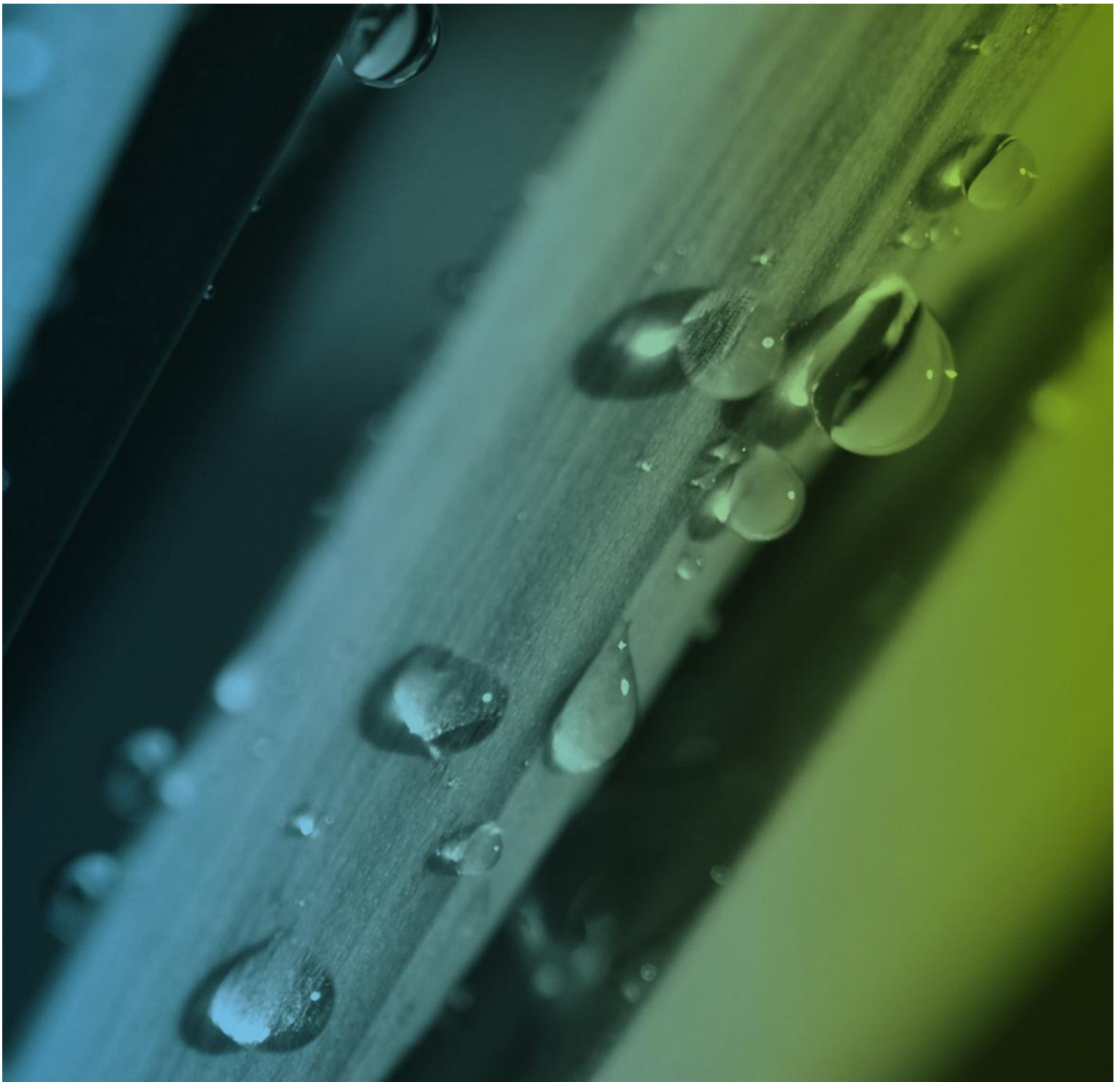


# Key Attributes

Desalination Investigations



## Key Attributes

Desalination Investigations

Prepared for  
Queensland Water Commission

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**List of Acronyms**

AHD	Australian Height Datum
ASS	Acid Sulphate Soil
BCC	Brisbane City Council
BoM	Bureau of Meteorology
CAPEX	Capital Expenditure
CPI	Consumer Prices Index
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DERM	Department for Environment and Resource Management
DP	Desalination Plant
DTMR	Department of Transport and Main Roads
EIS	Environmental Impact Statement
EPA	Environment Protection Agency
EPBC	Environmental Protection and Biodiversity Conservation
FDA	Food and Drug Administration
GHG	Greenhouse Gas
GIS	Geographical Information System
LOS	Levels of Service
MCA	Multi Criteria Assessment
NPI	Northern Pipeline Interconnector
NPV	Net Present Value
OPEX	Operational Expenditure
PoB	Port of Brisbane
QWC	Queensland Water Commission
RE	Regional Ecosystems
RO	Reverse Osmosis
SEQ	South East Queensland
SEQWG	South East Queensland Water Grid
SPRP	State Planning Regulatory Provisions
SWRO	Seawater Reverse Osmosis
TPI	Tender Prices Index
VfM	Value for Money
WA	Western Australia
WCRWP	Western Corridor Recycled Water Project

## Executive Summary

The aim of the Key Attributes report is to identify gaps in the process to date and identify further work required in the next phase of the planning process. The Phase 1 and Phase 2 reports both identified areas of further work that needed to be carried out in the latter stages of the planning process to ensure the successful delivery of the new desalination plants.

One of the items of scope identified was a review of the categorisation of the priority and reserve sites, which this report forms part. Further areas of scope were identified relating to the major areas of engineering, environmental investigations, planning approvals, social and community consultation and cultural heritage. This report covers these areas and identifies specific items of scope required during the next phase of the planning process.

In relation to the methodology followed, there are a number of matters that need to be closed out for completeness and auditability. It is not expected that these will change the decision but will improve the robustness of the outcomes from Phase 1 and Phase 2.

The level of investigation to date is appropriate for the identification of sites and a preliminary ranking based on the MCA. However, there is a question mark against whether the methodology has been discriminatory enough to differentiate between the sites identified as priority and reserve. There is a further step required to undertake a detailed paired comparison between the sites in each sub-region to determine which site is priority and which is reserved.

The approach to risk needs to be addressed, but these do not affect the prioritisation of the sites. Risk approach should be systemised, comprehensive and developing in detail as projects move into more detailed planning phase.

### Cost Estimating

The cost estimating carried out to date has been desktop and very linear in its nature. There will be a requirement in the next phase to adopt a more robust and risk based approach to estimating the new desalination plants to improve the accuracy of the estimates to aid the decision making process. Also, once more detail for each of the sites becomes available through acquisition of data and knowledge the estimates will become more robust and not necessarily lower.

### Common Tasks

There has been little community consultation regarding the new desalination plants and groups such as CADI are organised and active. The Commission has the benefit of time to use to build the case for desalination as well as further promoting their strategy for a portfolio of options to meet future demand.

There are a number of common tasks required for each of the sites in all areas. The need for better information on both marine and land environmental issues, in particular for impacts on local marine life of the intake and outfall during construction and operation.

Planning regulations have altered since 2009 in a number of areas and the impact of these changes on each site needs to be evaluated. Planning and approval risks should be incorporated in the risk register.

The need for the desalination plants is a number of years away and the locations chosen have been based on historic experience and future population projections. The current situation in SEQ is somewhat different when the new desalination plants were proposed and the rationale for the rapid build and site availability need to be revisited to ensure those criteria are still valid.

The corridors and connection points to the Water Grid have been identified and these need further study to minimise their impact on the environment and local community. The possibility of selecting a priority and reserve corridor may be worth considering.

The construction of the new desalination plants involve major construction associated with marine and land environments and as the projects develop these issues will become more apparent. In particular, the construction in open marine environment and the selection of pipeline routes for the intake and outfall,

The provision of power to each of the sites will need further review and the use of renewable energy is a pre-requisite for the new desalination plants. Consultation with the local energy provider on their renewable energy strategy is required to ensure that the increase in power from the new desalination plants is accounted for in any future planning.

