REPORT

OCEAN SHORES TO BRUNSWICK VALLEY STP TRANSFER FEASIBILITY STUDY - PEER REVIEW

Prepared for Byron Shire Council

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Byron Shire Council

Ocean Shores to Brunswick Valley STP Transfer Feasibility Study - Peer Review

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1 Introduction

Byron Shire Council (BSC) have engaged MWH to provide a Peer Review of the Ocean Shores to Brunswick Valley STP Transfer Feasibility Study Report, prepared by GHD and dated November 2016.

The purpose of this feasibility study was to compare the option of closing Ocean Shores (OSSTP) and transferring flows to Brunswick Valley STP (BVSTP) and upgrading BVSTP as required, to the previously identified option of upgrading OSSTP. The Feasibility Study concluded that transferring flows to BVSTP and shutting OSSTP is preferred to upgrading OSSTP.

The purpose of the Peer Review is to provide an opinion based on the information provided in the report as to whether the conclusion that BSC should proceed with planning to close OSSTP, transfer flows to BVSTP and upgrade BVSTP is justified.

1.1 Scope

The scope of this work is to provide a Peer Review of the Ocean Shores to Brunswick Valley STP Transfer Feasibility Study Report dated November 2016. The Peer Review, based on the information presented in the Feasibility Study Report, is to provide an opinion as to whether the conclusion that the option of closing OSSTP and transferring flows should be preferred over the option of upgrading the OSSTP. It is noted that the previous Planning Reports for the OSSTP upgrade were provided as background information, however these were not reviewed. .

In developing this Peer Review report MWH has:

- reviewed the inputs approaches, outputs and conclusions presented in the Study Report and provided opinion on the appropriateness or otherwise of these, based on experience of conducting similar studies;
- reviewed the Cost Estimates presented, looking for any omissions, and comparing the values presented to MWH expectations, based on experience, recent projects and other high level cost estimates.

In developing this Peer Review report MWH has:

- not reviewed the earlier work that identified the preferred option for an upgrade at OSSTP, and as such provides no opinion on the OSSTP upgrade option compared to alternatives to OSSTP upgrade;
- not separately conducted process calculations, or checked the results of calculations presented in the Study Report;
- not separately developed cost estimates to those presented in the report.

1.2 Methodology

The methodology used in for the Peer Review was to read the Feasibility Study Report, then for each of the following areas, provide an opinion as to whether the approach and outputs are reasonable, conservative, aggressive, or if there are any other concerns with the information provided in the report. The areas considered were:

- Project Inputs:
  - Assumptions (Feasibility Study Report Section 1)
  - Population and flow projections (Feasibility Study Report Section 2)
  - Licence requirements (Feasibility Study Report Section 3)
- BVSTP assessment:
  - Existing plant capacity (Feasibility Study Report Section 4)
  - Existing Plant performance (Feasibility Study Report Section 5)
- Upgrade development:
  - Process modelling (Feasibility Study Report Section 6)
  - Augmentation Strategy (Feasibility Study Report Section 7)
  - Augmentation requirements (Feasibility Study Report Section 8)
  - Safety in Design (Feasibility Study Report Section 9)

  - Layout (Feasibility Study Report Section 10)
- Options Assessment
  - Cost Estimate (Feasibility Study Report Section 11)
  - Conclusions (Feasibility Study Report Section 12)
- Recommendations (Feasibility Study Report Section 13).

2 Peer Review

2.1 Project Inputs

2.1.1 Assumptions

The assumptions identified in Section 1.5 are a reasonable basis for an assessment of this type. Some specific assumptions are discussed in subsequent Sections.

BSC's attention is drawn to the assumption that the existing environmental licence requirements on BVSTP effluent will hold. As this is a relatively typical coastal licence this is a reasonable assumption, however if moving to a single plant did trigger a tighter effluent quality this may impact BSC's decision to proceed with this option.

