Scotland Island Feasibility Study

Stage 1b Option Evaluation Workshop Notes

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Issue F

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PRESSURE SYSTEM SOLUTIONS PTY LTD

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1 INTRODUCTION

Disclaimer:
These workshop notes document the informal discussions undertaken during the review of the options for Water and Sewer servicing of Scotland Island. The notes record the opinions and views of the expert evaluation team for the purposes of informing the options shortlisting process. Any legal references are opinion only and are not based on legal advice.

1.1 Workshop Context

This Workshop is a component of the Stage 1b Demand and Options Stage of the **Scotland Island Water and Sewerage Feasibility Study**.

Prior works within this Feasibility Study, have included:

- Stage 1a, High Level Review of Social and Environmental Factors;
- Consultation with Northern Beaches Council (NBC) and peer review with Simon Fane;
- Consultation with Scotland Island Community Working Group (SICWG);
- Water Balance Assessment;
- Options development; and
- External peer review by Simon Fane, Project Expert Advisor to Northern Beaches Council

Identification of Key Considerations and Risks associated with this evaluation process, include:

- Inequity compared to other parts of the Sydney region;
    - Poor access to potable water, esp. during drought and bushfires
    - Impact of poorly performing on-site systems.
- Environmental Impacts;
    - Soil testing during study confirmed high faecal coliforms, effecting environment and health
- Confusion about who is responsible;
- Process and consultation fatigue;
    - Classified as 'a priority' since 1997,
- Site audits and resident's questionnaire (cross-section of 19 properties);
    - Lot size, topography, soil absorption capability
    - Australian Standards compliance achievability
    - Constructability
    - Community expectations and concerns
- Northern Beaches Council are currently planning upgrades to stormwater and overland flow paths, so there is likely to be changes on the Island.
- Fire-fighting capabilities was a key driver for getting a reservoir and water onto the Island.

1.1.1 Workshop Purpose

The purpose of this Assessment Workshop was to undertake a technical evaluation of the Water and Sewerage servicing options identified from the **Stage 1b Options Workshop** for the **Scotland Island Water and Sewerage Feasibility Study,** held 22 January 2019, at the RPS Sydney Office.

The identification, and subsequent assessment, of options for water and sewerage services to Scotland Island was undertaken by a panel of qualified and experienced industry specific professionals, that included Water Infrastructure Strategic Planners, water services engineers, environmental consultants and construction and installation contractors.

A summary of the water and sewerage servicing options that progressed through to this evaluation workshop were;

- 9 water supply options, from disconnection to reticulated potable water,
- 5 sewerage collection system options, and
- 13 sewerage servicing strategies, ranging from Do Nothing to retrofitting full sewerage systems.

Each option was assessed under a pre-determined multi-criteria analysis, each with an equal weighting;

- Environmental Impact,
- Community Acceptance,
- Stakeholder Acceptance,
- Technical Risk,
- Work Health and Safety.

Guidelines and context for the structure and assessment for Stage 1b was documented in *'Scotland Island Stage 1b Report Structure Rev F'* and externally reviewed by Simon Fane, Project Expert Advisor to Northern Beaches Council.

1.1.2 Workshop Aim

The aim of the workshop was for the Evaluation Team to determine at-least two (2) preferred options for water and sewerage, and for these to be documented, costed and articulated back to through to the Community Group.

1.2 Location, Date and Attendees

Location: RPS Office, Level 13, 255 Pitt Street, Sydney

Time and Date: 29 April 2019, 9:30am – 3pm

Evaluation Team:

Ruby Arden – *Project Leader* - Northern Beaches Council
Steve Wallace – *Technical Director* – PS Solutions
Gavin Ovens – *Senior Planner and Workshop Facilitator* – PS Solutions
Chris Rust – *Senior Technical Engineer* – PS Solutions
Robert Slade – *On-Property Feasibility and Constructability Advisor* – PS Solutions
Gareth Thomas – *Environmental Planning and Assessment* – RPS
Kurt Dahl – *Process Engineering and Treatment* – Permeate Partners
Elisabeth Paget – *Project Designer* – PS Solutions (recorded Workshop notes)

1.3 Workshop Structure

Prior to commencing the evaluation process the team reviewed and discussed each component of the evaluation criteria, as outlined in Gate 1 MCA table, to ensure a consistent application of the criteria was maintained during the assessment process.

The analysis was conducted utilising the expertise of each member of the Evaluation Team, assessing each option individually, with a majority consensus score agreed progressively for each criterion.

GATE 1 EVALUATION; MINIMUM SCORE 70		Weighting
1	Environmental Impact	20
	Construction Disturbance	
	Operational Impact on Island	
	Operational Impact off Island	
	Sustainability: Water, Energy, Material, Life Cycle Performance	
2	Community Acceptance	20
	Equity: Sydney Water area of operation / Local Community	
	Cost to Community	
	Land Use Impact	
3	Stakeholder Acceptance	20
	Management complexity (Governance)	
	Regulatory / Compliance	
	Legal Risk	
4	Technical Risk	20
	Design	
	Construction	
	Likelihood of failure	
	Operations	
5	Work Health and Safety	20
	Construction Risk	
	Operational Risk	
	Public Health	
	Fire Fighting	
GATE 2 EVALUATION		
	Indicative Cost NPV = Capex, Opex, IRR 7%, 30 years	Lowest 2

1.1.3 Mechanisms for Assessment

It was identified that the 'majority score' applied to the Evaluation Matrix, may not be a stand-alone score and may have variability depending on the assumptions applied to that score.

Therefore, Evaluation Matrix is not a stand-alone document and forms a component of the Technical Evaluation document.

The mechanisms for assessment included:

- Assumptions and scenarios (servicing and operational) associated with each Option;
- Considerations regarding each option, including potential interpretations of physical application and installation procedures, e.g. how would the option be constructed?
    - Including property works to sanitary and electrical connections;
- Risks, challenges and opportunities;
- Project specific technical constraints;

- General community concerns, as understood from previous studies, the community body's interest in pursuing the servicing investigations to recommence, and PS Solutions investigative works on Scotland Island during the study.
- Likelihood of stakeholder acceptance based on consultations and previous experience.

Each criterion was allocated equal weighting for the purpose of the evaluation workshop. A sensitivity analysis utilising alternate criteria weighting scenarios was undertaken post-assessment workshop to determine whether differently weighted assessment would impact on the final recommendations.

1.4 Purpose of this Document

The purpose of this document is to provide a record the Stage 1b Options Evaluation Workshop, and provide documentation of;

- Discussions and relevant commentary;
- Considerations, interpretations, and assumptions;
- Capture score variability through comments, where required; and
- Remove perception and provide an informed rational for short-listed options.

This document is by no-means exhaustive of all the issues and considerations associated with each option, however highlights consideration of differing perspectives based on the evaluations team's experience in delivering water and sewerage infrastructure to communities across Australia.

It is recognised that the assumptions and interpretations of each option would lead to variability in the assessment scoring, therefore the process was a subjective comparative assessment, and tended to be relative to each option rather than an absolute.

Refer to Attachment 1: Scotland Island Option Matrix

Moving forward, the preferred water and sewerage options will require further detailing in which the associated parameters are clearly defined and assumptions are clarified. Addressing items such as:

- Community survey;
- Cost to the community;
- Delivery mechanisms & servicing arrangements;
- Life expectancy of the services.

2 EVALUATION PROCESS

2.1 Overview of Options – Commencement of Discussion

From the five days the PS Solutions team were on Scotland Island undertaking detailed property audits, discussions with members of the community suggested there is an underlying priority for sewerage services over improved water supply services.

At present, Scotland Island property owners are able to be supplied with an emergency non-potable water top-up into their rainwater tanks through membership of the Scotland Island Residents Association (SIRA). On-site systems, such as septic tanks and aerated wastewater treatment systems (AWTS), is the current sewage service strategy for the property's on Scotland Island.

In 1997 faecal coliforms were identified within the non-potable water supply on the island, potentially as a result of cross-contamination or leakage. This was documented in the 1997 Summary Report on Options (*Scotland Island Water and Sewage Options Study, Martens & Associates, 1997).* Soil sampling undertaken as part of PS Solutions investigation works confirmed that faecal coliforms were also present in the soil on Scotland Island.

Faecal coliforms in the islands non-potable water supply present real risks associated with the 'Do Nothing' option for both water and sewerage. Risks identified by the evaluation panel included but are not limited to;

- Die back in the vegetation,
- Public Health,
- Soil samples,
- Effecting usability of property,
- Compliance with minimum Australian Standard requirements; and
- Duty of care – legal implications of stakeholders.

Active enforcement of system requirements and upgrades to existing on-site services will not be adequate, as the detailed property audits undertaken by PS Solutions identified that for all 19 properties audited, the on-site systems could not be upgraded sufficiently to meet Australian Standards compliance, primarily due to lot size and slope constraints.

Scotland Island is within Sydney Water's area of operations, situated in the Pittwater estuary, 35km north of Sydney, one of only two residential islands in the Sydney area, the other being Dangar Island situated 62km from Sydney located in the Hawkesbury River.

2.1.1 Assumption

Sydney Water has provided verbal confirmation that there is capacity in their sewerage and water supply networks for the Scotland Island loadings.

Therefore, based on this information and for the purpose of options assessment, the Evaluation Team assumed adequate capacity within the Sydney Water sewerage and water supply networks, without requirement for augmentation works or upgrades.

Written confirmation of capacity in Sydney Water's water and sewerage networks for Scotland Island has been requested by Northern Beaches Council.

3 WATER SUPPLY OPTIONS EVALUATION

3.1 Disconnect existing non-potable water supply

3.1.1 Description of Option

Scotland Island is currently supplied with an emergency non-potable water top-up supply to rainwater tanks located on individual properties.

This water is supplied via a 40Ø polyethylene pipe, laid under the Pittwater. Northern Beaches Council have advised that pipe failure and repair has occurred on this main, and that there are concerns that further failures may occur.

In addition, water quality of the current supply is of ongoing concern as observed from 1997 report which identified faecal coliforms present in the non-potable water supply ring-mains supply.