### **Northern Sites**

The Marcoola and Bribie Island sites present the most viable locations for a new desalination facility from a minimal impact on the environment and ease of planning approvals. Both sites do have issues but these are not deemed insurmountable. The main concern will be getting the community on board and understanding the benefits the new desalination plant will bring. However, both sites together will create significant upgrades in the Central region of the SEQWG.

The Pumicestone Passage issue for Bribie Island can be addressed by trenchless technology and if this is practicable it should overcome the major barrier to a new desalination plant on the island. There is still some work to be done to look at the feasibility and implications of this on the hydraulics and therefore pumping costs associated with connection to the network

### **Central Sites**

The site at Lytton still has the issues of Moreton Bay and the length of the intake and outfall to contend with and neither has been addressed satisfactorily to date. The Commission needs to embark on a process of identification and elimination of the risks and issues associated with the Lytton site. There are potential "fatal flaws" associated with the Lytton site, or any site that would require construction activity and discharge into Moreton Bay. This site is at the most risk of failing to be approved and is located in the area of most need and therefore represents the biggest challenge to the success of the strategy.

### **Southern Sites**

The Tugun site is attractive from an expansion point of view but is located in the wrong place to service the needs of the future growth. Unless the Water Grid can be reconfigured to supply more water to the central sub-region from Tugun then the viability of this site to meet future water demand is in question.

### **SEQ Water Supply Strategy**

The SEQ Water Supply Strategy is a living document and is reviewed on a regular basis. The Strategy is flexible enough to meet the changing drivers for future water supply and demand. There are some areas that could be improved from an overall planning process but these are minor in their nature. One area that should be covered in The Strategy is Occupational Health and Safety and how safety will be approached in the planning and design of the desalination plants. This will need to consider the safety aspects associated with construction, operation/maintenance and to the general public.

In terms of technology The Commission should maintain it watching brief. It should also consider the impacts of current advances in technology on footprint and energy requirements on the existing sites and the decision making process.

## 1.0 Overall

### 1.1 Methodology

The methodology followed has been detailed and considering the size of the undertaking can be considered to have been comprehensive. However, there are a number of inconsistencies in the methodology in particular the reduction from ten sites in Phase 1 to six in Phase 2. There is no detailed explanation for the exclusion of the Sunset Road, Peregian and Bells Creek Road sites. The Phase 1 Report does state that the top five or six should be carried forward for further investigation and it would be prudent to document the reduction from ten to six.

The ranking of Lytton as a consistently high site in spite of its "fatal flaw" raises concerns over the methodology. It is understood that the site has a number of advantages with respect to rapid delivery of a new desalination plant there are significant concerns about the length of the intake and outfall and both the suitability and acceptability of Moreton Bay as a location for a brine discharge. In view of the current water supply surplus the selection of Lytton as a priority site should be reviewed as a matter of urgency and in particular with respect to the Moreton Bay acceptability criteria.

The priority sites were required to meet two other criteria, namely, be suitable for development should a drought occur within the next 10 years and be practical for the construction of a desalination plant within a three-year timeframe having completed an adequate amount of preparatory work. This constraint needs to be challenged in light of the current water supply and demand situation in SEQ.

The level of investigation to date is appropriate for the identification of sites and a preliminary ranking based on the MCA. However, there is a question mark against whether the methodology has been discriminatory enough to differentiate between the sites identified as priority and reserve. There is a further step to be taken to compare the sites within each sub-region and carry out a more detailed comparison between them to make the most appropriate site is put forward for development.

A realistic differentiation between sites based on difficulty of obtaining approvals is not included. Obtaining approvals will be more difficult for Moreton Bay sites, especially when considering more construction techniques. This can cause significant costs in assessment and construction or lead to delays.

Construction advantages of constructing in a sheltered water body close to Brisbane are not fully assessed in the comparison of the sites. Open coast construction can have significant cost and time delay implications due to extreme weather events that are far less problematic in Moreton Bay.

### 1.2 Multi Criteria Assessment

The range of characteristics against which the north coast sites were assessed in order to identify the preferred site were different from those used in the overall MCA analysis and the Marcoola site should be assessed based on the MCA criteria outlined in Table 5 of the Investigation and Preliminary Ranking of Sites (GHD December 2007).

The Phase 2 MCA takes the approach of looking at the environmental areas affected and does not apply the sensitivity of the environmental areas affected and this is a weakness in the ranking of the sites and should be challenged and reviewed since not all the sites have an equally sensitive environmental ranking.

### 1.3 Risk

A bespoke risk register for the four sites should be developed and used as part of a new site ranking procedure. The risk register should be comprehensive and include an assessment of the impact of risks in planning, community, environmental, engineering and financial terms i.e. capital cost, operational cost and impact on delivery time.

The risk register is a tool used to track and mitigate risks and a systematic approach is required to ensure risks are identified, their likelihood and consequences established, their financial impact understood, mitigation measures put in place and responsibility assigned.

The risk of water supply security should also be assessed in relation to meeting LOS agreements and in the context of the vulnerability of the whole grid to the loss of strategic assets. This was highlighted by the recent floods and the reduced flows from strategic assets identifying weak points in the system. A model of the water grid

that looks at the probability of failure of assets and their impact on LOS should be investigated and the impact of the new desalination plants should be considered. This will ensure that the water grid is robust in both the short and long terms and that the value of the desalination plants on a regional basis is established. Liaison with the Water Grid Manager should be sought to understand the current status of any current thinking and planning in this area.

The risk assessment conducted in Phase 2 does not seem to be robust enough to ensure all risks associated with the project have been considered. The report mentions that operational and construction risk were taken into account; however these were not documented in the risk assessment reviewed. This exposes the project to potential delays and additional costs. Additionally, only risks ranked as Extreme, very high and high were considered significant deciders in the risk assessment. No methodology or explanation was given for this rationale. Furthermore, it was stated in the report that the risk assessment was done very broadly and may need a more detailed approach.

The construction risk associated with open coast conditions are not fully assessed in comparison with more protected sites such as Lytton. Open coast construction can have significant cost and time delay implications due to extreme weather events.

## 1.4 Financial

The costs developed for the sites to date have applied a unit costing approach and as such there appears no major cost differential between the sites. In order to ensure value for money the costs need to be refined in terms of inflation, scope and risk. The inclusion of costed risk will assist in setting an appropriate budget and help to ensure that the project remains on track in terms of finance.

Decisions on the acceptability of the intake and outfall construction should be taken early so not to waste time costing options that would not be allowable or acceptable. The likely construction methods include seabed pipeline method and various tunnelling methods.

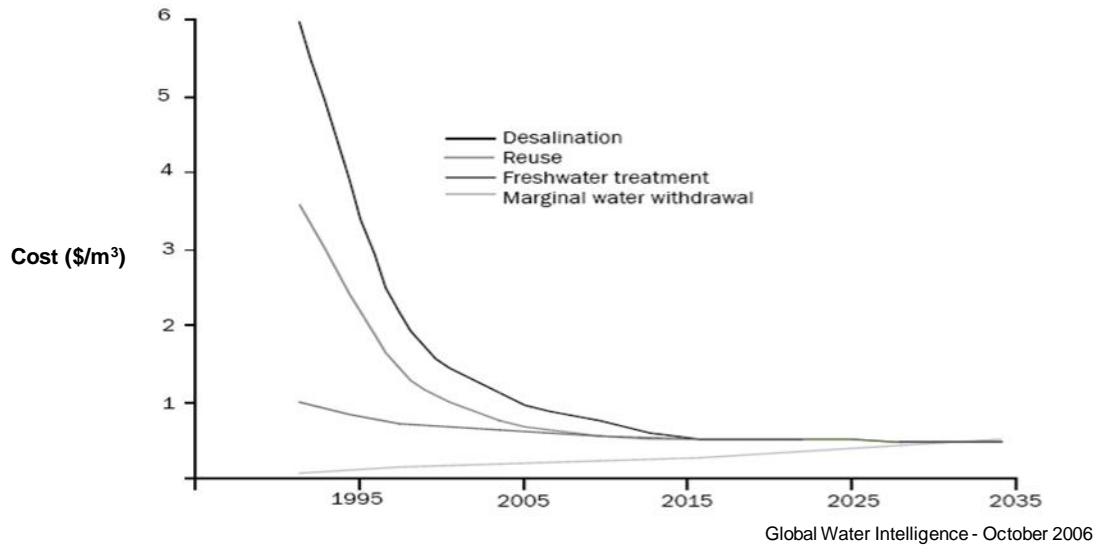
The use of the cost information to date has been purely for comparison purposes. If the next phase of financial refinement is to be used for budgeting purposes, then it is important to set expectations on the accuracy of the estimates and therefore the amount of detail required. If budgets are not being set, then the need for a detailed cost estimate at this stage of the planning process may be a costly exercise which will be overtaken by future events. The elements of the most certainty are the intake and outfall and the grid connection, hence these should be developed to a greater level of detail since they carry the most risk.

