EROSION CONTROL STRUCTURES
IN GILLEN CREEK — RIDE 1966
INVESTIGATION OF WATER COURSES.

To provide experience and data in river control and sedimentation problems including reduction of erosion it is proposed to construct many erosion control structures, erosion and sediment deposition measuring devices. Such survey will be carried out as will provide information on change of streams and catchments due to natural and artificial changes.

CATCHMENTS AND STREAMS.

The investigations will cover streams and areas in close proximity to Alice Springs. This is justified by economics and ease of taking observations. All types of erosion are prevalent in this area however there is the possibility that installations particularly measuring devices could be disturbed.

The streams to be investigated are the Todd River and its tributaries north of the Mataranka. Most of the erosion control structures are to be constructed on Willow Creek. This creek joins the Todd River at the foot of the Mataranka Range. The length of the main stream, is approximately five miles, it flows from west to east. This stream contains many excellent examples of small and large gully erosion, stream bank collapse, headwater and sheet erosion. It is believed that the construction of many types of structures on this catchment will show both the effect of each structure on the stream and the effect of the stream on each type of structure. Other streams in which structures are to be constructed are located on Bond Springs and Undoolya Stations. It is believed that these structures will indicate effect of the structures on catchments.

Measurement is to determine amount of erosion and deposition and places where they occur. It is to determine the reduction of erosion due to the various types of structure, and the life of reservoirs due to silting up. Finally it will determine whether a dual purpose structure designed to reduce erosion and provide storage water is feasible.

AIM OF STRUCTURES.

The purpose of the structures may be itemised as:-
1. Indicate reduction of erosion by a control structure.
2. Indicate which type of structure is most suitable for each type of erosion.
3. Provide small floodouts up stream of some types structures.
4. Provide storage water.
5. Show effect of structures on catchment vegetation.
7. Indicate cost of structures to show feasibility of their construction on a large scale.

TYPES OF STRUCTURES.

It is proposed to construct structures of various shapes, sizes and materials to control each type of erosion. To control headwater, gully and bank erosion drop structures are to be constructed.

1. TAR DRUM STRUCTURES.

At present the Department of Works have large dumps of empty tar drums. It is believed that these drums if filled with rocks and sand and joined together would provide a solid durable barrier. By the time the iron (which is covered with tar) corroded the sand and rock would have formed a hard sandstone. This mixture could of course be stabilised with lime or cement however this is believed to unnecessary, and would increase the cost of the structure considerably.
The types of tar drum structures proposed are:

One line of tar drums on their ends filled with a mixture of sand and rock set eighteen (18) inches in the bed of a stream several drums being dug into each abutment. The drums are to be wired together with log fencing wire, and abutment downstream is to be protected by hand placed rocks catch and side drains being constructed to protect the structure from run-off in the vicinity of the abutments.

As above plus mortar cementing the rock on the apron and abutments.

In a small gully drums are to be filled with sand and rock and placed on their sides with axis perpendicular to the direction of flow of the water. The half buried drums are to protrude well into each abutment.

As above with rock apron, abutment protection and drains.

Concrete Drop Structures.

It is proposed to construct two concrete drop structures one being a sand dam with siphon the other being a simple wall which placed above a stream bed. The simple wall will give a guide of time to silt up a dam and will be a control of water stored with reference to the sand dam. Both structures are to have upstream and downstream aprons with cut-off walls. Rock protection on abutments and catch and side drains. Both are to be reinforced with steel mesh. They will be constructed using metal formwork and ready mixed concrete.

Wire Mesh Structures.

The success of these types of structures has been proved in other parts of the world. Generally they consist of wire mesh boxes filled with stones, the boxes wired together to form a wall. By the time the wire has corroded the voids between the stone, have been filled with sand and silt to form a solid sandstone or conglomerate.

It is proposed that several types of wire mesh structures be constructed.

Boxes made from steel mesh. These boxes to be of size 3ft. x 2ft. x 1ft. and to be filled either with three inch aggregate or rock found in site. The boxes are to be wired together with 14 gauge tie wire. The structure is to have a down stream apron of placed rock and concrete and rock protected abutments plus catch and side drains.

Boxes with metal frame and covered with wire mesh. Similar structure as (a)

Rock wall covered with chain wire which is firmly staked down. This wall to have upstream and downstream aprons plus abutment protection.

Rock wall covered with wire mesh (poultry wire). Structure to be similar to (a) above.

Galvanized Iron Structures.

These structures will be essentially wires which in time will silt up to form drop structures. Two types are proposed.

A corrugated galvanized iron wall with two inch diameter pipe 'A' frame supports at six (6) feet centres plus sand and rock placed down stream at the wall. The placed rock is to include energy dissipator blocks. The abutments are to be protected by rock and drains.

As above without the 'A' frame supports.
5. **Sand Bag Walls.**

Although these structures may not be successful as drop structures in streams it is anticipated that they will be particularly suitable in shallow and narrow gullies.

One experimental structure should be built in a stream it should consist of a sand bag wall with rock protection down stream and on the abutments. Energy dissipators should be placed up stream these could consist of piles of rock or tar drums filled with rock and sand. Other sand bag walls should be placed in various small gullies. Good catch drains will be required. The sand bags should be filled with:

- (a) Course Sand.
- (b) Aggregate.
- (c) Mixture of sand and stones.

6. **Crib-Block Wall.**

Crib blocks with voids filled with rock or sand bags may provided a cheap (labour saving) strong wall. They would be suitable for streams and would consist of a crib block wall with rock protection down stream abutment protection and velocity dissipators upstream.

**Instrumentation.**

Many parameters control amount and types of erosion hence it is difficult to determine over a short period of time the reduction of erosion due to erosion control structures. We have considerable hydrographic data covering the area where these structures are to be constructed. A wide network of rain gauges, several pluviographs, rising stage sediment samplers, maximum height indicators and automatic float recorders exist in the area. Also an extensive programme of suspended sediment sampling has been undertaken in the area. Further instrumentation proposed is:

- a) Installation of further rising stage sediment samplers. These instruments consist of a stack of five (5) stubby bottles above each other to which plastic inlet pipes and breakers are connected. From the samples obtained an estimation of the suspended sediment load at that cross section of the stream can be calculated.
- b) Installation of further maximum height indicators. These instruments consist of a 10 gauge wire or 8” conduit painted with water colour paint and installed in a one (1) inch or two (2) inch diameter water pipe. Flow in the stream washes off the paint hence indicating maximum water level.
- c) Installation of further rain gauges. An extensive rain gauge network covers the Gold River catchment north of the Heavitree range however only one rain gauge is in existence on the Gillen Creek catchment it is likely that Heavitree Range has an orographic influence on this catchment hence a network of rain gauges is required on this catchment if the discharge of the creek is to be accurately estimated from rainfall figures.
- d) Chain scour gauge. This simple device provides a direct approximation of the net amount of channel scour and fill between observations. It consists of a five (5) feet long chain jetted vertically into stream bed. If the stream bed is scourd a part of the chain is exposed and laid horizontally on the stream bed by the current. It is then covered up in that position when fill occurs after the initial scour. On the resurvey, a hole is dug until the chain is reached and the position on the chain where it changes from a vertical to a horizontal position is noted.
- e) Erosion Pins. To measure surface erosion nails are slipped through a large washer and driven into the ground in a vertical position until the washer is flush with the ground surface. Surface erosion undermines the washer which they slip down the nail giving direct measurement.
(a) Pointed Rocks.

The movement of painted rocks in the stream bed, in conjunction with recordings with maximum height indicators enables estimates to be made of the ability of specific flows to move various sizes of bed material. In small head water rills each individual rill rocks of a uniform size are painted and located at ten foot intervals along the rill channel, each being numbered in a different colour representing the initial distance in feet up stream from the base point.

(b) Photography

Variations of erosion and vegetation may be best seen from a series of photographs taken from a particular point. It is proposed to take a series of photographs at each erosion control structure, interesting erosion and at some of the instruments.

