslope

Predicted Runoff (25yr) 5
(kilo m³/h)

MEASUREMENTS: Area 5114 ft² Volume 760 yd³

(treated area): Road Length/Width 1 ft. OS Slope 6.2% WB/XRD _____

FINISHED CHANNEL: 60/5 ft 75 ft 375 ft² 16.7 % 23133 %
top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 12 acres.

Jute/Curlex _____ rolls _____ ft².

Rocks _____ yds Avg. Depth (Rx) _____ ft.

Check Dam Boards _____ CD Size _____ EH _____ SW # Boards/CD _____

Straw Bales 8 No. .116 acre. Other(specify) _____

GRAND TOTAL COST \$ 5,500.00

COMMENTS/SKETCHES (See Over):

(22)

Site: Y-2

Category/Number: R/X

Ripped: yes no

Site: Y-2 (81-5)

Method/Time: _____

Category/Number: R/x 35+25 -

Reconstructed: yes ☒ no

Percent Gone: 0

Access: _____

<u>EQUIPMENT WORK</u>				<u>LABOR:</u> C = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
					P	
				TOTALS:		
WINTER MAINTENANCE						
					/	
TOTALS:			\$9.45.00	TOTALS:	.	

Purpose of work (circle one)
(1) Fill Removal
2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

#3.50/4³ HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) 16.2
(kmoeth)

MEASUREMENTS: Area 1525 ft^2 Volume 270 yd^3

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: $\frac{60}{\text{top/bottom width}}$ $\frac{7}{\text{ft}}$ $\frac{47.5}{\text{length}}$ $\frac{333}{\text{ft}^2}$ $\frac{22}{\text{gradient}}$ $\frac{33}{\text{sideslopes L/R.}}$

SECONDARY TREATMENT: (amounts) Drainage Basin 15 acres.

Jute/Curlex rolls _____ ft².

Rocks yds Avg. Depth (Rx) ft.

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD
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Straw Bales 3 No. .035 acre. Other(specify)

GRAND TOTAL COST	\$ 945.00
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COMMENTS/SKETCHES (See Over):

(23) Site: Y-2

Category/Number: _____

Ripped: ☒ yes ☐ no

Site: Y-2 (81-5)

Method/Time:

Category/Number: R/x 39 + 14

Reconstructed: yes ✓ no

Percent Gone: 0

Access: _____

<u>EQUIPMENT WORK</u>				LABOR: <u>C</u> = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	~~HOURS~~
					R	
				TOTALS:		
WINTER MAINTENANCE						
TOTALS:				\$997.00	TOTALS:	

Purpose of work (circle one)
 (1) Fill Removal
 2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

3.54/4d HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) 28.1
(kmoeth)

MEASUREMENTS: Area 1920 ft² Volume 282 yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD.

FINISHED CHANNEL: $\frac{60}{12}$ ft top/bottom width $\frac{48.5}{}$ ft length $\frac{546}{}$ ft² area $\frac{11}{}$ % gradient $\frac{33}{33}$ % sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 32 acres.

Jute/Curlex rolls _____ft².

Rocks	yds	Avq.	Depth (Rx)	ft.
-------	-----	------	------------	-----

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD	.
------------------	---------	----	---	----	-------------	---

Straw Bales 2 No. 437 acre. Other(specify)

GRAND TOTAL COST	\$ 997.00
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COMMENTS/SKETCHES (See Over):

(24) Site: Y-2

Category/Number: _____

Ripped: yes no

Site: Y-2 (81-5)

Method/Time: _____

Category/Number: R/X 46+13

Reconstructed: yes no

Percent Gone: 0

Access: _____

EQUIPMENT WORK				LABOR: <u>C</u> Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS
TOTALS:			4375	TOTALS:		

Purpose of work (circle one)

- ① Fill Removal
2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

4.12/4 HE Excavation

Jute/Curlex

Mulch/Seed

Other: _____

Other: _____

L.F. Outslope

Predicted Runoff (25yr) 34.1
(kilometh)

MEASUREMENTS: Area 7080 ft² Volume 1060 yd³

(treated area): Road Length/Width 1 ft. OS Slope % _____ WB/XRD _____

FINISHED CHANNEL: 82 / 14 ft 96 ft 1344 ft² 17 % 40 / 40 %
top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 32 acres.

Jute/Curlex _____ rolls _____ ft².

Rocks _____ yds Avg. Depth (Rx) _____ ft.

Check Dam Boards _____ CD Size _____ EH _____ / _____ SW # Boards/CD _____

Straw Bales 10 No. .14 acre. Other(specify) _____

GRAND TOTAL COST \$ 4375

COMMENTS/SKETCHES (See Over):

(25) Site: Y-2

R/X 46+13
Category/Number: _____

Site: Y-2 (81-5)

Method/Time: . . .

Category/Number: 2/1 48+50

Reconstructed: yes ☒ no

Percent Gone:

Access:

Purpose of work (circle one)

(1) Fill Removal

2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

4.05- HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) ^{66 cfs}
(kilo mth)

<u>EQUIPMENT WORK</u>				<u>LABOR:</u> C = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS
				R		
				TOTALS:		
				WINTER MAINTENANCE		
TOTALS:				18,000	TOTALS:	

MEASUREMENTS: Area ^{11,560} ft² Volume ⁴⁴⁴² yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: $\frac{126}{11}$ ft $\frac{137}{1507}$ ft $\frac{1507}{\text{ft}^2}$ $\frac{33.5}{\%}$ $\frac{501}{66}$ %
top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 55 acres.

Jute/Curlex rolls ft².

[illegible]

Check Dam Boards CD Size EH / SW # Boards/CD

Straw Bales 22 No. 26 acre. Other(specify)

GRAND TOTAL COST | \$ 18,000

COMMENTS/SKETCHES (See Over):

(26) Site: Y-2

Category/Number:

Ripped: ✓ yes no

Site: Y-2 (81-5)

Method/Time: _____

Category/Number: R/X-53+68 -

Reconstructed: yes ✓ no

Percent Gone: 0

Access :

[illegible]

Purpose of work (circle one)
(1) Fill Removal
2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

3.50 HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) ³ 40

MEASUREMENTS: Area 1496 ft² Volume 343 yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: $\frac{50}{5}$ ft $\frac{54$ ft $\frac{270}{}$ ft² $\frac{37}{}$ % $\frac{50}{50}$ %
top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 3 acres.

Jute/Curlex rolls ft².

Rocks _____ yds Avg. Depth (Rx) _____ ft.

Check Dam Boards CD Size EH / SW # Boards/CD .

Straw Bales 3 No. 105 acre. Other(specify)

GRAND TOTAL COST

\$ 1200.00

COMMENTS/SKETCHES (See Over):

(27)

Site: Y-2

R/X 53+68
Category/Number:

Site: Y-2 (81-5)

Method/Time:

Category/Number: R/V 5-6 + 8 7

Reconstructed: yes ☐ no ☒

Percent Gone:

Access :

Purpose of work (circle one)

(1) F: II Removal

2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

3.51 HE Excavation

Jute/Curllex

Mu3ch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) ⁴⁰
(kmoeth)

[illegible]

MEASUREMENTS: Area 2440 ft² Volume 342 yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: $\frac{59}{12}$ ft $\frac{64}{}$ ft $\frac{768}{}$ ft² $\frac{23}{}$ % $\frac{50150}{}$ %
top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin ~~34~~ acres.

Jute/Curlex rolls ft2.

[illegible]

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD
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Straw Bales 3 No. 04 acre. Other (specify)

GRAND TOTAL COST	\$ 1200.00
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COMMENTS/SKETCHES (See Over):

(28) Site: Y-2

Category/Number: _____

Site: Y-2 (81-5)

Method/Time:

Category/Number: R/X 76 + 61 -

Reconstructed: yes ☒ no

Percent Gone: 0

Access:

[illegible]

Purpose of work (circle one)
 (1) Fill Removal
 2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

4.00/4.00 HE Excavation

Jute/Curlax

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) 27
(kmoth)

MEASUREMENTS: Area $\frac{5160}{1160}$ ft² Volume 1322 yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD.

FINISHED CHANNEL: $\frac{62}{\text{top/bottom width}}$ $\frac{11}{\text{ft}}$ $\frac{144}{\text{length}}$ $\frac{1584}{\text{ft}^2}$ $\frac{31.4}{\text{gradient}}$ $\frac{59}{\text{sideslopes L/R.}}$

SECONDARY TREATMENT: (amounts) Drainage Basin *2* acres.

Jute/Curlex rolls ft2.

Rocks 40 yds Avg. Depth (Rx) 1 ft.

Check Dam Boards CD Size EH / SW # Boards/CD

Straw Bales 7 No. .098 acre. Other(specify)

GRAND TOTAL COST

\$ 5288.00

COMMENTS/SKETCHES (See Over):

(2a)

Site:

 $Y-Z$

R/X 76 + 61
Category/Number: _____

Ripped: yes no

Site: Y-2 (81-5)

Method/Time: _____

Category/Number: R/X 133+77

Reconstructed: yes no

Percent Gone: 0

Access: _____

Purpose of work (circle one)
 (1) Fill Removal
 2. Drainage Improvement

EQUIPMENT WORK				LABOR: (C) = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
					P.	
				TOTALS:		
WINTER MAINTENANCE						
TOTALS:						
			6904.32	TOTALS:		

UNIT COSTS:
 Check Dams
 People Rocking
 HE Rocking
 4.00/yd³ HE Excavation
 Jute/Curlex
 ? Mulch/Seed
 Other:
 Other:
 L.F. Outslope

Predicted Runoff (25yr) ^{13.7}
 (kmoeth)

MEASUREMENTS: Area ⁷⁴⁴⁰ ~~72~~ ft² Volume ¹⁷²⁶ yd³

(treated area): Road Length/Width 1 ft. OS Slope % WB/XRD

FINISHED CHANNEL: 125 / 10 ft 113 ft 1130 ft² 35% % 40/50 %
 (widest) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 12.7 acres.

Jute/Curlex rolls ft².

Rocks yds Avg. Depth (Rx) ft.

