Portsmouth Water

PRT07.04 THE ISOLATION AND RECOVERY OF SERVICE RESERVOIRS

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1. SUMMARY

This proposal describes the ambition of Portsmouth Water to establish measures that allow customers supplies to be effectively maintained whilst reservoirs are isolated from supply.

The proposal better allows inspection and maintenance works to be carried out with the minimum risk to water quality or service outages.

The proposal enhances some existing sampling arrangements, providing, where they do not currently exist, sampling facilities for each chamber of a multi-chamber reservoir in order that single chambers may be independently verified in accordance with DWI guidelines.

2. NEEDS

A. Overview

From time to time the need arises to isolate a reservoir from supply to respond to an unplanned incident. At present there is no readily achievable way of doing this whilst reliably maintaining supplies to customers. This proposal enables that important capability which protects customers supplies if the reservoir must be isolated as a result of, for example, a potential water quality issue to be validated and resolved.

From time to time, water quality challenges may arise, or maintenance needs may dictate, that samples are retrieved from each chamber of a multi-chamber reservoir independently. That is currently not possible at all of Portsmouth Water's reservoirs.

Both positions stated in 1 & 2 (above) result in an increased risk to customers supplies and extend the time for which that risk persists.

The proposal was submitted to the Drinking Water Inspectorate (DWI) as part of Portsmouth Water's 'appendix B' submission in March 2023. The DWI support these proposals and their letter of support, dated 31 August 2023, is included as appendix PRT07.04.01.

B. Supporting Our 'Vision'

The vision described by Portsmouth Water and supported by its customer comprises four key pillars. They are to:

Figure 1: Our Vision and Priorities

This investment proposal supports the second and the final components of the Portsmouth Water vision. The proposal seeks to improve the resilience of the water supply and thereby improve the quality of service that Portsmouth Water offers to its customers. The proposal provides an enhanced capability to existing assets through the addition of low-cost technological improvements and represents an ambitious plan to secure the resilient service that is required by our customers, at the lowest possible cost.

The ability to be able to continue to supply water, even though a whole reservoir is isolated, is a significant enhancement to the security of water supply. It will ensure that even if a reservoir must be temporarily taken out of service, the customer will not suffer a loss of their water supply.

The ability to take water quality samples from each chamber of a multi-chamber reservoir also significantly improves the resilience of the customers water supply by minimising the period for which both chambers need to be taken out of service.

The two measures proposed are both aimed at providing a shift in resilience at the least possible cost to the customer and will provide benefit for the life of the reservoir with no measurable impact on operational (Opex) costs.

C. Supporting Performance Commitments

Table 1 defines the linkages to common performance commitments and to additional commitments prioritised by Portsmouth Water.

The relationships may be interpreted as follows:

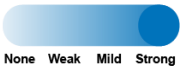
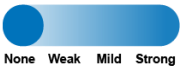
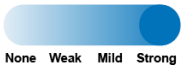
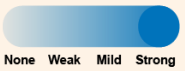
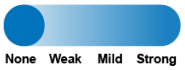
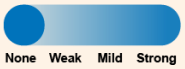
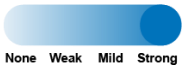
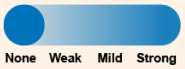
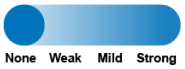
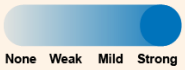
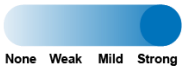
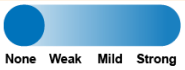
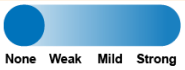
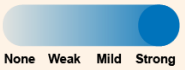
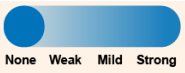
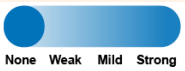
Strong	Weak	None
		
The proposal has the potential to directly and significantly impact the performance commitment or the corporate priority. The impact will not, by itself, improve current performance, though may, if the risks surface, significantly and negatively affect current performance.	The proposal has very limited impact on the performance commitment or corporate priority.	There is no perceived impact on the performance commitment or corporate priority.

