ENVIRONMENTAL MONITORING WITHIN STREAM AND RIVER RESERVE CUTTING TRIALS

1. BACKGROUND

It is proposed that the Department of Conservation and Land Management will commence a series of operational trials this year to examine the feasibility and consequences of extending coupes into selected road, river and stream reserves. In stream and river buffers all six trial coupes (3 river and 3 stream reserves) were inspected in the field and discussed with officers of the Public Works Departments.

Prescriptions, guidelines and possible monitoring techniques were discussed, as well as operational needs such as regeneration and protection. It is proposed that all these trial operations will be carried out in late spring and early summer 1984, so as to minimize siltation and turbidity of streams.

Officers of the PWD have pointed out that precise monitoring will be difficult on all sites and impossible on some, especially the larger streams. Several alternative techniques have been proposed and are being examined. However, the paired catchment and coupe studies, originally set up under the Kelsall Committee, are now yielding valuable information. It is expected that these will provide the precise, rigorous, scientific data on which to base future prescriptions. A co-operative effort between DCLM and PWD is proposed.

It has been decided to monitor only three stream and river reserve cutting trials using descriptive photographic and diagramatic methods prior to logging.

Trial areas to be monitored are Sutton 4, Poole 10 and Lochart 2 (see Appendix I original draft Prescription for detail).

After some practical application of the Draft Prescription it was found that some modification of methods was necessary.

1.1 It was impossible to accurately measure depth of stream bed sediment deposition by probing due to soft, deep alluvial nature of the stream bed. Discussion with Batini and King (PWD) devised a method of surface profile graphing of stream bed.

1.2 It was decided to carry out stream bed profile data collection after logging as the site would be more accessable and the site disturbance would be completed.

(See Appendix II Revised Prescription attached).

2. METHOD OF MONITORING

2.1 Descriptive

A field sheet was drawn up to ensure consistant descriptions and accurate recording of sites described. The following information is collected on these sheets:

Trial Cutting Area
Observation Point Number
Observer Identification
Date of Observations
Stream "Bank to Bank" Average Widths
Bank Height at 4 Points
Stream Bed Description
Description of Visible Dispersal and Build Up of Sediment
Type of Deposition
Bank and Bed Stability

2.2 Diagram

A scale diagram of each stream bed monitoring point was drawn. Details of the following information was recorded on each sketch:

Location of Sediment Deposition
Location of Gravel Deposition
Water Level at Time of Monitoring
Location of Photograph Positions
Location of Permanent Marker Pegs
Location of Trees and Stumps
Location of Sediment Deposition Bank Overflow
Stream Bank Position
Stream Bed Profile Survey (to be recorded when profile surveys are completed)

2.3 Photographic Records

Photographs were taken from recorded locations to allow a future visual comparison of "before and after" cutting appearance at each monitoring sites.

These monitoring methods were used in both Poole 10 and Sutton 4 Cutting Trials. (See Appendix III for examples).

2.4 Depressions and Culverts

2.4.1 Descriptive

A field sheet was drawn up to ensure consistant descriptive and accurate recording of sites described. The following information was collected:

Cutting Trial Area
Date of Observations
Observation Point Number
Observer
Description of Site

2.4.2 Diagram

A scale diagram of each culvert or depression monitoring point was drawn. The following information was recorded on each sketch:

Sediment Depth Probing Data and Location of Probe Lines
Location of Permanent Marker Pegs
Approx. Lowest Point of Drainage
Location of Fine Sediment Deposition
Location of Heavy Sediment Deposition
Location of Trees and Stumps

2.4.3 Photographic Records

Photographs were taken to allow future visual comparison of monitoring sites prior to and after logging.

These monitoring methods were used for culverts and depressions in Poole 10, Sutton 4, Lochart 2, Lochart 11 and Crowea 4. (See Appendix IV for example).

