# Mt Buller and Mt Stirling Alpine Resort Management Board

## Mt Buller Sustainable Water Security Project

## Off-Stream Storage Concept Design Summary

August 2016

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# 1. Introduction

This report for the Mt Buller Sustainable Water Security Project – Off Stream Storage (the Project) summaries the concept design for the project.

This report provides a summary of the project related infrastructure and associated design aspects and is based on a previous GHD report for the project (Concept Design Report, 232855 23 July 2014)(GHD 2014a). Where appropriate the original report has been referenced.

## 1.1 Background

The Mt Buller and Mt Stirling Alpine Resort Management Board (RMB) has established the Mt Buller Sustainable Water Security Project which encompasses a series of projects designed to assist it in meeting its obligation to provide a safe and reliable water supply to the Resort, both now and in the future.

One component of the Mt Buller Sustainable Water Security Project is the development of an Off-Stream Storage and an associated upgrade of the Resort water supply infrastructure. Based on a number of previous investigations and reviews, the RMB have determined that a 100 ML on mountain storage is required to assist it in meeting future potable and snow making water demands.

In late 2013 GHD were commissioned by the RMB to undertake investigations into the siting and concept design of a 100 ML storage and the ancillary infrastructure required to service this asset. The proposed project is known as the Mt Buller Off-Stream Storage Project (hereafter referred to as the Project).

## 1.2 Purpose of this report

The purpose of this report is to document an overview of the concept design and associated technical and engineering aspects of the project. The project Concept Design Report (GHD 2014a,) should be referred to for technical assessment and reference information on the projects engineering related design , with this report specifically providing an outline of the:

- Design criteria
- Project setting – specifically subsurface conditions including geotechnical and hydrogeological investigations
- Concept design summary of the proposed project infrastructure including storage dam and associated supporting infrastructure
- A summary of constructability requirements and preliminary programme.

# 2. Design Criteria

## 2.1 Data Collection and Review

During the concept design development, a review of available information including reports of prior investigations, desktop and field assessments and also RMB internal working documents was undertaken. The review of background data enabled GHD to understand the level of previous works undertaken while providing information to inform the concept design.

Information sources are detailed in the projects Concept Design Report (GHD 2014a) and have been referenced throughout this report.

## 2.2 Engineering Requirements

At the commencement of the concept design study, and after numerous investigations into sustainable water requirements for Mt Buller, the following major engineering requirements had been established for the project and were designated as design requirements or key criteria:

- The storage dam or dams are to be a minimum 100 ML in capacity
- Impact on skiable terrain, including future developments listed in current Master plans was to be minimised
- New infrastructure is to be minimised in number and complexity due to ongoing management restrictions
- New infrastructure to be designed for Alpine Conditions, including limited to no access for chemical transportation during winter months and ice formation in reservoir
- Lessons learnt from “Sun Valley Reservoir” are to be incorporated into the design, including management of groundwater and lining requirements
- Geotechnical risks, especially the dam related construction materials must be identified and inform the design and construction related constraints
- Construction related aspects such as access and supporting infrastructure must minimise environmental disturbance and degradation
- The storage must be able to tolerate regular rapid drawdown scenarios due to the often variable water level
- Construction and asset management cost to be minimised while achieving the above criteria.

## 2.3 Water Storage Design Philosophy

Dams comprise a number of elements, which can be considered as critical or non-critical to the safety of the structure. Failure of the critical elements, such as the water-impounding barrier, the outlet works or the spillway could result in a catastrophic failure of the works and uncontrolled release of water, with resulting loss of life and damage downstream of the dam. Though it is unlikely that the other non-critical components would cause a dam failure, they are still of importance as their failure could result in uncontrolled release of water and resulting erosion, flooding and loss of the storage as well as loss of access and therefore control of the dam.

The rational engineering approach applied for the storage design at Mt Buller was to verify that the design conforms to current minimum safety standards, incorporating a balance in the level of protection provided in the critical and non-critical elements. Where there are a variety of

possible approaches and where a preference is warranted, the selection was made based on past experience or current accepted practice such as ICOLD and ANCOLD guidelines and Australian standards.

# 3. Project Setting

## 3.1 Site Description

The proposed off stream storage and associated supporting water supply infrastructure is located within the Mt Buller Alpine Resort Ski Area. Table 1 in Section 4 summarises the location of the proposed infrastructure with a layout provided in Figure 1 with the proposed development drawings provided in Appendix A.

Further description of the project related infrastructure is outlined in Section 4.

## 3.2 Geotechnical Investigations

Geotechnical investigations have been carried out to inform the concept design and were completed from November 2013 to March 2014 (GHD 2014b). Investigations were primarily focused on the storage location and surrounding area.

Fifteen (15) geotechnical boreholes and nine (9) geotechnical test pits were drilled and excavated across the storage footprint. Details of the geotechnical investigations and geotechnical logs are presented in the project factual geotechnical investigation report (GHD 2014b) with an outline of the proposed storage and some of the associated investigation locations which now form part of the groundwater monitoring network provided in Figure 2.

The site investigations were undertaken to characterise conditions within the footprint of the proposed water storage, to determine potential borrow materials, and establish groundwater conditions.

## 3.3 Groundwater

A hydrogeology study was carried out for the project (GHD 2014c). This work resulted in the establishment of a groundwater monitoring network, and since then, an on-going monitoring program has been implemented at the storage site. An updated hydrogeological monitoring report was prepared following an initial review of groundwater data in 2015 (GHD 2015) which incorporated additional groundwater level, and groundwater quality monitoring information.

The hydrogeology of the off-stream storage site is relatively complex with groundwater being found within volcanic flows, interflow sediments, residual soils and weathered granite, and the more competent granite. The depth to water is variable across the site, depending upon the geologic unit, and the topography. Groundwater can be intersected within 2 m of the surface, particularly near springs or in the steeper topographies of the site. In other areas, nearer and slightly north of the Summit Road, groundwater can be deeper and over 12 m depth below the surface (GHD 2014c).

Over 12 months of water level monitoring data is available for some monitoring bores, including continuous monitoring (automated data collection) from a number of monitoring bores at, and hydraulic up-gradient of mapped Alpine bog areas (refer to Figure 2 for network locations). Review of the water level monitoring information indicates that most bores exhibit a significant decline in water levels over the summer period, however significant water level recovery occurs rapidly with recharge events (rainfall, snowfall). Water level from monitoring bores near Alpine Bogs have a more subdued seasonal response, relative to those further up-gradient

(hydraulically and topographically), and they too can also exhibit rapid water level recovery following recharge.

Springs and associated Alpine bogs have been mapped to the north of the storage location. Water levels near the Alpine bogs is close to the surface, and during some periods throughout a season, can be above the ground surface i.e. flowing or artesian conditions.

Additional springs were located along the proposed main pipeline alignment. Minor seeps or springs were also observed on the southern (upper) parts of the proposed pipeline alignment. Significant flowing springs transmitting considerable water were observed exiting the surface of the track adjacent to the existing treatment plant.

## 3.4 Geotechnical Risk

A geotechnical risk assessment was undertaken as part of the planning submission and results are detailed in the project Geotechnical Risk Assessment Report (GHD 2016a).

Where control measures are fully adopted, ten hazards associated with the proposed off-stream storage project were assessed qualitatively as having a residual risk rating of low or below. In accordance with Clause 3.2 of the EMO further quantitative or semi-quantitative risk assessment of these hazards is not deemed necessary for this project provided all recommended control measures are adopted.

Qualitatively assessed residual risk levels of three hazards were found to be at “Moderate” level. In line with Clause 3.2 of the EMO a semi-quantitative assessment was completed for these hazards. This semi-quantitative (risk-to-life) assessment found the assessed risk to life falls within published limits of tolerability.

Further geotechnical assessment of the risk of the project is not required (other than those associated with the dam structure as required by ANCOLD guidelines at detailed design stage). Based on the findings of the risk assessment the site is considered suitable for the proposed development providing the recommendations given detailed in the Geotechnical Risk Assessment Report are followed.

## 3.5 Summary of Subsurface Conditions

The subsurface intrusive investigations indicate that there has been an active and relatively complicated geological history to this region, resulting in a complex lithological profile comprising several phases of deposition of sediments and volcanism (GHD 2014b).

The soil profiles and groundwater conditions are discussed in detail in the Concept Design Report (GHD 2014a) with a conceptual section provided in Figure 3.

The highly variable nature of the excavated material may limit the ability to place it direct from cut to fill (to form the embankment for the dam), requiring it to be stockpiled and blended to achieve a uniform material for the storage embankment. This assumption has been incorporated into the concept design with stockpile areas allowed for within the designated project construction footprint.

# 4. Concept Design

## 4.1 Summary of proposed infrastructure

Table 1 summarises the location and proposed infrastructure to be constructed as part of the project. All infrastructure has been designed to a concept level with a project construction footprint (PCF) being determined.

Refer to Appendix A for the proposed development drawings.

It should be noted that an enhanced concept level of design has been undertaken for the storage dam to inform the site based constraints and address the technical requirements as outlined in Section 2. A summary of the storage design is outlined in Section 4.2.

The proposed off stream storage requires reconfiguration of the water supply infrastructure to connect the storage to new and existing infrastructure. The additional infrastructure required to integrate the proposed storage is outlined Table 1.

In addition, a landscape master plan has also been prepared to identify additional landscaping and supporting infrastructure associated with the storage (GHD 2016b). Some of these components have not been included within the concept design drawings.

The following project related assessment reports contain additional technical assessment and details relating to the various options considered and the requirement for the proposed infrastructure:

- GHD 2014a, Concept Design Report, #232855, 29 September 2014
- GHD 2014d Water Supply Concept Design Investigations, #227530, 3 July 2014
- GHD 2014e Options Assessment Report, #6974, 11 July 2014
- GHD 2015 Review of Alpine Bog Ecology, Hydrology and Additional Investigations, # 242542, 18 August 2015
- GHD 2016b Landscape and Visual Impact Assessment Report, #226161, 27 July 2016

A functional and detailed design stage is required to further inform the infrastructure details beyond what is described in this report. Each infrastructure component will be reviewed and consolidated into a revised project design within the construction footprint with further engineering assessment undertaken as required to enable the preparation of construction phase engineering plans and specifications.

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Table 1 Concept Design Details

| Infrastructure | Site location, requirement and description | Engineering details |
|---|---|---|
| Water Storage (1) | The proposed off stream storage is located north of the final stretch of the unsealed Summit Road over the existing Boggy Creek Ski Lift alignment and extends north down the hillside to the Summit Nature Walk Track. The site is located on a gently to moderately sloping plateau directly east of the Mt Buller summit. The site area slopes downhill to the north with the slopes steepening as they approach the valley below. | Refer to Table 2 for design parameters<br>Summary of storage infrastructure components:<br>• A cut to fill oval shaped storage with a maximum embankment height of about 21 m on the northern side.<br>• HDPE lined<br>• Inlet and outlet structures<br>• Drainage and collection system – includes discharges to aqueduct (see storage drainage) |
| Storage drainage (2) | A discharge drainage pipeline extents down the hillside north of the Summit Nature Walk Track and connects to the existing aqueduct. | Refer to Table 2 for design parameters |
| Storage transfer pump station (3) | The proposed pump station is situated on the northward facing slope immediately to the north of storage next to the existing summit walking track. | Pump station includes two pumps:<br>• Transfer to treatment plant and reticulation system (RMB supply)<br>• Transfer to Sun Valley Reservoir (Buller Ski Lifts snow making supply infrastructure requirements) |
| Sun Valley Pipeline (4) | From the proposed storage transfer pump station a new pipeline will deliver water from the new storage to the existing Sun Valley Reservoir. | 250 mm diameter truck main - 7 ML/d capacity. |

| Infrastructure | Site location, requirement and description | Engineering details |
|---|---|---|
| Raw water supply pipeline to treatment plant and low level reticulation network (5) | From the proposed storage transfer pump station a new pipeline will deliver raw water from the new storage to the existing treatment infrastructure and low level reticulation network located at Burnt Hut.<br><br>The pipeline is located around the steep slope on which the Control Building is constructed and then traverses across and down the slope towards the existing treatment plant. The proposed pipeline alignment coincides with an existing vehicular access track and location of existing water supply services to Baldy Tank. A small underground break tank prior to connection to the reticulation will be required so that the low level system is not over pressured. | 200 mm diameter trunk main<br><br>Connection into the low level treatment plant (hypochlorite and UV treatment systems located at Burnt Hut)<br><br>Estimated 10 kL underground break tank prior to connection to the treatment plant and reticulation system. |
| Raw water supply break tank and booster pump station (6) | A new break tank and booster pump station is located below Burnt Hut Reservoir, uphill of the Grimus access track. The break tank and pump station will connect to the existing raw water supply infrastructure from Boggy Creek to Burnt Hut. | New break tank - 0.15 ML<br><br>Booster pumps - 4 ML/d<br><br>Pump station structure – approx. 3 m x 3 m |
| Raw water supply pipeline from booster pump station to new water storage (7) | A new raw water pipeline will run along a similar alignment as the raw water supply pipeline to the treatment and reticulation network (5). | New 200 mm diameter transfer pipe from the Break Tank to the new storage - 4 ML/d capacity. |
| Summit carpark access road re-alignment (8) | The existing access road to the Summit carpark will be impacted by the proposed storage. Approximately 200 m of the existing access road intersects the proposed storage location and a new access track will be constructed. The new road will divert from the intersection with the access track to Federation and Southside Chairlift and extends in a westerly direction north of the Howqua chairlift before connecting into the existing summit access road near Pendergast Hut. | Estimated 5 m wide gravel access track with associated widening for connections to existing access tracks. |