Check Dam Boards CD Size EH SW # Boards/CD

Straw Bales 12 No. 164 acre. Other(specify)

GRAND TOTAL COST \$ 6904.32

COMMENTS/SKETCHES (See Over):

(30)

Site: Y-2 (81-5)

Category/Number:

Site: Y-2 (81-5)

Method/Time:

Category/Number: RX 156 + 13

Reconstructed: yes [✓]no

Percent Gone: 0

Access: _____

[illegible]

Purpose of work (circle one)
 (1) F:11 Removal
 2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

3.72/4 HE Excavation

Jute/Curler

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) 25
(k loms th)

MEASUREMENTS: Area 1060 ft² Volume 470 yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: $\frac{35}{5}$ ft $\frac{60}{}$ ft $\frac{300}{}$ ft² $\frac{35}{}$ % $\frac{66}{166}$ %

top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex _____ rolls _____ ft².

Rocks _____ yds Avg. Depth (Rx) _____ ft.

Check Dam Boards _____ CD Size _____ EH _____ / _____ SW # Boards/CD _____.

Straw Bales 4 No. .024 acre. Other(specify) _____

GRAND TOTAL COST

\$ 1750

COMMENTS/SKETCHES (See Over):

(31) Site: Y-2

R/X 156 + 1.
Category/Number:

GRAND TOTAL COST

Site: Y-2 (81-5)

Method/Time:

Category/Number: ~~24-30843~~

Reconstructed: yes ☒ no

Percent Gone: 0

Access:

EQUIPMENT WORK				LABOR: (C) = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
					P.	
				TOTALS:		
WINTER MAINTENANCE						
TOTALS:			1946	TOTALS:		

Purpose of work (circle one)
 ① Fill Removal
 2. Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

83.50 HE Excavation

Jute/Curllex

Mulch/Seed

Other:

Other:

L.F. Outslope

Predicted Runoff (25yr) ^{14.4} in
(kmoeth)

MEASUREMENTS: Area 258 ft^2 Volume 556 yd^3

(treated area): Road Length/Width / ft. OS Slope % WB/XRD

FINISHED CHANNEL: $\frac{71}{6}$ ft $\frac{77}{}$ ft $\frac{462}{}$ ft² $\frac{16.7}{}$ % $\frac{33129}{}$ %
(c/d.s.t) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin 17.3 acres.

Jute/Curlax rolls _____ ft².

Rocks	yds	Avg. Depth (Rx)	ft.
1	10	10	10
2	20	20	20
3	30	30	30
4	40	40	40
5	50	50	50
6	60	60	60
7	70	70	70
8	80	80	80
9	90	90	90
10	100	100	100
11	110	110	110
12	120	120	120
13	130	130	130
14	140	140	140
15	150	150	150
16	160	160	160
17	170	170	170
18	180	180	180
19	190	190	190
20	200	200	200
21	210	210	210
22	220	220	220
23	230	230	230
24	240	240	240
25	250	250	250
26	260	260	260
27	270	270	270
28	280	280	280
29	290	290	290
30	300	300	300
31	310	310	310
32	320	320	320
33	330	330	330
34	340	340	340
35	350	350	350
36	360	360	360
37	370	370	370
38	380	380	380
39	390	390	390
40	400	400	400
41	410	410	410
42	420	420	420
43	430	430	430
44	440	440	440
45	450	450	450
46	460	460	460
47	470	470	470
48	480	480	480
49	490	490	490
50	500	500	500
51	510	510	510
52	520	520	520
53	530	530	530
54	540	540	540
55	550	550	550
56	560	560	560
57	570	570	570
58	580	580	580
59	590	590	590
60	600	600	600
61	610	610	610
62	620	620	620
63	630	630	630
64	640	640	640
65	650	650	650
66	660	660	660
67	670	670	670
68	680	680	680
69	690	690	690
70	700	700	700
71	710	710	710
72	720	720	720
73	730	730	730
74	740	740	740
75	750	750	750
76	760	760	760
77	770	770	770
78	780	780	780
79	790	790	790
80	800	800	800
81	810	810	810
82	820	820	820
83	830	830	830
84	840	840	840
85	850	850	850
86	860	860	860
87	870	870	870
88	880	880	880
89	890	890	890
90	900	900	900
91	910	910	910
92	920	920	920
93	930	930	930
94	940	940	940
95	950	950	950
96	960	960	960
97	970	970	970

Check Dam Boards	CD Size	EH	/ SW	# Boards/CD
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Straw Bales 4 No. .056 acre. Other(specify)

GRAND TOTAL COST

\$ 1946

COMMENTS/SKETCHES (See Over):

(34) Site: Y-2 (81-5)

Category/Number:

Access :

EQUIPMENT WORK				LABOR: (C) = Contract I = In-House R = Redwoods United (circle one)		
LINE TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
39+50 TO 43+00	592	545	\$825	→ \$1.51/423 = \$1.39/lin ft		
57+18 TO 59+00	227 ft	409.5	\$615	→ \$1.50/423 = \$2.71/lin ft		
TOTALS:	819 ft	954.50	\$1440	TOTALS:		

Purpose of work (circle one)

1. Fill Removal

(2) Drainage Improvement

UNIT COSTS:

Check Dams

People Rocking

HE Rocking

\$1.50 HE Excavation

Jute/Curlax

Mulch/Seed

Other:

Other:

1.76 L.F. Outslope 12.12

Predicted Runoff (25yr) _____
(kloamth)

MEASUREMENTS: Area ft² Volume ⁹⁵⁸~~578~~ yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD .

FINISHED CHANNEL: 819 ft 572 ft ft² 4.4 1 %
 (widest) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls ft².

[illegible]

Check Dam Boards	CD Size	EH	/	SW	# Boards/CD
------------------	---------	----	---	----	-------------

Straw Bales	No.	acre.	Other(specify)
-------------	-----	-------	----------------

GRAND TOTAL COST

\$ 1440.00

COMMENTS/SKETCHES (See Over):

(35) Site: Y-2 (81-5-)

Category/Number: _____

Ripped: yes no

Site: Y-2 (81-5)

Method/Time: _____

Category/Number: Deep Disks

Reconstructed: yes ✓ no

Percent Gone: 0

Access: _____

Purpose of work (circle one)
1. Fill Removal
2. Drainage Improvement

EQUIPMENT WORK				LABOR: <u>C</u> = Contract I = In-House R = Redwoods United (circle one)		
TYPE	HOURS	COST/HR	TOTAL COST	TREATMENT	PERSON HOURS	HOURS Cost
	Bid	Paid	Comments			
<u>Rocked</u>						
#1 67+79	790	790	w/culv. rem.			
#2 169+50	700	<u>490</u>	only 70% complete due to hole of good fill site			
	<u>745</u>		Rocking <u>≈ 50</u> / dish Culvert Removal <u>≈ 30</u>			
<u>Unrocked</u>						
#1 167+93	690	690	w/culv. rem.			
167+92	685	685	w/culv. rem.	TOTALS:		
#3 180+90	680	680	no culv.	WINTER MAINTENANCE		
#4 201+10	680	680	no culv.			
	<u>683.75</u>					
		<u>4015.00</u>				
TOTALS:				TOTALS:		

UNIT COSTS:
Check Dams
People Rocking
HE Rocking
HE Excavation
Jute/Curlex
Mulch/Seed
Other:
Other:
L.F. Outslope

Predicted Runoff (25yr)
(kloms/yr)

MEASUREMENTS: Area ft² Volume yd³

(treated area): Road Length/Width / ft. OS Slope % WB/XRD

FINISHED CHANNEL: ft ft ft² % / %
(widest) top/bottom width length area gradient sideslopes L/R.

SECONDARY TREATMENT: (amounts) Drainage Basin acres.

Jute/Curlex rolls ft²

Rocks yds Avg. Depth (Rx) ft.

Check Dam Boards CD Size EH / SW # Boards/CD

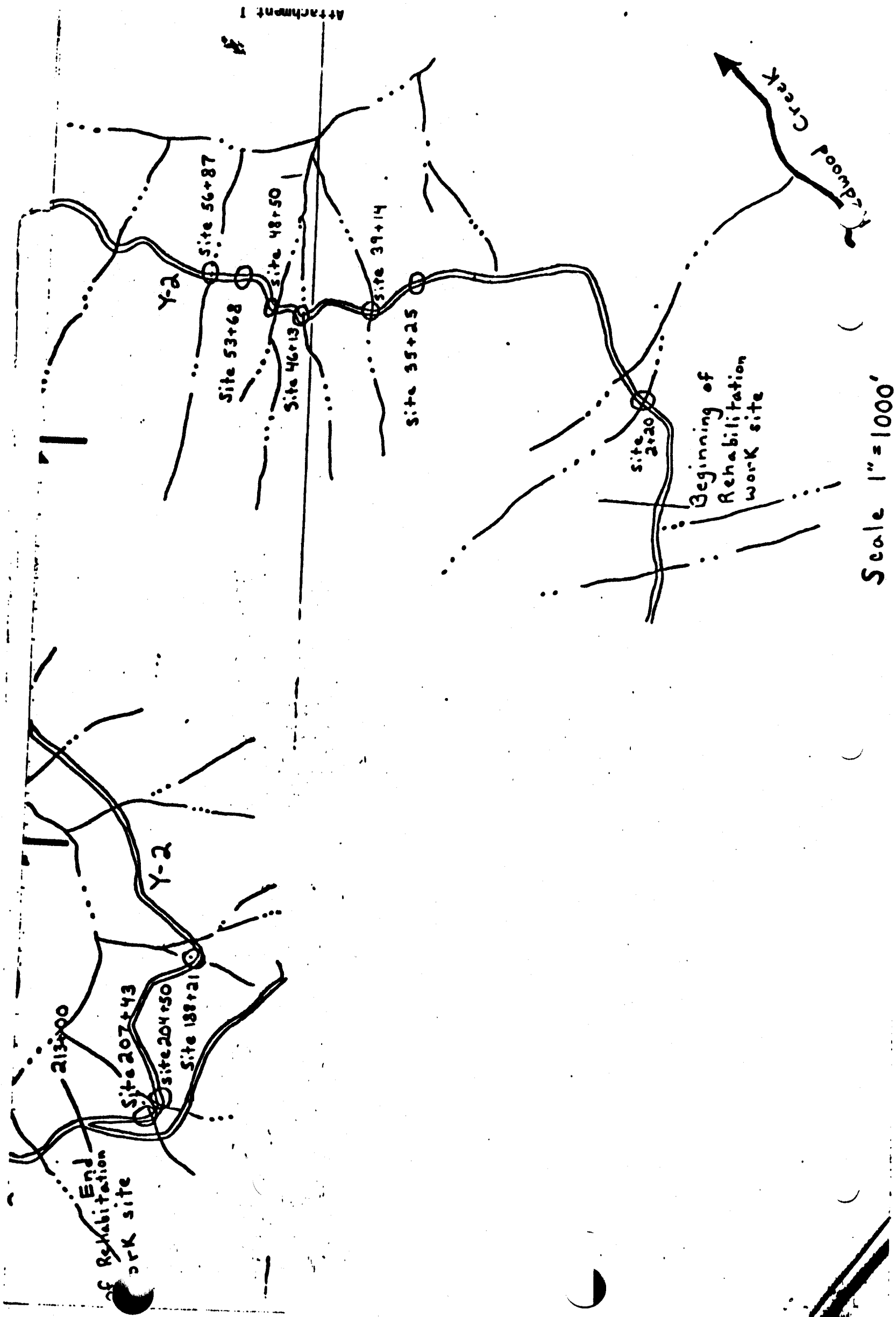
Straw Bales No. acre. Other(specify)

