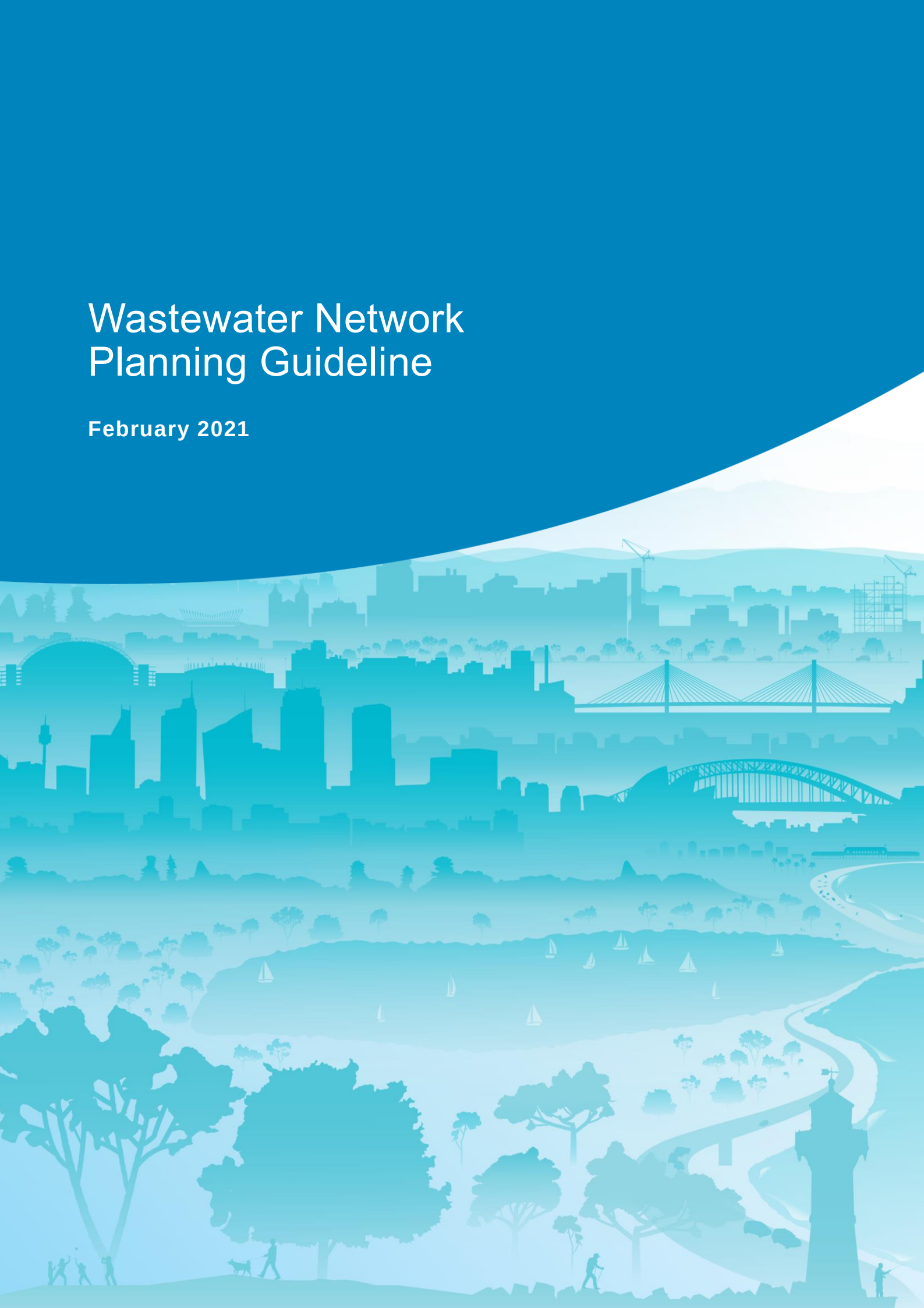
Wastewater Network Planning Guideline

February 2021

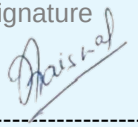


Role	Title
Author	Karthika Senthilnathan, Ashvittha Santhaseelan, Kevin Lin
Reviewer	Pradip Saha, Milroy Jayaveerasingam, Bala Selvananthan, Suganthini Niranjan, Pamini Prabaharan, Rhonda Tang, various stakeholders
Controller	Eldwin Gunawan / Warren Paige
Owner	Darryl Foster

Change history

Version		Issue Date	Approved by	Brief description of change and consultation
2	D0000666	11-03-2021	Darryl Foster	Updates to document post stakeholder input
1.1		08/12/2020		Initial Stakeholder comments addressed. Updates made
1		10/11/2020		New document

Document Status

Endorsed by		
Signature  ----------	Anil Jaiswal Manager, System Planning, SAP	Date 16/03/2021 ----------
Signature  ----------	Darryl Foster Manager, Asset and System Management, IIAP	Date 30/04/2021 ----------

Approved by		
Signature  ----------	Kate Miles Head of System and Asset Planning (SAP)	Date 11/05/2021 ----------

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1 OVERVIEW

Provision of effective and reliable wastewater services underpins environmental, economic, and public health outcomes for Sydney Water's customers. With continued growth and investment, it is essential to have a clear understanding of the processes, key parameters, and methodologies to be applied in the development and maintenance of the existing and future wastewater networks.

System and Asset Planning (SAP) undertakes various levels of planning including:

- Strategic plans.
- System plans.
- Precinct plans.
- Asset plans.

These plans are completed for current and future planning horizons. A 30-year planning horizon is used for growth servicing and protection of the environment and public health. This is executed based on the asset creation process.

The asset creation process is made up of strategic and option assessment phases;

- Strategic Planning – This is where Precinct Plans are developed, and System Plans updated or prepared for new precinct servicing strategies
- Option Assessment – This planning stage covers asset options/scheme configuration selection of the preferred option, asset needs specifications, concept designs, environmental assessment, land acquisition requirements and business case
- Delivery – This covers detail design, building of assets and scheme commissioning

This guideline sets out the planning parameters, key assumptions, methodology and performance criteria to carry out strategic and option assessment of wastewater networks for growth servicing and maintaining performance. The guideline will be used to assess:

- Growth forecast and flow estimates for current and future planning horizons.
- The capacity of existing networks to service growth and meet performance criteria and regulatory targets.
- Network amplification needs for maintaining / improving performance to service growth, meet regulatory requirements, and protect the environment and public health.
- Asset size and timing to develop staged investment plans to service infill and greenfield developments

A cost estimate will be developed as an indicative staged capital investment plan to service short, medium, and long-term future growth planning horizons.

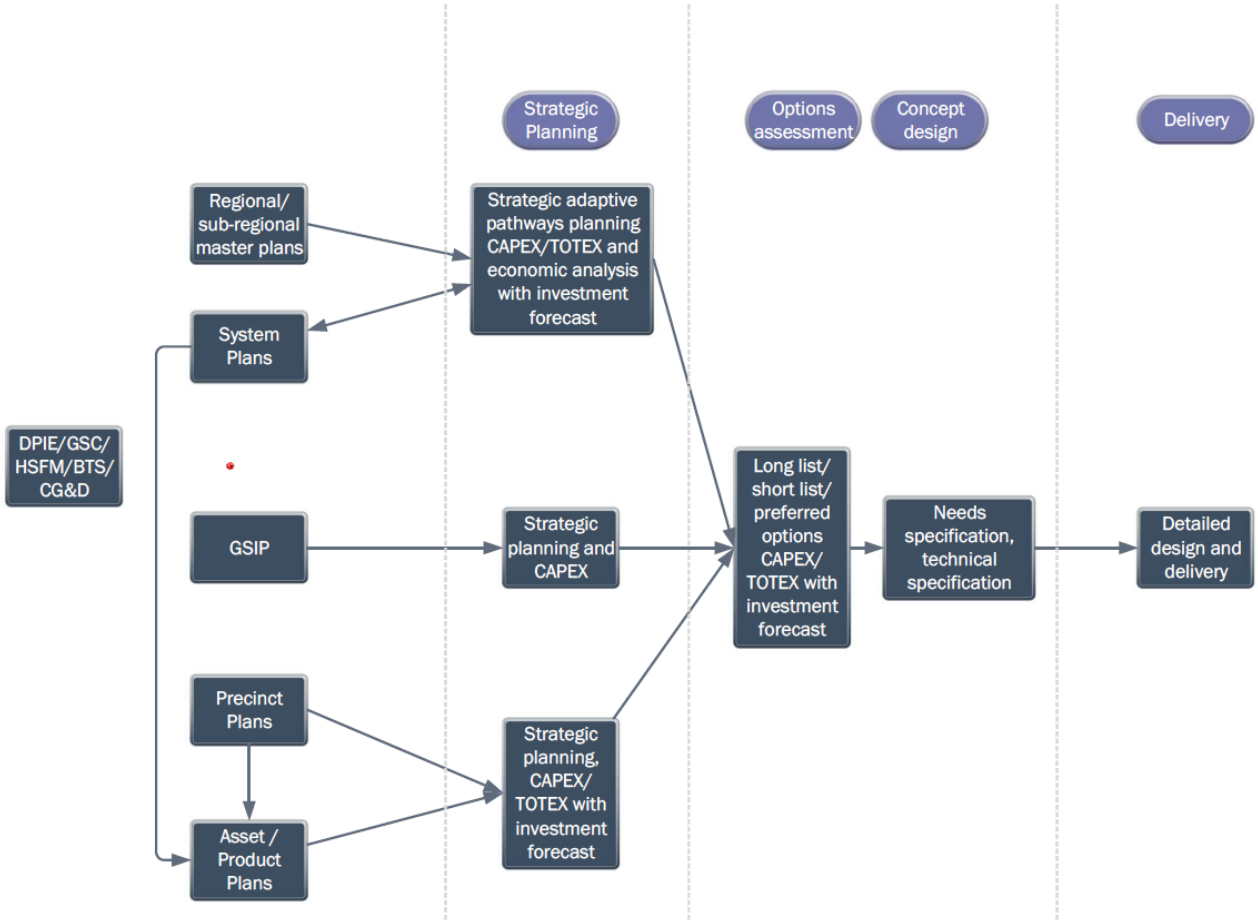


Figure 1: Planning stages and its documentation

Note: GSIP does not require economic analysis, NPV

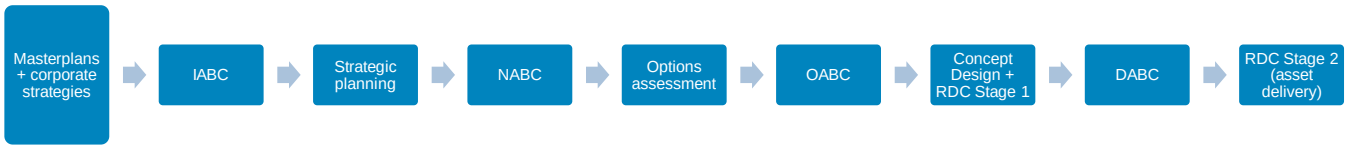


Figure 2: Planning value chain

Note: Planners need to refer to the latest gateway process

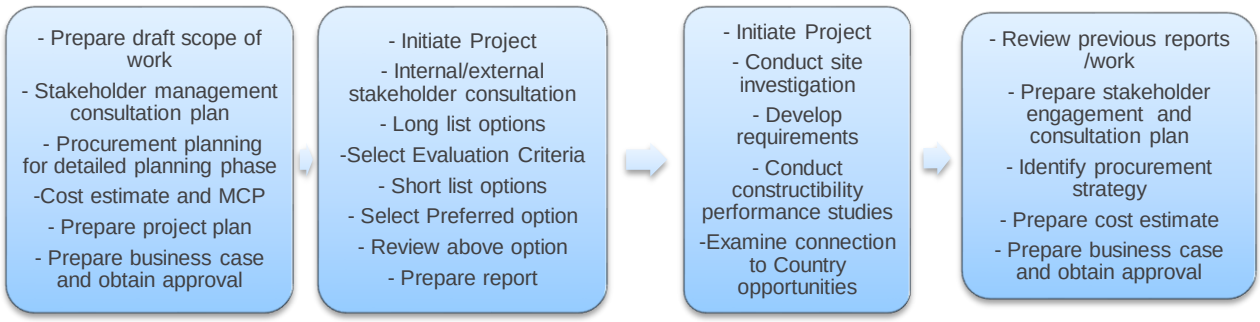


Figure 3: Detailed process map

For further detail description of tasks, refer to **Attachment 8**

1.1 Objective

The objective of this guideline is to ensure consistent, high quality, trackable and efficient wastewater planning is completed. This facilitates the development of asset investment plans required at different stages such as strategic plans for IPART price path submission or detailed plans for delivery of assets.

This document aims to focus on:

- **Model validation:** Identification and validation of an appropriate hydraulic model with the current network configuration. This should be agreed by Engineering & Tech internal stakeholders, to be used as a base model
- **Flow projection:**
  Dry weather – source and consideration of growth data and flow projections for infill and green field growth. This includes residential and non-residential customers.
  Wet weather – current rainfall ingress parameters and future deterioration for existing and new wastewater catchments.
- **Wastewater network performance:** capacity adequacy, upgrade requirements for dry and wet weather conditions to service infill and greenfield growth. This includes satisfying operational and maintenance and regulatory requirements

1.2 Scope

Strategic planning scope	Option assessment scope
• Determination of appropriate planning tools including updates and validation (see section 2.2).	• Determination of appropriate planning tools including updates and validation
• Growth and Flow projection.	• Growth and Flow projection
• Gap analysis of network performance for current and future planning horizons.	• Gap analysis of network performance for current and future planning horizons
• Assessment of wastewater network augmentation requirements to service future growth and to meet performance criteria.	• Develop options to address network performance gaps

• Development of strategic options for short, medium, and long-term requirements.	• Assessment of the options
• Development of a preferred strategic pathway including investment plan and staging plan with opportunities to align timing of the investment with residual life of pipes (renewals).	• Detailed hydraulic assessment of multiple options
• Preparation of capital investment plan.	• Determine preferred option for short, medium, and long-term
	• Development of a proposed staging plan
	• Preparation of capital investment plan

1.3 GSIP Planning

1.3.1 Wastewater catchments for GSIP (Growth Servicing Investment Program)

The GSIP (Growth Servicing Investment Program) is a strategic assessment of the existing network capacity to cater for current and projected future flows. GSIP identifies gaps based on the latest growth projections and determines strategic solutions to meet performance criteria while servicing growth. GSIP is not a detailed assessment of the strategic solutions, as such it does not consider multiple options and optimisation to solve capacity issues. GSIP focuses on providing an insight into the short, medium, and long-term strategies and indicative capital investment plan. The strategies developed are directly dependent on current intelligence about growth and consumption rates, as such changes to these would justify a revision every 12 months.

Identify wastewater catchments

The wastewater catchments with growth that require GSIP assessment are identified using the selection process for wastewater systems. (**Refer Attachment 1**) This includes catchments that are identified for planning study as part of the Wet Weather Overflow Abatement program (WWOA).

Determine suitable planning tools

Once the wastewater catchments are identified, then the suitable planning tools (**Refer Attachment 1**) STS trunk model or SCAMP model) can be determined, updated, and validated prior to using for capacity assessment.