Disconnection of the existing non-potable water supply to the island would mitigate the risks associated with failure of the 40Ø main and water quality. The residents would rely solely on potable water being transported across the Pittwater estuary from the mainland, either privately or as a collective group.

3.1.2 Environmental impact considerations

The environmental impact associated with disconnecting the existing non-potable service from a construction disturbance perspective was deemed negligible.

Sustainability rated highly, as the infrastructure, such as the transfer main under the Pittwater estuary, the distribution ring mains on the Island, water meters and valving would no longer require servicing and maintenance.

However, this rating was moderated in consideration of additional services that would be required to transport potable water across to the island and the mechanism to distribute to the properties.

Evaluation team deemed: **Neutral impact**

3.1.3 Community Acceptance

Disconnecting the emergency non-potable water supply, would be removing an essential service to the island, including top-up source for the fire-fighting storage tanks.

As at April 2019, the SIRA water charge is $5.00 per 1,000 Litres, with an online booking fee of $5.00 per booking, as per the Scotland Island Emergency Water Supply Information & Guidelines.

In the scenario that the non-potable water supply service was removed, all non-rainwater systems would need to be supplied with potable water transported across the Pittwater estuary from the mainland, then transported accordingly to the individual properties.

The logistics associated with the manual transportation of water is heavy and expensive, resulting in increased water supply costs to the community. For example, ferrying a tank of water across Pittwater on a barge, offloading onto a truck for transportation to individual properties where it is de-cantered into the rainwater tank.

During the five days PS Solutions undertook property audits and site investigations on Scotland Island it was identified that many residents currently rely on the non-potable water supply therefore it appeared that many residents would be greatly affected if this service was to be permanently disconnected.

Therefore, based on the removal of an essential service, the increased costs and the current reliance on the existing service provided to the island, the evaluation team determined that it would be unlikely the Community would be accepting of this solution.

Evaluation team assessment: Disconnecting existing non-potable water likely to be **unacceptable** to the community.

3.1.4 Stakeholder Acceptance

The Northern Beaches Council have an operational and maintenance responsibility for the transfer main from the mainland to Scotland Island, with the current system in place, upgrades are required to maintain service. Disconnecting the main eliminates Council's continuity and quality of service risks.

However, based on feedback from Council, the community perceive the non-potable supply as Council's responsibility, therefore Council are likely to receive more complaints from residents if the current non potable supply is disconnected.

Despite the immediate perceived benefits of disconnecting the non-potable water supply to the Island, such as elimination of ongoing maintenance costs and responsibilities, Scotland Island is an established residential area in Sydney with water quality and quantity performance expectations which need to be considered.

In the interest of public health and safety, there is a need to maintain a water supply service to conduct essential services such as toilet flushing and washing.

Although the evaluation team assessed stakeholder acceptance to be marginally positive. The risks associated with disconnecting the water supply, such as disease outbreak and fire-fighting capabilities, must outweigh this opportunity.

Evaluation team deemed: Stakeholder acceptance likely to be **marginally positive**, however warned that risks must outweigh the opportunity.

3.1.5 Technical Risk

Disconnecting the existing water supply is an option, however it is not an alternative technical solution. This option would involve cutting the source of water supply to the properties on Scotland Island, and may involve the removal of existing tanks and pipes.

Evaluation team deemed: Neutral impact

3.1.6 Work, Health and Safety

The evaluation team scored the work, health and safety (WHS) aspect of this option to be neutral (10) impact for the purpose of scoring in the evaluation matrix. However, depending on a quality or quantity assessment perspective, this criterion could be scored positively (15) or negatively (5).

The positive WHS aspect of this option (**score 15**), is derived broadly, from a whole community, health benefit perspective. The previous study in 1997 identified that faecal coliforms were already present within the non-potable water supply on the island. In addition, other sources of water contamination can occur from sources such as a roof with animal droppings in gutter. From this perspective, the current water quality on the Island has been identified as poor, therefore disconnection of the existing service may result in a positive broader health outcome.

Minimal operational changes are likely to occur on the individual properties, as council inspection of water tanks only currently occurs at the development application stage.

From an individual property perspective, the WHS aspect was deemed to be negative (**score 5**), with the water source being drastically impacted including the security to flush toilets and wash clothes.

The investigation works PS Solutions conducted on the Island, identified that there are residents on the island that are heavily reliant on the non-potable water supply service, and would be greatly affected if the supply was to be disconnected.

Construction implications of this option would include removing the existing system and cutting the pipes.

Reliance on only tank water is a risk, in particular in the event of drought and running out of water, and public health requirements such as flushing toilets.

The physical constraints associated with being on an Island impact on WHS, such as:

- on land, a water tank can be ordered to deliver water; in contrast,
- on an Island, a barge would bring tank water across then pump up through a fire-fighting hose – NEGATIVE.

In addition, the roads on Scotland Island are not suitable to regularly transport large volumes of trucked water. Therefore, future road upgrades, and associated environmental impacts, would likely be required.

Evaluation team deemed: WHS impact to be **positive (score 15)** and **negative (score 5)** depending on broader community or individual property perspective. Therefore, for the purpose of the evaluation matrix a score of **neutral (10)** was applied.

3.2 Do Nothing

What does this option mean in application, and subsequently, how should it be assessed?

3.2.1 Description of Option

The evaluation team identified through discussions that the base assumption for the 'Do Nothing' option has implications in the comparable assessment of the subsequent solutions.

In a practical application, the 'Do Nothing' option involves ongoing maintenance and repair costs of the existing service.

In order to maintain a service that has already served 30 years, it would be prudent to investigate the initial design life of the existing infrastructure, including the pipe material and rating, to ascertain technical viability of the system and anticipated time until replacement of system components, such as pipework, is required.

Therefore, forecast replacement/upgrade works of the existing service could be a consideration in the evaluation of the 'Do Nothing' option, such as:

- In the event of a failure/breakage of the existing Pittwater crossing pipeline supplying the non-potable water source for Scotland Island,
    - What are the failure response strategies?
    - Who are responsible for implementing and paying for these?
    - And for how long does the repair/replacement need to continue to provide service?

Are the proposed solutions being evaluated in this workshop expected to have a design life of 5-10 years before replacement/upgrade is required? Or is a 30-50 year design horizon expected, which is consistent with industry solutions?

This fundamental parameter for the proposed solutions/options being evaluated, impacts on the comparable assessment of the 'Do Nothing' option. As such,

- A solution expected to have a design life of 5-10 years,
    - may assume that basic maintenance and repairs could keep the existing system operational; or
- A solution with a 30–50 year design horizon, which is consistent with industry solutions,
    - weighed against a high likelihood of Pittwater crossing replacement.

If assessments are based upon providing a 30-50 year design horizon, in this respect other servicing options become comparatively viable against the 'Do Nothing' option.

For the purpose of this evaluation workshop and to minimise potential scenarios, the following assumption for the 'Do Nothing' option was applied.

- **Assumption:** The 'Do Nothing' option was assessed as exactly that 'do nothing', with no forecast operational scenario applied and the status quo being maintained.

3.2.2 Environmental Impact

This option maintains status quo, therefore assessed as have a neutral impact on the environment.

It was noted that the current system may be impacting the environment, however this had not been clarified or confirmed at the workshop, therefore this could not influence the assessment.

Evaluation team deemed: Neutral impact

3.2.3 Community Acceptance

The Scotland Island Community Association has been actively lobbying government representatives and Northern Beaches Council for water and sewerage services to Scotland Island.

A number of feasibility studies have been undertaken over the years, including the study conducted in 1997 which identified a number of risks associated with the current system. It is understood that from a community perspective, these studies resulted in no action or improvement of service.

Therefore, it is likely that a 'Do Nothing' approach would be perceived by the community as another feasibility study that has resulted in no action.

Rainwater top-up into existing on-property tanks, is cheaper than sourcing water supply from a tanker on a barge, based this cost impact, this option was assessed more positively than the disconnection option.

Evaluation team assessment: Do nothing likely to be seen as **unacceptable** to the broader Scotland Island community, however, was seen as potentially more palatable than the disconnection option.

3.2.4 Stakeholder Acceptance

Historically, the servicing responsibilities for Scotland Island have been forwarded to relevant bodies, such as Sydney Water, Northern Beaches Council, Scotland Island Community Association, with associated handovers of risk. As evidenced by the ownership model and supply responsibilities of the existing infrastructure.

This criterion was scored more negatively by the evaluation team compared to how it may have been scored 10 years ago, primarily due to legal liabilities. Legally, if an entity has an expertise in an area, the risk cannot easily be transferred or ignored.

Business as usual presents a significant public health risk and therefore legal risk the range of parties facilitating the service (SWC, Council, State Government, Community Association).

As such, investigations and soil sampling consistently flag serious health and environmental concerns on Scotland Island.

Stakeholders need to accept that this is a collective problem that requires a solution, therefore 'Do Nothing' is no longer a viable option therefore was assessed this way.

Evaluation team deemed: Negative stakeholder acceptance

3.2.5 Technical Risk

Although the 'Do Nothing' option requires no immediate action, the system is failing as indicated by the repair requirements and is inadequate for sustainable continuity of service.

Due to the age of the current infrastructure, the likelihood of failure increases daily, including the pipe across the Pittwater and chance of cross contamination of water supply.

Evaluation team deemed: Negative impact

3.2.6 Work, Health and Safety

On-property audits, water and soil sampling that have been undertaken as part of this feasibility assessment as well as the previous feasibility studies, have consistently flagged serious health and environmental concerns on Scotland Island.

Evaluation team deemed: Identified as a significant health issue, therefore **negative impact.**

3.3 Upgrade of rainwater storage tanks and water usage management

3.3.1 Description of Option

This option involves the upgrade of on-site rainwater tanks, that are appropriately sized and managed according to roof size and occupancy. The assessment of this option was based upon the following parameters:

- No top-up water in to tanks, just rainwater supply
  - Less reliant or no reliance on non-potable water source.
- Community to pay for upgrades
- Council to assist with the property audit and determining an on-property technical solution, and to,
  - Provide education to the property owners and residents,
  - Tank storage to include emergency storage allowance.
- Assumes community buying power, e.g. bulk deal on tanks. With possible assistance from Council.
- Critically, this option assumes that the community will have operational responsibility -
  - Residents to monitor and responsible for own water quality.