In terms of phasing the project to meet water supply demands the economic benefits of staging need to be more fully understood and this should be the subject of a value for money assessment. In particular the phased construction of the intake and outfall and the water grid connections needs to be fully understood in terms of both finance and operation.

The use of inflation models on costs needs to be understood since construction inflation differs from consumer price inflation and the correlation between the two is not consistent. QWC needs to determine how it will inflate any future cost information in order to keep budgets on track and manage any inflationary risks that may have been overlooked.

There is a question to be asked relating to is desalination still the best VfM option for meeting the future. An economic review of the costs of new desalination plants against the realistic damming options should be evaluated as a desk top exercise. The Global Water Intelligence (GWI) issued a report in 2006 looking at the true TBL costs of water supply which favoured desalination and water reuse as the preferred strategy for the future water resources, see below:

### Water Resource Cost Trends: US \$/m<sup>3</sup>



## 1.5 GHG

At the moment the new desalination plants are planned to be powered by 100% renewable energy and therefore this should not be a deciding criteria. It is important that Energex's renewable energy strategy takes into account the future power demands of the new desalination plants and a close alignment of the projects is advisable.

The impact of the Carbon Tax on the decision to proceed with desalination needs to be considered as a part of any future evaluations. If as anticipated future energy needs are satisfied by renewable sources then the impact may be regarded as negligible.

## 2.0 Marcoola

### 2.1 Environmental

Based upon the review, the following was noted:

- The study needs to be updated to current legislative and policy requirements. Alternatively, a new report with similar but updated scope prepared;
- There is a need to update the environmental assessment;
- The risk assessment and associated risk register needs to be updated in terms of environmental risk;
- There is a need to fully understand the impact of the intake and outfall on the marine environment and the specific marine habitat for the site. A survey to collect information on the nature of the local marine environment and marine habitats that would be potentially affected by the location of the intake and outfall would be required should the site be developed for a desalination plant. Mudjimba Island suggests that there is potential for rocky reef to be in the area;
- Brine dispersion modelling should be undertaken if the site is to be developed for a new desalination plant. Detailed assessment of benthic organisms at possible sites and an associated assessment of the vulnerability to high salinity, chlorine or construction related activities have not been undertaken;
- During construction significant filling of site will be required and there has been no consideration as to the effects this activity may have on the groundwater and the impacts on the natural systems relating to adjacent areas such as the Mount Coolool National Park;
- There is an inconsistency in the advice in respect to clearing within a National Park. There is a possible presence of threatened species along pipeline route pose significant constraints and may require tunnelling to avoid impacts. Need for a detailed survey to determine presence absence of threatened species should be undertaken; and
- Wallum Froglet is known to inhabit disturbed sites and therefore Wallum Froglet may utilise the site itself. A detailed survey to determine presence/absence of Wallum frogs will need to be undertaken.

### 2.2 Regulation

Based upon the review, the following was noted:

- The study needs to be updated to current legislative and policy requirements. Alternatively, a new report with similar but updated scope prepared;
- The risk assessment and associated risk register needs to be updated in terms of planning and approvals risk;
- Searches should be undertaken or re-done for:
  - Department of Environment and Resource Management (DERM) Aboriginal Cultural Heritage Database and Register to ensure there is no registered cultural heritage at the project site or nearby;
  - Queensland Heritage Register search to ensure there is no registered cultural heritage at the project site or nearby;
  - local heritage register, National Heritage List, Commonwealth Heritage List, and Register of the National Estate;
  - Australian historic shipwreck database should be undertaken to identify any historic shipwrecks in the project area. Failure to search this register may mean that potential historic heritage is not identified at the planning stage. This is a seldom used database, but searching it can limit potential future delays.
- The Native Title status of this area should be re-assessed. Consultation with the Aboriginal party(s) for the project area is of a level sufficient to satisfy this stage of the project, however further work will be necessary at later stages. An Aboriginal cultural heritage survey should be undertaken to determine if there are any features or items of cultural heritage significance;

- A historic cultural heritage survey should be undertaken to determine if there are any places of cultural heritage potential that may be affected by this project;
- It may be pertinent to treat Aboriginal and Cultural Heritage as discrete elements.

## 2.3 Water Supply

Detailed surveys of proposed routes will be required during the detailed design phase to confirm the presence/absence of various environmental constraints and to enable detailed environmental mitigations strategies and management plans to be developed.

The recent population forecasts need to be incorporated into the SEQ Water Strategy and the impact on the future planning of new water supplies and their location. The projected water demand calculations were based upon PIFU 2008 Population Projections. PIFU is now renamed DAP under Office Economic & Statistical Research of Queensland Treasury. DAP has released revised population projections in the 2011 edition of the *Queensland Government Population Projections to 2031 (Local Government Areas)*.

<http://www.oesr.qld.gov.au/products/publications/qld-govt-pop-proj-lga/index.php?>

The risk in terms of site prioritisation is that the revised population projections (2011) are significantly different (greater or less) than the 2008 figures utilised, including significant regional and subregional differences. Apart from the potential impact upon timing, this may impact upon the demand from the network being spatially different that it affects the site preference.

The current water demand forecasts are based on a target of 200 l/person/day. With current consumption at approx 165 l/person/day this would have a significant impact on the development and deployment of new desalination plants. Running an LOS scenario based on current usage would be a worthwhile exercise and potentially used to demonstrate the strategic nature of the strategy and may help with those who are anti-desalination to appreciate the Commission's responsible approach to managing the future needs.

LinkWater have identified a requirement for a further 600 ML/d of new supplies and this needs to be re-evaluated against new population data and water demand forecasts and a number of scenario's run and a risk assessment carried out to assist in the decision making process for future water supplies.

Staging of production also includes an assumption as to increasing Wivenhoe Dam operating levels. Due to the Brisbane January 2011 flood event, it is unlikely that an increase in Wivenhoe Dam operating levels will be supported. There is a possibility that consideration maybe made to lower operating levels as flood mitigation measure. In considering the supply and demand profiles of different options, the impact of the outcome of the Queensland Floods Commission of Inquiry will need to be considered.

Prioritisation of sites has not considered system outages (planned or unplanned) (i.e. WTP, PS or link) where a zero flow event occurs. This has recently occurred with the failure of Mt Crosby WTP during the Brisbane January 2011 floods. LOS yield and source allocation analysis of the options will need to consider scenarios where key assets fail.

The LinkWater approach has been to only identify one preferred route for the connection of the desalination plant to the SEQWG. The issue is that this potentially exposes QWC to the risk that the route is not secured in its entirety. Accordingly, to ensure connectivity is not compromised, QWC to give consideration to whether a "reserve" route is need to be identified in the event that the preferred route proves too complex or difficult to obtain.

## 2.4 Engineering and Construction

The construction of a conventional 400 ML/d desalination plant is the basis for the current decision making process, however, the benefits of technological advances in reducing footprint and energy should be assessed to see if this influences the choice of site. Use of large diameter membranes may reduce the footprint of the site by up to 40%. Implications on building height need to be investigated due to the proximity of the airport expansion plans.

Marcoola is a coastal site which is at risk of flooding based on current sea levels. Since sea levels are predicted to rise in the future the impact of rising sea levels on the choice of site and also the construction needs to be considered.