The following steps (**Figure 4**) are to be carried out to update the models:

- Collect information regarding system changes that have occurred within the study area to date and is not included in the model. System changes include asset upgrades, known operational capacity issues, rehabilitation such as lining, disused mains, new assets, modification to control systems, population, and other source of dry weather flow update
- Assess system performance for dry and wet weather condition to reflect system changes via MOUSE model base case run.
- Validate the models using the available sewer gauge data. The criteria for validation is “flow variation < ±10%”, and if the variation is more, then the models need to be calibrated by the modeller to meet the criteria by following Good Modelling Practice NPSP0004 (located in Sydney Water server). Validation also includes agreement of current system performance (model results) with internal stakeholders (operations / maintenance / Program Delivery). Note: The criteria of ±10% is considered for strategic planning

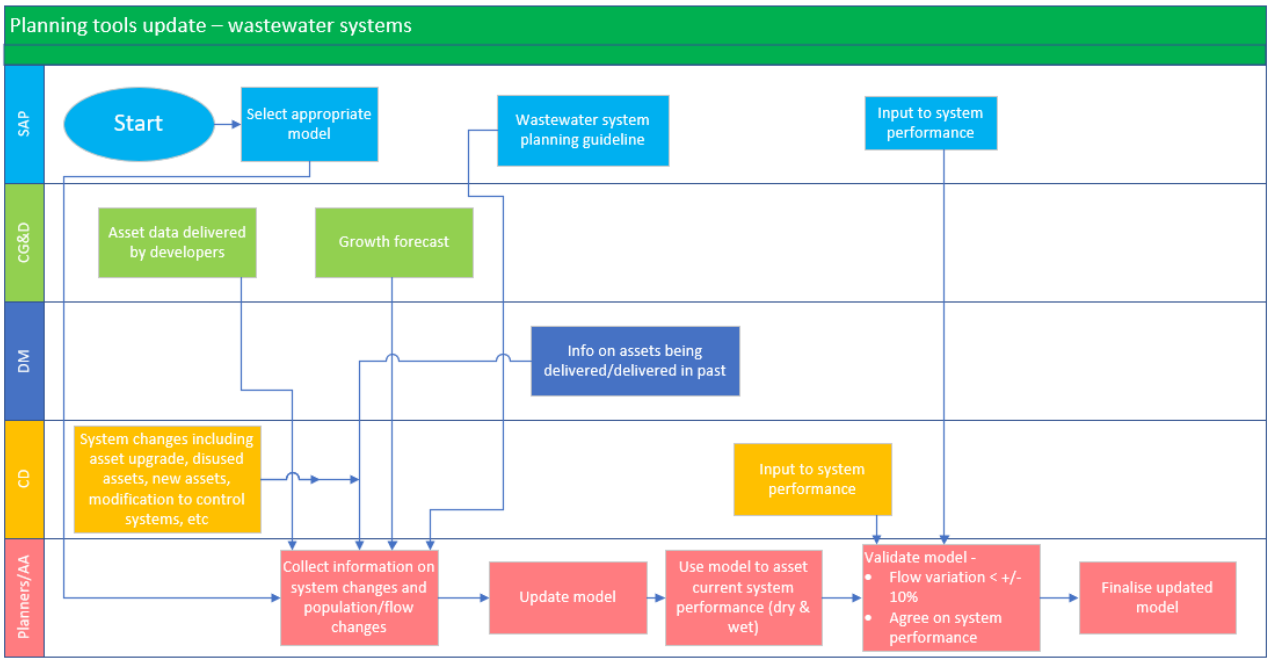


Figure 4: Steps to update models

Note: Document any changes to the model in the Log sheet

2 METHODOLOGY

2.1 Growth data

The growth data for planning purpose is maintained in a MapInfo file database. It contains existing properties, water consumption, population and trade waste properties and future population forecasts including future employment numbers. The database is available at the following location and can be accessed by clicking on the link below. The data covers the entire water and wastewater systems owned by Sydney Water.

N:\MapinfoSource\Planning\Growth forecasts

Residential growth is based on Department of Planning, Industry and Environment (DPI&E) growth projections, compiled by City Growth and Development (CG&D) Growth Planning team within Sydney Water and processed and populated in the above MapInfo database by Asset Analytics (previously known as Asset Knowledge), Sydney Water. Short, medium, and long-term projections are sourced from the Urban Growth Intelligence (UGI) and Housing Supply Forecast Model (HSFM).

Commercial and industrial growth projections are sourced from employment growth forecasts developed by the Bureau of Transport Statistics (BTS) and are also included in the link above.

The property table is updated quarterly (every 3 months) and is available in the same location.

2.2 Environmental Impact Assessment and Approval Pathway

Sydney Water's Environmental Management System (SWEMS) is ISO14001 certified and provides a framework to develop, implement, monitor and review our environmental objectives, actions and targets. We work in alignment with the EMS, by applying the SWEMS0019 Environmental Impact Assessment and Approval Pathway Procedure, which ensures that during planning we:

- identify environmental aspects and mitigate environmental impacts
- document environmental planning and approvals processes
- identify corporate environmental strategies, programs and actions in the environment plan.

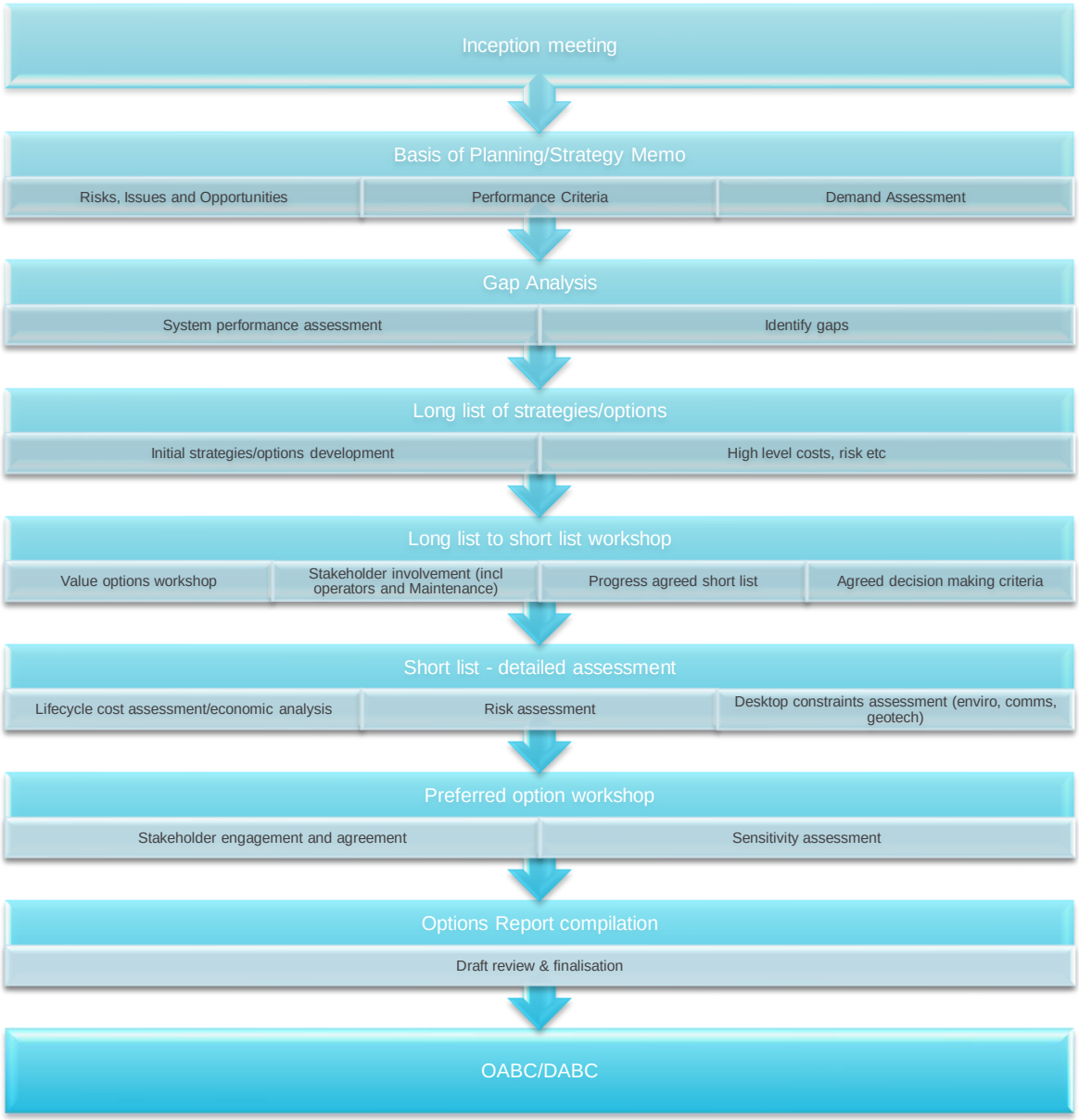
However, there will be continuous input from an environmental representative from strategic planning through to delivery and operations to meet our objectives, actions and targets.

The *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) is the main environmental planning instrument we deliver our projects under. In the planning process, typical deliverables include environmental constraints analysis (ECA) and an environmental impact assessment (EIA), such as a Review of Environmental Factors (REF) or environmental impact statement (EIS).

Sydney Water holds many Environmental Protection Licences (EPLs) under the *Protection of the Environment Operations Act 1997* (POEO Act) to control the impact of our wastewater network and facilities on the environment. These licences are issued by NSW Environmental Protection Authority (EPA) and are available on the public register on their website, and Sydney Water's intranet.

2.3 Planning process

2.3.1 Options Assessment



Note: Applicable to strategic planning

2.4 Base model validation

Base model validation requires the following to be completed:

- Confirm the appropriate models to be used for purpose (planning project) from Asset Analytics (AA) (https://elogin.ads.swc/sites/iConnect/SubContent/1504681931624)
- Planner verifies model to ensure recently delivered assets and recently rehabilitated asset information has been incorporated into the model (such as new mains, pipe linings, disused mains, duplication of mains, pumping station upgrades, rising main upgrades etc- sourced from HYDRA)
- Check SPS operational changes including # pump units due to operational/capacity constraints upstream or downstream. Planner must ensure appropriate pump capacities and configurations are used for modelling.(from Customer Delivery)
- Any pressure systems or private connections that are not included in the model to be captured (information to be obtained from Hydra and System Planning Team – Source Control)
- Confirm potential source control works carried out in the catchment has been incorporated in the model (information to be obtained from Hydra and System Planning Team - Source Control)
- Confirm internal surcharge works have been incorporated to the model (information to be obtained from Hydra and System Planning Team- Source Control)

2.5 Growth and flow forecasting

Flow forecasts are based on growth forecasts. They are used to identify future system capacity requirement to service growth, identify existing system deficiencies and to develop concepts for growth servicing strategies. It is important that the flow forecast is determined for current and future conditions for the identified wastewater catchments following a consistent methodology as described below.

2.5.1 Existing flow

Existing flows are taken from the calibrated models. The suitable planning tool (as determined above) together with the updated property details (2020) will be used to determine the current flows for the catchments as further detailed in this document.

The property table in MapInfo contains existing property details (2020), population, water consumption figures for the different property types and trade wastes and is located at: N:\MapinfoSource\Planning\Growth forecasts

2.5.2 Model update for future flow:

Use the latest property database for growth forecast. Use the software developed in excel (\\ns228nas1\hocpoacis1\oacis\OACIS\Utilities Software) and located at "N:\MapinfoSource\Planning\Growth forecasts" to update models with growth data and the flows (residential and non-residential) within the specific system for the following planning horizons. Note: (N:) defined as (CENTRALISED (\\ADS.SWC\DATA)

The future flow is a combination of the current flow taken from the calibrated models and a flow estimate for each of the planning horizons. First, the system boundary must be understood. Then the planning parameters (i.e. discharge parameters as specified below under 'average dry weather

flow (ADWF) estimation'), are used to estimate future flows for properties using the property tables. Using this estimate, the future flows can be estimated.

N:\MapinfoSource\Planning\Growth forecasts

This property table can be used for growth forecast for GSIP and strategic planning studies. For option assessment, in addition to the above growth forecast, further updated growth information should be obtained from CG&D to ensure latest growth forecast is considered for planning.

The future flow must also consider potential discharge from any growth areas adjoining the existing catchment boundary.

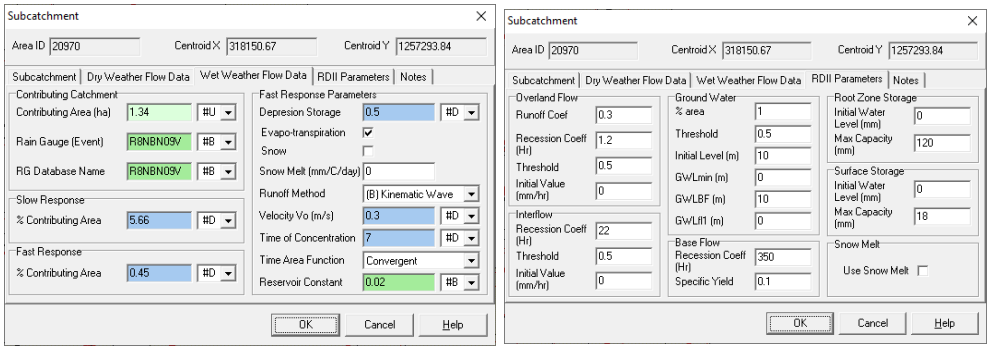
2.5.3 Extension of Existing Model Coverage for Future Flows

For large systems, such as Bondi, Cronulla, Malabar, and North Head, overlay major growth areas over the existing model and determine whether the model needs to be extended to cover any growth area. As a guide for model extension, consider concentrated major developments of more than 500 dwellings as well as system configuration changes

For a major catchment, servicing strategy of the catchment need to be confirmed prior to extend the model for catchment inclusion:

- If there is no servicing strategy available, the area can be included if it can naturally drain to the existing network based on the contours
- However, consideration should be given for a potential pump discharge for out of sequence catchment
- Seek advice from project Technical Lead

Where the planning tool includes the SCAMP models (once updated and validated) and there is a reasonably large concentrated infill growth (say about 200 or more dwellings, confirmed with technical lead of the project), then separate the growth area as a new catchment. Adjust wet weather parameters (for 2% I/I) and area of the existing infill catchment before escalating the I/I for infill catchment for future deterioration.



For systems with greenfield growth the models need to include the input flow from proposed greenfield growth area that would potentially be connected to the system.

Table 1: Planning horizons

Horizon	Notes
Current (2020)	Present day – Calculated as per the instructions for present day in the criteria
Current + 5 **2026**	5-year term and end date for the next IPART submission
Current + 10	10-year short term – DP&E population forecast from its demographic unit

2031	
Current + 20 **2041**	20-year medium term – DP&E population forecast from its demographic unit
Current + 30+ **2051**	30+ year long term – DP&E population forecast from its demographic unit

These are the planning horizons to be considered for planning purposes. However additional suitable planning horizons to be determined in consultation with technical lead by the planning team (as required).

Average dry weather flow (ADWF) estimation

The following flows are to be applied:

Table 2: Flows to be applied for existing and future systems

Existing System	Future System
RESIDENTIAL	
Use the existing model parameters	Residential discharge for existing population, same as the existing model parameters Future population discharge is 150 l/p/d
COMMERCIAL/INDUSTRIAL	
Use the existing model flows and/or property table	For flow by 2026 Combination of existing commercial/industrial flow and the future forecast in the property table (given as employee numbers) Use factor of 0.225 to convert employee number to equivalent population (EP)
	Future commercial / industrial flows based on property table converting employee number or hectares into EP
BASE FLOW	
Use the existing model flow	New catchment/sub-catchment to be created in the model will need to include 10% of total dry weather flow as the base flow

Peak dry weather flow (PDWF) estimation

The planner is to use the existing diurnal curves given in the model for existing residential and commercial/industrial areas. For new development areas, the planner should use the diurnal curve from a neighbouring catchment.