| Infrastructure | Site location, requirement and description | Engineering details |
|---|---|---|
| Control Centre access road (9) | An access road will be construction around the control centre building to facilitate construction of the pipelines and future access for on-going maintenance. | Estimated 5 m wide gravel access track connecting into existing access tracks. |
| Connection and re-connection of existing services (10) | The concept design plan indicates various existing services located within the proposed construction footprint. Not all of these services will be impacted by the project. However, the confidence level associated with the spatial accuracy of the existing services information is considered low and during functional and detailed design further assessment will be required to determine the required services connections within the proposed footprint. | Current services reconnection includes:<br>• Potable water supply to Kofflers<br>• Re-alignment of wastewater/sewage near Summit Nature Walk Track below the storage<br>• Power to service new infrastructure |
| Environmental watering system (11) | The design of an environmental watering system downslope of the storage would allow water from the storage and/or internal storage drainage water to be distributed across the contour above the Alpine bog community in response to a need to artificially water these communities as and when required in accordance with a project specific Hydrological and Ecological Monitoring and Adaptive Management Program (HEMAMP). | Refer to Figure 4 in Appendix A for a schematic concept design of the proposed system.<br>The system is designed to gravity feed water via a series of regulating pits (1 m x 1 m) connected via a network of underground and above ground distribution pipes. |
| Stockpile areas (12) | The concept design assumed a number of handling activities to ensure the final embankment material would meet the engineering design requirements and be a well-mixed uniform material. To minimise the variability in the embankment fill material it is proposed to stockpile all excavated materials before placement into the embankment is commenced. This will be reassessed during detailed design as the properties of the individual materials are further assessed. | Based on the areas identified as suitable for the stockpiling it is expected that the main stockpile will reach a maximum height if about 5 m, allowing for 3 to 1 batters, assuming only the main construction material is stockpiled in this area and the topsoil and waste is stockpiled in the smaller stockpile areas.<br>Refer to section 4.6 |

| | | |
|---|---|---|
| | Depending on the final operation of the stockpiles, it is likely that three stockpiles will be developed:<br>• A main stockpile area for general embankment fill will be located on a gently sloping area north of the Holden Express ski traverse, south of Tirol (12a).<br>• Two smaller stockpiles for the top soil and the excess / waste excavated materials will be located in the area surrounding Baldy Tank (12b). | |
| Construction phase support infrastructure and footprint | To facilitate the construction of the various infrastructure a number of construction phase impacts have been assessed and allowed for in determining the PCF. These include:<br>• Access between sites and construction equipment movements<br>• Temporary building sites<br>• Material stockpiles | Determined during detailed design |
| Landscape Master Plan | A landscape master plan has been prepared to identify potential landscaping and supporting infrastructure to assist in the blending of the storage into the surrounding landscape. | Refer to the project Landscape and Visual Impact Assessment Report (GHD 2016b) |

## 4.2 Water Storage

### 4.2.1 General

The proposed off stream storage will be a cut to fill embankment located on the northern side of the slope, producing an approximately oval shaped storage with a maximum embankment height of 21 m on the northern side. It is proposed to construct the embankment with materials won as part of the required excavation, as far as practical, with the design optimising the use of these materials. The nature of the materials will mean the embankment may be permeable and will therefore require an impermeable lining to control seepage.

### 4.2.2 Excavations

The estimated subsurface profile is described in Section 4.5 (Table 2). The lowest excavation level is at an approximate RL of 1724 m. At this level, the extremely weathered granite and colluvium are expected to be encountered and form the base of the excavation.

Materials within the dam footprint are anticipated to be stiff/very stiff to medium dense fine grained and granular mixes. It is expected that excavation of the soils and extremely weathered rock may be achieved by standard bucket excavation methods utilising traditional earthmoving machinery of suitable capacity. Layers of cobbles and boulders may be encountered, slowing progress.

Excavated materials, including topsoil will be excavated, and deposited in a designated topsoil stockpile for later reuse.

### 4.2.3 Embankment Foundations

Based on the geological model the main embankment foundation will be predominantly extremely weathered granite with some isolated sections of colluvium and extremely weathered/residual soils of basalt. Preparation will generally involve the stripping of top soil, with a further 500 mm excavation depth required to get to material with adequate strength. No additional foundation treatment is expected.

### 4.2.4 Embankment Design and Liner System

The proposed storage is proposed to be a cut to fill embankment with a maximum height of about 21 m from highest fill point to lowest cut. Both the fill and cut batters have been assessed as 1V to 2.5H. This provides adequate factors of safety against slope instability for all expected design loadings.

The storage is assumed to be fully lined, assumed to be a 2 mm HDPE to provide an impermeable lining, The lining will extend to the crest and be secured to a reinforced concrete anchor beam which will be located on the perimeter of the storage.

### 4.2.5 Piping Failure and Seepage Control

The HDPE liner will be backed by a drainage layer, which will provide adequate defence against piping. The liner is impermeable; therefore any seepage from the storage through the liner will be due to a flaw in the liner (eg failed weld, puncture etc). If such a flaw was present, then the seepage would be collected by the drainage layer immediately beneath the liner and diverted into the drainage system. The drainage system will be designed in accordance to modern filter design methods.

The filter layer will also act as a drainage layer to collect any seepage through the liner and to control up lift pressure from groundwater. These flows will be collected by a system of slotted pipes and passed under the embankment to the downstream toe, where flows can be directed to either the aqueduct or alpine bogs downstream of the embankment.

### 4.2.6 Basin Overflows/Spillway

An emergency over flow will be located on the eastern side of the storage to cater for possible overtopping events. This will be designed to handle the larger of these events and are likely to be:

- Pump control failure and overfilling of the storage; or
- Large rainfall events.

## 4.3 Pipework

The inlet pipe will consist of 200 mm pipe which will be located on the eastern side of the storage adjacent to the control building. The pipe will be in a trench nominally 1 m below the surface to provide protection against freezing, and will enter the storage adjacent to the overflow structure. It will then lay on the surface on the internal batter discharging at the base of the storage.

The outlet pipe will run from the northern side of the storage beneath the embankment in the foundation (on the same alignment as the sub floor drainage outlet). The pipe will be fully concrete encased while in the footprint of the dam. This will consist of a 600 mm diameter outlet pipe. The intake structure will be a screened inlet located at the base of the storage.

## 4.4 Pump Station

A small booster pump station will be located at the toe of the embankment to provide the head to transfer the outflow to either the water treatment plant or to the Sun Valley Storage for snow making supply. It will also be possible to bypass the pump station and allow discharge to the aqueduct downstream of the storage, either for additional environmental water if required, of in the case of an emergency drawdown.

A new break tank and booster pump station will be located below Burnt Hut Reservoir, uphill of the Grimus access track. The break tank and pump station will connect to the existing raw water supply infrastructure from Boggy Creek to Burnt Hut and will be used to transfer raw water to the new storage (inlet pipe).

## 4.5 Design Summary Details

Table 2 summarises the concept design parameters for the proposed infrastructure.

## Table 2 Storage Concept Design Parameters

| Concept Design Parameter | Details |
|---|---|
| **Storage Dam** | |
| Top of Bank | 1735.5 m AHD |
| Design Finished Floor Level (FFL) | 1724.2 – 1724.0 m AHD |
| Nominal Storage Capacity (Outlet to TWL covered) | 100,000 $m^3$ |
| Design Freeboard | 1.0 m |
| Design Top Water Level (TWL) | 1734.5 m AHD |
| Upstream Cut Batter | 1 V to 2.5 H |
| Upstream Fill Batter | 1 V to 2.5 H |
| Downstream Batter | 1 V to 2.5 H |
| Crest width | 5 m |
| **Storage Pipework and Structure** | |
| Inflow | 4 ML/day |
| Inlet Diameter<br>- From raw water booster pump | 200 mm |
| Outflow:<br>- Sun Valley<br>- Treatment plant transfer pipe | 7 ML/day |
| Outlet Diameter<br>- Sun Valley<br>- Treatment plant transfer pipe | <br>600 mm<br>200 mm |
| Outlet level | 1715 m AHD |
| Outlet control<br>- Upstream of embankment<br>- Downstream of embankment | TBC in Detailed Design |
| Scour configuration | Through outlet |
| Overflow capacity | TBC in Detailed Design |
| Overflow diameter | 1.0 x 1.0 m culvert through crest |
| **Liner** | |
| Liner | HDPE |
| Ring Beam | Concrete |
| **Instrumentation** | |
| - Level instrumentation | TBC in Detailed Design |
| - Flow meters | TBC in Detailed Design |
| - Telemetry and Power supply | TBC in Detailed Design |
| - Power outlets | TBC in Detailed Design |

| Drainage | |
|---|---|
| Underdrainage | |
| - Type | Full height filter protection |
| - Layout | Full cover of upstream embankment and floor |
| - Collection system | Drainage system of 150 mm pipe flows to one internal pit, which drains to a mutual pit outside external wall toe. |
| - Discharge location | Adjacent to alpine bogs below embankment |
| Fencing | Fencing to enclose site.<br>Gates at entrance to storage. |
| Safety equipment | Lifebuoys and ropes, spacing to be provided |

## 4.6 Borrow Materials and Stockpile Operation

The water storage concept has been designed to provide excess cut, based on an assumed wastage rate from the required excavation. The estimated total volume of excavation, including top soil is approximately 78,350 $m^3$. The estimated total volume of fill is approximately 56,800 $m^3$. This is made up of variable materials likely to be encountered in the required excavation.

To minimise the variability in the embankment fill material it is proposed to stockpile all excavated materials before placement into the embankment is commenced. This will be reassessed during detailed design as the properties of the individual materials are further assessed.

Depending on the final operation of the stockpiles, it is likely that three stockpiles will be developed:

- A main stockpile for general embankment fill
- Two smaller stockpiles for the top soil and the excess / waste excavated materials.

Based on the areas identified as suitable for the stockpiling it is expected that the main stockpile will reach a maximum height if about 5 m.

The proposed materials handling process for the main stockpile will be developed to maximise the blending of the different material types, but it is envisaged that it will be in line with the following:

1. Required excavation to be undertaken using truck and excavator
2. As the material is excavated it will be assessed as suitable or otherwise as fill, if suitable, trucked to stockpile, if unsuitable trucked to waste / waste stockpile location for later reuse
3. Suitable material to be spread in horizontal layers, nominally 300 mm depth within the stockpile
4. Material will be won from the stockpiles using deep vertical cuts to obtain material from a number of different stockpiled layers
5. Moisture conditioning may be required, particularly the material excavated from below the water table, which may be too wet to place in the embankment.

The excess in cut was targeted in the concept modelling due to the expected quantities of unsuitable material for use as embankment fill.  Of these materials, the 10 % topsoil component plus approximately 20 % are considered unsuitable for embankment construction. The topsoil and oversized rockfill material will be used in the site re-profiling and rehabilitation works upon completed of the dam construction.

The current options and associated landscaping plan are outlined in a separate Landscape and Visual Impact Report (GHD 2016b) and would be refined during the detailed design stage.

# 5. Programme

## 5.1 Project Programme

A project programme has been developed for the construction of the facility and is presented in Appendix B.

The program has been framed to determine the required construction period for the project and is framed around the following assumptions:

- A start after the completion of the snow season nominally taken as the end of September (This start date may need to be adjusted depending on seasonal conditions).
- The construction programme is based around a standard working week with 5 days on 2 days off roster, which runs for 122 days (25 weeks) until mid-March.
- Should the project incur delays, an additional 2 months are available for construction prior to the onset of the snow season.
- Specified equipment, work rates and construction sequencing are based on GHD's experience with similar dams and civil earthworks projects and will require re-assessment during functional and detailed design.
- Actual methodology adopted by the selected contractor may differ and result in changes to the programme as provided.

## 5.2 Detailed Design and Construction Phase

During concept design an assessment was undertaken to determine the options available to minimise the risks to the project, specifically the ability to work within the defined project construction footprint and proposed programme.

GHD recommended an Early Contractor Involvement (EPI) approach for the main contractor who will be responsible for the earthworks and piping and a Design and Construct (D&C) approach for the liner contractor is the most appropriate methodology for this project.

The reasoning for this approach is as follows:

- The earthworks comprise the bulk of the overall programme schedule (~90%) and controls when the liner installation can be initiated, i.e. it is the critical path component;
- The earthworks programme will have the highest impact upon the local community and environment, both through equipment movements, noise, dust, visual impacts, area affected and local access restrictions;
- Utilising a contractor during the design process will enable the overall team to identify the optimal methodology of completing the planned works through sequencing each construction step and selection of the most appropriate equipment fleet thereby reducing potential impacts upon the local community and environment and ultimately working within the defined project footprint;
- By involving the contractor, the overall programme schedule can be condensed as the works tender package that will be taken to the market will be robust with minimal requirement for supplemental design and information requirements thereby reducing the risk of schedule and cost overruns;

- The liner installation is a relatively straight forward process for which the works scope can be readily defined, scheduled and costed;
- The liner works will be restricted to the footprint of the storage, with the exception of the materials laydown area and the initial transport/unloading of the materials though the resort to the laydown area. These exceptions can be readily managed with minimal impacts upon the local community and environment;
- The largest risk to the liner installation schedule is earthworks completion and weather. The earthworks can be managed with the appropriate approach to minimise schedule disruptions. This minimisation is the available counter measure to adverse weather conditions.
- By utilising the traditional project engagement model for the project, the significant opportunities presented by early incorporation of the contractor into the team will minimise community and environmental impacts through the optimisation of the interaction between the engineering design requirements and the heavy equipment safe operating requirements. This will in turn lead to a reduced risk of community opposition as well project schedule and cost over runs.

