REPORT

FOR GLAMORGAN SPRING BAY COUNCIL

# POINT LOUISVILLE

## RAW WATER SYSTEM ANALYSIS



January 2016

Engineers & Planners
*Your Vision is Our Mission*

Engineers & Planners
*Your Vision is Our Mission*

Johnstone McGee and Gandy Pty Ltd
incorporating Dale P Luck & Associates
(trading as JMG Engineers and Planners)
ABN 76 473 834 852 ACN 009 547 139

www.jmg.net.au

HOBART OFFICE
117 Harrington Street
Hobart TAS 7000
Phone (03) 6231 2555
Fax (03) 6231 1535
infohbt@jmg.net.au

LAUNCESTON OFFICE
49-51 Elizabeth Street
Launceston TAS 7250
Phone (03) 6334 5548
Fax (03) 6331 2954
infoltn@jmg.net.au

**Issuing Office:** 49-51 Elizabeth Street, Launceston
**JMG Project No. J162007CL**

**Document Issue Status**

| Ver. | Issue Date | Description | Originator | | Checked | | Approved | |
|---|---|---|---|---|---|---|---|---|
| 1 | 22-1-2016 | Report | GAB | | DPL | | RB | |
| | | | | | | | | |
| | | | | | | | | |



**LIMITATIONS & DISCLAIMERS**

1. This report is based on a 'walkthrough' visual inspection of the various components of the building. The report does not check original designs or previous contracts. Our inspections do not cover system performance testing, nor destructive testing or intrusive inspections requiring breaking out, opening up or uncovering.
2. Compliance with BCA is not part of the scope of this report. The report may include references to BCA as a guide to likely compliance/non-compliance of a particular aspect but should not be taken as definitive nor comprehensive in respect of BCA compliance.
3. This report presents information and opinions which are to the best of our knowledge accurate. JMG accepts no responsibility to any purchaser, prospective purchaser, or mortgagee of the property who relies in any way on this report.
4. JMG have no pecuniary interests in the property or sale of the property.
5. This report presents information provided by others. JMG do not claim to have checked, and accept no responsibility for, the accuracy of such information.
6. **Asbestos**

   Due to the nature of building construction it is not physically possible to gain access to/inspect all materials of construction when conducting a non-destructive inspection. Inaccessible areas may include:

   - wall cavities/floor cavities/ceiling cavities,
   - service shafts,
   - certain plant/ducts/pipework/switchboards,
   - floor coverings covered by subsequent renovations.

   For this reason anyone who reads this report should not presume that the asbestos containing material (ACM) identified in this report is the only ACM in the building, nor should the absence of a mention of ACM be taken as a guarantee that there is no ACM. All occupants/users/contractors in the building should, irrespective of the findings in this report, proceed with due caution and diligence in respect of their activities within the building and in respect of any materials uncovered, discovered, disturbed, and/or likely to be disturbed in the course of their activities.

   This report does not purport to be comprehensive nor definitive with respect to the extent or condition of asbestos in the building.

   Where services performed by Johnstone McGee & Gandy Pty Ltd (JMG) involves, or is any way connected with, asbestos (whether or not its existence is known to you or JMG):

   i. JMG, its employees, subcontractors or agents are not liable for any loss, damage, personal injury or death to any person arising out of or in any way connected with the existence of asbestos;
   ii. You will keep JMG indemnified against any claim, demand, suit or proceeding by any third party arising out of or in any way connected with the existence of asbestos;
   iii. You will release JMG and hold it harmless for any loss, damage, personal injury or death to any person arising out of or in connection with the existence of asbestos.

   Professional Indemnity Insurance cover for "claims which would not have arisen but for the existence of asbestos" is not available.