GRAND TOTAL COST \$ 4015.00

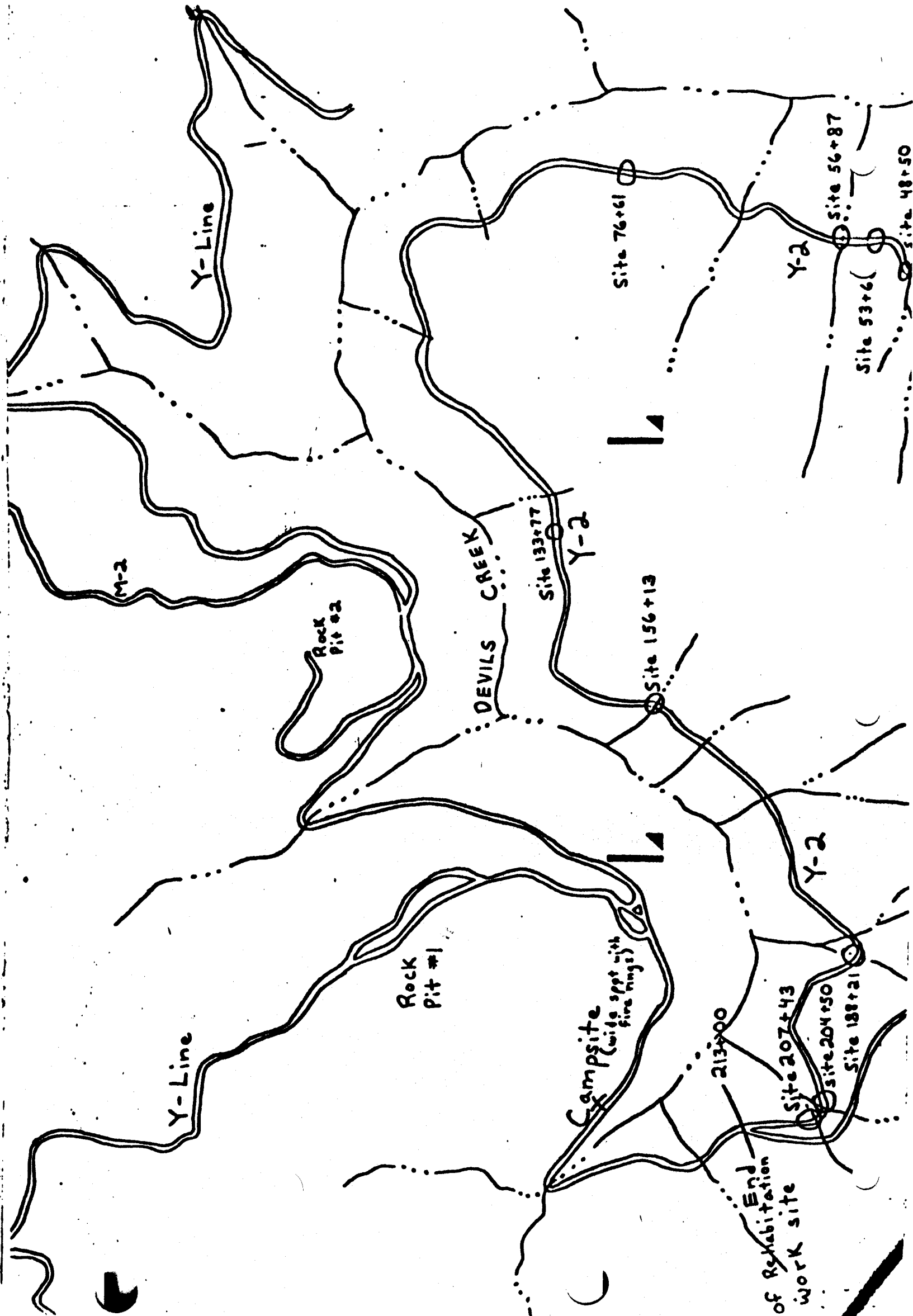
COMMENTS/SKETCHES (See Over):

(36) Site: Y-2 (81-5)

Category/Number:



Scale 1" = 1000'