# 6. References


GHD 2014a, *Mt Buller Sustainable Water Security Project – Concept Design Report*. Report #232855_Rev0, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2014b *Mt Buller Sustainable Water Security Project – Factual Geotechnical Report*. Report #230606, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2014c *Mt Buller Sustainable Water Security Project – Hydrological and Hydrological*. Report #231823, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2014d *Mt Buller Sustainable Water Security Project – Water Supply Concept Design Investigations*. Report #227530, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2014e *Mt Buller Sustainable Water Security Project – Off-Stream Storage. Options Assessment Report*, July 2014. Report #6974, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2015 *Mt Buller Sustainable Water Security Project – Off-Stream Storage. Review of Alpine Bog Ecology, Hydrogeology and Additional Investigations*. Report #242542, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2016a *Mt Buller Sustainable Water Security Project – Geotechnical Risk Assessment*. Report #233153_Rev2, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

GHD 2016b *Mt Buller Sustainable Water Security Project – Landscape and Visual Impact Assessment*. Report #226161_Rev1, Report for the Mt Buller and Mt Stirling Alpine Resort Management Board

# 7. Limitations and Assumptions

## 7.1 Assumptions

Due to the preliminary nature of the design of the storage and the associated ancillary infrastructure as described in this document and the project Concept Design Report (GHD 2014a), it was necessary to make a number of assumptions to undertake the concept design. These assumptions and the limitations of those assumptions are discussed where appropriate in the relevant sections of this summary document and the GHD 2014a report.

## 7.2 Scope and Limitations

This report has been prepared by GHD for Mt Buller and Mt Stirling Alpine Resort Management Board and may only be used and relied on by Mt Buller and Mt Stirling Alpine Resort Management Board for the purpose agreed between GHD and the Mt Buller and Mt Stirling Alpine Resort Management Board as set out in this section of the report.

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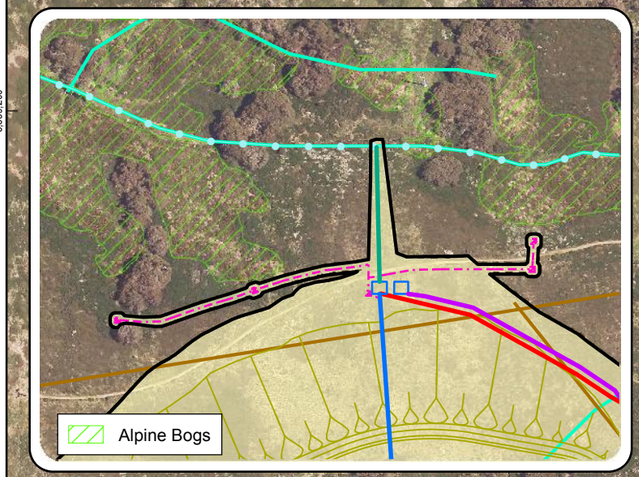
The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in Section 1.2 of this Report. No geotechnical investigations were undertaken for the ancillary infrastructure associated with the project including pipelines, pumping stations, water tanks and stockpile areas.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

# Figures





449,400 449,600 449,800 450,000 450,200 450,400

5,889,200 5,889,000 5,888,800 5,888,600

Potable Water Teatment Plant
Burnt Hut Reservoir
Baldy Tank
Control Centre
Summit Carpark
Boggy Creek T-Bar Station
Kofflers T-Bar Station
Sun Valley Storage

1 2 3 4 5 6 7 8 9 10 11 12 12A 12B

Paper Size A3

0 25 50 100

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

**New Infrastructure**
- Construction footprint
- Proposed stockpiles(12)
- Off stream storage (1)
- Irrigation Pipeline(11)
- New Road Alignments (8,9)
- Kofflers Water Supply Pipeline(10)
- Outlet Pipeline(2)
- Storage Tank(6)
- Sun Valley Water Supply Pipeline(4)
- Treatment Supply Pipeline(5)
- Water Supply Pipeline(7)
- Water Supply Pump(3)
- Aqueduct

Exisiting Water Infrastructure (approximate location)
- Water main
- Potable Water Pipeline
- Recycled Water Main
- Water Infrastructure
- Sewerage Main
- Sewerage Rising Main
- Gas Main

Mt Buller & Mt Stirling Resort Management
Mt Buller Sustainable Water Security Project

Job Number 31-30733
Revision F
Date 02 Aug 2017

# Project Concept Design

G:\31\30733\GIS\Maps\Working\31-30733_0_Project-Concept-Design-EES_A3L.mxd



Data source: Mt Buller & Mt Stirling Resort Management, Aerial imagery, 2011; ARI, bog mapping. Created by:tworth

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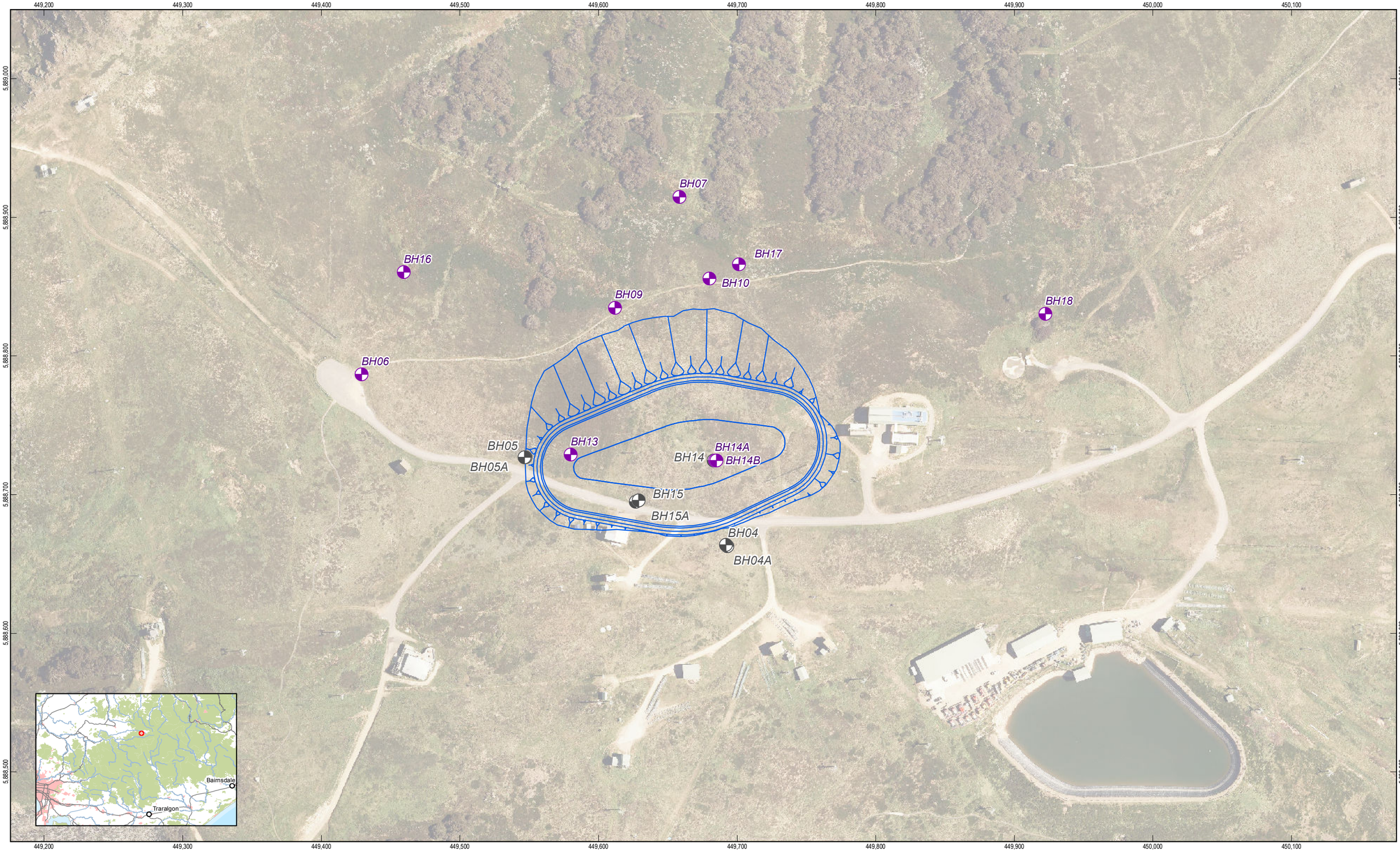


Paper Size A3

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Bore location
- Bore location (monitored since 2015)
- Dam footprint

Mt Buller & Mt Stirling Resort Management
Buller WSP GW Monitoring Program

| | |
|---|---|
| Job Number | 31-30733 |
| Revision | A |
| Date | 22 May 2015 |

# Figure 2
# Groundwater Monitoring Bore Network

G:\31\30733\GIS\Maps\Deliverables\Report_2015_May\313073318_01_GW_MonitoringBoreNetwork_A3L.mxd



Data source: Mt Buller & Mt Stirling Resort Management, Aerial imagery, 2011. Created by:emelero-blanca

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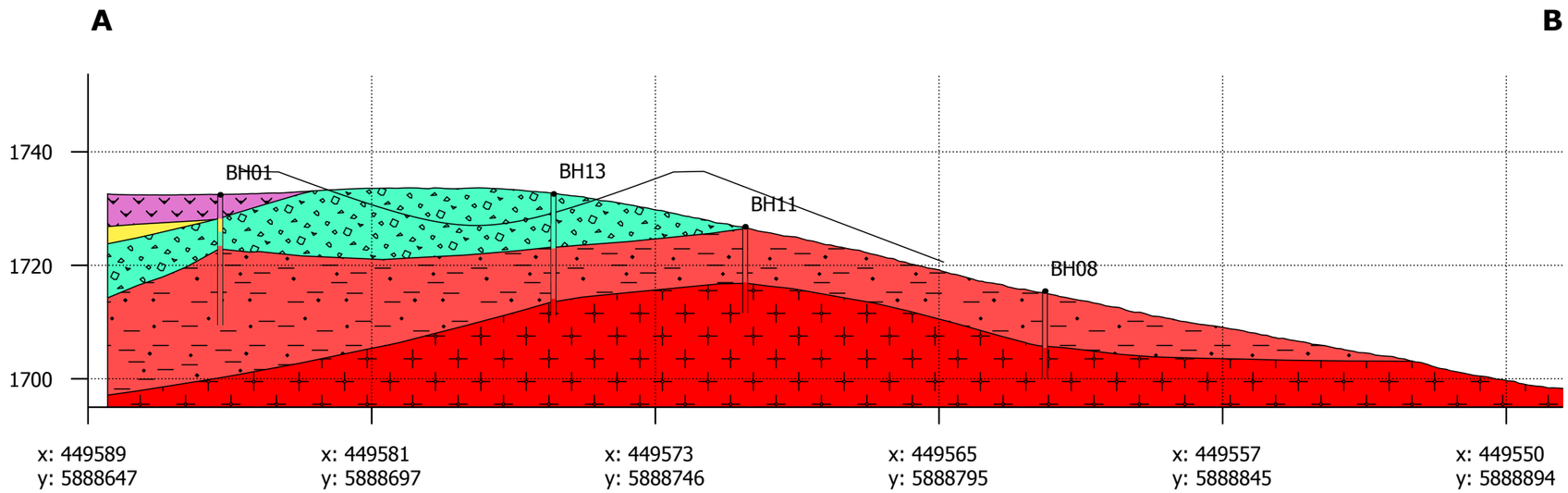
# Geological Section - North to South (NS1)




## Legend

### Geological Units

- Upper basalt
- Colluvium
- Granite (MW)
- Granitic Alluvium
- Granite (XW)

Scale: 1:1,000

Vertical exaggeration: 1x

0m 50m

### Location

A: 449589, 5888647

B: 449548, 5888904

SURFACE WATER FLOW

TO SUN VALLEY RESERVOIR

DAM EMBANKMENT

SURFACE WATER FLOW

TO VILLAGE WATER SUPPLY SYSTEM

SNOW MAKING PUMP STATION

WATER SUPPLY PUMP STATION

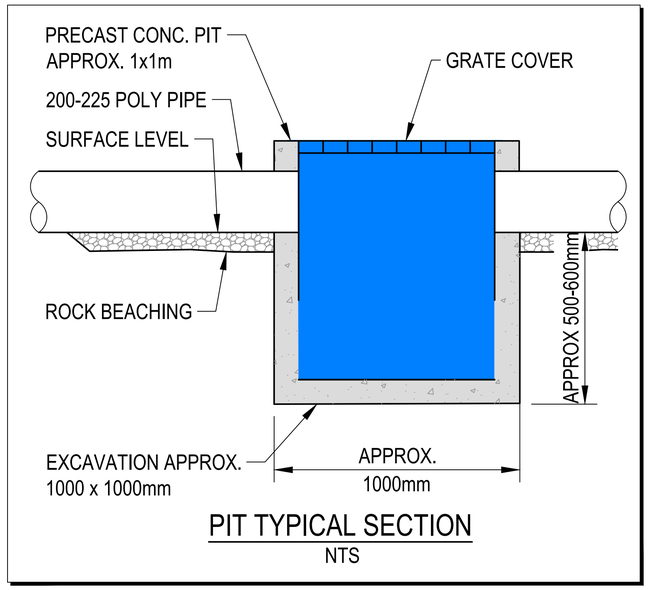
VALVE

FLOWMETER

REGULATING PIT

GATIC COVER

REGULATING WATER LEVELS




PIT TYPICAL SECTION

NTS

REGULATING PIT

GATIC COVER

ABOVE GROUND PIPELINE

PIPELINE UNDERGROUND

ROCK BEACHING AROUND PIT

VALVE AT SURFACE

PIPELINE UNDERGOUND

WALKING SUMMIT TRACK

UNDER DAM DRAINAGE TO AQUEDUCT

200-225 mm POLYPIPE

SAME WATER LEVEL

REGULATING PIT

GRATE COVER

REGULATING PIT

GRATE COVER

VALVE AT SURFACE

ROCK BEACHING AROUND PIT

REGULATING PIT

GRATE COVER

ROCK BEACHING AROUND PIT

ALPINE BOG

ALPINE BOG

**PRELIMINARY**

| No | Revision | Drawn | Job Manager | Project Director | Date |
|---|---|---|---|---|---|
| A | PRELIMINARY | RMS | GJ* | PB* | 16.09.15 |