The impact of water quality on the design of the desalination plant can be significant and a water quality sampling plan should be developed to look at the current gaps in the data and understand the variation in water quality and temperature. The lack of water quality data can be a risk for designing new plants and in particular understanding of transient climatic effects. It would be normal to have at least five years of water quality data based on weekly sampling.

An assessment from suitably experienced contractors on likely construction techniques that could be adopted specific to the site, not just what has been used in the past, should be part of the next phase of the planning process.

In relation to the inlet and outfall:

- An extensive metocean data gathering campaign to include site specific measured wave climates, measured currents and offshore winds is required and needs a minimum of one year's sampling to ensure that at least one annual cycle is covered;
- A project/site specific high resolution bathymetric survey is needed to capture the bed fluctuations. The exercise should include both marine and land based surveys that extend through the surf zone to coordinate with each other, to allow full description of the coastal zone and needs a minimum of one year's data collection;
- Site specific bed sedimentology and geotechnical information is required to ensure that difficult construction conditions are known and that coastal processes are understood. Specific attention should be given to the proposed and likely pipe corridors. Collection of data should not just focus on pipe routes alone, an overlaying coarse grid of data collection is recommended to allow generic maps to be prepared in case of changes in plans;
- Site specific water quality data that captures the range of temperatures and salinity of the ocean waters is required to ensure a full understanding of the intake water quality and the receiving water conditions;
- To be more certain of outfall performance modelling of a range of likely outfall configurations and the operational conditions (flow rates) under which they will be operated is required. The outfall performance in the near field is a critical element of the dilution of the outfall plume;
- Well calibrated and validated numerical models for the site, using good site specific data to confirm plume behaviour, for a full range of conditions and not just typical conditions is required. Since actual plume behaviour is likely to differ from model results and forecasts used to date;
- A detailed review of the performance of outfall and intakes from similar projects would provide a useful background into issues and thus guidance on the likely design. This should include need and design of intake screens, diffuser design and maintenance requirements;
- An options assessment (modelling) for different outfall locations and the expected full range of discharges to determine possible intake locations would need to be carried out in the next engineering phase of the project;
- A study that properly assesses design conditions would provide a more confident assessment of the outfall/intake location and configuration;
- The adoption of chemical treatment techniques over against alternative methods such as high flows or anti foul liners or the high salinity of discharges need to be properly assessed and a preferred solution adopted as this has a considerable impact on plume dilution requirements.

## 2.5 Resources

The technological advances in desalination indicate that in the next 10 years energy requirements will be reduced by at least 20% and the impact of this on the location of the new power supply for the desalination plant of the future should be investigated.

## 2.6 Community, Social and Economic

The Communities Against Desalination Inc. (CADI) is located in the Marcoola area and represents an organised opposition to any new desalination facility. A strategy of engagement and public education with respect to the real costs and impacts of desalination should be developed putting desalination in the context of other energy uses such as rainwater harvesting pumping, air conditioning and refrigeration.

Some local politicians are also actively against desalination. Early engagement and education of the electorate including the elected representatives at all levels is key to the successful implementation of a new desalination facility.

Need to ensure the message that the Water Strategy is a portfolio of options that will respond to future changes and the Commission is not fixing any dates. However, there is a need for future supplies even if the current demand is sustained. There is a strong lobby that are promoting the use of rainwater harvesting and stormwater re-use as an alternative supply source to centralised desalination systems. This issue needs to be addressed in terms of the impact of a decentralised supply system on the operations of water grid, ability of local authorities to operate and maintain such assets, as well as the ability of such assets to provide LOS yield commitments. It is unlikely that rainwater harvesting and stormwater storage will provide a robust strategy that meets the LOS yield commitments.

A strategy document around community consultation, engagement and education should be developed and lessons learnt from the six recently installed Australian desalination plants taken on board. There is a perception that the Perth desalination projects have courted the least controversy and this should be further investigated to see if the Commission can benefit from this experience. It is understood that the Perth projects had community engagement plans from an early stage and this was seen as fundamental to the success of the project.

With respect to the proposed pipeline routes the assessment is high level and appropriate for the level of study undertaken, however, further work would be required should detailed route assessment be undertaken to identify specific areas of impact in the urban environment and potential mitigation measures. Also, there may be areas of impact which are outside of the urban footprint which need to be identified and managed.

## 2.7 Proposed Marcoola Desalination Plant – Alternative Sites Study

GHD were engaged by QWC in response to a response to negotiations with the Sunshine Coast Regional Council (SCRC) concerning the location of the Marcoola Desalination Plant. Two alternative sites were identified by the SCRC as potential alternative locations. The report refers to the three available sites as:

- Priority Site
- Option 1
- Option 2.

The report is a preliminary assessment and was carried out in a relatively compressed timeframe and therefore any recommendations would require further examination and a more detailed evaluation. The report draws the following conclusion:

*“Given most of the factors described in this report, Option 1 would be the preferred site and is some ways it may be more advantageous than the Priority Site. The site is constrained, however, by land size and potential height restrictions”*

The height restrictions are caused by the close proximity of the aircraft landing instrumentation (NDB and DME). The report further states that:

*“If the aircraft landing instrumentation (NDB and DME) could be relocated or concessions could be obtained so as not to affect the subject site, then Option 1 Site would be the preferred site.”*

If the relocation of the landing instrumentation is not practicable then the height restrictions imposed may preclude the construction of a desalination plant the Option 1 site.

The arrival at the recommendations in this report have not be through the same rigour as the location selection carried out in the Phase 2 Siting Study and may therefore be seen to be subjective. The report identifies significant issues with the two new sites but does not present an objective approach to the comparison of the options presented. On the majority of criteria it is difficult to differentiate between the three sites but the report does highlight some significant issues with Options 1 and 2 that need to be subjected to a more detailed multi-

criteria analysis (MCA) along the lines of that carried out in the Phase 2 Siting Studies report in order to obtain a more robust and objective recommendation on the preferred location of the Marcoola Desalination Plant.

The areas of particular concern for the Priority Site are:

- 1) Building height and distance from the airport imposed by the Obstacle Limitation Surface restrictions

The areas of particular concern for Option 1 are:

- 1) The available land cannot support the construction of a 400 ML/d desalination plant
- 2) The proximity to aircraft landing instrumentation may preclude this site.

The areas of particular concern for Option 2 are:

- 1) Issues relating to construction and operational traffic interfering with normal day to day airport traffic
- 2) More complex Intake and Outfall construction and brine discharge.

The report refers to SPA but does not undertake a full review of legislative/policy framework. Option 1 and Option 2 are both within the Mt. Coolum National Park. The report refers to development in a national park as requiring a specific approval and may attract public interest. The issues associated with obtaining this approval are not discussed in detail and are likely to be very significant and more problematic than the report indicates. The conclusion that Option 1 is preferred over the Priority Site is questioned as the development in a national park issue is considered to be underrated. Development in a national park is likely to be highly problematic and likely to attract considerable community interest. The process could be extinguishment of part of the national park or it could be lease within the national park with an EIS. Any proposed development within a national park will require a very careful community and social approach and almost certainly will need to be predicated by having no alternative available outside the national park.

The report discusses 3 sites with respect to connection to intake pipes and Water Grid, project staging, land and environmental assessment, tenure, construction phase, constructability and operating phase. The approvals constraints issues for intake pipes and connection to the grid are not discussed in the report. The engineering and practical aspects of connection to intake pipe and the water grid are discussed, but there is no discussion of approval issues for the three options in the report.

The report purpose is to investigate engineering constraints, infrastructure requirements and broad cost issues. Underdeveloped review of legislative and policy requirements undertaken and needs to be revisited and a more comprehensive review carried out. National Park requirements reference appears ambiguous and misleading. GHD report is deficient in discussing approval requirements. In comparison the Phase 2 report has excellent scope for approvals but is out of date.