3. POST CUTTING MONITORING

3.1 Stream Bed Profile Charts

It is intended to compile profile surveys of stream beds at two points within each monitoring site at Sutton 4 and Poole 10. These will be compiled as soon as possible after completion of logging and prior to opening rains. Follow up surveys will be carried out during the summers of 1985/86 and 1986/87.

3.2 Stage Height Sampling

It is intended to install Stage Height Samplers at Sutton 4 and Poole 10 as soon as possible after completion of logging and prior to opening rains. PWD Water Resources Section will install and monitor Stage Height Samplers until a trend is recognized.

3.3 Sediment Traps

Sediment traps will be installed at Poole 10 Cutting Trial in the near future. (See Appendix II for details).

DCLM will monitor sediment traps until a trend is recognized.

3.4 Descriptive Photographic and Diagramatic Monitoring

Follow up descriptive, diagramatic and photographic monitoring will be carried out at culverts and depression points and stream bed monitoring points during the summers of 1985/86 and 1986/87.

Any new culvert or depression sediment movements will be recorded in addition to those being currently monitored.

4. RECORDING AND REPORTING ON MONITORING CARRIED OUT

A brief report summarizing monitoring work will accompany the descriptive material compiled.

All data collected for each monitoring point will be collated. Culvert and depression data will appear separately and using a different numerical sequence to stream bed data.

It is intended to add follow up monitoring data to initial monitoring data for ease of comparison.

Different coloured cardboard sheets have been sued for photo presentation and as a basic substitute for an index as it was felt that indexing should be done when trials are complete and all information is gathered.

All monitoring points have been recorded on an overlay of a colour vertical coupe photograph for each trial.

Other information to be gathered as it becomes available is:

4.1 Actual volumes of sawlog and chipwood cut from each coupe.

4.2 A diary of activities will be kept (commencement and completion) e.g. cutting, burning, planting, rehabilitation of landings etc.

4.3 Follow up monitoring data.

4.4 Information gained from PWD Stage Height Sampling.

4.5 Information gathered from sediment traps installed in stream bed.

APPENDIX I KAF1

WOODCHIP - MONITORING TECHNIQUES ASSOCIATED WITH PROPOSED TRIALS INTO CUTTING SELECTED RIVER AND STREAM RESERVES

Introduction

It is proposed that three coupes will be monitored during 1984/85. These coupes are:

Sutton 4 - clearfelling and regeneration of an area of 60 ha surrounded by established regeneration.

Poole 10 - expansion of an existing coupe, and reduction of and stream buffer strip from 100m to 50m.

Lockhart 2 - expansion of an existing coupe and reduction of and river buffer strip from 200m to 100m.

Coupes at Crowea 4, Lockhart 11 and Mattaband 12 will not be monitored. Further monitoring of additional coupes may be desirable at a later date. A decision will be made once the results of the initial monitoring have been evaluated for effectiveness and practicability.

Techniques

Several monitoring techniques have been suggested for studying the effects of trials related to additional cutting by coupe expansion into selected river and stream reserves in the Woodchip License Area. These techniques are:

(i) Silting ponds placed within stream channels. This type of monitoring is only suitable on small stream situations. The style of ponds suggested range from concrete structures formed on site to rectangular culvert section placed in the stream bed.

(ii) Placing sand bags or some similar obstruction within the stream channel to create a damming effect. This method has a similar application to (i) above.

(iii) Silt traps or troughs located within the catchment. This type of monitoring applies to the larger stream or river situations where it is not feasible to apply (i) and (ii). The technique involves several troughs located within depressions or minor water courses in the original buffer area. These depressions are likely to carry runoff from road culverts bordering the original stream reserve. Therefore, they constitute a point source monitoring technique that combines both road and treated catchment runoff.

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(iv) Descriptive studies of reworking of sediments both within the catchment and stream channel. This may involve a combination of several techniques. These include;

- tracing zones of erosion and deposition across the treated catchment i.e. tracing sediment deposition from road runoff below culverts.