3.3.2 Environmental Impact

The sustainability of this option was ranked highly, due to water efficiency, and the self-regulating and self-limiting nature of the solution.

Tannins in the water will be an on-going problem, however this can be addressed in the technical solution provided by Council such as utilising activated carbon filtration.

Intuitively this option assumes no tree removal will be required, however without the availability of the non-potable water supply source, storage tanks will require an emergency storage allowance, therefore;

- Tree clearing for larger storage tanks potentially will be required on many properties.

Evaluation team deemed: Overall **Positive impact**

3.3.3 Community Acceptance

The evaluation team discussed the following impacts on the community:

- Community less / not reliant on poor quality non-potable water supply;
- Individually responsible for own water quality - not impacted on by others;
- Equity amongst community;
- Inequality compared to the remainder of Sydney Metropolitan Area;
- Cost implications for upgrades and sourcing emergency top-up requirements;
- Implications during peak occupancy periods and increased demand requirements,

- E.g. family and friends staying over Christmas – 20,000L for 1 week is not unrealistic, and is based on a discussion with a property owner on Scotland Island during PS Solutions Investigative works on the island in 2019.

Evaluation team assessment: Assumed a **neutral outcome** / **marginally negative** acceptance:

3.3.4 Stakeholder Acceptance

Upgrading rainwater storage tanks and enabling sound water usage management processes on Scotland Island mitigates much of the stakeholder's legal responsibilities of supplying poor quality water to the community.

Stakeholders are likely to be comfortable that a solution has been provided and that the properties are capable of storing adequate quality and quantity of water.

Evaluation team deemed: Positive acceptance

3.3.5 Technical Risk

There are complexities with this option, as outlined by the summary of parameter assumptions listed under section 3.3.

Therefore, despite the apparent simplicity of this option the Evaluation Team cannot be certain that the solution will work on each property.

- Calculate storage volume based on property usage and emergency supply requirements.
  - Based on roof area, a property requires X amount of storage.
  - Compare storage volume requirements.
- Assess specific site constraints, such as,
  - Storage tank size restrictions, (e.g. clearing, accessibility, location),
  - Pump up arrangements e.g. from gutter into rainwater tank
- Level indicator would be required on tank to provide warning of low levels.
- Will the system be maintained to adequate standards? E.g. Activated carbon filtration maintenance, level indicator operation.

Evaluation team deemed: The technical risks of this solution are high as the evaluation team cannot be certain that it would work, therefore **Negative impact.**

3.3.6 Work, Health and Safety

There are WHS risks associated with this option however with adequate provisions and mitigation strategies, these risks were assessed as being better than neutral.

Based on the assumed parameters of this option, the water supply at each property would be less likely to run-out than that of the first option assessed, than the option to disconnect the non-potable water supply.

Evaluation team deemed: **Better than neutral WHS impact**.

3.4 Replace existing non-potable supply with small bore supply for drinking water with top-up to rainwater tanks

3.4.1 Description of Option

This option involves the replacement of the river crossing pipeline across Pittwater with a potable water supply (size to be confirmed). Replacement of current reticulated on-island supply system due to pipe sizes and state of repair of the existing system. The benefit of this option is to take away the manual interface, between reticulated system and rainwater tank top-up.

One small bore tube to be installed directly into the house with one connection point into the kitchen, providing potable water to each house. Automated daily trickle top-up into rainwater tanks, at this point the source will no longer be potable supply.

This option does not include enhancing or replacing existing rainwater tanks.

This option may not require a reservoir on the Island, however it will require a buffer tank with a re-chlorination loop.

This option does not try to provide a full potable water supply but aims to give a balance between quality and quantity of water supply, whilst minimising the interference with the Islands existing reliance on the non-potable supply arrangements at each property.

- Based on investigations and property owner discussions in 2019, PS Solutions estimates that 50-60% of the properties on Scotland Island use the non-potable supply source regularly, with the remainder of properties utilising the source a couple of times a year.
- The solution will require meter readings at each property.

3.4.2 Environmental Impact

The environmental impact and sustainability assessment are variable, within the positive range as determined by the evaluation team, the median score within this range was applied to the assessment matrix. The variability was dependent on the base assumption of the 'Do Nothing' option, whether the Pittwater crossing will require no action, maintenance or replacement.

Evaluation team deemed: **Positive impact**.

3.4.3 Community Acceptance

This solution provides the Scotland Island community with a reliable clean water supply, which an improvement on the current water quality of the non-potable water supply to the Island. Therefore, this option reduces health risks whilst continuing to provide the top-up system to rainwater tanks.

Unlike the option to upgrade the rainwater tanks, this solution can achieve regulatory compliance. However, this option still does not provide equity to Scotland Island customers comparatively with benchmark of services within Sydney Water area of operation.

Evaluation team deemed: Likelihood of a **positive community acceptance**

3.4.4 Stakeholder Acceptance

This option has two clear benefits for stakeholders;

- The solution can achieve regulatory compliance, and it
- Reduces risks for all stakeholders.

Evaluation team deemed: Likelihood of a **positive stakeholder acceptance**

3.4.5 Technical Risk

Any retrofit solution is difficult; however, this option has attempted to minimise on-property works. The option only commits to one potable water supply point into a dedicated tap, likely to be located in the kitchen.

There is a low likelihood of failures, however the more moving parts in the system, such as the automation component of the rainwater top-up system, the higher likelihood of failures.

Evaluation team deemed: **Positive impact**, noting associated technical difficulties

3.4.6 Work, Health and Safety

The WHS element was assessed more positively than the previous option to upgrade rainwater tanks, due predominantly to then reliability and quality of the water service and minimisation of on-property works.

However, critically this option does not provide for a fire-fighting water resource supply, as the velocity in the proposed small diameter pipe across Pittwater would be too high. These losses in the pipe, and subsequent flow restrictions would prevent effectiveness of a fire fighting resource direct from the supply pipe.

A 125PE pipe would provide a larger diameter which can be supplied in coils.

If required, a potable water reservoir, would likely be low level with variable speed drive (VSD) pumps.

Evaluation team deemed: **Positive WHS impact**.

3.5 Provide supply from Sydney Water system to reservoir on Scotland Island

3.5.1 Description of Option

This option provides a full reticulated potable water service, with a reservoir, on Scotland Island.

The key assumption being that the reservoir would be approximately 1ML in size and would be located at the highest elevation on Scotland Island.

3.5.2 Environmental Impact

Although this option may initially be perceived as the ultimate ideal solution, the environmental impact on the Island would be extreme, key impact identified by the evaluation team included;

- Major construction impact,
- Major land use impact,
- Reservoir size would require clearing of land at site of reservoir,
- Additional clearing of land would be required by Sydney Water for an all-weather road access up to the reservoir; and some
- Some loss of open space

Evaluation team deemed: Negative environmental impact

3.5.3 Community Acceptance

The evaluation team discussed many facets of the solution and how they would likely be accepted, or not, by the community. These included:

- The solution being perceived as the equitable Sydney Water service, 'gold-plated' option;
- Reservoir would provide emergency water supply in the event of power failure, or main crossing break.

However,

- The impact of the reservoir (e.g. ambience, environmental) would be major;
- Residents may feel that the reservoir would destroy the place they are living in and impact the amenity of the Island, as many trees would need to be cleared.
- The reticulated potable water supply would be the only source of water on the Island, it was thought that this may be a negative for some residents, as some may want to keep the rainwater tanks;
- It was thought that residents on the Island generally like that they do not received a water bill.

On balance, the evaluation team assessed that the community's preference would likely be towards the previous option 4 (small bore water supply) therefore this option needed to be rated this way in the evaluation matrix.

Evaluation team deemed: Likelihood of community acceptance **being slightly positive,** primarily due to the perceived benefits of the solution.

The option was assessed in the absence of specific detailed community consultation, therefore the could equally have a negative acceptance. Regardless, based PS Solutions limited investigative works and discussions with member of the community in 2019, it was thought that between the small bore water supply option (option 4) and this full reticulated system option (options 5), the communities preference would be towards the previous option 4, therefore it was rated this way in the matrix.

3.5.4 Stakeholder Acceptance

The full reticulated water supply with an on-island reservoir addresses many of the risks currently affecting the majority of stakeholders.

However, based on previous experience, Sydney Water will not be in favour of a reservoir on an Island and the associated impact on resourcing for up-keep of roads and infrastructure for operations and maintenance, and as such are likely to be opposed to this option.

Evaluation team deemed: Likelihood of **marginally positive** stakeholder acceptance.

3.5.5 Technical Risk

Retrofitting a complete reticulated system on Scotland Island will be hard, particularly with the site constraints, such as rock, slope, vegetation. Despite this;

- It is a typical solution, and
- It is constructible.

Evaluation team deemed: **Sightly positive,** noting associated technical difficulties of installing a complete reticulated system into an area with such site constraints.

3.5.6 Work, Health and Safety

The solution was assessed as satisfactory for most WHS aspects, including construction risk, operational risk, public health and fire-fighting.

Evaluation team deemed: **Positive WHS impact**.

3.6 Direct mains pressure supply from Sydney Water mains / pressure boosted if required

3.6.1 Description of Option

This option is similar to the previous (option 5) full reticulated potable water supply to the Island, the difference being without the reservoir, and supply being pressurised/pressure boosted from direct from the Sydney Water network.

3.6.2 Environmental Impact

The evaluation team concluded that there would be a negative environmental impact with this option, however the impact would not be as extreme as the previous option 5 that included the reservoir on the Island.