Table 1: Relationships to performance commitments

Performance commitment	Relationship	Notes
Water Supply Interruptions		Portsmouth Water currently (2021-22) achieve 2 mins 21secs against a current ODI target of 6mins 8 secs. This proposal may contribute to improvement; however, its main objective is to help protect the current levels of ODI performance, and customer service more Mitigation to increases in water supply interruptions from this enhancement case is set out in **PRT05: Delivering Outcomes for Our Customers.**
Compliance Risk Index (CRI)		Significantly improves our ability to sample reservoirs and act accordingly if problems arise. Portsmouth Water do not currently meet their targets in this important area and the enhanced sampling and enhanced flexibility, contained in this proposal, will help improve performance.
Per Capita Consumption (PCC)		There is no effect on PCC.
Leakage		There is no effect on Leakage.
Unplanned Outages		Significantly improves our ability to maintain water supplies.
Mains Repairs		There is no effect on Mains Repairs.
Pollution incidents		There is no effect on pollution incidents.
CMex, DMex, BR-Mex		Customer Service is dependent on our ability to reliably supply water.
Customer Contacts WQ		Customer contacts are overwhelming high in supply interruption circumstances.
Greenhouse Gas emissions		The risk of the need to supply bottled water is reduced.
Biodiversity Index		There is no effect on biodiversity.
Carbon Footprint		The risk of the need to supply bottled water is reduced.
Low customer bills		There is limited impact on customer bills.
Corporate responsibility		Strong belief in competent stewardship which is reflected in the strong desire to comply with statutory obligations implicit in this proposal but also go further, by improving the management of these important and critical assets.
Electricity usage		There is no impact on energy costs

Materials usage		Minimal increase achieved by minimising additional process plant procurement.
Community partnerships		There is no effect on Community Partnerships.

D. Historical Perspective

There is currently a significant risk of microbiological and no supply hazards leaving the service reservoirs identified within this proposal.

The assessment noted in 11 (above) is based on the issues identified within the Drinking Water Inspectorate (DWI) notice Management and Training Notice (PRT-2021-00001), issued to Portsmouth Water on the 22 October 2021. A minimum risk score of 15 is applied against the relevant hazards.

Risk scores may vary across individual hazards and individual assets. The current Regulation 28 reports are available to provide further details on individual risk scores. These reports were supplied to the DWI in March 2023 as part of Portsmouth Waters 'appendix B' paper on this subject.

Portsmouth Waters document 308, provides further information on Portsmouth Water's DWSP risk analysis and evaluation process.

Whilst the DWI notice (PRT-2021-0001) is firmly rooted in management processes including training, documentation and procedure, there are also exogenous factors that give rise to the same risks. Procedure based controls can provide some mitigation. Maintenance, inspection procedures, and staff training can act as partial controls, however appropriate asset design can also play an important role.

Limited controls are currently available should these exogenous risks manifest themselves and give rise to water quality incidents. For example, re-zoning can be undertaken in emergencies for some supply systems for short periods, however this takes time and, in some cases, cannot anyway be achieved.

There are no catchment management or communications solutions.

Enhancement work is necessary at the reservoirs described in table 2 (below).

E. Regulatory and Statutory Compliance

The proposal is a response to past commentary from the DWI Chief Inspector, and to TGN9 (Treated Water storage) which requires that: 'Facilities should be available to isolate the structure from service to allow continuation of supply '.

The need to provide separate sampling facilities for each chamber of a multi-chamber reservoir is determined by statute and regulation 14 of the *Water Supply (Water Quality) Regulations 2016*. The need is reinforced by guidance issued by the Drinking Water Inspectorate as '*Guidance on the implementation of the Water Supply (Water Quality Regulations 2016 (as amended) in England and the Water Supply (Water Quality) Regulations (Wales) 2018.* Compliance is common practice across the UK water industry; however, the facility has not been designed into some Portsmouth Water reservoirs, which are of some vintage. Sections 14.5 to 14.7 of the afore-referenced guidance notes refer to the need for sampling arrangements that are representative of the water stored within the reservoir chambers.

The need has been identified as a result of an operational management and engineering review consequent on the DWI notice (noted above). The review considered, at every reservoir asset in Portsmouth Waters portfolio, the physical facilities available to support customer supply, support sampling practices, and enable compliance with the previously stated (above) guidance and statute.