These sites are located within an existing National Park. Previous assessment has assumed that approval to use the National Park can be readily achieved. It is likely that achieving approval to use the National Park for the construction of a desalination plant would be difficult and slow. Also, as construction of a desalination plant is inconsistent with the intent of a National Park, there is risk of significant public opposition. The alternate sites are also part of the Noosa-Maroochy Wallum Area listed on the register for the National Estate

In February 2009 QWC received a report it commissioned from MJG Aviation investigating the impact of the Marcoola Desalination Plant, located at the Priority Site, on the Sunshine Coast Airport expansion. This report identified that building height restrictions would be placed at the south-west corner of the site but did not perceive any major impacts on the airport configuration other than some limitations for the relocation of the existing navigational aids. The report also discusses issues relating to materials of construction e.g. use of non-metal cladding and lighting associated with the desalination plant. The report also recommended that when the PAN-OPS and OLS are revised for the Sunshine Coast Airport expansion that the navigational aids limitations and height restrictions be re-assessed. Since the Sunshine Coast Airport has progressed in their planning of the expansion, including the development of the revised PAN-OPS and OLS the impact of the construction can be re-assessed.

In comparing the GHD and MJG Aviation reports there appears to be a conflict in the decision to conclude that moving to Option 1 is more preferable than the current Priority Site. The issues associated with the Priority Site appear to be manageable based on MJG Aviation's opinion whereas the issues associated with the Option 1 Site may not be.

In reviewing the process for the apparent recommendation to move to the Option 1 site there appears to be less rigour applied than that used during the Phase 1 and Phase 2 Siting Studies. It is unclear as to the status of negotiations between QWC and SCRC in relation to the proposed desalination plant at Marcoola and if any outcomes following the GHD report have been reached. However, before committing to a change in the preferred location for the Marcoola Desalination Plant a more rigorous decision making process should be undertaken involving all affected parties to ensure any MCA is objective, robust and satisfies key stakeholder needs.

Option 1 and Option 2 are both situated in a national park. The GHD report which discusses the three options does not raise this as an issue and appears to underestimate what effect this may have. This is a significant gap in the current reporting.

Should one of these sites be chosen, this is likely to be very contentious and cause considerable community and stakeholder backlash as the desalination plant is not a compatible land use in the national park. This is not identified as an issue nor discussed in terms of the need for careful community engagement should one of these sites be required.

## 3.0 Lytton

### 3.1 Environmental

Based upon the review, the following was noted:

- The discharge of brine into Moreton Bay may not be acceptable due to the poor dispersion characteristics, the sensitive nature of the area and potential conflicts with the Port of Brisbane. All these matters need urgent consideration since failure to address them may mean the site becomes unsuitable.
- Assessments of impacts are against current conditions, and reflect no prospect of improved outcomes for bay ecosystems. It would be prudent to consider outfall impacts on the future status of Moreton Bay.
- A detailed review of environmentally sensitive areas combined with approval conditions associated with allowed impacts can be used in the modelling to drive design.
- Detailed assessment of benthic organisms at possible sites and an associated assessment of the vulnerability to high salinity, chlorine or construction related activities have not been undertaken.

### 3.2 Regulation

Based upon the review, the following was noted:

- Need to update any issues associated with the Port Brisbane Motorway and the Australia TradeCoast Transport Study;
- The report's approach to historic heritage is sparse, and historic and Aboriginal cultural heritage are subsumed into one element;
- The study needs to be updated to current legislative and policy requirements. Alternatively, a new report with similar but updated scope prepared;
- The risk assessment and associated risk register needs to be updated in terms of planning and approvals risk;
- Searches should be undertaken or re-done for:
  - Department of Environment and Resource Management (DERM) Aboriginal Cultural Heritage Database and Register to ensure there is no registered cultural heritage at the project site or nearby;
  - Queensland Heritage Register search to ensure there is no registered cultural heritage at the project site or nearby;
  - Local heritage register, National Heritage List, Commonwealth Heritage List, and Register of the National Estate;
  - Australian historic shipwreck database should be undertaken to identify any historic shipwrecks in the project area. Failure to search this register may mean that potential historic heritage is not identified at the planning stage. This is a seldom used database, but searching it can limit potential future delays;
  - The Native Title status of this area should be re-assessed. Consultation with the Aboriginal party(s) for the project area is of a level sufficient to satisfy this stage of the project, however further work will be necessary at later stages. An Aboriginal cultural heritage survey should be undertaken to determine if there are any features or items of cultural heritage significance;
  - A historic cultural heritage survey should be undertaken to determine if there are any places of cultural heritage potential that may be affected by this project;
  - It may be pertinent to treat Aboriginal and Cultural Heritage as discrete elements.

### 3.3 Water Supply

The feasibility study draws attention to a number of actions required by The Commission in relation to the pipeline corridor highlighting that there are significant issues relating to community engagement and education, acquisition of land, cultural heritage and native title. The timing of the consultation process and procurement of land is highlighted as key ensuring the successful construction of the connection.

Detailed surveys of proposed routes will be required during the detailed design phase to confirm the presence/absence of various environmental constraints and to enable detailed environmental mitigations strategies and management plans to be developed.

The recent population forecasts need to be incorporated into the SEQ Water Strategy and the impact on the future planning of new water supplies and their location. The projected water demand calculations were based upon PIFU 2008 Population Projections. PIFU is now renamed DAP under Office Economic & Statistical Research of Queensland Treasury. DAP has released revised population projections in the 2011 edition of the *Queensland Government Population Projections to 2031 (Local Government Areas)*.

<http://www.oesr.qld.gov.au/products/publications/qld-govt-pop-proj-lga/index.php?>

The risk in terms of site prioritisation is that the revised population projections (2011) are significantly different (greater or less) than the 2008 figures utilised, including significant regional and subregional differences. Apart from the potential impact upon timing, this may impact upon the demand from the network being spatially different that it affects the site preference.

The current water demand forecasts are based on a target of 200 l/person/day. With current consumption at approx 165 l/person/day this would have a significant impact on the development and deployment of new desalination plants. Running an LOS scenario based on current usage would be a worthwhile exercise and potentially used to demonstrate the strategic nature of the strategy and may help with those who are anti-desalination to appreciate the Commission's responsible approach to managing the future needs.

LinkWater have identified a requirement for a further 600 ML/d of new supplies and this needs to be re-evaluated against new population data and water demand forecasts and a number of scenario's run and a risk assessment carried out to assist in the decision making process for future water supplies.

Staging of production also includes an assumption as to increasing Wivenhoe Dam operating levels. Due to the Brisbane January 2011 flood event, it is unlikely that an increase in Wivenhoe Dam operating levels will be supported. There is a possibility that consideration maybe made to lower operating levels as flood mitigation measure. In considering the supply and demand profiles of different options, the impact of the outcome of the Queensland Floods Commission of Inquiry will need to be considered.

Prioritisation of sites has not considered system outages (planned or unplanned) (i.e. WTP, PS or link) where a zero flow event occurs. This has recently occurred with the failure of Mt Crosby WTP during the Brisbane January 2011 floods. LOS yield and source allocation analysis of the options will need to consider scenarios where key assets fail.

The LinkWater approach has been to only identify one preferred route for the connection of the desalination plant to the SEQWG. The issue is that this potentially exposes QWC to the risk that the route is not secured in its entirety. Accordingly, to ensure connectivity is not compromised, QWC to give consideration to whether a "reserve" route is need to be identified in the event that the preferred route proves too complex or difficult to obtain.

The LinkWater pipeline route assessment identifies the need for a 200 ML/d desalination plant and this option has not been considered for this site.

### **3.4 Engineering and Construction**

The presence or risk of highly turbid water would have implications for the design and operation of a new desalination facility.

A risk assessment of possible issues arising from accidental or approved dredge plumes on the plant operations for a Moreton Bay site should be considered. Apart from turbidity, dredge spoils and associated plumes can contain contaminants that could enter the desalination plant and cause processing problems.

Assessment of likely risks to project due of community perceptions regarding impact of outfall on Moreton Bay, and the associated public reaction are not assessed. Community reaction to concerted public disquiet could stop this option at a late stage. Public perceptions of Moreton Bay and thus stakeholder risks are significant issue that cannot be ignored

An assessment of likely risks to the project of poor intake water quality, whether real or public perception, should be assessed.

