Sydney Water's WaterFix® Residential Program

Climate Change Fund 2019-2021

End of Program Evaluation Report

COBALT59, SYDNEY WATER, JUNE 2022

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1. EXECUTIVE SUMMARY

1.1 Context and background

The Climate Change Fund is designed to assist organisations in making adjustment to climate change. The fund granted Sydney Water $5.7million towards the WaterFix® Residential program in 2019. This money was used over an 18 month period starting in July of that year.

Given the drought conditions at this time, a decision was made to ramp up Sydney Water's WaterFix® Residential program by way of increased subsidies. This decision was supported by the Climate Change Fund. The objective was to transition the program to a new way of operating.

This report is an evaluation of this investment in WaterFix® Residential. This evaluation sort to understand why the program was chosen, how it was developed and if the changes were successful. It also needed to know if the changes would be durable into the future.

This report is intended for the Climate Change Fund administrators, and the general public and their representatives, seeking to know if the Climate Change Fund is well spent, and what can be improved. It also provides a summary and reflection for the many professionals within Sydney Water, and the organisation as a whole, needing to know what kind of impact their work is making.

This evaluation uses a combination of program logic and systems methodologies to illuminate and answer a set of specific evaluation questions.

1.2 Key findings

A. The project had a significant period of prior research and development, with comprehensive evaluations that showed the effectiveness of earlier program iterations. The research relating to this program is of international significance.

B. In using Climate Change Funding to further develop a tested program Sydney Water maximised the chances of a successful outcome. This program focused on the most significant water user segment as a response to an unusually intense drought.

C. The project was closely aligned to five of the Climate Change Fund objectives.

D. The WaterFix program activities were implemented as intended. The program developed several important embedded capabilities through regular review and intervention.

E. The program rapidly developed during the implementation phase. Critical bottlenecks in the process were enhanced with various software so that by the program conclusion, quality data was easily accessible in a timely manner for the most significant aspects of the program.

F. The program exceeded the participant numbers, at higher satisfaction levels, than forecasts given in the original objectives. This outcome was achieved despite considerable disruption and interruption from COVID lockdowns.

G. Customers were very satisfied across the measured criteria. The one area of improvement was a wish for greater product choice.

H. Overall, there is strong evidence that the program helped the customers who participated in

Waterfix® Residential during the Climate Change Funding period to conserve about 11kL per year per residential customer. .

I. The WaterFix® Residential program delivered value for money for Sydney Water and the NSW Government as demonstrated by meeting the Economic Level of Water Conservation in the planning and execution of the program.

J. WaterFix® Residential developed and grew as a sustainable program over the funding period into an overarching planned approach that enabled the program delivery to be appropriate for intended outcomes. The Climate Change Fund was a critical enabler of this development.

1.3 Recommendations

A. Maintenance of a stable governance structure. The danger is always 'who owns the program?'. If this ownership is unstable in terms of management and contractors, the quality of the program will deteriorate. (see 'Key Finding D' above)

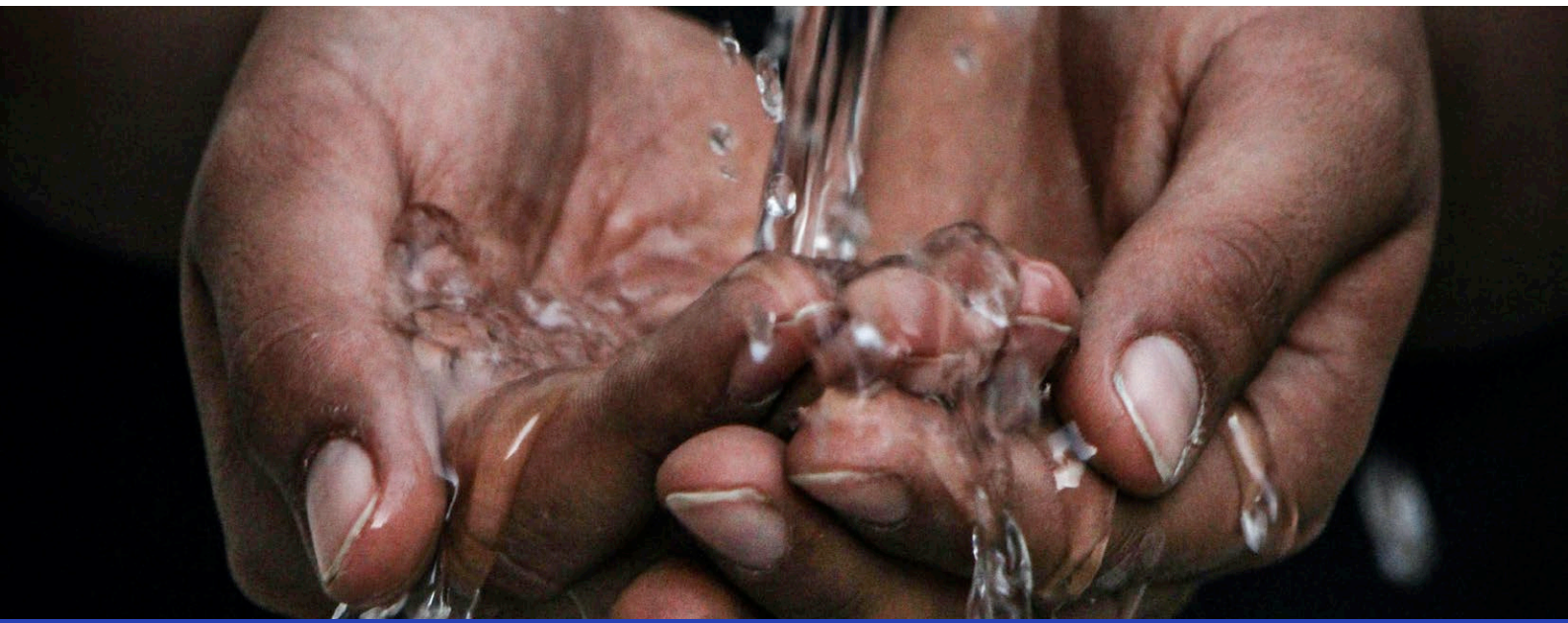
B. The present programs success shows that improving quality and productivity should remain the path towards reducing costs. An emphasis on costs as a primary driver will invariably work against the long-term effectiveness of the program. (see 'Key Finding E' above)

C. With increased complexity surrounding inventory, automated inventory systems should be investigated to replace the present manual inventory processes. (see 'Key Finding F' above)

D. Continue efforts to find high value and actionable participant segments based on the primary segmentation of geographic location. (see 'Key Finding G' above)

E. The continued impact of the Building Sustainability Index (BASIX) and the Water Efficiency Labelling and Standards Scheme (WELS) on overall demand is difficult to predict accurately without the quality of the research which this program has experienced up to date. This research needs to continue. (see 'Key Finding H' above)

F. Ongoing funding providing sustained capability is an important legacy of the Climate Change Fund's contribution, and though this need for funding has been recognised by the regulator, effort should be continued to demonstrate the value of the program. (see 'Key Finding J' above)



2. INTRODUCTION

2.1 Program Overview

The important details from the in the funding agreement between DPIE and Sydney Water are given below.

The Climate Change Fund, administered by the NSW Department of Planning Industry and Environment (NSW DPIE), invested $5,766,000 in the Sydney Water WaterFix®Residential program.

The dates of expenditure were 1 July 2019 to 31 January 2021.

(NSW DPIE, 2019)

ACTIVITY FUNDED:

To promote and deliver fixed price residential plumbing services to customers. Residential plumbing services include but are not limited to:

- repairing leaks
- Replacing toilets
- Fitting taps and showers with water efficient fittings

OBJECTIVES:

- Customer uptake (reach should be between 15,000-20000 for the funding available), anticipated delivery period of 15-18 months
- Water savings (kL per year: estimate 24kL per appointment = 360,000kL or 360ML for 15,000 appointments)
- High level of customer satisfaction (customer experience score >8.0)

The funding was granted based on a business case (Sydney Water , 2019), and an evaluation plan (Sydney Water , 2019).

2.2 Context and background to the program

The NSW Climate Change Fund provided funding to Sydney Water for a limited period to boost the output of the WaterFix® Residential program.

In general terms this Fund is to assist adjustment to climate change. This means that the money should be used to change a current situation to a new state that is more responsive to the changing climate. An evaluation should understand what the new state of the program is once the money was expended. Does the program have a capability to cope with more intense extremes? Is this capability durable?

More detail on the objectives of the fund is covered in various sections of the report below.

2.2.1 Water Supply and Demand

At the time of funding, Greater Sydney was in drought and dam levels were dropping at a faster pace than leading up into the Millennium drought. Inflows into the water catchment dams were at the lowest rates since the early 1940s and total dam levels were close to 50% of accessible capacity by June 2019. (Sydney Water, 2019)

The general response to coping with similar situations is through programs to reduce consumption of water, and to gradually bring in other sources of water (see Metropolitan Water Plan for more detail below). The WaterFix® Residential program aims at reducing consumption without impinging on the services the water provides. It is focussed on the domestic supply which is slightly above 60% of all water consumption.

In regard to consumption reduction, water restrictions are the bluntest instrument. These restrictions have various levels, with less allowable watering activity with increasing levels. During the period of funding, the following restrictions were in play:

- Level 1 water restrictions from 1st June 2019 to 9 December 2019
- Level 2 water restrictions from 10 December 2019 to 29 February 2020
- Level 1 water restrictions from 1 March 2020 to 30 November 2020

The restrictions affect the impact of more subtle programs such as the WaterFix® Residential Program. The principal effect is likely to be in a consumer's own consciousness of demand. Because water is undervalued in a market/$ sense, restrictions in other areas are likely to increase an awareness of possible wastage and prompt a search for a solution.

2.2.2 The Policy Context

THE CLIMATE CHANGE FUND

The NSW Government established the Climate Change Fund in 2007 during the Millennium Drought. This is a designated fund to address the impacts of climate change through encouraging energy and water saving activities and increasing public awareness and acceptance of climate change. (NSW DPIE, 2022)

The legislative empowerment is Part 6A of the NSW Energy and Utilities Administration Act 1987. In considering payments from the Climate Change Fund the Minister undertakes to the public provision of an evaluation (The evaluation is referenced in Part 6A [34H(4) of the Act].

The fund is administered by the NSW Department of Planning, Industry and Environment.

THE 2017 METROPOLITAN WATER PLAN

Sydney Water is a key stakeholder in the Metropolitan Water Plan[1]

The water plan in force during the program period was the Metropolitan Water Plan for Greater Sydney. This plan was approved by the NSW Premier in 2017. (NSW Government , 2017).

The Metropolitan water plan process was first developed in 2004 in response to the Millennium drought (1997-2009). Successive plans from that period have created a portfolio of actions that, amongst other aims, are meant to respond quickly and flexibly to droughts.

The essential elements of the Metropolitan Water Plan 2017[2] are predicated around safe, secure and affordable water for Sydney that accommodates the longer stresses of population growth and climate change, while responding to shocks like drought.

1 This is presently being updated as The Greater Sydney Water Strategy.
2 https://www.planning.nsw.gov.au/-/media/Files/DPE/Other/About-us/Metropolitan-Water/2017-Metropolitan-Water-Plan.pdf?la=en

The WaterFix® Residential program is an important program in achieving this. It is seen as being able to be expanded rapidly to deliver real and significant water savings when there is a perceived need like drought. The savings achieved continue for many years.