Surveying.

A topographic map at the Gillen Creek Catchment is being drawn using photogrammetry. This map will enable an accurate estimation of the catchment area, location of networks, location of structures and instruments, enable geology and vegetation to be delineated.

Where necessary detail topographic maps will be drawn using a plane table. These plans will be required in the vicinity of the erosion control structures, areas of erosion under observation and near some of the measuring devices. A series of cross-sections across the various channels should enable a measurement of the aggradation or degradation of the channel bed with time. A series of cross sections have been set out by Lands & Survey Branch covering the Todd River in the Alice Springs town area. The lack of detail that may be obtained from these section indicates that numerous levels should be taken and care should be used when choosing locations.

A longitudinal section along the centre of Gillen Creek will be required to locate position of erosion control structures.

The structures should be located outside of each others direct influence.

MATERIALS LIST.

<table>
<thead>
<tr>
<th>TAR DRUM DROP STRUCTURE TYPE (a)</th>
<th>Item</th>
<th>No. Required</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tar Drums</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire - fencing, galvanised</td>
<td></td>
<td>250ft.</td>
<td></td>
</tr>
<tr>
<td>(Plain) 16 gauge</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>TAR DRUM DROP STRUCTURE TYPE (b)</th>
<th>Item</th>
<th>No. Required</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tar Drums</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire - fencing, galvanised</td>
<td></td>
<td>250ft.</td>
<td></td>
</tr>
<tr>
<td>(Plain) 10 gauge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>6 bags</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TAR DRUM DROP STRUCTURE TYPE (c)</th>
<th>Item</th>
<th>No. Required</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tar Drums</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire - fencing galvanised</td>
<td></td>
<td>20ft.</td>
<td></td>
</tr>
<tr>
<td>(Plain) 10 gauge</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TAR DRUM DROP STRUCTURES TYPE (d)</th>
<th>Item</th>
<th>No. Required</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tar Drums</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire Fencing galvanised</td>
<td></td>
<td>20ft.</td>
<td></td>
</tr>
<tr>
<td>(Plain) 10 gauge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure Type</td>
<td>Material</td>
<td>Dimensions or Quantity</td>
<td>Cost</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------</td>
<td>------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Wire Mesh Drop Structure Type (a)</td>
<td>Steel mesh boxes.</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Angle iron 1&quot; x 1 1/2&quot; x 3/8&quot;</td>
<td>1200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 gauge tie wire</td>
<td>200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td>6 bags.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weld rods, 10g.M.S.</td>
<td>50 lb.</td>
<td></td>
</tr>
<tr>
<td>Wire Mesh Drop Structure Type (b)</td>
<td>Angle iron 1&quot; x 1 1/2&quot; x 3/8&quot;</td>
<td>1200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chain wire width 10ft. 2&quot; mesh.</td>
<td>1200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 gauge tie wire</td>
<td>200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td>6 bags.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weld rods, 10g. M.S.</td>
<td>50 lb.</td>
<td></td>
</tr>
<tr>
<td>Wire Mesh Over Rock Wall (a)</td>
<td>Chain wire width 10ft. 2&quot; mesh.</td>
<td>600ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 gauge tie wire</td>
<td>200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Star pickets. 6ft.</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Poultry Wire Covering Rock Wall</td>
<td>Wire mesh.</td>
<td>Coil.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 gauge tie wire</td>
<td>200ft.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Star pickets 6ft.</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Galvanized Iron Wire With A Frame</td>
<td>Corrugated G.I. Sheets.</td>
<td>12 sheets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20g. 10/3&quot; square.</td>
<td>3 lengths.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/4&quot; Water pipe 21ft. lengths.</td>
<td>3 lengths.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elbow 90°-P x 2&quot;</td>
<td>6 required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolts 5&quot; x 1/2&quot;</td>
<td>1 gross.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weld rods, 10 gauge.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paint primer.</td>
<td>1 gallon.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paint gold.</td>
<td>1 gallon.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>turps.</td>
<td>1 gallon.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement.</td>
<td>6 bags.</td>
<td></td>
</tr>
</tbody>
</table>
It is recommended that 6 ft. 20 gauge, 10/3" Conduit be used. Paint is preferred. Ajay Gold Paint is to be used. Cement is used.

Sand Bags to cover well. 21 ft. length. Tie 14 gails.

Cement is used.

Painted Rocks. Required Paint: Gold, Black, Green.

Tie Rods: 12 sheets. 3 lengths. 100 ft.

Cost: 10 gals.

Number Required: 12 sheets.

Cost: 100 ft.
## Materials for Erosion Control Structures

<table>
<thead>
<tr>
<th>Specification</th>
<th>No. Req.</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugated galvanised sheets</td>
<td>24 sheets</td>
<td>48 - 00</td>
</tr>
<tr>
<td>- Length: six (6) fest.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gauge: 20 G.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Corrugations: 10/3&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolts &amp; Nuts</td>
<td>2 gross</td>
<td></td>
</tr>
<tr>
<td>- Steel: black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cup head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Square neck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Round Shank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Square nut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Whitworth thread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Length: 3&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Diameter: 3⁄4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fencing Wire - 10 gauge</td>
<td>1 coil</td>
<td>8 - 30</td>
</tr>
<tr>
<td>Tie Wire - 14 gauge</td>
<td>1 coil</td>
<td>9 - 00</td>
</tr>
<tr>
<td>Cement</td>
<td>60 bags</td>
<td>123 - 60</td>
</tr>
<tr>
<td>Angle Steel</td>
<td>05/1449</td>
<td>140 - 00</td>
</tr>
<tr>
<td>- 1&quot; x 1&quot; x 3/8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain wire (cyclone)</td>
<td>2,400 ft.</td>
<td>140 - 00</td>
</tr>
<tr>
<td>- Width: 10 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mesh: 2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gauge: 12 G.</td>
<td>180 ft.</td>
<td>106 - 00</td>
</tr>
<tr>
<td>Netting Stock items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire netting - galvanised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 36&quot; x 1&quot; x 20 gauge - Poultry</td>
<td>04/475</td>
<td>7 - 85</td>
</tr>
<tr>
<td>Elbow - 90° Female x Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galvanised malleable cast iron</td>
<td>06/339</td>
<td>5 - 45</td>
</tr>
<tr>
<td>- Length: 6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Diameter: 3⁄4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tubing Steel</td>
<td>05/911</td>
<td>31 - 30</td>
</tr>
<tr>
<td>- Galvanised medium screwed &amp; socketted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 5 ft. x 6 mm. long</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>- Diameter: 2 inch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tubing Steel</td>
<td>06/909</td>
<td>172 - 00</td>
</tr>
<tr>
<td>- Galvanised medium screwed and socketted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 5 ft. x 6 mm. long</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>- Diameter: 2 inch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rods for mild steel</td>
<td>150 lb.</td>
<td>37 - 50</td>
</tr>
<tr>
<td>(Graded 47 A.W.S. Class B 7014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Star Pickets - 6 foot long</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valves - gate 3⁄4&quot; Bronze</td>
<td>06/1002</td>
<td>6</td>
</tr>
</tbody>
</table>