In relation to the inlet and outfall:

- An extensive metocean data gathering campaign to include site specific measured wave climates, measured currents and offshore winds is required and needs a minimum of one year's sampling to ensure that at least one annual cycle is covered;
- A project/site specific high resolution bathymetric survey is needed to capture the bed fluctuations. The exercise should include both marine and land based surveys that extend through the surf zone to coordinate with each other, to allow full description of the coastal zone and needs a minimum of one year's data collection;
- Site specific bed sedimentology and geotechnical information is required to ensure that difficult construction conditions are known and that coastal processes are understood. Specific attention should be given to the proposed and likely pipe corridors. Collection of data should not just focus on pipe routes alone, an overlying coarse grid of data collection is recommended to allow generic maps to be prepared in case of changes in plans;
- Site specific water quality data that captures the range of temperatures and salinity of the ocean waters is required to ensure a full understanding of the intake water quality and the receiving water conditions;
- To be more certain of outfall performance modelling of a range of likely outfall configurations and the operational conditions (flow rates) under which they will be operated is required. The outfall performance in the near field is a critical element of the dilution of the outfall plume;
- Well calibrated and validated numerical models for the site, using good site specific data to confirm plume behaviour, for a full range of conditions and not just typical conditions is required. Since actual plume behaviour is likely to differ from model results and forecasts used to date;
- A detailed review of the performance of outfall and intakes from similar projects would provide a useful background into issues and thus guidance on the likely design. This should include need and design of intake screens, diffuser design and maintenance requirements;
- An options assessment (modelling) for different outfall locations and the expected full range of discharges to determine possible intake locations would need to be carried out in the next engineering phase of the project;
- A study that properly assesses design conditions would provide a more confident assessment of the outfall/intake location and configuration;
- The adoption of chemical treatment techniques over against alternative methods such as high flows or anti foul liners or the high salinity of discharges need to be properly assessed and a preferred solution adopted as this has a considerable impact on plume dilution requirements.

The construction of the intake and outfall present significant engineering challenges due to the length of pipelines involved and the feasibility of the construction needs to be assessed as this may mean that the site is unsuitable.

There is a high probability of ASS being present. A detailed survey of the site would identify the extent of ASS. If ASS is found to be present plans to remediate these soils would need development during construction.

The LinkWater pipeline route assessment indicates that a 200 ML/d desalination plant is required for the central SEQ sub-region. To date only a 100 ML/d and 400 ML/d plant have been investigated. The impact of a 200 ML/d construction needs to be undertaken.

Use of large diameter membranes may reduce the footprint of the site by up to 40% and mean that any future expansion can be accounted for within the existing boundary.

### 3.5 Resources

The technological advances in desalination indicate that in the next 10 years energy requirements will be reduced by at least 20% and the impact of this on the location of the new power supply for the new desalination plant should be investigated. The impact on Lytton may be negligible since sufficient power is available at the site.

### 3.6 Community, Social and Economic

Public perceptions of Moreton Bay and thus community risks are significant issue that cannot be ignored. Stakeholder reaction to concerted public disquiet could stop this option at a late stage.

An assessment of likely risks to the project of poor intake water quality, whether real or public perception, should be assessed. As demonstrated by the recycled water campaign, stakeholder reaction to public disquiet is a concern, and the public are not easily convinced that wastewater can be made safe to drink.

There is insufficient discussion of the community, social or economic issues associated with the Lytton site. Given that the proposed plant may require use of land within the Moreton Bay marine park, it is considered a significant gap in the current reporting.

Some local politicians are also actively against desalination. Early engagement and education of the electorate including the elected representatives at all levels is key to the successful implementation of a new desalination facility.

Need to ensure the message that the Water Strategy is a portfolio of options that will respond to future changes and the Commission is not fixing any dates. However, there is a need for future supplies even if the current demand is sustained. There is a strong lobby that are promoting the use of rainwater harvesting and stormwater re-use as an alternative supply source to centralised desalination systems. This issue needs to be addressed in terms of the impact of a decentralised supply system on the operations of water grid, ability of local authorities to operate and maintain such assets, as well as the ability of such assets to provide LOS yield commitments. It is unlikely that rainwater harvesting and stormwater storage will provide a robust strategy that meets the LOS yield commitments.

A strategy document around community consultation, engagement and education should be developed and lessons learnt from the Big Six Australian desalination plants taken on board. There is a perception that the Perth desalination projects have courted the least controversy and this should be further investigated to see if the Commission can benefit from this experience. It is understood that the Perth projects had community engagement plans from an early stage and this was seen as fundamental to the success of the project.

## 4.0 Bribie Island

### 4.1 Environmental

Based upon the review, the following was noted:

- Ramsar wetland areas would be affected by construction of the network pipeline if installed by trenching. Trenchless techniques would not require clearing of National Park, therefore confirmation of routes and construction techniques is required;
- Confirmation of presence/absence of threatened species or significant populations of threatened species needs to be undertaken;
- Detailed assessment of benthic organisms at possible sites and an associated assessment of the vulnerability to high salinity, chlorine or construction related activities have not been undertaken. Unplanned constraints may be placed on plant operation or construction methodology in the approvals process. A detailed review of environmentally sensitive areas combined with approval conditions associated with allowed impacts can be used in the modelling to drive design.

### 4.2 Regulation

Based upon the review, the following was noted:

- The study needs to be updated to current legislative and policy requirements. Alternatively, a new report with similar but updated scope prepared. The approval requirements for the site are unclear because of reference to superseded legislation;
- The study identifies that the site is within Unallocated State Land and will soon be converted to State Forest tenure. Once this occurs, the proposed plant would conflict with the objectives of the Recreation Areas Management Act. This is not discussed further as to how much of an issue this may be and what the consequences or mitigation strategy would consist of. It is necessary to identify the current tenure status of the site and whether the *Recreation Areas and Management Act* applies;
- Pumicestone Passage is within the Marine Parks (Moreton Bay) Zoning Plan. There is no discussion of what requirements there are with respect to the zoning plan. This may or may not be a significant constraint and requires further investigation;
- The risk assessment and associated risk register needs to be updated in terms of planning and approvals risk;
- Searches should be undertaken or re-done for:
  - Department of Environment and Resource Management (DERM) Aboriginal Cultural Heritage Database and Register to ensure there is no registered cultural heritage at the project site or nearby;
  - Queensland Heritage Register search to ensure there is no registered cultural heritage at the project site or nearby;
  - local heritage register, National Heritage List, Commonwealth Heritage List, and Register of the National Estate;
  - Australian historic shipwreck database should be undertaken to identify any historic shipwrecks in the project area. Failure to search this register may mean that potential historic heritage is not identified at the planning stage. This is a seldom used database, but searching it can limit potential future delays.
- The Native Title status of this area should be re-assessed. Consultation with the Aboriginal party(s) for the project area is of a level sufficient to satisfy this stage of the project, however further work will be necessary at later stages. An Aboriginal cultural heritage survey should be undertaken to determine if there are any features or items of cultural heritage significance;
- A historic cultural heritage survey should be undertaken to determine if there are any places of cultural heritage potential that may be affected by this project;

- The report's approach to historic heritage is sparse, and historic and Aboriginal cultural heritage are subsumed into one element. It may be pertinent to treat Aboriginal and Cultural Heritage as discrete elements.

### 4.3 Water Supply

The LinkWater pipeline route assessment identifies the need for a 200 ML/d desalination plant and this option has not been considered for this site.

The feasibility study draws attention to a number of actions required by The Commission in relation to the pipeline corridor highlighting that there are significant issues relating to community engagement and education, acquisition of land, cultural heritage and native title. The timing of the consultation process and procurement of land is highlighted as key ensuring the successful construction of the connection.

Detailed surveys of proposed routes will be required during the detailed design phase to confirm the presence/absence of various environmental constraints and to enable detailed environmental mitigations strategies and management plans to be developed.

The recent population forecasts need to be incorporated into the SEQ Water Strategy and the impact on the future planning of new water supplies and their location. The projected water demand calculations were based upon PIFU 2008 Population Projections. PIFU is now renamed DAP under Office Economic & Statistical Research of Queensland Treasury. DAP has released revised population projections in the 2011 edition of the *Queensland Government Population Projections to 2031 (Local Government Areas)*.