SYDNEY WATER OPERATING LICENCE 2019-2023

Sydney Water is a state-owned corporation and operates under a licence issued by the NSW Governor. The licence is administered by the Independent Pricing and Regulatory Tribunal (IPART), and is reviewed every five years.

IPART determines Sydney Water's maximum prices, reviews the operating licence conditions and monitors compliance. The licence (Sydney Water, 2019-2023) and associated reporting manual (IPART , 2022) set out requirements for its planning, implementing, and reporting of water conservation.

Each financial year, Sydney Water must prepare a Water Conservation Report that is submitted to IPART and the NSW Department of Planning and Environment. This evaluation reviewed the 2018-19, 2019-20, and 2020-21 reports.

An important part of this report is including details of measures that are economic when 'assessed by the Current Economic Method'. The current method is known as the Economic Level of Water Conservation (ELWC).

THE ECONOMIC LEVEL OF WATER CONSERVATION

Sydney Water's focus on conservation measures is presently determined by the economic level of water conservation (ELWC) methodology.

The ELWC is based on marginal analysis principles, finding the delivery of water conservation where its marginal cost equals its marginal benefit.

In applying ELWC there are five steps to the process

1. quantifying the water savings,
2. estimating the costs to achieve that volume,
3. calculating the levelized cost using the outputs of these two steps,
4. comparing the levelized cost against the benchmark ELWC, and
5. using this to evaluate (in part) the program.

(Sydney Water , 2022)

OTHER REGULATORY APPROACHES AFFECTING DOMESTIC DEMAND

The following regulatory instruments are designed to reduced water demand. Overtime it can be expected that these instruments (depending on ongoing implementation) will diminish the water savings achievable under the WaterFix® Domestic program.

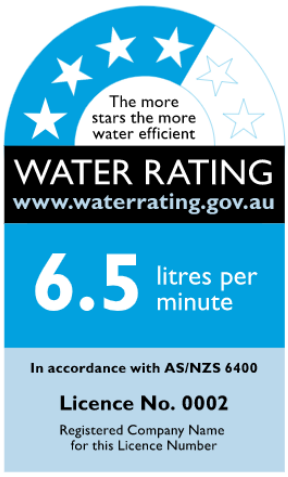
Water Efficiency Labelling and Standards Scheme (WELS)

The use of products rated to a specific WELS standard is central to the WaterFix Domestic program.

The Water Eciency Labelling and Standards Scheme (WELS) requires certain products to be registered and labelled with their water effciency and given a star rating in accordance with the national Water Effciency Labelling and Standards Act 2005.

The scheme also introduces minimum water effciency standards for various water-using products including toilets. Roughly one-third of the water savings will come from more efficient showers, one-third from washing machines and 23 per cent from toilets.

FIGURE 1: SAMPLE WELS LABEL



The WELS Scheme is a joint initiative of the Australian, state and territory governments

The Building Sustainability Index (BASIXs)

These provisions assess energy and water use if building a new home, or doing renovations greater than $50,000. These works need to comply with minimum sustainability requirements which this index sets out.

The Building Sustainability Index (BASIX) operates under the Environmental Planning and Assessment Regulation 2000, and the 2004 BASIX State Environmental Planning Policy. (NSW Government , 2004)

It commenced on 1 July, 2004, and aims to deliver equitable, effective water and greenhouse gas reductions across the state by improving new and renovated homes when they are built. The provisions are integrated into the development application process in NSW.

2.2.3 Water Conservation in Greater Sydney (NSW Auditor-General, 2020)

On the 23 June, 2020, the NSW Audit Office released an audit on 'Water Conservation in Greater Sydney'. This audit considered the evidence surrounding water conservation initiatives for the Greater Sydney Metropolitan area being effectively investigated, implemented, and supported.

At the time of this reports release, the project using Climate Change Fund monies for Sydney Water's WaterFix® Residential was still in the intense stages of implementation. No systematic evaluation was yet available.

The key findings of this report relevant to this evaluation include the following:

A. Governance around water conservation is weak

B. They have been no recent, detailed analyses of water conservation options

C. These is a lack of planning for water conservation, including securing the necessary funds

D. Sydney Water did not implement initiatives as required and was slow to respond to drought

E. There is limited evaluation and reporting on water conservation initiatives

While the Auditor General's report was much broader in scope than the present evaluation, these findings can be taken as part of the base case on which to measure progress made using Climate Change Fund monies.

2.3 The Program Details

Sydney Water's WaterFix® Residential program is a long-running program to create water efficiency and water savings for residential customers. Overtime it has evolved from a simple toilet replacement program to one that offers the services of a plumber for the following:

A. Tap and toilet leak repairs

B. Installation of WELS 4 star showerheads

C. Installation of WELS 4 star dual flush toilets

D. Installation of WELS 3 star flow regulating aerators or WELS 4 star in body flow regulators

The program adapts to changing circumstances and perceived customer needs, and the charges associated with the program change with the greater need to conserve water. Figure 2: Residential Water Use shown below gives the results of domestic use studies for water carried out by Sydney Water.

FIGURE 2: RESIDENTIAL WATER USE

(Sydney Water, 2021)

2.4 Purpose of the evaluation

The crux of the evaluation focus is understanding what was the real impact of using Climate Change Fund money to expand the WaterFix program rapidly. Was the money well spent? And how might the program best be improved into the future?

The WaterFix® Residential Program received financial support from the Climate Change Fund from 1 July, 2019 until the 31 January 2021. The $5.8million funding boost was for an 18 month project that significantly scaled up the program.

This funding was used to offer savings to customers of approximately $200 per household. The callout fee of $33 (incl GST) was waived. At the conclusion (31st January 2021) the callout fee was reintroduced. For a certain period during this project time, the program was placed on hold due to the COVID19 pandemic.

The original project was accompanied by a business plan and an evaluation plan.

3. EVALUATION METHODOLOGY

3.1 Scope

This review is implemented over a year after the project has been completed. It makes use of the quantitative and qualitative data that is available leading up to the project, during the project, and the relevant information following.

In that sense the evaluation is a meta - analysis - bringing together all previous research and management experience. It is designed to provide an understanding of the 'before' knowledge, actions during the funded period, and understanding of the 'after' conditions.

The systems described in the efficiency section were initially created through detailed descriptions from the system coordinator and manager, then cross checked in the field.

The limits of the evaluation are determined by gathering knowledge and understanding from the following stakeholder groups:

A. **Customers** (those affected) – these people are the primary focus.

B. **Direct interest** – those directly responsible for the day-to-day implementation of the program

C. **Hierarchy** – those people that control financing and funding across various associated areas

D. **Experts** – stakeholders associated with the analytics or expert knowledge for aspects of the program

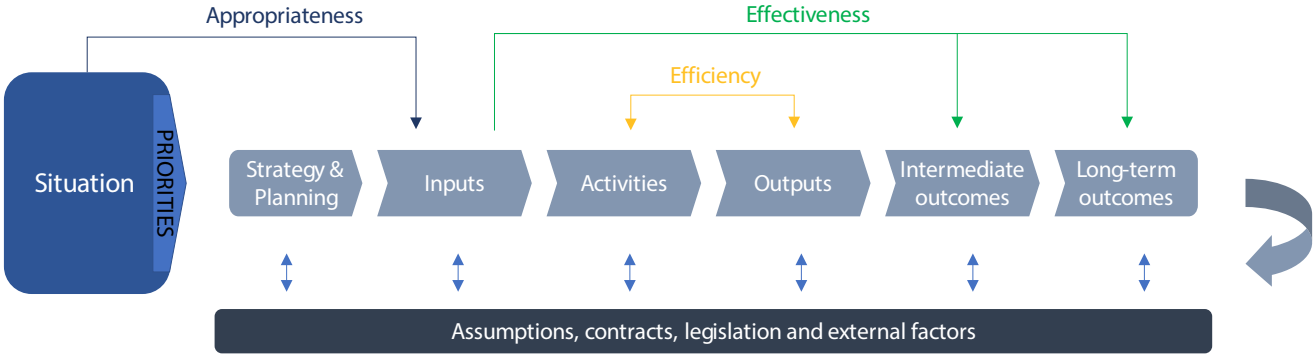
(Ulrich , Werner, & Reynolds, 2010)

3.2 Methods

The approach to this evaluation has been to use program logic to provide a framework to understand the program over time, and to use a systems evaluation methodology (SET) to understand the program in detail.

Best practice evaluation has evolved from a process of temporal logic named program logic, developed for the World Bank in the late 1960s (Bamberger, 1986). The different types of evaluations are shown in *'Figure 1: Evaluations related to program logic' below.*

FIGURE 3: EVALUATIONS RELATED TO PROGRAM LOGIC



The three different types of evaluation questions are:

A. **Appropriateness** – this evaluation asks if the program was implemented based on good knowledge and was it suitable for the situation based on an understanding of what was happening in the internal and external environments.

B. **Efficiency** – an efficiency evaluation is concerned with understanding the quality of the process used to produce the desired outputs. An improvement in quality and productivity is the path to decreasing costs - not vice versa. (Anderson, 1994)

C. **Effectiveness** - Is the program achieving positive outcomes, is it continuing to achieve these outcomes over time, and will it into the foreseeable future? Is the program cost effective?

A program logic framework by itself is limited to giving a theoretical cause and effect outline without providing an understanding of system interactions. Significant further insights can be provided using a systems evaluation methodology. A practical and useful systems evaluation is provided by Systems Evaluation Theory (Renger , 2015). An outline of the process is provided in 'Appendix A: Systems Evaluation Theory Outline'.

Systems Evaluation Theory (SET) gives a set of principles that assist evaluators to move through a series of interdependent sequenced steps. These steps use systems thinking to help explore the detailed aspects of the system to understand how it is functioning and where it can be improved (Knight & Baldwin, 2022)

Three guiding principles are:

1. It is necessary to define the system before evaluating efficiency and effectiveness. This includes defining the system boundaries, subsystems, processes, relationships, feedback mechanisms, attributes, inputs and common goal(s)

2. System efficiency is a necessary prerequisite for optimal system effectiveness

3. System effectiveness is evaluated after system efficiency. (Renger , 2015)

3.3 Key Evaluation Questions

The key evaluation questions are the original questions from the WaterFix Residential Climate Change Fund Evaluation plan (see Figure 2: Program Logic WaterFix Residential CCF Evaluation Plan below).

In addition, three 'appropriateness' evaluation questions have been included to better understand the impact of the program within the context of the surrounding environment.

3.3.1 Appropriateness

- Did the project align to the objectives of the Climate Change Fund?
- Did the project align to the corporate strategy of Sydney Water?
- Was the project informed by best practice? This includes national, international, and internal best practice.