- tracing sediment deposition in pools along stream channels below areas of disturbance.

- measuring sediment deposition at predetermined points along the stream channel, in depressions or below culverts by cross-sectional surveying from set points or measuring stakes surveyed into the stream channel.

- a pictorial history of specific areas to act as a backup to the methods outlined above.

(v) Stage height sampling of suspended sediment.

With the exception of stage height sampling, the techniques outlined above only allow detection of the courser bed load fraction of sediment discharge associated with treatment of stream buffers. In order to gain a more accurate insight into the effects of cutting stream buffers on both the fine and coarse components of sediment discharge, it has been proposed to cut the stream buffer on the April Road North catchment three to four years after replanting. Additionally, this will allow at least one detailed study of the clearing cycle associated with the catchment clear-felling operation.

Prescriptions

Sutton 4; - This stream is too large to install proposals (i) and (ii). Therefore, it will be necessary to implement methods (iii) and (iv). This will ential placing several troughs below culverts from the main haul road that runs parallel to the stream. This will provide information on sediment supply to the stream. Details of sedimentation within the water course itself will have to be done descriptively by method (iv).

(a) Pools within the coupe and up to 100m upstream of the coupe will be described during summer 1984/85, once flow has ceased. At least 10 pools uniformly spread along each section will be probed for silt depth along the two widest axes. These pools will be re-examined in a similar way during summer 1985/86 and 86/87. Photographic records will complement this work.

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(b) All natural depressions and culverts leading into the coupe will be described before cutting commences. The nature of silt deposition will be recorded in terms of length, width (every 5m along the length) and depth (every 25 cms along the width). A sketch plan will be prepared. Photographic records will complement this work. These areas will be revisited and described in summer 85/86 and 86/87.

(c) When major problem areas occur as a result of the operation, these will be described during the following summer by methods outlined in (b) above.

Pool 10; - This stream is small enough to utilise methods (i) or (ii). However, resulting from poor roading design during treatment of the coupe, large amounts of deposition are present within the stream channel. Because of this, it may be more fruitful to carry out a type (iv) descriptive study of sedimentation within both the buffer area and the stream channel.

(a) Pools within the coupe will be described in early summer 84/85 once flow has ceased, at four sites each about 50m in length (see plan for location of these sites). At least 10 pools uniformly spread along each section will be probed for silt depth along the two widest axes. These pools will be re-examined in a similar way during summer 85/86 and 86/87. Photographic records will complement this work.

(b) All natural depressions and culverts leading into the experimental areas will be described in early summer. The nature of silt deposition will be recorded in terms of length, width (every 5m along the length) and depth (every 25 cms along the width). A sketch plan will be prepared. Photographic records will complement this work. These areas will be revisited and described in summer 85/86 and 86/87.

(c) When major problems areas occur as a result of the operation, these will be described during the following summer by methods outlined in (b) above.

(d) Silting ponds (either sandbags or 200 litre drums cut in half) will be built below each of the four sites and below the confluence of the two streams.

(e) A stage height sampler will be installed below the confluence of the two streams. Samples will be analysed for turbidity and sediment concentrations less than 63 microns in size. Installation operation analysis will be carried out by the PWD.

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Lockhart 2:- The Deep River is too large to be monitored adequately. Monitoring will be confined to the edge of the cutting coupe.

(a) All natural depressions and culverts on the existing edge of the coupe (200m from stream line) and the new edge (100m) will be described in early summer 84/85. The nature of silt deposition will be recorded in terms of length, width (every 5m along the length) and depth (every 25 cms along the width). A sketch plan will be prepared. Photographic records will complement this work. These areas will be revisited and described in summer 85/86 and 86/87.

(b) When major problems areas occur as a result of the operation, these will be described during the following summer by methods outlined in (a) above.

