

Appendix 2: Sustainable Diversion Limits

ISF's understanding of the SDL varies slightly compared to the eWater assessment and the similarities and differences have been summarised in the Table 16.

Table 16: Comparison of ISF and eWater's understanding of water efficiency and SDL

| eWater assessment of impact on the SDL | ISF comment. |
|--|---|
| How efficiencies are distributed across these options will have different impacts on the total SDL compliance | Agreed |
| Demand management will reduce demands and thereby annual take, thus increasing the amount of water left in the river by the reduction in demand | <p>Some demand management options will also reduce the annual return to the system through wastewater discharge. Thus <u>not all</u> demand management options have a 1:1 relationship to SDL.</p> <p>For outdoor savings (irrigation efficiency, improved efficiency on outdoor taps) 1:1 ratio</p> <p>For leakage reduction 1:1 ratio</p> <p>For cooling tower reduction 1:1 ratio</p> <p>For indoor fittings and fixtures the net difference for the SDL will be small and will consist of reduced leakage from movement around the network.</p> |
| WSUD and stormwater harvesting are a reduction in return flows from stormwater runoff and is potentially a take against the SDL by reducing the flows contributing to the amount of water left in the river | <p>Agreed for stormwater harvesting</p> <p>For WSUD, we do not think rainwater tanks are treated the same way under the formula so savings through rainwater tanks will have a 1:1 relationship with the SDL.</p> <p>For WSUD outdoor efficiencies the savings will have a 1:1 relationship with the SDL. For indoor fittings and fixtures the net difference for the SDL will be small and will consist of reduced leakage from movement around the network.</p> |
| Reductions in demand due to infrastructure improvements (e.g. reducing leaks) or reduced irrigation usage (e.g. by more efficient irrigation) will increase the amount of water left in the river by the reduction in demand. Irrigation water savings are not considered in this study. | Agreed. ISF did consider irrigation efficiency and recommend the eWater modelling also include it as it is a major part of the efficiency program. |

An assessment of each water efficiency option shows the following differences between the levelised cost for potable and SDL water savings as well as a difference between total potable and SDL water savings ML/2050 (Table 17).

Table 17: ISF's interpretation of the relationship between water savings measures and SDL.

| ID | Program | % SDL:Potable ML/2050 | \$/kL potable | \$/kL SDL | Total potable ML/2050 | Total SDL ML/2050 | Comment |
|---------|---|-----------------------------|------------------|-----------|-----------------------------|-------------------------|---|
| IRR1 | Irrigation upgrades at top 20 parks (by opportunity to save water) | 145% | \$1.13 | \$0.78 | 800 | 1161 | 100% savings plus reduction in leakage in the system |
| IRR2 | Irrigation upgrades at second 20 parks (by opportunity to save water) | 114% | \$0.98 | \$0.86 | 564 | 641 | 100% savings plus reduction in leakage in the system |
| IRR3 | Irrigation upgrades at third 20 parks (by opportunity to save water) | 112% | \$1.15 | \$1.03 | 359 | 402 | 100% savings plus reduction in leakage in the system |
| IRR4 | Irrigation at parks 61-109 (by opportunity to save water) | 116% | \$1.55 | \$1.33 | 403 | 470 | 100% savings plus reduction in leakage in the system |
| SWH 1 | Lake Tuggeranong Stormwater Harvesting Scheme | 8% | \$6.22 | NA | 350 | 26 | reduction in leakage in the system |
| SWH 2 | INRN expansion - Stormwater harvesting scheme | 8% | \$6.69 | NA | 307 | 23 | reduction in leakage in the system |
| WSUD 1 | 75% Roof Water Collection | 115% | \$17.02 | \$14.80 | 144 | 165 | 100% savings plus reduction in leakage in the system |
| WSUD 2 | Rainwater tanks for small blocks <250m2 | 115% | \$15.02 | \$13.06 | 232 | 267 | |
| WSUD 3 | Certification of installation of rainwater tanks | 115% | \$3.11 | \$2.70 | 160 | 184 | 100% savings plus reduction in leakage in the system |
| WSUD 4 | Ongoing monitoring and repair of rainwater tanks | 115% | \$19.03 | \$16.55 | 601 | 692 | 100% savings plus reduction in leakage in the system |
| WSUD 5 | Outdoor water efficiency taps<12l/s | 108% | \$2.38 | \$2.22 | 630 | 678 | 100% savings plus reduction in leakage in the system (water only) |
| WSUD 6 | Indoor efficient fixtures 4star (not showers) | 15% | \$2.27 | \$15.29 | 1014 | 151 | reduction in leakage in the system |
| WSUD 7a | Apartment appliances water efficient | 15% | \$7.51 | \$50.09 | 372 | 56 | reduction in leakage in the system |
| WSUD 7 | Combined WSUD 5, 6, 7a | 47% | \$1.21 | \$2.60 | 1786 | 836 | |
| DM1 | Education program | 118% | \$0.03 | \$0.05 | 1060 | 621 | |
| DM21 | Digital metering | 124% | \$4.07 | \$6.79 | 1256 | 780 | |
| DM7 | Residential showerhead swap | 15% | \$1.79 | \$11.96 | 1 | 0 | reduction in leakage in the system |
| DM14 | Residential retrofits | 15% | \$3.25 | \$18.99 | 30 | 5 | reduction in leakage in the system |