The planner will provide flow forecasts to the wastewater treatment planners to assess impact on the related wastewater treatment facilities. Therefore, the planner must confirm that the existing model flow represents the actual (gauged) flow at the treatment plant.

Wet weather flow (WWF) estimation

- Use the current inflow/infiltration (I/I) parameters for the existing systems to estimate future wet weather flow, if the system is implemented with source control works
- If not, use historical trend of I/I for 10 years **(Attachment 9)** to determine the I/I parameters for future scenarios
- Use I/I deterioration for next 20 years and no change beyond 20 years
- Use 2% I/I for new growth areas assuming low infiltration sewer
- Use 1% I/I to new areas served by pressure systems
- Rain events to determine overflow frequency for future growth scenarios will be based on ten years of actual data from 1985 to 1994
- Contributing area of catchment refer **Attachment 3**

Hold point No.1 – Stakeholder Review – Flow forecast

1. Peer review (meeting) to be conducted on growth figures, flow forecast, and model extension (if required)

2. Once the growth and flows have been determined for each of the planning horizons, a summary of these must be prepared and distributed to key stakeholders who are part of the project team

Once these have been reviewed by stakeholders (stakeholders will be decided at the start of the project (part of CSAP Consultation Action Plan) the planner can:

3. Provide population growth and flow forecasts (total, residential, and non-residential) to the wastewater treatment planners to assess impact on the related wastewater treatment facilities

4. Continue with identifying system performance deficiencies

2.6 Network Performance Assessment

This section describes how to assess system capacity and performance for the current and future planning horizons of 2026, 2031, 2041 and 2051.

2.6.1 System Performance Compliance Criteria

The wastewater planning criteria to be used for system performance assessment are listed below. In addition, refer to Sewerage Code of Australia (SW Edition) - Version 4 and Version 3, Sewage Pumping Station Code of Australia (SW Edition), Pressure Sewerage Code of Australia, Vacuum Sewerage Code of Australia.

Dry Weather

- No dry weather overflow in the networks and SPSs
- No dry weather by-pass from WWTPs/WRPs
- Peak dry weather shall be less than 60% pipe full capacity to provide satisfactory operation and maintenance
- At SPSs, greater than 4-hour emergency detention time available for peak dry weather flow volume of 4-hour moving average during the day
    - Detention time should be calculated by following the methodology described in *Methodology to estimate Detention Time at sewage pumping stations* and the spreadsheet specified in **Attachment 13**.
    - For an existing pumping station – 4-hour detention time requirement should be checked for failures of both pumping station as well as the rising main

- For new pumping stations – the capacity should be designed to meet the 4-hour emergency detention time
- Solutions such as generator, power upgrade, storage tank etc to address the 4-hour requirement, should be assessed against failures of both pumping station as well as the rising main, to ensure the related risks are addressed

Chokes and odour

- *Environment Protection Licence O4.*8 - For the purposes of determining whether the system environmental performance has fallen below existing system environmental performance:

a) In relation to chokes, the licensee is to compare the average number of chokes per year per 100km of pipe in the reticulation system of all of the licensee's wastewater treatment systems averaged over the period 1 July 1995 to 30 June 2000 to the average annual number of chokes averaged over all of the licensee's wastewater treatment systems over the reporting period and the preceding four twelve month periods;

b) In relation to odour complaints, the licensee is to compare the number of odour complaints from the reticulation system per year averaged over the period 1 July 1995 to 30 June 2000 to the average annual number of odour complaints over the reporting period and the preceding four twelve-month periods.

c) In the system performance workshop, CD will be invited and will have the opportunity to report any known issues

Wet Weather

Sydney Water has reviewed EPA's licencing targets for wastewater systems and has transitioned away from frequency targets to risk based licencing overflows in the four big systems (Bondi, Cronulla, North Head and Malabar systems). EPA have regulated Sydney Water to 60 points (PRP307) through WWO abatement works during the 2020-2024 period. Refer to the *Wastewater Overflow Abatement Guidelines* for further information.

In addition to the high-risk overflows, the EPA licence requires no deterioration and continuing improvement in the wastewater treatment system environmental performance relative to 2017 baseline performance. The criteria for wet weather performance can be found as per (**Attachment 2** "Wet weather performance for wastewater systems") and described below.

Four big coastal systems

As mentioned above, the four big systems Bondi, Cronulla, North Head and Malabar must be assessed against the following performance criteria. For detailed description of the criteria, refer to W*et Weather Overflow Abatement Guidelines*.

- Identify high-risk ERSs and assess their performance
  - Reduce Category 1, 2 & 3 overflows to the relevant long-term target and go beyond this benchmark if it is justified by a positive benefit-cost ration (BCR).
- If there exists high risk ERSs, then their performance must meet the points set by EPA by means of volume and frequency reductions.
- Other ERSs and manholes to satisfy the no deterioration criteria:
  - The frequency of Category 4 & 5 SCAMP overflows cannot increase beyond the current level (2017 base year) if they already exceed the long-term frequency target. We have a tolerance of 10% increase in frequency (individual overflow) as determined by the relevant system wastewater network (MOUSE) model.
  - Overflows below the target can deteriorate up to the frequency target which is documented in the relevant Environment Protection Licence (EPL).

All other wastewater systems

- The performance of these systems must meet their corresponding EPL targets
- Systems with interim and long-term targets must consider both targets and confirm the timing and EPL requirements
    - If the overflow frequency of an existing Emergency Relief Structure (ERS) for current and future scenario is less than the EPL or agreed SOLP target, then no improvement works is required.

      For example: SOLP target for St Marys is 20 in 10 years.

      If overflow frequency of each ERS is < 20 in 10 years, then improvement works not required
    - If the overflow frequency of an existing ERS for current and future scenario is less than the current EPL target then, maintain the system overflow frequency below current EPL target.

      For example: current EPL target for St Marys is 35 in 10 years

      If o'flow frequency is < 35 in 10 years, then improvement works not required for each ERS, provided the system frequency does not exceed 35 in 10 years.
    - If the overflow frequency of an existing ERS is more than EPL limit and is not in Bondi, Cronulla, Malabar, or North Head, then improvement works will be required to meet the current EPL limit and must be included in works plan.

      For example: current EPL limit for St Marys is 35 in 10 years

      If each ERS o'flow frequency is > 35 in 10 years, then improvement works is required to maintain the o'flow frequency of each ERS and the system below 35 in 10 years.

Wet weather surcharge

- No customer experiences a repeat surcharge inside their home
- No customer experiences manhole surcharge within property boundary at a frequency more than 5 times in 10 years (2-year ARI) as per design standard.

Wastewater Treatment Plant by-pass

Each Treatment Plant performance should not exceed the primary disinfection capacity as per the EPL limit (O4.9). (Refer **Attachment 3**).

2.6.2 Existing system performance assessment

The system performance against the above criteria is to be assessed for:

- An absolute dry week (7 days)
- Wet weather 10 years' simulation between 1985 and 1994

Dry weather performance

Use the validated base model version 1 (as determined above in Section 2.3) to assess the existing system capacity and performance for dry weather, for current and future flow conditions.

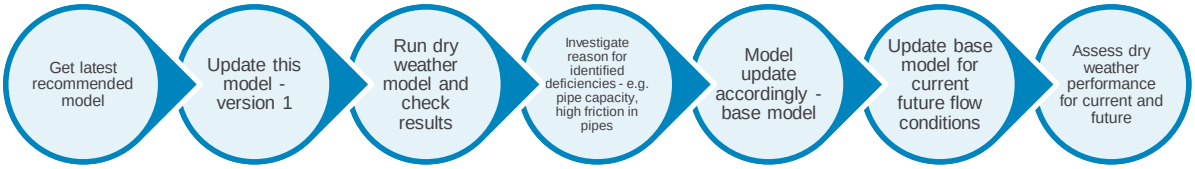


Figure 5: Dry weather performance procedure

Assess and compare the system/catchment performance to other available existing catchment/system performance such as STS licence report, any other planning reports. Following network performance can be assessed against the system performance criteria.

- Sewer mains
  - Pipe full capacity
  - Choke complaints (refer U9 in the EPL)
  - Any rehabilitation works completed in the past including desilting
  - Any new assets laid in the area
- Pumping stations
  - Pump capacity, any recent pump test data available
  - Pump operational configuration changes
  - Renewal works (completed/in progress/planned)
  - Age of assets
  - Power requirements
  - Rising main capacity including velocity, age of rising main, condition assessment, failure history of rising main and potential single point failure
  - Contingency arrangements
  - Population being served by this pump catchment
  - Odour issues
  - Any odour control units (OCUs), chemical dosing units (CDUs) at site
  - Operation and maintenance constraints
  - Reference to risk assessment register
- Pressure sewer system (including PSP areas)
  - Identify any pressure systems connected to this catchment
  - Any known operational issues
  - Any known odour issues
- Reliability
  - Any known reliability issues
  - Any potential reliability issues
  - Check age of assets
  - Any known historical failure

- Odour
    - Any known odour issues
    - For existing or new pump stations, there is the need to carry out odour assessments. Contact Service Planning Senior Analyst - Asset Planning and Service Planning Lead - Treatment Planning for assessments.
    - Refer to Corrosion and Odour Guidelines for odour assessment (**Attachment 14**– Corrosion and Odour Guidelines)
    - Any odour control units (OCUs) installed at site
    - Any chemical dosing units (CDUs) installed at site
    - Any upgrades required at site
    - Identified with potential upgrade with odour units for future by the past odour study
- Renewals/rehabilitation
    - Contact CD and obtain existing renewal program for any assets that have been identified with capacity inadequacy and for potential amplification works
    - Assess any potential integration to renewal program regarding assets and timing
- Siltation
    - Assess the performance to confirm contribution of siltation (pipe section with less than 0.6 m/s velocity and/or with high friction factor)
    - Inform CD by email for desilting if the siltation is affecting the hydraulic capacity considerably
    - Refer to any known siltation issues and traverse reports of necessary
- Sea water ingress
    - Identify any known sea water ingress into assets near waterways
    - Refer to ingress assessment carried out in the past (*"SPS Tidal Inflow Summary.xls"* located in R:\SCAMPS\Tidal_Influences_to_SPS)

Note: Dry weather results from model simulation is to be treated as a starting point. Any capacity deficiencies identified should be investigated against the actual field performance and model parameters. The model must be verified and updated where necessary before proceeding to further analysis.

If model is updated, the dry weather performance is to be reassessed.

Wet weather performance

Use the validated base model (as determined above) to assess the existing system capacity and performance for wet weather.

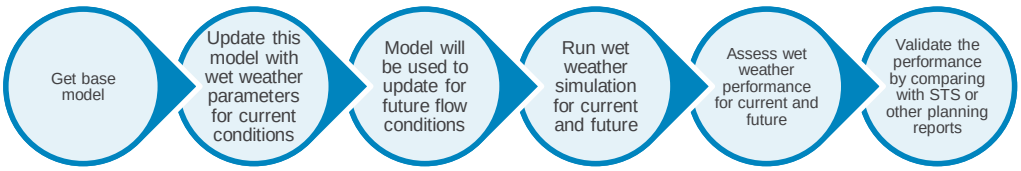


Figure 6: Wet weather performance procedure

Compare the system/catchment performance to other available existing catchment/system performance such as STS licence report, any other planning reports. Assess the performance against the above wet weather performance criteria. Planner to investigate the reasons if there are major differences and inform the project team.

- Individual ERS performance for no deterioration
- High risk ERS
    - Frequency reduction
    - Volume reduction
- System performance
- Analyse the Inflow/Infiltration (I/I) performance
- 2-year ARI performance for potential wet weather surcharge
- Sewer mains
    - Capacity constraints
- Spilling manholes
- Pumping stations
    - Capacity check
    - Rising main capacity
- Pressure sewer system
    - Any capacity issues
    - Transfer main capacity
- Sewer mining
    - Identify any sewer mining in operation in the catchment comprising the study area
    - Gather information on the flow extraction and document it
    - Use the details to assess the downstream sewer system
- Treatment plant
    - Inlet capacity
    - Bypass frequency
    - Liaise with treatment group

Note: Communicate with treatment planners on necessary upgrades required.

Wastewater Treatment Plant by-pass

Each Treatment Plant performance should not exceed the primary disinfection capacity as per the EPL limit (O4.9). (Refer **Attachment 2**)

2.6.3 Future System performance

Identify 60% pipe full during peak dry weather that may cause an increase in wet weather overflows (area dependent), when

- There is potential for significant growth in the catchment
- Dry weather flow is greater than 200 l/s (200 l/s max flow which can be pumped out)
- Sewer are more than 5.5m deep (no pump available on the market to pump flow out, by-pass arrangement is not possible)

- Sewers have low grade and are silt prone (60% or 80% pipe full will quickly become 100% full)
- Sewers are old, located in a built-up area and by-pass arrangement could be challenging and costly
- Triggers operation / maintenance issues including siltation in a built-up area (risk to be assessed)

To minimise the planning effort, the planner is to start with the 2046 planning horizon. If system has adequate capacity to meet the dry and wet weather performance criteria and no deficiencies were identified, then the planner can assume that the system will have capacity for the planning horizons before the ultimate planning horizon.

If there is a deficiency identified at 2046, then assess the performance for 2036 planning horizon. If there is insufficient capacity to meet the performance criteria, then assess the performance for 2021 scenario and progress to 2026 scenario.

To assess system deterioration (including WWTP/WRP bypasses) the planner needs to compare system overflow frequency for different planning scenarios to the system overflow or licence overflow limits. For more information regarding system deterioration refer to **Attachment 2**

Every assessment and output must follow the checklist as per **Attachment 5** in the Appendices.

2.6.4 Dry Weather performance

- *Sewer Pipes – Dry Weather Performance* For each model run, the planner will prepare a Figure showing DWF capacity and a list of pipe sections where the depth exceeds 60% of pipe height at PDWF.
- *Sewage Pumping Station (SPS) Performance:* The planner will prepare a summary Table of all modelled SPSs listing the current and future detention times (refer to **Attachment 13**), and current contingency arrangements. Highlight the SPSs with less than 4hr and 2hr emergency storages and without contingency arrangements.

2.6.5 Wet Weather performance

- *ERSs – Wet Weather Performance:* For relevant model runs the planner will prepare a Figure showing predicted overflow frequency for standard 10-year rainfall time series and a Table listing details of wet weather overflow activation of directed overflows and spilling manholes (MHs) for existing and future scenarios.
- *2 Year ARI – Wet Weather Performance:* The planner will prepare a summary Table of all modelled MHs listing the current and future performance, if they are within property boundaries.

Hold point No 2.

Peer review (a short presentation during a meeting) of the existing system performance and deficiencies to service growth, by selected members of SAP,CD and other relevant stakeholders. The review will identify the major areas that will require network amplification for growth servicing and compliance to wet weather performance targets (EPL / SOLP / 2015 performance).

2.7 System Amplification Strategy

2.7.1 Strategies

For system amplification, the planner shall develop a feasible strategy for 2046 scenario to ensure the system performance meets the wastewater planning criteria. In determining the solution, the planner must consider existing network capacity issues, operational issues, network condition assessment and renewal works. The planner will then stage the proposed strategy based on the performance identified for all the planning horizons.

For the major development sites, the planner is to use design criteria shown in **Attachment 3**.

Hold point No 3.

Internal peer review (meeting) of the proposed solution and sign off by SAP managers.

2.7.2 Long list of potential options

Options development:

When developing options, the planning team must focus on the licence requirements. Some systems have interim (due for review in 2021) and long-term targets and the options assessment must consider both requirements and accordingly determine the optimised solution and the capital investment. For example: if an asset is upgraded, it could potentially be planned to satisfy the interim target whereas if it is a new asset, it must be planned for the long-term targets.