2.1.2 Population and Flow Projections

The report details that the assumption of peak population projects from the Strategic Business Plan (2016) were adopted following agreement with BSC. It is noted, as pointed out in the report that there is a slight discrepancy in the populations used for the previous OSSTP upgrade strategy compared to those used for the option of diversion to BVSTP. However, the report states that the new values are higher, so if there is any significant difference that should disadvantage the option of transfer to BVSTP.

The approach to developing the flow projects appears reasonable. The report notes in Section 2.2.2 that the dry weather day definition used impacts the calculation of ADWF. It is suggested that the impact of this may have been understated in the report, that is, that the ADWFs are over estimated. However, for the purposes of this study, that would potentially disadvantage the transfer option.

Basing the assessment of simultaneous Peak Wet Weather Flows (PWWF), interpreted as all pump stations operating at maximum, is a conservative approach which again would disadvantage the transfer option. As such this is reasonable in the context of the assessment BDC require, however, in actual implementation of a transfer scheme should be reviewed when finalising the design basis.

2.1.3 Licence Requirements

The point noted above around the PWWF impacts on Section 3.1 of the report where it is identified that the maximum daily flow will need revision and trigger a new licence. An opportunity in implementing a transfer scheme would be to consider storage/balancing and reviewing pump station options to determine if this new maximum limit of 33 ML/d is actually needed.

Section 3.2 uses the existing BVSTP licence mass load limits and assesses the concentrations required at the increased flows to meet those mass load limits. The report states that these back calculated concentrations (with the exception of Oil and Grease) are within the envelope of licence and design concentrations and/or current performance. Whilst that statement is correct, it is important that BSC is aware that for BOD, TN and TP the concentrations required for a plant receiving OSSTP loads to meet the existing mass load licence are well below existing 90%iles concentration licence limits, and would require the plant to produce effluent quality matching that during the process proving period.

This is a significant issue for BSC to consider, that is, can increased mass load limits be negotiated, or will BSC accept that the plant must achieve concentrations significantly lower than the concentration limits.

2.2 BVSTP Assessment

Whilst not affecting the recommendation and outcomes, the structure of the report relating to existing capacity, process modelling and augmentation strategy is a little hard to follow. In particular it is implied that the modelling confirmed the design capacity of BVSTP but this is not explicit.

2.2.1 Existing plant Capacity

The assessment relating to hydraulic capacity that there is < 0.2m between the feed channel downstream of the inlet works and the bioreactor outlet channel has a significant impact on the assessment in terms of not including a bioreactor bypass. However, if anything this disadvantages the BVSTP option therefore is a conservative approach.

The review of the clarifier capacity is justified and appropriate.

2.2.2 Existing Plant Performance

The sludge settleability discussion and conclusions are appropriate.

2.3 Upgrade Development

2.3.1 Process modelling

Bioreactor modelling results are partially summarised in Section 6.5, and are included in Appendix E as a spreadsheet, so are a little hard to follow. The report structure at this point is also a little hard to follow because the augmented plant solution is modelled here although it has not yet been introduced. However, for this level of assessment:

- The approach used, including the inputs are reasonable
- Using steady-state spreadsheet model for preliminary planning sizing is appropriate
- Key modelling parameters used are reasonable assumptions for this level of assessment.

The approach used does not initially consider options of pushing BVSTP beyond the original design parameters (for example lower sludge ages), this is raised later. For developing a conservative solution to use as the basis of comparison to the OSSTP upgrade option this is reasonable, however it is agreed with subsequent statements that the upgrade could be deferred, or optimised.

The clarifier modelling approach is appropriate, in particular using a more conservative SSVI value than the original BVSTP design, based on the actual plant data. However, alternatives to the full PWWF being received by the bioreactor and clarifiers should be considered in further development of the BVSTP solution.

Whilst under the heading of process modelling, some of the main augmentation requirements are introduced in Section 6.5.2, and as such are commented on in this section of this Peer Review Report.