3.3.2 Efficiency

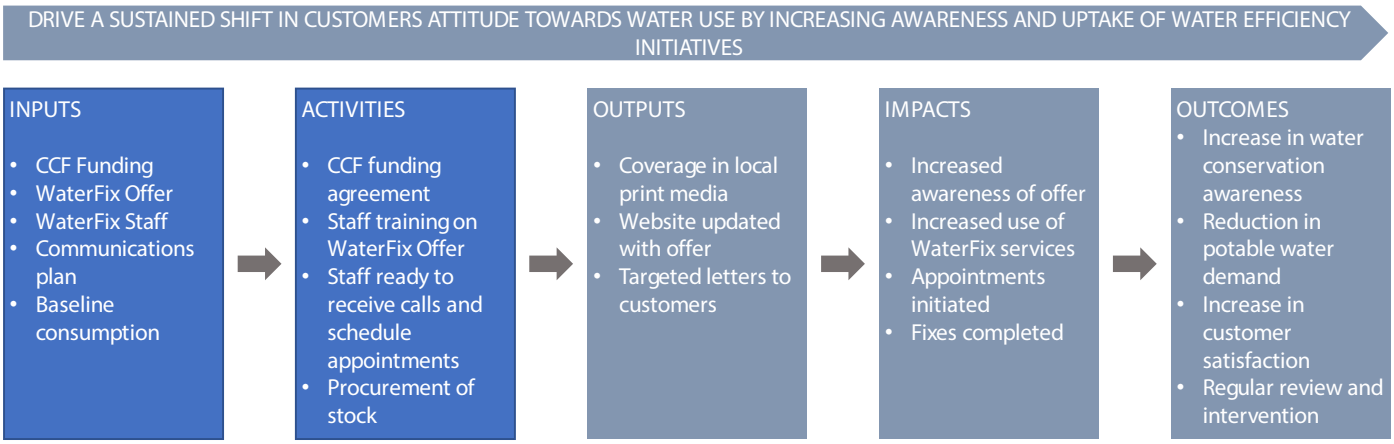
- Were the WaterFix program activities implemented as intended?
- To what extent did the program reach intended recipients?
- Was the data collected appropriate for informing and decision making?
- What do customers think could have been done differently to make the program more effective and efficient?

3.3.3 Effectiveness

- To what extent has the project helped participating customers use water efficiently?
- To what extent did the WaterFix program deliver value for money for Sydney Water and the NSW Government?
- To what extent was the program delivery appropriate for intended outcomes?

The tasks undertaken to answer these questions, the data sources and the accuracy of this data is provided in 'Section 6.2 Appendix B: Key Evaluation Questions Data Source and Accuracy'

FIGURE 4: PROGRAM LOGIC WATERFIX RESIDENTIAL CCF EVALUATION PLAN



(NSW Office of Environment and Heritage, 2019)

3.4 Limitations

The evaluation is limited to the WaterFix® Residential program. No attempt is made to understand if other programs would have been 'more appropriate' in achieving water savings. The focus period is the changes that were able to be enacted during the funded period, and to a certain extent the follow on impacts to the program.

No original studies were conducted for this evaluation. Sydney Water has considerable analytic capabilities, and these capabilities were used to provide valuable insights into the WaterFix® Residential program.

In relation to analytics around customer experience of program quality and satisfaction Sydney Water uses Qualtric software. These customer experience analytics were only introduced in the final third of the program. Prior to this, the default proxy measure of customer experience was number of complaints.

4. FINDINGS AND DISCUSSION

4.1 Appropriateness evaluation

4.1.1 Key Evaluation Questions

- Was the project informed by best practice? This includes national, international, and internal best practice.
- Did the project align to the corporate strategy of Sydney Water?
- Did the project align to the objectives of the Climate Change Fund?

4.1.2 Findings

A. **The project had a significant period of prior research and development, with comprehensive evaluations that showed the effectiveness of earlier program iterations. The research relating to this program is of international significance.**

B. **In using Climate Change Funding to further develop a tested program Sydney Water maximised the chances of a successful outcome. This program focused on the most significant water user segment as a response to an unusually intense drought.**

C. **The project was closely aligned to five of the Climate Change Fund objectives.**

4.1.3 Research behind the program

The genesis of WaterFix® Residential is through the following:

A. **A planning study** considering ways to reduce the demand for water without diminishing utility - least cost planning in 1998 (White & Howe , Water efficiency and reuse: A least cost planning approach, 1998). This study canvassed options for the less expensive options of reducing the demand of water, as opposed to increasing supply. This was a joint project between Sydney Water and the Institute of Sustainable Futures at the University of Technology in Sydney.

B. **A pilot program** with 3478 customers in 1999 that involved retrofitting households with water efficient equipment, and provided information on how to reduce water to participants (White & Fane , 2002). The evaluation was carried out by the UTS Institute of Sustainable Futures. Customers' before and after water consumption was measured and compared to a control group of an equivalent number of customers who didn't participate in the program.

   The results for the winter and spring quarters immediately following the program were 18 ± 7.0 kL/hh/a and 23 ± 5.5 kL/hh/a, respectively. The average annual demand reduction attributable to the program was estimated to be 19.6 ± 4.6 kL/hh/a.

C. **"Every Drop Counts"** residential retrofit program from January 2000 to September 2002 with 200,000 participating households. The evaluation was carried out by the UTS Institute of Sustainable Futures (Turner , White , Beatty, & Gregory , 2005)

   The results showed savings of 20.9 ± 2.5 kilolitres per household per annum, which is about 8% of average household demand or 12% of estimated indoor demand. This was consistent with previous investigations.

TABLE 1: NUMBER OF PARTICIPANTS DAILY PREVIOUSLY

Start Date	End Date	Working Days	Participants	Prtcpnts/day
1/1/2000	30/9/2002	689	200,000	290.28

The WaterFix® Residential program has been implemented in various iterations since these studies were completed. Of note is that the water savings measured are all prior to the introduction of the following regulations (see 2.2.2. The Policy Context, above):

A. The Building Sustainability Index – BASIXs was commenced 1 July, 2004

B. Water Efficiency Labelling and Standards Scheme – WELs was enacted in 2005

4.1.4 The objectives of Sydney Water

Sydney Water was faced with responding rapidly with a range of measures to an environment that was showing signs of severe drought. A key commitment under The Metropolitan Water Plan 2017 was to increase expenditure on water conservation measures.

Using Climate Change Fund monies to create a focussed investment on an established program amongst the various options given by the Economic Level of Water Conservation was a good decision for the following reasons:

A. The program had solid research and many trial periods. It was known to work. While the program had been diminished to a low level of operation, some capability existed in the organisation for rapid expansion.

B. The program reached the customer segment with the most consumption. The residential sector, the focus of this program, accounted for 65% of water use in 2018-19 (Sydney Water, 2019)

C. The program had potential to be very flexible in its scalability. It relied on one central contract that provided access to a lot of independent operators for implementation.

D. It provided a strong alignment with the WELs scheme for domestic appliances.

This program had a higher chance of implementation success when considered against lesser developed programs.

4.1.5 Climate Change Fund Objectives

The simple evaluation answer is yes, the program choice was closely aligned to the objectives of the fund.

The purposes of the Fund that this program addresses are as follows—

A. to provide funding to reduce greenhouse gas emissions and the impacts of climate change associated with water and energy activities

B. to provide funding to encourage water and energy savings and the recycling of water

C. to provide funding to reduce the demand for water and energy, including addressing peak demand for energy

D. to provide funding to stimulate investment in innovative water and energy savings measures

E. to provide funding to increase public awareness and acceptance of the importance of climate change and water and energy savings measures

(NSW Government , Accessed 21/04/2022)

4.2 Efficiency evaluation

4.2.1 Key Evaluation Questions

- Were the WaterFix program activities implemented as intended?
- Was data collected appropriate for informing and decision making?
- To what extent did the program reach intended recipients?
- What do customers think could have been done differently to make the program more effective and efficient?

4.2.2 Findings

A. **The WaterFix program activities were implemented as intended. The program developed several important embedded capabilities through regular review and intervention.**

B. **The program rapidly developed during the implementation phase. Critical bottlenecks in the process were enhanced with various software so by the program conclusion, quality data was easily accessible in a timely manner for the most significant aspects of the program.**

C. **The program exceeded the participant numbers at higher satisfaction levels than those given in the original objectives. This is despite considerable disruption and interruption from COVID lockdowns.**

D. **Customers were very satisfied across the measured criteria. The one area of improvement was a wish for greater product choice.**

4.2.3 Implementation as intended and data collection

The intention was to provide the service for 15-20,000 participants with a high level of customer satisfaction (a customer experience score of >8.0/10).

To facilitate access to the program the following barriers were anticipated and allowed for in the program design:

A. **Socio-economic barriers**

Language
Sydney Water has an across organisation approach to language access. The six major languages of Sydney are accommodated to some extent with written information. The program did not move beyond these access provisions. Written information is provided in the following languages:

- Arabic
- Chinese (simplified and traditional)
- Greek
- Korean
- Vietnamese

Spoken access is facilitated through a translation service and is broader in range.

Financial

The service cost was eliminated (except for individual choices beyond the range of the program). The program was rolled out using a geographic focus. This accommodated all levels of income, and additional assistance was available through Sydney Water's financial hardship program.

B. Information access barriers

Lack of marketing awareness

Communicating to the highest 10,000 users by direct mail in a geographically determined area was the most successful approach over time. Initial traction was gained through the use of public relations, principally the influence of news content in broad based media. This program related directly to general stories of low dam inflows and water restrictions.

Paid advertisements in social media, internet placements and broad based marketing through traditional media advertisements were far more expensive, and much less effective. Overtime it will be anticipated that segment knowledge with allow for much more nuanced and finer grain program targeting. This has to be continually balanced against cost.

C. Useability barriers

Acting on awareness

Creating access to booking in a timely fashion was a primary focus. Within eight months the access had improved to a level which easily maintained customer contact for close to 100% of the callers. During the lockdown period, lists were created of people wishing to access the service. The call centre was upgraded to a level where customers could interact with the service team with limited delays.

COVID Lockdowns

The COVID period meant a complete gap in servicing participants. During this period lists were created for future appointments, however demand is likely to have been significantly suppressed by COVID lockdowns. The lists were a positive response to a difficult and unusual situation.

RESPONSE

Customers responded to the adjusted program offer rapidly. Data collection was initially cumbersome, consisting of paper forms and spreadsheet entries, however these feedback mechanisms rapidly evolved. The program focussed on continuous innovation in program delivery and customer service. In this regard, the program achieved remarkable results.

The table below shows the massive growth in the participants numbers when the project was implemented. The first period (1/07/18-30/06/19) shows the number of participants in the program prior to the use of Climate Change Fund monies.

TABLE 2: NUMBER OF PARTICIPANTS DEALT WITH DAILY

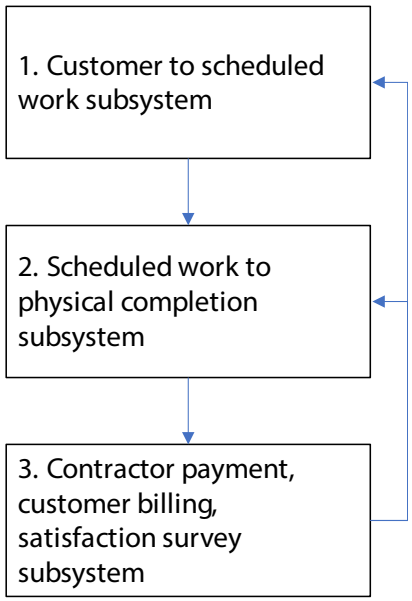
		Wrkdys	Prtcpnts	COVID		Wrkd Lost	Days	Prtcpnts /Day
1/07/18	30/06/19	250	689	0		0	250	**2.76**
1/07/19	30/06/20	253	14765	30/03/20	30/06/20	-64*	189	**78.12**
1/07/20	30/06/21	253	12919	1/07/20	3/07/20	-3*	250	**51.68**

**These lost workdays were due to COVID restrictions*

The next two periods show the growth. Of importance is the growth between 1/07/19 and 30/06/20. This program moved from dealing with 3 participants per day to 78 participants per day within a year. This growth equates to growing a program at the rate of 2600% pa, a remarkable achievement that caused considerable pressure.