| ID | Program | % SDL:Potable ML/2050 | \$/kL potable | \$/kL SDL | Total potable ML/2050 | Total SDL ML/2050 | Comment |
|------|---|-----------------------------|------------------|-----------|-----------------------------|-------------------------|---|
| DM18 | Public housing retrofit program | 92% | \$4.46 | \$5.57 | 6 | 6 | Substantially leakage program |
| DM4 | Non residential smart metering | 33% | \$0.28 | \$0.84 | 230 | 76 | Some onsite leakage reduction mainly water efficiency |
| DM5 | Non residential best practice guidelines | 34% | \$0.23 | \$0.69 | 60 | 20 | Some onsite leakage reduction mainly water efficiency |
| DM13 | Non residential WEMPS (over XML/yr) | 33% | \$0.27 | \$0.82 | 1201 | 398 | Some onsite leakage reduction mainly water efficiency |
| DM20 | Voluntary non residential audit program | 25% | \$0.37 | \$1.49 | 104 | 26 | Some onsite leakage reduction mainly water efficiency |
| DM9 | Asian restaurant efficiency | 15% | \$0.89 | \$5.94 | 24 | 4 | reduction in leakage in the system |
| DM10 | Smart rinse retrofit | 26% | \$0.29 | \$1.14 | 67 | 17 | reduction in leakage in the system |
| DM11 | Government Buildings Audits | 15% | \$1.06 | \$7.07 | 15 | 2 | |
| DM16 | Commercial laundry washing machine rebate | 25% | \$0.20 | \$0.83 | 416 | 103 | |
| DM17 | Schools audit program | 44% | \$1.54 | \$3.55 | 76 | 34 | |

This difference has been accounted for in the comparison of factors by focusing on the returned potable water savings.

Appendix 3: Assumptions for programs included in recommendations

The following assumptions have been extracted from the consultants' report.

Assumptions - WSUD

There are some inconsistencies with the calculations of the WSUD assumptions (from Alluvium) – DM options are much better when combined (WSUD 7)
If ALL options combine it is noted certification costs will decrease to \$150/ apartment & \$250/ house

| ID | Option | ACT Gov OPEX | Other | | Coverage | Modelled \$/hh |
|---------|-----------------------------|---|--|-------------------------|--|----------------|
| | | | CAPEX (additional costs for higher rating) | OPEX | | |
| WSUD 3 | Raintank certification | 5% FTE WSUD code revision (\$50,000) | | \$150/ hh certification | All single hh (1000/yr) | |
| WSUD 4 | Raintank maintenance | 5% FTE code 2 FTE increasing by 1 FTE every 10 years \$300/hh first inspection \$500/hh replacement 1 st year 15%/hh \$500/hh every 5years inspect and maintain \$1,000/hh every 10 years parts | | | All single hh (1000 new/yr + existing stock) | |
| WSUD 5 | Outdoor taps | 5% FTE (for 5 years) WSUD code revision (\$50,000) | \$100/hh flow restrictors on taps | \$150/ hh certification | Single hh (1000/yr) | \$525 |
| WSUD 6 | Minimum 4-star fixtures | 5% FTE (for 5 years) WSUD code revision (\$50,000) | \$120/hh taps (no toilet premium) | \$150/ hh certification | Houses and apartments (1000 + 1000/yr) | \$405 |
| WSUD 7a | Apartment 4-star appliances | 5% FTE (for 5 years) WSUD code revision (\$50,000) | \$100 each for 4-star washing machine & dishwasher | \$150/ hh certification | Apartments (1000/yr) | \$990 |
| WSUD 7 | All DM options | 15% of FTE (for 5 years) WSUD code revision (\$150,000) | \$100/hh flow restrictors on taps \$120/hh taps (no toilet premium) \$100 each for 4-star washing machine & dishwasher | \$150/ hh certification | Houses and apartments (1000 + 1000/yr) | \$375 |

