2. Detailed Description of the Water Supply Pipeline

2.1 Overview

The proposed water supply scheme to the pulp mill sources its water from Trevallyn Dam, located west of Launceston. The project includes the construction of a new pump station located between the eastern abutment of the dam and Hydro Tasmania’s intake tunnel, as well as the installation of a large bore rising main along the Hydro Tasmania’s Trevallyn Power Station Intake tunnel easement, across the Tamar River and generally following the alignment of the East Tamar Highway to the Bell Bay Site. Further details on the water supply scheme are provided in Appendix 44, Volume 15.

The Bell Bay pulp mill water supply scheme from Lake Trevallyn will comprise the following key components:

1. A raw water pump station located between the eastern abutment of the dam and Hydro Tasmania’s intake tunnel;
2. A pipeline following the Hydro power station intake tunnel route to the edge of the Tamar River;
3. A 3 ML balance/control tank at the top of the hills near the Reatta Water Treatment Plant;
4. A pipeline under the Tamar River to the East Tamar Highway;
5. A pipeline generally following the East Tamar Highway and Esk Water pipeline to the pulp mill site;
6. A storage dam of up to 670 ML above the pulp mill site, including pipe connection; (discussed in Volume 2).

The pipeline has been designed for a nominal flow of 40 GL/yr. This is to allow for future industrial growth in the area or along the pipe corridor. Gunns is seeking approval for the pulp mill design flow of 26 GL/yr and any increase will need to be subject to a further and separate environmental impact assessment process.

The pumps have a design flow of 26 GL/yr, with provision for expansion by adding additional pumps.

Gunns has been advised by Hydro Tasmania that planning should be based on Lake Trevallyn being drained down to RL 117 metres twice a year, for one week on each occasion. The lake is drained to allow for maintenance of trash racks at the power station intake tunnel. Major shut downs are planned for every ten years, which last approximately three months, during which the water level will be dropped to RL 107 metres AHD.
2.2 Water Demand

The required water supply for the pulp mill when operating, as provided by Jaakko Pöyry (2006) is:

| Ultimate Production at Pulp Mill | 1,100,000 ADt/yr |
| Annual Water Demand               | 26.0 GL          |
| 350 days/year Operation*          | 75 ML/d          |

* A 350 day operating year due to 15 days non production per annum.

The pump station and pipeline will be sized to allow for some future industrial growth in the area or other industries along the pipe corridor.

2.3 Pump Station

A pump station is required at Lake Trevallyn to pump water from the dam, into the pipeline.

The dam has an operating top water level of RL 127 m and minimum operating level of RL 122 m. However, to allow for maintenance works, the water level will vary and may be lowered to RL 107 metres AHD.

Hydro Tasmania advise the 1 in 1,000 year flood level is RL 137 metres. The pump station electrical works will be located above this level at RL 138 metres.

2.3.1 Options Considered

This range of lake water levels is large and difficult to meet with a single pump station.

Three options have been examined as part of this Draft IIS. Appendix 44, Volume 15 (the Concept Design for Water Supply from Lake Trevallyn) lists the three options as:

1. a deep wet well type pump station;
2. an inclined draft tube arrangement; and
3. a temporary low-level pump for the extreme low flow events.

Discussion on each option is provided below.

Option 1 - Deep Wet Well Type Pump Station

The deep wet well type pump station includes a deep wet well, extending down below the lowest lake level, (approximately 104 m, 3 metres below the water level required for major shutdowns), with long vertical turbine pumps contained in the well.

A detailed consideration of this option is provided in Appendix 44, Volume 15. Option 1 is not considered further in this section because this type of pump station can accommodate the range of
operating water levels, but there are a number of major drawbacks as a consequence of the deep well arrangement:

1. There would be considerable expense involved in constructing a deep well over 30 metres deep (137 m – 104 m) in rock and constructing the extended intake piping;
2. Construction will involve lake drawdown for an extended period; and
3. Larger pump motors will be required to allow for the occasional additional lift i.e. from 107 m.

For these reasons it is considered that this option is not preferred for the Lake Trevallyn pump station configuration.

Discussion on the two preferred options is provided below.