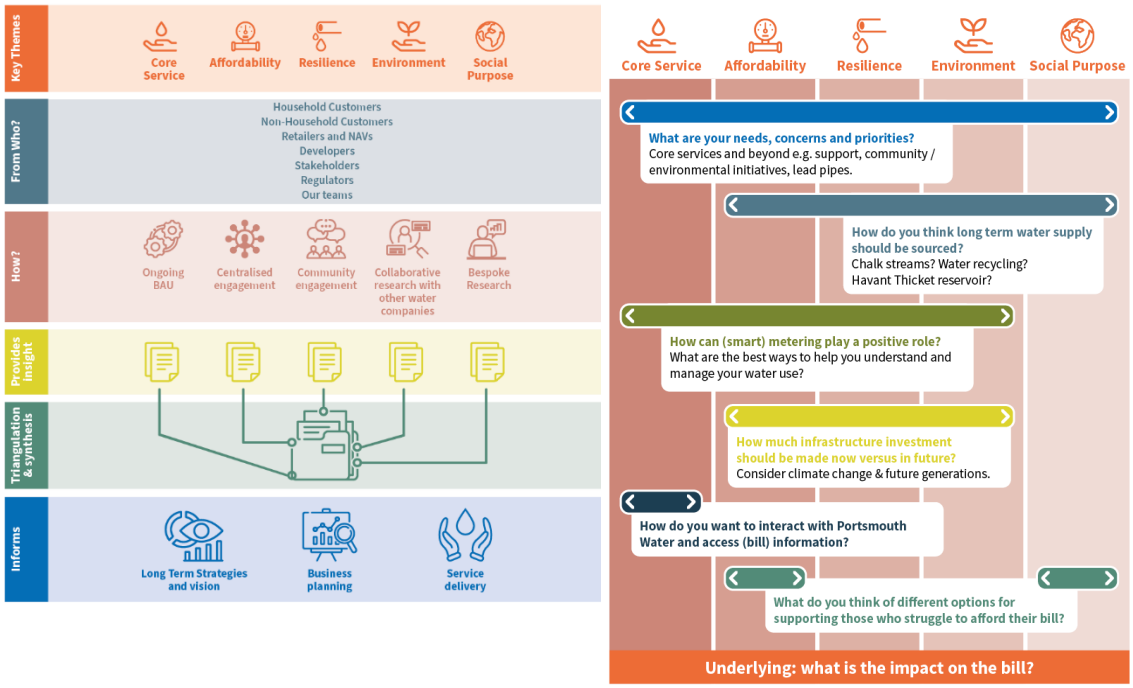
The review involved Portsmouth Water staff and /or its contractors, physically visiting every reservoir and determining its state and the enhancement actions necessary. Reports and estimates were produced for each site and an outline design undertaken. Where (other necessary) work could be carried out as part of the routine inspection and maintenance activities, then this has / is being accommodated within these programs. Such comprehensive and detailed information has not previously been available or documented. If this proposal is accepted, then all reservoirs within the portfolio will be compliant and no further similar work will be required in future AMPS.

The proposal received the support of the DWI in its August 2023 'Final Decision Letter' (appendix PRT07.04.01) concerning the 'appendix B' submission (PRT11) in March 2021. Their response contained no caveats.

F. Customer Support

This business plan has been informed and shaped through insights gained through our Engagement Strategy and triangulation process which has been embedded from 2020 and continues to inform and adapt our service delivery plans through two key elements of:

Our Engagement Strategy (represented on the left below) and our Big Conversation Framework (represented on the right below).



In all phases of engagement our customers and stakeholders feeding into our Vision, Long Term Delivery Strategy and this plan have supported the need for a secure and reliable water supply. This is consistent across all engagement right through to achieving a great result in our Acceptability and Affordability testing with customers.

Our engagement approach for supporting the plan is set out in PRT03: Engaging with our Customers and Communities. Alongside this we have published all research on our website.

Customers really supported the need for us to maintain a secure and reliable water service across a number of phases of engagement. In phase 1 we focused on understanding priorities for our customers and our range of research alongside Ofwat's own ODI research ranked these areas of company activity in importance.

This proposal supports the customers priorities by enhancing the resilience of their water supply and protecting the supply when things go wrong. The proposal would provide the same level of resilience enjoyed by customers of other water companies.