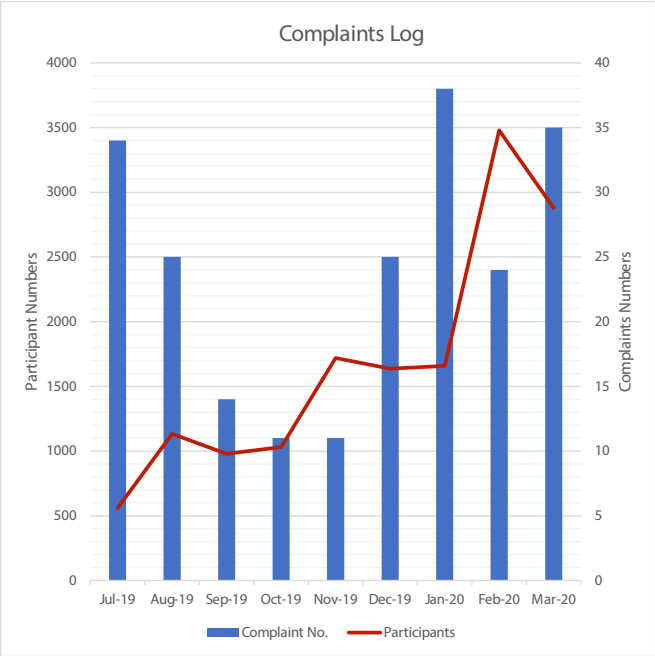
The efficiency evaluation is based on three subsystems given in *Figure 4: Process component subsystems below:*

FIGURE 5: PROCESS COMPONENT SUBSYSTEMS



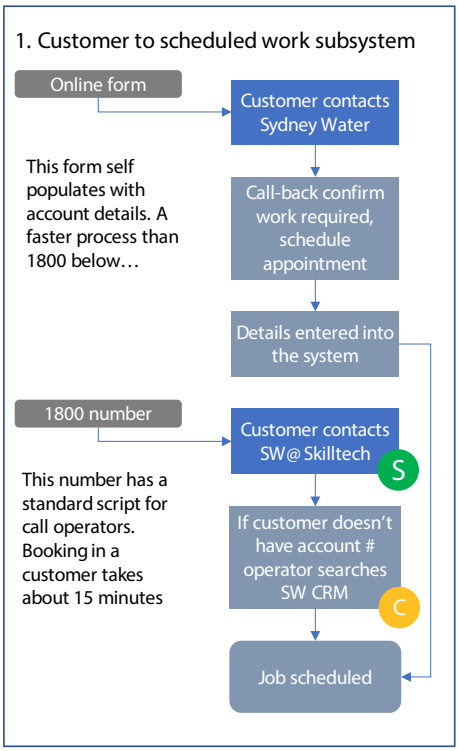
While overall, complaints were very low, the initial concern was the wait time and inability to get through to an operator to book. 'Figure 4 Complaints Log First Period' below shows customer frustration in July 2019 (startup) and January2020 (rapid growth).

FIGURE 6: COMPLAINTS LOG FIRST PERIOD



The system analysis, 'Figure 7: Customer to scheduled work subsystem' below, shows the implementation of a call centre facility, along with an expansion of staffing created a satisfaction rating of 90% (extremely satisfied or satisfied) in the second period. 'Figure 8: Satisfaction Rating Period Two' below provides appointment scheduling satisfaction feedback for seven months.

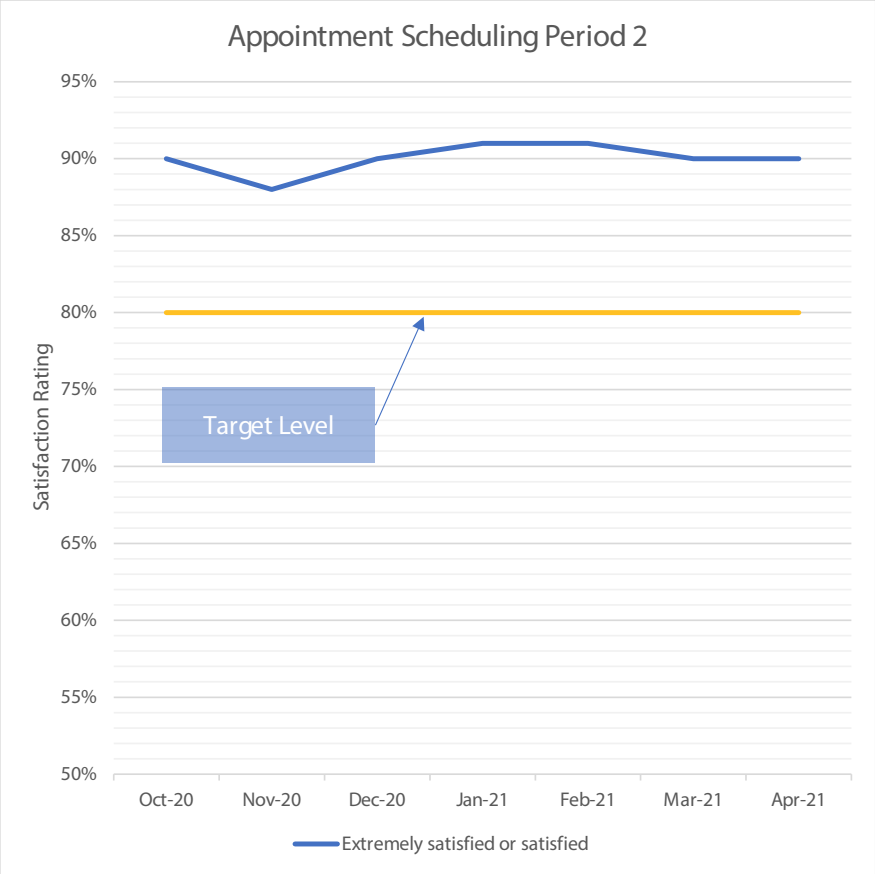
FIGURE 7: CUSTOMER TO SCHEDULED WORK SUBSYSTEM



S — Climate Change Funding allowed call centre capabilities to be developed at this point. This capability is now embedded in the program

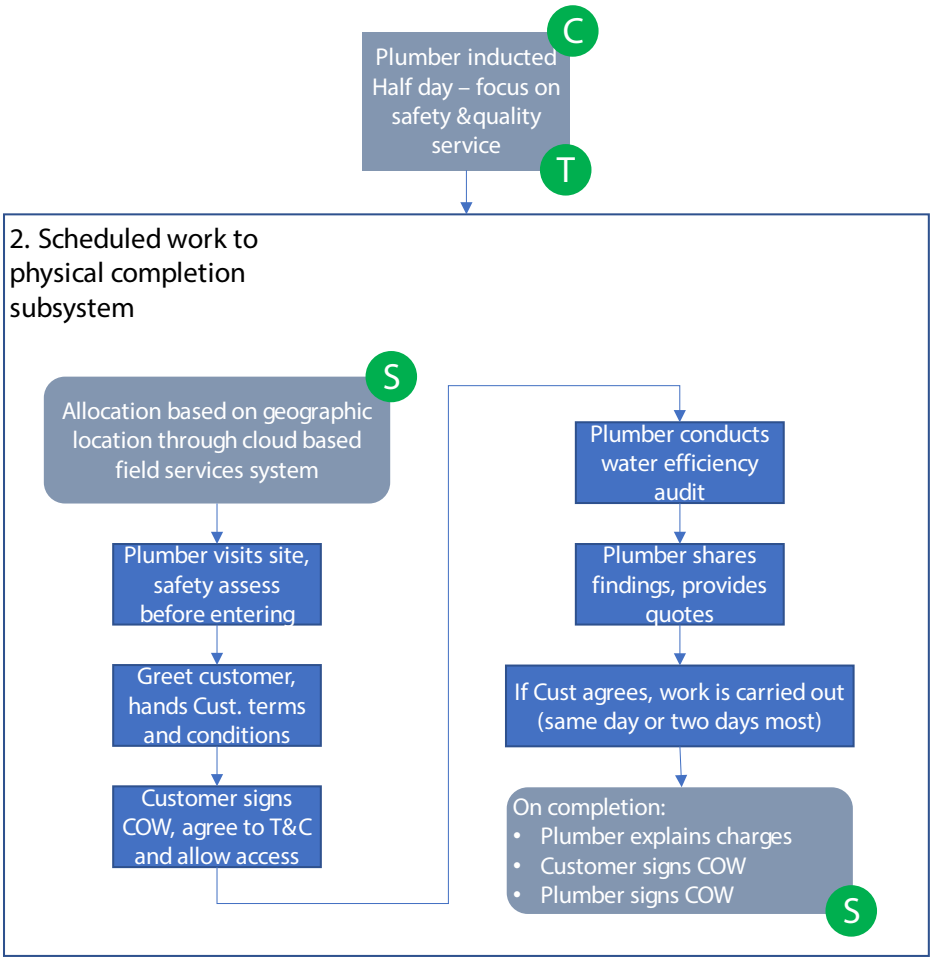
C — Identified constraint – the process slows here, however this is not severe. This may be an area of future development

FIGURE 8: SATISFACTION RATING PERIOD TWO



(Sample sizes for satisfaction ratings are given in Appendix C: Response Data for Qualtrics Satisfaction Survey)

FIGURE 9: SCHEDULED WORK TO PHYSICAL COMPLETION SUBSYSTEM



C — The Culture of Sydney Water/Skilltech is embedded at this point. The critical advantage of the program is dependable, quality work

T — Training is the main influence attribute for the program. Low satisfaction feedback is corrected with direct feedback, or at this point.

S — Climate Change Funding allowed automation capabilities to be developed at these points. These capabilities are now embedded in the program

The important connection between subsystem 2 and subsystem 3 was integrating the Cost of Works form (COW) into an automated billing software. This enabled the program managers to move from concentrating only on program delivery to a focus on quality metrics.

During period 2, satisfaction levels with plumber service averaged at 87% of customers being extremely satisfied or satisfied with the service they received. Satisfaction results are given below in 'Figure 10 Plumber Service Satisfaction – Period 2'.