The planners should also consider in the options assessment the resilience into decisions to meet customers' aspirations and the risk appetite of the Board. A systems approach is required to protect against all possible shocks and stresses. Refer Business Resilience Policy

http://nt032pdmnotes.swc/BMIS/SWDOCCONTROL.NSF/ALLACTIVE/D0000503/$FILE/D0000503.docx?OPENELEMENT

The long list of options that can be considered in general (but not limited to) are shown below.

Servicing options for greenfield and brownfield areas:

- Gravity mains
- Pumping stations (new, upgrade or consolidation)
- Storage
- Pressure systems
- Precinct-scale treatment plant and network
- Potential recycled water plant
- Flow transfers
- Raising of ERS level

Dry weather:

Sewer mains

- Amplification
- Duplication
- Replacement

- Diversion of flows into alternate system or branch
- Recycle water to reduce dry weather flows (sewer mining)
- Reduce the base flow
- Desilting
- Relining
- Reduce water consumption rate – L/EP/day

Pressure mains

- Amplification
- Duplication
- New main with existing one as a contingency
- Extension and new discharge point

SPS

- Provide 4 hours storage – this must be checked against the requirements to address the pumping station failure, rising main failure and the wet weather requirements
- Provide generator
- Provide diesel or gas pump
- Dual power supply
- Decommissioning of pump stations
- Consolidating with nearby pumping stations
- Replacement of pumping stations
- Or a combination of the above

Wet weather:

Wastewater mains, ERS discharge and MH spillage

- Source control of Sydney Water Assets
- Amplification
- Duplication
- Replacement
- Diversion of flows into alternate system or branch
- Recycle water to reduce dry weather flows (sewer mining)
- Reduce the base flow
- Reduce water consumption rate – L/EP/day
- Modification of pumps operating levels (for the pipes affected by pump operating levels – backwater)
- Weir Modifications
- Back flow prevention (headwall/MH replacements, valve installations)
- Perform source control on private properties
- Provide local storage for ERS and MH discharge
- Upgrade SPS capacity

- Construct new wet weather overflow only after all reasonable alternative measures have been taken (see hierarchy of options in Wet Weather Internal Surcharge Decision Framework,
- http://nt032pdmnotes.ads.swc/BMIS/SWDocControl.nsf/26c11579a7df664aca258407001b9d1c/$FILE/D0001361.pdf

2.8 Short-listed options

The fatal flaw analysis to be carried out on the long-list options which will determine the short-listed options.

2.9 Capital Estimates

Should a capital investment be required for future planning horizons, cost estimate needs to be carried out using Sydney Water's latest cost estimating tool. The cost estimating tool can be found as "*Sydney Water Cost Estimating Tool - Revision 19.07.02*" in N:\LCS_ISP\Projects\6. Business Process Projects\20035611 Cost Estimator Tool Upgrade\3. Execute\11. Deliverables. Cost estimates of the preferred option need to be verified by Delivery Management.

The cost estimate must include allowances for scope development contingencies for different degrees of development (greenfields to high density built-up areas), indirect cost, operation, and maintenance costs etc. Refer to **Attachment 7** for Information Sheets 1, 2 & 3 (2012) with standard percentages to be considered for the above allowances.

The planner should consider the following in determining the capital cost of each amplification.

Amplification works are not limited to:

- pipe amplification (low/high level)
- pump upgrade including rising main upsizing and water hammer mitigation measures
- new rising mains
- storage tanks (no treatment options)
- potential source control.

And need to include:

- Purchase of land / easements
- The size, type, and material of the proposed asset/amplification
- The location. The location can add costs to items such as restoration work hours
- Need for power upgrade
- Construction methodology, whether tunnelling or boring required
- Any river / railway crossings required

Refer to Error! Reference source not found. for information sheets regarding options maintenance c osts, contingency and indirect costs.

Once the preferred option is determined, the capital cost needs to be completed for P50 and P80 with a contingency of 20%. On top of this, the capital uplift (latest) must be added to get the total cost of the project.

2.10 Preferred options

The preferred options to be determined based on the least life cycle cost with acceptable risk. However, the planning team must refer to the planning decision framework (D0000732).

The preferred options must be assessed for a sensitivity of +/- 10% growth forecast to confirm the proposed infrastructure size, cost, and staging.

2.11 Reporting

For documentation, appropriate report template should be chosen from “Planning Portal – Template” in iConnect (Link: https://elogin.ads.swc/sites/iConnect/SubContent/1504673326145)

2.12 Quality

The planner should complete the verification plan for growth servicing strategy and endorsed by their respective manager at each major milestone. A verification plan template is provided in **Attachment 4.**

3 CONTEXT

3.1 Definitions

Term	Definition
ADWF	Average dry weather flow
BASIX	Introduced by the NSW Government, BASIX, the Building Sustainability Index, ensures homes are designed to use less potable water and be responsible for fewer greenhouse gas emissions by setting energy and water reduction targets for house and units.
CAPEX	Capital Expenditure
CD	Customer Delivery
CSP	Collaborative Services Planning
DIPs	Development and Infrastructure Portfolio services
DPIE	Department of Planning Infrastructure and Environment
EP	Equivalent Persons
EPL	Environment Protection Licence
GSC	Greater Sydney Commission
GSIP	Growth Servicing Investment Plan
HSFM	Housing Supply Forecast Model
IICATS	Integrated Instrumentation Control Automation and Telemetry System
MDD	The maximum daily demand that occurs during a given period
OACIS	Overflow Abatement Customer Information System. Mapinfo table containing property details including population projections
PDWF	Peak Dry Weather Flow
PWWF	Peak Wet Weather Flow
SAP	Systems and Asset Planning
SPS	Sewage Pumping Station
STS	Sewage Transport System
WRP	Water Recycling Plant
WSAA	Water Services Association of Australia
WWTP	Wastewater Treatment Plant

3.2 Responsibilities

Position	Responsibility
System and Asset Planning	Approve changes and updates to guideline Coordinate changes and updates to procedure

3.3 References

Document type	Title
Legislation	*State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) *Protection of the Environment Operations Act 1997* (POEO Act)
Licences and process flow diagrams	Sewage Treatment System Licences
Policies and procedures	Environmental policy, Trade waste policy, Sewer Overflow Policy
Forms and checklists	Verification Plan for 2017 (**Attachment 5**)
Other documents	GSS 2012, WSAA codes
Tools	MEERA, Cost Estimating Tool, OACIS, Econv

3.4 Attachments

Attachment number	Attachment name
Attachment 1	Selection of planning projects for wastewater systems
Attachment 2	Wet weather performance criteria for wastewater systems GSIP-2017 Wastewater systems wet weather overflow performance
Attachment 3	Design criteria for the different land uses and wastewater networks
Attachment 4	Verification plan for wastewater review process
Attachment 5	Checklist
Attachment 6	SPS planning assessment
Attachment 7	Information sheets
Attachment 8	Detailed process chain/ planning map
Attachment 9	I/I percentage
Attachment 10	Sydney Water average HHsize PPG2014 (Population Density)
Attachment 11	Source control works effectiveness assumptions and cost
Attachment 12	Wastewater Overflow Abatement - Guideline
Attachment 13	Detention time spreadsheets
Attachment 14	Corrosion and Odour Guidelines

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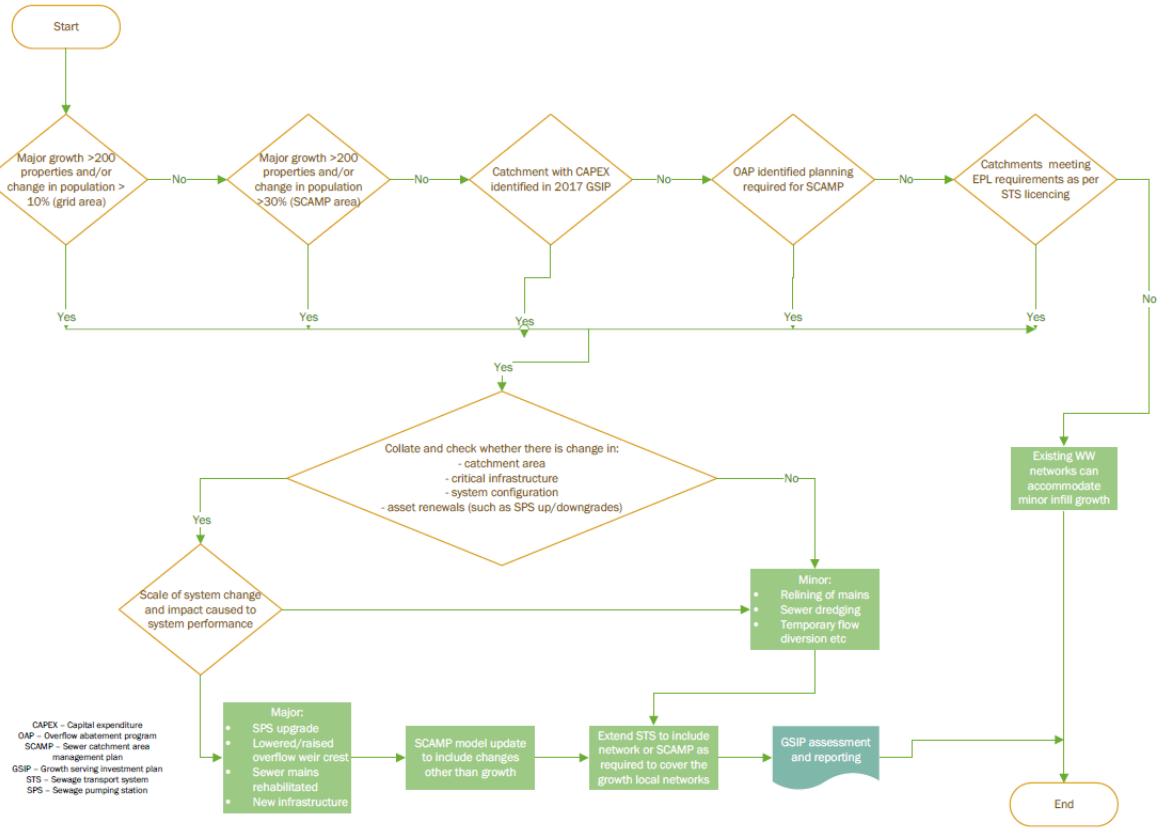
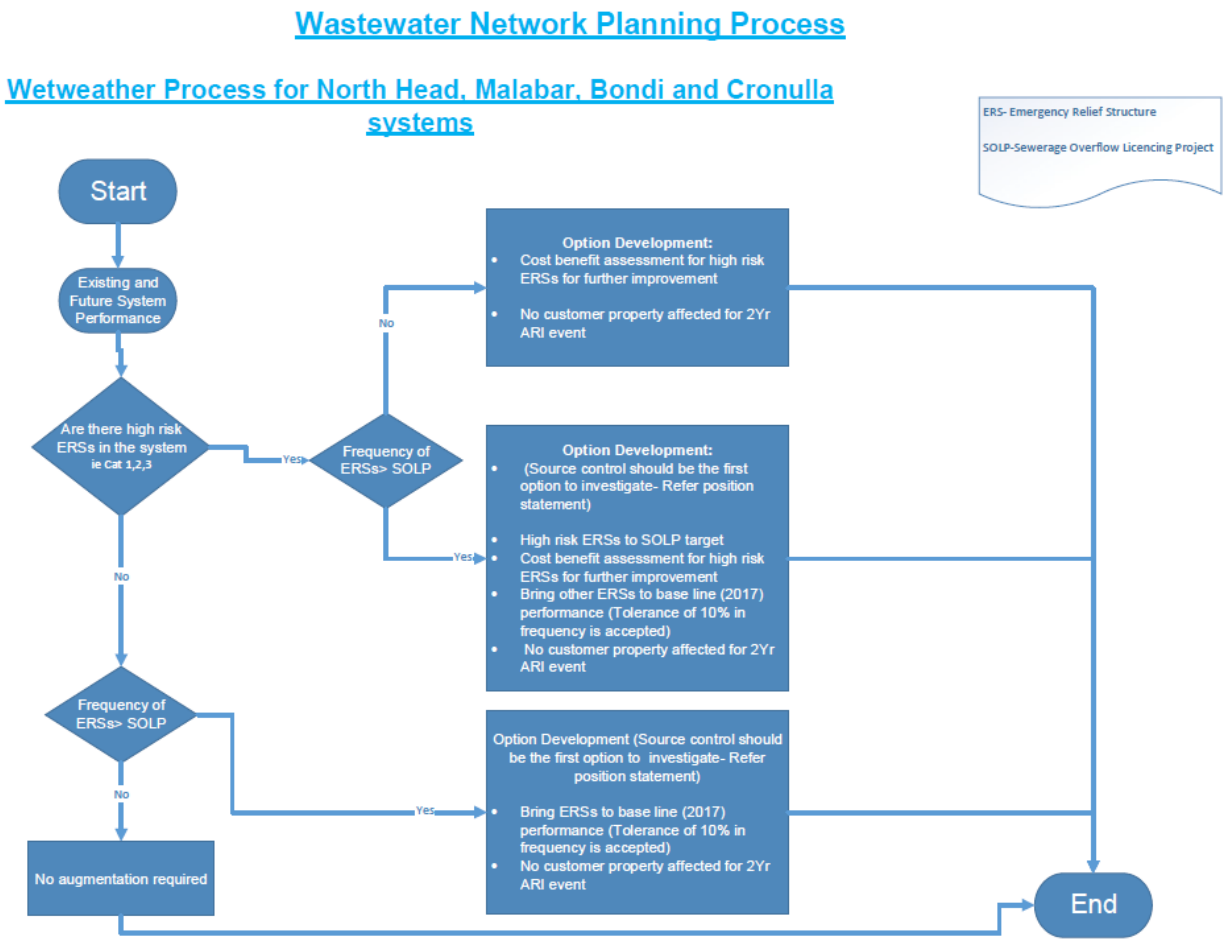
Attachments

Attachment 1 – Selection of Planning Projects for Wastewater Systems



Attachment 2– Wet Weather Performance Criteria (PRP307) for no Deterioration of 4 Coastal Wastewater Systems. (Bondi, Cronulla, North Head, Malabar)



Wastewater systems wet weather overflow performance

Note: The below table is based off 2020 annual reporting. Future outcomes and reporting should be referred accordingly to the updated versions of annual reporting.