Discussion points included that;

- Most of the retrofitted reticulation could be directionally drilled,
- Accessibility and road access may need to be upgraded by Council, for operations and maintenance of the system.
    - It was noted that Council are currently in the planning stage for upgrade of the stormwater system and overland flow paths on Scotland Island – therefore there is potential for concurrent upgrades to occur.
- Environmental risks increase if this option is not combined with reticulated sewage disposal, as a reticulated water supply results in increased wastewater disposal from properties.

Evaluation team deemed: Negative environmental impact

3.6.3 Community Acceptance

Comparable to option 5, this option would also be perceived as the 'gold-plated' solution and provides good equality across the Sydney Water customer base.

Unlike option 5 which proposed the reservoir located at the highest elevation on the Island, this option without the reservoir minimises the associated land use impact, such as clearing of land and upgrades of access roads.

Akin to option 5,

- The reticulated potable water supply would be the only source of water on the Island, it was thought that this may be a negative for some residents, as some may want to keep the rainwater tanks; in addition;
- It was thought that residents on the Island generally like that they do not received a water bill.

Scheme cost to the property owner may be limiting factor, therefore quantum of cost would need to be determined before the level of community acceptance can truly be determined.

Evaluation team deemed: Likelihood of community acceptance **being positive,** with generally an anticipated high acceptance of the solution, with scheme cost potentially being a limiting factor in level of acceptance.

3.6.4 Stakeholder Acceptance

The full reticulated, pressurised, water supply addresses many of the risks and responsibilities currently affecting the key stakeholders. Therefore, it was identified by the evaluation team as likely to have a high stakeholder acceptance.

Evaluation team deemed: Likelihood of **positive impact / high** stakeholder acceptance.

3.6.5 Technical Risk

Retrofitting a reticulated system on Scotland Island will be hard, particularly with the site constraints, such as rock, slope, vegetation. Despite this;

- It is a typical solution,
- It is constructible, and
- Most of the reticulation could be directionally drilled.

From a technical perspective this option offers the best solution, compared to all the other options identified.

Evaluation team deemed: **Positive**, best solution from a technical perspective, noting associated technical difficulties of installing a complete reticulated system into an area with such site constraints.

3.6.6 Work, Health and Safety

The key difference between this option and option 5, being the fire-fighting resource of the reservoir located on the Island, which was offset by WHS issues associated with the reservoir.

Upon discussion, the evaluation team determined that this solution addresses the WH&S risks better than all the other options, therefore was ranked in the matrix accordingly.

Evaluation team deemed: **Positive WHS impact**.

3.7 Desalination plant with new water reticulation

3.7.1 Description of Option

Desalination plant located on the Island providing water supply through a new reticulated system. For context, the desalination plant on the Island would be of relatively small size with the purpose to only service 370 lots.

3.7.2 Environmental Impact

A desalination plant requires high energy to produce potable water. However, this trait should not necessarily discount the option for consideration. In contrast, Palm Beach also has high energy requirements to transport water supply through the current Sydney Water network.

A product of the desalination process is concentrated salt which would need to be discharged. It is not clear where it would be possible to discharge this concentrated salt, and what consent requirements would be imposed on this discharge.

Evaluation team deemed: Negative environmental impact

3.7.3 Community Acceptance

A desalination plant on the Island to service 370 lots would be very expensive to construct and operate, based on this and the environmental impacts, the evaluation team anticipated that community acceptance for this option would be very low.

In contrast, the desalination plant may provide Scotland Island residents with a sense of independence from the mainland.

Evaluation team deemed: Very low community acceptance anticipated.

3.7.4 Stakeholder Acceptance

The desalination plant would provide Scotland Island with a Guaranteed supply of water that was not drought related.

The solution could be delivered and operated by either Sydney Water or the private sector, with similar systems already operating on Hayman Island and Rottnest Island.

Based on previous experience, the evaluation team forecast that the state government would be unlikely to endorse a desalination plant for only 370 properties on an Island, based on the known costs to provide the plant, undertake upgrades and maintain a plant on the mainland.

- Therefore, costs are going to be significantly more on an Island.
- Potentially something to consider if the plant became a local issue/responsibility.

Evaluation team deemed: Likelihood of a **neutral** stakeholder acceptance.

3.7.5 Technical Risk

Key technical factors associated with the desalination plant option are that:

- It is imperative that the water supplying the desalination plant is of good quality;
- The outlet, the location for the discharge of the brine, is likely to be difficult to determine; and
- Accommodations of the system will factor into the final score for this option
    - E.g. who will own, operate, maintain system?

Evaluation team deemed: Technical risk to be a **negative risk** but not significant enough to not be able to be managed. The final score for this option can only be determined once specifics such as who will own, operate and maintain the system is determined.

3.7.6 Work, Health and Safety

This solution provides a reliable source of potable water source for the Island, however it was noted that operational risks would be higher than for the two previous servicing options (option 5 and 6) with reticulated supply from Sydney Water's network.

Evaluation team deemed: **Positive WHS impact**, however evaluated as less than that of options 5 and 6.

3.8 Reuse non-potable

3.8.1 Description of Option

Reticulated recycled water system for external use, and toilet and washing use if necessitated. This would not be a stand-alone solution and would be integrated with the sewerage system solution. A third reticulated pipe (purple) network, such as Rouse Hill, would be required on the Island.

The benefit of this solution would be less reliance on the potable water supply source.

3.8.2 Environmental Impact

Deemed to have a high environmental impact when compared with option 6 (reticulated water supply). The solution involves two reticulated services to be installed, - 1. Potable Water and 2 – Recycled Water.

Evaluation team deemed: Negative environmental impact

3.8.3 Community Acceptance

The recycled water system would offer greater overall reliability of service on the Island. However, PS Solutions did not observe much evidence of irrigation on the Island during the investigation works conducted for this feasibility study. Therefore, the need for a recycled water service on Scotland is questionable.

Evaluation team deemed: Slightly positive community acceptance anticipated.

3.8.4 Stakeholder Acceptance

Based on the evaluation team previous experience with recycled water systems, the amount of effort required to get the reuse non-potable water service up and running would far out-weigh any benefit, particularly for a scheme of this size.

Evaluation team deemed: Likelihood of stakeholder acceptance to be **negative**.

3.8.5 Technical Risk

From a technical perspective the solution can be delivered, with the main risk associated with this option is with end-user failure, e.g. cross-connections and contamination of water supply.

Evaluation team deemed: Technical risk to be a **negative risk**

3.8.6 Work, Health and Safety

This solution provides a non-essential service, therefore additional risks factors are being introduced where they would otherwise not be required.

Evaluation team deemed: **Negative** WHS impact, as service is non-essential.

3.9 Reuse potable water

3.9.1 Description of Option

Sewage treatment plant on Island to provide reuse potable water. This would not be a stand-alone solution and would be integrated with the sewerage system solution

3.9.2 Environmental Impact

The sewage treatment plant located on the Island would be small but complicated to provide a reuse potable water supply source. The plant would produce a brine stream that would need to be disposed of, consequently requiring approval for discharge into Pittwater. It was discussed that other schemes of this type tend to have scope for a larger fresh water dilution.

Evaluation team deemed: Negative environmental impact

3.9.3 Community Acceptance

Reuse potable water tends to broadly have a negative perception across the wider community. Studies have indicated that it requires on average seven years of education for a technology of this type to gain acceptance within a community.

Evaluation team deemed: Negative community acceptance anticipated, based on perception of process and service, and resulting environmental impact.

3.9.4 Stakeholder Acceptance

As above, reuse potable water generally has an extremely negative perception amongst the broader community, and is likely to require a long journey of education to gather acceptance amongst stakeholders and the community.

Evaluation team deemed: Negative stakeholder acceptance anticipated, based on perception of process and service, and resulting environmental impact.

3.9.5 Technical Risk

Technically the scheme is possible, however there are very few existing schemes of this scale to compare and evaluate from based on their learnings.

Evaluation team deemed: Technical risk to be **negative,** risks are higher as there a very few existing schemes of this scale to gather learnings from.

3.9.6 Work, Health and Safety

This option presents with high WHS risks in all areas associated with construction, operation, public health and fire-fighting.

Evaluation team deemed: **High risk** WHS impact**,** risks are higher as there a very few existing schemes of this scale to gather learnings from.

4 SEWERAGE COLLECTION SYSTEM OPTIONS EVALUATION

4.1 Gravity Sewerage System

4.1.1 Description of Option

A gravity sewerage system is a typical sewerage solution, widely accepted as a sound servicing strategy. The basic requirements of a system of this type include:

- Pipes that maintain constant downward sloping grades to allow adequate flows and velocities to carry solids;
- Access chambers (a.k.a. manholes);
- Where adequate pipe grade cannot be maintained, sewage pumping stations (SPS) are required.
- Pipes are installed via digging trenches, with limited trenchless technology application.
- High risk of ingress and infiltration (I&I) into the system, with associated risk of sewage overflows from the network.
- Trenching will be required in private properties
- Ductile iron cement lined (DICL) pipe would be required to be exposed across private properties on Scotland Island.
- A sewer junction is provided for each property connection.

4.1.2 Environmental Impact

The construction techniques required to install a gravity sewerage system are generally environmentally invasive. These environmental impacts are increased due to the specific constraints and characteristics on Scotland Island, such as:

- High likelihood that excavation into Pittwater will be required;
- High likelihood of I&I into the system
- To maintain constant downward sloping pipe grades, trenches will be required across properties;
- High number of SPSs will be required at various locations around Scotland Island;
- Road accessibility required to all pump stations in network;
- Extensive tree removal and root damage will occur.

Evaluation team deemed: **Negative** environmental impact

4.1.3 Community Acceptance

Intuitively, community acceptance of a gravity sewerage system solution is initially likely to be high. However, the impact will be different for Scotland Island, than for typical areas suited to gravity sewerage – this will need to be clearly articulated in order to educate the community.

Once the impacts are articulated, educating the residents on the damage that a gravity sewerage system would cause not only the Island, but also their property, and the associated effect of amenity in the area, it is anticipated that acceptance would become much lower.