FIGURE 10: PLUMBER SERVICE SATISFACTION - PERIOD 2

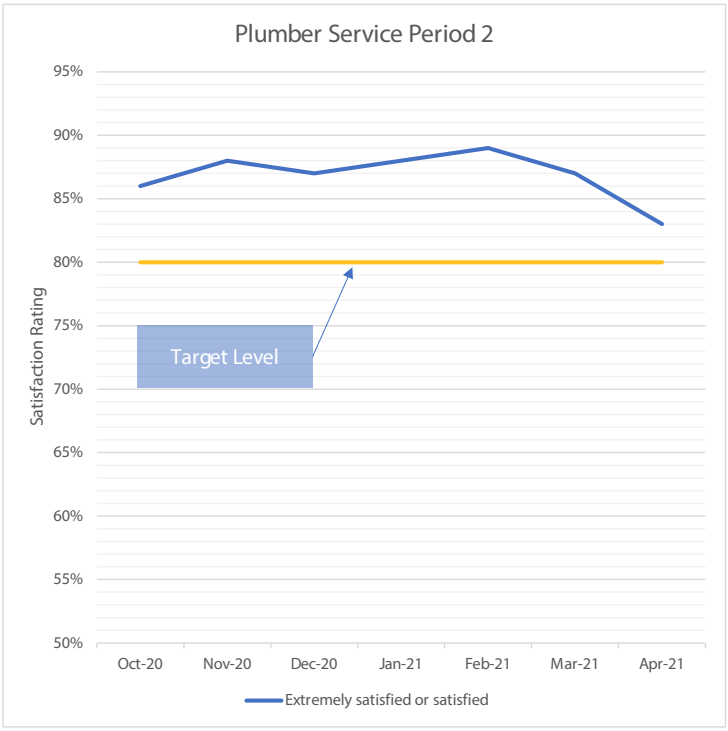
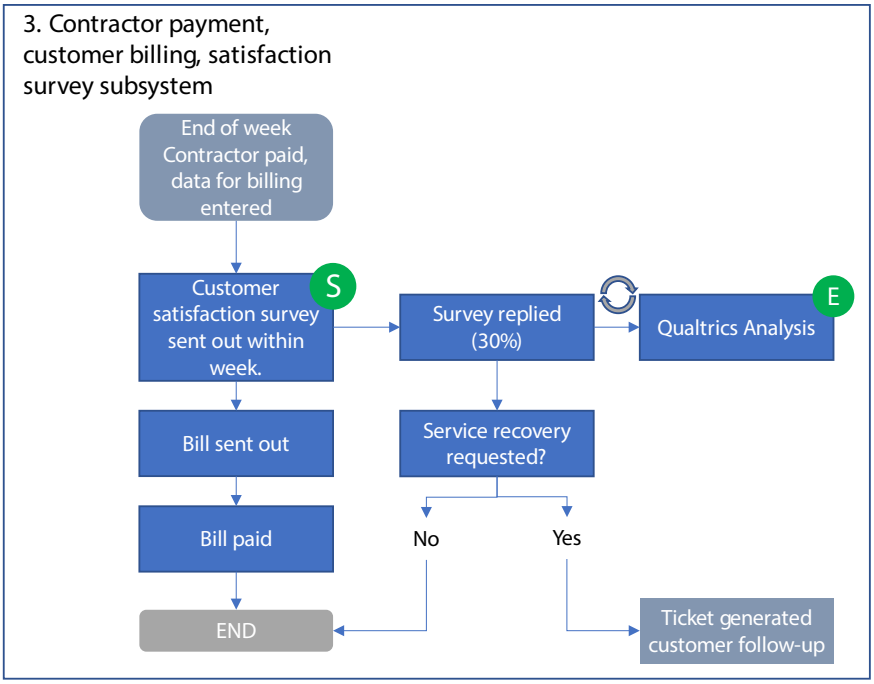


FIGURE 11: PAYMENT, BILLING, SATISFACTION FEEDBACK SUBSYSTEM



S — Climate Change Funding allowed automation capabilities to be developed at this point. These capabilities are now embedded in the program

E — Evaluation point – does this process provide quality feedback, and will it cope with a rapidly expanded program?

The WaterFix® Residential program integrated the Sydney Water customer satisfaction software (Qualtrics) which automated survey collection and analysis. This means less risk of failure from inadequate software support, and enhanced credibility within the corporate structure. It also meant a reasonably high rate of survey return (30%). The automated analysis provides quality feedback in a timely fashion.

4.2.4 Reaching intended recipients

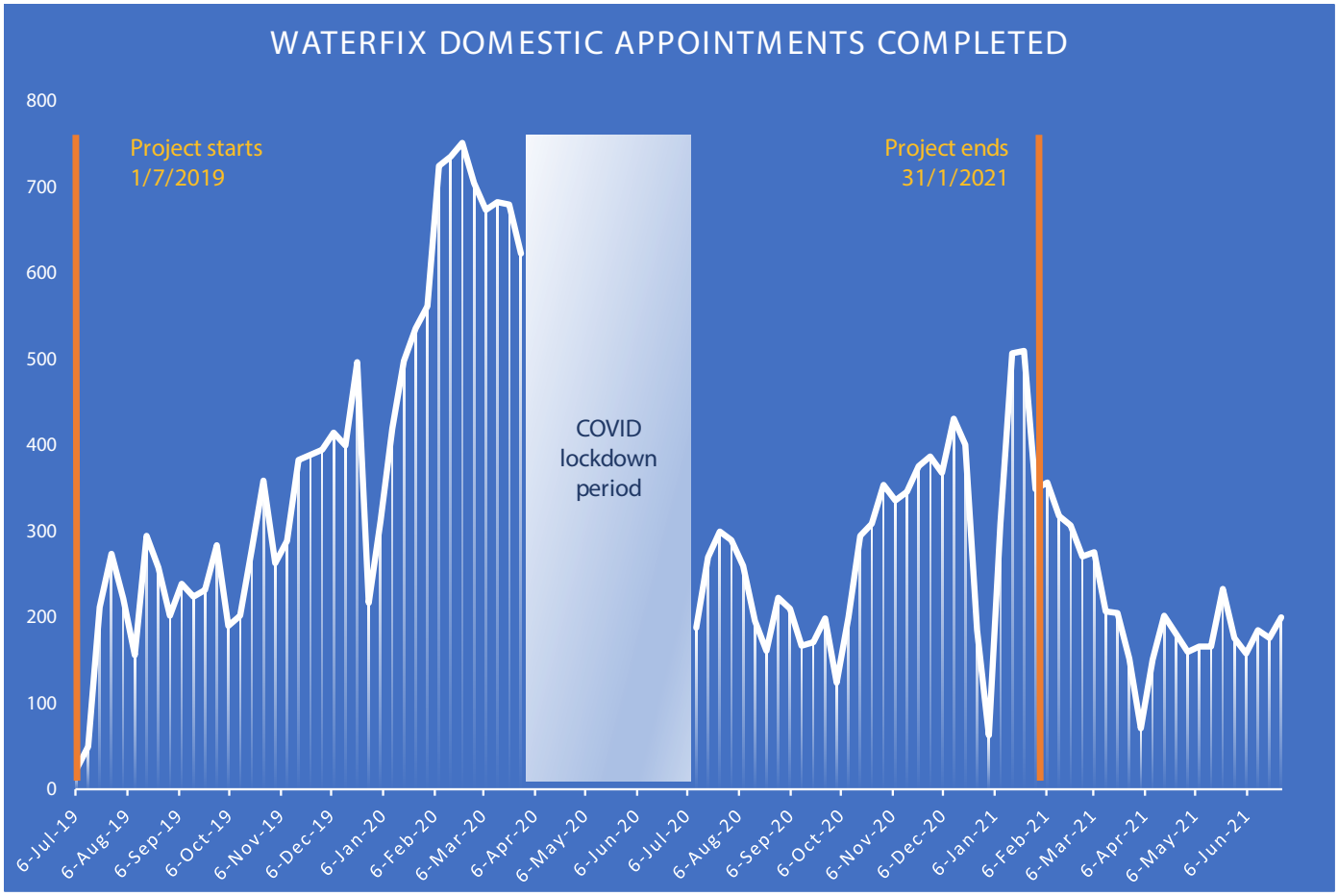
Regardless of the COVID19 interruption, WaterFix® Residential appears to have been an overwhelming success. Participants rose from 500/year to 20,000/year over the 18-month period. This well exceeded the original target which was approximately 15,000 appointments.

In the WaterFix® Residential appointments given in 'Figure 12: WaterFix Appointments per Month' below, not surprisingly, the appointments followed a pattern of increasing during the summer months and dipping dramatically during the Christmas holiday period. The upwards trajectory resumes quickly and only starts to decline with the onset of Autumn.

The COVID period meant a complete gap in servicing participants. During this period lists were created for future appointments, however demand is likely to have been significantly suppressed by COVID lockdowns.

A similar pattern is repeated the following year, albeit at lower levels.

FIGURE 12: WATERFIX APPOINTMENTS PER MONTH

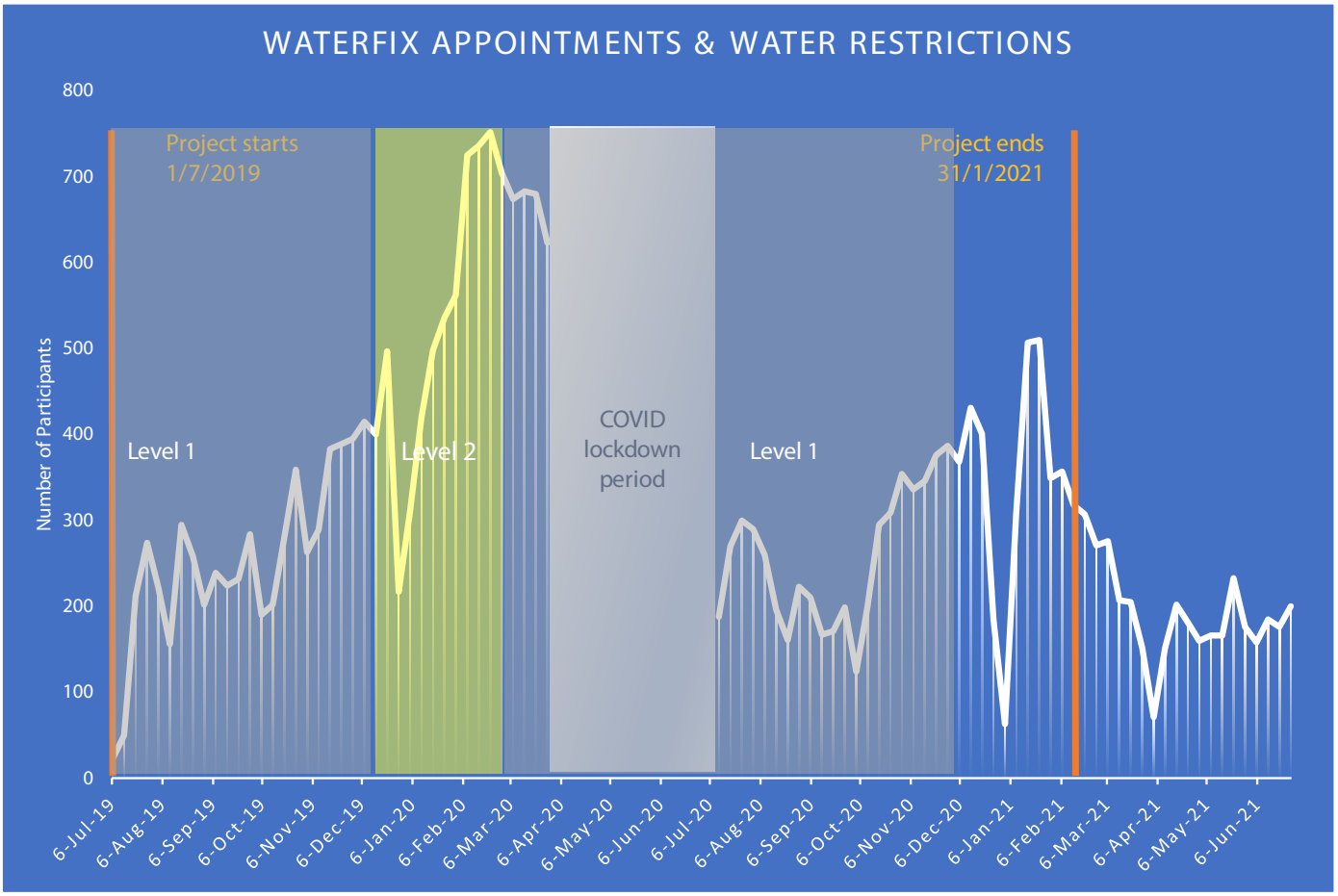


The potential demand for WaterFix is most probably influenced by water restrictions. To test this water restrictions dates (Table 3: Water Restrictions During Project Period) were mapped against program demand (Figure 13: Water Restrictions and Potential Demand Impacts).