Groups: A, B, C & D – Assessing limit conditions for networks (L7.2) and no deterioration conditions for partial treatments (O4.9)

System	Sub-system	Reticulation system overflow			Exceedance of primary disinfection capacity				Compliance achieved	
		(A) L7.2 Limit events/10yrs	(B) 2019 events/10yrs	2018 events/10yrs	(C) O4.9 Limit events/10yrs	Year	(D) 2019 events/10yrs	2018 events/10yrs	L7.2 Compliance (B) ≤ (A)	O4.9 Compliance (D) ≤ (C)
Winmalee	Blackheath	10	7	8	33	2001	26	26	Yes	Yes
	Mount Victoria	10	6	8	88	1999				
	Winmalee	10	10	8	32	2002				
North Richmond	North Richmond	10	16	16	20	2001	0	0	No	Yes
Richmond	Richmond	19	10	10	32	2002	0	0	Yes	Yes
Riverstone	Riverstone	14	14	12	11	2002	0	0	Yes	Yes
Wallacia	Wallacia	25	61	61	74	2002	0	0	No	Yes
West Camden	West Camden	18	14	14	65	2001	0	0	Yes	Yes
Castle Hill	Castle Hill	20	20	20	116	1994	116	114	Yes	Yes
Hornsby Heights	Hornsby Heights	27	11	11	48	2002	40	40	Yes	Yes
Rouse Hill	Rouse Hill	12	21	21	69	2000	0	0	No	Yes
West Hornsby	West Hornsby	27	27	27	46	1994	36	36	Yes	Yes
Bombo	Bombo	40	38	36	17	2002	15	16	Yes	Yes
Shellharbour	Shellharbour	45	56	47	52	1994	4	0	No	Yes
Penrith	Glenbrook	10	7	7	121	2001	5	5	Yes	Yes
	Penrith	36	32	32	198	2002			Yes	
Quakers Hill	Quakers Hill	48	40	40	134	2001	0	0	Yes	Yes
St Marys	St Marys	35	38	38	153	2001	116	109	No	Yes
Warriewood	Warriewood	31	22	22	92	2001	39	45	Yes	Yes
Picton[1]	Picton	N/A	6	13	N/A	N/A	0	0	N/A	N/A

System	Sub-system	Reticulation system overflow			Exceedance of primary disinfection capacity				Compliance achieved	
		(A) L7.2 Limit events/10yrs	(B) 2019 events/10yrs	2018 events/10yrs	(C) O4.9 Limit events/10yrs	Year	(D) 2019 events/10yrs	2018 events/10yrs	L7.2 Compliance (B) ≤ (A)	O4.9 Compliance (D) ≤ (C)
Brooklyn-Dangar Island[2]	Brooklyn-Dangar Island	N/A	0	0	N/A	N/A	0	0	N/A	N/A
Wollongong	Wollongong Network	40	49	53	-	-		-	No	-
	Bellambi	-	-	-	114	1994	0	0		Yes
	Wollongong	-	-	-	11	1994	0	0		Yes
	Port Kembla	-	-	-	99	2001	81	81		Yes

Note: 1 The Picton system doesn't have condition L7.2 or O4.9.
2 The Brooklyn-Dangar Island system doesn't have condition L7.2 or O4.9

Groups: E – Assessing - no deterioration conditions for networks (O4.8) and exceedance of primary disinfection / partial treatment (O4.9)

System	Sub-system	Reticulation system overflows				Exceedance of primary disinfection capacity			Compliance achieved	
		(A) O4.8c) Limit events/10yrs	Year	(B) 2019 events/10yrs	2018 events/10yrs	(C) O4.9 Limit events/10yrs	(D) 2019 events/10yrs	2018 events/10yrs	O4.8(c) Compliance (B) ≤ (A)	O4.9 Compliance (D) ≤ (C)
Cronulla	Cronulla	73	2001	69	69	0	0	0	Yes	Yes
System	**Sub-system**	**Reticulation system overflows**				**Partial treatment discharge**			**Compliance achieved**	
		(A) O4.8c) Limit events/10yrs	Year	(B) 2019 events/10yrs	2018 events/10yrs	(C) O4.10 Limit events/10yrs	(D) 2019 events/10yrs	2018 events/10yrs	O4.8(c) Compliance (B) ≤ (A)	O4.10 Compliance (D) ≤ (C)
Bondi	Bondi	154	2002	124	123	5	0	1	Yes	Yes
North Head	North Head Network	228	1994	218	218	1	0	0	Yes	Yes
Malabar	Malabar Network	238	1994	278	278	-	-	-	No	-
	Malabar STP[1]	-	-	-	-	58	7	7	-	Yes
	Liverpool WWTP	-	-	-	-	0	0	0	-	Yes
	Glenfield WWTP[2]	-	-	-	-	28	0	0	-	Yes
	Fairfield SSTP[3]	-	-	-	-	50	112	127	-	No

Note: 1. The Malabar plant partially treats inflows when inflow exceeds 11,600 L/s
2. The Glenfield plant partially treats when the discharge from oxidation ponds exceeds 1,900 L/s.
3. The Licence for this plant, Fairfield specified that the partial treatment capacity is exceeded if any discharge occurs to Orphan School Creek from the plant.

System	*Sewerage Transport Level 2 Catchment*	*L7.2 Wet Weather Overflow Limit (events/10yrs)*	*2019 Model Network Overflow (events/10yrs)*	*SOLP Target*
Winmalee	*Blackheath*	*10*	*7*	*10*
	Mount Victoria	*10*	*6*	
	Winmalee	*10*	*10*	
North Richmond	*North Richmond*	*10*	*16*	*10*
Richmond	*Richmond*	*19*	*10*	*19*
Riverstone	*Riverstone*	*14*	*14*	*14*
Wallacia	*Wallacia*	*25*	*61*	*25*
West Camden	*West Camden*	*18*	*14*	*18*
Castle Hill	*Castle Hill*	*20*	*20*	*20*
Hornsby Heights	*Hornsby Heights*	*27*	*11*	*27*
Rouse Hill	*Rouse Hill*	*12*	*21*	*12*
West Hornsby	*West Hornsby*	*27*	*27*	*27*
Bombo	*Bombo*	*40*	*38*	*32*
Shellharbour	*Shellharbour*	*45*	*56*	*45*

System	Sewerage Transport Level 2 Catchment	L7.2 Wet Weather Overflow Limit (events/10yrs)	2019 Model Network Overflow (events/10yrs)	SOLP Target
Penrith [1]	Glenbrook	10	7	20
	Penrith	36	32	
Quakers Hill [2]	Quakers Hill	48	40	19
St Marys [3]	St Marys	35	38	20
Warriewood [4]	Warriewood	31	22	14
Picton	Picton	N/A	6	-
Brooklyn-Dangar Island	Brooklyn-Dangar Island	N/A	0	-
Wollongong [5]	Wollongong Network	40	49	
	Bellambi	-	-	40
	Wollongong	-	-	
	Port Kembla	-	-	

System	Sewerage Transport Level 2 Catchment	O4.8c) Limit events/10yrs	2019 Model Network Overflow (events/10yrs)	SOLP Target
Cronulla [7]	Cronulla	73	69	40
	#Every over flow within Cronulla SCAMP	-	-	40
Bondi [6]	Bondi	154	124	20
	#Sydney West SCAMP	-	-	20
North Head [8]	North Head Network	228	218	
	#Every over flow within the following SCAMPS			
	North Sydney			20
	Cremorne			
	Cromer			

System	Sewerage Transport Level 2 Catchment	O4.8c) Limit events/10yrs	2019 Model Network Overflow (events/10yrs)	SOLP Target
	Collaroy			
	Narenburn			
	Manly			
	Brookvale			
	Curl Curl			
	In addition NST 5 over flows, East Lane,Scotts Creek,Tunks Park, Quackers Hat Bay, Shelley Beach			20
	Tarban Creek Overflow			40
Malabar [9]	Malabar Network	238	*278*	
	#Every over flow within following SCAMPS	-	-	
	Peakhurst	-	-	40
	Penshurst	-	-	

Notes:

[1] Penrith System – interim Licence limit is 36 o'flows/10 years by June 2021. The long term limit may change to 20 o'flows/10 years. (not yet in the licence)

[2] Quackers Hill System – interim Licence limit (U1 PRP302) is 48 o'flows/10 years by June 2021. The long term limit (PRP 302.5) is 19 o'flows/10 years by 2021

[3] The St Marys System – interim Licence limit is 35 o'flows/10 years by June 2021. The long term limit (not yet in the licence) may change to 20 o'flows/10 years

[4] The Warriewood System – interim Licence limit is 31 o'flows/10 years by June 2021. The long term limit (not yet in the licence) may change to 14 o'flows/10 years

[5] The Wollongiong System – interim target for Belambi, Wollongong and Port Kembla is 43 o'flows/10 years (in the licence under PRP302). The long-term limit (U1.2 PRP 302.2) is 40 o'flows/10 years.

[6] The Bondi System – the long-term licence limit (PRP303) is 20 o'flows/10 years by 2021

[7] The Cronulla System – the long- term licence limit (PRP302.2) is 40 o'flows/10 years by 2021

[8] The North Head System – the long- term licence limit (PRP303) is 20 o'flows/10 years by 2021

[9] The Malabar System – the long- term licence limit (PRP303) is 40 o'flows/10 years by 2021

[#] The Performance of these system must meet Licence Limit as well as SOLP target.

Attachment 3 – Design Criteria for the Different Land Uses and Wastewater Networks

Item	Design Criteria	Units		Wastewater
Single dwelling residential	person	person/dwelling (occupancy ratio)		Ref **Attachment 10** "SydneyWater average HHsize PPG2014.xlsx" "Detached dwellings"
Medium density residential (townhouses/up to 4 storeys)	person	person/dwelling		Ref **Attachment 10** "SydneyWater average HHsize PPG2014.xlsx" "Detached dwellings"
High density residential (>4 storeys)	person	person/dwelling		Ref **Attachment 10** "SydneyWater average HHsize PPG2014.xlsx" "Attached dwellings"
Employment number/students	EP	EP/job EP/students		0.225[2]
Light industrial	EP	EP/ net ha		30-50[1]
Heavy industrial	EP	EP/ net ha		150[1]
Commercial	EP	EP/ net ha		75[3]
Design flow This can be determined using: - hydraulic model - flow schedule (available on the Sydney Water website)	Average Dry Weather Flow (ADWF)	L/person/day		150
	Dry weather peaking factor (d) is a function of the gross development area in hectares	n/a		$d = 0.01(\log A)^4 - 0.19(\log A)^3 + 1.4(\log A)^2 - 4.66(\log A) + 7.57$ Where A is gross plan area of the development's catchment in hectares
	Peak Dry Weather Flow (PDWF)	L/s		PDFW = d x ADWF
	Wet Weather contributing area	Low density	hectare	**(Total EP)/45**, limited to maximum of 100%
		Medium density	hectare	**(Total EP)/75**, limited to maximum of 100%
		High density	hectare	**(Total EP)/150**, limited to maximum of 100%

	I/I	%	• No I/I deterioration for areas with source control works being implemented • I/I to be forecasted based on the available historical trend for the past 10 years I/I% for each system **(Attachment 9)** • I/I deterioration to be applied for the next 20 years and no further deterioration beyond • For all new areas 2% I/I • 1% I/I for pressure sewer systems Refer to **Attachment 10**
Design flow for low infiltration sewers		L/s	Use the flow schedules and/or use MOUSE model results to verify the target EPL targets. If MOUSE model is not available (greenfield areas), model needs to be built.
Pump units	Pump design capacity	L/s	Minimum 2.5 x PDWF[4]
Pump units	Maximum pump head	m	70m otherwise assume pumps in series required
Pump station (civil structure)	Emergency storage	KL or ML	4 hrs x PDWF – system storage Or alternate arrangement such as permanent generator/dual power supply or operation contingency plan
Gravity main	Minimum diameter	mm	150
Rising main	Capacity	L/s	Maximum available capacity ≥ to total pump station capacity
	Minimum velocity	m/s	0.75
	Target velocity	m/s	1.2-1.8
	Maximum velocity	m/s	2 m/s

			Where this is exceeded, suitable control measures need to be investigated and incorporated within the design.
Odour **(refer to *Odour Guidelines*)**	Hydraulic retention time (HRT)	hours	<2 hours

Note: ***The above SPS criteria should be used along with SPS WSA code***

All areas refer to gross hectares

[1] Planners should explore this to determine the number relevant to the site, potentially using information from developers or for similar known industrial commercial developments.

[2] Where employment number is given, EP should be calculated based on employee count.

[3] When no employment number is given, use net hectare (if known) to estimate the EP, otherwise assume 80% of the total area as the net area to estimate the EP.

[4] This is applicable for new pumping stations in greenfield area. New pumping station or pump units due to renewals in infill area will need to consider downstream impact, existing rising main and civil structure conditions.

Attachment 4 – Verification Plan for Wastewater System Review Process

https://sydneywatercorporation.sharepoint.com/:w:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Verification%20Plan_detail%20planning.doc?d=w21cef6f39e0b459a9771d8859ead47e3&csf=1&web=1&e=QznKL9

Attachment 5 – Checklist

Outputs	
DRY WEATHER PERFORMANCE	
Sewer mains	☐ Pipe full capacity ☐ Choke complaints (refer U9 in the EPL) ☐ Any rehabilitation works completed in the past including desilting ☐ Any new assets laid in the area
Pumping stations	☐ Detention time (refer to **Attachment 13**) ☐ Should the 4-hour detention time be maintained, to address the rising main failure risk ☐ Contingency arrangements ☐ Operation and maintenance constraints ☐ Power requirements ☐ Pump capacity ☐ Pump operational configuration changes ☐ Renewal works (completed/in progress/planned) ☐ Age of assets ☐ Population being served by this pump catchment ☐ Odour issues ☐ Any odour control units (OCUs), chemical dosing units (CDUs) at site ☐ Reference to risk assessment register ☐ Summary table of all modelled SPSs listing current and future detention times and current contingency arrangements (refer to **Attachment 13**) ☐ Highlight SPSs with less than 4hr and 2hr emergency storages and with no contingency arrangements ☐ SPS planning assessment (example can be found in Error! Reference s ource not found. below) ☐ Inflow to the pumping station (ADWF, PDWF, design wet weather flow from model, diurnal graphs)
Sewer pressure mains	☐ Rising main capacity including velocity, age of rising main, failure history of rising main and potential single point failure ☐ Are adequate contingency measures available to address rising main failure scenarios? ☐ Rising main renewals completed/in progress/planned? (confirm with customer delivery)
Odour	☐ Any known odour issues ☐ Any odour control units (OCUs) installed at site ☐ Any chemical dosing units (CDUs) installed at site

	☐ Any upgrades required at site
Renewals/rehabilitation	☐ Refer to existing renewal program for any assets that have been identified with capacity inadequacy and for potential amplification works ☐ Assess any potential integration to renewal program regarding assets and timing ☐ Check with program delivery (North, South and West) for any renewal programs
Siltation	☐ Assess the performance to confirm contribution of siltation ☐ Inform CD for desilting if the siltation is affecting the hydraulic capacity considerably ☐ Refer to any known siltation issues and traverse reports of necessary
Sea water ingress	☐ Identify any known sea water ingress into assets near waterways ☐ Refer to ingress assessment carried out in the past (*"SPS Tidal Inflow Summary.xls"* located in R:\SCAMPS\Tidal_Influences_to_SPS*.*)
WET WEATHER PERFORMANCE	
High risk ERS	☐ Does high-risk ERS exist? If so: ☐ Frequency reduction ☐ Volume reduction
Other ERSs	☐ Individual ERS performance for no deterioration ☐ System performance
Manholes	☐ Spilling manholes ☐ 2-year ARI performance for potential wet weather surcharge
ERS and manholes	☐ Figure showing predicted overflow frequency for standard 10-year rainfall time series ☐ Figure showing manhole locations with potential wet weather surcharge not meeting 2-year ARI performance ☐ Table listing details of wet weather overflow activation of directed overflows and spilling manholes (MHs) for existing and future scenarios
Source control	☐ Analyse the Inflow/Infiltration (I/I) performance ☐ Potential for source control ☐ Is source control in progress? ☐ For source control works effective assumptions and cost refer to **Attachment 11**

Sewer mains	☐	Capacity constraints map
Pumping stations	☐ ☐ ☐	Capacity check Rising main capacity Technical input to technical specification (similar to **Attachment 7**)
Pressure sewer system	☐ ☐	Is pressure sewer system part of the study area? Refer to pressure sewer system guideline
Treatment plant	☐ ☐ ☐ ☐	Inlet capacity Bypass frequency Liaise with treatment group Inform treatment group of the future capacity requirements