/- 2 -
<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>No. Req.</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiwel Coil Chain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size  ( \frac{3}{8} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inside width 1/2''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inside length 1.7/64''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10, 3 links per foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint, Gloss - Gold (yellow)</td>
<td>3 gals.</td>
<td></td>
</tr>
<tr>
<td>Paint, Primer (Metal)</td>
<td>1 gal.</td>
<td></td>
</tr>
<tr>
<td>Turpentine</td>
<td>4 gals.</td>
<td></td>
</tr>
<tr>
<td>Nails - wire 6'' x 4 g.</td>
<td>02/514</td>
<td>20 lbs.</td>
</tr>
<tr>
<td>Washers, Steel - Black flat round 9/16</td>
<td>02/5707</td>
<td>3 lbs.</td>
</tr>
<tr>
<td>Standard Sand Bag - Mason 36'' x 14''</td>
<td></td>
<td>750 bags</td>
</tr>
<tr>
<td>Trowel - Bricklayers, laying</td>
<td>A1/6670</td>
<td></td>
</tr>
<tr>
<td>Trowel - Bricklayer, pointing</td>
<td>A1/6676</td>
<td></td>
</tr>
<tr>
<td>Trowel, Flooring Float 14''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiers, Combination for wire fencing</td>
<td>10''</td>
<td></td>
</tr>
<tr>
<td>Aluminum lined surface level with hooks to hold it on a line weight ( \frac{3}{4} ) oz. length 3 inches.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level - Spirit with Plumb Aluminum 30'' long</td>
<td>A1/3123</td>
<td></td>
</tr>
<tr>
<td>Line Chalk carpenter - 60 ft. roll</td>
<td>A1/3167</td>
<td>2 rolls</td>
</tr>
<tr>
<td>Claw Hammer 20 oz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Nose diagonal cuttingpliers 6''</td>
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<td></td>
</tr>
<tr>
<td>Bolt cutter - for cutting bolts, wire chains etc.</td>
<td>Length 24''</td>
<td>Cat bolts up to ( \frac{3}{8} ) diameter.</td>
</tr>
<tr>
<td>Back Saw - Frame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tubular bow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cast handle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>blade length 12''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>depth of bow ( \frac{3}{2} )''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hacknew Blades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>length 12''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>width ( \frac{3}{2} )''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thickness 0.025''</td>
<td></td>
<td></td>
</tr>
<tr>
<td>teeth per inch - 18</td>
<td>A1/4285</td>
<td></td>
</tr>
<tr>
<td>Try Square Marked on both sides in inches</td>
<td>Lengths 10''</td>
<td>A1/5653</td>
</tr>
<tr>
<td>Tin Snips - straight pattern 10''</td>
<td>A1/4752</td>
<td></td>
</tr>
<tr>
<td>String (for sand bags)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Strainer - Fencing Wire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(-3\)...
EROSION CONTROL STRUCTURES.

DROP STRUCTURE NO. 1.

A drop structure has been constructed across Gillen Creek upstream of the sand borrow area (see locality plan).

PURPOSE.

This structure is the first of several to be constructed in the area. The type of erosion prevalent in the area can only be arrested by channel stabilisation with artificial structures. A drop structure provides an artificial control which prevents further down cutting of the stream into its bed. The control places a limit on headward erosion in the gulleys and other tributaries upstream of the structure. Its shape and size, particularly in the vicinity of its abutments will control lateral erosion of the stream channel. Artificially raising of the stream bed reduces the stream gradient with subsequent deposition of sediment load along the stream banks in the vicinity of the structure and a reduction in the total suspended sediment carrying capacity of the stream.

The structure is one of several types of drop structures to be constructed which will indicate which structure is most suitable. The criterion are economics, effectiveness, structural soundness and aesthetics. The structure will also provide statistics on time taken to construct, indicate best construction techniques and provide hydrological information such as time for structure to silt up.

LOCATION.

The structure is located in a deep narrow gully, section of Gillen Creek, as shown in the accompanying cross-section. This gully or scour is seven (7) feet deep and thirty (30) feet wide, and continues from the sand pits (approximately one hundred (100) yards downstream) to the top of the catchment (one and a half (1½) miles upstream).

EROSION.

This deep gully erosion has been partly induced by removal of sand at the sand pits, partly by concentration of water in various areas with the construction of the bitumen road which passes over the catchment, but the main causes are
the natural catchment parameters and the condition of the catchment, prior to heavy precipitation which has occurred during the past summer. Some of these parameters are type and variation of vegetation, steep stream gradient with high catchment run-off coefficient due to the quartzite range parallel with the stream, depth of gravel in the valley, lack of natural controls, such as rapids, rock bars or waterfalls.

The deep gully erosion in the primary stream and its considerable meander causes significant bank collapse with subsequent wide spread lateral erosion of the stream channel. The secondary and tertiary tributaries are deep vee shaped gullies usually terminating with deep headward erosion or rilling. The lack of vegetation has enabled widespread wind and water sheeting to occur over the valley catchment.

The impingement of grains derived from the decomposition of the quartzite is another large factor which contributes to the dramatic erosion which occurs on this catchment. Many large river gums, which have grown along the stream bank, have been undercut, causing their collapse into the stream. The lateral erosion will cause further trees to collapse unless the bank collapse is arrested.

**TYPE OF STRUCTURE.**

The structure of one line of 'tar' drums on their ends, filled with a mixture of sand and rock. These drums are set eighteen (18) inches into the bed of the stream. A hand placed rock apron and energy dissipator protects the structure downstream. A small mound of rock should prevent scouring along the toe of the structure.

**APERTURES.**

The structure extends three (3) drums into each bank, hand placed pitching protecting the structure from scouring. A catch drain to intercept surface water flowing towards the abutments has been constructed. This drain is intended to prevent the undercutting which generally occurs around the abutments of drop structures causing their failure.

**INSTRUMENTATION.**

Maximum height indicators, channel scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of the structures. However, our main method of observations will be visual. Camera stands have been set up and photographs will be taken when necessary.

(S. Ride) 9/3/86
ENGRENER.
CONSTRUCTION REPORT.
DROP STRUCTURE NO. 1.

The construction of this structure commenced on the 2nd March, 1966. When completed it will have taken three and a half (3½) days with around seventy man hours of work.

Construction was carried out in the following steps:

1. Selection of site and survey of cross-section.
2. Excavation across bed of stream pitting the tar drums approximately eighteen (18) inches into the bed.
3. Excavation of abutments for a width of three (3) tar drums.
4. Placement of tar drums.
5. Rock and sand filling of tar drums.
6. Dumping rock downstream of drums to form an apron.
7. Dumping a small quantity of rock along the toe of the drums.

ESTIMATED COST.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>70 hrs.</td>
<td>$70</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>- 2 inch dia. WP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 20ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>- Hire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mileage</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$130</strong></td>
</tr>
</tbody>
</table>

This structure was constructed by hand using free materials - the tar drums and rock. A better method would be to hire a front end loader which could do the excavations and dump the rock. Using this method, the structure could be constructed in three (3) hours or less for the same cost as the above method.
A trickle flow approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL

Structurally the drop structure has withstood the minor flow, minor silting up occurring. The structure directly affected the stream for forty (40) yards upstream.

UPSTREAM APRON.

Has worked satisfactorily, and is covered by silt.

DOWNSTREAM APRON.

With this flow, only a small discharge over the crest of the spillway occurred. Water tended to pass through the structure. The hand placed rocks were not dislodged.

MAIN WALL.

The rocks in some drums had subsided a few inches, presumably silt had been shovelled into the drums instead of sand.

ABUTMENTS.

The protection to the abutments is satisfactory.

( G. Ride )
Erosion Control Structures

Drop Structure No. 1

Inspection Report - 29/6/66

A discharge of approximately eighteen (18) inches deep occurred after high intensity shower rainfall fell on the catchment.

Rainfall:

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/6/66</td>
<td>24</td>
</tr>
<tr>
<td>29/6/66</td>
<td>53</td>
</tr>
<tr>
<td>30/6/66</td>
<td></td>
</tr>
</tbody>
</table>

Structure General:

Good silting up behind the structure has occurred, the structure withstanding the flow. Although the rocks of the downstream apron have been moved slightly, no rocks were carried downstream. The structure is sound.

Upstream Apron:

Worked satisfactory.

Downstream Apron:

The rocks have been dislodged but not shifted downstream.

Main Wall:

The drums have not shifted in position but further subsidence has occurred.

Abutments:

Satisfactory.

Remarks:

Two (2) scours approximately one (1) foot deep have developed downstream. They appear to have stabilized.