Impact on the Island including:

- Trenches required across properties;
- Tree and tree roots will be damaged – resulting in extensive tree removal in many locations across the Island;
- Waterfront properties would likely have a visible pipe along the water's edge;
    - The gravity sewer pipes would likely need to be above the ground along the water front, leaving the main collector pipe for the Island exposed.
- Vibrations from construction works may affect house structures;
- Removal / decommissioning of existing septic systems will be required;
- Sewage pumping stations across island with a number below water level;
- Road accessibility required to all pump stations in network.

Property connection costs for this scheme will be extremely high for this solution on Scotland Island, based on known connection costs from other schemes;

Evaluation team deemed: Negative community acceptance anticipated, once impacts of solution are clearly articulated to the community and residents are educated on the effect on the Island.

4.1.4 Stakeholder Acceptance

The risks associated with retrofitting a gravity sewerage system into Scotland Island are high in terms of all aspects, including; delivery, operation, maintenance and managing the impact on the Island. The evaluation team deemed that these would be too high risk for any stakeholder to want to be responsible for.

In addition, there would be an ever-present high risk of inflow and infiltration (I&I) and overflows to the environment.

Evaluation team deemed: Too high risk, therefore **negative** stakeholder acceptance anticipated,

4.1.5 Technical Risk

Technically Scotland Island is very different to typical areas suited to a gravity sewerage system solution. The risks associated with this option are very high.

Despite mitigation strategies the chance of system failure will remain high, and operation will be problematic, particularly in relation to I&I.

The scheme costs could easily escalate, due to unmanageable delivery risks.

Evaluation team deemed: Technically **too high risk** for successful implementation, therefore **negative** assessment.

4.1.6 Work, Health and Safety

Construction works will be high risk in all aspects (e.g. procedures, property damage, costs, environmental damage).

Operational risks will remain high and ongoing – the system will consistently be problematic, labour intensive, and require high expenditure.

Public health risks are high – with chances for sewage overflows and odour.

Evaluation team deemed: WHS **too high risk** for successful implementation, therefore **negative** assessment.

4.2 Pressure Sewerage System

4.2.1 Description of Option

Pressure sewer is a proven technology, accepted in Australia for over 20 years and currently operating in more than 250 systems, and internationally for more than 50 years. The basic characteristics of a system of this type include:

- Pressure sewer units (PSU), with grinding pump, located on each property;
- Small diameter pipes, predominantly directionally drilled;
- Not constrained by pipe grades;
- Fully sealed pressurised pipe network;
- Power to be supplied by the property;
- Sewage pumping station may be required, to boost flows across Pittwater.

4.2.2 Environmental Impact

Retrofitting a new reticulated service will have an environmental impact, however the characteristics of pressure sewer, such as small diameter pipes which are not constrained by maintaining a constant grade, can be installed using less invasive construction techniques. Therefore, the environmental impacts can be minimised with a pressure sewerage system in comparison to other system types as follows:

- Most of the retrofitted sewerage reticulation could be directionally drilled;
    - Minimising trenching requirements,
    - Reducing impact to trees and tree roots.
- Pressure sewer units (PSU) to be installed in each property;
    - Reducing the requirement for many SPS's around Scotland Island,
    - May require a pumping station to boost flows across Pittwater.

Sewage no would no longer leaching into soils and ground water – positive impact. As indicated by the soil sampling undertaken by PS Solutions.

The nature of the pressurised system minimises I&I within the system.

Evaluation team deemed: Negative environmental impact

4.2.3 Community Acceptance

- Reliability of the technology has been proven in Australia;
- Provides and equitable servicing solution for Scotland Island;
- Residents will be required to supply and pay for the electricity to operate the PSU - negative;
- Provides equity with other comparable Sydney Water customers, such as Dangar Island.

Evaluation team deemed: Positive community acceptance anticipated, as it provides a sewerage service to the community, whilst causing less environmental impact that the gravity sewerage solution.

4.2.4 Stakeholder Acceptance

Pressure sewerage is a fully equitable and widely accepted servicing solution that has gained stakeholder acceptance, within the Sydney Water operating region, and more widely across Australia. The solution is comparable to the servicing solution provided at Dangar Island.

- SWC currently have many systems of this type operating in their area of operations and previously produced a pressure sewerage system concept design for Scotland Island.

Evaluation team deemed: Positive stakeholder acceptance anticipated.

4.2.5 Technical Risk

As before, any retrofit solution has its difficulties and complications, however site investigations and audits conducted by PS Solutions as part of this study, identified that there is nothing on Scotland Island that has not been delivered previously, therefore based on experience the risks have been deemed to be manageable.

At many properties, it is likely that pressure sewer units could be retrofitted into the existing septic tanks.

In every measure, the gravity sewerage option has greater risk compared to a pressure sewerage option. Therefore, from a technical perspective then evaluation team determined that there was a positive balance of risk, comparatively to a gravity sewerage solution.

Evaluation team deemed: The technical aspect to have a **positive balance of risk**.

4.2.6 Work, Health and Safety

Due the pressurised nature of the reticulated network, there is less risk of odour, I&I and chance of overflow occurring throughout the network. Through experience and commencing at design, these risks are manageable.

Evaluation team deemed: WHS impact assessed as a **positive balance of risk**.

4.3 Vacuum Sewerage System

4.3.1 Description of Option

A vacuum sewerage system requires installation of a saw-tooth profile for the sewer network. Vacuum pots, with valves, are located on each property connecting to the sanitary drainage connection point. A vacuum station transfers sewage through the pipe network and, in this case a pumping station would be required on the Island to pump flows across Pittwater.

The major difference, and known failure point, of a vacuum system is that in order to maintain service the system must be kept under a constant vacuum. A failure of one valve has the potential to affect the service of the whole system.

A design maximum of 8m lift.

4.3.2 Environmental Impact

The environmental impact of a vacuum sewerage system being constructed on Scotland Island would be comparable to the impact of the gravity sewerage system.

- Likelihood is high that excavation in Pittwater will be required;
- High likelihood of I&I into the system;
- Trenches required across properties to achieve saw-tooth profile along contours, disregarding property boundaries; and
- Extensive tree removal and root damage will occur.

Evaluation team deemed: The environmental impact of a vacuum system would be comparable to that of the gravity sewerage system, therefore **negative** impact.

4.3.3 Community Acceptance

Generally, there is less is known about vacuum sewerage systems, with the community already having a familiarity with pressure sewer from Dangar Island, therefore community acceptance is likely to be cautious of this solution initially. The community may be offered further understanding of the system and its implications for the Island and each property, however in summary the impact would not be dissimilar to the impacts associated with a gravity sewerage system.

- Trenches dug across properties, to achieve saw-tooth profile along contours, disregarding property boundaries,
- Tree and tree roots will be damaged – resulting in tree removal in locations,

Evaluation team deemed: Negative community acceptance anticipated.

4.3.4 Stakeholder Acceptance

The risks associated with retrofitting a vacuum sewerage system into Scotland Island are very high in terms of all aspects, including; delivery, operation, maintenance and managing the impact

on the Island. The evaluation team deemed that these risks would be too high for any stakeholder to want to be responsible for.

In addition, there would be an ever-present high risk of I&I and overflows to the environment.

Based on other known operating vacuum systems, maintaining consistent service to the properties on Scotland Island, would be labour intensive and costly.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

4.3.5 Technical Risk

PS Solutions assessed the technical feasibility of the vacuum sewerage system solution. Theoretically it found that it may be possible to design a vacuum system on Scotland Island as multiple smaller systems, with short strips of saw-tooth profile pipework tracking along the contours of the Island, to multiple vacuum stations and pump stations.

- Virtually impossible to the implement with any certainty of success – risk is too high;
- Costs would easily escalate;
- Chance of system failure is high, and
- Based on experience, ongoing operation will be problematic.

Evaluation team deemed: Technical risk **too high**, to achieve successful implementation and operation.

4.3.6 Work, Health and Safety

Extremely negative high-risk solution,

- Construction works high risk in all aspects (e.g. procedures, property damage, environmental damage)
- Operational risk high – system will consistently be problematic, labour intensive, and require high expenditure.
- Public health risk high – overflows, odour

Evaluation team deemed: Technical risk **too high**, to achieve successful implementation and operation.

4.4 Hybrid Sewerage System

4.4.1 Description of Option

The hybrid system is a combination of different system types that best suit the area being serviced. For Scotland Island the proposed hybrid system consists of a combination of gravity sewer, where feasible, and the remainder pressure sewer.

4.4.2 Environmental Impact

Retrofitting a new reticulated service will have an environmental impact, utilising the combination of gravity and pressure system types where suited, will improve the environmental impact than of gravity system alone.

Even where the system is suited, the construction techniques required to install a gravity sewerage system remain generally environmentally invasive. Utilising pressure sewer in the more difficult areas will reduce the environmental impact.

Comparatively against the gravity sewerage solution, the hybrid system is likely to:

- reduce excavation requirements into Pittwater;
- Still be affected by I&I into the system, but not to the degree of a full gravity system;
- Fewer trenches likely to be required across properties;
- Reduced number of SPSs will be required (compared to a full gravity sewerage system) at various locations around Scotland Island;
- Accessibility required to across network to all pump stations;
- Reduced tree removal and root damage will occur.

The environmental impact of the hybrid system will be negative. The impact is an improvement on the complete gravity sewerage system, however the construction impact of trenching and multiple pumping stations will still exist, therefore the hybrid system will have more of an impact than a complete pressure sewerage system.

Evaluation team deemed: Negative environmental impact

4.4.3 Community Acceptance

One of the key issues associated with a hybrid system is that it does not provide and equitable service across the community, such as differing;

- connection costs depending on whether the property is serviced by gravity or pressure;
- on-property asset requirements, such as a pressure sewer unit, or direct connection;
- electricity costs supplied by the property to run the pump in a PSU;
- servicing arrangements on the property,
- I&I entry points into the system, can be monitored with a pressure sewer connection, very difficult to manage with a gravity connection.

Evaluation team deemed: Negative community acceptance anticipated.

