NEILLY GROUP
ENGINEERING

CATCHMENT SOLUTIONS

TECHNICAL SPECIFICATION: BANNOCKBURN STATION REEF TRUST IV GULLY REPAIR DESIGN

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Document Control

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Author(s)	Adam Neilly Brett Twycross Elle Searston
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Revision History

Revision	Date	By	Nature of change	Checked By	Approved By
1	1/05/2018	Adam Neilly Brett Twycross	Draft for comment	Brett Twycross	Adam Neilly
2	22/08/2018	Adam Neilly Brett Twycross	Final – re-design using new LiDAR	Brett Twycross	Adam Neilly
3	29/05/2020	Adam Neilly Brett Twycross Elle Searston	Re-design using new Drone Photogrammetry Data	Adam Neilly	Adam Neilly

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1 Introduction

This Technical Specification sets out the requirements for the construction of two rock chute drop structures and overland flow bunds for the Bannockburn Station Reef Trust IV Gully Repair project. The Bannockburn Station Reef Trust IV Gully Repair project site is located on Bannockburn Station, which is approximately 62 km north-west of Rockhampton, Queensland.

This Specification should be read in conjunction with the *Bannockburn Station Reef Trust IV Gully Repair Design report* (Neilly Group Engineering, 2020).

1.1 General requirements

This Specification is to be read in conjunction with the conditions of the contract, and all other specifications and drawings.

Where works are directed to be performed by the Contractor but are not specified in the Specification, the Contractor shall carry them out with full diligence and expedience as are expected for works of this nature under the obligations of the Contractor.

1.2 Standards and guidelines

Unless stated otherwise in the Specification, the approved drawings, or elsewhere in the construction documents, work shall comply with the current and relevant Australian Standards. Any variations or ambiguity between the Specification, other construction documents and Australian Standards shall be referred to the Designer for direction before proceeding with the work.

1.3 Drawings

The Drawings referred to in this Specification are those endorsed by the Designer. The Drawings must not be varied without the written approval of the Designer. The Drawings are listed in Table 1.

Table 1. Drawings

Drawing Number	Revision	Drawing Title
20023-101	C1	Overall plan view
20023-102	C1	Rock chute 1 plan view, longitudinal section & setout
20023-103	C1	Rock chute 1 typical details
20023-104	C1	Rock chute 2 plan view, longitudinal section & setout
20023-105	C1	Rock chute 2 typical details

1.4 Timing of works

Works shall be undertaken during the dry season to reduce the risk of erosion on freshly exposed surfaces.

1.5 Sequence of works and hold points

Staging of works shall be undertaken as follows:

1. Site preparation;
2. Construction of rock chute drop structures and overland flow bunds; and
3. Topsoiling of all designated and disturbed areas.

Hold points that require approval by the Catchment Solutions representative before proceeding are detailed in Table 2.

Table 2. Schedule of hold points for the Rock Chute Drop Structures

Hold Point	Details	Inspection by
Foundation preparation	Foundation preparation in accordance with this Specification prior to the placement of geotextile, granular filter material or rock.	Catchment Solutions Representative
Placement of geotextile	Placement of geotextile in accordance with this Specification prior to the placement of granular filter material and rock	Catchment Solutions Representative
Placement of granular filter material	Placement of granular filter material in accordance with this Specification prior to the placement of rock	Catchment Solutions Representative

Revegetation works have not been included in this Specification. They are to be undertaken at the direction of the Catchment Solutions Representative in accordance with relevant specifications.

2 Site preparation

2.1 Set-out

The Contractor is responsible for setting out alignments and levels from the Drawings and shall establish sufficient set-out pegs to ensure smooth changes in both vertical and horizontal alignment. Bench marks, survey pegs, level pegs or supplementary reference marks must not be adjusted or moved without written approval of the Catchment Solutions Representative. The contractor must transfer any pegs affected by the earthworks to side positions clear of operations and must note the extent of the movement in distance and level.

2.2 Clearing and grubbing

Clearing must be carried out in advance of any earthwork operations and is to include the removal of all foreign material and vegetation, except trees and plants required to be preserved as identified by the Catchment Solutions Representative, from within the boundaries of areas affected by earthworks or other areas to be cleared as designated on the Drawings.

All stumps and roots must be grubbed to a depth of at least 150mm below the finished surface level. Grub holes are to be backfilled and well compacted with approved material. All foreign material and vegetation cleared except topsoil must be removed from the site and is to be deposited at the appropriate disposal site.

2.3 Stripping and stockpiling of topsoil

All topsoil is to be stripped from areas to be excavated or filled and from other areas as shown on the Drawings. Topsoil is to be stored in approved stockpiles for use in re-instatement of the work by the Contractor. Stripping topsoil shall consist of the removal of topsoil to a depth of 150mm below ground level.

2.4 Backfill

Holes or cavities that are found within the site shall be backfilled with materials similar to the adjacent ground, and such fill shall be compacted to a dry density similar to that of the surrounding material.

3 Construction of rock chute drop structure

3.1 Excavation to foundation level

No excavation shall be commenced until the Contractor has undertaken a Dial Before You Dig (DBYD) search and obtained current underground location plans which provide an indication of the presence, location and depth of underground plant in the area of the works.

Excavation shall be carried out to the depths and dimensions shown on the Drawings, or to such greater depths and dimensions as will ensure sound, permanent foundations. All excavation carried out shall be approved by the Catchment Solutions Representative before any materials are placed on the excavated surfaces (**hold point**).