MANJIMUP 6/11/84 - ADDITIONS TO PRESCRIPTIONS

A. Hordacre, P. King, Don Barrett, F. Batini

SUTTON 4

A. Proposed changes:

a. Stage ht sampler + rating curve for outlet (PWD) at 10 cm increments.

b. Grab samples both above and below Sutton 4, stage height sampler, 3 in all. (FD and PWD).

c. Level survey between sites across pools (PWD) after burning.

d. Location of stage ht. sampler at Strop Road.

B. Planned programme of cutting:

Commence cutting soon (top priority).

C. Monitoring

Profile of stream bed + banks (2m +). Star pickets + tape. Measure depth to streambed at every point of change. Preferably record on computer coding sheets.

D. Continue with description prior to the cut, and preliminary selection of sites.

E. Problem areas - depth probing (Hordacre)
- place sample site below coupe - Yes
- birds.

F. Graph paper on reverse of descriptive sheet. Probe OK in silt off road (wooden pegs), bnt not in stream bed.

POOLE 10

* 44 gal drums cut as follows and placed at 90° to stream bed --

(level and as natural as possible)

* Stage height sampler below confluence of 2 streams. FD to cut walkway to the junction from the log road. Suggested increments for sampler is 5 cm increment.

* Sampler sites can be established now as the stream buffer won't cut.

* Descriptive work only applies to the bank on the side where cutting is taking place.

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LOCKHART 2

* A.H. to contact P. Bidwell to establish regen. boundary.
FB, AH, PK, DB to visit again in about 3 weeks.
Next visit 27.11.84.

Frank Batini.

F. BATINI
INSPECTOR ENVIRONMENTAL PROTECTION

FB:vh

Copies to:
Mr. Hordacre - Manjimup
Mr. King - PWD
Mr. Barrett - PWD, Mjp
Mr. Walker - Manjimup ✓

SHANNON ALTERNATIVE RESOURCE

CUTTING TRIALS IN RIVER AND STREAM BUFFERS

STREAM BED AND BANK OBSERVATIONS

TRIAL CUTTING AREA: •SUTTON 4

OBSERVER: A. HORDACRE DATE: 30/9/84

POINT NUMBER: 1A

BANK TO BANK WIDTH: VARIES FROM 4-6M. NATURAL BANKS DISTURBED AND BATTERED FOR 8M DOWNSTREAM OF BRIDGE.

BANK HEIGHT: POINT 1 2M POINT 3 1.5M

POINT 2 1.5M POINT 4 1M

STREAM BED DESCRIPTION:
- BED OF AN UNEVEN NATURE
- GRAVEL BED WHERE ROAD MATERIAL HAS FALLEN FROM BRIDGE
- WATER CLEAR
- BED GENERALLY SANDY ON UNDISTURBED SITE
- QUANTITIES OF TRASH AND LOG MATERIAL LITTER STREAM BED

DESCRIPTION OF VISIBLE DISPERSAL OR BUILD UP:
- HEAVY GRAVEL AND SHALE BUILD UP 2.3M UP STREAM OF AND 14M DOWNSTREAM OF BRIDGE. MOVEMENT OF THIS MATERIAL HAS BEEN IMPEDED LOG AND TRASH DEBRIS.
- WHITE SANDY SEDIMENT IS BANKED AGAINST LOG DEBRIS IN STREAM BED.
- SOME SANDY SEDIMENT BANK OVERFLOW OBSERVED ON FLOOD PLAIN.