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| Drafting Check | | Design Check | |
| Approved (Project Director) | | | |
| Date | | | |
| Scale AS SHOWN | This Drawing must not be used for Construction unless signed as Approved | | |

Client: MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD

Project: MT BULLER SUSTAINABLE WATER SECURITY PROJECT

Title: CONTROL CENTRE OFF STREAM STORAGE
ENVIROMENTAL WATERING CONCEPT DESIGN SCHEMATIC

Original Size **A1**

**Drawing No: 31-30733-FIG 4**

**Rev: A**

Plot Date: 16 September 2015 - 12:06 PM Plotted by: Rob Slarks

Cad File No: C:\buller\31-30733-FIG 5.dwg

# Appendices

N

EXISTING AQUEDUCT

E C022

DISCHARGE PIT

PIPELINE UNDERGROUND

PUMP STATION

PROPOSED OUTLET TO AQUEDUCT

PUMP STATION (SKI LIFTS)

PIPELINE UNDERGROUND

IRRIGATION PIPELINE

REGULATING PIT

OUTLET PIPE

DISCHARGE PIT

REGULATING PIT

B C020

PIPELINE

DISCHARGE PIT

ENVIRONMENTAL WATERING OFFTAKE FROM DAM OUTLET

OUTLET PIPE

DRAIN

F C022

NEW ROAD ALIGNMENT

F C022

OVERFLOW

APPROXIMATE LOCATION OF TELSTRA AND WATER

TW

A C020

TOE DRAIN

CONTROL STORAGE OPTION 5

INLET PIPE

D C021

E C022

C C021

GRADE FLOOR

A C020

5m CREST WIDTH

VEHICLE ACCESS AT THIS POINT

NEW ROAD ALIGNMENT

B C020

LEGEND

TOE DRAIN

PRELIMINARY

| No | Revision | Drawn | Job Manager | Project Director | Date |
|---|---|---|---|---|---|
| C | IRRIGATION PIPELINE ADDED | RMS | GJ* | PB* | 16.09.15 |
| B | PRELIMINARY RE-ISSUE | RMS | GJ* | GJ* | 22.07.15 |
| A | PRELIMINARY | RMS | GJ* | GJ* | 24.07.14 |

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0 5 10 15 20 25m

SCALE 1:500 AT ORIGINAL SIZE

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Drafting Check | Design Check
Approved (Project Director)
Date
Scale AS SHOWN

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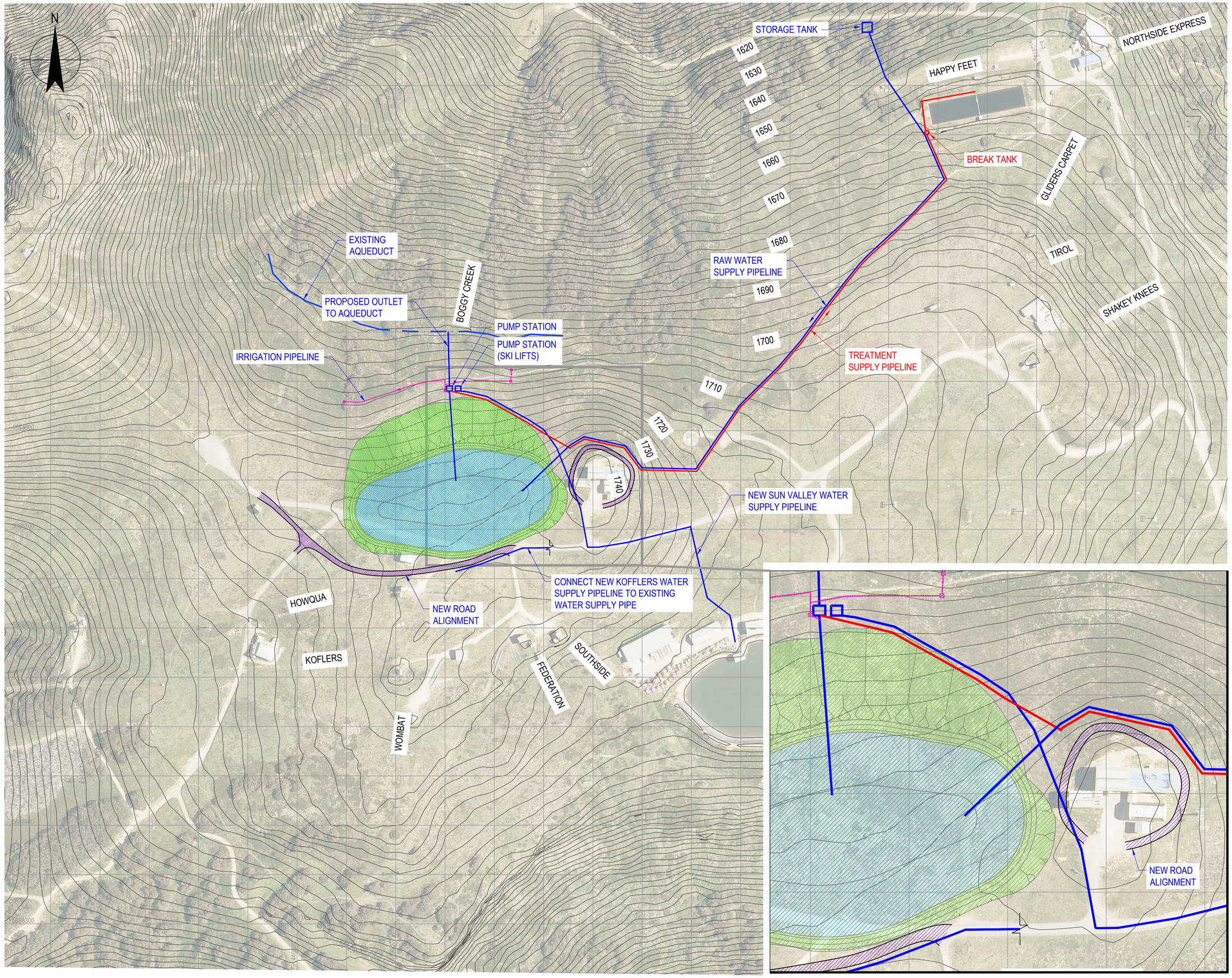
Client MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD
Project MT BULLER SUSTAINABLE WATER SECURITY PROJECT
Title CONTROL CENTRE OFF STREAM STORAGE GENERAL ARRANGEMENT

Original Size A1
Drawing No: 31-30733-C010
Rev: C

Plot Date: 28 July 2016 - 2:53 PM Plotted by: Rob Slarks Cad File No: G:\31\30733\CADD\Drawings\31-30733-C010.dwg




**PRELIMINARY**

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|---|---|---|---|---|---|---|
| B | PRELIMINARY RE-ISSUE | | RMS | GJ* | GJ* | 22.07.15 |
| A | PRELIMINARY | | RMS | GJ* | GJ* | 24.07.14 |

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SCALE 1:1000 AT ORIGINAL SIZE

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

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|---|---|---|---|
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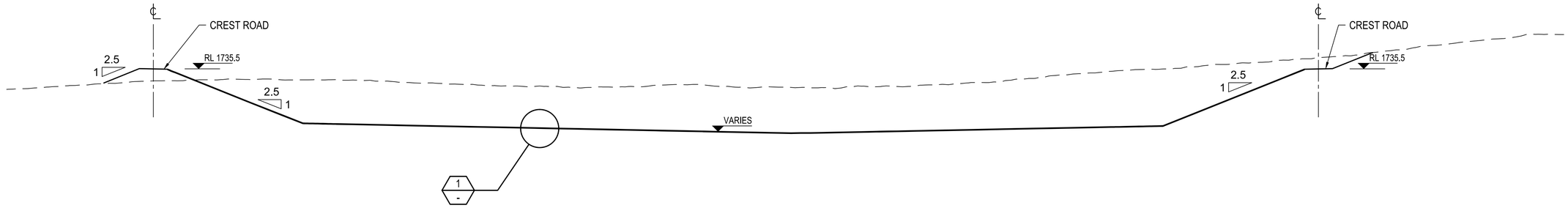
| Drafting Check | | Design Check | |
| Approved (Project Director) | | | |
| Date | | | |
| Scale | 1:1000 | This Drawing must not be used for Construction unless signed as Approved | |

Client: MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD
Project: MT BULLER SUSTAINABLE WATER SECURITY PROJECT
Title: CONTROL CENTRE OFF STREAM STORAGE WATER SERVICES PLAN

Original Size: A1
Drawing No: 31-30733-C015
Rev: B

Plot Date: 28 July 2016 - 4:00 PM
Plotted by: Rob Slarks
Cad File No: G:\31\30733\CADD\Drawings\31-30733-C015.dwg

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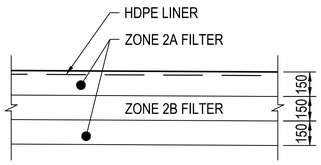


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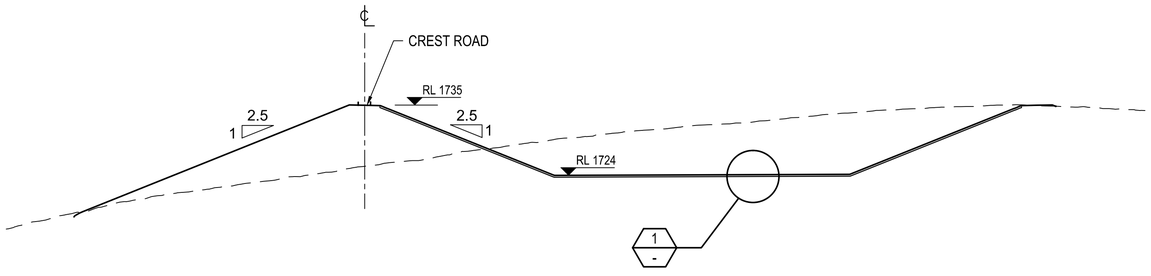


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C010 SCALE 1 : 1000

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| A | PRELIMINARY | | RMS | | | |

0 10 20 30 40 50m
SCALE 1:1000 AT ORIGINAL SIZE

0 20 40 60 80 100m
SCALE 1:2000 AT ORIGINAL SIZE

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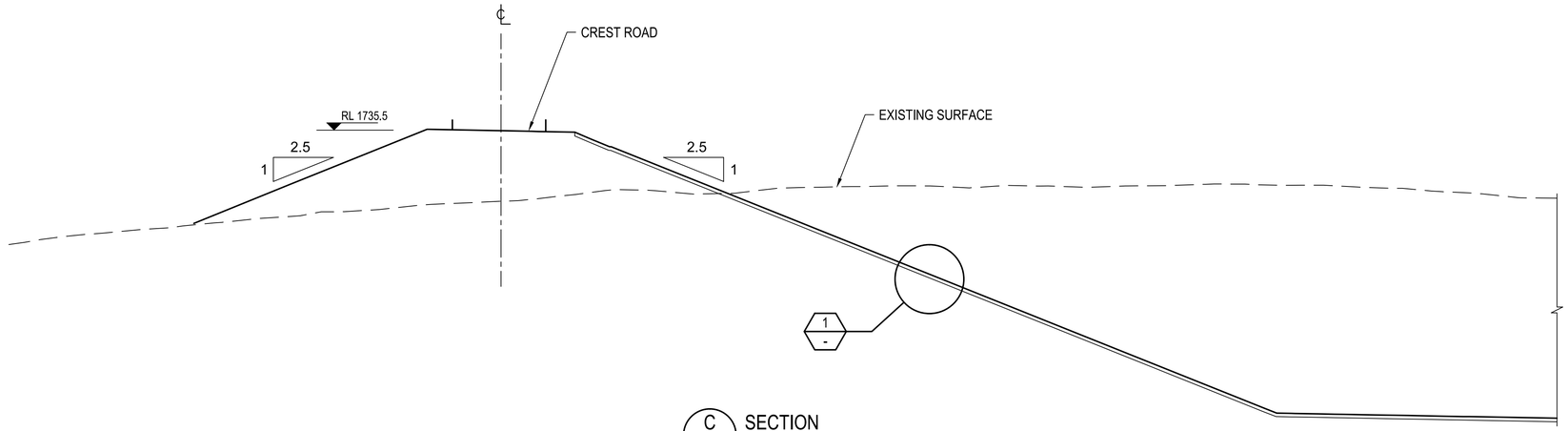
Client MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD
Project MT BULLER SUSTAINABLE WATER SECURITY PROJECT
Title CONTROL CENTRE OFF STREAM STORAGE SECTIONS