3. OPTIONS

A. Overview

A do-nothing option is not considered appropriate given the limited level of investment to achieve the benefit for the customer and the fact that there is no adverse effect on operating costs. Portsmouth Water firmly believe that to do nothing is not a tenable option and that this stance is supported by the DWI. Furthermore, the regulatory pressure and support suggests that some mitigating enhancement action must be taken. A do-nothing option is not developed in this paper, and only one option has been developed for the reasons described below and elaborated in section 4 (below).

This proposal to mitigate against the reservoir outages described in 1. (above) levers on modifying and adding to existing assets and providing control. It represents the least cost option to satisfy the obligation to the customer. The proposal to provide a sampling facility for each chamber also utilises existing assets.

Option 1 provides the only practical and economic solution. The technicalities proposed are straight-forward, proven, and simple. The proposal modifies existing assets to enhance their capability. The unit cost at each reservoir is relatively low and the total costs are simply a reflection of the number of reservoirs at which the enhancements are necessary. Options to, for example, duplicate existing reservoirs, or provide underground pipes from other points in the distribution network, are clearly and beyond doubt, impractical from a spatial and planning perspective, not cost effective in Capex or Opex terms, and, in most cases, be unlikely to allow Water Quality to be maintained. An option to do nothing is not considered tenable given the regulatory pressure to enhance the capability.

B. Option 1

Description

The proposal to mitigate against the reservoir outages described in 1 is achieved by electrically manipulating the output of existing pumps such that they provide the correct flows and pressures to satisfy customer demand whilst the reservoir is out of service. In practice, this involves fitting variable speed drives (VSD) linked to pressure (PT), via a programmable controller. Where enhanced sampling facilities are required to separately sample each chamber of a multi chamber reservoir then these will be provided accordingly.

In one case ([redacted] reservoir) where, since the existing pumps are too large to be able to 'turn-down' to the reduced flows and directly supply the customer, additional smaller pumps are included in the proposal and controlled as described above. At one reservoir ([redacted] reservoir) some minor pipework modifications are necessary to achieve the bypass arrangements.

The work proposed is summarised in table 2 (below).

Table 2: Summary of enhancement interventions

Reservoir	Enhanced bypass provision	Enhanced sampling provision needed	Notes
[redacted]	VSD & PT	Not required	
[redacted]	VSD & PT	Yes	See # 4 below
[redacted] 1	VSD & PT	Not required	
[redacted] 2		Not required	See # 1 below
[redacted] 1	VSD & PT	Yes	
[redacted] 2			See # 1 & 4 below
[redacted]	VSD & PT	Not required	
[redacted]	PT	Not required	Via [redacted]
[redacted]	VSD & PT	Yes	See # 4 below
[redacted]	VSD & PT, & piped bypass	Not required	See # 5 below
[redacted] 1	VSD & PT	Not required	At duty and assist pumps
[redacted] 2		Not required	See # 1 below
[redacted] 2	PT	Yes	See # 4 & 6 below
[redacted] 1	VSD & PT	Not required	
[redacted] 2		Not required	See # 1 & 11 below
[redacted] 1	VSD & PT	Not required	
[redacted] 2		Not required	
[redacted]	New booster set with VSD & PT	Yes	See # 2 & 4 below

Notes

1. Where bypass provisions are provided for one of a pair or group of reservoirs then the design arrangement is effective for the pair or group.
2. The existing booster set is oversized for the emergency duty and an additional smaller set is included in the proposal.
3. The proposal includes the installation of new pumps and the associated pipework.
4. The enhanced sampling arrangements may be fitted to either of the reservoir group or pair according to engineering design.
5. To achieve the objective the [redacted] reservoir requires the installation of an additional bypass pipeline around the Porchester outlet and the installation of a VSD controlling the existing pump set.
6. At [redacted] an existing flow control valve is to be changed to a pressure-controlled valve.

All the work is proposed for a rolling programme beginning early in AMP 8 and completing before the end of AMP 8.

Portsmouth Water are confident that all the work can proceed without interrupting supplies to customers. Management systems including Process Risk Assessments and Method Statements would ensure supplies to customers are not affected and the familiar provisions surrounding water hygiene would be implemented by contractors that have been approved by Portsmouth Water to work on its water process systems. Delivery of the scheme is considered low risk. The design is simple and robust, all the components needed are 'off-the-shelf' and are a well understood technology. Installation is straight-forward, and all the work could be completed within three years.