4.4.4 Stakeholder Acceptance

Technically a hybrid solution at Scotland Island can be achieved. However past experience has shown that the non-equity (different system requirements serving properties) will cause issues across a range of project delivery elements, such as connection costs, servicing arrangements, asset ownership. Operationally and logistically a hybrid system can be difficult to manage.

Evaluation team deemed: Neutral stakeholder acceptance anticipated.

4.4.5 Technical Risk

The hybrid system, from a technical perspective can be achieved. The system utilises the benefits of pressure sewer where advantageous and only utilises gravity sewer where there are benefits to do so – hybrid of convenience.

However, the site constraints and associated difficulties on the Island to install sections of gravity sewer, resulted in the evaluation team assessing the options as having a positive balance of risk but slightly higher risk than a complete pressure sewer technical solution.

Larger pump stations would be required in the hybrid system than that of the full pressure sewerage system, due to I&I entering the system from the sections of gravity sewer.

Evaluation team deemed: Positive balance of risk.

4.4.6 Work, Health and Safety

Evaluation team assessed the hybrid system to have a positive balance of risk, as the design would be driven by being a hybrid of convenience and benefits.

However, the WHS risks are higher, particularly in construction and on-going operation, than for pressure sewer alone.

Evaluation team deemed: Positive balance of risk.

4.5 Variable Grade Sewer

4.5.1 Description of Option

Variable grade sewer system consists of sealed gravity sewer carrier pipes, with intermediate lift stations. The intended benefit of this type of system is to keep the gravity sewers relatively shallow compared to the traditional gravity system.

4.5.2 Environmental Impact

The trenching to provide variable grade sewer potentially would be more manageable than that of a gravity sewerage system. However there maintains a high likelihood of I&I into the system. Trenching and intermediate lift station requirements will be environmentally invasive, and tree removal and root damage will occur.

Evaluation team deemed: **Negative** environmental impact

4.5.3 Community Acceptance

As with the gravity sewerage solution, trenching will be required across properties. With multiple lift stations required across the Island, locations of would likely be controlled by site constraints and system requirements rather than property boundaries. Further issues associated with this option include:

- Treatment plant or SPS at the bottom of the hill;
- Odour and I&I will still be an issue
- Accessibility will be required to across network to all lift stations

Evaluation team deemed: **Negative** community acceptance anticipated.

4.5.4 Stakeholder Acceptance

The risks associated with this option are high, therefore it is unlikely to gather stakeholder acceptance. The chance of system failure is high with this type of solution on Scotland Island and operationally will always be problematic and difficult.

Costs could easily escalate, during construction and into operations and maintenance.

Evaluation team deemed: **Negative** stakeholder acceptance anticipated.

4.5.5 Technical Risk

From a technical perspective, variable grade sewers require adequate velocity in the pipes sufficient enough to carry solids, without them dropping out of the flow, increasing risk of blockages within the network.

Preliminary assessment conducted by PS Solutions identified that this option was unlikely to be technical feasible on Scotland Island.

Evaluation team deemed: Technically high risk, **negative**.

4.5.6 Work, Health and Safety

If a technical design solution providing variable grade sewer for Scotland Island was possible, the construction works would be high risk to achieve a successful system.

The locations of lift stations need careful consideration for access and maintenance, whilst maintaining the requirements of the system such as pipe velocity.

Operational risk high – system will likely be problematic, labour intensive

Public health risk high – overflows, odour

Evaluation team deemed: Negative impact, high WHS risk.

5 SEWERAGE SERVICING OPTIONS EVALUATION

5.1 Do Nothing

5.1.1 Description of Option

Scotland Island properties are currently serviced by on-site systems, many of which are non-compliant to minimum standards. The study in 1997 identified that faecal coliforms are present in the non-potable water supply. Soil sampling conducted as part of this study also identified faecal coliforms in the soil.

5.1.2 Environmental Impact

PS Solutions conducted desk-top assessment and on-site investigations on Scotland Island, including a number of detailed property audits as a component of this feasibility study. It was identified that the majority of on-site systems are non-compliant to minimum standards and therefore are likely to be causing environmental damage, ground water contamination and public health concerns.

This environmental impact has been reaffirmed by the data collected from this and previous studies.

Evaluation team deemed: **Negative** environmental impact

5.1.3 Community Acceptance

The Scotland Island Community Association has been actively lobbying government representatives and Northern Beaches Council for water and sewerage services to Scotland Island. It is understood from these communications that the vocal members of the community that want sewerage services on the Island.

A number of feasibility studies have been undertaken over the years, including the study conducted in 1997 which identified a number of risks associated with the current system. It is understood that from a community perspective, these studies resulted in no action or improvement of service. Therefore, it is likely that a 'Do Nothing' approach would be perceived by the community as another feasibility study that has resulted in no action.

Based on the investigation works conducted by PS Solutions, and talking with many residents on the Island, it is estimated that approximately 10% of the community would like to keep their existing onsite system. However, costs are a key determining factor in the community's level of acceptance.

Water and soil sampling on the Island has identified that there are real health and environmental risks associated with doing nothing.

If enforcement occurred to get each lot up to minimum code and compliance requirements, many of the lots would become uninhabitable – which is not an option for Council – as the Island was historically declared by Council as having developable lots.

Evaluation team deemed: **Negative** community acceptance anticipated.

5.1.4 Stakeholder Acceptance

Historically, the servicing responsibilities for Scotland Island and associated risks have shifted to other stakeholders, such as Northern Beaches Council, NSW Environmental Protection Authority (EPA), Scotland Island Community Association (SICA), Sydney Water.

This criteria was scored more negatively by the evaluation team compared to how it may have been scored 10 years ago, primarily due to a change in acceptance of legal liabilities. Legally, if an entity has an expertise in an area, the risk cannot easily be transferred or ignored.

As such, investigations and soil sampling consistently flag serious health and environmental concerns on Scotland Island.

Stakeholders need to accept that this is a collective problem that requires a solution, therefore 'Do Nothing' is no longer a viable option therefore was assessed this way.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

5.1.5 Technical Risk

Technically, it is impossible to make the 'Do Nothing' option plausible even with enforcement, as it is not technically possible to get many of the on-site systems on Scotland Island to meet Australian Standards compliance, this is primarily due to lot sizes and slope.

Evaluation team deemed: Negative technical risk

5.1.6 Work, Health and Safety

On-site systems have been installed on Scotland Island which do not satisfy minimum code requirements, therefore providing a public health and environmental risk.

This risk has been reinforced by the findings from the water and soil sampling conducted as part of this study, and previous studies. There is high risk to public health on Scotland Island.

Evaluation team deemed: Negative, high-risk to WHS on Scotland Island

5.2 Upgrade of Existing Domestic Systems (Managed System)

5.2.1 Description of Option

This option proposes the upgrade of all the physical on-site systems and the engagement of a functioning operating strategy with an ownership and management plan.

Assumptions of this option include:

- That there is an effluent disposal strategy is in place; and
- That there will be a common body to make the system work.

5.2.2 Environmental Impact

Construction disturbance on property will be high, in many cases needing to remove the existing system and install a larger replacement system.

A centrally managed system implementing the operational strategy and management plan is required for there to be potential of an environmental improvement, however sustainability of this strategy will be an ongoing concern.

However, it was identified during PS Solutions detailed property audits, that there are examples where new existing onsite systems, approved within the last 4-5 years, are already failing, due to:

- limited irrigation area,
    - mechanically overflowing and
    - trenches are overflowing
- Soil does not have capacity for effluent disposal volumes
- Land disposal areas are largely insufficient
- Non-compliance to Australian Standards

Therefore, even by upgrading existing on-site systems and implementing a managed system strategy it is likely that the on-site systems will continue to fail.

Evaluation team deemed: Negative environmental impact

5.2.3 Community Acceptance

One of the aspects of achieving compliance with the on-site system, is having adequate irrigation area. Many properties are likely to be limited with area available for irrigation. In these cases, if there is not enough land area on the property to irrigate, then the system effluent must be pumped-out and remotely disposed.

It is understood that few properties would currently pump their systems out, unless out of necessity. Therefore, this option will generally require a change in behaviour across broader community, and the systems will become more labour intensive than current processes.

Regardless of the pump-out requirements, solids within the on-site systems require regular removal.

Accessibility for the pump-out truck to access the on-site systems will be required, potentially resulting in road upgrades and clearing requirements.

Evaluation team deemed: **Negative** community acceptance anticipated.

5.2.4 Stakeholder Acceptance

Minimum compliance requirements for on-site systems will be difficult to achieve on Scotland Island, even if the systems are upgraded and the operation of the systems are centrally managed, resulting in continuing implications on environment and health.

Product manufacturers generally specify that on-site systems are required to be serviced once a quarter, therefore with 370 properties on the Island, an agent would be required to service 5 properties per day in order to meet the regular servicing requirements.

How do Stakeholders get comfort that these servicing requirements are being maintained?

Part-privatisation option?

The servicing strategy for the Island would likely lead to equity issues with other customers of the stakeholder, particularly where these customers have on-site systems but do not have a managed servicing strategy being provided. The difference in strategy/policy for providing the service may be place because it is an island.

Evaluation team deemed: **Negative** stakeholder acceptance anticipated.

5.2.5 Technical Risk

It is likely that installing an upgraded system may not be technically achievable for some properties. For example, assuming the site was upgraded with an AWTS with approximate dimensions around 2.4m diameter by 2.4m deep, some properties will not have this land space to install unit of this size.

For the properties that do have the land space to install an upgraded unit, minimum compliance requirements on many properties will be difficult to achieve. Therefore, likelihood of ongoing failure of the system as a collective is high.

A clear distinction will be required defining:

- who will own the asset; and,
- who will be responsible for the onsite systems working and being maintained.

Evaluation team deemed: Technically **high risk / negative impact** option, with limited chance of ongoing success and improvements in public health and environmental concerns.

5.2.6 Work, Health and Safety

Despite implementation of an upgraded, managed system and effluent disposal strategy, water logged ground will still exist, due to the composition and type of soils on Scotland Island that have limited capacity, therefore the effect on public health and the environment is likely to continue.