TABLE 3: WATER RESTRICTIONS DURING PROJECT PERIOD

Water Restriction Level	Start Date	Dams Level	End Date	Dams Level
Level 1	1 June 2019	Dams at 53.4%	9 December, 2019	Dams at 46.1%
Level 2	10 December, 2019	Dams at 46.1%	29 February, 2020	Dams at 80%
Level 1	1 March, 2020	Dams at 80%	30 November, 2020	Dams at 93.5%

FIGURE 13: WATER RESTRICTIONS AND POTENTIAL DEMAND IMPACT



"Figure 13: Water Restrictions and Potential Demand Impact" above shows rapidly increased demand during when water restrictions moved to level 2. Water restrictions as a trigger are consistent with stated intentions surveyed around the uptake of water conservation and efficiency measures (Moglia, Cook , & Tapsuwan, 2018), and this seems intuitive.

The implementation of restrictions is likely to significantly increase the public relations value of WaterFix® Residential availability. In addition, it is likely to stimulate a lot more 'word of mouth' recommendations.

4.2.5 What do customers think could have been done differently?

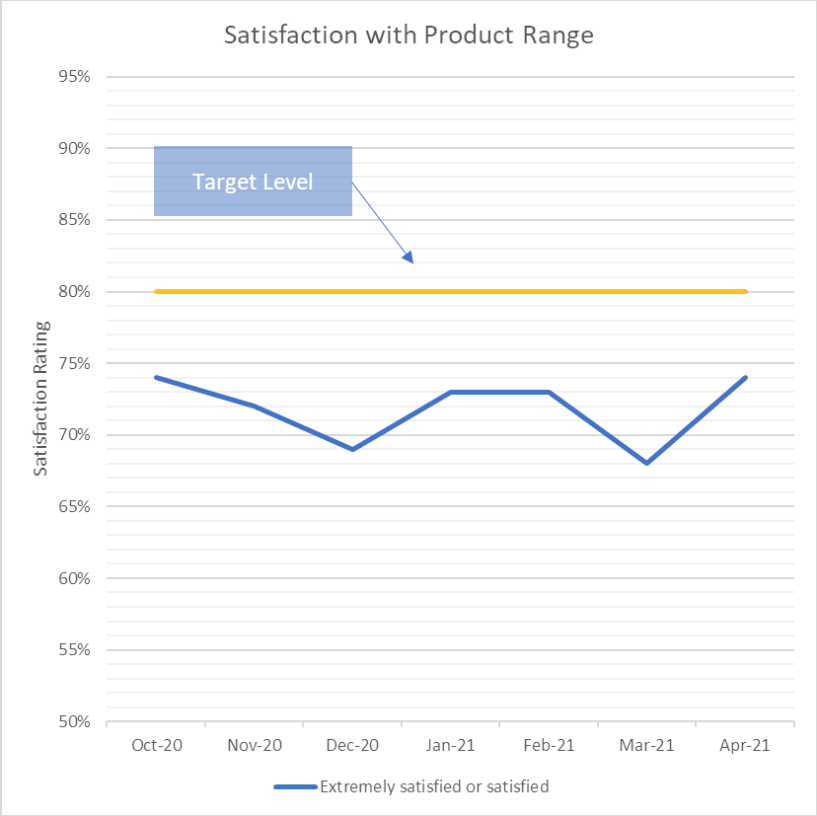
The satisfaction survey considers six areas:

- **A.** Cost of service
- **B.** Plumber service
- **C.** Quality of products
- **D.** Quality of work
- **E.** Product range
- **F.** Scheduling appointments

The two areas of below target satisfaction are quality of products and product range. Closer analysis shows that these questions have a very high level of correlation in responses, meaning survey respondents equated these two questions as asking the same thing.

The quality of product supplied was a mid to higher level quality product, and survey respondents would not have had enough time to make judgements about the functional life of the product. This leads to a presumption that survey respondents were less satisfied with the limited product range. 'Figure 14: Product Range Satisfaction' shown below gives the results for this area of the survey.

FIGURE 14: PRODUCT RANGE SATISFACTION



A text analysis of 'any other suggestions?' in the Qualtrics Satisfaction Survey shows the highest level of negative responses were received in relation to 'products'. The timeframe for these responses is slightly different to the quantitative data, however the message is the same.

The challenge will always be finding the right product range and mix while not incurring excessive costs.

4.3 Effectiveness evaluation

4.3.1 Key Evaluation Questions

- To what extent has the project helped customers participating in the WaterFix use water efficiently?
- To what extent did the WaterFix program deliver value for money for Sydney Water and the NSW Government?
- To what extent was the program delivery appropriate for intended outcomes?

4.3.2 Findings

A. **Overall, there is strong evidence that the program helped the customers who participated in Waterfix® Residential during the Climate Change Fund contributions to conserve about 11kL per year per residential customer.**

B. **The WaterFix® Residential program delivered value for money for Sydney Water and the NSW Government as demonstrated by meeting the Economic Level of Water Conservation in the planning and execution of the program.**

C. **WaterFix® Residential developed and grew as a sustainable program over the funding period into an overarching planned approach that enabled the program delivery to be appropriate for intended outcomes. The Climate Change Fund was a critical enabler of this development.**

4.3.3 Extent of WaterFix® Residential Savings

The facilitation success by Sydney Water of the participation of consumers in the Waterfix® Residential program can be measured by the number of appointments and the water savings coming out of the subsequent interventions. This can be summarised as the extent of Waterfix® Residential water savings.

The water saving estimate was 24kL per annum per appointment. The potential savings were estimated at 360,000kL per annum.

Sydney Water provided analytics that it had undertaken of the WaterFix® Residential program in November 2021. The analysis covered the period July 2019 to March 2020.

The following charts show, firstly, the before and after water consumption for properties where a WaterFix® Residential investment occurred and in the second chart, for properties not on the program. The blue line in each chart shows the median household water consumption in kL for the 12 months before the investment and the red line, the median consumption for the 12 months after the investment. The second chart shows the equivalent before and after curves for a control group matching the properties in the first chart. The control group was more than 1 million single dwelling properties supplied by Sydney Water.

The first chart clearly shows a significant water consumption reduction in the second year, whereas, the control group shows a modest reduction, which disappeared over the twelve-month period. On average, the net water consumption reduction for WaterFix® Residential properties was 16kL for the year, while a 5kL average reduction was observed for the control group. Therefore a net 11 kL saving per year can be calculated on an initial consumption of around 200kL per year. That is about a 5% consumption reduction.

FIGURE 15: WATERFIX PROPERTIES BEFORE AND AFTER CONSUMPTION PATTERN

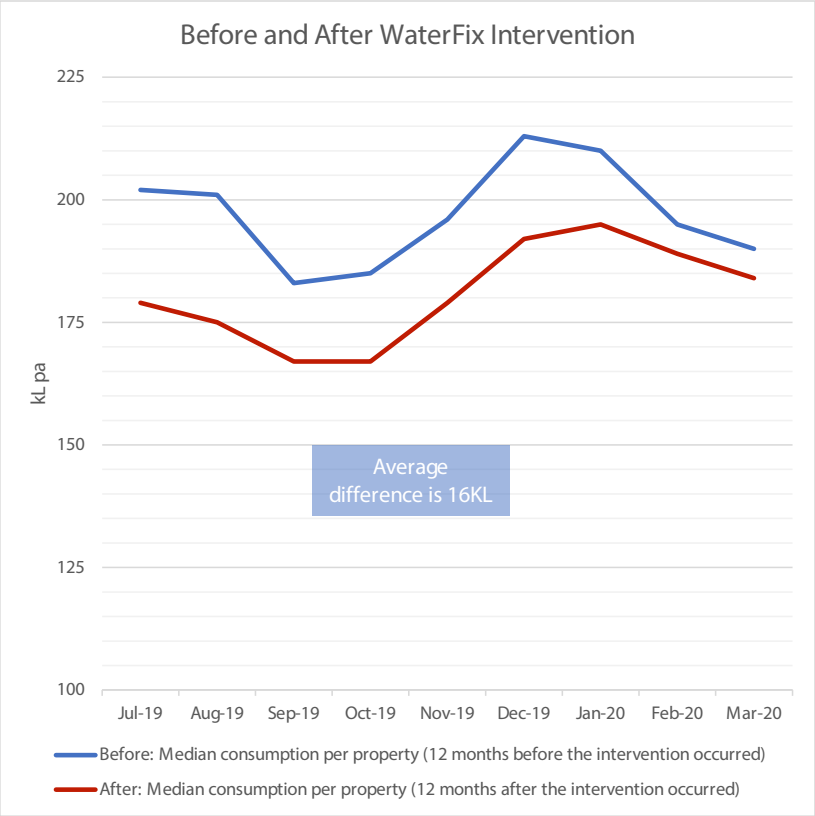
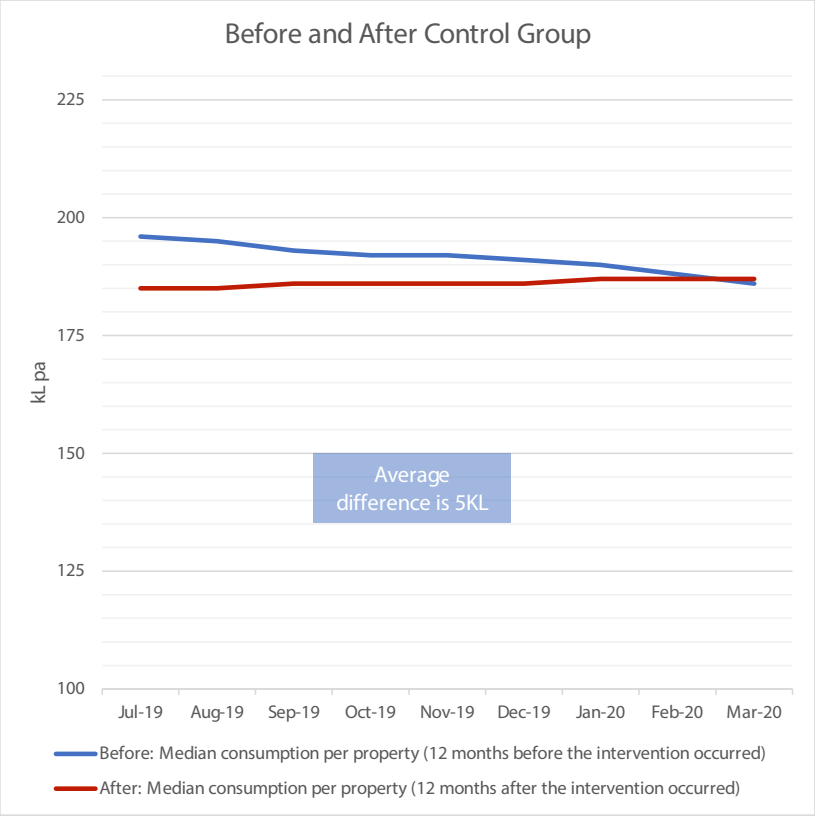


FIGURE 16: BEFORE AND AFTER CONTROL GROUP



The analysis included a variation excluding outliers, properties with large savings. This had a substantial effect on average consumption reduction, reducing this to 8kL for the year. This highlights a key benefit of the program, locating and addressing water waste within large consumption residential properties.

The primary target of direct marketing (the most effective form for this program) is the top 10 000 domestic water users within a geographical region.