Work at [redacted] is to be coordinated with enabling work for the [redacted] which, requires the partitioning of the existing [redacted] (effectively) single chamber reservoir into a fully twin chambered unit. For clarity: the partitioning work is funded by, and will be carried out by, Portsmouth Water's [redacted] team in AMP8. This partitioning work is not included in the scope or costs of this proposal. Management systems including Process Risk Assessments and Method Statements would ensure supplies to customers are not affected.

Long-term Delivery

The proposal provides benefit for the lifetime of the reservoir. There are no plans within the Long-Term Delivery Strategy (LTDS) to decommission any reservoirs, and the proposal is confirmed as being on the least cost pathway, and all adaptive pathways, of the LTDS.

Costs

Table 3: Summary of costs

Component	VSD	Sampling	Pipework Modifications Etc	Total	
	Capex £M	Capex £M	Capex £M	Capex £M	Cost source
1. [redacted]	0.033	0.000	0.000	**0.033**	Trant
2. [redacted]	0.034	0.025	0.000	**0.059**	Trant
3. [redacted]	0.039	0.000	0.000	**0.039**	Trant
4. [redacted]	0.033	0.160	0.000	**0.193**	Trant
5. [redacted]	0.033	0.000	0.362	**0.396**	Trant
6. [redacted]	0.033	0.021	0.000	**0.055**	Trant
7. [redacted]	0.060	0.000	2.072	**2.133**	Trant
8. [redacted]	0.092	0.000	0.000	**0.092**	Trant
9. [redacted]	0.000	0.117	0.022	**0.139**	Trant
10. [redacted]	0.030	0.000	0.000	**0.030**	Trant
11. [redacted]	0.033	0.000	0.000	**0.033**	Trant
12. [redacted]	0.028	0.000	0.000	**0.028**	Trant
13. [redacted]	0.036	0.048	0.164	**0.248**	Trant
Subtotals	***0.485***	***0.371***	***2.620***	***3.477***	
Risk and Contingency	0.068	0.052	0.365	**0.484**	
PWL Management Overhead	0.073	0.056	0.393	**0.522**	
Gross Capex	**0.626**	**0.478**	**3.378**	**4.482**	
Intrinsic allowance (deduction)	0.000	0.000	0.000	**0.000**	
Delivery efficiency target (deduction)	0.125	0.096	0.676	**0.896**	
Sub Total Net Capex	**0.500**	**0.383**	**2.703**		
Total Net Capex				**3.586**	

The costs are presented on a 22/23 price basis.

Costs identified as 'Trant' are derived from engineering estimates provided by Trant Engineering Ltd. Rushington House, Totton, Southampton SO40 9LT, and exclude Portsmouth Water risk and management overheads.

The capital costs are considered a one-off cost with no associated operating costs.

The accuracy associated with estimates, being specifically derived by 3rd party engineering contractors, is believed to be within +/-10%. The contracting estimator has omitted PLC software changes from his estimates hence Portsmouth Water have estimated and allowed 5 man-days per site for the associated design, implementation, and documentation etc.

The costs are considered enhancement costs since they protect against exogenous factors that may impact the supply of water to customers. They provide enhanced resilience for customers water supplies, protecting against, for example, water quality excursions derived by climatic conditions, or raw water deteriorations, or third-party disruptions to the distribution network.

The work at [redacted] is an outlier since the objective also requires that a physical pipeline be installed to bypass the 20" [redacted] outlet, and, due to the flow requirements under bypass conditions, the required pumping capacity is greater than at other reservoirs and hence the VSD's are larger and subsequently more expensive. The solution otherwise is the same as at other reservoirs.

These are new assets and capability and there are no intrinsic costs associated with the proposal.

Opex costs are zero or so near zero as to be considered as trivial.

A full cost breakdown and the source estimates are available on request.

Benefits

This proposal provides the customer with increased resilience in their water supply. The proposal reduces the likelihood of an interruption to supply as a result of a water quality event that affects the water in either or both compartments of a reservoir. If a Water Quality event did occur then the proposal reduces the time that the customer suffers a loss of water.