Y-2 REHABILITA
SITE 81-5

天
王
人

Scale $\approx 1:6000$

① 170+00 - STATION NUMBERS, MEASUREMENTS FROM BEGINNING OF F

MAJOR HAUL ROADS

REHABILITATED HAUL R(

OLD GROWTH / TRACTOR

ALSO BORDERED BY

RIDGES

PERENNIAL STREAM

INTERMITTENT STP

ACTIVE SCARP

LANDSLIDE

OUT SLOPED AREA

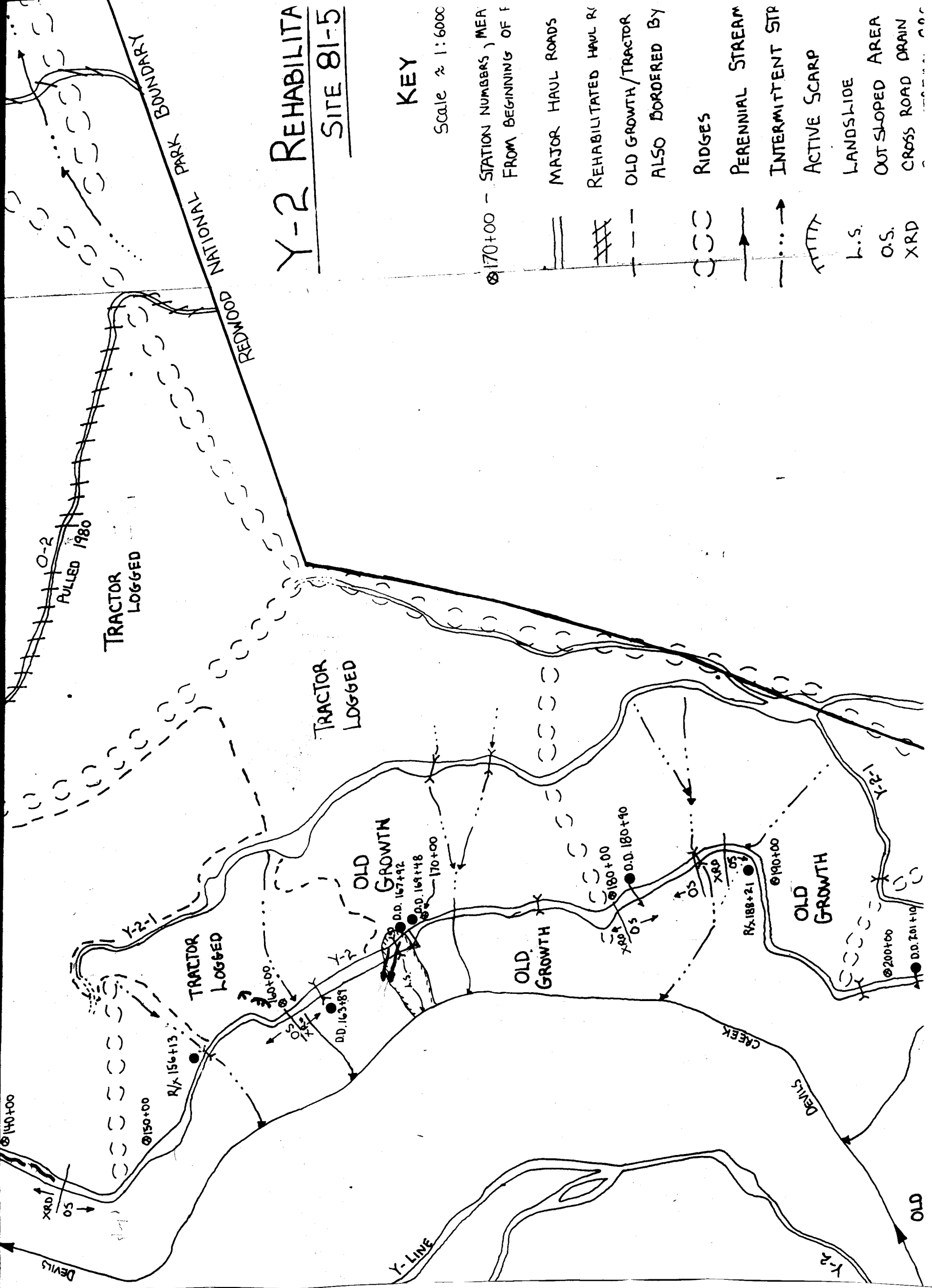
CROSS ROAD DRAIN

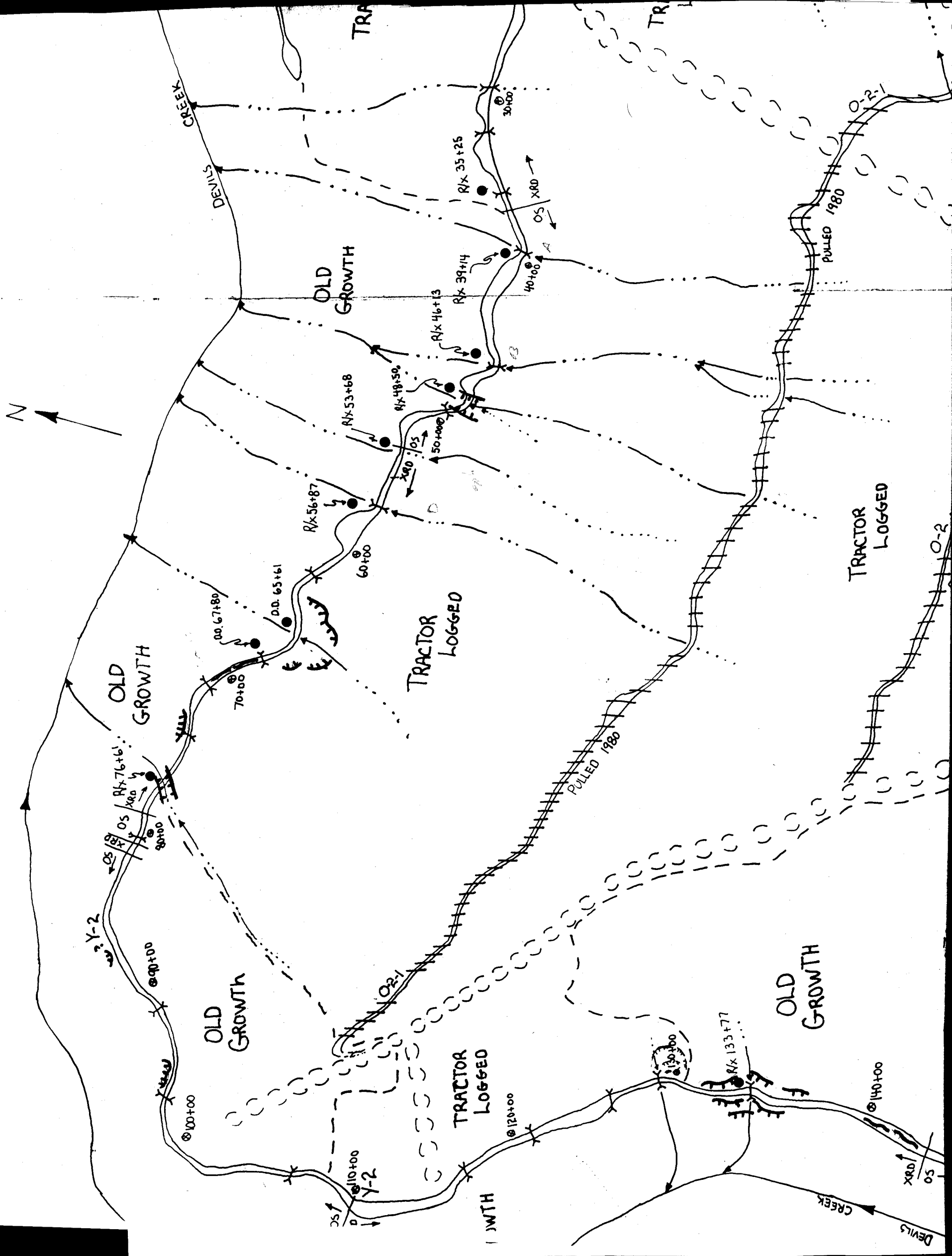
CROSS ROAD DRAIN

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०५

XRD





REVEGETATION REPORT

REHABILITATION SITE 81-4, DEVILS CREEK

AND

REHABILITATION SITE 81-5, BRIDGE CREEK

RESOURCE MANAGEMENT DIVISION

REDWOOD NATIONAL PARK

By

Roy W. Martin

Site Descriptions

The Devils Creek Rehabilitation Site 81-4 is located on the west side of the Redwood Creek basin. The site consists of a 4.1 mile section of the Y-2 haul road extending from the park boundary to the Y-2-1 intersection. Elevations range from 1100 to 1700 feet. Most of the acreage immediately upslope of the Y-2 road has been tractor logged. Downslope there are two cut block units located near the park boundary end of the work site.

Vegetation in logged areas is predominantly red alder (*Alnus rubra*), interspersed with varying amounts of coyote brush (*Baccharis pilularis* ssp. *consanguinea*). Uncut slopes are clothed with an old growth forest co-dominated by redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*) in the canopy. A considerable amount of tanbark oak (*Lithocarpus densiflora*) and madrone (*Arbutus menziesii*) occur in the overstory. The understory vegetation is mostly California huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*) and young tanbark oaks, with lesser amounts of sword fern (*Polystichum munitum*) and rhododendron (*Rhododendron macrophyllum*).

The Bridge Creek Rehabilitation Site 81-5 is located on the west side of the Redwood Creek basin downstream from Site 81-4. This site consists of 0.9 miles of the M-7-5-1 haul road and 2.3 miles of the M-7-5-2 haul road. Elevations at this site range from approximately 800 to 1800 feet. Tractor logged cut block units intersperse with old growth area both above and below the M-7-5-2 road. Acreage surrounding the M-7-5-1 road is mostly old growth forest, with some tractor logged areas upslope.

Vegetation in logged areas consist of remnant tanbark oak and madrone in the overstory. The understory is primarily rhododendron, salal, California huckleberry and young Douglas-fir also tanbark oaks. Some large patches of coyote brush and blue brush (*Ceanothus thyrsiflorus*) occur as scattered patches. Old growth vegetation is dominated by redwood and Douglas-fir in the overstory, with lesser amounts of tanbark oak, madrone and western hemlock (*Tsuga heterophylla*). The understory is mostly salal, California huckleberry, rhododendron and sword fern.

Table 1.
Vegetation Treatment. Rehabilitation Site 81-4
Bridge Creek, M-7-5-1 Road

Site Descriptions	Acreage	Planting Treatment
RX-1	.06	308 A at 3'
RX-2	.08	376 A at 3'
RX-3	.06	276 A at 3'
RX-5	.22	1048 A at 3'
RX-6	.29	1400 A at 3'
RX-7	.30	1440 A at 3'
Road Surface ^a	5.57	930 R and 930 Df at 10' ^b
Total	6.58	4848 A 930 R 930 Df

- RX - Road crossing
- A - Alder, 1 year, containerized
- R - Redwood, 1 year, containerized
- Df - Douglas-fir, 2 year, bareroot
- a - includes landings and road stretches exclusive of crossings
- b - conifers planted at 10-foot spacings, alternating Redwood and Douglas-fir; every other conifer received a fertilizer tablet.

Table 2.
Vegetation Treatment. Rehabilitation Site 81-4
Bridge Creek, M-7-5-2 Road

Site Description	Acreage	Planting Treatment
RX-15	.15	702 A at 3'
RX-16	.12	562 A at 3'
RX-17	.16	760 A at 3'
RX-18	.11	536 A at 3'
RX-19	.10	494 A at 3'
RX-22	.18	878 A at 3'
SX-29	.03	158 A at 3'
SX-23	.03	N/T
RX-24	.15	300 A at 3'
XRDs, RX-24 to RX-27	--	588 A at 3'
RX-27	.16	788 A at 3'
SX-26A	.01	42 A at 3'
SX-26B	.03	148 A at 3'
SX-26D	.04	174 A at 3'
SX-26E	.04	188 A at 3'
SX-26F	.01	56 A at 3'
RX-28	.23	1098 A at 3'
Road Surface ^a	9.92	3,380 R and 3,380 Df at 8' ^b
Total		7472 A 3380 R 3380 Df

RX - Road Crossing

SX - Stream Crossing

XRD - Cross Road Drain

A - Alder, 1 year, containerized

R - Redwood, 1 year, containerized

Df - Douglas-fir, 2 year, bareroot

a - includes landings and road stretches exclusive of crossings.

b - conifers planted at 8-foot spacings, alternating Redwood and Douglas-fir every other conifer received a fertilizer tablet.

Table 3.
Vegetation Treatment. Rehabilitation Site 81-5
Devils Creek, Y-2 Road

Site Description	Acreage	Planting Treatment
RX 2+20	.12	594 A at 3'
RX 35+25	.04	170 A and 30 R at 3'
RX 39+14	.04	176 A and 36 R at 3'
RX 46+13	.15	611 A and 125 R at 3'
RX 48+50	.25	1022 A and 210 R at 3'
RX 53+68	.03	126 A and 26 R at 3'
RX 56+87	.05	211 A and 45 R at 3'
RX 76+61	.12	471 A and 95 R at 3'
RX 133+77	.11	462 A and 90 R at 3'
XRDs, RX 133+77 to RX 188+21	--	2000 A and 2000 R at 1-5'
RX 156+13	.05	216 A and 40 R at 3'
RX 188+21	.09	372 A and 76 R at 3'
RX 204+50	.01	281 A and 57 R at 3'
RX 207+43	.09	347 A and 71 R at 3'
Road Surface ^a	14.91	3300 R and 3300 Df at 10' ^b
	16.06	7069 A 6201 R 3300 Df

RX - Road Crossing

XRD - Cross Road Drain

A - Alder, 1 year, containerized

R - Redwood, 1 year, containerized

Df - Douglas-fir, 2 year, bareroot

a - includes landings and road stretches exclusive of crossings.

b - conifers planted at 10-foot spacings, alternating Redwood and Douglas-fir; every other conifer received a fertilizer tablet.

COST ANALYSIS FOR PLANTING OF TREES AND FERTILIZER TABLETS
REHABILITATION SITE 81-4, BRIDGE CREEK, M-7-5-1 AND M-7-5-2 ROADS
REHABILITATION SITE 81-5, DEVILS CREEK, Y-2 ROAD

Table 4
Numbers and Costs For Trees and Fertilizer Tablets

	M-7-5-1	M-7-5-2	Y-2	Total	Unit Price Per Item	Amount
Alder ^a	4848	7472	7069	19,389	.15	\$2908.35
Redwood ^a	930	3380	6201	10,511	.15	1576.65
Douglas-fir ^b	930	3380	3300	7,610	.0875	665.88
Total	6708	14,232	16,570	37,510		\$5150.88
Fertilizer Tablet ^c	930	3380	3300	7,610	.012	91.32
Total for Trees and Fertilizer Tablets						\$5,242.20

a - 1 year, containerized; b - 2, year, bareroot, c - Agriform 20-10-5 Fertilizer tablets.