- This section also introduces the need to provide a new raw influent flow splitter upstream of inlet works. This could have an impact on both the existing BVSTP catchment pumps and the transfer pumps to pump to a higher level than existing inlet works. It is noted subsequently in Section 8.1.1 on SPS5009, that there is a high point earlier in the rising main that governs the hydraulics, so this should not be a factor for this pump station. The assessment does include an upgrade of SPS5004 which appears justified.
- The proposed new RAS flow splitter and removal of RAS screening at the inlet works and replacement with dedicated RAS screening is reasonable, but conservative and RAS screening may not be required.

2.3.2 Augmentation Strategy

Without understanding the OSSTP catchment in detail, it is assumed that the reason diversion to BVSTP prior to OSSTP has not been considered is that it isn't feasible. Assuming that it isn't feasible, then the considerations of two options for the transfer system are reasonable. For this study proceeding with Option A is a sound approach, the potential for Option B and flow balancing to reduce the peak flow to the upgraded BVSTP has not been explored and should be considered at further project stages.

Subject to the comments made above in the Process Modelling section of this Peer Review Report, the features of Option A detailed inspection 7.2.1 are reasonable. As detailed in the introduction of this Peer Review report, no assessment of the preferred option for the upgrade at OSSTP has been conducted as this was earlier work than this transfer feasibility study.

2.3.3 Augmentation Requirements

The Sewerage transfer system requirements presented in Section 8.1 are discussed above.

2.3.4 Safety in Design

This section is not particularly relevant, but agree that at this preliminary stage specific safety issues would not be detailed.

2.3.5 Layout

The preliminary BVSTP upgrade layout plan presented in the report and used as the basis for cost estimating appears reasonable. It is noted that the layout would result in some tree removal, this is not explicitly discussed. It is recommended that BSC should confirm that there are no significant issues with removing trees that would potentially cause a layout change that may change the upgrade costs.

2.4 Options Assessment

2.4.1 Cost Estimate

The approach and methodology detailed in the report for developing the cost estimate are reasonable for a study of this type. Specifically in terms of the basis of estimate it is noted that:

- The report states that BSC directed that the decommissioning costs for OSSTP be excluded. It should be noted that recent experience elsewhere (e.g Unitywater's Suncoast STP closure and conversion to pump station) is that even when not selling the land, is there are making 'safe costs', Tweed Shire Council also have experience of decommissioning costs for the Tweed West STP.
- Power supply upgrade can be a significant cost, therefore it is recommended that BSC confirm that they will not incur significant costs.

A significant assumption in the comparison is that for the retention and upgrade of OSSTP options, the effluent would still be transferred to BVSTP to add to recycled water supplies. It is assumed that BSC has confirmed that this is required and is part of the baseline. If not required, the change to the project costing is not expected to change the Feasibility Study recommendations.

In terms of the BVSTP capital cost estimates:

- Raw sewage rising main: the estimate is about 25% lower than the high level planning costs used by MWH and some of our clients. The estimate equates to $738/m, MWH (and several clients) would use $1000-1050/m. It is unclear how the comparison to the effluent rising main for the OSSTP option is included in the comparison.
- Upgrade SPS 5004 – Estimate appears reasonable
- Complete 1.9 ML/d upgrade (approx. 8,000 EP) – the estimate equates to around $3900/EP, which is quite high, however based on the comparison with the OSSTP estimate this in no way advantages the BVSTP option hence does not impact on the recommendation.

- The capital deferment estimates, in terms of difference to the complete upgrade estimate are reasonable.

In terms of the OSSTP Cost estimates, STP upgrade estimate is virtually the same as the BVSTP upgrade in terms of total capital, or nearly $3000/EP.