<http://www.oesr.qld.gov.au/products/publications/qld-govt-pop-proj-lga/index.php?>

The risk in terms of site prioritisation is that the revised population projections (2011) are significantly different (greater or less) than the 2008 figures utilised, including significant regional and subregional differences. Apart from the potential impact upon timing, this may impact upon the demand from the network being spatially different that it affects the site preference.

The current water demand forecasts are based on a target of 200 l/person/day. With current consumption at approx 165 l/person/day this would have a significant impact on the development and deployment of new desalination plants. Running an LOS scenario based on current usage would be a worthwhile exercise and potentially used to demonstrate the strategic nature of the strategy and may help with those who are anti-desalination to appreciate the Commission's responsible approach to managing the future needs.

LinkWater have identified a requirement for a further 600 ML/d of new supplies and this needs to be re-evaluated against new population data and water demand forecasts and a number of scenario's run and a risk assessment carried out to assist in the decision making process for future water supplies.

Bribie Island DP was not considered as part of the LOS Yield analysis that represents short to medium lower limit of source water available to SEQWG during drought conditions. The driver for LOS Yield analysis of the priority sites of Marcoola DP and Lytton DP was that if the 2008 drought continued, then QWC needs to be ready to activate a desalination plant site. Accordingly, if either of the priority sites is to be considered to be relegated to reserve site status, then Bribie Island DP should be considered in LOS Yield Analysis to determine if specific network integration upgrades are required and implications on SEQWG upgrades.

Staging of production also includes an assumption as to increasing Wivenhoe Dam operating levels. Due to the Brisbane January 2011 flood event, it is unlikely that an increase in Wivenhoe Dam operating levels will be supported. There is a possibility that consideration maybe made to lower operating levels as flood mitigation measure. In considering the supply and demand profiles of different options, the impact of the outcome of the Queensland Floods Commission of Inquiry will need to be considered.

Prioritisation of sites has not considered system outages (planned or unplanned) (i.e. WTP, PS or link) where a zero flow event occurs. This has recently occurred with the failure of Mt Crosby WTP during the Brisbane January 2011 floods. LOS yield and source allocation analysis of the options will need to consider scenarios where key assets fail.

The LinkWater approach has been to only identify one preferred route for the connection of the desalination plant to the SEQWG. The issue is that this potentially exposes QWC to the risk that the route is not secured in its entirety. Accordingly, to ensure connectivity is not compromised, QWC to give consideration to whether a "reserve" route is need to be identified in the event that the preferred route proves too complex or difficult to obtain.

## 4.4 Engineering and Construction

Access to Bribie Island is via two lane bridge constructed 1963. The bridge may be unsuitable for heavy construction and operational traffic in 20 to 50 year time frame for new desalination plant. There is no listed road limit on bridge and it is open to general mass limit restrictions and a Bridge Engineer survey of the existing Bridge is required to determine load limits. Plans for the existing bridge need to be discussed with the DMR to see what plans are in place to upgrade or construct new bridge crossing.

The confirmation of the vulnerability to flooding needs to be confirmed through historical records and a more detailed assessment of the risk. The impact of climate change and rising sea levels would need to be considered in the next phase to explore the impact on the site and construction and should be entered on the risk register.

An assessment of likely risks to the project of poor intake water quality, whether real or public perception, should be assessed.

In relation to the inlet and outfall:

- An extensive metocean data gathering campaign to include site specific measured wave climates, measured currents and offshore winds is required and needs a minimum of one year's sampling to ensure that at least one annual cycle is covered;
- A project/site specific high resolution bathymetric survey is needed to capture the bed fluctuations. The exercise should include both marine and land based surveys that extend through the surf zone to coordinate with each other, to allow full description of the coastal zone and needs a minimum of one year's data collection;
- Site specific bed sedimentology and geotechnical information is required to ensure that difficult construction conditions are known and that coastal processes are understood. Specific attention should be given to the proposed and likely pipe corridors. Collection of data should not just focus on pipe routes alone, an overlaying coarse grid of data collection is recommended to allow generic maps to be prepared in case of changes in plans;
- Site specific water quality data that captures the range of temperatures and salinity of the ocean waters is required to ensure a full understanding of the intake water quality and the receiving water conditions;
- To be more certain of outfall performance modelling of a range of likely outfall configurations and the operational conditions (flow rates) under which they will be operated is required. The outfall performance in the near field is a critical element of the dilution of the outfall plume;
- Well calibrated and validated numerical models for the site, using good site specific data to confirm plume behaviour, for a full range of conditions and not just typical conditions is required. Since actual plume behaviour is likely to differ from model results and forecasts used to date;
- A detailed review of the performance of outfall and intakes from similar projects would provide a useful background into issues and thus guidance on the likely design. This should include need and design of intake screens, diffuser design and maintenance requirements;
- An options assessment (modelling) for different outfall locations and the expected full range of discharges to determine possible intake locations would need to be carried out in the next engineering phase of the project;
- A study that properly assesses design conditions would provide a more confident assessment of the outfall/intake location and configuration;
- The adoption of chemical treatment techniques over against alternative methods such as high flows or anti foul liners or the high salinity of discharges need to be properly assessed and a preferred solution adopted as this has a considerable impact on plume dilution requirements.

The LinkWater report recommends a preferred pipeline corridor and connection to the Water Grid with similarities to that recommended in the Phase 2 Sitings Study Report with one major difference; the crossing of the Pumicestone Passage using trenchless technology and therefore a slightly different corridor in the early part of the mainland route. The Pumicestone Passage crossing was identified as a risk which may have been seen to be

critical however; this is mitigated by the use of current trenchless technology. This should be included on the risk register as a low risk but should not be excluded as it has been in the LinkWater report.

## **4.5 Resources**

The technological advances in desalination indicate that in the next 10 years energy requirements will be reduced by at least 20% and the impact of this on the location of the new power supply for the new desalination plant should be investigated.

The LinkWater report recommends a 200 ML/d desalination plant at Bribie Island and the implications for power supply needs to be assessed.

## **4.6 Community, Social and Economic**

There is insufficient discussion of the community, social or economic issues associated with the Bribie Island site. Given that the proposed plant may require use of land the Moreton Bay marine park, it is considered a significant gap in the current reporting.

Some local politicians are also actively against desalination. Early engagement and education of the electorate including the elected representatives at all levels is key to the successful implementation of a new desalination facility. Need to ensure the message that the Water Strategy is a portfolio of options that will respond to future changes and the Commission is not fixing any dates. However, there is a need for future supplies even if the current demand is sustained. There is a strong lobby that are promoting the use of rainwater harvesting and stormwater re-use as an alternative supply source to centralised desalination systems. This issue needs to be addressed in terms of the impact of a decentralised supply system on the operations of water grid, ability of local authorities to operate and maintain such assets, as well as the ability of such assets to provide LOS yield commitments. It is unlikely that rainwater harvesting and stormwater storage will provide a robust strategy that meets the LOS yield commitments.

A strategy document around community consultation, engagement and education should be developed and lessons learnt from the Big Six Australian desalination plants taken on board. There is a perception that the Perth desalination projects have courted the least controversy and this should be further investigated to see if the Commission can benefit from this experience. It is understood that the Perth projects had community engagement plans from an early stage and this was seen as fundamental to the success of the project.

## 5.0 Tugun

### 5.1 Environmental

The seafloor around existing marine structures is sandy and is reported to be naturally devoid of marine flora and fauna. The assumption that sandy seabed is of limited ecological value has been made, however this should be demonstrated rather than assumed.

An assessment of life on marine structures themselves i.e. their role as artificial reef, may be warranted and any potential impact due to increased salinity assessed.