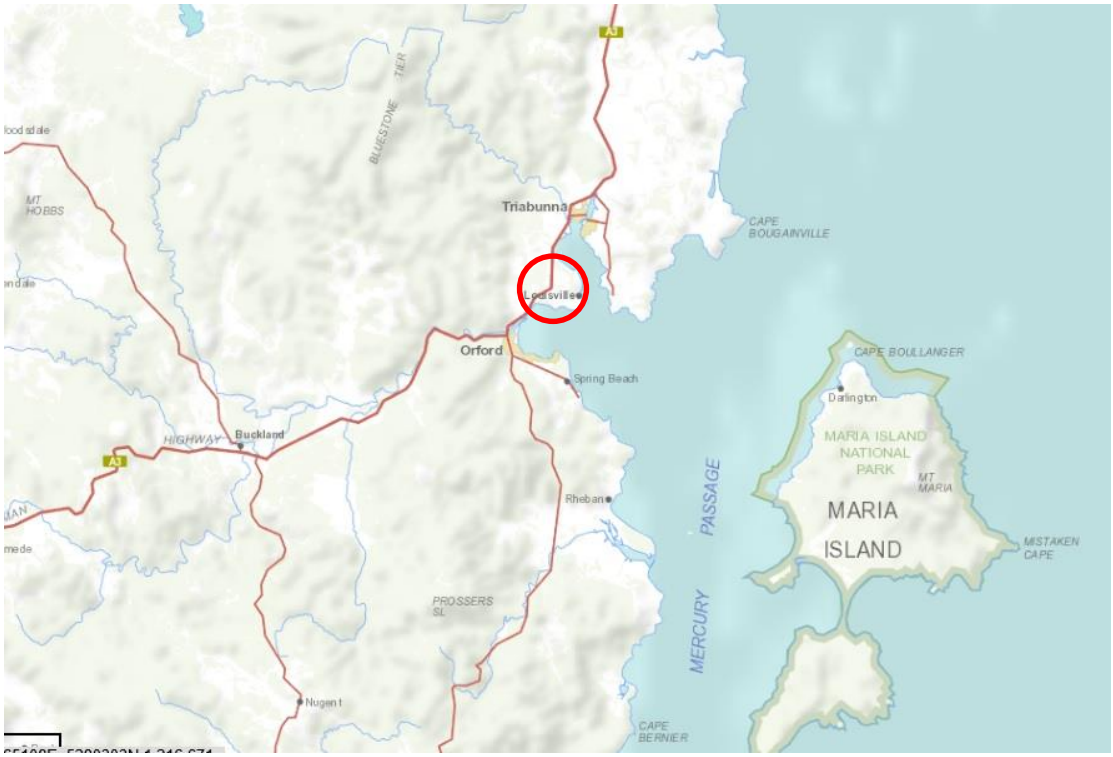
**ESTIMATES**

1. Estimates have been prepared on the basis of information to hand at the time.
2. Estimates are order of cost. They are not quotes, nor based on quotes and are not upper limit of cost.
3. Estimates are not based on measured quantities or a defined scope of works.
4. Estimates are exclusive of GST, engineering fees, market escalation, associated builder's works, builder's margins, design contingency, project contingency.
5. As project scope becomes better defined it is strongly recommended that estimates are updated.

# TABLE OF CONTENTS

# 1. INTRODUCTION

Louisville Point is located on the eastern coast of Tasmania, 3km north of the town of Orford.




An opportunity has arisen where a land owner of the peninsula wishes to develop a golf course, and TASSAL, a fish farm operator offshore from the peninsula, can unite to secure raw water to support both of their operations.

This report has been prepared to examine the system that could be constructed to satisfy the demand for raw water.

Glamorgan Spring Bay Council may become the asset owner and scheme operator.

# 2. CUSTOMER DEMANDS

| | |
|---|---|
| GOLF COURSE-**GC** | 300 ML per annum |
| TASSAL | 500 ML per annum |
| OTHER | 200 ML per annum |
| TOTAL | 1,000 ML |

The '**other**' customer has not been identified, but has been considered in the assessment of the Dam. They may include the local land owner on whose land the dam will be built.

The '**other**' customer will be also assumed in the design of the Pipeline. This will be conservative however it will allow the operator to consider selling this water within the peninsula. – Demand = 1,000 ML/annum.

## 2.1 PEAK DEMANDS- PIPELINE

**TASSAL** require individual peak flows – 5 ML/day and up to 21 ML/week for the full three months of summer, or 273 ML.

The **GC** have +- 80 ML of dam storage on site to enable flow balancing.

This enables the system to deliver only to TASSAL during their peak flows. However It has been assumed that the GC will need to draw 250 ML during the 3 months of summer. This represents 83 % of their annual demand.

The **Other** customer is assumed to take 50% of the annual demand over the 3 months of summer.

| CUSTOMER | UNITS | ANN. | AV. MNTH | PEAK DAY No Balance | PEAK DAY(*) with Balance | PEAK WEEK | PEAK MNTH | PEAK 3 MNTH |
|---|---|---|---|---|---|---|---|---|
| TASSAL | ML | 500 | 41.7 | 5.0 | 5.0 | 21.0 | 91.0 | 273.0 |
| GC | ML | 300 | 25.0 | 2.7 | 0.0 | 19.2 | 83.3 | 250.0 |
| OTHER | ML | 200 | 16.7 | 1.1 | 0.0 | 7.7 | 33.3 | 100.0 |
| **TOTAL** | **ML** | **1,000** | **83.3** | **8.8** | **5.0** | **47.8** | **207.7** | **623.0** |
| | | | | | | | | |
| FLOW | ML/D | 2.7 | 2.7 | 8.8 | 5.0 | 6.8 | 6.8 | 6.8 |
| | L/s | 32 | 32 | 102 | 58 | 79 | 79 | 79 |

(*) Flow Balancing allows the peak design flow to be significantly reduced from 8.8 ML/d to 6.8 ML/d.

The consumption for the golf course during the 3 months of summer is a very conservative allowance at 250 ML, and assumes no use of the internal water storage. Through the use of the Golf Course storages its consumption in the critical summer 3 months reduced by 50 to 80 ML. This in turn could reduce the Peak Week daily flow by 0.87 ML/d.