(G. Ride)
VIEW OF STRUCTURE FROM LEFT BANK UPSTREAM
(NOT TAKEN FROM CAMERA STAND)

(taken 2/8/66)

(taken 4/2/66)
CROSSECTION AT DROP STRUCTURE 1

HORIZONTAL SCALE 1/8" = 1' 0"
VERTICAL SCALE 1/2" = 1' 0"
EROSION CONTROL STRUCTURES.

DROP STRUCTURE NO. 2.

A drop structure has been constructed across a primary tributary of Gillen Creek upstream of drop structure number one.

LOCATION.

The structure is located in a deep narrow gully as shown in the accompanying cross-section. This gully or scour is seven (7) feet deep and fifteen (15) feet wide and continues from its junction with Gillen Creek forty (40) feet downstream and one hundred (100) upstream. The gradient of this gully is particularly steep as is shown by its longitudinal cross-section.

EROSION.

This deep gully erosion has been induced by the concentration run-off with the construction of the bitumen road nearby. The high intensity precipitation and consequent high run-off which has occurred during the past two months has caused significant quantities of erosion in this gully, many yards of alluvium being moved with each flow.

TYPE OF STRUCTURE.

The structure consists of one (1) line of 'Tar' drums on their ends, filled with a mixture of sand and rock. These drums are set eighteen (18) inches into the bed of the stream. A hand placed rock apron and energy dissipator protects the structure downstream. The surface pitching of this apron is cemented using a mortar slurry. A small mound of mortered rock should prevent scouring along the toe of the structure.

ABUTMENTS.

The structure extends three (3) drums into each bank, hand placed pitching protecting the structure from scouring. This pitching is also cemented using a mortar slurry. The southern abutment is several feet higher than the other abutment, the slope falling away from the gully hence a catch drain is not required on this abutment. A small drain is required on the eastern abutment to prevent scouring and undercutting of the pitching.
PURPOSE.

This structure is one of several to be constructed in secondary streams of Gillen Creek. It will show the effect of channel stabilisation (in its lower reaches) on erosion along its length. A drop structure provides an artificial control which prevents further downcutting of the stream into its bed. In this case, where the structure protrudes above the bed of the stream, the stream bed is raised upstream of the structure and there is a reduction in the average stream gradient hence a reduction in the total suspended sediment carrying capacity of the stream.

This structure is one of several types of drop structures to be constructed which will indicate which structure is most suitable. The criterion are economics, effectiveness, structural soundness and aesthetics. It will also provide hydrological information such as time for structure to silt up and indicate best construction techniques.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of the structures. However, the main methods of observations which will be used will be cross-section, topographic surveys over the small catchment and series of photographs from camera stands.

(G. Ride)
Engineer.
CONSTRUCTION REPORT.

DROP STRUCTURE NO. 2.

The construction of this structure commenced on the 3rd March, 1966. When completed, it will have taken four (4) days with around fifty six (56) man hours of work.

Construction was carried out in the following steps:

1. Selection of site and survey of cross-section.
2. Excavation of abutments for a width of three (3) tar drums.
3. Excavation across bed of stream pitting the tar drums approximately eighteen (18) inches into the bed.
4. Placement of tar drums.
5. Rock and sand filling of tar drums.
6. Dumping rock downstream of drums to form an apron.
7. Dumping a small quantity of rock along the toe of the drum.
8. Cementing Pitching.

ESTIMATED COST.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>56 hours</td>
<td>$36</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td>$12</td>
</tr>
<tr>
<td>- 2 in. dia. W.P. 20ft.</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>- cement - 4 bags.</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
<td>$8</td>
</tr>
<tr>
<td>- Hire</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>- Mileage</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$123</td>
</tr>
</tbody>
</table>

This structure was constructed by hand, there being a small material cost, the drums and rocks being free. The limited space would possibly mean that the abutments could not be excavated using power machines. However, the rock could be truck or power shovel dumped. This would reduce the construction time considerably. The cost of using this equipment would be offset by reduction in construction time hence labour cost.
EROSION CONTROL STRUCTURES

DEEP STRUCTURE NO. 2

INSPECTION REPORT - 7/6/66.

A trickle flow approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

The structure is not working satisfactorily, as much of the water flowing past is flowing under the structure.

UPSTREAM APRON.

Has worked satisfactorily being partly covered by silt.

DOWNSTREAM APRON.

The concrete apron has not been affected by the flow. However, water flowing through the structure is eating away the sand fill beneath the apron.

MAIN WALL.

Satisfactory.

ABUTMENTS.

Satisfactory.

( G. Ride )
Erosion Control Structures

Drop Structure No. 2

Inspection Report - 29/6/66

A six (6) inch discharge over the spillway occurred after the high intensity shower rainfall fell on the catchment.

Rainfall:

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/6/66</td>
<td>24</td>
</tr>
<tr>
<td>29/6/66</td>
<td>83</td>
</tr>
<tr>
<td>30/6/66</td>
<td></td>
</tr>
</tbody>
</table>

Structure General

Good silting up behind the structure has occurred however the downstream apron has collapsed.

Upstream Apron

Satisfactory.

Downstream Apron

With the removal of material (sand and silt) beneath the concrete membrane resulted in the collapse of the apron.

Main Wall

The drums have not shifted in position, minor subsidence has occurred.

Abutments

Satisfactory.

(G. Ride)
EROSION CONTROL STRUCTURES.

DROP STRUCTURE NO. 3.

A drop structure is to be constructed across a deep scour, primary tributary of Gillen Creek, upstream of Drop Structure number one (1).

LOCATION.

The structure is located in a deep narrow gully, as shown in the accompanying cross-section. This gully, or scour, is four (4) feet deep and eighteen (18) inches wide and continues from its junction with Gillen Creek, one hundred (100) feet downstream for two hundred (200) feet upstream. The gradient of this gully is particularly steep as is shown by its longitudinal cross-section.

EROSION.

This deep narrow gully erosion has been induced by concentration of run-off in a shallow valley which has a large potential bed erosion capacity due to depth of Gillen Creek at the junction. Large trees grow on the valley slopes, there being little vegetation along the gutter.

The erosion has occurred as bed erosion with a series of headward erosion steps. Limited bank collapse has occurred, the vertical banks in a mixture of gravel and silt are stable.

TYPE OF STRUCTURE.

The structure will consist of two (2) 'tar' drums on their sides, filled with a mixture of sand and rock. The drums will be at bed level, hand placed rock aprons and energy dissipators protecting the structure upstream and downstream.

ABUTMENTS.

The drums will extend well into each bank, hand placed pitching protecting the structure from scouring. Catch drains will be excavated on the banks above each abutment to prevent surface run-off scouring around the pitching.

PURPOSE.

This structure is one of several to be constructed in secondary streams of Gillen Creek. A drop structure provides an artificial control which prevents further downcutting of
the stream into its bed at the point where the structure is constructed.

This structure is one of several types of drop structures to be constructed which will indicate which structure is most suitable. The criterion are economics, effectiveness, structural soundness and aesthetics. It will also provide hydrological information such as time for structure to silt up and indicate best construction techniques.

PHOTOGRAPHY.

A series of photographs will be taken from two (2) cameras stands. These photographs will show the effect of the structure on the stream.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of the structure. However, the main methods of observations, which will be used, will be cross-sections, topographic surveys over the small catchment and series of photographs from camera stands.

(Seal)
LONGITUDINAL PROFILE, GULLY OFF GILLEN CREEK

Field book No. 368

Scales: Vert. 1 inch = 2 feet
Horz. 1 inch = 20 feet

Surveyed 17-3-66
Drawn 19-3-66
CONSTRUCTION REPORT.

DROP STRUCTURE NO. 3.

The construction of this structure commenced on the 17th March, 1966, and was completed in four (4) hours.

