COORDINATION OF OPERATIONAL ASSET MAINTENANCE AND RENEWAL WORKS ACROSS MULTIPLE WATER SUPPLY SYSTEMS

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ABSTRACT

Sydney Water has a complex and interconnected drinking water supply system which involves many stakeholders and agencies. Sydney Water has developed two robust and dynamic plans to manage the coordination of asset maintenance and renewal projects across the system. These plans account for short and long-term critical asset activities and aim to reduce operational risk to water supply. The key to the success of these plans is thorough engagement of all stakeholders, risk assessments and consistent reviews. The plans have been proven to be effective in ensuring no interruption to the water supply for 5.4 million customers even throughout an ever-changing environment.

INTRODUCTION

Sydney Water is Australia's largest water utility, supplying about 1.5 billion litres of drinking water to 5.4 million people. This requires an expansive water supply system (Figure 1), with a variety of different assets operated by internal and external stakeholders with multiple control systems and commercial agreements in place. Raw water is supplied by a network of dams, managed by WaterNSW, to nine water filtration plants (WFP). Five of these WFPs are operated by Sydney Water, with the other four being operated under WFP partnerships (Build Own Operate Transfer – BOOT arrangement) with Suez (Prospect), Veolia (Woronora/Illawarra) and TRILITY (Macarthur). Up to 15% of the drinking water system can also be supplemented by the Sydney Desalination Plant (SDP). The drinking water produced is then supplied to 13 delivery systems across the Greater Sydney region via approximately 23,000 km of pipelines, 251 reservoirs and 153 pumping stations which are managed by three network area teams (North, West and South).

Due to the number of assets and external stakeholders in the Sydney Water drinking water supply system, a wholistic and coordinated asset maintenance and outage planning is critical to maintain safe and reliable drinking water supply to customers. The Water Supply and Production (WS&P) team coordinate two outage maintenance plans with both internal and external stakeholders to ensure asset maintenance work and capital upgrades can be delivered whilst maintaining continuous drinking water supply to customers. The Joint Annual Maintenance (JAM) program (1-year plan) is a detailed program of works for the upcoming calendar year. The 5-year plan is a long-term look ahead at the significant activities that will impact water supply over the coming five years.

DISCUSSION

Scoping and Engagement

The first step is to engage all stakeholders and scope which projects/outages need to be included in the plans and collate as much preliminary project information as possible. The setting up of this process is complex and involves the implementation of an overarching operating protocol for all stakeholders (internal and external) that underpins the objective of the delivery of critical outages

without disruption to supply to customer while still meeting contractual and all regulatory requirements.

Projects included in the scope of the 1-year plan capture all activities (from internal and external stakeholders) within the upcoming calendar year, including:

- raw water asset maintenance which impacts supply strategy (e.g. major valve renewal)
- all WFP (SW and BOO), SDP plant outages/capacity reductions and major flowmeter calibrations
- network maintenance outages/capacity reductions (e.g. reservoir relining, pumping station overhaul)
- HV maintenance outages that require generator(s) for water supply.

Major projects included in the scope of the 5-year plan are those which have an actual or potential impact on the water supply system quality and/or quantity, including:

- raw water asset maintenance/outages/upgrades (pipelines, pumping stations, dam infrastructure)
- WFP extended maintenance/outages/upgrades (including SW, BOO and SDP)
- major network projects (reservoirs, trunk mains, pumping stations, new connections)
- third-party projects (eg. Western Sydney Aerotropolis Growth Area, developer projects)
- any other works which may impact the water supply system (e.g. Prospect mini hydro).

Programming

Following initial stakeholder consultation and preliminary information sourcing, an assessment of whether the project meets the criteria for inclusion in the 1 and 5-year plans is conducted. Relevant projects are included in the draft programs, which should highlight potential project clashes/constraints/interdependencies for discussion at the upcoming workshops. For the 1-year plan, the draft program is distributed to stakeholders in February for review and feedback prior to consultation and review workshops in March (Figure 2). Most of the outages and maintenance activities are conducted between March to November to avoid the high water demand period.

For the 5-year plan, the schedule of works is updated based on the engagement with relevant stakeholders every six months (Figure 3).