Option 2 - Inclined Draft Tube Arrangement

This type of pump station is shown in Figure 2-2 and Figure 2-3 and will involve constructing long inclined draft tubes into Lake Trevallyn, and installing vertical turbine submersible pumps within the tubes. The draft tubes will be located at a level to provide water during all Lake Trevallyn levels with the exception of the ten yearly maintenance event.

For this option, the pump station will be located between the eastern abutment of the dam and Hydro Tasmania’s intake tunnel, positioned to minimise the length of draft tube required to reach the lowest point.

Pumps to be used will be determined as part of the detailed design phase. Options considered to achieve a flow of 26 GL/year, include, but is not limited to:

- six (five duty and one standby) multi stage submersible pumps; and
- four pumps (3 duty and one standby) multi stage submersible pumps.

The pumps will be required to pump a maximum static lift of 88 m, have an overall normal operating pump head of about 100 m, and the estimated motor size will be 375 kW per pump for a water level of RL 122m (minimum operating level of the lake).

Comments were sought from pump suppliers regarding this configuration, and suppliers have advised that, while the pump capacity and head requirements are challenging, there are pump manufacturers who can meet the duty head required.

The pumps will be continuously monitored by remote/online systems, to detect any change in pump or motor condition. This will allow any problems to be detected and fixed prior to any potential significant environmental or operational problem occurring.

The general layout for this option is shown in Figure 2-2 and Figure 2-3 and indicate the following features:

- Excavation of a sump approximately one m deep to provide the necessary submergence at minimum reservoir water level. It is likely that the excavation would be into rock and a large excavator using a rock breaker would undertake this. It is unlikely that blasting will be required.
- Draft tube supports will comprise prefabricated steel supports which will be fixed to reinforced concrete footings anchored to the base rock material.
An existing access track will be extended a short distance to the proposed pump station site and enable crane and other maintenance equipment access to lift pumps out of the draft tubes for maintenance.

A concrete platform to locate and anchor the rising main and associated valves and fittings.

The water level in Lake Trevallyn will need to be lowered for a period of approximately 7 days to RL 107 m, to carry out the sump and lower draft tube support footing excavations, and to cast the concrete for the lower draft tube support footing.

This option will have a lower construction impact as the water level would need to be lowered for a much shorter period to facilitate construction than Options 1 or 3.

This option would have a significantly lower cost than the Option 3, due to the less complex construction techniques required.

**Option 3 - Low Level Pumping**

A conventional wet well pump station with vertical turbine pumps will be constructed such that it could operate between normal lake levels of 122 - 127 RL metres (normal duty). This option is shown in Figure 2-4 and Figure 2-5.

Water will be drawn from Lake Trevallyn through twin 1,200 mm diameter intake pipes, laid horizontally into the pump station wet well at 3 m below the lowest normal water level. The pipes will be at a level sufficient to ensure reliability of supply when the dam water level is RL 122 m.

There will also be a second higher level intake for the low level pump station, when the storage is lowered to 107 m.

The pump station will be located between the eastern abutment of the dam and Hydro Tasmania’s intake tunnel, positioned to minimise the length of intake pipe required to reach the lowest point.

The floor of the pump station will be set at approximately RL 138m.

There will be coarse bar screens in the intake pipes, as well as isolation valves and possibly a fine screen in the pump station.

The intake pipes, which are approximately 3 m below the normal low water level in Lake Trevallyn, will be constructed when the water level has been lowered. It will be necessary to liaise with Hydro Tasmania to coordinate this.
Figure 2-2  Trevallyn Water Pump Station – Option 2
Figure 2-4  Trevallyn Water Pump Station – Options 1 and 3
Figure 2-5  Trevallyn Water Pump Station – Section Through Dam Options 1 and 3
Figure 2-4 and Figure 2-5 show the need to excavate a wet well to RL 117 m AHD, and the installation of twin 1200 mm diameter intake pipes. It is likely that excavation will be in rock, and as blasting will not be allowed by Hydro Tasmania, the cost and duration of construction will be very significant as it will be necessary to use excavator mounted rock breakers and pneumatic equipment.

Pump options will be determined as part of the detailed design phase as described in Option 2 above.