Original Size A1
Drawing No: 31-30733-C020
Rev: A

Plot Date: 28 July 2016 - 2:57 PM Plotted by: Rob Slarks Cad File No: G:\31\30733\CADD\Drawings\31-30733-C020_C022.dwg

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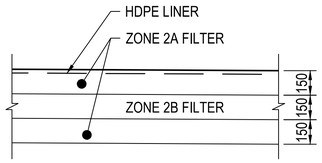


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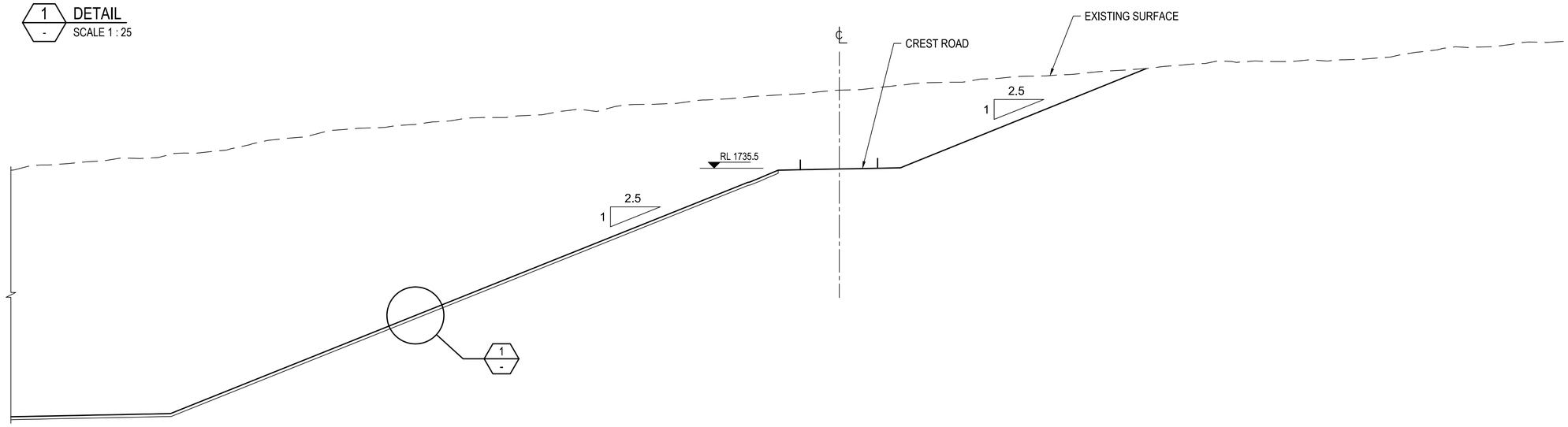


D SECTION
C010 SCALE 1 : 500

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|---|---|---|---|---|---|---|
| A | PRELIMINARY | | RMS | | | |

0 5 10 15 20 25m
SCALE 1:500 AT ORIGINAL SIZE


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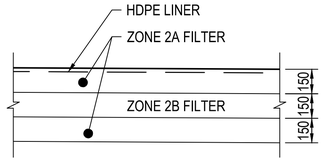
|---|---|
| Client | MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD |
| Project | MT BULLER SUSTAINABLE WATER SECURITY PROJECT |
| Title | CONTROL CENTRE OFF STREAM STORAGE SECTIONS |
| Original Size | A1 |
| Drawing No: | 31-30733-C021 |
| Rev: | A |

Plot Date: 28 July 2016 - 2:55 PM Plotted by: Rob Slarks Cad File No: G:\31\30733\CADD\Drawings\31-30733-C020_C022.dwg

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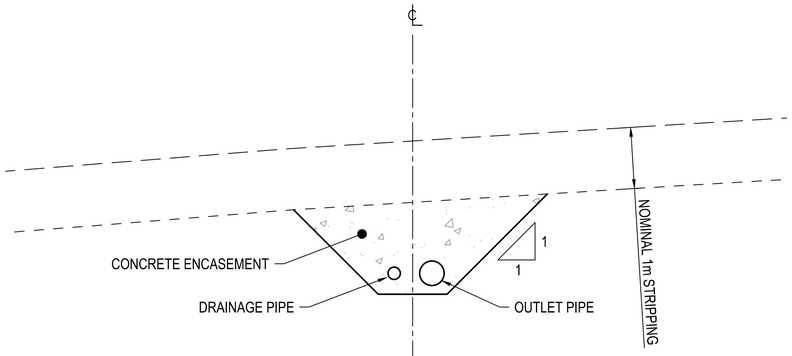


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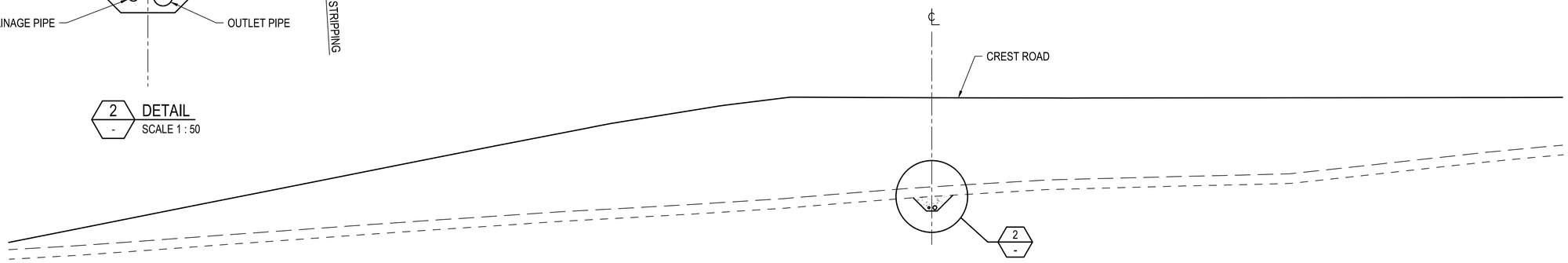


F C010 SECTION
SCALE 1 : 250

**PRELIMINARY**

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|---|---|---|---|---|---|---|
| A | PRELIMINARY | | RMS | | | |

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

0 0.25 0.5 0.75 1.0 1.25m
SCALE 1:25 AT ORIGINAL SIZE

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

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Date
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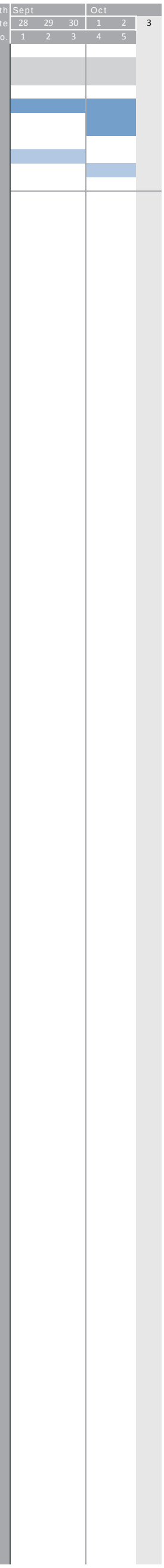
Client MT BULLER & MT STIRLING ALPINE RESORT MGMT BOARD
Project MT BULLER SUSTAINABLE WATER SECURITY PROJECT
Title CONTROL CENTRE OFF STREAM STORAGE SECTIONS

Original Size A1
Drawing No: 31-30733-C022
Rev: A

Plot Date: 28 July 2016 - 2:55 PM
Plotted by: Rob Slarks
Cad File No: G:\31\30733\CADD\Drawings\31-30733-C020_C022.dwg

| Task | Description | No. | Units | Labour | Equipment | Rate | Units | Duration | Units |
|---|---|---|---|---|---|---|---|---|---|
| **Preliminaries** | | | | | | | | | |
| **1** | **Telstra cable relocation** | 1 | ea | | | 2 | week | 2 | week |
| **2** | **Waterline relocation** | 1 | ea | | | 2 | week | 2 | week |
| **3** | **Chairlift** | | | | | | | | |
| 3.1 | removal of cable and two pylons from within embankment foot print | 1 | ea | | | | | | |
| 3.2 | removal of chairlift buildings from within embankment footprint and dispose of in accordnace with site requirement | 1 | ea | | | | | | |
| **4** | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** | | | | | | | | |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage | 1 | ea | | | 3 | day | 3 | day |
| 4.2 | Excavation and relocation of salvage plants to interm staging area | 1 | ea | | | 12 | day | 12 | day |
| 4.3 | relocation of salvage plants from staging area to planting site | 1 | ea | | | 5 | week | 5 | week |
| **Construction Works** | | | | | | | | | |
| **5** | **Site Establishment** | | | | | | | | |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. | 1 | ea | | | 5 | day | 5 | day |
| 5.2 | installation of office, crib and toilet block | 4 | ea | | | 2 | day | 2 | day |
| 5.3 | electrical hook-up | 1 | ea | | sparkie, genset/mains | 2 | day | 2 | day |
| 5.4 | water hook-up | 1 | ea | | | 2 | day | 2 | day |
| 5.5 | installation of gatehouse and fencing around work area | 1 | ea | | | 5 | day | 5 | day |
| 5.6 | equipment mobilisation | 27 | ea | | | 3 | day | 9 | day |
| | • dozer | 2 | ea | | | | | | |
| | • excavator (35 t) | 2 | ea | | | | | | |
| | • excavator (20 t) | 2 | ea | | | | | | |
| | • excavator (5 t) | 1 | ea | | | | | | |
| | • grader | 1 | ea | | | | | | |
| | • articulated dump truck | 6 | ea | | | | | | |
| | • compactor - sheepsfoot | 2 | ea | | | | | | |
| | • compactor - smoothdrum | 1 | ea | | | | | | |
| | • IT28 | 1 | ea | | | | | | |
| | • manitou (telehandler) | 1 | ea | | | | | | |
| | • water cart (16$m^3$) | 2 | ea | | | | | | |
| | • fuel cart | 1 | ea | | | | | | |
| | • service cart | 1 | ea | | | | | | |
| | • ute | 2 | ea | | | | | | |
| | • bus | 1 | ea | | | | | | |
| | • workshop | 1 | ea | | | | | | |
| 5.7 | Baseline Survey (if required) | 1 | ea | | | 5 | day | 5 | day |
| **6** | **Stockpile area preparation works** | 1 | ea | | | | | | |
| 6.1 | Slash vegetation and move to temp stockpile | 72,000 | $m^2$ | 4 | ute, trailer, slashers, | 30,000 | $m^2$/day | 2.4 | day |
| 6.2 | cover stockpile area with geofabic | 72,000 | $m^2$ | 4 | IT28, tele handler, ute, trailer | 8,000 | $m^2$/day | 9 | day |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area | 1 | ea | 3 | 20 t excavator, 2 trucks | 1 | day | 1 | day |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products | 1 | lump sum | | | 0.2 | day | 5 | day |
| **7** | **Relocate haul/access road around pond** | | | | | | | | |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area | 2,200 | $m^2$ | 3 | dozer, 20 t excavator, 2 trucks | 3,000 | $m^2$/day | 0.7 | day |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) | 660 | $m^3$ | 3 | D7 Dozer, 20 t excavator, 2 trucks | 700 | $m^3$/day | 0.9 | day |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base | 1,350 | $m^3$ | 4 | Grader, 20 t excavator, 2 trucks | 650 | $m^3$/day | 2.1 | day |
| **8** | **Storage Pond preparation works** | | | | | | | | |
| 8.1 | Clear , grub, load, haul and place vegetation from water pond footprint to designated stockpile area | 34,000 | $m^2$ | 3 | dozer, 20 t excavator, 2 trucks | 3,000 | $m^2$/day | 11.3 | day |
| 8.2 | Clear , grub, load, haul and place topsoil from water pond footprint to designated stockpile area (300mm thk) | 10,200 | $m^3$ | 3 | D7 Dozer, 20 t excavator, 2 trucks | 2,000 | $m^3$/day | 5.1 | day |
| 8.3 | Excavate, load, haul and place unsuitable material from water dam footprint to designated stockpile area | 200 | $m^3$ | 3 | 20 t excavator, 2 trucks | 500 | | 0.4 | day |
| **9** | **Storage Pond Excavation works** | | | | | | | | |
| 9.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area | 75,000 | $m^3$ | 9 | 2No. 30 t excavators, 6 trucks, watercart, D7 dozer | 3,000 | $m^3$/day | 25 | day |
| 9.2 | Moisture condition and blend excavated material from water dam foot print placed at designated stockpile in accordance to specifications | 75,000 | $m^3$ | 2 | D7 dozer, grader, watercart | 3,000 | $m^3$/day | 25 | day |
| **10** | **Storage Pond Underdrainage works** | | | | | | | | |
| 10.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area | 8,850 | $m^3$ | 9 | 1No. 30 t excavators, 3 trucks | 1,500 | $m^3$/day | 5.9 | day |
| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover | 90 | m | 6 | 2No. 20 t excavator, 2 trucks, jumping jack | 400 | m/day | 0.225 | day |
| 10.3 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into outlet pipe slot to design limits | 8,700 | $m^3$ | 9 | 2No. 20 t excavators, 4 trucks | 2,000 | $m^3$/day | 4.35 | day |
| 10.4 | supply and install geotextile seperation layer within the underdrainage trenches | 1,500 | $m^2$ | 3 | franna/IT | 3,000 | $m^2$/day | 0.5 | day |
| 10.5 | supply and install underdrainage pipework within embankment footprint | 290 | m | 3 | Ute, ± 20 t excavator | 500 | m/day | 0.58 | day |
| 10.6 | supply and install drainage media within underdrainage trenches | 120 | $m^3$ | 6 | 1No. 20 t excavator, 1 truck, loader/excavator at stockpile, 2 jumping jacks/plate tampers | 240 | $m^3$/day | 0.5 | day |
| 10.7 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill over underdrains to design limits to form cushion layer | 50 | $m^3$ | 3 | 1 grader, 1 truck, loader/excavator at stockpile | 150 | $m^3$/day | 0.33 | day |
| **11** | **Storage Pond Embankment Works** | | | | | | | | |
| 11.1 | Grade, moisture condition and compact water dam embankment foot print in accordance to specifications | 30,000 | $m^2$ | 1 | sheepsfoot compactor | 5,000 | $m^2$/day | 6 | day |
| 11.2 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into water pond embankment in accordance to design limits and specifications | 75,000 | $m^3$ | 9 | 2No. 30 t excavators, 6 trucks, dozer, 2 sheepsfoot compactors | 3,000 | $m^3$/day | 25 | day |
| 11.3 | Proof roll upstream embankment of water dam and floor of basin | 15,000 | $m^2$ | 1 | sheepsfoot compactor | 5,000 | $m^2$/day | 3 | day |
| 11.4 | Supply and install HDPE liner on prepared upstream embankment trench including excvation and backfill of anchor trenches along crest | 20,000 | $m^2$ | 6 | Manitou or IT28, 5t excavator, ute, genset (2), liner welding and testing gear | 1,000 | $m^2$/day | 20 | day |
| 11.5 | Supply and install perimter fence along crest of embankment | 540 | m | 2 | posthole digger, ute with trailer, concrete mixer | 150 | m/day | 3.6 | day |
| 11.6 | Load from stockpile, haul, place, spread and compact moisture conditioned topsoil onto the downstream water pond embankment in accordance to design limits and specifications | 10,860 | $m^3$ | 5 | 1No. 30 t excavators, 3 trucks, dozer, | 1,500 | $m^3$/day | 7.24 | day |
| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat | 500 | $m^3$ | 5 | 1No. 30 t excavator, 1No. 20 t excavator, 2 trucks, dozer | 100 | $m^3$/day | 5 | day |
| 11.8 | Supply and install erosion control mat onto downstream embankment slope in accordance to design and specifications | 12,000 | $m^2$ | 6 | 20 t excavator or IT28, ute with trailer, staple guns | 1,000 | $m^2$/day | 12 | day |
| 11.9 | Supply and place all materials required for seeding and fertilising downstream slope of water dam downstream embankment slope | 12,000 | $m^2$ | 4 | Hydroseeder or manual *(time scheduled is for manual)* | 1,000 | $m^2$/day | 12 | day |
| **12** | **Site Rehabilitation** | | | | | | | | |
| 12.1 | Remove and dispose in accordance with legal requirements the geotextile liner placed beneath the stockpile area | 72,000 | $m^2$ | 4 | IT28, tele handler, ute, trailer | 8,000 | $m^2$/day | 9 | day |
| 12.2 | Remove and dispose in accordance with legal requirements the redundant erosion control measures placed for the project works | 1 | lump sum | | | 0.2 | day | 5 | day |
| 12.3 | repair damage to public road caused by haul fleet | 1 | lump sum | | | 0.2 | day | 5 | day |
| 12.4 | Black top section of haulroad constructed along southern side of water pond | 1 | lump sum | | | 0.2 | day | 5 | day |
| **13** | **Demobilisation** | | | | | | | | |
| 13.1 | Disconnect the electrical power | 1 | ea | | sparkie, genset/mains | 0.5 | day | 2 | day |
| 13.2 | disconnect the water supply | 1 | ea | | | 0.5 | day | 2 | day |
| 13.3 | Remove office, crib and toilet block | 4 | ea | | | 2 | day | 2 | day |
| 13.4 | remove the gatehouse and safety fencing around work area | 1 | ea | | | 0.4 | day | 2.5 | day |
| 13.5 | Equipment de-mobilisation | 27 | ea | | | 3 | day | 9 | day |
| | • dozer | 2 | ea | | | | | | |
| | • excavator (35 t) | 2 | ea | | | | | | |
| | • excavator (20 t) | 2 | ea | | | | | | |
| | • excavator (5 t) | 1 | ea | | | | | | |
| | • grader | 1 | ea | | | | | | |
| | • articulated dump truck | 6 | ea | | | | | | |
| | • compactor - sheepsfoot | 2 | ea | | | | | | |
| | • compactor - smoothdrum | 1 | ea | | | | | | |
| | • IT28 | 1 | ea | | | | | | |
| | • manitou (telehandler) | 1 | ea | | | | | | |
| | • water cart (16$m^3$) | 2 | ea | | | | | | |
| | • fuel cart | 1 | ea | | | | | | |
| | • service cart | 1 | ea | | | | | | |
| | • ute | 2 | ea | | | | | | |
| | • bus | 1 | ea | | | | | | |
| | • workshop | 1 | ea | | | | | | |
| 13.6 | Final pick-up Survey (if required) | 1 | ea | | | 5 | day | 0.2 | day |