Metrics of customers participating and distribution of savings

The total water conservation achieved during the Climate Fund were estimated using the End User benchmarking model and distributed across the range of interventions employed. These amounts are shown below in 'Table 4: Estimated total water savings by intervention'

TABLE 4: ESTIMATED TOTAL SAVINGS BY INTERVENTION

WaterFix Residential services	2019/20	2020/21*	Total	Water savings per item	Total Savings
				kL pa	kL pa
Waterfix plumber appointments	**14,636**	**11,622**	**23,209**	-	-
Leaking taps repaired	**21,044**	**14,915**	**32,046**	4.599	147,380
Standard Outdoor Tap Replacement	5,901	6,203	10,477	2.628	27,534
Toilet Leak Repair	2,958	2,913	5,107	41.472	211,798
4* showerheads replaced	7,200	7,440	12,688	24.3	308,318
Toilets & cistern replacement	378	308	605	8.1	4,901
Toilet Inlet Valve Replacement*	2,150	2,287	3,837		
Tap and mixer replacement*	7,823	2,504	9,670		
Total					699,930

Source: (Sydney Water, 2021) * to 31st January 2021.

The services above were delivered over 23,209 initial plumber appointments, giving a mean annual saving per household of 30kL. The benchmarking against actual savings of 11kL per annum in Figure 15 and Figure 16 above suggests that these 'End User Benchmaking' savings estimates may overstate the realised savings.

As an alternative, 'Appendix E: Estimated Annual Savings' includes the analytical estimate of water savings for the twelve months after investment during the period of July 2019 to March 2020. Savings are calculated based on rolling twelve-month increments.

Though descriptive of how program savings were being delivered, the segments described are not readily actionable for targeting in relation to plumber visits as they rely on data obtained after the first visit. The data does provide ways in which the program can be targeted by charges and/or subsidies for hardware.

This analysis work is continuing.

Assessment of customer behaviour changes

The longer run savings from the program depend on how the customer uses the new hardware and whether there is a change in water consumption behaviour. The amount of effort and inconvenience of water conservation efforts has been shown to influence the chances of adopting water conservation behaviour. (Fredericks , Stenner , & Habman , 2015)

The studies we reviewed showed some uptick in water consumption after installation, but that overall, the bulk of savings were sustained. Sydney Water estimated in 2019 that water conservation from Waterfix® Residential interventions would continue for 17 years from 2019-20 (Sydney Water, 2019). The ELWC model calculates benefits for a duration of 21 years, though with discounting, the significance of later years is low.

No longitudinal studies have been conducted in this area. This figure was supplied by Sydney Water based on a manager's long-term experience working in this area.

Caroma is the principal supplier of the plumbing fixtures used in the program. The minimal replacement guarantee they have is ten years. For some fixtures the guarantee is twenty years, and for others a lifetime. The frequency of renovation of buildings (principally domestic housing) is the subject of intense interest at present because of concerns over climate change, and the desire to measure embedded energy. Fnais, et al., 2022 (Fnais, et al., 2022)completed a systematic literature review of the life cycle assessments of buildings earlier this year. While they did find most studies ignored non-energy-rehabilitation measures, the lower end renovation life cycle measurements with the use of sensitivity analysis are twenty years.

The estimate of 17 years of benefits, while uncertain, does not appear to be excessive. There are, therefore, quite extended benefits from Waterfix investments and their assessment is realistic.

4.3.4 Economic Level of Water Conservation: Role and Governance

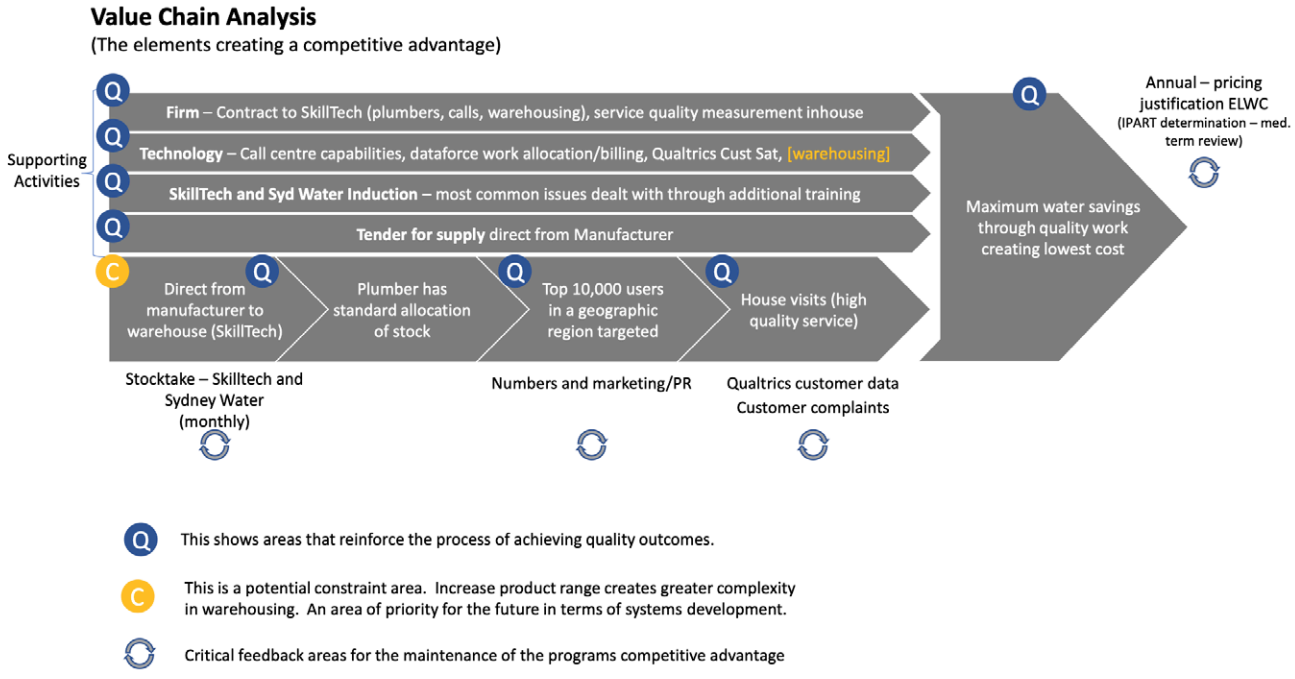
The second part of this effectiveness assessment is the question as to whether the Waterfix® Residential program added value to the State and the Sydney Water Corporation. The following flow chart 'Figure 17:Program Components Creating Value' is a schema, based on Michael Porter's well accepted Competitive Advantage theory (Porter, 1985), on how business decisions add value.

The figure shows firstly the process by which the Waterfix® Residential program provides a value added service to Sydney Water customers. Through integration with Government planning and regulatory processes, the value-add processes for the State are shown. The processes within the firm show a significant value adding action within every component of the model.

The right-hand side of the chart shows how this aligns with State Government planning and funding controls. In particular, the firm (Sydney Water) is regulated to achieve water conservation outcomes and to assess its investments against an algorithm, the Economic Level of Water Conservation (ELWC) that integrates water pricing and cost benchmarking.

Overall, the chart shows how Sydney Water and Government objectives are met through a multi-layered process combining competitive market inputs, least cost targeting and outcome benchmarks aligning with regulatory and planning requirements.

FIGURE 17:PROGRAM COMPONENTS CREATING VALUE



A critical part of the value-add process illustrated in Figure 17 above is the use of the Economic Level of Water Conservation (ELWC). This algorithm integrates program business decisions into economic assessment and planning at a high level.

The ELWC is a threshold for economic investment in water conservation (such as Waterfix® Residential). After this threshold has been reached, then further considerations come into effect for investment prioritisation.

Assessment of ELWC

Overall the WaterFix® Residential program was planned and delivered according to the ELWC principles. Analysis by IPART in 2020 showed that the ELWC was undervaluing the value of water conservation in drought (See Section 4.3.5). This could potentially result in underinvestment over time but was not a constraint on the program under the Climate Change Fund financing. Beyond the Climate Change Fund period there will be the opportunity for more sustained and efficient funding using the ELWC and IPART regulated funding through the price mechanism.

The ELWC model was reviewed on both a planning and delivery basis, and though it may not have always meet IPART marginal price targets, it would have met the IPART revised targets as set down in the 2020 Determination. To that extent the Climate Change funding was important because it provided a funding mechanism until IPART funding had been adjusted to set the price more appropriately within the ELWC to match marginal costs of water losses.

The planned ELWC was based on a cost per participant of $250. Given the difficulties with getting the program underway, and then complications with Covid 19 shutdowns, the budgeted amount was not met until the final year of the funding, $245 per participant (after adjusting $255 in 2020/21 dollars to 2018/2019 real dollars). The overall program cost per participant was 11% higher than budgeted ($2.76 in 2018/19 dollars) and feeding that cost back into the ELWC model, the ELWC was still positive for the program.

TABLE 5: WATERFIX EXPENDITURE PER PARTICIPANT

Dollars of the Year	2018/2019	2019/2020	2020/2021
Total WaterFix Expenditure	$357,000	$4,442,000	$3,330,000
Number of participants	689	14,765	12,919
Cost per participant	$518.14	$301.03	$255.44

(Sydney Water, Water Conservation Reports, 2018-19, 2019-20, 2020-21)

4.3.5 Delivery of Intended Outcomes

At the start of the funding, Waterfix® Residential began as an ELWC assessed investment against Operating Licence targets but without a specific IPART expenditure allowance. During the evaluation period is moved to an approved IPART expenditure under the Price Determination, but with adjusted pricing for ELWC screening to better allow water conservation to meet marginal value.

Program Governance: IPART Operating License and Metropolitan Water Plan

As set out in Section 1, there are several planning documents which communicate the intended outcomes set out in NSW Government policy. There are conservation targets within the Metropolitan Water Plan and Sydney Water's Operating Licence as set by IPART provided water conservation targets before the beginning of the Review Period.

Program Funding: IPART Price Reviews

The IPART Price Determination for 2017-2020 did not include specific program funding to deliver on these water conservation outcomes. This higher-level governance made the meeting of those outcomes difficult.

2020 IPART Price Review – Water Conservation sustainable funding

IPART reviewed the ELWC methodology in the 2020 Sydney Water Price Determination Report. IPART found that the methodology was undervaluing water scarcity in July 2019 as Sydney moved into water restrictions:

"In its most recent water conservation report, Sydney Water estimated a short-run value of water of $1.85/kL in early July 2019. This is despite the Sydney region entering Level 1 water restrictions on 1 June 2019, which would intuitively suggest the value should be higher. " (Independent Pricing and Regulatory Tribunal, NSW, 2020, p. 159)

IPART recommended, and Sydney Water accepted, a review of the ELWC methodology. The Department of Planning, Industry and Environment communicated to IPART that it intended to undertake such a review (Independent Pricing and Regulatory Tribunal, NSW, 2020). Elsewhere in its Report, IPART adjusted the drought price for calculating the ELWC to $3.18 from $2.48. This results in a greater margin for WaterFix® Domestic projects commenced in drought (that is, longer term savings would increase).

Climate Change Fund sources

The effect of the changed IPART program funding allowances was to make WaterFix® Residential, and other Sydney Water water conservation programs, sustainable in the medium term. The Climate Change Fund contribution allowed Sydney Water to meet its operating licence and Metropolitan Water Plan requirements when this might not have been possible otherwise.