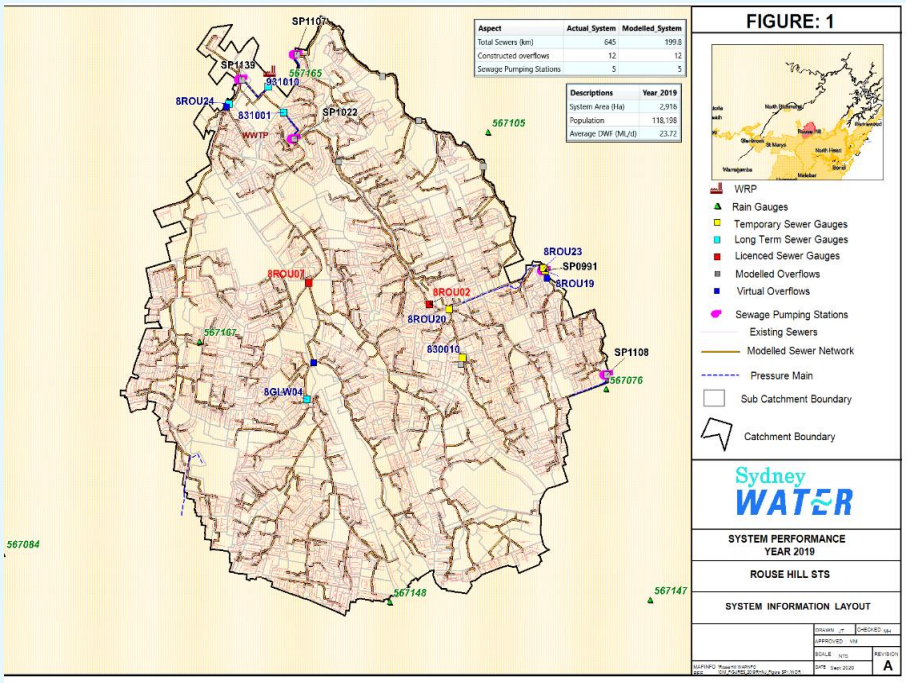
Figures to be produced for current and future performance	Name of figure	Snip
Figure SP 1	System Information Layout	