Excavations shall be conducted by machine as necessary to produce profiles to the accuracy required by this Specification and the Drawings. In carrying out excavation work, all reasonable precautions against mishap or accident, whether arising from insufficient strength of supports, bad workmanship, breakage of machinery or plant, inefficient caulking or packing of open joints or spaces, flood, or any other cause whatsoever shall be taken.

3.1.1 Excavated material

All materials cleared and excavated shall be removed from site and recycled appropriately or disposed of legally. If an appropriate area exists on the site, suitable material may be stockpiled and used for backfilling, provided that excess stockpiled material is disposed of when all backfilling is completed. Special care is to be taken to ensure that the proposed stockpile does not impact on any existing trees or structures.

3.1.2 Explosives

Explosives are not permitted.

3.1.3 Unsuitable material

Unsuitable material such as silt, mud, roots, organic matter, rubbish, areas of very soft clay or high moisture content and any other deleterious substances shall be disposed and replaced with select material.

The Contractor shall rework or replace any material that has become unsuitable because of inappropriate construction activities. Inappropriate construction activities include poor surface drainage, restricted or inoperative subsurface drains, contamination, excessive sized plant where the imposed local load exceeds the material strength, poorly maintained plant allowing leakage of oils and water onto the formation and leaving the surface open to wet weather allowing moisture ingress.

3.2 Placement of geotextile

Bidim A44 or equivalent geotextile shall be placed within the perimeter of the apron and crest cut-off walls of the rock chute drop structure as shown on the Drawings. Where a single width of geotextile is insufficient to provide full coverage, a minimum overlap of 500mm must be maintained where multiple widths of geotextile are required. The geotextile shall be placed to form a surface that is smooth, free of creases and depressions and shall be pinned into place. Geotextile shall be placed and approved by the Catchment Solutions Representative prior to the placement of granular filter material or rock beaching (**hold point**).

3.3 Placement of granular filter material

Granular filter material shall be placed following excavation to foundation level and subsequent placement of geotextile in the crest and apron cut-off walls. The granular filter material shall be placed and compacted by machine bucket in accordance with this Specification and to the thicknesses and locations as shown on the Drawings. Granular filter material shall be placed and approved by the Catchment Solutions Representative prior to the placement of rock beaching (**hold point**).

3.3.1 Granular filter material specification

Granular filter material shall be hard and durable gravel and shall be sized in accordance with Table 3. The granular filter material shall be approved by the Catchment Solutions Representative prior to placement.

Table 3. Granular filter material size specification

Sieve size (mm)	Percentage finer (by weight)
50	100
25	50
7.5	10

3.4 Placement of rock beaching

Rock beaching shall be placed following excavation to foundation level and subsequent placement of geotextile and granular filter material. The rock beaching shall be placed in accordance with this Specification and to the thicknesses and locations as shown on the Drawings.

The Contractor shall use appropriate methods for handling and placement of rock that will:

- Avoid tearing of geotextile material.
- Avoid segregation of the rock size fractions

The rock shall be placed to form an interlocking blanket of rock with low void spaces. Voids in the blanket of rock shall be reworked as required by the Catchment Solutions Representative. Rock beaching shall be placed and approved by the Catchment Solutions Representative prior to the placement of topsoil on the upper batters of the rock chute drop structure.

3.4.1 Rock beaching material specification

The rock used to line the rock chute drop structure must be durable, resistant to weathering and angular in shape. The D_{50} is used to describe the nominal rock size required for the rock chute drop structure works, where D_{50} represents the nominal rock diameter, of which 50% of the rocks (by weight) are smaller. No rocks should be greater in diameter than twice the D_{50} and should be proportioned such that neither the breadth nor thickness of a single rock is less than one-third its length. The rock must also be well graded so that the rock can interlock with low void spaces. Poor grading of the rock will increase the potential for structural failure of the rock chute drop structure works. The size specification is shown in Table 4. The rock must have a relative density greater than or equal to 2.40.

Table 4. Rock beaching size specification

Sieve size (mm)	Percentage finer (by weight)
1000	100
500	50
150	10

3.1 Construction of overland flow bunds

The overland flow bunds shall be formed to capture and direct overland flow to the crest of the rock chute drop structures. Embankments shall be formed from suitable material excavated from the adjacent rock chute drop structure footprints, with dimensions as shown on the Drawings. The fill material shall consist predominantly of clay where possible.

The fill material shall be placed in near horizontal layers not exceeding 300mm in loose thickness and track rolled to achieve compaction prior to placement of subsequent layers.

3.2 Placement of topsoil

Topsoil shall be placed following excavation to foundation level and subsequent placement of geotextile, granular filter material and rock beaching. Topsoil shall be placed in accordance with this Specification and to the thicknesses and locations as shown on the Drawings.

Topsoil shall be placed in loose layers of 150mm thickness, to the thickness as specified in the Drawings. The finished surface shall be ripped to a minimum depth of 300mm along contour and shall be left rough and free draining.

4 Site reinstatement

Upon the completion of works, the Contractor shall reinstate the works site and all other areas disturbed because of the works. This shall include:

- Disposal, or re-use where approved by the Designer, of all waste material resulting from the works.
- Filling or grading of disturbed areas to match adjacent undisturbed surface levels to ensure areas remain free draining.
- Topsoiling all disturbed areas not already specified in the Drawings to a minimum loose thickness of 150mm, ripping to a minimum depth of 300mm along contour, left rough and free draining.
- Reinstating any access tracks to a condition similar to that prior to the commencement of works.

5 References

Neilly Group Engineering, 2020. *Bannockburn Station Reef Trust IV Gully Repair Design*, report prepared by Neilly Group Engineering for Catchment Solutions.