Consultation and Review

For the 1-year plan, a rigorous and thorough joint risk workshop is conducted in March with all impacted stakeholders from upstream and downstream of the work. The purpose of the risk workshop is to assess the impact of the works on the system capacity and redundancy under normal and exceptional conditions (e.g. rain events, low dam water levels and changes to source water quality). Appropriate actions are identified in the risk assessment process to mitigate high residual risks maintenance work to ensure proper contingencies are in place for the work to be carried out at an acceptable risk. Project clashes, constraints and interdependencies will also be reviewed and resolved, where possible. Mitigation actions will need to be resolved or completed before any high risk work is to be carried out.

For the 5-year plan, a joint review workshop is conducted every six months with all impacted stakeholders. Project clashes and interdependencies will also need to be resolved, either during or following the workshop. The 5-year plan provides a “placeholder” for critical asset outages and

upgrade works that normally requires extensive planning, significant investment and funding. This 5-year 'look ahead' planning process ensures these projects can be scheduled in and delivered in lowest risk manner, avoiding major project clashes and going offline at the same time. It also provides assurance to project managers (external and internal) the expected timing for the delivery of their projects.

Implementation

The 1-year plan is implemented in accordance with existing outage processes and procedures established with Sydney Water's major delivery partners. Fortnightly meetings are held to update the plan and inform all parties involved. The WS&P team generate a weekly report to notify the wider business of the upcoming activities. The relevant risk rating and contingency plans are amended as required to account for any changes.

Implementation of the 5-year plan requires ongoing feedback and consultation between stakeholders and the WS&P team to ensure the plan remains current and representative. Successful implementation of the 5-year plan is identifying and scheduling major projects to ensure no overlapping or clashes during delivery stages in the 1-year plan.

OUTCOMES

- Dynamic plan which ensures no interruption to water supply to 5.4 million customers during an ever-changing environment (COVID-19, drought, bushfire, and floods)
- Successful/efficient completion of major asset renewal, capital projects and critical asset maintenance across entire supply system
- All stakeholders are involved in an agreed process to ensure all essential activities can be conducted with minimal impact to other stakeholders
- The process has been proven very effective in enabling the completion of a significant volume of work since 2022 due to many postponed projects during the pandemic and major flood events of recent years.

CONCLUSION

Sydney Water's WS&P team manages the coordination of asset maintenance and renewal projects that have the potential to impact water supply. This requires an inclusive and adaptive approach to ensure all immediate and future maintenance activities can be effectively carried out by Sydney Water and all external partners. The comprehensive 1 and 5-year plans have been proven to be robust, dynamic, and effective in reducing operational risk to water supply and impact to customers.

ACKNOWLEDGMENTS

Thank you to various stakeholders contributing to the 1 and 5-year plans. This includes WaterNSW, Suez, TRILITY, Veolia, Stark and Sydney Desalination Plant.

Figure 1 shows the Sydney Water drinking water supply system.