Figure SP 2A Peak DWF Velocity

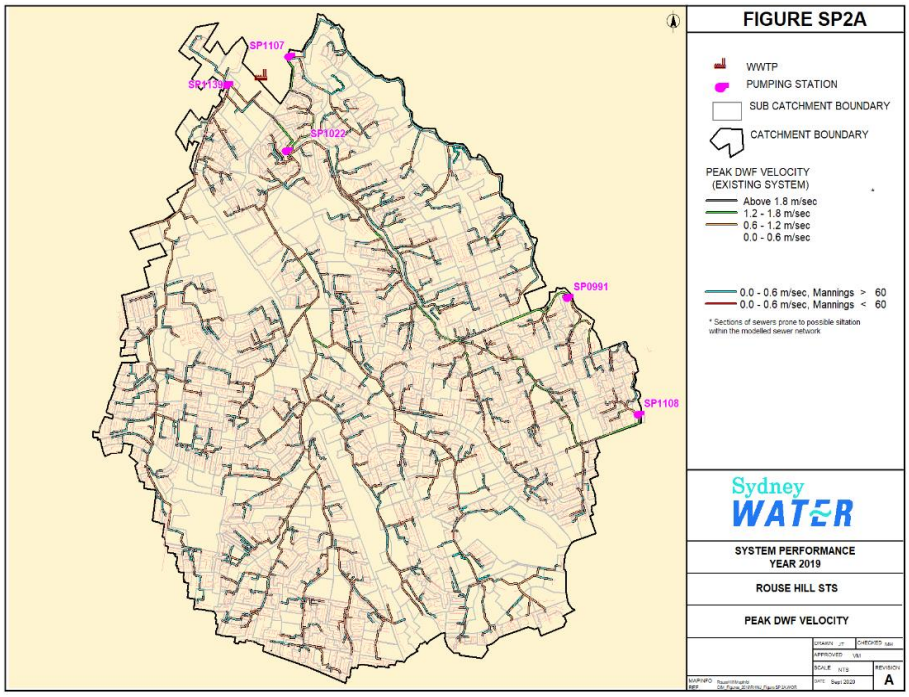


Figure SP 2B Pipes Capacity Types for Dry Weather Event

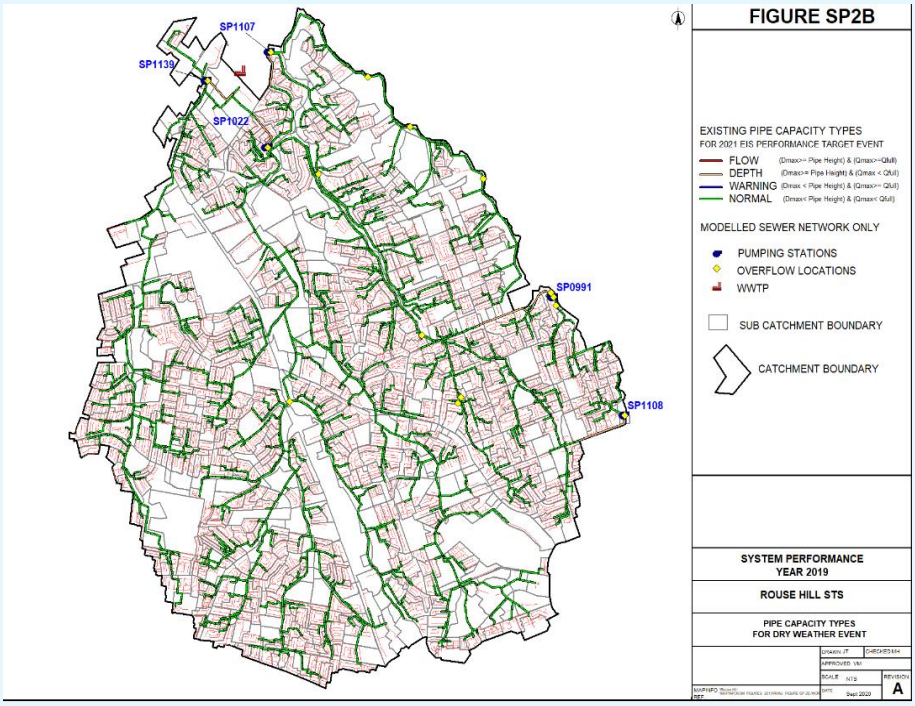


Figure SP 3 DWF Infiltration Exfiltration

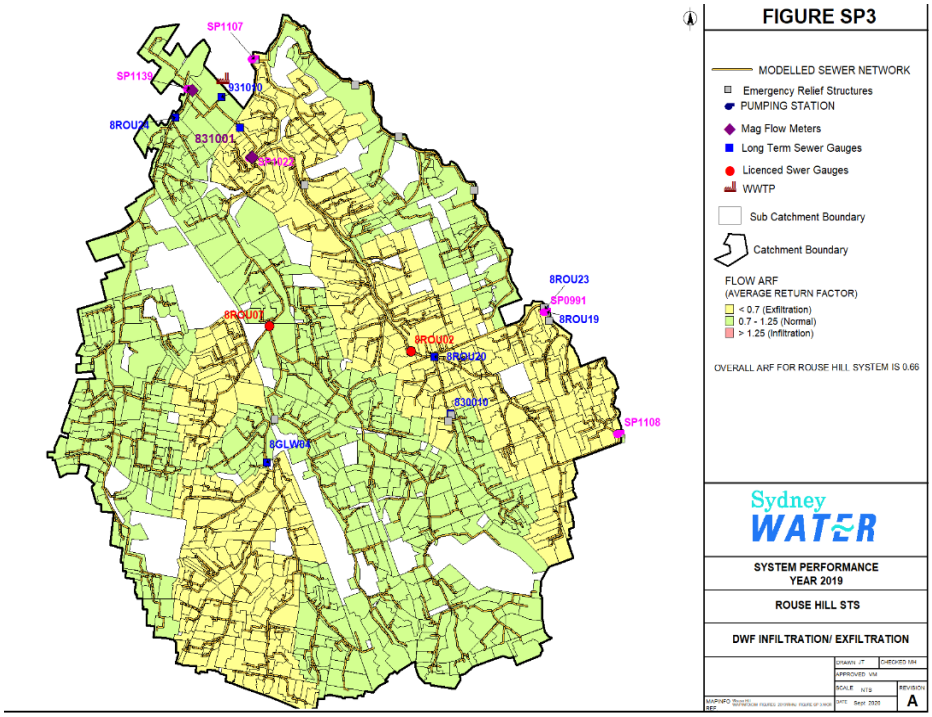


Figure SP 4 Predicted Overflow Frequency

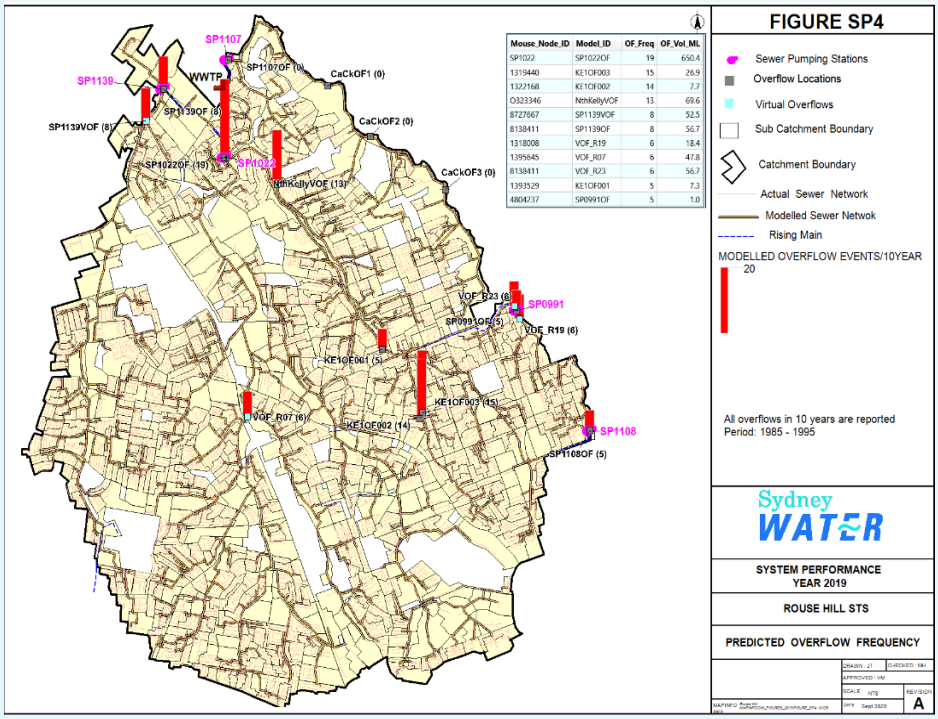


Figure SP 4A

Predicted Manhole Spill Frequency

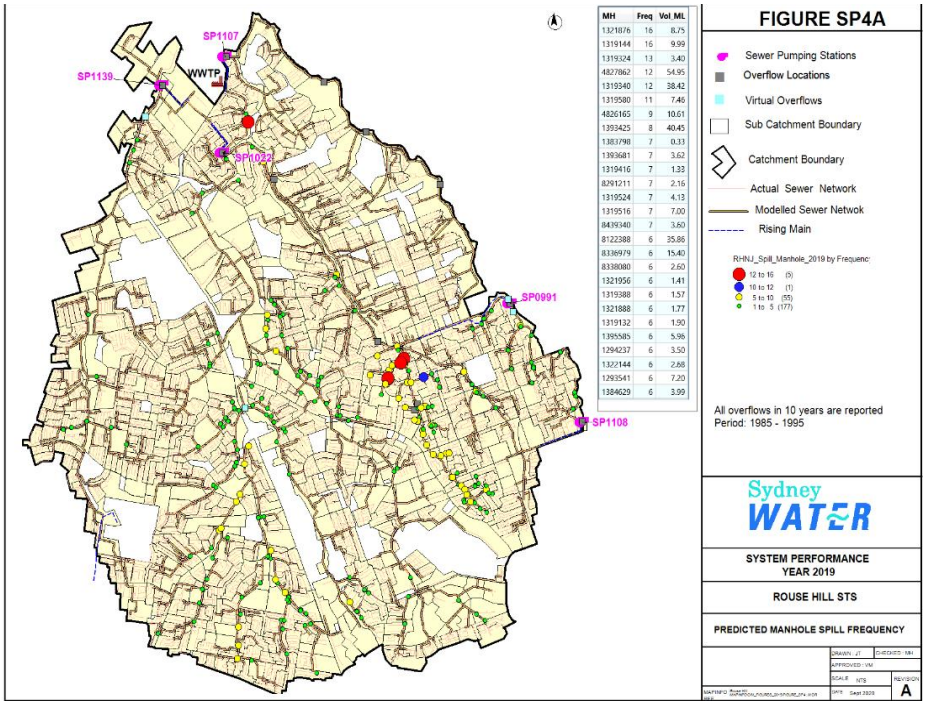


Figure SP 5

Percentage of average rainfall Ingress

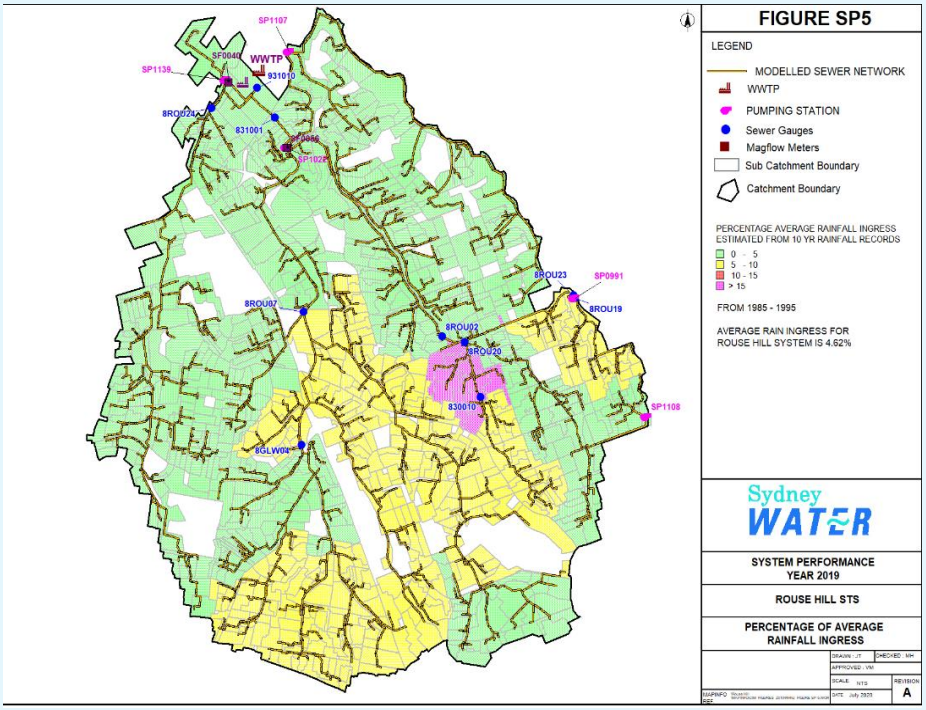


Figure SP 6A

Pipe Capacity Types for 12/10 years Ari Event

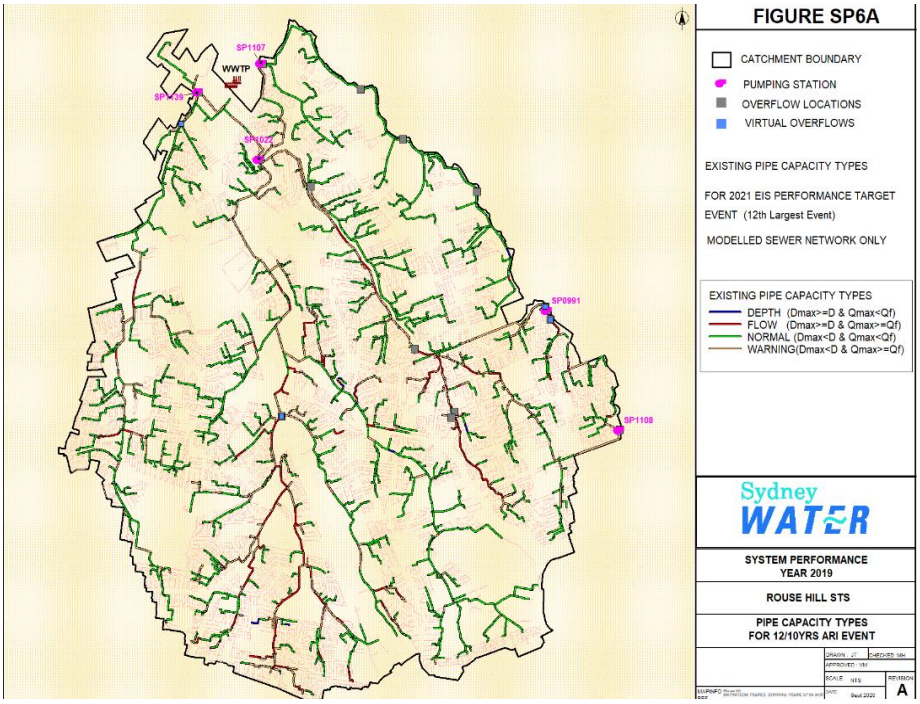
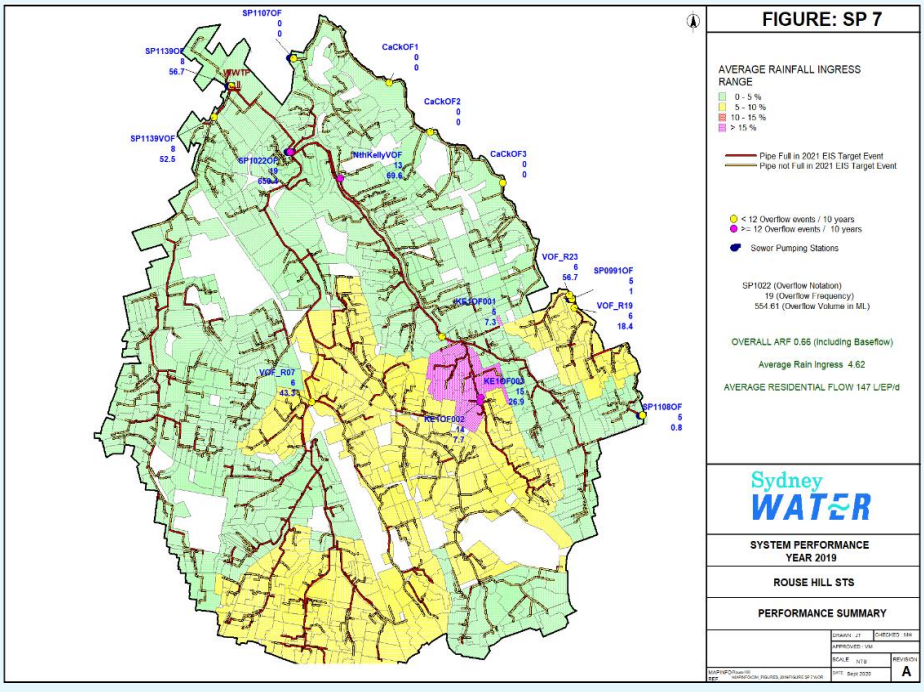


Figure SP 7

Performance Summary



Attachment 6 – SPS Planning Assessment

SPS Renewals & Reliability Improvement Program Package 4

SP0224
Lennox Street, Richmond

Richmond Sewerage System

SP0224 has been scheduled for renewal in 2016-17 under the SPS Renewals & Reliability Improvement Program Package 4. Prior to renewals, detailed planning (including hydraulic modelling) was undertaken in June/July 2016 to determine the ultimate required pump capacity (refer to the SPS Renewals & Reliability Improvement Program Package 4 – Detailed Planning Report [August 2016]). The requirements are listed below.

1. ULTIMATE PUMPING CAPACITY AS AT AUGUST 2016

1. Equivalent Population

   For the purpose of designing the upgrade of the station, an ultimate residential load of 8,410 EP has been adopted.

2. Total (Res + Comm/Ind + BF) Average Dry Weather Flow (Q_{adwf}) [1] — 18.3 L/s
3. Peak Dry Weather Flow ($Q_{pdwf} = Q_{adwf} \times r$, r = 2.36) [2] — 43.2 L/s
4. Upstream SPS ($Q_{SP1115} + Q_{SP0526}$) — 109.5 L/s
5. Dilution Factor (D) [3] — 2.59
6. Peak Wet Weather Flow ($Q_{pwwf} = Q_{pdwf} \times D$) [3] — 112 L/s
7. Minimum Design Pumping capacity ($Q_{pump} = Q_{pdwf} \times 2.5 + (Q_{SP1115} + Q_{SP0526})$) [4] — 217.4 L/s
8. Required pumping capacity to achieve minimum slime control velocity — 69 L/s

   (The existing variable speed pumps have a nominal capacity of 68-128 L/s.)

9. Recommended pumping capacity (Design Flow) [5] — 220 L/s

2. MEAN GROSS PUMPING HEAD at Design Flow

(Rising main = 609m of DN225/DN300 CICL)	*Existing Pumps (128 l/s)*	*Recommended Pumps (220 l/s)*
1. Mean Static Head	10.34 m	10.34 m
2. Friction losses in rising main + fitting losses	1.66 m	16.06 m
3. Mean Gross Head (m)	12.0 m	26.4 m

Note:
[1] The average dry weather flow value was based on the updated future (2036) model data.
[2] The peak dry weather flow value was agreed during Stage 1 of the project.
[3] The dilution factor (D) for calculating PWWF of an existing catchment has been derived from modelled data using the system overflow target wet weather event (i.e. 40th ranked event for a licence target of 40/10yrs)
[4] The 2.5 x PDWF factor for calculating design pump capacities is taken from the Wastewater Network Growth Servicing Strategy – Criteria & Guidelines 2012.
[5] Recommended pumping capacity should be a) the minimum design pump capacity (2.5 x PDWF) if this achieves the slime control velocity in the rising main and satisfies the system wet weather overflow target, or b) the required pumping capacity to achieve minimum slime-control velocity in the rising main if this also satisfies the system wet weather target, or c) the pumping capacity required (up to PWWF) to meet (or help to improve) the wet weather overflow target in the upstream catchment.

https://sydneywatercorporation.sharepoint.com/:w:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Addendum%20to%20Needs%20Specification%20SP0224%20FINAL.docx?d=w4014c5742abf4caaba39978c606d2771&csf=1&web=1&e=Gabgmn

Attachment 7 – Information Sheets

Engineering & Environmental Services

Operation & Maintenance Costs

Capital and Operation/Maintenance (O & M) costs should be taken into account when assessing the viability of a given scheme and or options via a NPV analysis.

Network assets

Unless better information is available from the Operating and Maintenance divisions the Annual Operating and Maintenance costs have been estimated as a percentage of the capital cost of infrastructure (including contingencies and overheads) applied from the completion of the staged construction of assets over time. Hence the O&M costs will increase as assets are built. The following table summarises the percentages (or cost per lot) to be adopted.

Asset Type	Operating	Maintenance
Reservoirs (surface and elevated)	0.6%	0.5%
SPS	2.0% where total kw < 50 kW 0.7% where total kw >= 50 kW and add energy cost using method below	1.8%
WPS (excludes street boosters)	5% where total kw < 50 kW 1.0% where total kw >= 50 kW and add energy cost using method below	1.5%
Pipelines	0.2%	0.4%
Tunnels	0.15%	0.1%
Pressure Sewers (On-property) Pressure Sewers (network)	$20 per lot per year -	$300 per lot per year $25 per lot per year

Sources: SWC Data (O&M Cost Vs Replacement Value (MEERA), June 2010

Sustainability Planning Manual – Options Library – Community Wastewater Systems (Jan 2012)

LPSS Growth Monitoring Spreadsheet (2012-13)

Notes: All operating percentages include allowances for energy usage unless otherwise specified.

Example – Energy Costs

A planner has been asked to calculate the energy costs for a proposed new pumping station to be commissioned in 2014. The pump will discharge 250 l/s at a total discharge head of 70m and will run 12 hours per day. From the pump efficiency curve, the planner knows that the pump efficiency is 62 percent.

Calculate Power (kW)

Power (kW) = (Q (l/s) x H (m)) / (102 x eff)

= (250 x 70) / (102 x 0.62)

= 277 kW (>= 50 kW)

Calculate kWh

kWh/Year = 0.0098QHt / eff

Where

Q	=	pumping rate (l/s)
H	=	total pumping head (m)
t	=	duration of pumping per year (hrs)
eff	=	pump efficiency (decimal)

kWh/Year = 0.0098 x 250 x 70 x 12 x 365 / 0.62

= 1,211,565 (1212 MWh)

Calculate annual pumping costs

Click on the link to obtain the latest site specific Electricity Tariffs from iConnect:

https://elogin.ads.swc/swimcommon/idcplg?IdcService=GET_FILE&dID=1309294&dDocName=1034877&Rendition=web&allowInterrupt=1&noSaveAs=1&fileName=1034877.xlsx

The table below shows average tariffs for large and small sites. This should be used for high level assumptions only

The tariffs are in real values only. Add CPI to obtain nominal values.

Note: electricity tariffs are site specific. The tariffs shown below are for high level assumptions only.

Prices in $/MWh	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
Large sites	94	88	92	92	95	98	97	98	100
Small sites	147	142	148	148	153	157	157	159	163
Note: Values are in real terms only. Add CPI to obtain nominal values									

Calculation of Energy Cost

Year	MWh/yr	Nominal tariff ($/MWh)	Energy Cost ($)	Present Value ($) @ 7% discount rate
2012	0	0	0	$0
2013	0	0	0	$0
2014	1,212	185	$224,220	$195,842
2015	1,212	197	$238,764	$194,903
2015	1,212	197	$238,764	$194,903
2016	1,212	207	$250,884	$191,398
2017	1,212	211	$255,732	$182,333
2018	1,212	219	$265,428	$176,866
2019	1,212	226	$273,912	$170,579
2020	1,212	233	$282,396	$164,357
2021	1,212	238	$288,456	$156,901
2022	Etc	Etc	Etc	Etc
2023	Etc	Etc	Etc	Etc

The PV for the energy cost for a 30 year period is approximately $3.2 million.

If the planner had used the '%' method to calculate the energy costs for this water pumping, the energy cost would have been estimated at approximately $100,000 per year (PV = $1.1 million) which significantly underestimates the energy costs.

The tables below detail the allowances to be adopted for Scope Contingency and Non-direct costs within the Sydney Water corporate estimating system. These allowances are a guide only and should be adopted if more detailed information is unavailable. Values are in the form of percentages

Scope Development (included in direct costs)

Planning Level	*Greenfield allowance*	*Infill (Low density) allowance*	*Infill (High density) allowance*
Strategic	50%	75%	90%
Detail	30%	50%	75%
Delivery	10%	20%	50%

Notes:
1. Table resourced from System Plan manual

Indirect Cost allowances

Component	*Formula*	*Allowance (%)*
Contractor Design Costs	% of Direct Costs	10
Contractor Indirect Costs	% of Direct Costs	20
Contractor Margin	% of Direct Costs + Indirect Costs	15
Risk Contingency	% of Direct Costs + Indirect Costs + Margin	35

Direct + Indirect = *Total Construction Costs*

SWC Client Costs

Component	*Formula*	*Allowance (%)*
Design Costs	% of Construction Costs	1
Tender Costs	% of Construction Costs	0.5
Planning Costs	% of Construction Costs	5
Project Management Costs	% of Construction Costs	5
Insurances & Financing Costs	% of Construction Costs	0.55

Total Construction Costs + SWC Client Costs = *Total Project Cost*

Sydney WATER

Information sheet 3 (September 2012)

Engineering & Environmental Services

Wastewater Storage Costs

The current SWC Cost Estimator does not provide any cost estimates for wastewater storages. Unless better information is available the following data can be used for estimating costs for storages.

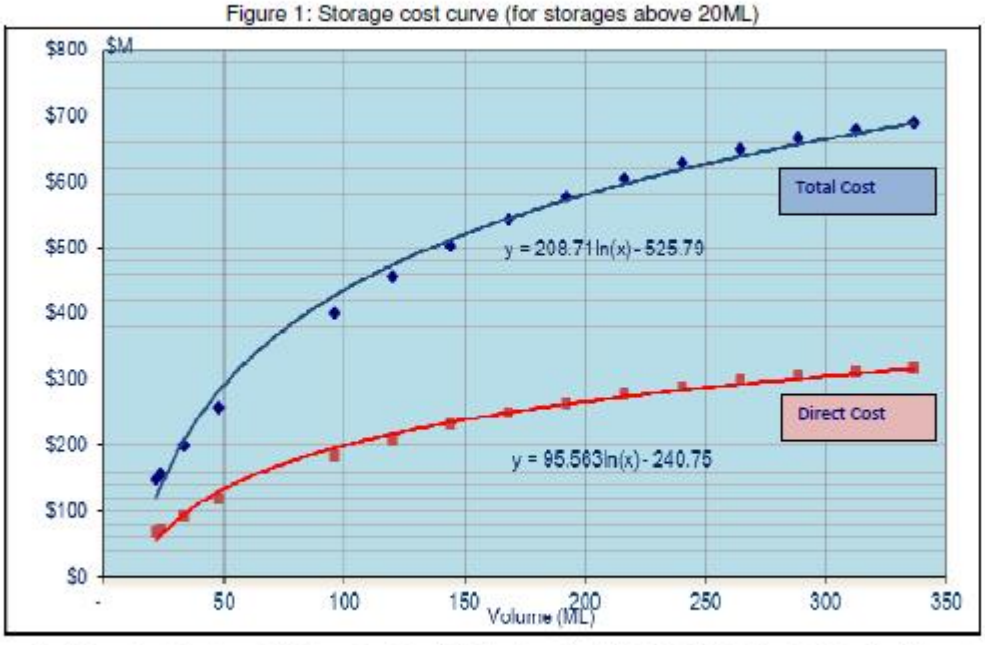
Category A – storage volume above 20 ML

Use Figure 1 for cost estimating wastewater storages above 20 ML.

Category B – storage volume up to 20 ML

Use Table 1 for cost estimating wastewater storages of up to 20 ML.