Construction was carried out in the following steps:

1. Selection of site and survey of cross-section
2. Collection of rock fill
3. Excavation of abutments
4. Placement of rock filled tar drums
5. Rock pitching of upstreams and downstream apron and abutments
6. Construction of catch drains

ESTIMATED COST.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>$8</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>- drums</td>
<td></td>
</tr>
<tr>
<td>- rock</td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
</tr>
<tr>
<td>- Hire</td>
<td>$1</td>
</tr>
<tr>
<td>- Mileage</td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td>$11</td>
</tr>
</tbody>
</table>

This structure was constructed by hand there being no material cost. Camera stands have yet to be located. Their cost will be approximately $6.

(G. Ride)  
Engineer.
Erosion Control Structures

Drop Structure No. 3

Inspection Report - 29/6/66.

A flow approximately four (4) inches deep occurred in the gully after high intensity shower rainfall over the catchment.

Rainfall:

- 28/6/66  24 points
- 29/6/66  83 points

Structure General:

Further silting up has occurred and the partial bank collapse has not increased.

( G. Ride )
EROSION CONTROL STRUCTURES.

Drip STRUCTURE NO. 1
INSPECTION REPORT - 7/6/66.

A trickle flow approximately four (4) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

Partial collapse of the southern abutment has not caused failure of the structure. Minor silting up has occurred. The bank collapse which has occurred is due to lack of suitable catch draining.

( G. Hide )
CROSS-SECTION AT DROP STRUCTURE 3

Field book No. 368
Scales: Vert. 1 inch = 2 feet
Horiz. 1 inch = 5 feet
Surveyed 14 17 3 '66
Drawn 14 19 8 '66
EROSION CONTROL STRUCTURE.

DROP STRUCTURE NO. 4.

A drop structure is to be constructed across Gillen Creek upstream of drop structure number one (1).

LOCATION.

The structure is located in a deep narrow gully as shown in the accompanying cross-section. This gully is approximately twelve (12) feet deep and twenty five (25) feet wide. The stream at this section is straight both upstream and downstream of the proposed site.

EROSION.

This deep gully erosion has been partly induced by removal of sand at the sand pits, partly by concentration of water in various areas with the construction of the bitumen road which passes over the catchment, but the main causes are the natural catchment parameters and the condition of the catchment, prior to heavy precipitation which has occurred during the past summer. Some of these parameters are type and variation of vegetation, steep stream gradient with high catchment run-off co-efficient due to the quartzite range parallel with the stream, depth of alluvium in the valley and lack of natural controls on the plain surface.

Three hundred (300) feet upstream of the proposed site, a natural control, a rock bar, has been exposed.

TYPE OF STRUCTURE.

It is proposed to construct an artificial rock control. The structure will consist of a rock wall two and a half (2½) feet high which is covered by wire mesh (poultry wire). In time, sand and gravel will fill the voids between the irregular rock spalls. By the time the wire is rusted, the wall will have formed a solid stable mass.

ABUTMENTS

Excavations are to extend at least three (3) feet into each bank. The cut is to be filled with rock up to natural surface level. A catch drain is to be constructed on each abutment to prevent surface runoff undercutting the pitching.
This structure is one of several to be constructed in Gillen Creek. It will show the effect of channel stabilization on erosion along its length. A drop structure provides an artificial control which prevents further downcutting of the stream into its bed. In this case, where the structure protrudes above the bed of the stream, the stream bed is raised upstream of the structure and there is a reduction in the average stream gradient hence a reduction in the total suspended sediment carrying capacity of the stream.

This structure is one of several types of drop structures to be constructed which will indicate which structure is most suitable. The criteria are economics, effectiveness, structural soundness and aesthetics.

Studying the effect of the stream on the structure is more important in this case than studying the effect of the structure on the stream. The catchment has been altered, by roads, structures, sand pits etc. hence the area is not ideal for study of stream erosion characteristics. However, the intensity, extent and speed at which erosion is now occurring in the area means that dramatic effects will be shown by any structure constructed in the creek. Thus the best design and construction techniques will be indicated after a few stream flows.

PHOTOGRAPHY.

Three (3) camera stands are to be set up around the structure. From these stands a series of photographs will be taken during construction and after various stream flows.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of the structures. However, the main methods of observations which will be used will be cross-sections, detail topographic survey around the structure and a series of photographs from stands.

(G. Ride)
Engineer.
CONSTRUCTION INSTRUCTIONS

DROP STRUCTURE NO. 4

This structure is to be constructed using the materials and method as described below:

LOCATION

The structure is to be located in Gillen Creek as shown on the accompanying locality plan. A short steel picket on each bank indicates the centre of the wall.

TYPE OF STRUCTURE

The structure will consist of a rock wall two and a half (24) feet above the bed of the stream. This wall is to be covered by wire mesh (poultry wire). The wire is to be staked into the rock spalls.

The structure is to have a hand placed rock, downstream apron and an upstream apron and rock cut-off wall.

INSTRUCTION TECHNIQUE

1. Excavate abutments, aprons and cut-off wall, and construct compacted earth wall along the centre line of the structure.

2. Place wire in cut-off wall and fill cut-off wall with rock spalls.

3. Dump rock to form wall and apron of shape as specified in the accompanying cross-sections.

4. Dump rock in abutment cuts, filling the excavation with spalls up to the natural surface level.

5. Securely stake wire over rock wall. The wire mesh should be as tight as is possible.

6. Finish off wall, cleaning up the bed.

7. Construct catch drains on each bank.

8. Erect three (3) camera stands.

MATERIALS REQUIRED

(a) 20 yards of rock spalls - to be taken from borrow area nearby.

(b) Wire mesh.

(c) Steel stakes.

(d) Three (3) camera stands.
PLANT AND EQUIPMENT REQUIRED.

1. Landrover
2. Two picks and shovels and a bar
3. Sledge hammer
4. Builders line.

(S. Ride)
Engineer.
EROSION CONTROL STRUCTURES

DROP STRUCTURE NO. 4

INSPECTION REPORT - 29/6/66

A discharge of approximately one (1) foot deep occurred after high intensity shower rainfall fell on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>29/6/66</td>
<td>24</td>
</tr>
<tr>
<td>29/6/66</td>
<td>33</td>
</tr>
</tbody>
</table>

GENERAL.

The structure is both sound structurally and is effective as an erosion control structure. The structure is silting up to a high degree.

Small scour has occurred downstream however they appear to have stabilized.

( G. Ride )
EROSION CONTROL STRUCTURES.

DROP STRUCTURE No. 4

INSPECTION REPORT – 7/6/66.

A trickle flow approximately six inches deep in the stream occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

GENERAL.

The structure is both sound structurally and is effective as an erosion control structure with small flows. The structure is silting up to a high degree.

UPSTREAM APRON.

Has worked satisfactorily and is covered by silt.

DOWNSTREAM APRON.

Only a small discharge over the crest of the spillway occurred. Water tended to pass through the structure. The hand placed rocks were not dislodged.

MAIN WALL.

The main wall is unscathed the wire mesh appears satisfactory.

ABUTMENTS.

The protection to the abutments is good.

( S. Ride)
EROSION CONTROL STRUCTURES.

GROyne NO. 1.

A groyne has been constructed in Gillen Creek upstream of the sand borrow area (see locality plan).

LOCATION.

The structure is located on the left bank bed in a deep gully section of Gillen Creek, as shown in the accompanying cross-section. This gully or scour is seven (7) feet deep and fifty (50) feet wide, the structure commencing at a meander.

EROSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden stream, particularly at initial points in the irregular meander pattern.

TYPE OF STRUCTURE.

The structure consists of a three inch (3") diameter galvanised iron water pipe wall three (3) feet high and twenty (21) feet long. The wall which is at an angle of 35 degrees (35°) has three (3) supports around which concrete blocks are set to bed levels.

PURPOSE.

This structure is one of several types to be constructed in Gillen Creek. These structures will indicate the best method of combating bank collapse in streams with high vertical banks.