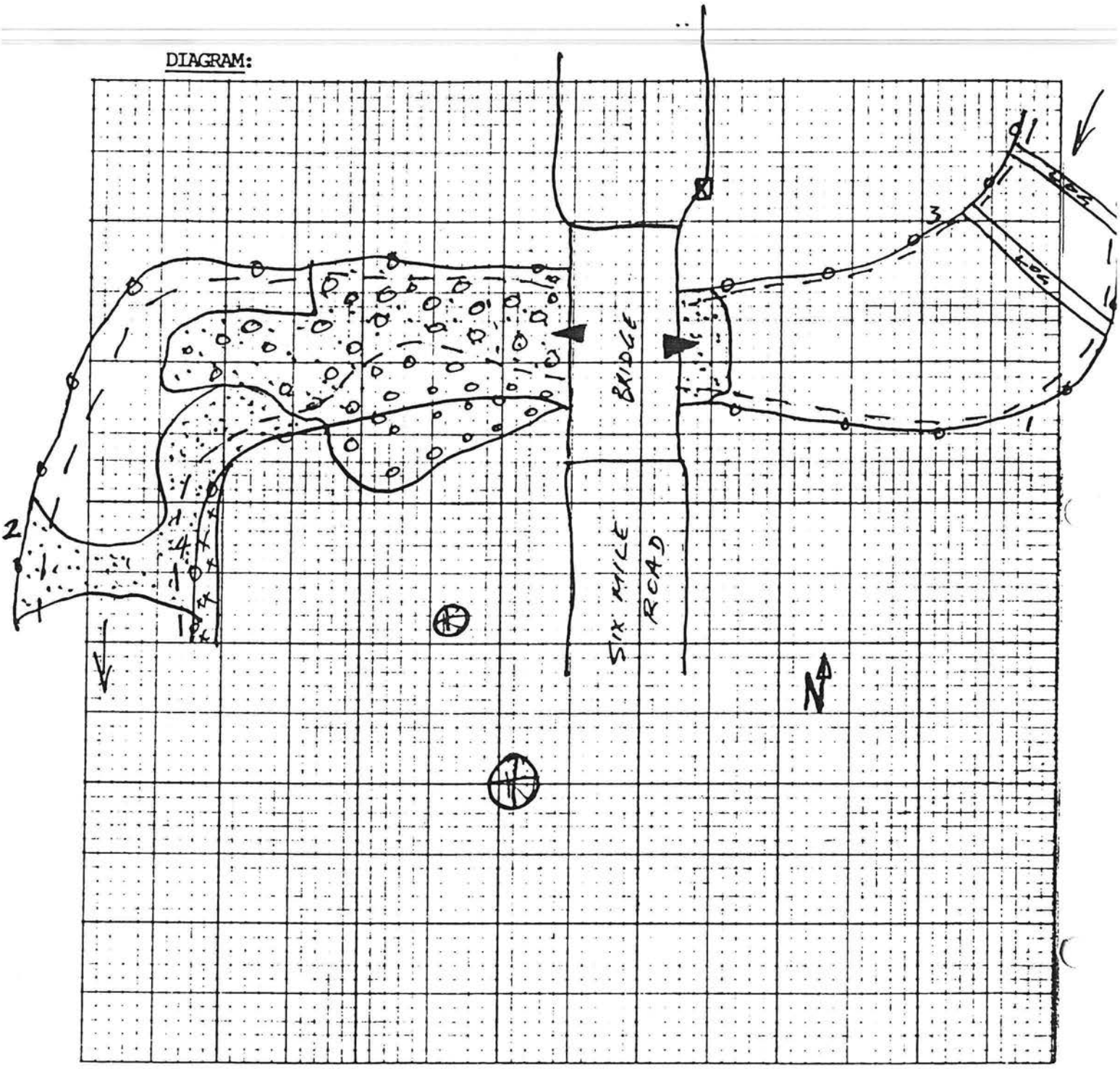
TYPE OF DEPOSITION:

- GRAVEL AND SHALE (AS ABOVE)
- WHITE SAND OVER LAYED BY 10MM OF SUSPENDED PARTICLES WHERE WATER PRESENT.
- WHITE SANDS, SOME CLAYS AND ORGANIC MATERIAL WHERE BANK OVERFLOW HAS OCCURRED.