Assumptions - Residential

| ID | Option | Costs | Coverage | Assumed savings | Comments |
|------|---------------------------------|--|------------------------|----------------------------|--|
| DM7 | Residential showerhead swap | | Residential 2% uptake | | Plumbing code requirement for plumbers to install showerheads will increase cost of program. Assumes low uptake (2%) and rapid decay of savings, possibly due to market transformation. |
| DM14 | Residential retrofits | \$26k campaign planning \$24k campaign design \$24k television and radio material \$42k plumbing industry engagement (includes registration and training) \$6k website update \$125k advertising for 25 days | Residential 20% uptake | 1.78% of average hh demand | Low assumed savings, other studies have shown 20% No cost allowed for showerheads |
| DM18 | Public housing retrofit program | \$31.5k campaign planning \$10k campaign design \$21k tendering plumbing suppliers \$92.5k annual administration \$186/hh plumbing call \$66/hh aerators \$40/hh tap and toilet repair | 20% of public housing | 8% of average hh demand | Campaign planning cost more than normal retrofit? Annual administration double normal retrofit |
| DM1 | Education program | \$96K 1 st year \$35k on-going | All | 5% | Low costs for design and dissemination of education program that covers all of ACT demand |
| DM21 | Digital metering | \$75K campaign planning \$900/meter \$50M start-up costs \$7,600/yr software subscription \$30/meter management fee | All | ~6% | Unlikely that metering program can be rolled out in 4-years. Icon Water Currently operates on 12-year replacement program for meters. Costs do not include customer costs to repair leaks, ongoing renew costs of meters or asset write off of meters replaced before their full asset life. Costs do include ongoing subscription to the smart metering software. |

Assumptions - non-residential

| ID | Option | Costs | Coverage | Assumed savings / site | Comments |
|------|---|--|--|--|--|
| DM4 | Non residential smart metering | \$75K campaign planning \$450K base station establishment \$900/meter \$7,600/yr software subscription \$30/meter management fee | Large users 1% of total non-res demand) | 100% of average non-residential demand? 10% of any site | |
| DM13 | Non residential WEMPS (over XML/yr) | \$37.5k campaign planning \$6k update of website \$37.5k annual administration \$5,000/WEMP (paid by customer) | Large users 1% uptake (of total non-res demand) | 50% of average non-residential demand, 10% of any site | |
| DM20 | Voluntary non residential audit program | \$18k campaign planning \$24k design of campaign materials \$24k design of television and radio \$28k tendering audits \$6k update of website \$70 annual administration \$3,000/audit & retrofit 50% audit cost paid by customer | 2.5% of industrial demand (12.4% of ACT consumption) | 100% of average demand 10% reduction at any site | Ratio of overhead to audit costs seems high. Average of 9 audits a year for 4 years. Audit cost = \$3,000/audit, average overhead cost = \$10,000/audit Costs for audit and actions seem low, particularly if targeting very large water users. |

Assumptions – non-residential

(note if total costs for woks, smart rinse and commercial washers are not included in program cost and only the ACT subsidy portion are, then the overhead costs will halve but will still be proportionally high. If the total costs are not included the levelized cost calculations will be incorrect, and will be government levelized costs, rather than whole of society).

| ID | Option | Costs | Coverage | Assumed savings | Comments |
|------|---|--|---|---|---|
| DM5 | Non residential best practice guidelines | \$26k campaign planning \$70k design of program materials \$17.5k annual program refresh | 10% of Non-residential demand | 5% savings (similar to education) | \$70K seems low to target all of non-residential demand best practice. It is likely these costs cover one or maybe two sectors that use 10% of total non-residential demand. |
| DM9 | Asian restaurant efficiency | \$26k campaign planning \$3k update of website \$6k completion of work forms | \$36k annual administration arranging appointments \$4,000/wok (50% paid by customer) | 12.5% of ACT non res demand is target, with 1.6% uptake assumed 1 ML/wok/yr 7.5% of targeted demand | Ratio of overhead to wok costs seems high. Average of 6 woks a year for 4 years. Wok cost = \$4,000/audit, average overhead cost = \$7,000/wok |
| DM10 | Smart rinse retrofit | \$10,500 campaign planning \$7k design of campaign materials | \$50k annual administration arranging appointments \$2,000/washer (50% paid by customer) | ~12.5% of ACT non res demand is target, with 4% uptake assumed 0.13 ML/site/yr Or 0.75% of targeted demand | Ratio of overhead to smart rinse valves costs seems high. Average of 30 sites a year for 4 years. Site cost = \$200/site, average overhead cost = \$1,400/site |
| DM11 | Government Buildings Audits | \$18k campaign planning \$24k design of campaign materials \$24k design of TV / radio | \$24k tendering audits \$6k update of website \$30k annual administration \$3,000/audit & retrofit | 10% of non residential demand 10% reduction of average non-residential demand ~1.4ML/site/yr | Unusual to include campaign planning and advertising for mandatory government audits. Audit plus retrofit costs seem low for large water savings. |
| DM16 | Commercial laundry washing machine rebate | \$18k campaign planning \$100k design of campaign materials \$28k tendering audits | \$6k update of website \$30 annual administration \$5,000/audits plus retrofits | ~12.5% of ACT non res demand is target, with 1% uptake assumed 4ML/machine/yr 75% of targeted demand | Ratio of overhead to washer replacement costs seems high. Average of 3.5 machines a year for 4 years. Machine cost = \$2,000/machine, average overhead cost = \$15.00/machine |
| DM17 | Schools audit program | \$26k campaign planning \$3k update of website \$6k completion of work forms | \$36k annual administration arranging appointments \$200/call out fee plus pre rinse valves (50% paid by customer) | 80% uptake of school demand (25% of total ACT demand) 65 schools 20% of average school demand ~0.5ML/site/yr | If it is an ongoing best practice education program it will require ongoing investment to maintain the savings. |