| Task | Description |
|---|---|
| | **Preliminaries** |
| 1 | **Telstra cable relocation** |
| 2 | **Waterline relocation** |
| 3 | **Chairlift** |
| 3.1 | removal of cable and two pylons from within embankment foot print |
| 3.2 | removal of chairlift buildings from within embankment footprint and dispose of in accordnace with site requirement |
| 4 | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage |
| 4.2 | Excavation and relocation of salvage plants to interm staging area |
| 4.3 | relocation of salvage plants from staging area to planting site |
| | **Construction Works** |
| 5 | **Site Establishment** |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. |
| 5.2 | installation of office, crib and toilet block |
| 5.3 | electrical hook-up |
| 5.4 | water hook-up |
| 5.5 | installation of gatehouse and fencing around work area |
| 5.6 | equipment mobilisation |
| | • dozer |
| | • excavator (35 t) |
| | • excavator (20 t) |
| | • excavator (5 t) |
| | • grader |
| | • articulated dump truck |
| | • compactor - sheepsfoot |
| | • compactor - smoothdrum |
| | • IT28 |
| | • manitou (telehandler) |
| | • water cart (16m$^3$) |
| | • fuel cart |
| | • service cart |
| | • ute |
| | • bus |
| | • workshop |
| 5.7 | Baseline Survey (if required) |
| 6 | **Stockpile area preparation works** |
| 6.1 | Slash vegetation and move to temp stockpile |
| 6.2 | cover stockpile area with geofabic |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products |
| 7 | **Relocate haul/access road around pond** |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base |
| 8 | **Storage Pond preparation works** |
| 8.1 | Clear , grub, load, haul and place vegetation from water pond footprint to designated stockpile area |
| 8.2 | Clear , grub, load, haul and place topsoil from water pond footprint to designated stockpile area (300mm thk) |
| 8.3 | Excavate, load, haul and place unsuitable material from water dam footprint to designated stockpile area |
| 9 | **Storage Pond Excavation works** |
| 9.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
| 9.2 | Moisture condition and blend excavated material from water dam foot print placed at designated stockpile in accordance to specifications |
| 10 | **Storage Pond Underdrainage works** |
| 10.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover |
| 10.3 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into outlet pipe slot to design limits |
| 10.4 | supply and install geotextile seperation layer within the underdrainage trenches |
| 10.5 | supply and install underdrainage pipework within embankment footprint |
| 10.6 | supply and install drainage media within underdrainage trenches |
| 10.7 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill over underdrains to design limits to form cushion layer |
| 11 | **Storage Pond Embankment Works** |
| 11.1 | Grade, moisture condition and compact water dam embankment foot print in accordance to specifications |
| 11.2 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into water pond embankment in accordance to design limits and specifications |
| 11.3 | Proof roll upstream embankment of water dam and floor of basin |
| 11.4 | Supply and install HDPE liner on prepared upstream embankment trench including excvation and backfill of anchor trenches along crest |
| 11.5 | Supply and install perimter fence along crest of embankment |
| 11.6 | Load from stockpile, haul, place, spread and compact moisture conditioned topsoil onto the downstream water pond embankment in accordance to design limits and specifications |
| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat |
| 11.8 | Supply and install erosion control mat onto downstream embankment slope in accordance to design and specifications |
| 11.9 | Supply and place all materials required for seeding and fertilising downstream slope of water dam downstream embankment slope |
| 12 | **Site Rehabilitation** |
| 12.1 | Remove and dispose in accordance with legal requirements the geotextile liner placed beneath the stockpile area |
| 12.2 | Remove and dispose in accordance with legal requirements the redundant erosion control measures placed for the project works |
| 12.3 | repair damage to public road caused by haul fleet |
| 12.4 | Black top section of haulroad constructed along southern side of water pond |
| 13 | **Demobilisation** |
| 13.1 | Disconnect the electrical power |
| 13.2 | disconnect the water supply |
| 13.3 | Remove office, crib and toilet block |
| 13.4 | remove the gatehouse and safety fencing around work area |
| 13.5 | Equipment de-mobilisation |
| | • dozer |
| | • excavator (35 t) |
| | • excavator (20 t) |
| | • excavator (5 t) |
| | • grader |
| | • articulated dump truck |
| | • compactor - sheepsfoot |
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| | • IT28 |
| | • manitou (telehandler) |
| | • water cart (16m$^3$) |
| | • fuel cart |
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| | • bus |
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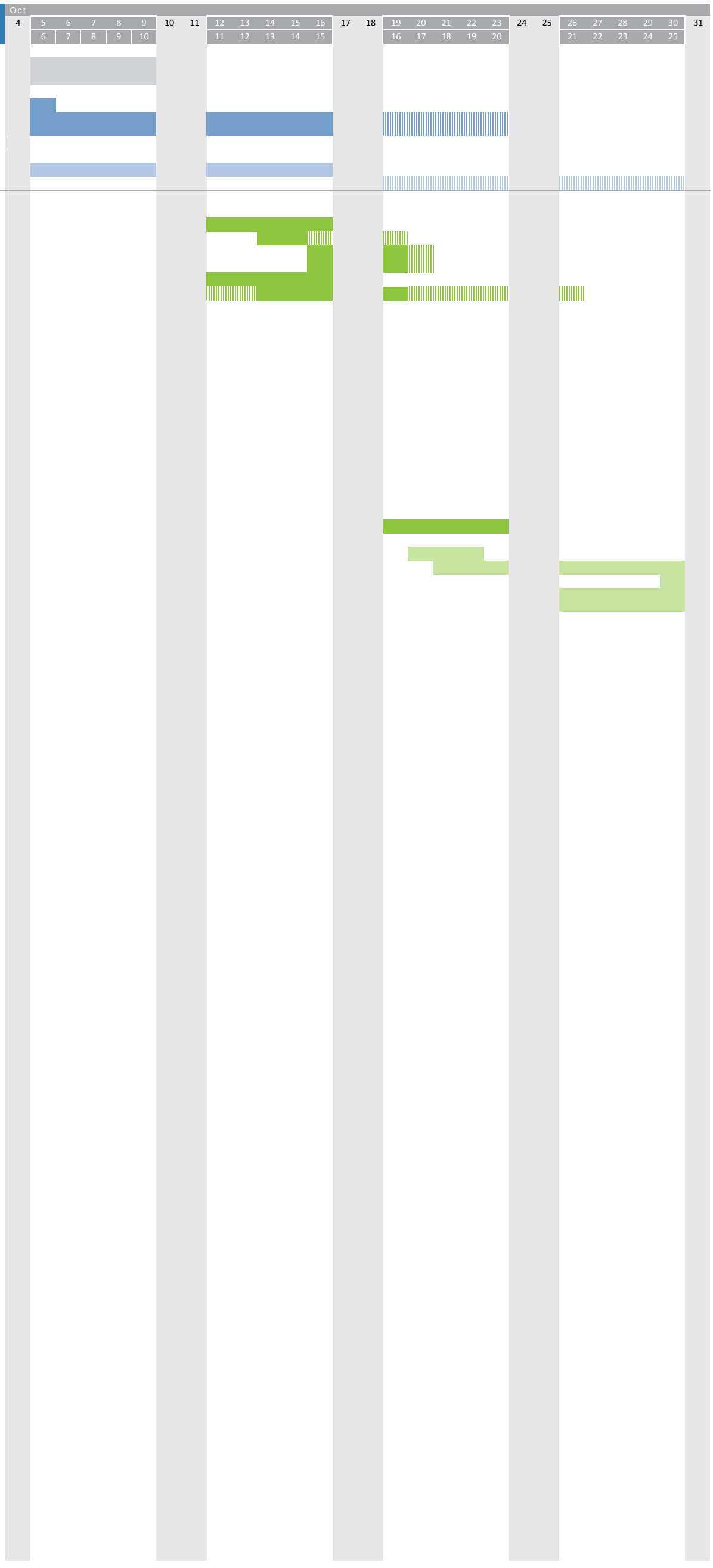
| 13.6 | Final pick-up Survey (if required) |