The proposal enables Portsmouth Water to meet its obligations under the Water Supply Regulations.

They further provide a capability for Portsmouth Water to establish 'normal' stable conditions more quickly in the supply of water to the customers.

The proposals ease the conditions under which chambers can be taken out of service for maintenance purposes and marginally reduces the down time associated with reservoir maintenance.

Additional operating costs are near zero. An unquantifiable though marginal decrease is anticipated because of the reduced recovery effort and the increased ease and flexibility afforded to inspection and maintenance practices. This is trivial and considered offset by the marginal and equally trivial increase in operating costs associated with maintaining VSDs.

4. ANALYSIS OF OPTIONS

One option is presented since the proposal levers on the improved control of existing assets and the provision of simple additional facilities. This approach reflects the continued ambition of Portsmouth water to provide best value to its customers, whilst still providing continual improvement to the customer experience.

All other options to meet the same objective would require additional hard above ground infrastructure or the laying of many kilometres of underground pipes. The costs associated with such options are hundreds of times greater than the cost of this proposal. They are so in excess of the presented proposal that their further development is unnecessary and would burden the customer with additional engineering development costs.

In leveraging existing assets, the impact on the environment is minimal and although the proposal provides nothing in the way of environmental improvements, the societal benefit, which is reflected in the statutory and regulatory position, is substantial. Risks to Water Quality and Water supplies are substantially reduced and this reduction would be reflected in future regulation 28 reports.

This option was supported by the DWI in their response to the Portsmouth Water 'appendix B' submission in March 2023 (appendix PRT07.04.01).

A. Customer Impact

This proposal will help reduce interruptions to supply in the event of Water Quality excursions and other similar perturbations. The proposal will also help, where interruptions are unavoidable, that water supplies are re-established in the fastest possible time.

Table 3: Annual costs and customer bill impacts

2022-23 prices	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8 total
Capex £k	717	717	717	717	717	3586
Opex £k	-	-	-	-	-	-
TOTEX	717	717	717	717	717	3586
Bill impacts (average HH bill) (£)	0.06	0.19	0.30	0.41	0.51	
Source: Table CW3, Rows 120 and 123						

5. ASSURANCE AND BOARD APPROVAL

Production of this supporting document has been undertaken in accordance with internal governance and assurance procedures and processes. Third party assurance has also been provided by Jacobs Global Consultancy.

This comprised initial drafting by a Lead Author, under the direction of an Executive Owner who retains Executive responsibility for the document content including robustness and accuracy.

The document has undergone three stages of internal review and third party assurance before being signed off by the Board. Internally this has included:

i. Executive Owner, and subject matter experts for the Executive Owner,
ii. Nominated Executive,
iii. Internal Executive Review Team including the CEO and CFO.

Details of the third-party assurance, including findings/opinion, can be found in PRT15.04.

Supporting cost data has been provided by Trant Engineering Contractors.

The Board has been engaged in the development of the business plan and its content through subject specific discussions at monthly PR24 Steering Committee meetings that have taken place since late 2021. Minutes of relevant meetings are included in PRT15 Board Assurance, Appendix PRT15.01.

6. CONCLUSION

The proposal relates the addition of simple bypass control and sampling facilities at identified reservoirs to improve or protect customer service.

This proposal to improve the resilience of water provided to Portsmouth Water customers contains no additional operating costs and yet provides a significant benefit to customers in terms the continuity of supply of wholesome water and protection against Water Quality excursions.

The facility is of particular benefit in circumstances where an excursion in drinking water is suspected or determined. The ability to supply water when a whole reservoir needs to be isolated and to quickly determine if any problem is constrained to one chamber, or effects both, enables Portsmouth Water to quickly take corrective action and provides a significant enhancement to customers with minimal impact on their bills.

Portsmouth Water has an enviable record in terms of its Interruptions to Supply. Current performance is better than target and whilst the proposal may not result in further improvement, the work identified in this proposal will help ensure that this record is protected and maintained into the future.

An ODI based on the strategic objectives outlined in section 1 is proposed.

The improvement will be reflected in improved risk scores within the regulation 28 reports.

PRT07.04 APPENDIX


Portsmouth
Water