Table 5
In-House Labor Costs for Planting Trees
Rehabilitation Site 81-5, Devils Creek (Y-2 Road)

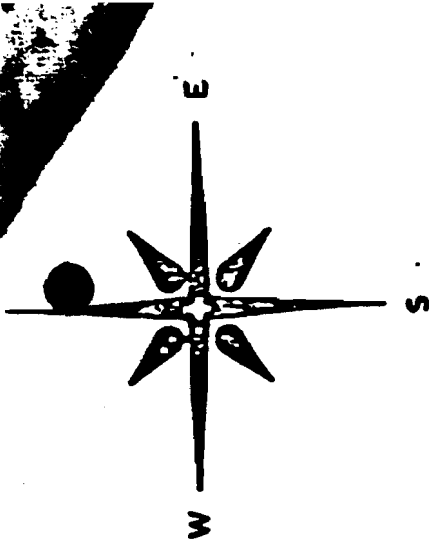
Date	Labor	Wage/Hour [*]	Hours	Amount
3-16-82	Laborer	\$8.13	10	\$81.30
	Laborer	8.13	10	81.30
3-17-82	Laborer	8.13	10	81.30
	Laborer	8.13	10	81.30
3-18-82	Laborer	8.13	10	81.30
	Laborer	8.13	10	81.30
3-22-82	Laborer	8.96	10	89.60
	Laborer	8.46	10	84.60
	Laborer	8.13	10	81.30
	Laborer	8.13	10	81.30
3-23-82	Laborer	8.96	8	71.68
	Laborer	8.13	8	66.04
	Laborer	8.13	8	66.04
	Laborer	8.13	8	66.04
3-24-82	Laborer	8.13	8	66.04
Total			140	\$1160.44

* Wage/hour includes overhead

Table 2.

Total Costs for Vegetation Treatments
Rehabilitation Site 81-4, Bridge Creek (M-7-5-1 & M-7-5-2 Road)
Rehabilitation Site 81-5, Devils Creek (Y-2 Road)

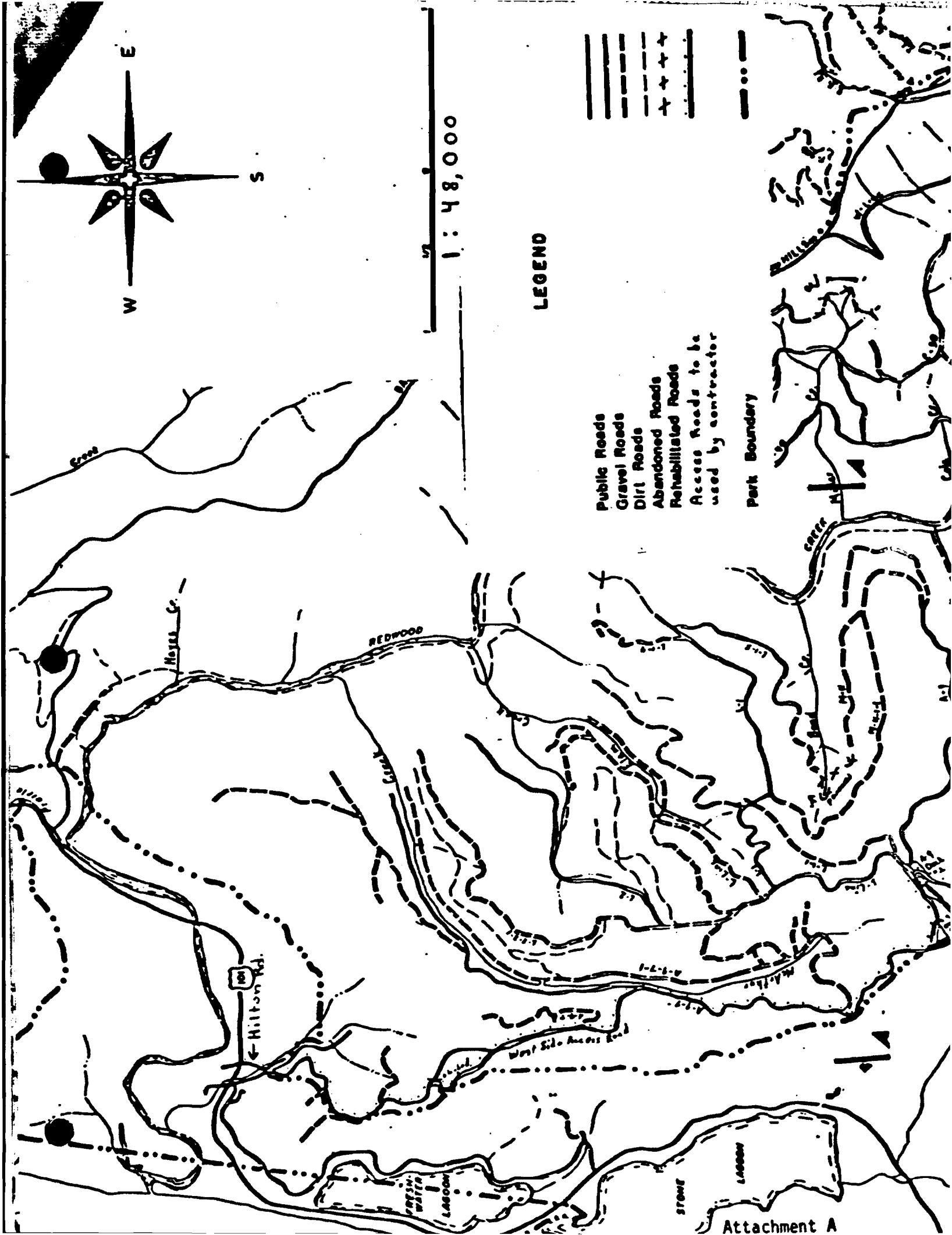
Material Costs	\$5,242.20
Contract Costs	4,029.76
Operation dates 2-16-82 to 3-6-82	
1.75 lost crew days	579.25
Labor Costs	<u>1,160.44</u>
Total Cost	\$11,060.65

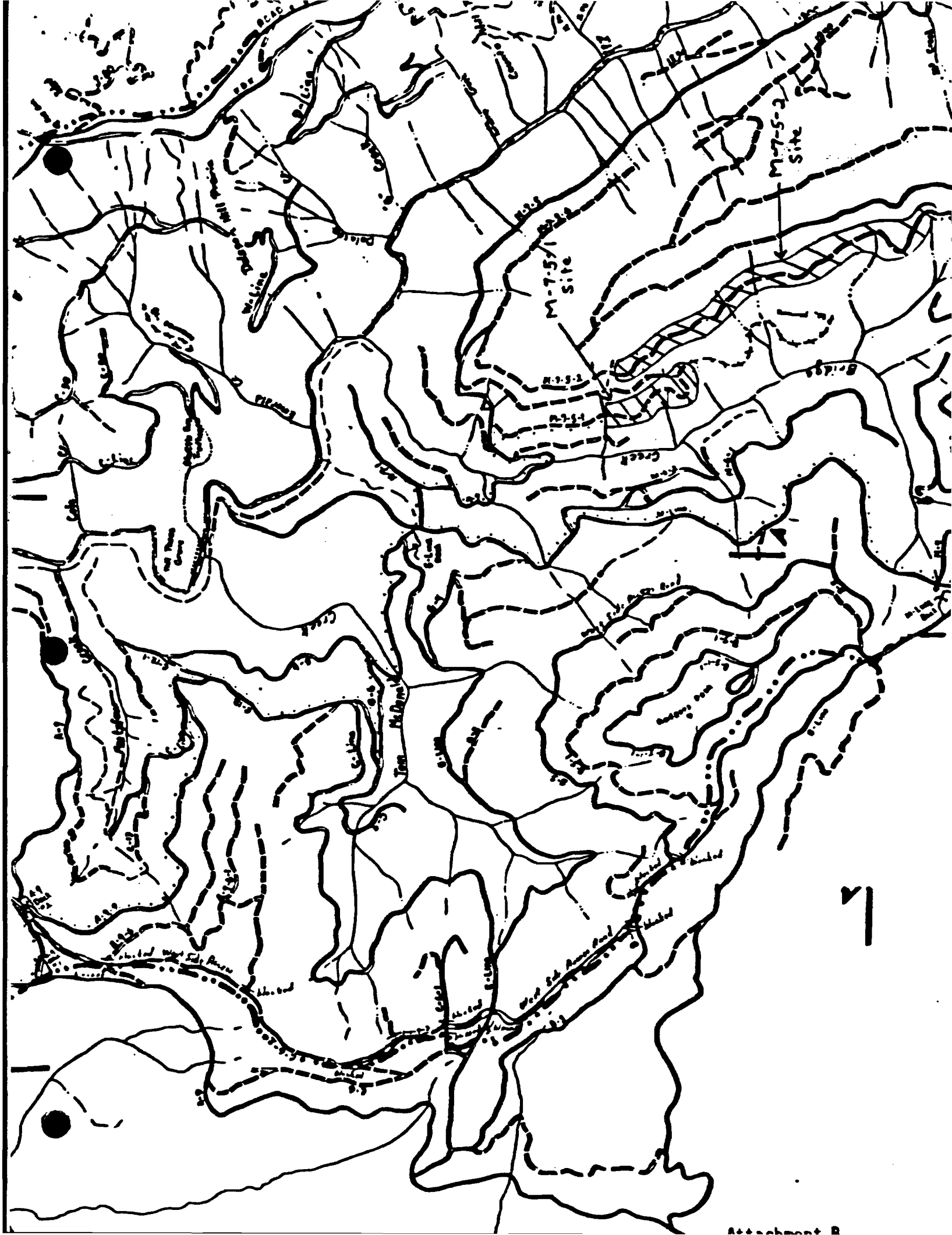


1: 48,000

LEGEND

- Public Roads
- Gravel Roads
- Dirt Roads
- Abandoned Roads
- Rehabilitated Roads
- Access Roads to be used by contractor
- Park Boundary







Uncontrolled.

in Canyon,
road 15'
(yote Peak).