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| 3 | **Chairlift** |
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| 3.2 | removal of chairlift buildings from within embankment footprint and dispose of in accordnace with site requirement |
| 4 | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage |
| 4.2 | Excavation and relocation of salvage plants to interm staging area |
| 4.3 | relocation of salvage plants from staging area to planting site |
| | **Construction Works** |
| 5 | **Site Establishment** |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. |
| 5.2 | installation of office, crib and toilet block |
| 5.3 | electrical hook-up |
| 5.4 | water hook-up |
| 5.5 | installation of gatehouse and fencing around work area |
| 5.6 | equipment mobilisation<br>• dozer<br>• excavator (35 t)<br>• excavator (20 t)<br>• excavator (5 t)<br>• grader<br>• articulated dump truck<br>• compactor - sheepsfoot<br>• compactor - smoothdrum<br>• IT28<br>• manitou (telehandler)<br>• water cart (16m$^3$)<br>• fuel cart<br>• service cart<br>• ute<br>• bus<br>• workshop |
| 5.7 | Baseline Survey (if required) |
| 6 | **Stockpile area preparation works** |
| 6.1 | Slash vegetation and move to temp stockpile |
| 6.2 | cover stockpile area with geofabic |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products |
| 7 | **Relocate haul/access road around pond** |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base |
| 8 | **Storage Pond preparation works** |
| 8.1 | Clear , grub, load, haul and place vegetation from water pond footprint to designated stockpile area |
| 8.2 | Clear , grub, load, haul and place topsoil from water pond footprint to designated stockpile area (300mm thk) |
| 8.3 | Excavate, load, haul and place unsuitable material from water dam footprint to designated stockpile area |
| 9 | **Storage Pond Excavation works** |
| 9.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
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| 10 | **Storage Pond Underdrainage works** |
| 10.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover |
| 10.3 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into outlet pipe slot to design limits |
| 10.4 | supply and install geotextile seperation layer within the underdrainage trenches |
| 10.5 | supply and install underdrainage pipework within embankment footprint |
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| 11.1 | Grade, moisture condition and compact water dam embankment foot print in accordance to specifications |
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| 11.5 | Supply and install perimter fence along crest of embankment |
| 11.6 | Load from stockpile, haul, place, spread and compact moisture conditioned topsoil onto the downstream water pond embankment in accordance to design limits and specifications |
| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat |
| 11.8 | Supply and install erosion control mat onto downstream embankment slope in accordance to design and specifications |
| 11.9 | Supply and place all materials required for seeding and fertilising downstream slope of water dam downstream embankment slope |
| 12 | **Site Rehabilitation** |
| 12.1 | Remove and dispose in accordance with legal requirements the geotextile liner placed beneath the stockpile area |
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| 12.3 | repair damage to public road caused by haul fleet |
| 12.4 | Black top section of haulroad constructed along southern side of water pond |
| 13 | **Demobilisation** |
| 13.1 | Disconnect the electrical power |
| 13.2 | disconnect the water supply |
| 13.3 | Remove office, crib and toilet block |
| 13.4 | remove the gatehouse and safety fencing around work area |
| 13.5 | Equipment de-mobilisation<br>• dozer<br>• excavator (35 t)<br>• excavator (20 t)<br>• excavator (5 t)<br>• grader<br>• articulated dump truck<br>• compactor - sheepsfoot<br>• compactor - smoothdrum<br>• IT28<br>• manitou (telehandler)<br>• water cart (16m$^3$)<br>• fuel cart<br>• service cart<br>• ute<br>• bus<br>• workshop |
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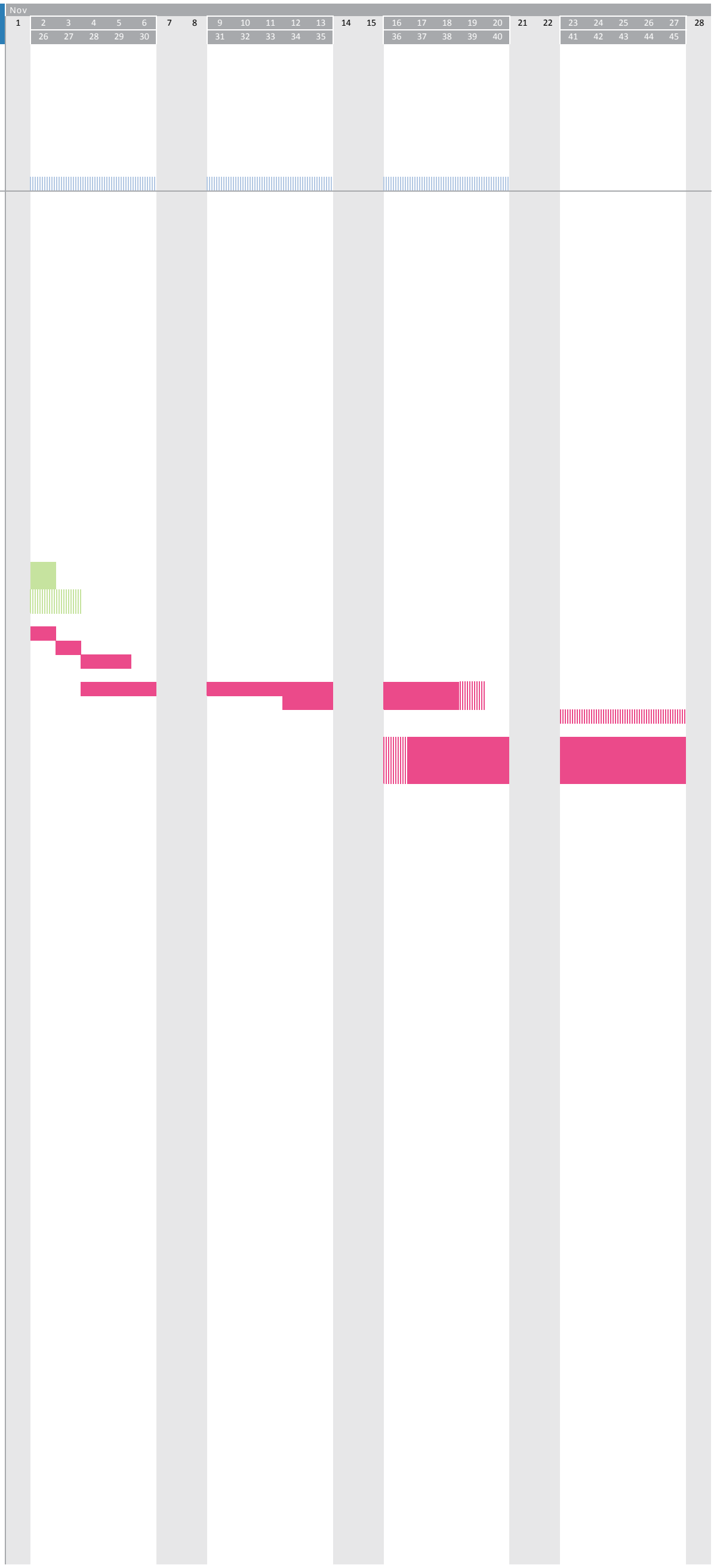

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| | **Preliminaries** |
| **1** | **Telstra cable relocation** |
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| 3.1 | removal of cable and two pylons from within embankment foot print |
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| **4** | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage |
| 4.2 | Excavation and relocation of salvage plants to interm staging area |
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| | **Construction Works** |
| **5** | **Site Establishment** |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. |
| 5.2 | installation of office, crib and toilet block |
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| 5.7 | Baseline Survey (if required) |
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| 6.1 | Slash vegetation and move to temp stockpile |
| 6.2 | cover stockpile area with geofabic |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products |
| **7** | **Relocate haul/access road around pond** |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base |
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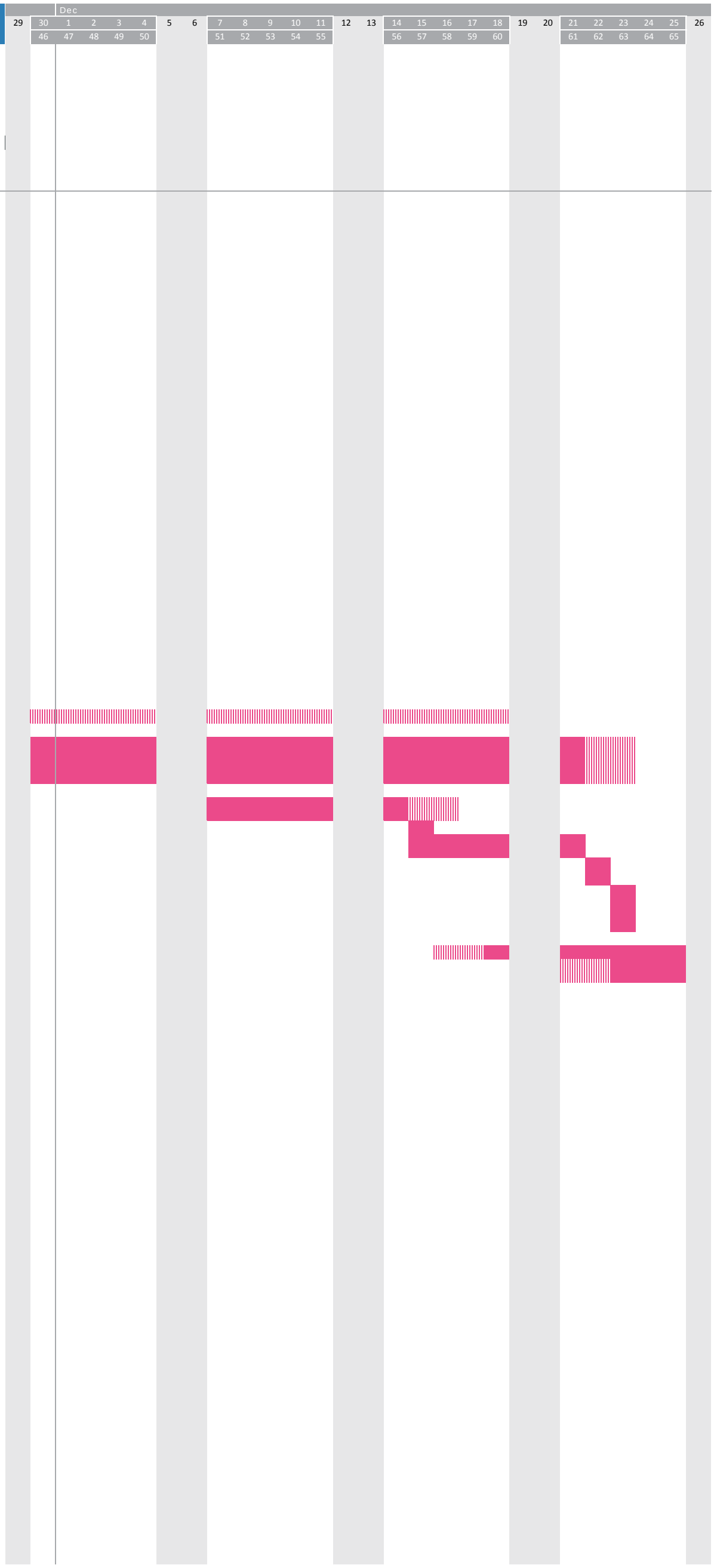