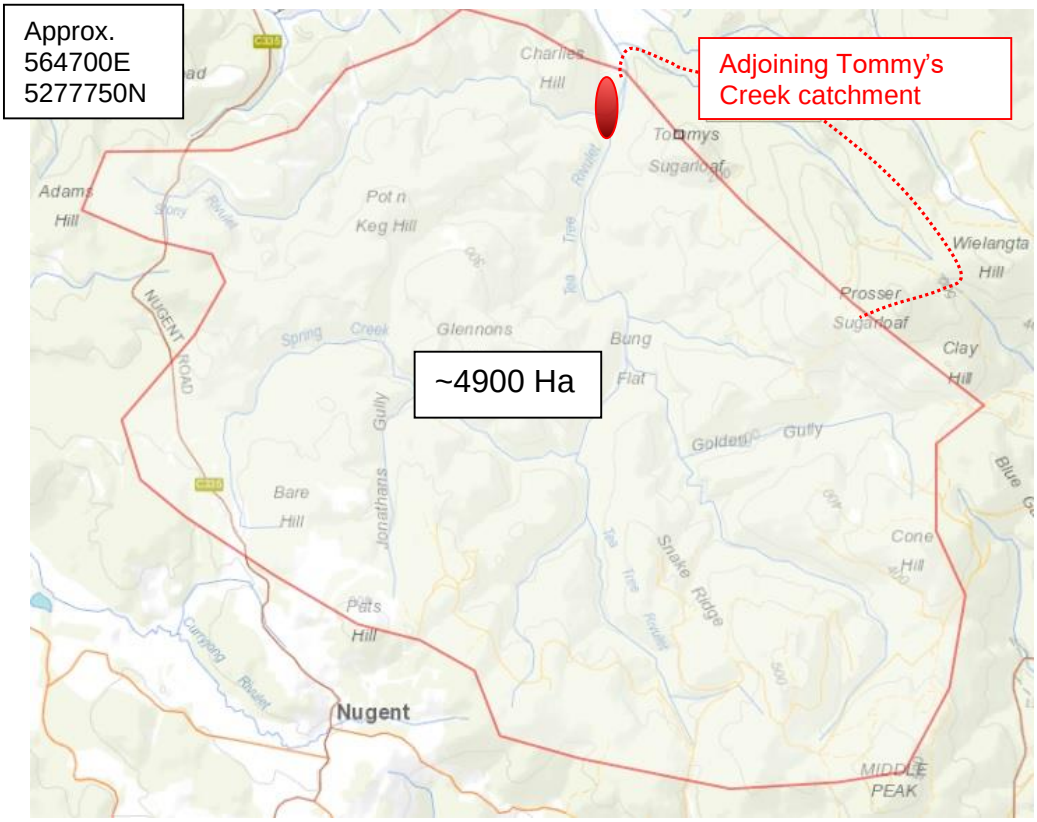
In a similar vein the 'other' customer may not be available. Removing this consumption would see the Peak Week daily flow reduced by a further 1.1 ML/d. Both reductions together would see a peak week daily flow rate of 4.85 Ml/d – almost equivalent to the TASSAL Peak Day flow rate. This would be 28% lower than the proposed Peak Week flow rate of 6.8 Ml/d.

There is no need to alter this assumption, however its conservative nature should be recognized when critical design decisions are required.

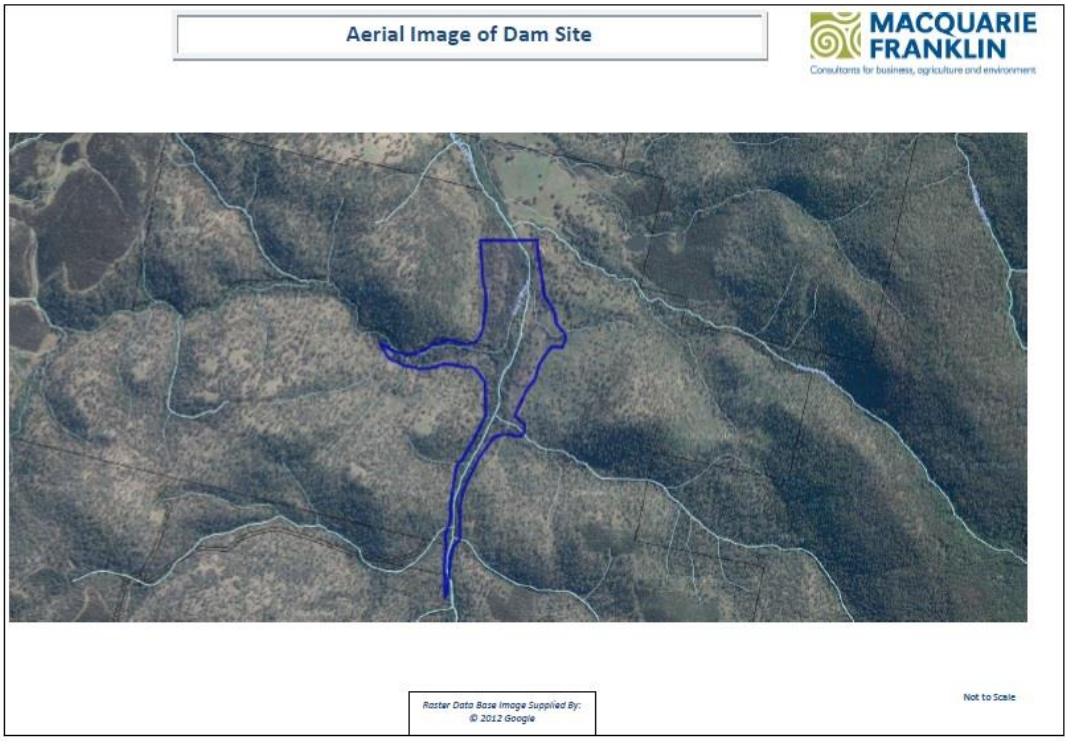
# 3. DAM STORAGE AND SURETY

A potential dam site has been identified upstream of the existing Taswater Dam in Paradise Gorge on the Prosser river.