To provide additional pumping capacity during Hydro Tasmanian’s station shut down periods, pontoon mounted pumps could be purchased and stored at site with appropriate pipe work etc, or an arrangement could be made for pump hire. These low lift pumps would deliver water from the lower levels within the dam to the conventional pump station for pumping to the pulp mill.

The low lift discharge pipe could be fabricated from polyethylene and fixed to the ground using concrete anchor blocks. The section of pipe between the pontoon mounted pump and the inlet for normal operation would float or be suspended to the pump station pontoon.

This option has a lower capital cost than the deep well option, Option 1. The operating costs are similar, but may be lower for this option if the water level is not dropped as frequently as expected.

The main pump station will be designed to meet the normal duty, therefore avoiding many of the construction risks faced in Option 1.

**Summary**

Appendix 44, Volume 15 contains details of a preliminary environmental assessment, of which details have been incorporated into Sections 3 and 4 of this volume of the Draft IIS. The Water Supply Concept Design considered Option 2 as having the least environmental impact and Option 1 the greatest.

Of the pump station options considered, the inclined draft tube configuration, Option 2 is estimated to have the lowest capital cost.

It is considered that the net present value (NPV) of Options 1 and 3 are similar, but there are higher operational and occupational health and safety risks with Option 1, due to the depth of the well, and the water quality risks associated with an off take at the lowest level in the lake. These options will be reassessed at the detailed design stage when operating conditions in the lake and conditions of supply for the pulp mill have been resolved. However it is likely that either Option 2 or 3 will be adopted.

Subject to geotechnical investigations, detailed design, and liaison with Hydro Tasmania, Options 2 and 3 are the preferred options.

With respect to Option 2, it will be necessary to confirm the availability of pumps, spare parts and training of local service agents to maintain/service the units.

Option 2 and Option 3 will be considered further, as part of the detailed design phase, and that investigations continue to ensure that Option 2 pumps can perform reliably. For the purposes of this integrated impact assessment, the potential environmental, social, community and economic impacts are considered for both Options 2 and 3.
2.3.2 Instrumentation and Control

The pumps will be controlled by a telemetry signal from a 3 ML buffer storage tank. The pumps will start and stop on the same level.

2.4 Balance Control Tank

The main purpose of the balance control tank is to obviate the need for air release valves and vacuum breakers at the high point of the pipeline. The tank has outlet points which allow a continuous flow of water (rather than air) in the event pumps temporarily stop. (It will provide some buffer storage so that inflow does not have to exactly match outflow. This will prevent the pumps starting and stopping too frequently).

The assessment of the hydraulics of the water supply pipeline indicates that the operation of the system will be less problematic if a storage reservoir or balance tank is constructed at the high point on the line (near Reatta Road WTP), and control valves are installed at the outlet points for the main (refer to Figure 3-1).

Without this balance tank and the valves, each time the pump(s) stop, significant portions of the main would drain and fill with air. This would enable air to accumulate in the pipeline downstream of Mount Direction and in the short section of pipe downstream of the high point near Reatta Road WTP. It is estimated that a combined total of 3 ML of air could be present at these locations. When the pumps restart, it would take around 1.2 hours to expel the air at a design water flow of 765 L/s. This would mean that, not only would there be a 1.2 hour delay until there was a full flow of water at the pulp mill, but that there would also be 1.2 hours of air release at the two high points. Such a situation would require a substantial muffler/silencer to reduce public nuisance.

In addition, in the early life of the system it is likely that the pipe friction will be lower than in later years. The system, however, has to be designed to allow for the expected future conditions. In this case, the grade lines are critical because most of the main will flow by gravity. It is likely that, for the first 5 to 10 years, the hydraulic grade line will be flatter and it is almost certain that air will be drawn into the main. Regardless of how many air valves are in place, it is also likely that the air will enter and expel at varying rates, thereby directly affecting the rates of delivery of water through the main. The varying air levels in the main will lead to gulping of flows.

With a reservoir and control valves in operation, the control logic for the system would be as follows:

1. a level indicator at the reservoir would send a signal to the pump station to stop and start the pumps; and
2. flow to the pulp mill water reservoir and the pulp mill treatment plant would be by gravity from the reservoir and controlled/regulated by actuated valves at each destination.