RNP
RMGR
10/77

Access to Work Site
Rehabilitated Roads (not driveable)



1:6,600
550 Ft. per inch

Attachment D

Work Site
Beginning

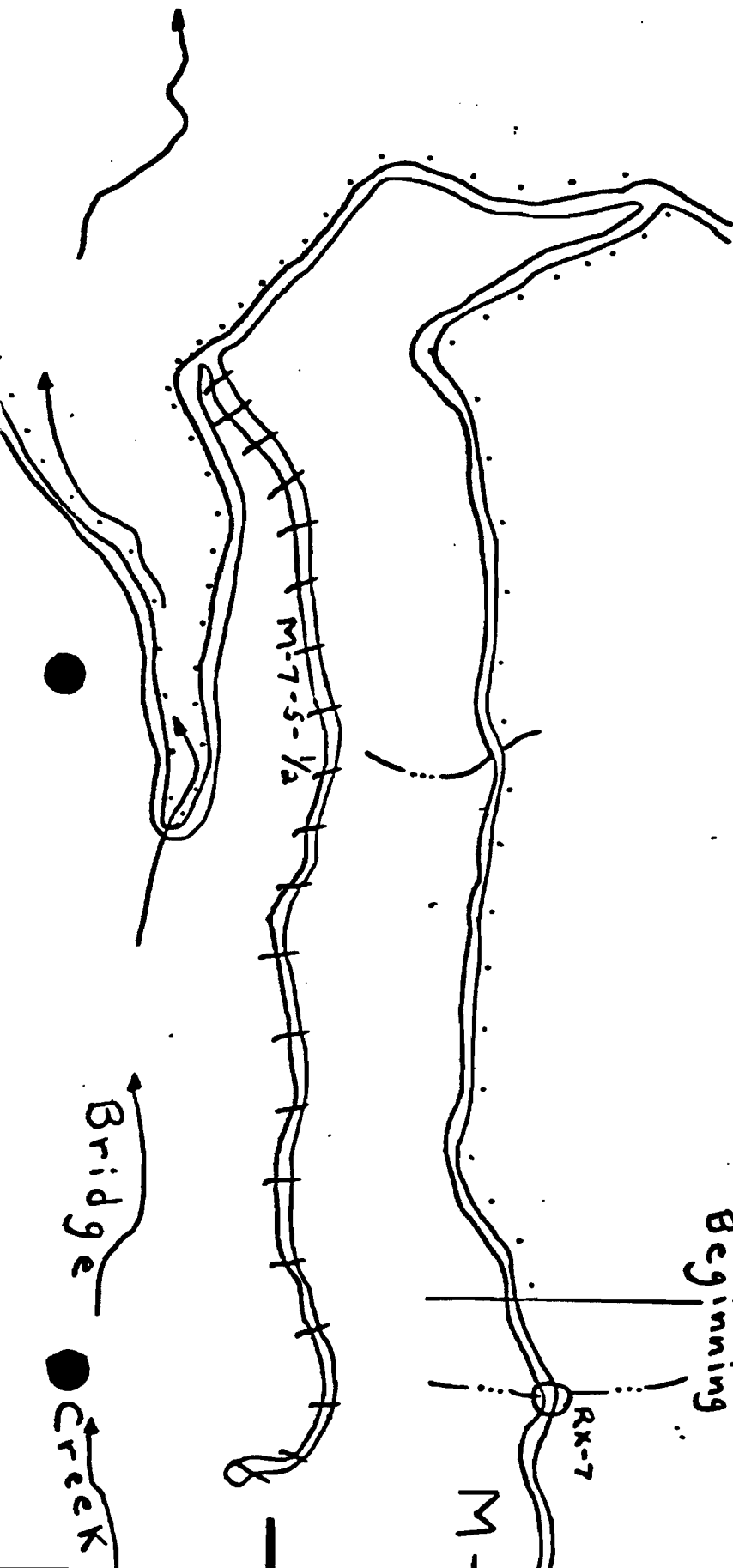
Rx-7

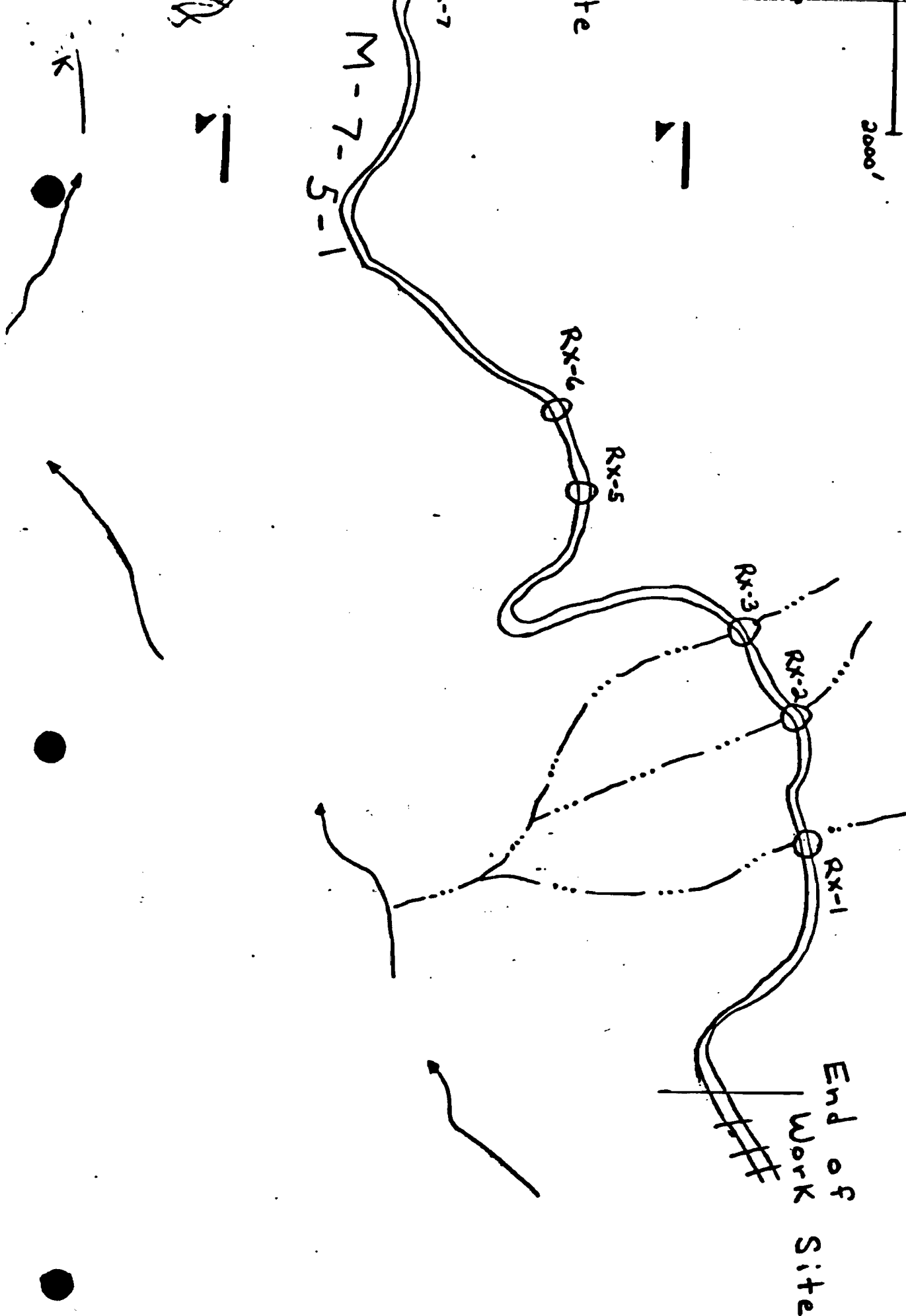
M-

M-7-5-1/2

Bridge

Creek







M-3-1-2 SCALE 1:5,112 (1"=426')

M-7-5-2

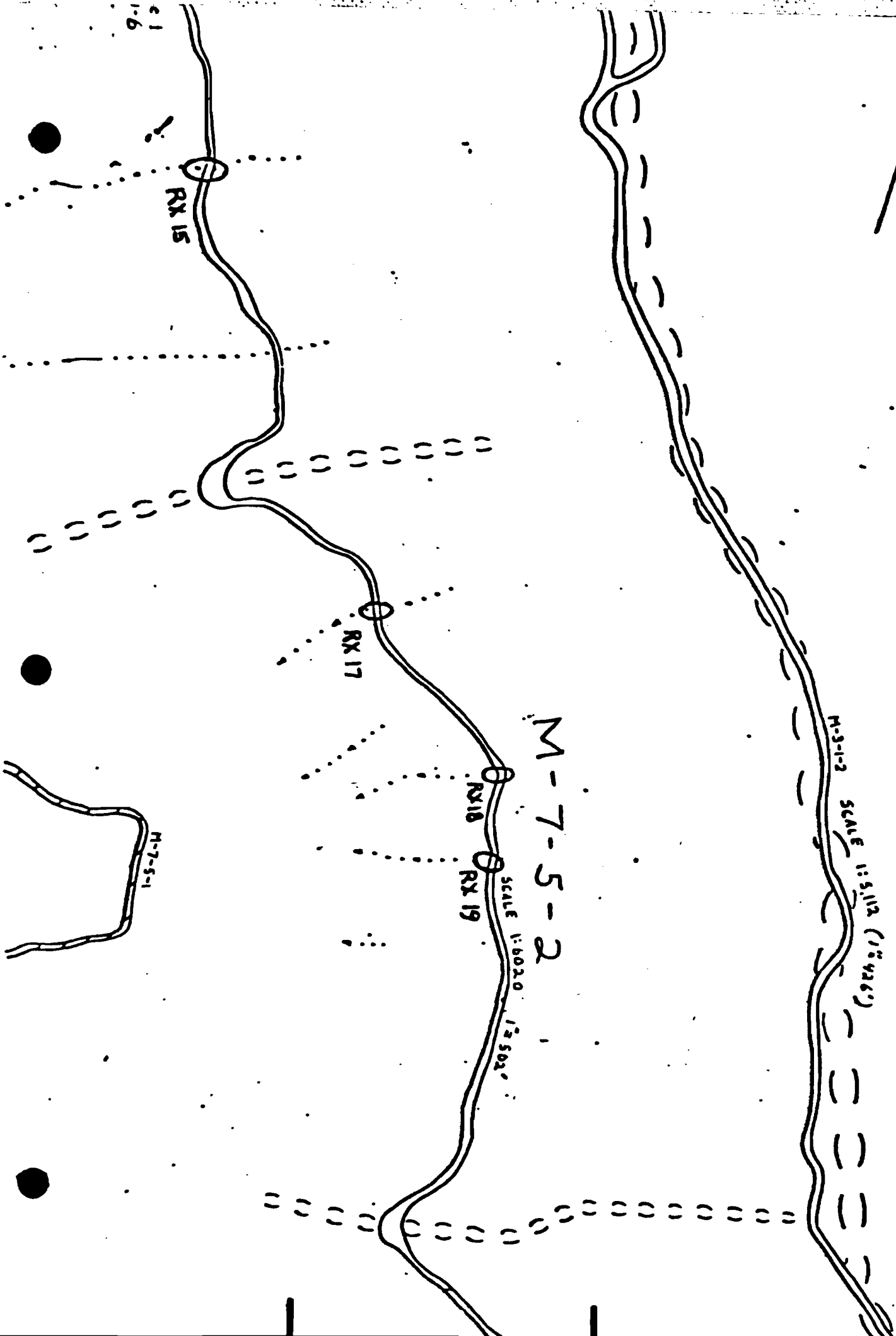
RX 18 RX 19 SCALE 1:6020 (1"=502')