The Dam has an approximate catchment of 4900 Ha.



…. And a potential storage volume of 3000 ML.




It was originally considered useful to capture the Tommy's creek catchment through the construction of a diversion channel – on the contour. This would enlarge the catchment and lead to a greater water yield. However with a catchment of less than 350 Ha it was not considered worthy of further investigation.

DPIPWE's "Water Assessment Tool" was used by Macquarie Franklin to show the amount of water available at surety 5 (80% reliability) and surety 6 (around 70% reliability). These were considered to be "the maximum winter allocations that DPIPWE are likely to allocate for these locations. There is no summer period water (1st Nov to 30th April) available for allocation."

| Watercourse | Location | Water Availability | | Total available per annum |
|---|---|---|---|---|
| Tea Tree Rivulet | 564715E, 5277701N | Surety 5 = 927ML | Surety 6 = 868ML | 1,795ML |
| Tommy's Creek | 565175E, 5277599N | Surety 5 = 53 ML | Surety 6 = 49 ML | 102 ML |

The low water yield from Tommy's creek confirms that little would be gained from the additional works required to divert this catchment.

Further Analysis remains necessary to confirm the dam volume required for the 97% surety required by the customers. Macquarie Franklin have been engaged to undertake this work including preparing the permits required to make formal applications.

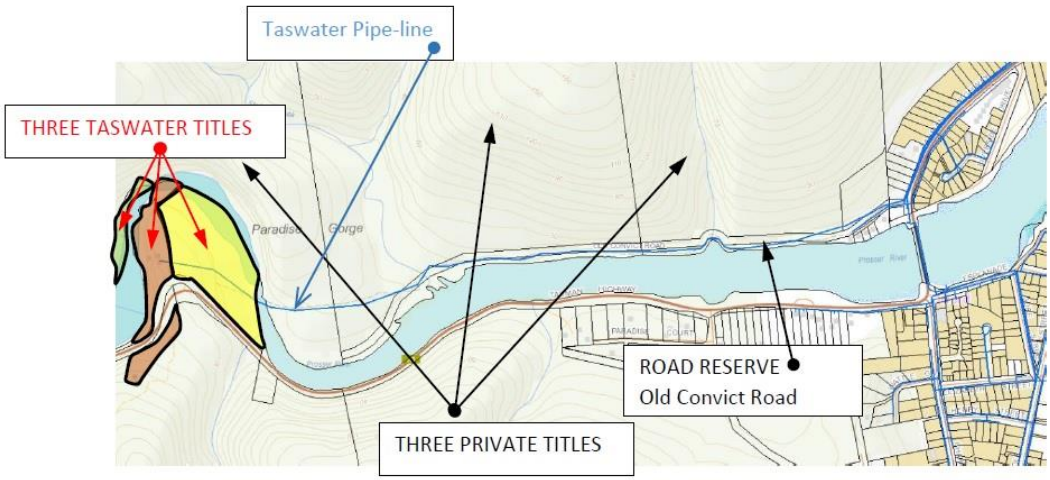
From preliminary discussions with Macquarie Franklin it appears likely that a 3000 ML Dam will satisfy the surety needs, however further discussion and clarification of what constitutes a failure may be necessary. Obtaining less than the full annual allowance of 1,000 ML may not practically constitute a recorded failure, however there will be a level of annual supply, below which the operators will wish to assume the system has failed. This has yet to be defined.

# 4. PIPELINE DELIVERY – Dam to Peninsula

It is intended to deliver flows from the Tea Tree Dam to the Taswater holding Dam in Paradise Gorge by a run of river scheme.

From the Taswater Dam an extraction license will be required to re-take the water and to pump it to the Louisville peninsula. Taswater own three titles surrounding the dam, and there are another two private titles between the dam and the 'Old Convict Road' reserve – along the existing alignment of the Taswater pipeline. Land owner approvals will be required to follow this alignment.

The Old Convict Road is shown as partly a Crown License and partly a road reserve on the State Government LIST site.




The Old Convict Road joins the Tasman Highway at the Prosser River Bridge after which the pipeline would follow within the Tasman Highway road corridor until Sheas Creek at the Louisville peninsula. Dept. of State Growth (DIER) permits will be required to construct a pipeline within this corridor.

# 5. DISTRIBUTION SYSTEMS - Louisville Peninsula

The Golf Course distribution system will utilise two partially built dams representing a volume of +-80 ML. The TWL in these dams are at RL 29.5 and RL 35. There is an additional Header Dam at RL 69.5 that will be used for distribution within the Golf Course. Water was to be pumped to the Header Dam by the Golf Course under a separate arrangement.