The wall will act as a buffer and deflector causing a reduction in stream momentum with subsequent deposition of sand and silt in the transition area of the stream bend. There is likely to be some scour around the pipe struts, also bank collapse will not cease immediately. A number of flows must occur before the stream reaches a stable condition.

The pipe used as the construction material was reject pipe. The use of pipe for such a structure would normally be uneconomic however any solid durable barrier of the same shape and size would exhibit similar properties.
INSTRUMENTATION.

Maximum height indicators and chain scour gauges will, in time, be placed in the vicinity of this structure. However, the main method of observations which will be used will be cross-sections and a series of photographs from camera stands.

(G. R. Ride)
Engineer.
CONSTRUCTION REPORT.

GHOYNE NO. 1.

The construction of this structure commenced on the 4th March, 1966, and was completed in two hours.

Construction was carried out in the following steps:

1. Selection of site and survey of cross-section.
2. Three (3) vertical supports were pitted.
3. Pipes were welded to supports.
4. Braces were welded to supports.
5. Cement blocks were placed around each support.

ESTIMATED COST.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>4 hours</td>
<td>$4</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2 inch dia. WP 20ft.</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>- 3 inch dia WP</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>- 2 bags of cement</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hire</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>- Mileage</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>$103</td>
</tr>
</tbody>
</table>

The structure was constructed from reject pipe. Any other strong durable material which is cheap would be satisfactory.

(G. Ride)
Engineer.
EROSION CONTROL STRUCTURES

GROYNE NO. 1

INSPECTION REPORT - 7/6/66.

A trickle flow, approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28 points</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78 points</td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

The discharge passed beneath the lower rail. No scouring occurred. A large section of the stream bank behind the structure collapsed.

( G. Ride )
EROSION CONTROL STRUCTURES

GROYNE NO. 1

INSPECTION REPORT – 29/6/66

A discharge of approximately eighteen (18) inches deep occurred after high intensity show rainfall fell on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/6/66</td>
<td>24</td>
</tr>
<tr>
<td>29/6/66</td>
<td>83</td>
</tr>
<tr>
<td>30/6/66</td>
<td></td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

The structure has withstood the flow, no scouring around the columns or struts being apparent. Further collapse of channel banks behind the structure has not occurred.

( G. Ride )
CROSS-SECTION AT GROYNE N° 1

Field book N° 36

Scale: Vert. 1 inch = 2 feet
Horiz. 1 inch = 10 feet

Surveyed: 17-3-66
Drawn: 18-3-66
Horizontally placed pipes recovered by Richie Ronn on behalf of Heathfield Corp. on 11 July 1972.

71-365
REMOVAL OF CRYSTAL NO 1 FROM GILLEN CREEK

Having received information at about 1645 hours on Tuesday 12 July 1972 that persons in a truck were removing some material from Gillen Creek, Engineer Macqueen and myself went to investigate.

As we arrived at a site approximately 400 yards upstream of the Gillen Creek gauging station (COG-003) we noticed a truck in the creek bed. Upon approaching two men climbed into the truck and proceeded about 100 yards upstream so as to be able to drive out of the creek bed. The truck, bearing licence plates 77 71-365 stopped as it reached us on the side of the bank and it was noticed that there were many lengths of pipe on the truck. There was also oxy-acetylene equipment on the back of the truck.

Engineer Macqueen asked the driver (who later gave his name as Richie Roma) what they had been doing in the creek bed. He replied that he and the other men in the cab had been told by their employer, Mr. Heath (a contractor), to go and pick up the pipes from the creek bed. The pipe consisted of nine lengths of 3" water pipe.

The pipe had originally been placed horizontally and tack welded onto three vertical supports in the creek bed and apparently formed some type of erosion-control structure. The bottom pipes had been covered by sand to a depth of about 18 inches. The uprights had been bent, presumably by the men removing the pipes, and were lying at about 45 degrees to the vertical position.

The truck and the pipes were finally allowed to leave the scene at 1705 hours.

K.F. Robert

K.F. Roberts

Copy to R38/2.
CONSTRUCTION REPORT.
GROYNE NO. 2.

The construction of this structure commenced on the 16th March, 1956, and was completed in six (6) hours.

Construction was carried out in the following steps:-

1. Selection of site and survey of cross-section
2. The four (4) 'tar' drums were pitted
3. The drums were filled with a mixture of rock and sand

ESTIMATED COST.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour - 2 men</td>
<td>12</td>
</tr>
<tr>
<td>12 hours</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>- drums</td>
<td></td>
</tr>
<tr>
<td>- rock</td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
</tr>
<tr>
<td>- Hire</td>
<td>1</td>
</tr>
<tr>
<td>- Mileage</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>$37</td>
</tr>
</tbody>
</table>

This structure was constructed by hand, there being no material cost. Camera stands have got to be located. Their cost will be approximately $6. The structure appears small in relation to the size of the vertical banks.

(G. Ride)
Engineer.
ERSION CONTROL STRUCTURES.

GROYNE NO. 2.

A groyne is to be constructed in Gillen Creek, upstream of Groyne number one (1) — (see locality plan).

LOCATION.

The structure is to be located on the right bank bed in a deep gully section of Gillen Creek, as shown in the accompanying cross-section. This gully, or scour, is seven (7) feet deep and fifty (50) feet wide, the structure commencing at a meander.

ERSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden stream, particularly at initial points in the irregular meander pattern. At the place where the structure is proposed, gullying is commencing, however, further considerable erosion will occur before the creek stabilises.

TYPE OF STRUCTURE.

The structure will consist of several 'tar' drums half buried in the creek bed, being filled with rock. The rock filled drums will be approximately three (3) feet apart in a straight line at an angle of approximately thirty (30) degrees to the right bank.

PURPOSE.

This structure is one of several types to be constructed in Gillen Creek. These structures will indicate the best method of combatting bank collapse in streams with high vertical banks.

The wall will act as a buffer and deflector causing a reduction in stream momentum with subsequent deposition of sand and silt in the transition area of the stream bend.

It is unlikely that this structure will be permanent. The turbulence around the drums will cause considerable scour with subsequent removal of drums with large stream discharges. The structure will indicate whether these types of structures are practical and how their construction should be modified so that a permanent structure can be constructed.
INSTRUMENTATION.

Maximum height indicators and chain scour gauges, will in time be placed in the vicinity of this structure. However, the main method of observations which will be used, will be detail topographic surveys and a series of photographs from camera stands.

(C. Ride)
EROSION CONTROL STRUCTURES

GROYNE NO. 2

INSPECTION REPORT - 29/6/66

A discharge of approximately eighteen (18) inches deep occurred after high intensity shower rainfall fell on the catchment.

RAINFALL:

<table>
<thead>
<tr>
<th>Date</th>
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</tr>
</thead>
<tbody>
<tr>
<td>28/6/66</td>
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<td>83</td>
</tr>
<tr>
<td>30/6/66</td>
<td></td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

The drums were not displaced and scour did not occur. Their effectiveness as energy dissipators will have to be determined by inspection while creek is flowing.

( G. Ride )
EROSION CONTROL STRUCTURES

GROIN NO. 2

INSPECTION REPORT - 7/6/66.

A trickle flow approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

GENERAL.

The small flow did not cause displacement or scour around the drums.

Their effectiveness as energy dissipators will have to be determined from larger flows.

(G. Ride)
CROSS-SECTION AT GROYNE N° 2

Field book N° 368

Scales: Vert. 1 inch = 2 feet
Horz. 1 inch = 10 feet

Surveyed
Drawn

Distance from S.S.P. Feet.
CONSTRUCTION INSTRUCTIONS.

GROYNE NO. 3.

This structure is to be constructed using the materials and method as described below:

LOCATION.

The structure is to be located in Gillen Creek upstream of Groyne Number Four (4) as is shown in the accompanying locality plan.

TYPE OF STRUCTURE.