BANK AND BED STABILITY:

- BANKS HAVE STABILIZED WHERE DISTURBANCE HAS OCCURRED - ALL BANKS WELL VEGETATED AND STABLE.
- BED IN NATURAL STABLE CONDITION OUTSIDE DISTURBED AREA - STABILIZED BY LOG AND TRASH DEBRIS.
- IT IS LIKELY THAT CHANNEL DEPTH HAS BEEN REDUCED BY SEDIMENTATION FROM PAST LOGGING.

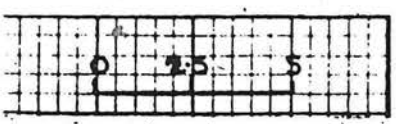
DIAGRAM:



LEGEND:

- Sediment Deposition
- Gravel Deposition
- Water Level
- Photograph Position
- Permanent Marker Pegs
- Tree or Stump
- Sediment Deposition Bank Overflow
- Stream Bank
- Stream Bed Profile Survey

SCALE:



EXAMPLES OF STREAM BED PHOTOGRAPHY RECORDS

EXAMPLE ONLY

SAND BANKING AND DEBRIS WITHIN STREAM BED

SHANNON ALTERNATIVE RESOURCE

CUTTING TRIALS IN STREAM AND RIVER BUFFERS

DEPRESSION & CULVERT OBSERVATIONS

TRIAL CUTTING AREA: SUTTON 4

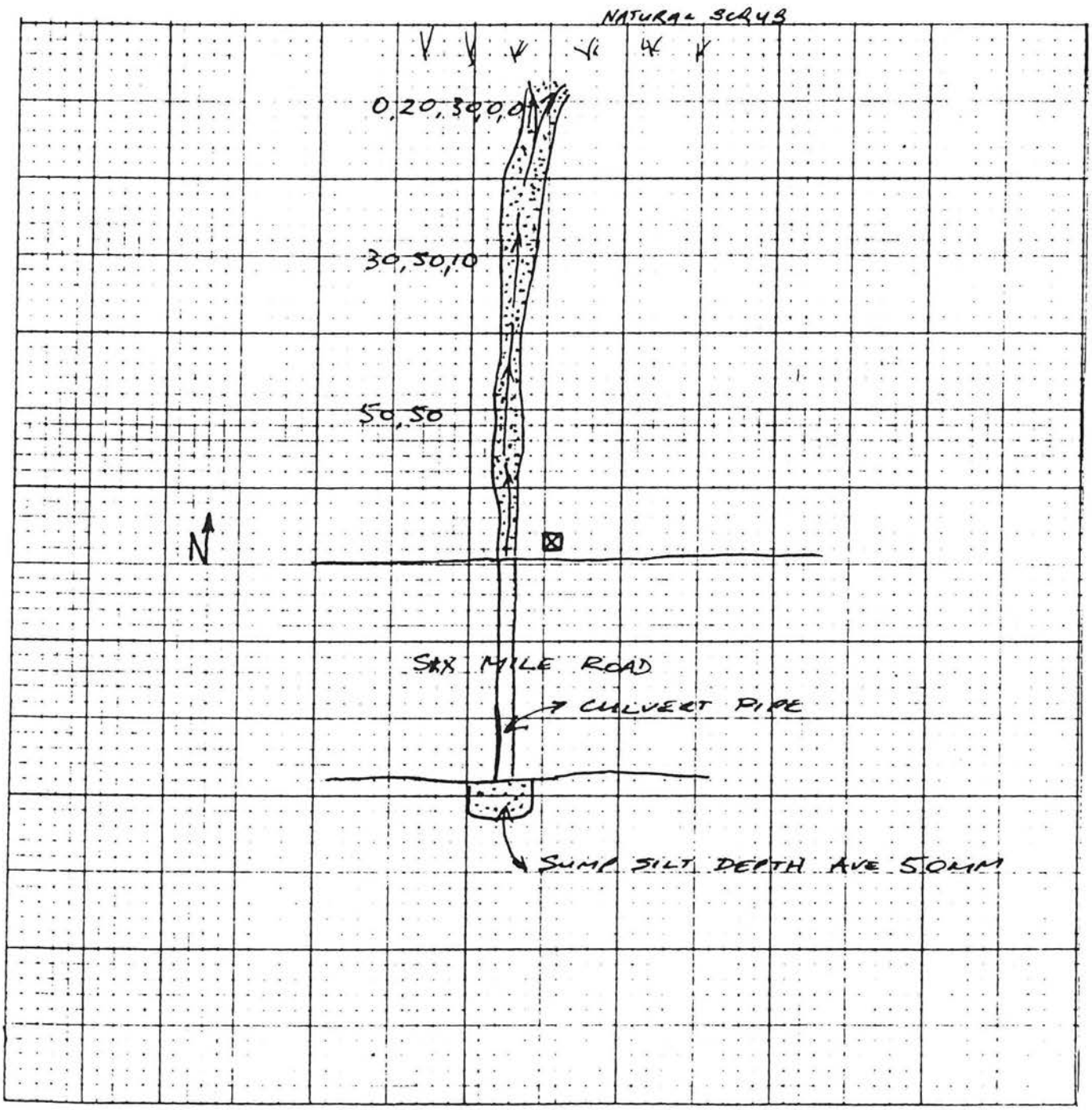
DATE: 24/10/84 POINT NO: 1

OBSERVER: A. HORDACRE

DESCRIPTION OF SITE:

- 375MM CULVERT PIPE, SIX MILE ROAD.
- CULVERT OPEN.
- VERY STABLE AND SEDIMENT FREE SITE.
- RE-VEGETATION OF NATURAL SCRUB BEGINNING.
- SEDIMENT DISPERSAL AND DEPTH (SEE DIAGRAM OVER PAGE).
- VERY LITTLE HEAVY SILT OBSERVED.
- NO SEDIMENT OBSERVED BELOW MAIN CHANNEL OR WITHIN VEGETATED AREA.

DIAGRAM:

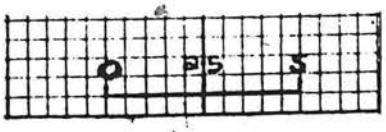