Evaluation team deemed: **Negative, high-risk** to WHS on Scotland Island

5.3 On-Site Grey Water Reuse using existing septic tank, with on-site reduced disposal

5.3.1 Description of Option

It was identified previously that success of the on-system options, in many cases, would be limited by the size of the property's irrigation area and soil capacity, in which land disposal areas have been identified as largely insufficient on Scotland Island.

This option to reuse the on-site grey water indoors aims to reduce the onsite disposal requirements by utilising the grey water from the existing septic tanks.

The grey water reuse would require separate plumbing to be installed on the property.

5.3.2 Environmental Impact

This option is non-compliant to standards, unless an approved grey water treatment is also installed on each property. The greywater must be treated and disinfected before storage and general reuse, and be suited for intermittent use, if required (such as for a holiday home).

The following is an extract from http://www.yourhome.gov.au/water/wastewater-reuse.

> *Any greywater reused indoors must be disinfected. All disinfection systems require frequent maintenance. Chlorine, although the most common disinfectant, has been found to have adverse environmental impacts. Alternatives such as UV or ozone disinfection should be used where possible, but they do require electric power to operate. UV sterilisers disinfect the water as it passes through them and use about 20–40W of electric power depending on the water flow rate they can treat. Ozone systems use about 50W of power and operate for about 30 minutes six to eight times a day depending on water usage.*

Evaluation team deemed: **Negative** environmental impact, whether greywater treatment was, or as not installed on the property.

5.3.3 Community Acceptance

On-site greywater treatment system would need to be installed as well as the addition plumbing on the property. This treatment and disinfectant system would be additional infrastructure located on the property, requiring additional regular maintenance.

Evaluation team deemed: **Negative** community acceptance anticipated.

5.3.4 Stakeholder Acceptance

This option does not achieve much improvement to the current situation, therefore current stakeholder risks and responsibilities remain.

Evaluation team deemed: **Negative** stakeholder acceptance anticipated.

5.3.5 Technical Risk

Technically this option will not achieve much improvement on the current situation.

- Requires separate plumbing on the property, and the
- Quality of grey water is high risk, therefore public health and environmental concerns remain.

Evaluation team deemed: Negative technical risk

5.3.6 Work, Health and Safety

This option does not improve on the current WHS situation on Scotland Island, and introduces an additional risk of greywater reuse quality affecting public health and the environment

Evaluation team deemed: Negative, increased risk to WHS on Scotland Island

5.4 Tanker Truck Disposal from each lot

5.4.1 Description of Option

It has been identified that compliance will be difficult to achieve with on-site sewage systems sewage systems. This option investigates the possibility of tanker trucks disposing of sewage collected directly from each property.

Theoretically removing the health and environment risks associated with inadequate on-site treatment and disposal.

5.4.2 Environmental Impact

The ongoing operational impact of the tanker trucks tasked with collecting and disposing of effluent from each lot is extremely high.

An upgrade to most Island roads would be required to transport tanker trucks. The evaluation team calculated that 20 tanker trucks per day would be required to service the 370 properties on Scotland Island, resulting in:

- High disturbance on the Island; and
- Low sustainability measure

Evaluation team deemed: Negative environmental impact

5.4.3 Community Acceptance

It was estimated that in order to service the 370 properties, 20 tanker trucks on Scotland Island would be required each day, resulting in most of the roads on the Island needing to be upgraded to accommodate this volume of traffic.

The amenity of the island would be greatly affected. Barging and a holding tank may need to be constructed on the Island and odour would be an issue.

The costs to maintain ongoing disposal would need to be considered, as well as the costs and implications of ordering a tanker truck for emergency pump-out.

Evaluation team deemed: Negative community acceptance anticipated.

5.4.4 Stakeholder Acceptance

The logistics of providing a disposal / discharge arrangement for 20 tanker trucks and barging per day would be problematic, and not a sustainable ongoing strategy.

Council would be required to upgrade the road network on Island to accommodate the estimated 20 tanker trucks per day.

Public health and environmental risks would remain an ongoing concern for stakeholders and the option is not equitable amongst stakeholder customers.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

5.4.5 Technical Risk

Technically managing the logistics of the 20 tanker trucks required per day to collect and dispose of sewage from every property, on and off an Island, is not a sustainable solution.

Evaluation team deemed: Negative technical risk

5.4.6 Work, Health and Safety

The daily transportation of 20 tanker trucks, operating on an off the barges and around the Scotland Island road network, on and off every property, introduces many WHS risks.

Evaluation team deemed: Negative, high-risk to WHS on Scotland Island

5.5 Tanker Truck Disposal from Common Collection Storage Tank

5.5.1 Description of Option

Installation of a collection system on Scotland Island, collecting and transporting septic tank effluent or live sewage to a central common collection tank.

Tanker truck could remain on the barge, therefore upgrades of the roads not required.

No bore under Pittwater would be required.

5.5.2 Environmental Impact

The collection system reduces the risk of illegal discharges into the Pittwater, and takes sewage off the property, reducing seepage into groundwater, improving public health and environment risks.

There will be issues with odour around the common collection tank on the foreshore.

The type of collection system selected will affect the environmental impact, however the various system types were assessed in the previous section.

Evaluation team deemed: **Neutral balance** of environmental impact

5.5.3 Community Acceptance

This option removes sewage off each property, shifting responsibility away from the property owners, which is likely to be viewed positively by the community.

However, there will be issues with odour around the common collection tank, which will need to be situated on the foreshore. Location of tank would be on the western foreshore, where the ferry's land at Church Point, Bay View or Rowland Reserve affecting the amenity of the area.

This option is not equitable compared to the services provided elsewhere, therefore it is unlikely the community will be accepting of this solution.

Evaluation team deemed: **Negative** community acceptance anticipated.

5.5.4 Stakeholder Acceptance

The retention time of the sewage could easily be two days old by the time it is discharged into Sydney Water's network;

- from the point of discharge at the property,
- transportation through the network,
- into the common collection tank for storage, until
- the tanker truck collects the sewage, and
- discharges it into Sydney Water's network.

Sydney Water may be resistant to receiving 2 day old, highly septic and odourous, sewage into its network which has potential to effect issues such as;

- asset condition;
- treatment processes;
- customer complaints, etc.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

5.5.5 Technical Risk

Technical assessment would be required to determine a suitable location in the Sydney Water network to discharge the septic sewage, assessing details such as;

- Required flow rate;
- Capacity within network;
- Adequate dilution; and
- Odour

Evaluation team deemed: Neutral technical risk

5.5.6 Work, Health and Safety

WHS risks can be managed with this option, in particular situating the common collection tank on the waterfront to eliminate the requirement for the tanker truck to disembark from the barge.

Sewage collection into the tanker truck can be achieved efficiently, reducing the WHS impact on the island itself.

Evaluation team deemed: Neutral risk to WHS on Scotland Island

5.6 Upgrade existing on lot systems with disposal redirected to Pittwater

5.6.1 Description of Option

Upgrade the existing on-site systems, to redirect effluent disposal off the property, for direct discharge into Pittwater.

5.6.2 Environmental Impact

Minimises many of the on-property works requirements comparatively to other on-property upgrade options.

Redirecting effluent to Pittwater may reduce the effluent currently being absorbed into the soils, however detailed property audits have identified that the inground treatment on many properties is not currently adequate.

Evaluation team deemed: Negative environmental impact

5.6.3 Community Acceptance

There is already a perception of pollution around Scotland Island based on discussions with community members, therefore disposing effluent from the septic into Pittwater will add to this concern.

Knowing that effluent directly from individual properties into Pittwater is likely to raise further public health and environmental concerns, for example impact on children playing in the creeks and along the waterways.

Evaluation team deemed: Negative community acceptance anticipated.

5.6.4 Stakeholder Acceptance

This option to directly discharge effluent into Pittwater cannot meet ANZECC (1992) guidelines, and it is anticipated that NSW Public Health would have major concerns.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

5.6.5 Technical Risk

This option to directly discharge effluent into Pittwater cannot meet ANZECC (1992) guidelines, and it is anticipated that NSW Public Health would have major concerns.

Increased, and regular, water sampling and monitoring would be required to ensure that the solution was not increasing/contributing to pollution in the area.

Evaluation team deemed: Technically **negative impact / high risk** option, with limited chance of success.

5.6.6 Work, Health and Safety

The effluent concentration discharged into Pittwater is an introduced risk of this option, as detailed property audits identified that inground treatment is not currently adequate on many properties.

Evaluation team deemed: Negative impact, high-risk to WHS on Scotland Island

5.7 Septic tank effluent pump-out (STEP) system, discharging to an island treatment facility with Pittwater disposal

5.7.1 Description of Option

This option investigates a pump-out system directly from the septic system, transporting effluent through a collection system, discharging to a treatment facility located on Scotland Island, with treated effluent disposal into Pittwater.

5.7.2 Environmental Impact

Removes effluent off the property, reducing seepage into groundwater, and therefore vegetation deterioration. This option reduces the risk of illegal discharges into the Pittwater.

Sewage treatment to occur on the Island, with a suitable site required for the treatment plant.

Evaluation team deemed: Neutral environmental impact

5.7.3 Community Acceptance

The inclusion of a treatment plant into this option, improves the acceptance from the previous option 6 (effluent discharge directly from properties into Pittwater).

The affected amenity of a treatment plant being located on the Island is anticipated to be viewed upon negatively by the community.

In addition, not all existing septic tanks would suitable for the STEP system, therefore many are likely to need upgrading to larger tanks, and subsequent on-property works.

Evaluation team deemed: Negative community acceptance anticipated.

5.7.4 Stakeholder Acceptance

Responsibility, ownership and operation of a satellite sewage treatment plant and system located on Scotland Island is unlikely to be accepted by any stakeholders as similar systems tend to be labour intensive and are unviable without subsidy.

Evaluation team deemed: Negative stakeholder acceptance anticipated.

5.7.5 Technical Risk

Not all existing septic tanks would suitable for the STEP system, therefore it is likely that many would need upgrading to larger tanks, and subsequent on-property works.