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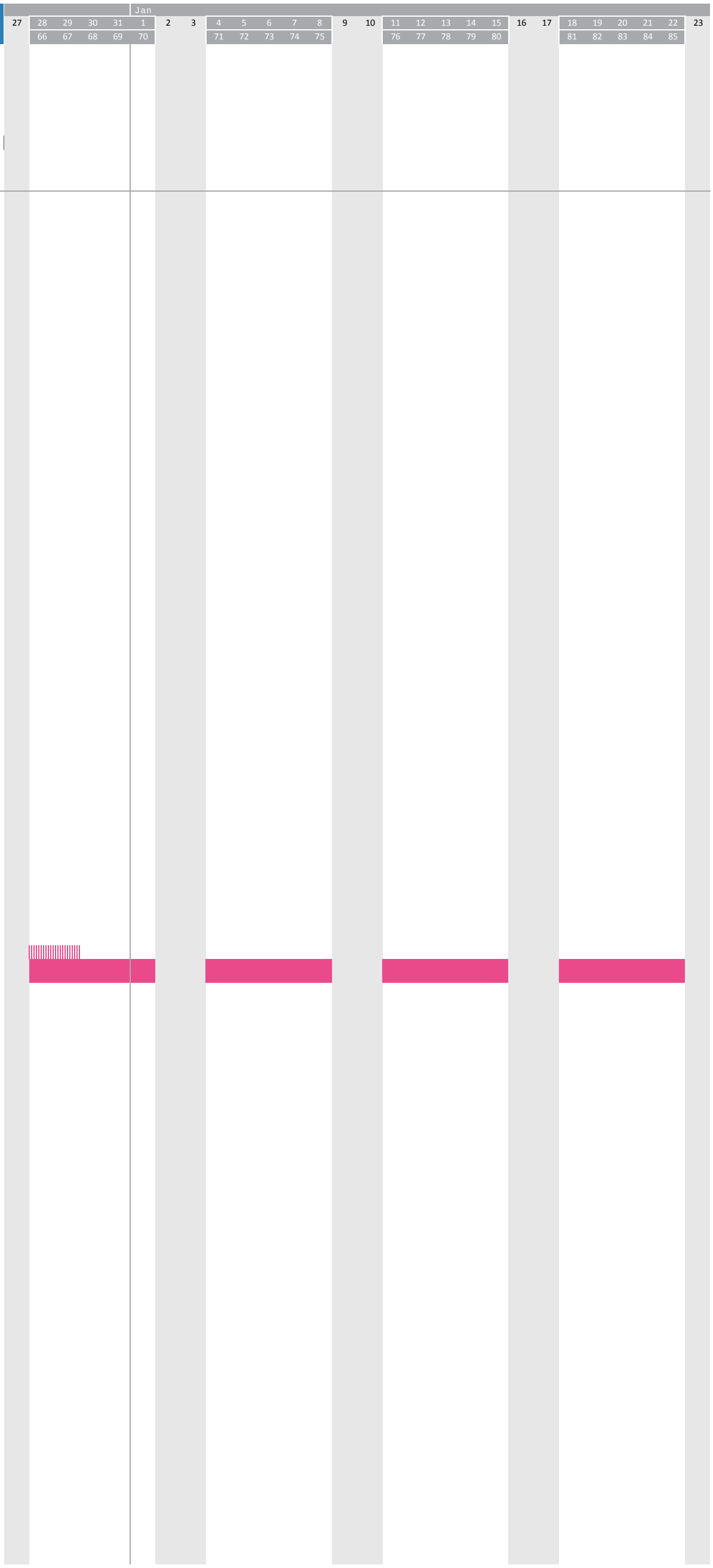
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base |
| 8 | **Storage Pond preparation works** |
| 8.1 | Clear , grub, load, haul and place vegetation from water pond footprint to designated stockpile area |
| 8.2 | Clear , grub, load, haul and place topsoil from water pond footprint to designated stockpile area (300mm thk) |
| 8.3 | Excavate, load, haul and place unsuitable material from water dam footprint to designated stockpile area |
| 9 | **Storage Pond Excavation works** |
| 9.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
| 9.2 | Moisture condition and blend excavated material from water dam foot print placed at designated stockpile in accordance to specifications |
| 10 | **Storage Pond Underdrainage works** |
| 10.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area |
| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover |
| 10.3 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into outlet pipe slot to design limits |
| 10.4 | supply and install geotextile seperation layer within the underdrainage trenches |
| 10.5 | supply and install underdrainage pipework within embankment footprint |
| 10.6 | supply and install drainage media within underdrainage trenches |
| 10.7 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill over underdrains to design limits to form cushion layer |
| 11 | **Storage Pond Embankment Works** |
| 11.1 | Grade, moisture condition and compact water dam embankment foot print in accordance to specifications |
| 11.2 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into water pond embankment in accordance to design limits and specifications |
| 11.3 | Proof roll upstream embankment of water dam and floor of basin |
| 11.4 | Supply and install HDPE liner on prepared upstream embankment trench including excvation and backfill of anchor trenches along crest |
| 11.5 | Supply and install perimter fence along crest of embankment |
| 11.6 | Load from stockpile, haul, place, spread and compact moisture conditioned topsoil onto the downstream water pond embankment in accordance to design limits and specifications |
| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat |
| 11.8 | Supply and install erosion control mat onto downstream embankment slope in accordance to design and specifications |
| 11.9 | Supply and place all materials required for seeding and fertilising downstream slope of water dam downstream embankment slope |
| 12 | **Site Rehabilitation** |
| 12.1 | Remove and dispose in accordance with legal requirements the geotextile liner placed beneath the stockpile area |
| 12.2 | Remove and dispose in accordance with legal requirements the redundant erosion control measures placed for the project works |
| 12.3 | repair damage to public road caused by haul fleet |
| 12.4 | Black top section of haulroad constructed along southern side of water pond |
| 13 | **Demobilisation** |
| 13.1 | Disconnect the electrical power |
| 13.2 | disconnect the water supply |
| 13.3 | Remove office, crib and toilet block |
| 13.4 | remove the gatehouse and safety fencing around work area |
| 13.5 | Equipment de-mobilisation |
| | • dozer |
| | • excavator (35 t) |
| | • excavator (20 t) |
| | • excavator (5 t) |
| | • grader |
| | • articulated dump truck |
| | • compactor - sheepsfoot |
| | • compactor - smoothdrum |
| | • IT28 |
| | • manitou (telehandler) |
| | • water cart ($16m^3$) |
| | • fuel cart |
| | • service cart |
| | • ute |
| | • bus |
| | • workshop |
| 13.6 | Final pick-up Survey (if required) |



| Task | Description | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Feb 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 86 | 87 | 88 | 89 | 90 | | | 91 | 92 | 93 | 94 | 95 | | | 96 | 97 | 98 | 99 | 100 | | | 101 | 102 | 103 | 104 | 105 | |
| **Preliminaries** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | **Telstra cable relocation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **2** | **Waterline relocation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **3** | **Chairlift** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | removal of cable and two pylons from within embankment foot print | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.2 | removal of chairlift buildings from within embankment footprint and dispose of in accordnace with site requirement | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **4** | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.2 | Excavation and relocation of salvage plants to interm staging area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3 | relocation of salvage plants from staging area to planting site | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Construction Works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **5** | **Site Establishment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.2 | installation of office, crib and toilet block | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.3 | electrical hook-up | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.4 | water hook-up | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.5 | installation of gatehouse and fencing around work area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.6 | equipment mobilisation<br>• dozer<br>• excavator (35 t)<br>• excavator (20 t)<br>• excavator (5 t)<br>• grader<br>• articulated dump truck<br>• compactor - sheepsfoot<br>• compactor - smoothdrum<br>• IT28<br>• manitou (telehandler)<br>• water cart (16m$^3$)<br>• fuel cart<br>• service cart<br>• ute<br>• bus<br>• workshop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.7 | Baseline Survey (if required) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **6** | **Stockpile area preparation works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | Slash vegetation and move to temp stockpile | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.2 | cover stockpile area with geofabic | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **7** | **Relocate haul/access road around pond** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.3 | Excavate from stockpile, load, haul, place, moisture condition and compact road sub-base | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **8** | **Storage Pond preparation works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.1 | Clear , grub, load, haul and place vegetation from water pond footprint to designated stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.2 | Clear , grub, load, haul and place topsoil from water pond footprint to designated stockpile area (300mm thk) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.3 | Excavate, load, haul and place unsuitable material from water dam footprint to designated stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **9** | **Storage Pond Excavation works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.2 | Moisture condition and blend excavated material from water dam foot print placed at designated stockpile in accordance to specifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **10** | **Storage Pond Underdrainage works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.1 | Excavate to design limits, load, haul and place in situ material from water dam footprint to designated stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into outlet pipe slot to design limits | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.4 | supply and install geotextile seperation layer within the underdrainage trenches | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.5 | supply and install underdrainage pipework within embankment footprint | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.6 | supply and install drainage media within underdrainage trenches | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.7 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill over underdrains to design limits to form cushion layer | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **11** | **Storage Pond Embankment Works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.1 | Grade, moisture condition and compact water dam embankment foot print in accordance to specifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.2 | Load from stockpile, haul, place, spread and compact moisture conditioned blended fill into water pond embankment in accordance to design limits and specifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.3 | Proof roll upstream embankment of water dam and floor of basin | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.4 | Supply and install HDPE liner on prepared upstream embankment trench including excvation and backfill of anchor trenches along crest | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.5 | Supply and install perimter fence along crest of embankment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.6 | Load from stockpile, haul, place, spread and compact moisture conditioned topsoil onto the downstream water pond embankment in accordance to design limits and specifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.8 | Supply and install erosion control mat onto downstream embankment slope in accordance to design and specifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.9 | Supply and place all materials required for seeding and fertilising downstream slope of water dam downstream embankment slope | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **12** | **Site Rehabilitation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.1 | Remove and dispose in accordance with legal requirements the geotextile liner placed beneath the stockpile area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.2 | Remove and dispose in accordance with legal requirements the redundant erosion control measures placed for the project works | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.3 | repair damage to public road caused by haul fleet | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.4 | Black top section of haulroad constructed along southern side of water pond | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **13** | **Demobilisation** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.1 | Disconnect the electrical power | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.2 | disconnect the water supply | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.3 | Remove office, crib and toilet block | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.4 | remove the gatehouse and safety fencing around work area | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.5 | Equipment de-mobilisation<br>• dozer<br>• excavator (35 t)<br>• excavator (20 t)<br>• excavator (5 t)<br>• grader<br>• articulated dump truck<br>• compactor - sheepsfoot<br>• compactor - smoothdrum<br>• IT28<br>• manitou (telehandler)<br>• water cart (16m$^3$)<br>• fuel cart<br>• service cart<br>• ute<br>• bus<br>• workshop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.6 | Final pick-up Survey (if required) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Task | Description |
|---|---|
| | **Preliminaries** |
| 1 | **Telstra cable relocation** |
| 2 | **Waterline relocation** |
| 3 | **Chairlift** |
| 3.1 | removal of cable and two pylons from within embankment foot print |
| 3.2 | removal of chairlift buildings from within embankment footprint and dispose of in accordnace with site requirement |
| 4 | **Vegetation salvage from footprint area (water pond, dam, road realignment & stockpile)** |
| 4.1 | Assessment of vegetation with identification of individual plants for salvage |
| 4.2 | Excavation and relocation of salvage plants to interm staging area |
| 4.3 | relocation of salvage plants from staging area to planting site |
| | **Construction Works** |
| 5 | **Site Establishment** |
| 5.1 | preparation of site for offices, crib, toilet block, goline, workshop, parking lot, etc. |
| 5.2 | installation of office, crib and toilet block |
| 5.3 | electrical hook-up |
| 5.4 | water hook-up |
| 5.5 | installation of gatehouse and fencing around work area |
| 5.6 | equipment mobilisation |
| | • dozer |
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| | • excavator (20 t) |
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| | • water cart (16m$^3$) |
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| 5.7 | Baseline Survey (if required) |
| 6 | **Stockpile area preparation works** |
| 6.1 | Slash vegetation and move to temp stockpile |
| 6.2 | cover stockpile area with geofabic |
| 6.3 | relocate slashed vegetation stockpile onto designated area of covered stockpile area |
| 6.4 | construct and install erosion control measures, including supply of all required manufactured products |
| 7 | **Relocate haul/access road around pond** |
| 7.1 | Clear , grub, load, haul and place vegetation from road footprint to designated stockpile area |
| 7.2 | Clear , grub, load, haul and place topsoil from road footprint to designated stockpile area (300mm thk) |
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| 10.2 | Supply and install 200 dia outlet pipe including bedding to 800mm cover |
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| 11.5 | Supply and install perimter fence along crest of embankment |
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| 11.7 | Load, haul, place over size boulders and stripped vegetation from stockpile onto downstream embankment slope in accordance to design drawings for provision of fauna habitat |
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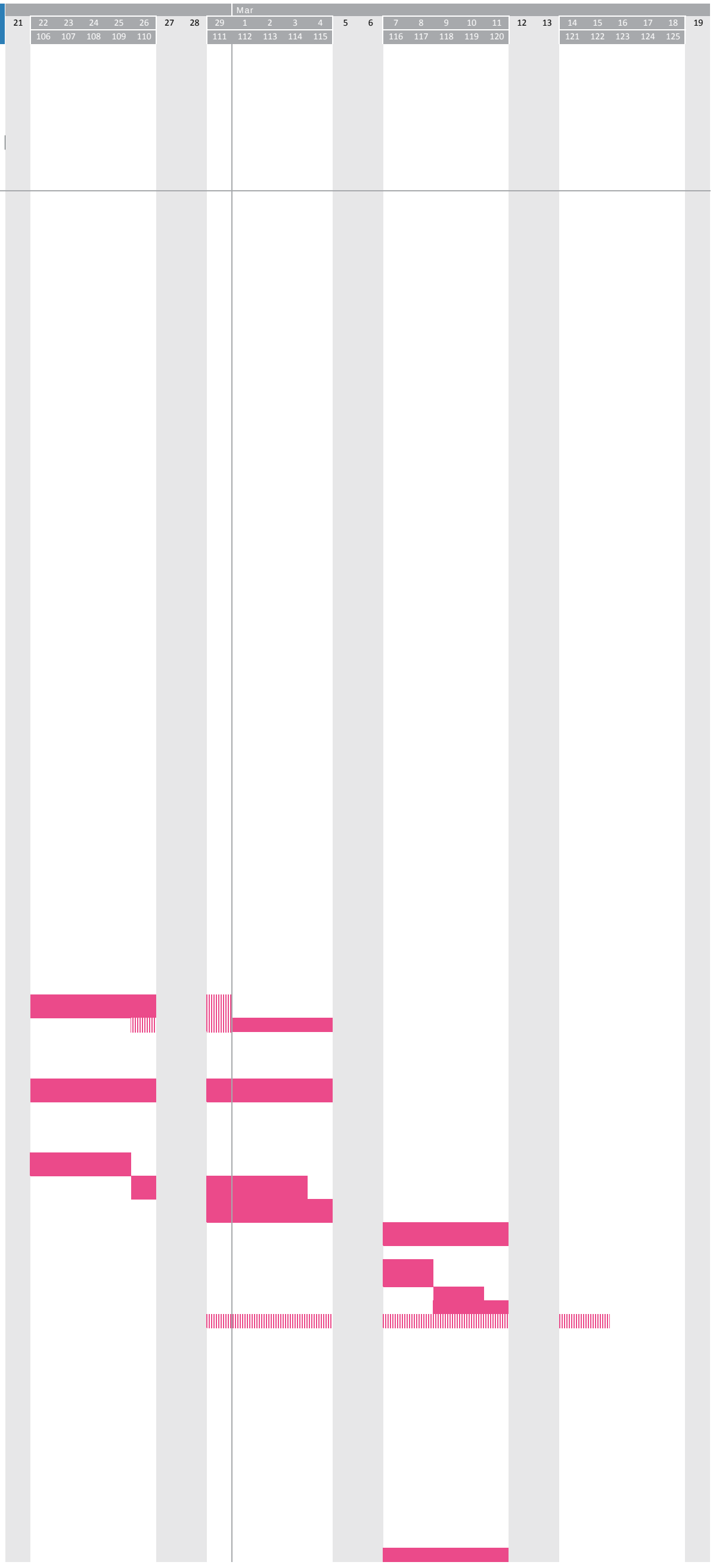

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Document Status

| Revision | Author | Reviewer | | Approved for Issue | | |
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| | | Name | Signature | Name | Signature | Date |
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