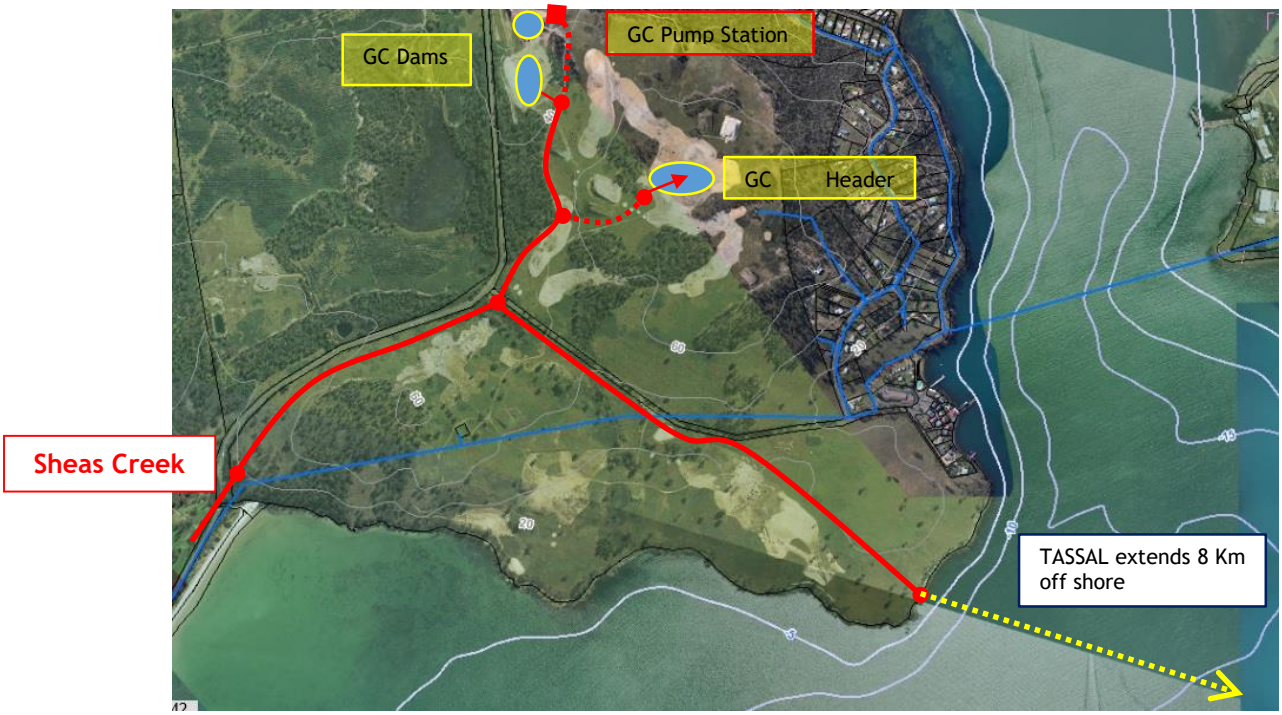
The highest ground level to traverse in delivering water to the peninsula is at RL 50, adjacent to the intersection of the Tasman Highway and Louisville road. The alignment through the Golf Course property, to avoid the trees, will pass through RL 55, and this has been assumed for this report. It would be possible to run the pipeline lower on the contour, for marginal benefit.

The Golf course do not intend to construct any additional holding dams within their property. Preliminary proposals to consider a distribution dam at RL 50 will not be further advanced. Tassal will therefore normally be required to take its delivery directly from pumped flows.

To cover emergency contingencies it is intended to ensure that the Golf Couse Pump station, apart from pumping to its header dam, can be used to pump flows directly to Tassal should the main pump station or the distribution main to Sheas Creek be unavailable, under repair or under maintenance.

Given the interrelationship of the pipe lines, pump stations it is recommended that all the on land pipe work and pump stations and dams, except for the header dam, should be part of a single system, with one defined asset owner. Any separate customer or nodal pricing required can be devised based on assumed, and/or actual usage of parts of the overall system.

The Distribution System on the Peninsula will be similar to:




Valve and control systems will be defined to enable the various operating scenarios to operate efficiently and effectively. They will include:

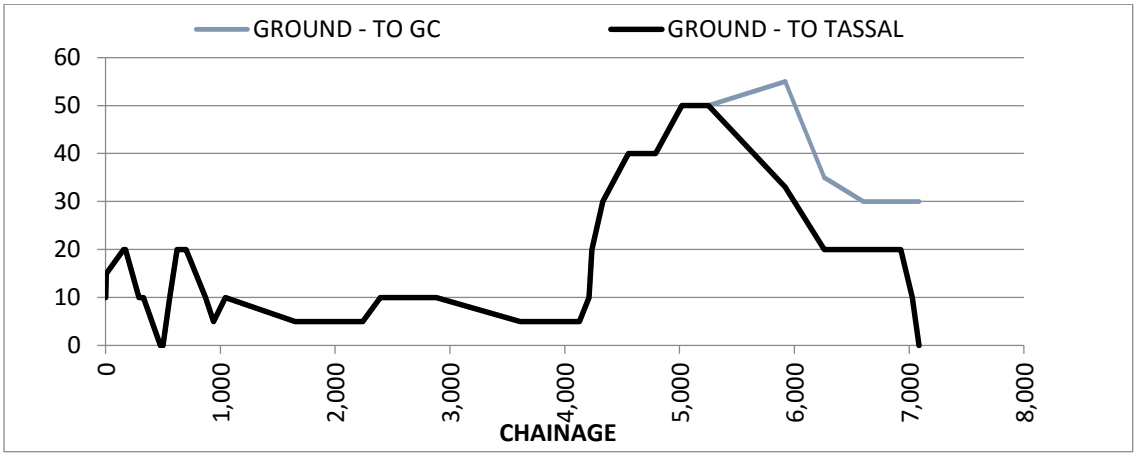
Operating scenarios:

| Type | Event | From | To |
|---|---|---|---|
| Normal | Peak Load | Prosser River | Tassal Only |
| Normal | Peak load | Prosser River | Golf Course Dams and Other users only |
| Normal | Peak Week | Prosser River | Tassal & GC & Other-lesser flow or in sequence?? |
| Normal | Operational | GC Dam | GC Header Dam |
| Emergency | Peak Load | GC Dam | Tassal Only |

Where possible controls will be automated.

# 6. MAIN PUMP & PIPE SIZING

The long section from the TasWater Dam to the Golf Couse Pump House and to the Tassal foreshore offtake is shown below.




Design flows are taken from the Table in Section 2

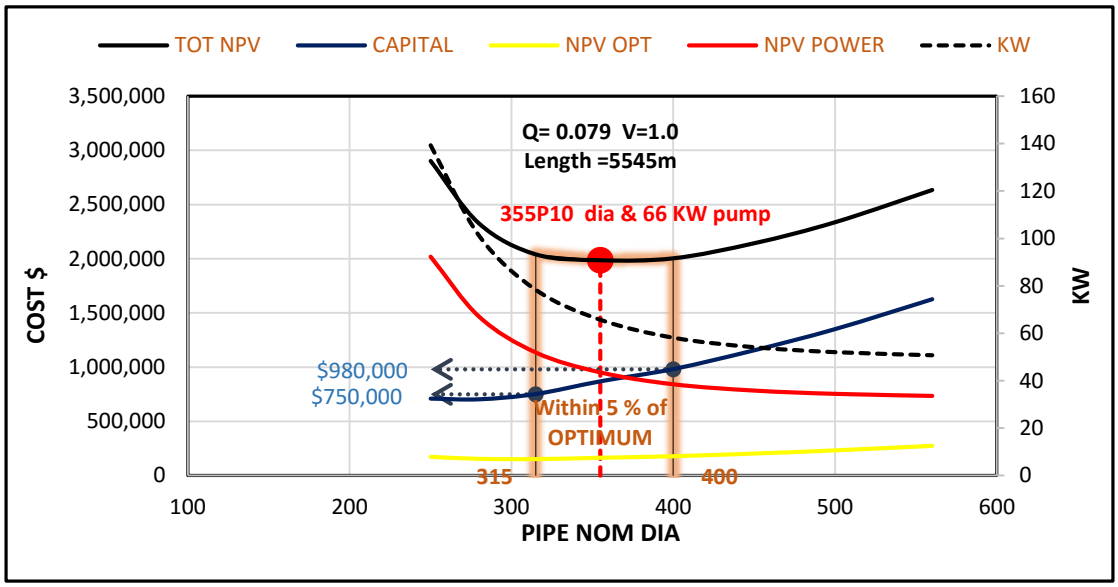
The design flow to deliver to Tassal and over the RL 50 hill is 5ML/d (58 l/s) – PEAK DAY

The design flow to deliver to the Golf Course and over the RL 55 hill is 6.8 ML/d (79 l/s) – PEAK WEEK

The second scenario represents the critical design parameters.

The appropriate pipe size and pump combination can be made by examining a combination of capital, replacement, operating and power costs brought forward to Net Present Value (NPV). These sums need only be considered between the pump station and the top of the hill, a length of 5.5 km. The figures stated are not construction costs based on ground conditions, but are a fair relative evaluations of pump and pipe capital and operational costs. They include replacement costs at the end of useful lives. Actual design figures may vary.

The following graph indicates that the optimum pipe and pump combination occurs for 355 HDPE and a 66 KW pump.




Actual flow modeling and design may change some parameters

However the curve is so flat that a smaller pipe and larger pump is marginally different. An envelope of pump pipe combination within 5% of the optimum costs is also shown. Between the two extremes there is a difference in capital cost of $230,000, but also an opposite difference in pumping costs of $20,000 per annum.

The critical alternatives are.

| Pipe | Pipe $ | Pump $ | Total $ | Pipe V m/s | KW pump | Power $/a | NPV TOT |
|---|---|---|---|---|---|---|---|
| 315P10 | 596,000 | 156,000 | 753,000 | 1.3 | 78 | 74,000 | 2,040,000 |
| 355P10 | 739,000 | 131,000 | 870,000 | 1.0 | 66 | 62,000 | 1,985,000 |
| 400P10 | 867,000 | 116,000 | 983,000 | 0.8 | 58 | 55,000 | 2,003,000 |

The velocity of the smaller pipe is not excessive, and it could be chosen with confidence. In this instance it is considered that the peak design flow is so conservative that the lesser capital value is worth capturing. The size of the pump could be readily changed in the final design in order to satisfy either design outcomes.