The balance tank will contain sufficient volume to provide for around 15 minutes of continuing flow after the pumps stop. This is necessary to allow for the time needed to close the control valve in such a manner to minimise the risk of developing significant surges. In practice, it would include an allowance for two closely spaced stops, requiring at least 20 to 30 minutes of flow or approximately 3 ML of storage. The tank will be around 30 metres diameter and 4.5 metres high (including 300 mm of freeboard). There is no requirement to construct a roof on this tank to maintain water quality, but there
may be some security benefits from this. The reservoir will be constructed above the high point on the pipe route near Reatta Road WTP (that is, above the RL 210 metres contour).

2.5 Pipeline

2.5.1 Design Parameters

The optimum pipe size has been established (Appendix 44, Volume 15) by undertaking a Net Present Value Analysis based on the following key assumptions:

1. the pumps will operate for 350 days per year, delivering 26 GL per year;
2. the pumps will operate at an efficiency of 80%;
3. the pipes will have a roughness coefficient of $C = 130$ (Hazen-Williams) this is a value that is reasonable for the life of the pipe that considers existing and future friction values eg. a dirty pipe would have higher friction and a lower roughness coefficient. A clean pipe would have a lower friction level and a higher friction coefficient;
4. power cost at 10c/kW.hr;
5. all capital costs are at year 0;
6. supply of water from Lake Trevallyn by Hydro Tasmania cost an average of $30 per ML (2005 dollars); and
7. an NPV factor of 7% per annum was used over 25 years operation (if it was assessed over a 30 year period which is consistent with the pulp mill life, the pipe size will not change).

The analysis showed that there was very little difference in the NPV cost for pipes under 1,000 millimetres in diameter. This is because of the minimal difference in capital cost of the pipe and because of the high static head to pump the water over the ridge near Reatta Road WTP.

Based on a hydraulic analysis (Appendix 44, Volume 15) of the proposed pipe route, from the preferred pump station location near the Lake Trevallyn Hydro intake, the pipe diameter is expected to vary as follows:

**Table 2-2 Details of Proposed Pipe Diameter**

<table>
<thead>
<tr>
<th>Section of Pipeline</th>
<th>Proposed Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Station to Reatta Road WTP</td>
<td>813 mm OD</td>
</tr>
<tr>
<td>Reatta Road WTP to Mt Direction</td>
<td>1016 mm OD</td>
</tr>
<tr>
<td>Mt Direction to Pulp Mill</td>
<td>972 mm OD</td>
</tr>
</tbody>
</table>

The above estimates will be reviewed during detailed design.

All pipeline materials will be subject to detailed design. Mild steel cement lined (MSCL) is likely to be predominant with some shorter sections in high density polyethylene where the pressure allows.
2.5.2 Corridor Alignment

A number of pipeline alignment options have been considered. The options are discussed in Volume 1, Chapter 10. The proposed pipe corridor is depicted in Figure 3-1. The feasibility of the proposed route of the pipeline has been assessed through consideration of potential impacts on environmental, economic, social and community values. This information has then been used to prepare this section of the Draft IIS, determine the preferred route and establish management measures to reduce and minimise impacts during construction and operation of the infrastructure.

There are two significant vertical features of the proposed pipe corridor: the high point adjacent to Reatta Road WTP (RL 210 metres approximately); and the high point approximately 500 metres north of the Magazine Road Junction (RL 155 metres approximately). These determine the hydraulic grade line of the pumping system for most design scenarios for realistic pipe sizes.

2.5.3 Construction of the Pipeline

Laydown areas

During the construction phase of pipelines, laydown areas are typically used for preparation of the pipe prior to installation. For the majority of the pipeline route, preparation of the pipe will occur within the construction corridor (approximately 20 metre easement). It is anticipated that the pipe will be shipped to Bell Bay, Bell Bay Port, stored there, and trucked on a daily basis pipe to the construction site. Construction of the pump station area will be located within the disturbance footprint of the construction corridor and temporary road access.