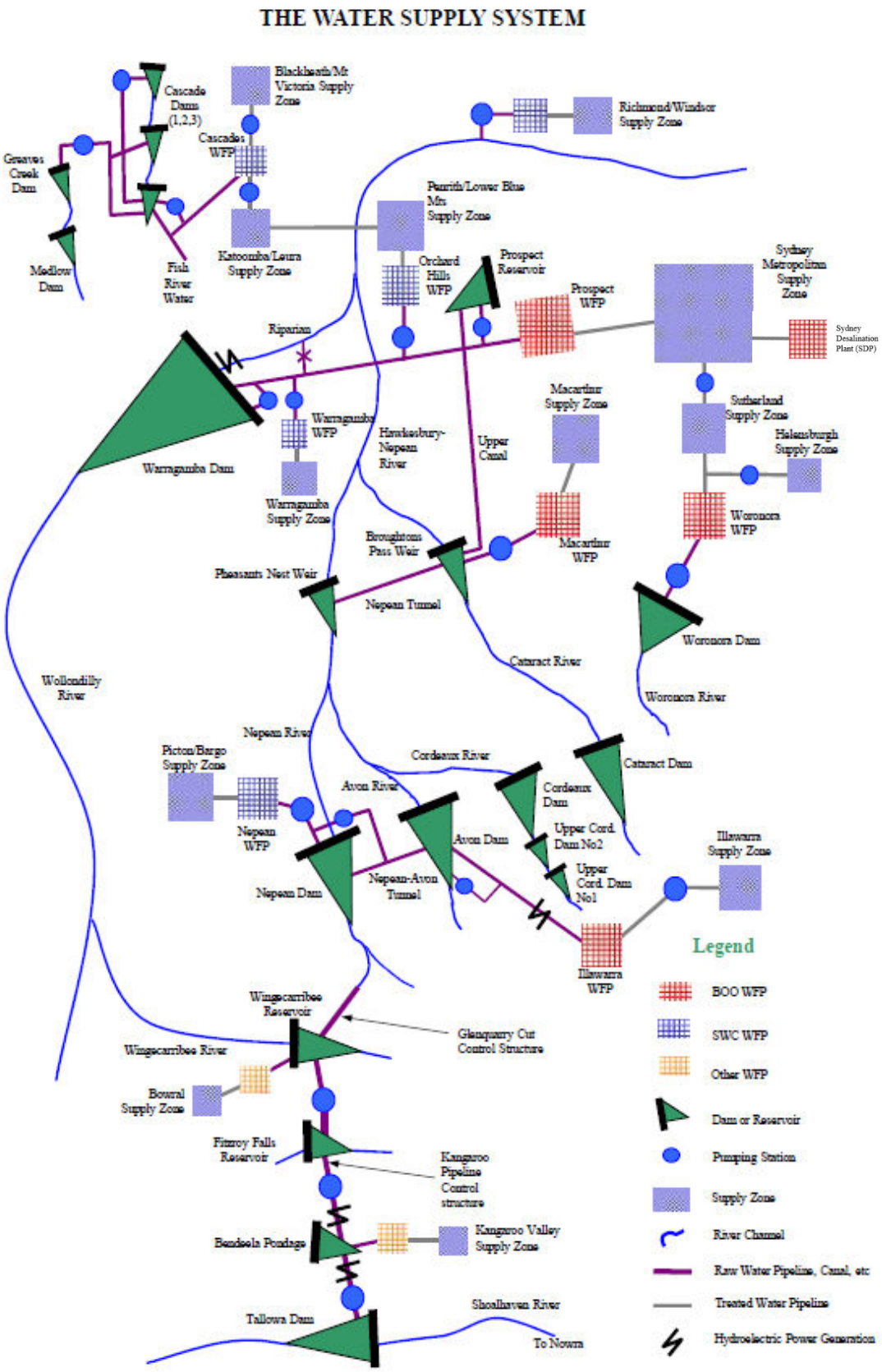

Figure 1: Sydney Water's drinking water supply system

Figure 2 is a typical example of a Joint Annual Maintenance Plan (1-year plan).