### 5.2 Regulation

Based upon the review, the following was noted:

- The report makes an assumption that the approvals process for the expansion will be similar to that used for the original facility that is, prescribed project and authorised works. The initial project was originally approved on the basis of being essential services required for drought-proofing SEQ. Since SEQ is no longer in drought it may not necessarily be regarded as meeting the criteria for being considered as a prescribed project. This would mean that the approval path for the expansion would be different than that as prescribed in the report and this is unlikely to be accurately identified at this stage of the process;
- Land ownership is unclear from the documentation provided. The report identifies issues with other landowners and infrastructure provider's interests as an issue but does not expand on the scope of these issues. This suggests that there is more detail available than that contained within the report about stakeholder land interests. It would be worthwhile to identify what these specific issues are and how advanced planning may be for alternative land uses such as Queensland Rail, Gold Coast Airport and Gold Coast City Council landfill;
- The risk assessment and associated risk register needs to be updated in terms of planning and approvals risk;
- Searches should be undertaken or re-done for:
  - Department of Environment and Resource Management (DERM) Aboriginal Cultural Heritage Database and Register to ensure there is no registered cultural heritage at the project site or nearby;
  - Queensland Heritage Register search to ensure there is no registered cultural heritage at the project site or nearby.
  - local heritage register, National Heritage List, Commonwealth Heritage List, and Register of the National Estate
  - Australian historic shipwreck database should be undertaken to identify any historic shipwrecks in the project area. Failure to search this register may mean that potential historic heritage is not identified at the planning stage. This is a seldom used database, but searching it can limit potential future delays.
- The Native Title status of this area should be re-assessed. Consultation with the Aboriginal party(s) for the project area is of a level sufficient to satisfy this stage of the project, however further work will be necessary at later stages. An Aboriginal cultural heritage survey should be undertaken to determine if there are any features or items of cultural heritage significance;
- A historic cultural heritage survey should be undertaken to determine if there are any places of cultural heritage potential that may be affected by this project;
- The report's approach to historic heritage is sparse, and historic and Aboriginal cultural heritage are subsumed into one element. It may be pertinent to treat Aboriginal and Cultural Heritage as discrete elements.

### **5.3 Water Supply**

The Tugun site is located in the southern SEQ sub-region and it is the current thinking that there is no requirement for any further expansion of the water supply beyond the completion of the Wyaralong WTP and the expansion of the infrastructure associated with it. The need for Tugun to be investigated further needs to be challenged in conjunction with the Water Grid Manager and if appropriate no further work on expanding the facility should be undertaken.

There are multiple supply sources into the southern sub-region and expanding Tugun does not appear to increase the security of supply, in particular with the likelihood of the Wyaralong WTP being a more cost-effective solution.

### **5.4 Engineering and Construction**

No modelling is referenced for examining future discharge impacts. Increased discharges will be simple scale up versions of existing operations. Detailed hydrodynamic modelling of intake and outfall are required. There are risks that the increased plume volumes or intensity will cross a threshold that causes impacts not seen with current operations.

A program of monitoring to examine the outfall performance and plant operational issues is required. Existing issues will be magnified or duplicated with expanded plant.

The site at Tugun has not been assessed in the same level of detail at the other locations. There are reports of some post-construction issues with settlement which need to be more fully understood before any decision to proceed is taken.

### **5.5 Resources**

At the time of the report it was assumed that the planned Energex infrastructure development in the locality was proceeding. This assumption needs to be revisited to see what the current Energex supply strategy is for the region.

### **5.6 Community, Social and Economic**

A strategy document around community consultation, engagement and education should be developed and lessons learnt from the Big Six Australian desalination plants taken on board. There is a perception that the Perth desalination projects have courted the least controversy and this should be further investigated to see if the Commission can benefit from this experience. It is understood that the Perth projects had community engagement plans from an early stage and this was seen as fundamental to the success of the project.

There are sporting facilities associated with the adjacent land and the consumption of this land for an expanded desalination facility would cause significant concern with the local community.

## 6.0 SEQ Water Supply Strategy Planning Process

The current planning process should be reviewed and documented in more detail with a pictorial representation produced to look at the interconnectivity between the phases.

A delivery program of the process should be produced detailing as many tasks as possible with dates so that the overall process can be seen and updated easily. The use of Project Management software to develop both an emergency plan and a strategic development plan should be produced and maintained as influencing factors change.

A planning narrative should accompany the program describing the key stages and giving guidance and rationale to the process for future participants in the process. This is a long-term strategy and is likely to involve many changes of personnel and thus a detailed record of the process would be a worthwhile and useful document which can be updated as influencing factors change.

Aligning the program with costs should be undertaken so that as the plan changes costs can be updated and a spend and resource profile developed which can be managed. The program and costs should ensure all upfront planning costs and tasks are included. This will demonstrate good cost management and control and should ensure the approved costs should not overrun.

The addition of two new phases in the planning process should be considered, these being an evaluation and review stage which looks at the longer terms objectives of the project and the long term performance of the plant. Also, a lesson learnt database should be developed as a record of the knowledge accumulated during the process.

A Health and Safety file should be started demonstrating the Commissions understanding and commitment to Occupational Health and Safety from the very early planning stages of major capital projects. By establishing a safety policy consistent with Queensland Legislation for the desalinisation plant will enable the Commission to start to demonstrate their commitment to safety and how safety will be approached in the planning and design of the desalination plants. This will need to consider the safety aspects associated with construction, operation/maintenance and to the general public.

## 7.0 Technology

Recent developments in membrane technology indicate that plants of the future will be physically smaller and more energy efficient. It would be prudent to carry out an exercise in the short-term to look at the positive impacts that technology will have on future desalination plants. It is worth considering a number of options in terms of future predictions based on a 20 to 40% footprint reduction and a 20% energy reduction.

Revisiting the land requirements for a reduced footprint in the RO building at each of the sites would be worth considering to see if the perceived benefits will have a significant impact on the layout and land take.

Revisiting the energy requirements based on future lower energy technology is worth investigating to see if the perceived benefits impact the existing and future energy plans for Energex.

The QWC requested AECOM to look into the energy costs of desalination in comparison to other household activities. A number of internet sources were used and the assumptions in the data have not been reviewed they have just been reported.

Current estimates for the production and supply of desalinated water are approximately 4.5 kWh/m<sup>3</sup> this equates to the supply of enough water for 5 people/day and based on an electricity cost of \$0.11c/kWh this equates to \$180 per annum for a household or \$36/person/year. Putting this in the context of the energy consumed for daily household appliances (**these are example numbers taken from a number of internet sources and should only be used for comparison purposes The numbers have not been produced by AECOM, they are intended to illustrate and not to demonstrate and need further analysis, review and confirmation before use**):

- Fridge-Freezer (300W) operating 15h/day = 1,625 kWh/yr = \$180/yr
- Air Conditioner (900W) operating 8h/day = 2,628 kWh/yr = \$289/yr
- Dishwasher (1200W) operating 2h/day = 876 kWh/yr = \$96/yr
- Plasma TV (350W) operating 8h/day = 1,022 kWh/yr = \$112/yr
- Xbox 360 (170W) operating 5h/day = 310 kWh/yr = \$34/yr
- TV/Satellite on S/by (44W) 16h/day = 257 kWh/yr = \$28/yr
- Laptop (30W) operating 8h/day = 88 kWh/yr = \$10/yr

In the context of the energy used on average household appliances the cost of supplying 200l/person/day is comparable to a teenage boy playing on his Xbox 360 for 5 hours per day, this does not include the TV energy which would effectively double the power consumption. If the technical advances continue then the costs of supplying desalinated water could reduce to 4 kWh/m<sup>3</sup> which would equate to \$32/person/year using 200L per day.

If we look at the operation of a rainwater tank pump rated at 500W operating for 2h per day this equates to 365 kWh/yr or \$40/yr i.e. equivalent to the 200l/person/day for desalinated water.

An interesting comparison with desalination is the move from Cathode Ray (CR) TV to big screen Plasma or LCD TV. The average energy rating for the three types of TV are as follows:

- CRTV 100W
- LCDTV 200W plus 9W on standby
- Plasma TV 250W plus 9W on standby

Assuming the TV is on for approximately 8 hours per day then the total energy used per annum is:

- CRTV 292kWh
- LCDTV 637kWh
- Plasma TV 783kWh

The cost of providing 200l of desalinated water is estimated at 0.9kWh/person/day or 329kWh per annum.