In comparing the capital costs of the BVSTP and OSSTP upgrades, the differences presented in the following table stand out as significant, whilst they increase the cost of the OSSTP option compared to the BVSTP option, at a higher level based on $/EP the BVSTP upgrade appears more conservative. As such whilst these are brought to BSC's attention, they are not significant enough to change the recommendation of the Feasibility Study to proceed with the transfer to BVSTP.

Item	OSSTP Scope	OSSTP Cost	BVSTP Scope	BVSTP Cost	Justification
Bioreactors	190 kL Anaerobic Tank, 2320 kL ditch, 190kL each secondary anoxic and aerobic tanks,	$4.38m	1885 kL anaerobic tank, 1665 kL ditch.	$2.46m	OSSTP slightly larger, more complex process, more expensive
Clarifiers	2 no. 21m diameter	$2.27m	2 no. 23m diameter	$2.25m	Potentially higher construction costs at OSSTP
UV Disinfection	1 no. 240 L/s	$1.06m	1 no. 314 L/s	$0.75m	The difference are likely due to OSSTP being a new system compared to expansion at BVSTP.
Aerobic Digester	Modify existing tank, new diffused aeration system and decanter	$0.47m	New 0.25ML digester and aeration system	$0.43	Unclear why costs are similar, expect that BVSTP would be more expensive
Switch Room and Blower Room		$0.8m		$0.4m	Unclear as to why the OSSTP cost would be double the BVSTP cost.

For the operational costs basis of estimate:

- The saving of 0.5 FTE by closing OSSTP is a reasonable to conservative assumption;
- Power cost assumptions appear reasonable;
- Biosolids disposal cost whilst based on current BSC costs, appears low compared to costs to other utilities. However, the comparison is unlikely to be sensitive to increases in these costs;
- Maintenance cost approach for existing assets is a little confusing, but if these have been checked against BSC actual costs then there is no issue.

2.4.2 Conclusions

The conclusions are reasonable and justified based on the information presented. However there are a number of discrepancies between the capital cost estimate for BVSTP compared to OSSTP upgrade, that could be perceived as inflating the OSSTP estimate relative to the BVSTP estimate that are not fully justified in the Feasibility Study Report. Whilst they are not likely to be significant enough to change the recommendation, the NPV comparison would be closer.

2.5 Recommendations

The study recommendations are reasonable and justified based on the information presented.

3 Peer Review Conclusions and Recommendations

This Peer Review has concluded that the majority of assumptions, approaches, outcomes and conclusions of the Feasibility Study are justified. However, several items are brought to the attention to BSC.

This Peer Review has concluded that the BVSTP upgrade estimate is reasonable, if slightly at the higher end of expectations, based on $/EP comparison. The OSSTP upgrade estimate is also in the high range based on $/EP. Whilst some minor discrepancies between the capital cost estimates for BVSTP and OSSTP are noted in this Peer Review, if addressed these are highly unlikely to change the Study recommendations.

Even if the BVSTP upgrade was more expensive, or the OSSTP estimate was less expensive by comparison, it is unlikely that the relative NPV (assuming there is significant capital deferment in the BVSTP option) would change to favour the OSSTP upgrade option.

The Peer Review agrees that the BVSTP upgrade approach is quite conservative, and therefore there is significant potential to defer capital spend at BVSTP and/or optimise the upgrade approach.

Other issues to which BSC's attention is drawn are:

- the assumption that the existing environmental licence requirements on BVSTP effluent will hold;
- if the BVSTP mass load limits in the licence are not increased, with the additional OSSTP loads, the BVSTP would need to achieve BOD, TN and TP concentrations significantly lower than the concentration limits;
- the cost estimate is based on a layout that requires significant tree removal at BVSTP;
- the exclusion of decommissioning costs at OSSTP;
- exclusion of power upgrade costs;
- the rising main cost estimate is around 25% lower than expectation based on high level costing, however the rising main is only around 10% of the project cost, hence a 25% increase in the rising main is unlikely to change the outcome.

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