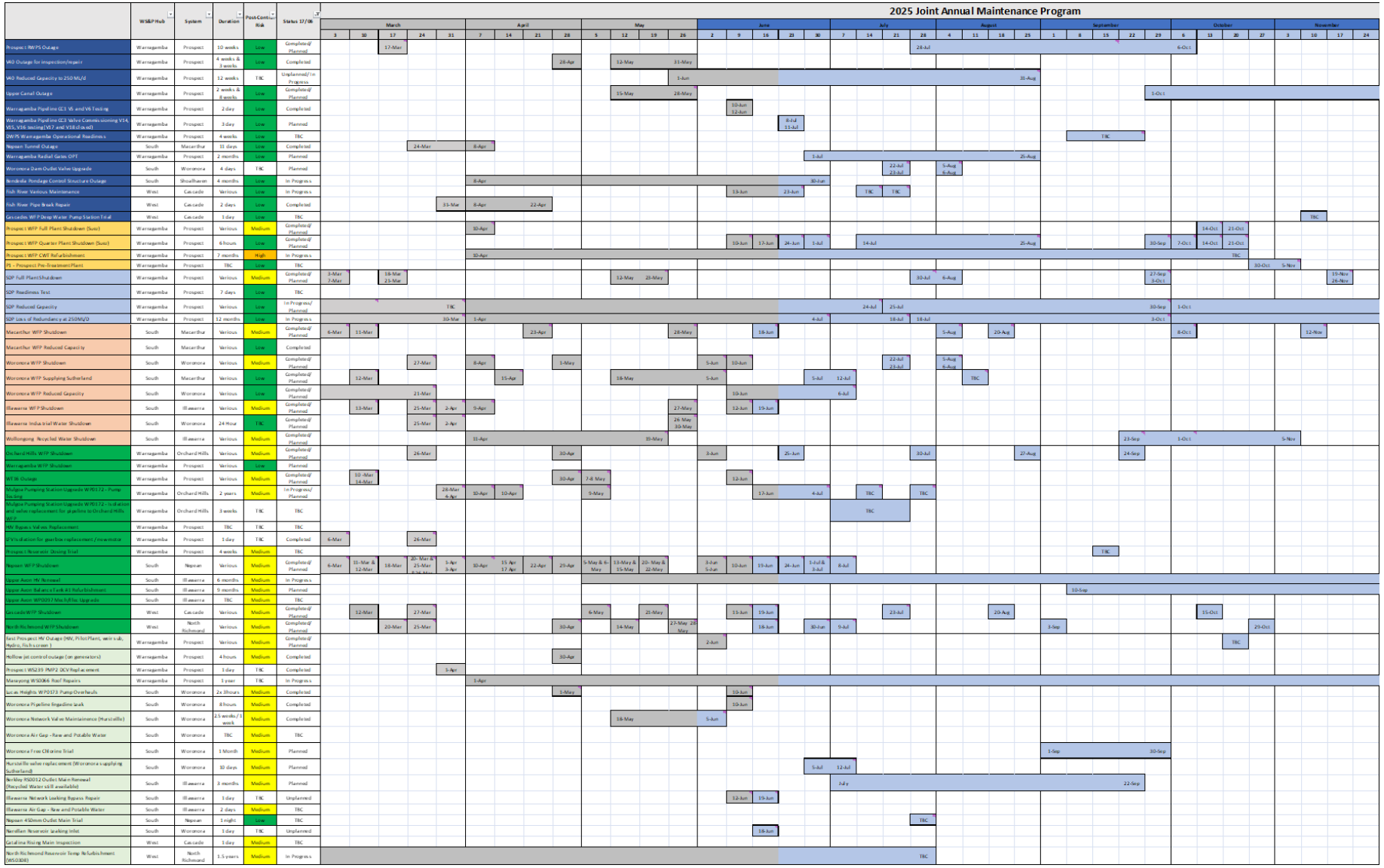

Figure 2: Example of a Joint Annual Maintenance (JAM) Plan (1-year plan)

Figure 3 shows a small section of a typical 5-year plan for water supply.