Figure 1: Storage cost curve (for storages above 20ML)



Source: Direct Capex. from Sewerfix project(Northwern beaches, Northside storage tunnel); Indirect & SWC client cost obtained from Information sheet 2

Table 1: Storage cost (for size up to 20 ML)

No.	Concrete underground tank						Concrete above ground tank				
	Internal sizes of the tank			Capacity (KL)	Direct Cost ($)	Total Cost ($)	Internal sizes of the tank		Capacity (KL)	Direct Cost ($)	Total Cost ($)
	Length (m)	Width (m)	Depth (m)				Diameter (m)	High (m)			
1	60.00	50.00	7.05	20,000	$25,423,000	$55,523,832	58.00	7.97	20,000	$13,305,000	$29,058,120
2	50.00	50.00	5.07	12,000	$16,914,000	$36,940,176	45.00	7.95	12,000	$9,319,000	$20,352,696
3	50.00	40.00	4.25	8,000	$12,255,000	$26,764,920	37.00	7.85	8,000	$7,133,000	$15,578,472
4	40.00	36.00	2.95	4,000	$7,104,000	$15,515,136	30.00	5.99	4,000	$4,332,000	$9,461,088
5	36.00	36.00	2.45	3,000	$5,590,000	$12,208,560	28.50	4.95	3,000	$3,397,000	$7,419,048
6	36.00	28.00	2.10	2,000	$4,026,000	$8,792,784	24.85	4.35	2,000	$2,437,000	$5,322,408
7	25.00	20.00	2.15	1,000	$2,168,000	$4,734,912	17.50	4.40	1,000	$1,449,000	$3,164,616
8	20.00	12.00	2.20	500	$1,175,000	$2,566,200	13.00	4.00	500	$874,000	$1,908,816
9	10.00	10.00	2.15	200	$577,000	$1,260,168	9.40	2.95	200	$446,000	$974,064
10	10.00	5.50	1.95	100	$346,000	$755,664	7.00	2.85	100	$279,000	$609,336
11	5.00	5.50	1.95	50	$191,000	$417,144	5.00	2.75	50	$180,000	$393,120

Source: Direct Capex. from Sewerfix; Indirect & SWC client cost obtained from Information sheet 2

Assumptions:

1. The ground condition is considered as good for construction purposes so that piling is not required
2. Rock excavation is involved below 5m depth, hence allowance is to be made for any rock excavation up to 5m depth
3. No allowance has been made for any special underground surface treatment (e.g. For sulphur resistance)
4. No allowance has been made for any piping work, valves, pumps and related electrical works
5. No allowance has been made for any reinstatement works to the excavated area (cost varies depends on the type of surface finishes)
6. Extra allowance has to be made for any congested construction condition where equipment access or/and operation is restricted
7. Ground water level is below the bottom of the excavation, if not allow for dewatering.
8. No allowance has been made for acid sulphate soil treatment and/or disposal
9. No provision made available for removal of unsuitable soil below the excavation level and/or preparation of sub-grade
10. No provision has been made for removal/disposal of contaminated soil.
11. Extra allowance should be made for disinfection (UV or chlorination), if required.
12. Extra cost to be included for land acquisition, if necessary
13. Extra cost to be included for piling, if required due to poor ground condition.

Attachment 8– Description of Tasks at Planning Phases

Activity	Tasks	Description
Option Assessment Project Initiation	Prepare Draft Scope of work	Review area planning report (phase 3 and 4) and growth servicing plan Review system plan reports e.g. Network \/Trunk/Treatment plants Prepare Draft scope of work
	Prepare stakeholder Engagement and consultation plan	Prepare RACI activity sheet for option assessment phase Key stakeholder identification and meeting Send stakeholder engagement request forms Identify and agree on key stakeholders for review and sign off Prepare stakeholder meeting matrix for option assessment phase
	Identify Procurement strategy for option assessment phase	Communicate with ASD and AP management Identify planning preferred procurement strategy
	Prepare cost estimate and MCP	Review RACI activity sheet Input time allocation for each sub activity on RACI activity sheet prepare cost estimate for option assessment phase prepare a detailed project MCP (activity/duration/resources)
	Prepare Project Plan	Prepare a project plan for option assessment phase (inclusions: SECP, meeting matrix, RACI and sign off project plan
	Prepare Detail planning business case and obtain approval	Specify Corporate drivers Check availability of funds (current CIP/SCI) Prepare Cashflow Prepare draft business case Review Business case Finalise Business case Obtain approval for business case

Options Report	Initiate Project	Conduct Project Team meeting Review business case Review system plan reports e.g. Network/Trunk/Treatment plants Review recent developments applications Review area planning report (phase 3 and 4 reports) Define planning parameters Define Design criteria and assumptions Verify Development timetable Review environmental reports (Preliminary assessment reports)
	Internal and external stakeholder consultation	Review stakeholder engagement and consultation plan Form Integrated project team Assign responsibilities including reviews, endorsements, and approvals Develop external stakeholder consultation plan
	Develop Long list of options	Consider Asset options Consider scheme configuration options Consider technology options (based on lifecycle costs and energy – see Best Practice energy Efficiency Guide) Develop route/site options including options costs and risks Assess existing system performance (hydraulic modelling) Assess future system performance (Hydraulic modelling) Preliminary assessment on long list of options (initial screening) Conduct broad risk assessment Estimate lifecycle costs including energy costs
	Select evaluation criteria	Develop preliminary evaluation criteria for short list based on environmental social and develop evaluation criteria for MCA (Tool in identifying Trade-offs for risk assessment)
	Develop Short list of options	Review Long list of options and assessments criteria with internal stakeholders Refine Long list of options Develop short list of options with stakeholders by applying preliminary evaluation criteria Conduct external stakeholder workshop, where applicable Prepare short list of options

	Select the preferred option	Assess design, construction, operability and maintainability Conduct Detailed Hydraulic modelling Prepare detailed cost estimate (NPV) of short listed options Assess property requirements Conduct site visits and geotechnical investigations Assign weightings to selection criteria(WS3) Assign scores to short listed options (WS3) Select the preferred option -Decision based on lowest life cycle cost meeting stakeholders requirements at acceptable level of risk (WS3) Conduct external stakeholder workshop Prepare staging plan
	Review Preferred option	Conduct sensitivity tests Conduct Detailed Modelling Conduct detailed risk assessment (Workshop Depending on project) Present Preferred option to external stakeholders
	Prepare Options Report	Prepare Environmental Section Prepare scheme drawings Prepare investment plan Prepare draft options report Review Options Report Finalise Options Report Endorse and approve options report Inform Stakeholders
Needs Specification	Initiate Project	Conduct Project team meeting Review options report Review business case Review Available Information and data Identify stakeholders/update stakeholder engagement and consultation plan
	Define Scope and functional requirements	Define scope of work Define performance requirements Define Functional requirements including control system Seek stakeholder input into scope of work, functional and performance requirements Finalise Scope of work performance and functional requirements

	Specify specific requirements	Develop scheme drawings (treatment plant and process drawings) Specify land and property requirements Specify Planning parameters Specific Planning Technical requirements Specify Design criteria Specify Performance Criteria
	prepare needs Specification	Prepare Draft Needs Specification Review Needs specification Finalise needs specification Endorse and approve Needs specification Inform Stakeholders
Concept Design	Initiate Project	Conduct Project Team meeting Review Needs specification Identify stakeholders/update stakeholders' engagement and consultation plan
	Conduct Site/Field Investigation	Conduct Field survey and long sections (Network) Conduct Plant survey (treatment only) Undertake Geotech studies Conduct site investigations including environmental assessment Refine Route/Site selection
	Develop Detailed Requirements	Undertake Corrosion and Odour modelling Refer to *Corrosion and Odour Guidelines* to determine the necessary requirements

		Develop Process Requirements Develop Mechanical Requirements Develop Electrical Requirements Develop control requirements Develop Power Supply requirements Develop civil and structural requirements Develop operational control strategy Confirm hydraulic and process modelling Prepare equipment and drive list prepare scheme and asset drawings
	Conduct Constructability, performance Studies and other requirements	Conduct constructability studies Confirm performance criteria Develop Commissions and acceptance criteria prepare asset reliability and redundancy details Specify asset information Requirements e.g. Maximo/WAMS
	Prepare cost estimate and concept design	Prepare Draft concept design Review Concept Design Undertake risk assessment e.g. CHAIR. HAZOP etc Finalise concept design Prepare risk-based cost estimate Validate NPV (Lifecycle Costs, etc) Endorse and Approve Concept design Inform Stakeholders
Environmental Planning	Prepare Scope and review previous work	Prepare scope including proposed construction method Review Scope and preliminary assessment reports (Strategic planning phase)
	Input to stakeholder engagement	Identify Key stakeholders (mainly external local councils)
	Input to option assessment	Establish Evaluation criteria (Relate to environmental factors) to identify the preferred option Confirm Approval Pathway for preferred option
	Input to Needs specification	Specify EIA process requirements (Needs) for preferred option

	Input to concept design	Conduct Environmental Assessment Manage DOP communication Process Manage Specialised Studies Conduct revision of economic analysis Obtain legal advice Prepare Env. Draft report Review Env. Report Finalise Env. Report Obtaining Approval
Delivery Business Case	Review Previous work	Review Concept design
	Prepare Stakeholder Engagement and consultation plan	Prepare RACI activity for delivery Phase Key stakeholder identification and meeting Send stakeholder engagement request Forms Identify and agree on key stakeholders for review and sign off Prepare stakeholder meeting matrix for delivery phase
	Identify Procurement strategy for delivery phase	Communicate with ASD and AP management Identify preferred procurement strategy
	Prepare Cost estimate	Review RACI activity sheet Input time allocation for each sub activity on RACI activity sheet Review Rick based cost estimate for preferred option Finalise cost estimate for delivery phase
	Prepare Business case and obtain Approval	Specify Corporate drivers Check availability of funds (current CIP/SCI) Prepare Cashflow Prepare draft business case Review Business case Finalise Business case Obtain approval for business case

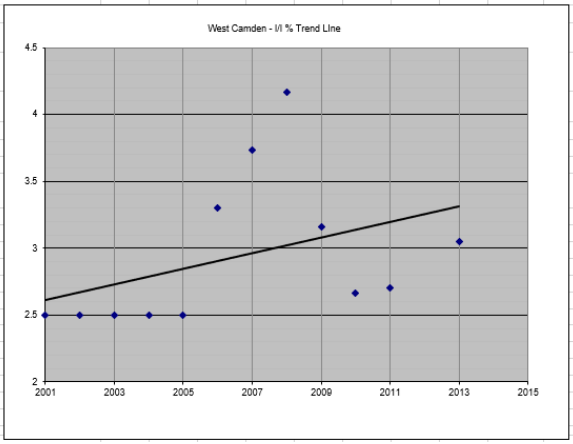
Attachment 9 – I/I Percentage

Wastewater system rainfall ingress history trend

West Camden

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2013
I/I% (system ave)	2.5	2.5	2.5	2.5	2.5	3.3	3.73	4.17	3.16	2.66	2.7	3.05

Information obtained from STS reports



West Camden Trend	
2001	2.60%
2013	3.30%
Per year	0.058%
Per 20 years	1.167%

2001-2013 must be revised to include latest 10 years

Hydraulic Guidelines

If I/I < 0.025% per year, which is < 0.5% per 20 years	then increase existing I/I by 0.025% per year, over 20 years
If 0.025% < I/I < 0.1% per year, which is 0.5% < I/I < 2% per 20 years	then increase existing I/I by current historic rate, over 20 years
If I/I > 0.1% per year, which is > 2% per 20 years	then increase existing I/I by 0.1% per year, over 20 years

Historical data

Average Rainfall Ingress (%)																			
	1994	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2015	2016	2017	2018	2019
Bondi	9.3	-	10.1	10.2	10.6	10.6	9.18	7.35	9.94	9.49	-	-	8.84	-	-	8.05	8.68	9.28	8.35
Castle Hill	3.4	-	4.4	4.4	3.6	3.4	4.5	4.88	6.66	6.13	-	-	7.43	6.32	-	7.48	-	-	7.87
Malabar	7.2	-	-	-	-	-	6.5	6.66	6.16	7.19	7.12	6.84	-	6.73	6.56	-	7.41	7.33	6.93
Picton	1.1	-	1.14	1.14	1.14	1.11	1.6	1.86	1.72			2.33	-	-	-	1.96	-	-	1.75
Port Kembla	-	-	-	-	-	8.04	7.73	7.63	8.03	10.15	10.33	9.35	9.15	9.62	-	-	-	10.43	-
Riverstone	1.4	-	2.6	2.6	2	2.1	1.74	3.06	2.93	6.27	-	-	-	-	6.18	6.11	5.77	4.6	4.4
Rouse Hill	-	2.3	-	-	2.3	2.3	2.43	2.68	3.54	3.84	3.75	3.74	4.31	3.83	-	4.26	4.32	4.31	4.62
Winmalee	-	3.6	2.9	3	2.4	2.3	2.4	2.2	2.07	2.07	2.03	-	-	-	2.1	-	-	-	2.51

Attachment 10 – Sydney Water average HHsize PPG2014

https://sydneywatercorporation.sharepoint.com/:x:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/SydneyWater%20average%20HHsize%20PPG2014.xlsx?d=wc5efb2934aa24f648654b05edf4a99fd&csf=1&web=1&e=OMHQ1i

Attachment 11 – Source Control Works Effectiveness Assumptions and Cost

Criteria	Element	Assumption
Stage 1 - Inflow control at Sydney Water assets	Inflow reduction	Inflow reduced by 50% (from existing inflow to ultimate aim of 1%). Initially applied to catchments where: – Total I/I ≥10%, &/or – FRC ≥ 3%.
Stage 2 – Infiltration management	Infiltration reduction	Infiltration reduced to 5%. Applied to catchments where infiltration > 5%.
Stage 3 – Inflow control at private properties	Inflow reduction	Inflow reduced to 1%. Applied to catchments where: – Total I/I ≥10%, &/or – FRC ≥ 3%
CAPEX	ERSs	Consider ERSs within high inflow catchments and u/s of high-risk overflow points. Assumed $250k per ERS.
	MHs	Assumed an initial 10% of total number of MHs within high inflow Stage 1 areas. MH rectifications will include a mix of civil works and/or rain stoppers installing. Assumed $2k per MH.
	Pipes	Assumed an initial 75% of total number of DN300 or larger pipes within high infiltration Stage 2 areas will require works, which will first need to be confirmed via CCTV. Assumed $400/m for re-lining.
	Private properties	Assumed an initial 10% of total number of properties within high inflow Stage 1 areas may require investigating (subject to the success of the Stage 1 works). Assumed $3k per property, which includes smoke testing, with rectification works required at 10% of tested properties.

Attachment 12 – Wastewater Overflow Abatement - Guideline

http://nt032pdmnotes.ads.swc/BMIS/SWDocControl.nsf/f932fd6c300632e6ca25850a00756de2/$FILE/D0001603.pdf

Attachment 13 – Detention time spreadsheets

https://sydneywatercorporation.sharepoint.com/:x:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Emergency%20Storage%20Calc%20and%20Retention%20Time%20calc.xlsx?d=w14e28b780abc481ea645a7e3be8f018d&csf=1&web=1&e=3OVkyW

https://sydneywatercorporation.sharepoint.com/:x:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Emergency%20Storage%20and%20Retention%20Time%20Calc%20AH.xlsm?d=wf9c91f08a4864524a4e3272485ed3a67&csf=1&web=1&e=ZZijKS

Guideline - Methodology to estimate Detention Time at sewage pumping stations:

https://sydneywatercorporation.sharepoint.com/:b:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Wastewater%20pumping%20station%20Retention%20Time%20Estimate%20Guideline.pdf?csf=1&web=1&e=FTnP85

Attachment 14– Corrosion and Odour Guidelines

https://sydneywatercorporation.sharepoint.com/:w:/r/sites/ExternalSharing-SWPlanningPartnershipISP/Shared%20Documents/20038003%20Wastewater%20Network%20Planning%20Guideline/Reports/Attachments/Corrosion%20and%20odour%20guidelines%20for%20new%20growth%20areas_Final.docx?d=wcc4079e655be4e1e8005089432b10b6a&csf=1&web=1&e=6Aidsg