The recommended pipe size is a nominal 315 HDPE P10, with an internal diameter of 277 mm.

# 7. ACTUAL PIPE SIZES AND RESIDUAL HEAD

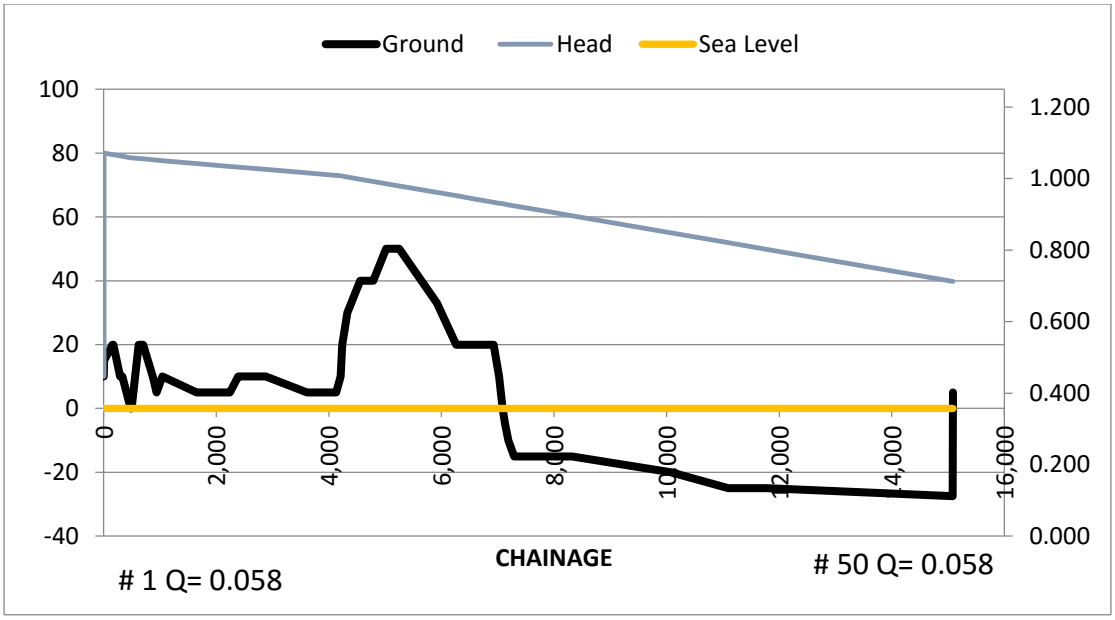
Whilst the initial hydraulic analysis assumed the pipes would be HDPE (poly) pipes it is often impractical to use long stringers of this material. Within built up areas, such as the Tasman Highway, where trenches have to be opened and closed in one day for safety, where space is limited and construction will occur amongst traffic, it is likely that the pipes will be 6 m lengths of 300 PVC-12 with an ID of 311 mm.

Similar issues may arise on the old convict road where width limitations and bends in the alignment may limit the capability to string out long lengths of poly pipe. Existing Taswater pipes in this corridor are above ground. These pipes may therefore be PVC below ground or DICL above ground.

HDE pipes have been assumed on farm land and for the offshore application for TASSAL.

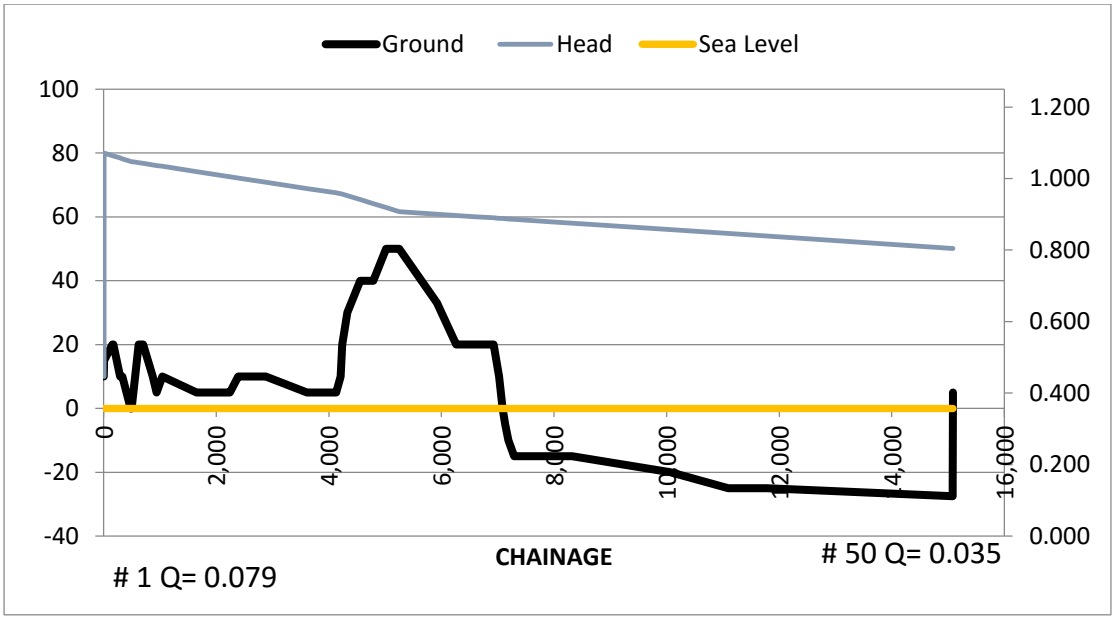
The larger PVC pipes improve the hydraulics. At the time of tendering it is possible to request contractors to price alternative materials and methods.