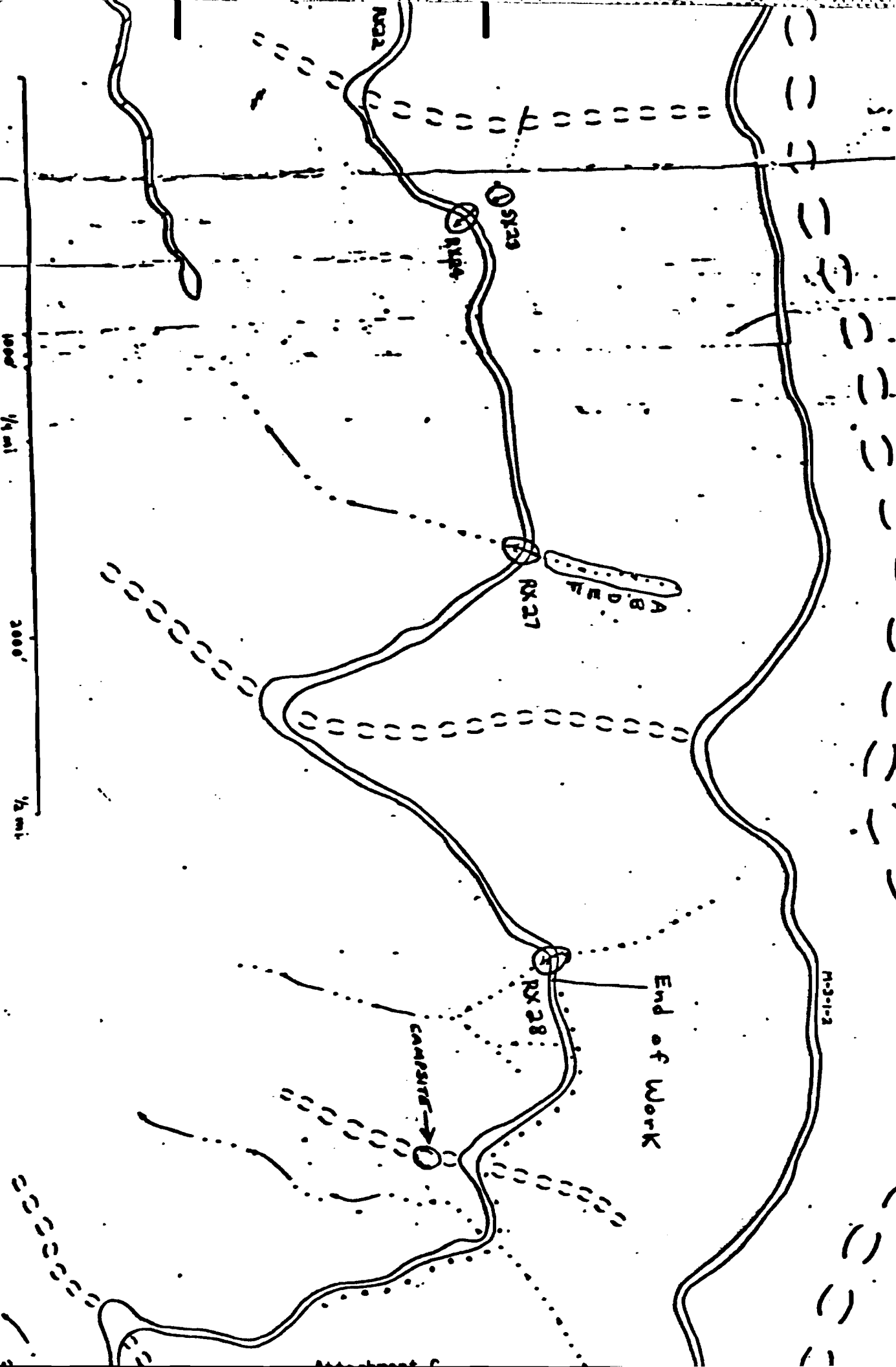
RX 17

RX 15

61
1-6

M-7-5-1

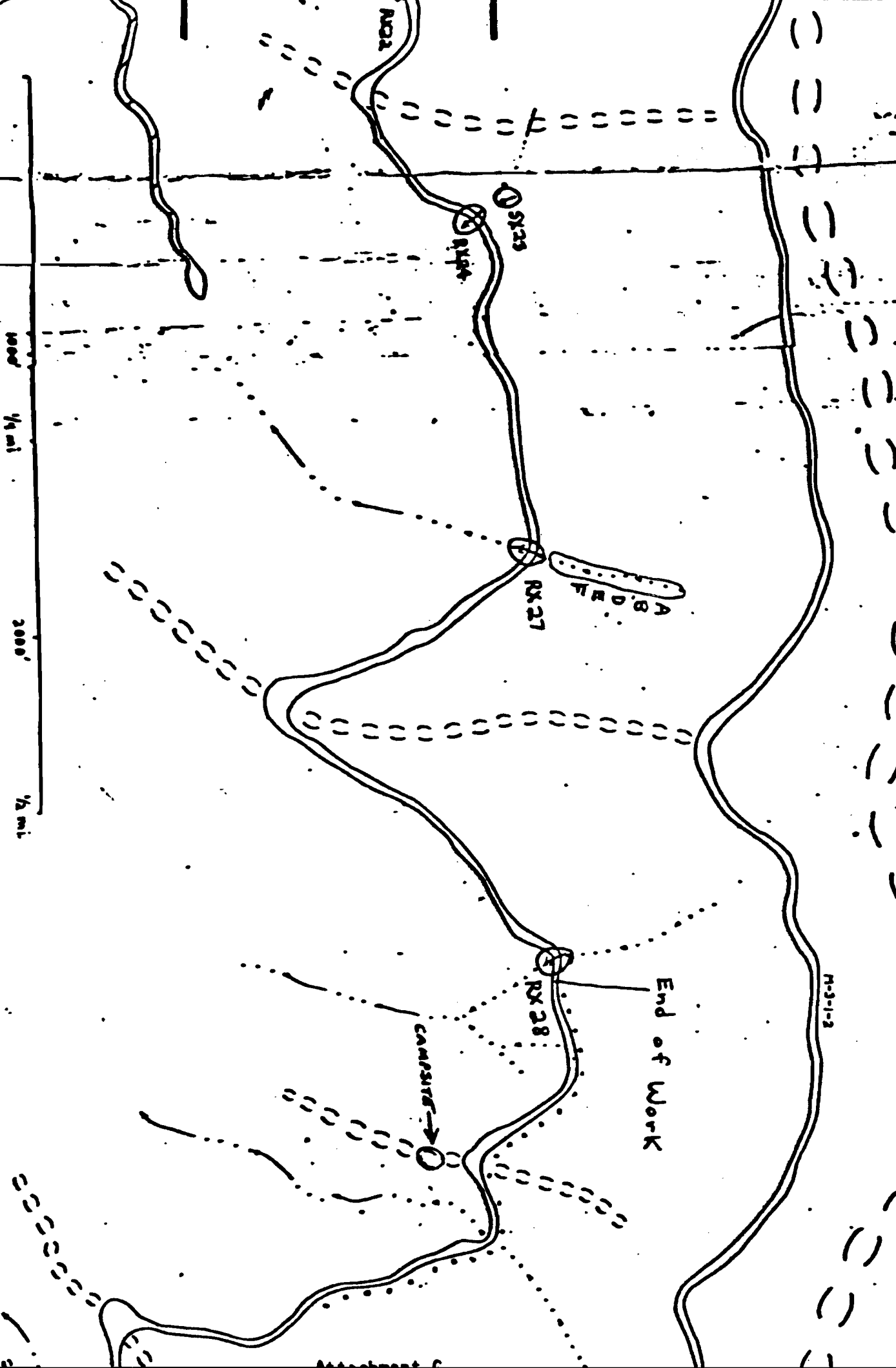




Average Scale Between Roads 1:5,566

1" = 464'