2026								
Project Name	Water Supply System	SW Project No.	Start on Site	Operational Completion	Project Status	Dependency Risk	Key Periods for Interface Consideration	Project Dependencies/Clash
Prospect Raw Water Pumping Station - PMs (2026)	Prospect (Combined)	N/A	1/02/2026	15/02/2026	Operational Planning	Medium	2 x week long outages for PM work prior to pipeline outage	Warragamba Pipeline Valve Maintenance
Prospect Raw Water Pumping Station Resilience project	Prospect (Combined)	N/A	1/07/2025	1/07/2026	Operational Planning	Medium	October 2025 through to mid/late-2026	Warragamba Pipeline Valve Maintenance Upper Canal Outage
Upper Canal Maintenance (2026)	Prospect (Combined)	N/A	1/03/2026	1/11/2026	Operational Planning	Medium	6 weeks spring outage and 6 weeks autumn outage	Warragamba Pipeline Valve Maintenance Prospect RWPS Resilience Project
Warragamba DWPS Operational Readiness Project to undertake testing and commissioning of the DWPS	Prospect (Combined)	N/A	1/04/2026	1/12/2026	Operational Planning	Medium	TBC	TBC
Warragamba Pipeline Valve Maintenance (2026)	Prospect (Combined)	N/A	1/06/2026	1/09/2026	Operational Planning	High	Winter 2025	Prospect/Orchard Hills WFP capacity. Warragamba raw water quality
Prospect WFP Filter Module 3 Outage PM Maintenance and condition Inspections	Prospect (Combined)	N/A	1/05/2026	1/07/2026	Operational Planning	Medium	6 week drain down of contact channel (1/4 plant outage)	Prospect WFP capacity Warragamba raw water quality SDP Outages
Prospect WFP CWT 2 cover/liner	Prospect (Combined)	N/A	1/03/2026	1/11/2026	Operational Planning	High	Winter 2026	WT16 Outages Ryde Surge Tank (Contingency) Liverpool Reservoir Refurbishment Warragamba Deep Water Pumping Station Operational Readiness Pressure Tunnel Inspection SDP Plant Outages Thornleigh Outlet Main Duplication Ryde to Pymble (RP03) Replacement
P2 - Flood Mitigation	Prospect (Combined)	N/A	31/05/2025	1/12/2026	Preliminary planning	High	Interface with CWT works	Prospect WFP CWT 2 cover/liner Prospect Pre-Treatment Plant Augmentation and Upgrade (P1 and P3)
P3 - Prospect Improvements Works	Prospect (Combined)	N/A	31/05/2025	1/09/2026	Preliminary planning	High	Interface with CWT works	Prospect WFP CWT 2 cover/liner Prospect Pre-Treatment Plant Augmentation and Upgrade (P1 and P2)
Prospect Pre-Treatment Plant Augmentation and Upgrade (P1)	Prospect (Combined)	IN.P0000361	27/03/2025	18/04/2028	Construction to Operational Completion	High	4 week outage of Channel 1 (29 July 26 to 28 Aug 26)	Warragamba Deep Raw Water Pump Station Prospect Raw Water Pump Station Cutting in to Channel 1 - impact to PWFP sources Installation of baffles in Prospect reservoir Prospect East HV/ Prospect South HV
Pressure Tunnel Inspection	Prospect (Combined)	IN.P0000434	3/02/2026	1/10/2026	Project Initiation & Develop Needs Appro	High	Proposed tunnel shutdown period - February 2026 to end Oct 2026	Pressure Tunnel Shutdown will rely on Sydney Desalination Plant to boost customer water pressure in some areas. Higher risk if CWT2 work extends into Summer, need SDP for unplanned
SDP Expansion Outages (Plant)	Prospect (Combined)	N/A	1/01/2026	1/12/2029	Preliminary planning	High	An outage schedule is being developed	Prospect WFP plant outages
SDP Network Expansion	Prospect (Combined)	IN.P0001482	1/01/2026	1/12/2029	Detailed Planning	High	System Integration	Existing Operations and business continuity
SDP Plant shutdown preventative maintenance	Prospect (Combined)	N/A	2/03/2026	6/03/2026	Operational Planning	High	5day shutdown duration for each	Prospect WFP plant outages
SDP Plant shutdown preventative maintenance	Prospect (Combined)	N/A	18/05/2026	22/05/2026	Operational Planning	High	5day shutdown duration for each	Prospect WFP plant outages
SDP Plant shutdown preventative maintenance	Prospect (Combined)	N/A	27/07/2026	31/07/2026	Operational Planning	High	5day shutdown duration for each	Prospect WFP plant outages
SDP Plant shutdown preventative maintenance	Prospect (Combined)	N/A	23/11/2026	27/11/2026	Operational Planning	High	5day shutdown duration for each	Prospect WFP plant outages
SDP 1st Pass RO M# Train #and M # Train # Periodic Maintenance	Prospect (Combined)	N/A	4/03/2026	28/04/2026	Operational Planning	Medium	Reduction in capacity to 200MLD, contingent on APR	Prospect WFP plant outages
SDP 1st Pass RO M# Train # Periodic Maintenance	Prospect (Combined)	N/A	13/05/2026	7/07/2026	Operational Planning	Medium	Reduction in capacity to 225MLD, contingent on APR	Prospect WFP plant outages
SDP Installation of 3rd DWPS Pump	Prospect (Combined)	N/A	1/01/2026	31/12/2028	Preliminary planning	High	Early stages of project - will be a significant interaction as delivery pipeline will be isolated and dewatered to facilitate connections	Prospect WFP plant outages
SDP 132kV feed duplication	Prospect (Combined)	N/A	1/01/2026	31/12/2028	Preliminary planning	Medium	Early stages of project - will be a significant interaction as main 132kV power supply will be turned off to facilitate connections	Prospect WFP plant outages
SDP Installation of 2nd DWT	Prospect (Combined)	N/A	1/01/2026	31/12/2028	Preliminary planning	Medium	Early stages of project - will be a significant interaction as DWPS will be isolated to facilitate connections	Prospect WFP plant outages
Dual Medial Filters - Media changeout	Prospect (Combined)	N/A	1/01/2026	31/12/2028	Preliminary Planning	Low	Expected to have no impact to plant capacity	Prospect WFP plant outages
DWEER to ERI changeout	Prospect (Combined)	N/A	1/01/2026	31/12/2028	Preliminary Planning	High	To be confirmed	Prospect WFP plant outages
RO membrane replacements	Prospect (Combined)	N/A	TBA	TBA	Operational Planning	Low	Expected to have no impact to plant capacity, to be completed at the same time as RO train periodic maintenance	Prospect WFP plant outages

Figure 3: Snippet of a 5-year plan Example