A laydown area during construction for the crossing of the Tamar River will be required on the east and west banks.

The east bank laydown area will be 200 m long by 50 m wide to accommodate the winch and equipment to pull the pipe across the river. The west bank will be 400 m long by 50 m wide to allow delivery, storage and fabrication of the pipe. Both sides of the bank will likely contain site sheds, containers and construction plant and equipment.

All laydown areas are subject to contractor construction methodologies and more detail will be provided as part of the contractor’s Construction EMP.

Trenching

The construction method will primarily require trench excavation, pipeline installation, backfilling, rehabilitation, and pipeline signage.

The majority of the water supply pipeline construction corridor will be 20 metres wide and the pipeline trench will be dug to a width of 2 metres at the bottom of the trench and a depth of up to 3 metres.

The pipe will be bedded on sand, sand backfilled and subsequently backfilled with bedded excavated material, and then topsoiled and revegetated in accordance with management measures described in the construction management plan (to be prepared by the contractor). The pipe will be laid in sections that are likely to have a maximum length of 12 metres.
Crossing of Water Courses

The water supply pipeline crosses several watercourses. Detailed design will be required to determine construction methods for each water crossing.

The preferred crossing of the Tamar River will be on a stretch of the Tamar River opposite Newnham, between Barnes Point, north of the Tamar Cut and the University of Tasmania (refer to Figure 2-1). This crossing point has a number of advantages, including:

1. It is a narrow section of the river, reducing the length of the crossing;
2. There are large areas of flat land on both sides of the river for construction sites;
3. It avoids tight spots in the East Tamar Highway road easement between Mowbray and Newnham; and
4. Minimise potential environmental impacts.

The length of this section of the pipeline (including river and river flats) will be approximately 400 m.

Trenching using water jetting is the preferred construction method for the pipeline section crossing the Tamar River. Air jetting would lift sediment particles into the water column on bubbles (air) and result in a higher turbidity than water jetting. Two jet trenching options have been considered:

- In situ trenching using air jetting; and
- In situ trenching using water jetting.

Jet trenching injects air or water into sediments to liquefy (in this case bring a solid into a liquid condition) sediment in its current location.

This method of installation results in a trench 2 to 3 m wide and avoids the need for removing sediment. It is also likely to reduce the disturbance of the estuary bed compared to other options.

The report *Gunns Pulp Mill Water Supply, Tamar River Crossing Pipeline Installation* (Pitt and Sherry, 2006f) (Appendix 56, Volume 16) addressed the preferred crossing method and potential aquatic impacts.

Once the pipeline is in place, a jetting machine will roll along the submerged pipeline and inject high pressure water underneath the pipeline. The pipeline will then gradually sink into the liquefied river bed.

Construction of the pipeline will involve the following steps:

- Establish laydown areas on the east and west banks of the Tamar River.
- Join sections of the pipe to create a pipe string approximately 400 m long.
- Pressure test the pipe string.
- Excavate a trench to provide a curved transition from the land based trench to the under river trench (construct sheet piling if necessary to stabilise the banks).
- Install stay wires and anchor points (either in the river or on the banks) to prevent the pipe string from moving while it is winched across the river.
- Set up pumps and compressors on the western bank to drive the jetting machine.
- Mobilise work boats and barges.
- Winch the pipeline across the Tamar River and secure.
- Jet trench until the pipeline is a nominal 5 m below the surface of the silt.
- Place any scour protection that may be required over the pipeline and where the pipeline transitions from river to land, as necessary.
- Connect the land based pipeline in large concrete chambers installed below ground level at the east and west river banks.
- Install a cathodic protection system to minimise corrosion.
- Further pressure testing prior to backfill of the trenches on the river banks.
- Reinstate and stabilise the river banks.
- Demobilise plant and equipment, clean up and rehabilitate work areas. Revegetate disturbed areas where necessary.
- Establish survey points for monitoring of the river bank profile.

**Construction Period**

Construction of the entire water supply pipeline is estimated to take 9 months (Jaakko Pöyry 2006) and is planned to be completed by month 17 of the overall project time schedule.

It will involve progressive construction along the route. Construction activities will occur in short blocks along the alignment.