The structure is to consist of a brush groyne four (4) feet high and seventeen (17) feet long at an angle of thirty (30) degrees to the left bank and extending three (3) feet into the abutment. The brush is to be supported by a post and rail fence and is to be securely wired to this fence using fourteen (14) gauge tie wire. A concrete block footing is to be laid around each post.

Longitudinal support is to be provided by a stay attached to a two (2) inch diameter by four (4) feet long steel deadman. Lateral support is to be provided by wooden struts at right angles to the wall.

CONSTRUCTION TECHNIQUE.

1. Excavate abutment
2. Construct post and rail fence
3. Erect supports
4. Wire brush to fence
5. Erect camera stands

MATERIALS REQUIRED.

(a) five (5) approximately
EROSION CONTROL STRUCTURES.

GROYNE NO. 3.

A groyne is to be constructed in Gillen Creek upstream of Groyne number two (2) – (see locality plan).

LOCATION.

The structure is to be located on the left bank bed in a deep gully section of Gillen Creek as is shown in the accompanying cross-section. This gully, or scour, is eight (8) feet deep and fifty (50) feet wide, the structure commencing at a meander.

EROSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden stream, particularly at initial points in the irregular meander pattern. This structure is to be located in the primary curve of an 'S' meander. It is evident from the high slip-off bar that the vertical bank provides the force to divert the direction of stream flow.

TYPE OF STRUCTURE.

The structure will consist of a brush groyne four (4) feet high and seventeen (17) feet long at an angle of thirty (30) degrees to the left bank and extending three (3) feet into the abutment. The brush, (witchity bush), will be supported by a post and rail timber fence hewn from green timber nearby. Fourteen (14) gauge tie wire will be used to securely attach the brush to the fence. The fence posts will extend several feet into the bed of the stream, a concrete block footing providing extra weight.

Longitudinal support will be provided by a steel deadman attached to a two (2) inch, diameter by four (4) feet long steel deadman. Lateral support will be provided by wooden struts at right angles to the wall 'veed' into the posts.

PURPOSE.

This structure is one of several types to be constructed in Gillen Creek. These structures will indicate
Purpose Cont...

the best method of combating bank collapse in streams with unstable high vertical banks.

The wall will act as an energy dissipator and deflector, causing a reduction in stream momentum with subsequent deposition of sand and silt in the transition area of the stream bend. The wall reduces the cross-section of stream flow significantly hence there will be some erosion of the slip-off bar however, a stable cross-section will soon be reached. The previous nature of the groyne will prevent excessive turbulence downstream of the wall.

The nature of local scouring around the groyne will be indicated by actual stream flows, its extent cannot be estimated at this time. Methods of combating this weakness will be devised when the extent and type of scouring is seen.

It is unlikely that bank collapse will cease immediately after the structure is constructed. Generally a number of flows must occur before the stream reaches a stable condition.

It is difficult to estimate an expected life for this type of structure. Should termites attack the timber, then its life would be reduced significantly. It is possible that with the construction of the structure, a gravel bar will build up the banks, will stabilise with vegetation growing on the slopes and vegetation, in particular brush, will grow on the bars behind the structure thus natural protection will, in time, replace the decayed wall. The suitability of timber for these types of structures will be indicated by the construction of proto-types. No doubt, use of preservatives, such as cresote would increase these structures expected life however, their expense may not be justified.

The structure will indicate whether these types of structures are practical and whether their construction should be modified to provide a more suitable design.

PHOTOGRAPHY.

Three (3) camera stands are to be set up around the structure. From these stands, a series of photographs will be taken during construction, and after various stream flows. They will provide a quick visual analysis of the effect of the structure.
Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of this structure. However, the main method of observation, which will be used, will be cross-sections, a detailed topographic survey around the structure and a series of photographs from stands.

(G. Ride)
Engineer.
A discharge of approximately eighteen (18) inches deep occurred after high intensity shower rainfall fell on the catchment.

**RAINFALL.**

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<thead>
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<th>Date</th>
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<td>83</td>
</tr>
<tr>
<td>30/6/66</td>
<td></td>
</tr>
</tbody>
</table>

**STRUCTURE GENERAL.**

The brush has withstood the flow. No scouring appears to have occurred. Further bank collapse behind the structure has not occurred. The structure is not preventing erosion of the bank downstream. The structure should extend further into the stream.

( G. Ride )
EROSION CONTROL STRUCTURES

GROIN No. 3

INSPECTION REPORT - 7/6/66

A trickle, flow approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL:

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

GENERAL:

The small flows did not scour around the columns and struts. A section of the bank of the southern edge of the abutment collapsed.

( G. Ride )
CONSTRUCTION INSTRUCTIONS.

GROYNE NO. 4.

This structure is to be constructed using the materials and method as described below:

LOCATION.

The structure is to be located in Gillen Creek as shown on the accompanying locality plan.

TYPE OF STRUCTURE.

The structure is to consist of three (3) lines of timber piles four (4) feet above bed level. The lines are to be approximately eighteen (18) inches apart, the centre line being staggered. The piles are to consist of not less than six (6) inches diameter, green timber posts approximately six (6) feet long. The structure is to extend approximately fifteen (15) feet from the right bank at an angle of thirty (30) degrees to the bank. A log footing is to be constructed around the base of the piles.

CONSTRUCTION TECHNIQUE.

1. Excavate foundation
2. Erect piles
3. Place timber footing
4. Dump rock spalls where necessary
5. Level bed and clean area
6. Erect camera stands and targets

MATERIALS REQUIRED.

(a) Thirty four (34) timber piles approximately six (6) feet long and not less than six (6) inches in diameter.
(b) One hundred and sixty (160) feet of timber logs.
(c) One cubic yard of rock spalls
(d) Three (3) camera stands
(e) Bag of cement.

PLANT AND EQUIPMENT REQUIRED.

1. Landrover
2. Picks, shovels and bars
3. Builders line
4. Level

(S. Rye)
Engineer.
EROSION CONTROL STRUCTURES.

GROyne NO. 4.

A groyne is to be constructed in Gillen Creek downstream of Groyne number three (3) — (see locality plan).

LOCATION.

The structure is to be located on the right bank bed in a deep gully section of Gillen Creek as is shown in the accompanying cross-section. This gully, or scour, is eight (8) feet deep and fifty (50) feet wide. The structure is to be located in the secondary curve of an 'S' meander, Groyne number three (3) being located in the primary curve.

EROSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden stream, particularly at the initial points in the irregular meander pattern. Should the stream be left to continue its natural erosion pattern, then the erosion into the left bank of the primary curve would eventually relocate the stream bed. Thus, bank erosion at this point caused by stream flow in Gillen Creek would cease, the erosion which would occur would be due to gully- ing in primary tributaries.

TYPE OF STRUCTURE.

The structure will consist of three (3) lines of timber piles four (4) feet above bed level. The lines will be approximately eighteen (18) inches apart, the centre line being staggered. The piles will consist of not less than six (6) inches diameter green timber posts approximately six (6) feet long. The structure will extend approximately fifteen (15) feet from the right bank at an angle of thirty (30) degrees to the bank. The piles being approximately at eighteen (18) inch centres. To prevent scouring at bed level and to provide support, a log footing will be constructed. This footing will be around six (6) inches below bed level. No nails, bolts, wire or any other fasteners are to be used.
PURPOSE.

This structure is one of several types, to be constructed in Gillen Creek. These structures will indicate the best method of combating bank collapse in streams with unstable high vertical banks.

The piles will act as an energy dissipator causing a reduction in stream momentum with subsequent deposition of sand and silt in the transition area of the stream bed, and a reduction in the erosion capacity of the stream at this point. Silt deposition will not occur beyond the lower limit of stream carrying capacity.

These types of structures have been used extensively as energy dissipators at the bed of drop structures and spillways and on the outlet aprons of large culverts. Their effectiveness as erosion control groynes has got to be studied.

This structure is one of several types of groynes to be constructed which will indicate which structure is most suitable. The criteria are economics, effectiveness, structural soundness and aesthetics.