NOTE: All sediment probing was done diagonally across direction of movement. Depth records shown were all probed at 30cm intervals.

LEGEND:

Marker Peg	⊠
Lowest Point	→→→
Fine Sediment	⬭
Heavy Sediment	⬭
Trees or Stumps	⊗
Sediment Depths	20, 30, 40 ETC.

SCALE:



EXAMPLE OF DEPRESSIONS AND CULVERTS PHOTOGRAPHY RECORDS

EXAMPLE ONLY

SEVERELY DISTURBED TABLE DRAIN AND SEDIMENT DEPOSITS WITHIN SUMP AREA

E.P.A. VISIT - FRIDAY 19TH JULY

THEME: Jarrah Forest - logging and regeneration
Hydrology including stream reserve trials

0830 Depart Manjimup
Travel via Muir Highway

0845 **Stop 1.** Dingup 4 - Jarrah/Marri selection cut, road reserve cutting trial.

Travel via Muir Highway, Nyamup, Pine Road.

0920 **Stop 2.** Mooralup 2 - Kelsall Project 4 catchment, Jarrah/Marri clearfell 1978.

Travel via Muir Highway, Deeside Coast Road, Lockyer Road (Sutton 19/21 no stop).

1000 **Stop 3.** Sutton 13 - Kelsall Project 2 catchment, 1983 karri regrowth Hydrology studies.

Travel via Six Mile Road.

1030 **Stop 4.** Sutton 4 - Stream reserve cutting trial, karri clearfelling, erosion control.

Travel via Lockyer Road, Bannister Road.

1130 **Stop 5.** Poole 10 - Stream reserve cutting trial, karri cut to seed trees.

1230 Arrive Manjimup

(CALM Paricipation: McKinnell, Christensen, Walker, Water Authority: Loh, Stokes (?))