From 0-6112000. Points 6-13, 6-15, K-1K

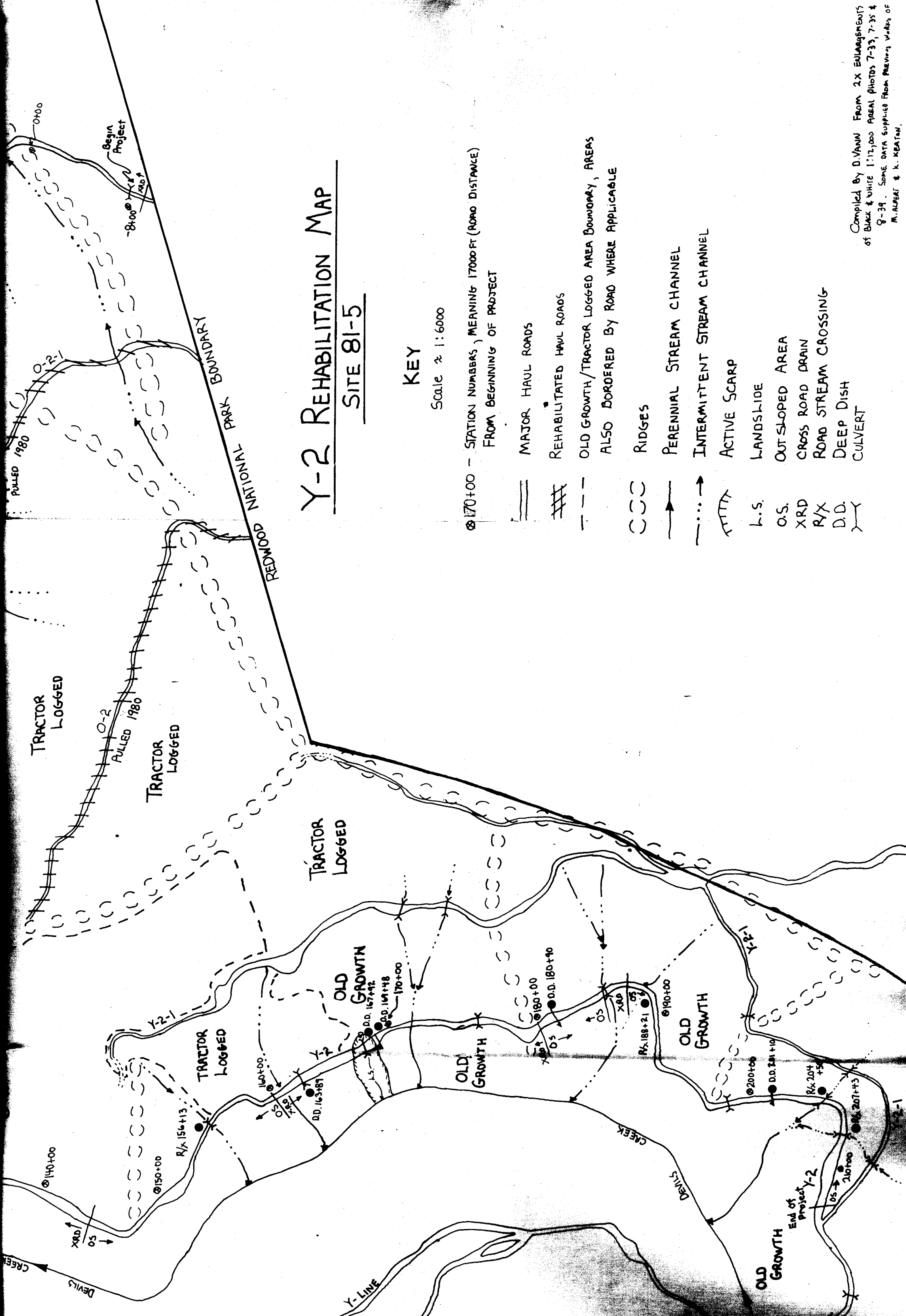


1000' 1/4 mi 2000' 1/2 mi

Average Scale Between Roads 1:5,566

1" = 464'

From 20-781:12000. Photos 6-13, 6-15. K.J.K.



Y-2 REHABILITATION MAP

SITE 81-5

KEY

Scale 1:6000

170+00 - STATION NUMBERS, MEANING 17000 FT (ROAD DISTANCE)
FROM BEGINNING OF PROJECT

MAJOR HAUL ROADS

REHABILITATED HAUL ROADS

OLD GROWTH/TRACTOR LOGGED AREA BOUNDARY, AREAS
ALSO BORDERED BY ROAD WHERE APPLICABLE

RIDGES

PERENNIAL STREAM CHANNEL

INTERMITTENT STREAM CHANNEL

ACTIVE SCARP

LANDSLIDE

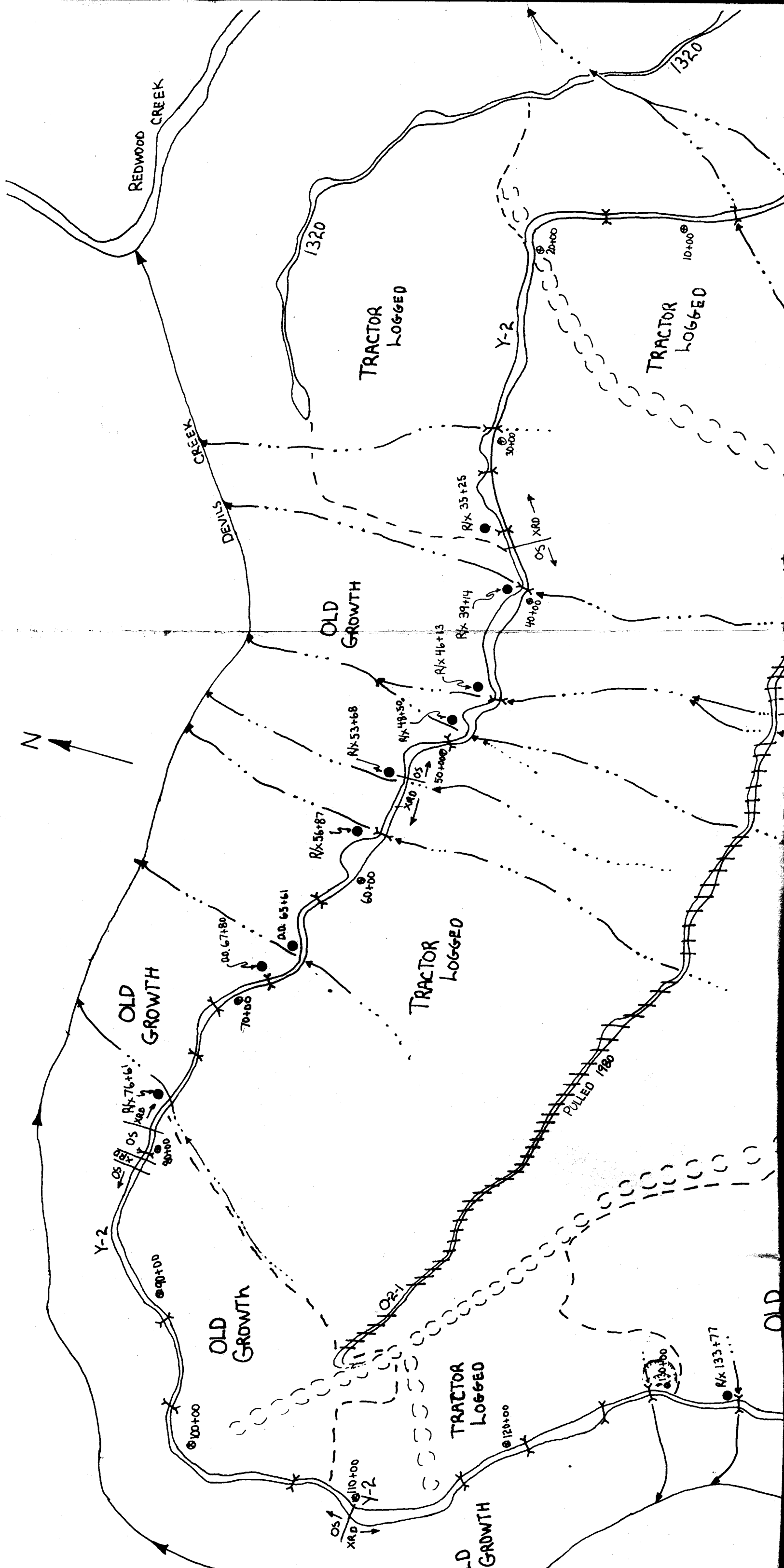
OUTSLOPED AREA

CROSS ROAD DRAIN

ROAD STREAM CROSSING

DEEP DISH

CULVERT



Most crossing excavations have experienced minor downcutting along the channel, although in most cases it is limited to three feet in depth or less. All crossing excavations appear to be under-excavated, and a large fluvial event may cause an average of up to 100 - 200 cubic yards to be mobilized in each crossing.

The crossing excavation at sta. 48+50 has experienced a loss of between 300 and 700 cubic yards, (depending on the original configuration of the excavation) most of which appears to have occurred in the 1997 storm event. Most of the material seems to have been transported offsite. Channel sideslopes are freshly exposed and oversteepened, and incision within the channel appears to be active and headcutting upstream. Up to 300 cubic yards of fill material remains within the boundaries of the crossing, and hundreds of cubic yards remain above the crossing, all at great risk of mobilizing in future events.

Several debris flows originating (1997 storm) above the Y-2 Road have coalesced into a large area of debris along the road bench around the deep drain at sta. 65+61. These debris flows seem to have originated from the failure of skid road fill material at several points where the skid roads crossed this broad swale. A total of approximately 5,000 cubic yards of material is involved, most of the debris lies above the road bench, with approximately 500 cubic yards resting on the road bench, and 800 cubic yards reaching the old-growth below the road.

Tension cracks and minor slumping of the outboard edge of the roadbench occurs between DD 65+61 and sta. 74+00.

Near sta. 74+00 an approximately 1,000 cubic yard failure of the outboard portion of the road bench occurred, apparently in the 1997 storm. All the material went into the old-growth, but no old-growth trees were directly killed.

The crossing excavation at 76+61 has experienced downcutting up to 7' deep along the channel. Approximately 300 to 400 cubic yards of material have been transported off-site.

A 300 cubic yard failure of the outboard edge occurred near sta. 87+00. Also due to the 1997 storm. Location of this feature was not well-recorded in my notes, and so may be somewhere else along this reach of road.

Near sta. 96+00 an approximately 1,000 cubic yard failure of the outboard portion of the road bench occurred, apparently in the 1997 storm. All the material went into the old-growth, partially burying several old-growth trees. They were still healthy in December, 2000.

A 500' or more section of the road bench has completely failed in a series of small slumps near RX 133+77. Most movement appears to have been during the 1997 storm, although this location may have been experiencing movement for some time. Up to 10,000 cubic yards is involved. Not much movement off-site into the old-growth below.

Tension cracks occur along an approximately two hundred linear length of road reach near sta. 141+00.

At sta. 158+00 failure of skid road fill material from above the road bench has caused failure of some of the Y-2 Road bench.

At the site of the old debris flow, at DD 167+92, two large gullies have formed. At the outboard edge of the road bench one is 15' wide and 8' deep. They still appear to be active.

Revegetation along the outsloped reaches seems to be much better than along the un-treated reaches. Fir trees up to 10' tall, fairly high density stands, with much salal and other brush are found in the outsloped reaches, whereas much more dispersed trees and dominantly ferns are found on the untreated reaches.

PHIL FREIBERG

See attached map



Unit: 81-5 1-A 7/28/81 PP#3B OS @ Sta 38-00



Unit: 81-5 1-B 11/15/81 PP#3B E.W.



Unit: 81-5 1-C 9/15/82 PP#3B E.W.



Unit: 81-5 2-A 7/28/81 PP#8 E.W.



Unit: 81-5 2-B 11/15/81 PP8 E.W.



Unit: 81-5 2-C 9/15/82 PP8 Xing 48-50



Unit: 81-5 2-D 7/21/83 PP8 L.T.