Technical implications of receiving sewage from the septic tank on the treatment plant will be high. This is because the septic tank will have left all the elements in the sewage that are hardest to treat in the system e.g. nitrogen.

In all likelihood, carbon will need to be added back into the sewage at the plant in order run the treatment processes.

Evaluation team deemed: Technically **negative impact / high risk** option, predominantly associated with the treatment complications of receiving high volumes of effluent from septic tanks.

5.7.6 Work, Health and Safety

The water tightness (extent of external water entering or exiting the system, such as I&I) of the independent on-property systems will become a component of the entire system, as this component needs to be contemplated in the sizing and design of the treatment plant.

Increased operational risks associated with a satellite treatment plant.

Evaluation team deemed: **Negative, high-risk** to WHS on Scotland Island

5.8 Septic Tank Pump-Out System discharging to Sydney Water

5.8.1 Description of Option

This option investigates a pump-out system directly from the septic system, transporting effluent through a collection system crossing the Pittwater, for discharge into Sydney Water's network.

5.8.2 Environmental Impact

Removes effluent off the property, reducing seepage into groundwater, and therefore vegetation deterioration. This option reduces the risk of illegal discharges into the Pittwater.

It was considered a better option than previous option 7 (pump out to treatment plant located on Scotland Island) from an environmental perspective.

However, there's not positive reason to keep the on-property septic tank as part of the solution for this option, as Sydney Water will treat the sewage regardless of treatment in septic.

Evaluation team deemed: **Slightly positive** environmental impact

5.8.3 Community Acceptance

This solution provides a servicing solution that removes sewage off the property and removes it off the Island into Sydney Water's network.

However, not all existing septic tanks would suitable for the STEP system, therefore many are likely to need upgrading to larger tanks, and subsequent on-property works.

Evaluation team deemed: **Slightly positive** community acceptance anticipated.

5.8.4 Stakeholder Acceptance

In the evaluation team's experience, Sydney Water would likely prefer non-treated sewage into their network, rather than effluent higher in nitrogens and more difficult to treat.

The configuration of this option presents a difficult utility ownership model for stakeholders, because there are assets on private properties that are not being replaced; i.e. dedicating non-performing assets to a utility, would usually flag as a high unacceptable risk structure.

Evaluation team deemed: Slightly positive stakeholder acceptance anticipated.

5.8.5 Technical Risk

The Collection system would be required to transport septic effluent to a sewage pumping station, for pumping across Pittwater to the mainland.

Technical complexities would arise with the various property connection configurations and arrangements required to collect effluent from existing septic tanks.

The under bore required across Pittwater, also has complexities associated with this option, such as:

- Pumping (septic, treated) effluent across Pittwater for discharge into suitable location within the Sydney Water network;
- Effluent pumps required at each property (same principle as pressure sewer system, but different type of pumps).

Evaluation team deemed: Technically **negative impact / high risk** option,

5.8.6 Work, Health and Safety

Construction risks and high potential for cost escalations associated with on-property works

- Residual risks from utilising onsite septics,
- More trouble than benefits.

Evaluation team deemed: Negative impact, high-risk to WHS on Scotland Island

5.9 Installation of a Sewerage Collection System Discharging to a Treatment System on the Island, with Disposal to Pittwater

5.9.1 Description of Option

Installation of a new sewerage collection system, discharging to a treatment facility located on Scotland Island, with treated effluent disposal into Pittwater. Decommissioning/removal of on-site septic systems.

Assumption: Pressure sewerage system was evaluated as the collection system for this option.

5.9.2 Environmental Impact

Removes sewage off the property, reducing seepage into groundwater, and therefore vegetation deterioration. Reducing the risk of illegal discharges into the Pittwater.

Clarification on consent requirements for disposing of effluent into Pittwater would be required.

Brooklyn, Dangar Island and Hawkesbury River systems discharge effluent into these waterways, however these are not good examples of precedence for their disposal is into waterways better flushed than Pittwater.

Evaluation team deemed: Slightly positive environmental impact

5.9.3 Community Acceptance

It is anticipated the community acceptance for this option on balance to be neutral.

Community perception regarding treatment then discharge into Pittwater, is likely to be negative, along with the affected amenity of a treatment plant being located on the Island.

However, this option does provide a solid sewerage servicing solution for the residents on Scotland Island, with the ability to improve upon their public health and environment concerns.

Evaluation team deemed: Neutral community acceptance anticipated.

5.9.4 Stakeholder Acceptance

Council would no longer be responsible for the septic tanks on properties, as these would have been decommissioned/removed. Compliance with codes and standards can be achieved, reduces associated risks for stakeholders.

However, responsibility, ownership and operation of a satellite sewage treatment plant located on Scotland Island is unlikely to be accepted by any stakeholders as similar systems tend to be labour intensive and are unviable without cross-subsidy.

Effluent disposal consent remains the key consideration for resolution, in terms of assessment moving forward.

Evaluation team deemed: Neutral stakeholder acceptance anticipated.

5.9.5 Technical Risk

From a collection system perspective, retrofitting a new system into an existing area is always difficult but risks the can managed.

Sewage received at the treatment plant will be easier to manage and treat than the effluent from the septic tanks (option 7).

Evaluation team deemed: Slightly positive technical risk

5.9.6 Work, Health and Safety

Construction risks are more typical to the types of risks on other similar projects, and therefore can be managed accordingly.

Evaluation team deemed: Positive balance of risk and impact to WHS on Scotland Island.

5.10 Installation of a sewerage collection system discharging to a treatment system on the Island, with dry weather disposal to Sydney Water, wet weather disposal to Pittwater

5.10.1 Description of Option

From previous experience, the NSW EPA would rather discharge treated effluent into waterways, than untreated sewage with a wet weather component.

It is understood that the NSW EPA has expressed that no nutrients are to be discharged into the Hawkesbury River.

This option was removed from the evaluation process, due to the assumption at the beginning of the workshop that Sydney Water has adequate capacity in their network for servicing of Scotland Island.

5.11 Collect Sewage and Pump to Sydney Water sewerage system

5.11.1 Description of Option

Installation of a new sewerage collection system, with pumped flow via an under bore across Pittwater, discharging into Sydney Water's sewerage system.

Decommissioning/removal of on-site septic systems.

5.11.2 Environmental Impact

Most of the retrofitted sewerage reticulation could be directionally drilled. Sewage no longer leaching into soils and ground water – resulting in a positive environmental impact.

Pumping station required to pump flows across Pittwater.

Evaluation team deemed: Positive environmental impact

5.11.3 Community Acceptance

Provides equity of service, reliability, health benefits comparative to customers on mainland Sydney, whilst minimising operational responsibilities on the Island. Comparable to Dangar Island.

Evaluation team deemed: On the balance of all the options it is anticipated community acceptance **positive** in comparison.

5.11.4 Stakeholder Acceptance

Risk is transferred to the organisation best placed to manage the risks. Provides a fully equitable solution that's comparable to Dangar Island, which was implemented and now operated by SWC;

Viability of the solution still requires needs to be determination and measurement, in terms of,

- Environment
- Public health
- System capacity

Evaluation team deemed: Positive stakeholder acceptance anticipated.

5.11.5 Technical Risk

Any retrofit solution has its difficulties and complications, however site investigations and audits identified no complications that have not been addressed before, therefore risks are manageable. Such as,

- Sewage pumping station may be required,
- Under bore across Pittwater.

Evaluation team deemed: **Positive balance** of technical risk

5.11.6 Work, Health and Safety

Public health and environmental risks are addressed with this option, resulting in

- Less odour,
- Less chance of overflow,
- All risks are manageable

Evaluation team deemed: **Positive balance** of technical risk

5.12 Non-potable Reuse

5.12.1 Description of Option

Soil absorption capabilities and irrigation opportunities are limited on Scotland Island, and no other users on the Island have been identified that may be interested in non-potable reuse water. A typical customer for non-potable reuse water in other servicing areas is a Golf Course for irrigation purposes.

5.12.2 Environmental Impact

The additional infrastructure required to be installed to facilitate non-potable reuse on the island, on balance is likely to have a negative impact based on limited users for the service/product.

Evaluation team deemed: **Slightly negative** environmental impact

5.12.3 Community Acceptance

The perceived sustainability of a non-potable reuse system on the Island may be viewed positively by the community.

Evaluation team deemed: **Positive** community acceptance anticipated.

5.12.4 Stakeholder Acceptance

The costs, risks and responsibilities associated with providing non-potable reuse would significantly out-weigh any benefits.

Evaluation team deemed: **Negative** stakeholder acceptance anticipated.

5.12.5 Technical Risk

Providing suitable quality of non-potable reuse would involve many technical risks, that would out-weigh the benefits of the system on Scotland Island.

Evaluation team deemed: Technically **negative impact / high risk** option,

5.12.6 Work, Health and Safety

Maintain suitable water quality, chance of cross-connections, would introduce risks within the system.

Evaluation team deemed: Negative impact to WHS on Scotland Island

GLOSSARY / ABBREVIATIONS

AWTS	Aerated wastewater treatment system
DICL	Ductile iron cement lined
EPA	Environmental Protection Authority
ET	Equivalent Tenement = Number of Equivalent Dwellings
GSS	Gravity sewerage system
HDB	Horizontal Directional Boring
HDD	Horizontal Directional Drilling
I&I	Ingress and Infiltration
MCA	Multi-criteria analysis
ML	Mega Litre
NBC	Northern Beaches Council
PE	Polyethylene
PSS	Pressure sewerage system
PSU	Pressure sewer unit
PW	Potable water
RW	Recycled water
SICWG	Scotland Island Community Working Group
SIRA	Scotland Island Residents Association
SPS	Sewage Pumping Station
SRM	Sewer Rising Main
STEP	Septic tank effluent pump-out
STP	Sewage Treatment Plant
SWC	Sydney Water Corporation
VSD	Variable speed drive
VSS	Vacuum sewerage system
WHS	Work, health and safety
WWPS	Wastewater pump station

ATTACHMENT 1 – SCOTLAND ISLAND OPTION MATRIX