Overall, WaterFix® Residential developed as a program over the funding period into an overarching planned approach that enabled the program delivery to be appropriate for intended outcomes. The Climate Change Funding was a critical enabler of this development.

5. RECOMMENDATIONS

This is a high-quality program, so these recommendations are aimed at reinforcing what is already occurring.

A. Maintenance of a stable governance structure. The danger is always 'who owns the program?'. If this ownership is unstable in terms of management and also contractors, the quality of the program will deteriorate. (see 'Key Finding D')

B. The present programs success shows that improving quality and productivity should remain the path towards reducing costs. An emphasis on costs as a primary driver will invariably work against the long-term effectiveness of the program. (see 'Key Finding E')

C. With increased complexity surrounding inventory, automated inventory systems should be investigated to replace the present manual inventory processes. (see 'Key Finding F')

D. Continue efforts to find high value and actionable participant segments based on the primary segmentation of geographic location. (see 'Key Finding G')

E. The continued impact of BASIX and WELS on overall demand is difficult to predict accurately without the quality of the research which this program has experienced up to date. This research needs to continue. (see 'Key Finding H')

F. Ongoing funding providing sustained capability is an important legacy of the Climate Change Fund's contribution, and though this need for funding has been recognised by the regulator, effort should be continued to demonstrate the value of the program. (see 'Key Finding J')

6. APPENDICES

6.1 Appendix A: Systems Evaluation Theory Outline

System Evaluation Theory

	System Definition
1a.	Define system boundaries
1b.	Define subsystems and subsystem boundaries
1c.	Define within subsystem processes
1d.	Define between subsystem processes (ie. Relationships and communication)
1e.	Define system feedback mechanisms
1f.	Define system attributes
1g.	Define system inputs
1h.	Define the common system goals
1i.	Validate system definitions and goals
	System efficiency is a necessary prerequisite for optimal system effectiveness
2a.	Feedback mechanisms must provide timely, relevant, credible, frequent, and specific information to maximise efficiency
2b.	Attributes must be aligned to maximise system efficiency
2c.	Evaluate alternative pathways to improve efficiency
	Evaluate system effectiveness after evaluating system efficiency

Source: Renger, R. (2015). System evaluation theory (SET): A practical framework for evaluators to meet the challenges of system evaluation. Evaluation Journal of Australasia, 15(4), 16-28

6.2 Appendix B: Key Evaluation Questions Data Source and Accuracy

6.2.1. Appropriateness

Key Evaluation Questions	TASK	Data Source	Accuracy
1. Did the project align to the objectives of the Climate Change Fund (CCF)?	Identify the link between the objectives of the Climate Change Fund(CCF) and the project	Funding deed CCF reported outcomes CCF purpose (NSW Legislation)	**Document evidence** • Aligns • Partially aligns • No alignment
2. Did the project align to the corporate strategy of Sydney Water?	Identify the strategy of Sydney Water through IPART submissions and licences, and through audit (planned and enacted strategies)	Sydney Water Water licence IPART determinations NSW Auditor General report	**Document evidence** • Aligns • Partially aligns • No alignment
3. Was the project informed by best practice? This includes national, international, and internal best practice.	Identify and assess the quality of research that informed program establishment, and adaptive management	Peer reviewed literature (referencing is provided throughout report)	**High level of accuracy** Two published peer reviewed studies of previous implementation: 1.1999 – 3478 customers (White & Fane, 2002) 2.2002 – 200 000 customers (Turner , White , Beatty, & Gregory , 2005) The project was developed with the UTS Sustainable Futures – significant black and grey literature
		Other high-quality research carried out internally	Sydney Water has very well-developed analytics. Close to 100% of the population measured in large scale studies with large scale control groups (>1mil)

6.2.2. Efficiency

Key Evaluation Questions	TASK	Data Source	Accuracy
Were the WaterFix program activities been implemented as intended?	**Mapping of implementation process**	Stakeholder interviews - process formed and tested across multiple perspectives • Direct program interest • Hierarchy (resource control • Experts • Customers	**Interview evidence** **Triangulation across specific stakeholder groups** • Aligns • Partially aligns • No alignment
Was data collected appropriate for informing and decision making?	Review data collection points using SMART: • Specific • Measurable • Actionable • Relevant • Timely	Data collection points mapped against implementation process Evidence of decision making through historical management reports	**High level of accuracy** Triangulation across multiple sources
To what extent did the program reach intended recipients?	Elaborate the segmenting, targeting positioning strategy and implementation process Identify the actual customers	Program documentation and reporting Billing records Customer site visits	**High level of accuracy** Records of clients can be checked across multiple documentation sources. Site visits provided qualitative data for some granular detail.
What do customers think could have been done differently to make the program more effective and efficient?	Customer feedback sample feedback that provides sufficient confidence	**Complaints logs** Sydney Water logs every complaint through to resolution.	**Qualitative – indicative, not necessarily representative** **Start – September, 2020**

		Qualtric - Sydney Water customer survey feedback. Likert 5-point scale measuring satisfaction across: • Cost • Plumber • Quality of produc • Quality of work • Range of product • Scheduling	**High level of accuracy** **October, 2020-January, 2021** - 1,645 responses - 5850 clients Certainty >95% +/- 5%
		'Other suggestions' open ended question text analysis	**Qualitative** High % of returns. Collection framework same as quantitative data

6.2.3. Effectiveness

Key Evaluation Questions	TASK	Data Source	Accuracy
To what extent has the project helped customers participating in the WaterFix use water efficiently?	Determine post-appointment actual water usage Determine attribution (second program users)	Metrics of customers participating Distribution of water conserved	**High level of accuracy** Program relies on volumetric usage metrics for data.
		Assessment of customer behaviour changes	**No behaviour change assessment.** Behaviour change is assumed based on the lifecycle of the fix, and subsequent changes in standards. No specific indicators relating to this element.
	Determine the estimated life of the changes	Internal experts, literature review (life cycle assessments of buildings)	**Best guess** No longitudinal studies for this area Renovation studies around embodied energy in houses provided support to expert estimates
To what extent did the WaterFix program deliver value for money for Sydney Water and the NSW Government?	Determine preparedness for future drought Costs per KL of water saved	**Two models:** A. Value Chain analysis Interviews across stakeholders, direct observation of operations B. Economic Level of Water Conservation (ELWC): Role and Governance Budget and actual measures of the ELWC Assessment of the ELWC	**Reasonably accurate** Triangulation across program levels/stakeholders, and directly observable results **Accurate** The ELWC is a well-developed, peer reviewed, economic model. It has the approval of the Independent Pricing and Regulatory Tribunal. The model continues to develop.
		Water Conservation reports 2018-2021	**Accurate** Three publicly released reports on water conservation. These reports combine auditable financial information with auditable records.
To what extent was the program delivery appropriate for intended outcomes?	Assess the process against standards (how can it be said to be best practice?) Determine the durability of the change in the longer term	Program Governance: IPART Operating License Program Funding: IPART Price Reviews Climate Fund Sources 2021 IPART Price Review - Water conservation sustainable funding	**Accurate** Sydney Water's licence is audited Changes embodied in the licence by IPART are the strongest mechanisms for ensuring durability for the life of the licence (4 years)

6.3 Appendix C: Response Data for Qualtrics Satisfaction Survey

TABLE 6: QUALTRICS SATISFACTION SURVEY RESPONSES

	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	TOTALS
Number of Responses	221	306	323	362	465	246	127	**2050**
Appointments completed	1201	1445	1448	1675	1253	897	548	**8467**
Responses per Appointment Completed	18%	21%	22%	22%	37%	27%	23%	**24%**

6.4 Appendix D: Sample Information on measuring before and after consumption[3]

The WaterFix® Residential properties considered in the analysis are the ones that had 1 visit with an intervention/s. The selection criteria result in the sample size used in the analysis being smaller than the actual number of properties that went through the WaterFix® Residential program (many of the properties had multiple visits).

The control group consists of single dwellings located in Sydney Water's area of operations. To avoid properties with high consumption pattern, only properties with less than 50 KL of consumption in a month were included.

Please see below the numbers of the WaterFix® Residential properties and control group properties used in the analysis.

TABLE 7: AVERAGE ANNUAL WATER SAVINGS BY INTERVENTION COMBINATION

Date	Number of WaterFix properties	Number of properties in Control group
1/07/2019	347	1104170
1/08/2019	530	1104993
1/09/2019	682	1106067

3 Information provided by the Strategic Analytics Section, Sydney Water, April 2022

1/10/2019	816	1107104
1/11/2019	995	1107921
1/12/2019	1046	1109010
1/01/2020	1180	1109820
1/02/2020	1673	1111126
1/03/2020	1332	1112586

*Data provided by Strategic Analytics Section, Sydney Water, April 2022

The **12 months median rolling sum (before and after)** per property is considered. This helps to capture the consumption pattern in all seasons and avoid substantial movement.

For the analysis, **median** was used (Control and WaterFix® Residential properties) to avoid 12 months rolling sum consumption being affected by too high or too low value.

6.5 Appendix E: Estimated annual savings

These savings calculations differ from those in the body of the report due to a different sampling period and categorisation. This analysis uses a sample rather than the full program dataset and is more differentiated into actual product mix.

TABLE 8: ESTIMATED ANNUAL SAVINGS

Type of Intervention	Number of Properties	Savings Average (KL)	Total Savings (KL)	%
Leak repair	1,572	12	18,864	21.7%
Tap and mixer replacement	1,114	11	12,254	15.4%
Leak repair, Tap and mixer replacement	754	8	6,032	10.4%
Leak repair, Showerhead	721	11	7,931	10.0%
Leak repair, Showerhead, Tap and mixer replacement	572	14	8,008	7.9%
Showerhead, Tap and mixer replacement	551	9	4,959	5.4%

Type of Intervention	Number of Properties	Savings Average (KL)	Total Savings (KL)	%
Showerhead	394	10	3,940	5.4%
Toilet leak repair, Tap and mixer replacement	302	19	5,738	4.2%
Leak repair, Toilet leak repair, Tap and mixer replacement	286	18	5,148	3.9%
Toilet leak repair	220	15	3,300	3.0%
Leak repair, Toilet leak repair, Showerhead, Tap and mixer replacement	192	16	3,072	2.7%
Leak repair, Toilet leak repair	188	21	3,948	2.6%
Toilet leak repair, Showerhead, Tap and mixer replacement	177	20	3,540	2.4%
Leak repair, Toilet leak repair, Showerhead	95	21	1,995	1.3%
Toilet leak repair, Showerhead	58	14	812	0.8%
Toilet suites & cisterns replacement	25	22	550	0.3%
Showerhead, Toilet suites & cisterns replacement, Tap and mixer replacement	20	22	440	0.3%
Total	7,241		90,531	100.0%

Waterfix Residential Analysis, Strategic Analytics - 16 November 2021 & calculations.

* Final half year components estimated proportionally to appointments.

ABBREVIATIONS / DEFINITIONS

BASIX	The Building Sustainability Index
CCF	Climate Change Fund
COVID-19	An acute respiratory illness in humans caused by a coronavirus
ELWC	Economic Level of Water Conservation
GST	Goods and Services Tax
IPART	Independent Pricing and Regulatory Tribunal
kL	1 kL = 1000 litres
kL/hh/a	KiloLitres/household/annum
NSW DPIE	NSW Department of Planning and Environment
SET	Systems Evaluation Theory
WELS	Water Efficiency Labelling and Standards Scheme

7. LIST OF TABLES

8. LIST OF FIGURES

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