**Peak Flow 5 ML/Day** - TASSAL ONLY



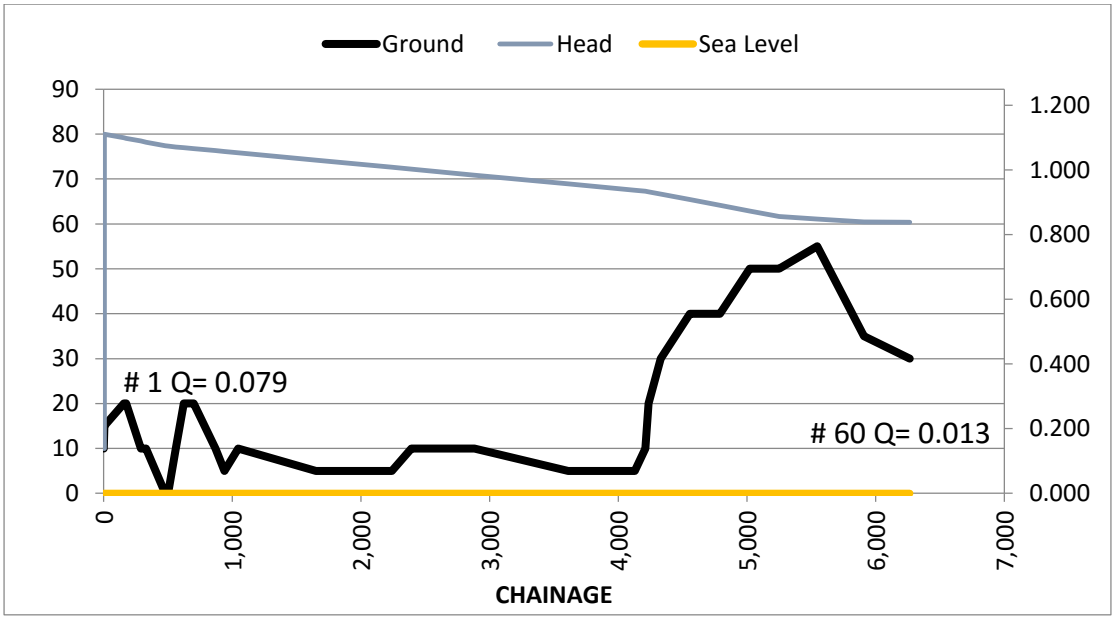

The residual head 8km offshore is approximately 35 m, which is considerable and in excess of operational needs. It could be reduced through smaller pipes after the hill is crossed, however Tassal are comfortable with a minimum 315 HDPE pipe as it is considered a standard size pipe for their operations. There is approximately 20m of residual head over the hill.

**Peak Week flow (6.8 ML/d)** - TASSAL profile




The residual head off shore is considerable at 45m, but this is not the TASSAL peak flow regime, so less head is lost in delivering to the offshore location. The residual head across the hill is 12m, but this cannot be reduced given the need to pass over the higher hill in the golf course.

**Peak Week flow (6.8 ML/d)** - Golf Course Profile




The residual head at the first Golf Course receiving Dam is considerable at about 30 m however the residual head over the hill is only 6m and can't be reduced. The pipe size to the dam from the hill must also be maintained to enable the TASSAL emergency flows to be pumped through the same pipe at 5 ML/d. The 315 HDPE P10 pipe would be suitable for this purpose.

# 8. PUMPS

The preliminary pump size at the Taswater Dam site is 70 m head at 6.8 Ml/d.

This is a 70 KW pump station using some 240,000 KWH per annum. At a unit cost of $0.22/KWH this will cost $53,000 per annum or $53/ML ($0.053/KL).

For the Golf course to pump 5ML/d to Tassal would need to pump 35m of Head and would be approximately a 25 KW pump station.

Pump selection has not been further investigated.

**Johnstone McGee and Gandy Pty Ltd**

incorporating Dale P Luck & Associates
(trading as JMG Engineers and Planners)

ABN 76 473 834 852 ACN 009 547 139

**www.jmg.net.au**

HOBART OFFICE
117 Harrington Street
Hobart TAS 7000
Phone (03) 6231 2555
Fax (03) 6231 1535
infohbt@jmg.net.au

LAUNCESTON OFFICE
49-51 Elizabeth Street
Launceston TAS 7250
Phone (03) 6334 5548
Fax (03) 6331 2954
infoltn@jmg.net.au

Engineers & Planners

*Your Vision is Our Mission*