Studying the effect of the stream on the structure is more important in this case, than studying the effect of the structure on the stream. The catchment characteristics have been affected by the construction of roads, structures, sand pits etc., hence the area is not ideal for the study of catchment erosion, characteristics. However, the intensity, extent and speed at which erosion is now occurring in the area means that dramatic effects will be shown by any structure constructed in the creek. Thus, the best design and construction techniques will be indicated after a few stream flows.

PHOTOGRAPHY.

Three (3) camera stands, are to be set up around the structure. From these stands, a series of photographs will be taken during construction and after various stream flows. They will provide a quick visual analysis of the effect of the structure.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of this structure. However, the main methods of observations which will be used will be cross-sections, a detailed topographic survey around the structure and a series of photographs from stands.

(G. Ride)
Engineer.
EROSION CONTROL STRUCTURES

GROIN NO. 4.

INSPECTION REPORT - 29/6/66.

A discharge of approximately eighteen (18) inches deep occurred after high intensity shower rainfall fell on the catchment.

RAINFALL.

<table>
<thead>
<tr>
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<tbody>
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<td>83</td>
</tr>
<tr>
<td>30/6/66</td>
<td>points</td>
</tr>
</tbody>
</table>

STRUCTURE GENERAL.

The structure withstood the flow, no scouring or dislodgement of posts occurring. Three (3) posts which were lying on the stream bed were carried several chains downstream.

( J. Ride )
EROSION CONTROL STRUCTURES.

GROYN No. 4

INSPECTION REPORT - 7/6/66.

A trickle flow approximately six (6) inches deep occurred after rainfall on the catchment.

RAINFALL.

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6/66</td>
<td>28</td>
</tr>
<tr>
<td>7/6/66</td>
<td>78</td>
</tr>
</tbody>
</table>

GENERAL.

The flow covered the scour protection with sand. Larger flows will be necessary to determine the energy dissipation characteristics of the structure.

( G. Ride )
CROSS-SECTION AT GROYNE NO. 4

Field book No. 368

Scale: Vert. 1 inch = 2 feet
Horiz. 1 inch = 10 feet

Surveyed 17/3/66
Drawn 18/3/66
EROSION CONTROL STRUCTURES.

GROYNE NO. 5.

A groyne is to be constructed in Gillen Creek downstream of drop structure number five (5) - (see locality plan).

LOCATION.

The structure is to be located on the right bank bed in a deep gully section of Gillen Creek as is shown in the accompanying cross-section. This gully, or scourt, is seven (7) feet deep and forty (40) feet wide. The structure is to be located close to the bank in the bend. Groyne number six (6) is to be located in the transition zone of this bend.

EROSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden streams, particularly at the initial points in the irregular meander pattern. The stream is rapidly eating into the right bank. It is apparent that the sharp bend developed when the stream was in its infancy, most likely a large gum tree grew in the original stream gutter.

TYPE OF STRUCTURE.

The structure will be a previous revertment extending from three (3) feet into the right bank to twenty (20) feet into the stream being at an angle of approximately sixty (60) degrees to the right bank. The wall will consist of a two (2) inch chain wire box one foot thick filled with three (3) inch screenings and spalls. The wall will be four (4) feet high and supported by two (2) and three (3) inch diameter steel posts. The footings will consist of dumped rock of depths of at least one (1) foot and of sufficient width to form a hand pitched apron upstream and downstream of the wall. The chain wire will be wired to the supports using 14 gauge tie wire.
The abutment is to be protected by dumped rock, pitching and a catch drain to intercept surface run-off.

PURPOSE.

This structure is one of several types to be constructed in Gillen Creek. These structures will indicate the best method of combating bank collapse in streams with unstable, high vertical banks. By constructing walls of various materials and design, we shall be able to select the most suitable structure. The criteria are economics, effectiveness, structural soundness and aesthetics.

PHOTOGRAPHY.

Four (4) camera stands and targets will be set up around the two (2) groynes to be constructed in this area. From these stands, a series of photographs will be taken during construction and after various stream flows. They will provide a quick visual analysis of the effect of the structure.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks, will in time, be placed upstream and downstream of this structure. However, the main methods of observations which will be used will be cross-sections, a detailed topographic survey around the structure and a series of photographs taken from camera stands.

(G. Hite)
Engineer.
CONSTRUCTION INSTRUCTIONS.

GROYNE NO. 6.

This structure is to be constructed using the materials and method as described below:

LOCATION.

The structure is to be located in Gillen Creek in the position indicated on the accompanying locality Plan. Yellow painted ranging poles indicate the ends of the structure.

TYPE OF STRUCTURE.

The structure is to consist of a brush filled jetty extending fifteen (15) feet from the right bank at an angle of approximately thirty (30) degrees. The jetty is to consist of a two (2) inch chain wire box one foot thick filled with brush. The wall is to be four (4) feet high and being supported by five (5) and three (3) inch diameter steel posts. The footings are to consist of dumped rock with an upstream and downstream hand pitched apron.

CONSTRUCTION TECHNIQUE.

1. Erect Posts.
2. Construct footing and apron.
3. Wire, chain wire to posts.
4. Fill the box with brush.
5. Erect Camera stands.

MATERIALS REQUIRED.

(a) Prefabricated pipe frame work.
(b) Thirty three (33) feet of three feet wide chain wire.
(c) Four yards of spalls.
(d) Brush to fill box.
(e) Two camerastands.
(f) Two hundred (200) feet of tie wire.

PLANT AND EQUIPMENT.

1. Landrover
2. Pick and Shovels
3. Axes
4. Pliers
5. Level
6. Builders line

(S. Hyde)
Engineer.
A groyne is to be constructed in Gillen Creek downstream of drop structure number five (5) (see locality plan).

LOCATION.

The structure is to be located on the right bank bed in a deep gully section of Gillen Creek as is shown in the accompanying cross-section. This gully, or scour, is seven (7) feet deep and forty (40) feet wide. The structure is to be located in the transition zone of the sharp bend, upstream of Groyne Number five (5).

EROSION.

Widespread bank collapse occurs during and after each flow in this creek. The high vertical silt banks are quickly undercut by the sand and silt laden stream, particularly at the initial points in the irregular meander pattern. There is a particularly sharp bend in the section of the stream where the structures are to be constructed, consequently the stream is rapidly eating into the right bank.

TYPE OF STRUCTURE.

The structure will be a brush filled jetty extending fifteen (15) feet from the right bank at an angle of approximately thirty (30) degrees. The jetty will consist of a two (2) inch chain wire box, one foot thick, filled with brush (witchity bush). The wall will be four (4) feet high being supported by two (2) and three (3) inch diameter steel posts. The footings will consist of dumped rock of a depth of at least one (1) foot and of sufficient width to form a hand pitched apron upstream and downstream of the wall. The chain wire will be wired to the supports using 14 gauge tie wire.

PURPOSE.

This structure is one of several types to be constructed in Gillen Creek. These structures will indicate the best method of combating bank collapse in streams with unstable, high vertical banks. By constructing walls of
various materials and design, we shall be able to select the most suitable structure. The criteria are economics, effectiveness, structural soundness and aesthetics.

At this section of the creek, two (2) groynes are to be constructed. It is believed that the first groyne, the brush jetty, will reduce the stream momentum and enable a sand bank to form between the two groynes. The second groyne will further reduce the momentum and also apply a deflecting force.

PHOTOGRAPHY.

Four (4) camera stands and targets will be set up around the two (2) groynes. From these stands, a series of photography will be taken during construction and after various stream flows. They will provide a quick visual analysis of the effect of the structure.

INSTRUMENTATION.

Maximum height indicators, chain scour gauges, erosion pins and painted rocks will, in time, be placed upstream and downstream of this structure. However, the main methods of observations which will be used, will be cross-sections, a detailed topographic survey around the structure and a series of photography taken from camera stands.

(S. Ride)
Engineer.