Assumptions - Irrigation (hydroplan)

| ID | Option | Costs | Coverage | Assumed savings/ site | Comments |
|-------------|---------------------|--|---------------------------|---|-------------------------------------|
| IRR 1 2 3 4 | Irrigation upgrades | \$4,500 design/ site once off \$75,000/ha whole system replacement (every 20 years) \$11,700 sprinkler head replacement costs (every 10 years, included in full replacement costs) \$1,000 Rainbird controller replace and set (every 5 years, included in full replacement cost) | Largest water using sites | Difference between current demand and best practice | May be overestimating some savings. |

Appendix 4: Examples of best practice guidelines

Best practice guidelines for water conservation in commercial office buildings and shopping centres:

https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdu0/~edisp/dd_054580.pdf

Best practice guidelines for water management in aquatic leisure centres

https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045262.pdf

Best practice guidelines for water efficiency in clubs

https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045254.pdf

Best practice guidelines for holistic open space turf management in Sydney

https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045253.pdf

Benchmarks for businesses (aquatic leisure centres, clubs, commercial kitchens, commercial laundries, commercial office buildings and shopping centres, hotels, turf irrigation)

<http://www.sydneywater.com.au/SW/your-business/managing-your-water-use/benchmarks-for-water-use/index.htm>

Benchmark and efficiency factsheets (Water Compare)

<http://www.watercompare.com.au/Useful-resources/Factsheets.aspx>

Factsheets for amenities, cleaning, cooling towers, irrigation, kitchens, steam efficiency

City West water's Best Practice Guidelines for Functional Open Space at

<https://www.clearwater.asn.au/user-data/research-projects/swf-files/bpg-final.pdf>

SA Water's Irrigated Public Open Space guidelines at <https://www.sawater.com.au/business/products-and-services/irrigated-public-open-spaces-ipos>

The sustainable caravan park: (savings of around 50% at each park)

<http://nevrwaste.vic.gov.au/wp-content/uploads/2011/07/SCPP-Final-report.pdf>

Appendix 5: Options ID and description comparison

To provide clarity when referring to particular options, ISF has used logical and distinct naming throughout this report which differs from the codes and descriptions given to each program throughout each specialist report. Table 18 provides a comparison of the ID and description of each option. The options have been grouped by their into their demand management type.

Table 18: Options ID and description comparison table

| ISF ID | ISF description | Specialist Report | Specialist ID | Specialist description |
|--|--|-------------------|-----------------|--|
| Residential demand management | | | | |
| DM 1 | Education program | HARC | ALL01 | Education programs |
| DM 21 | Digital metering | HARC | BUS06 AND RES08 | Mandatory smart metering of large users & broad scale Smart Meter installation combined with nudge program |
| DM 7 | Residential showerhead swap | HARC | RES11 | Efficient shower rebate |
| DM 14 | Residential retrofits | HARC | RES21 | Home tune-up |
| DM 18 | Public housing retrofit program | HARC | RES22 | Public housing home tune-up |
| Non-residential demand management | | | | |
| DM 4 | Non residential smart metering | HARC | BUS06 | Mandatory smart metering of large users |
| DM 5 | Non residential best practice guidelines | HARC | NRS01 | Best practice benchmarks and guidelines |
| DM 13 | Non residential WEMPS (over XML/yr) | HARC | BUS05 | Water Efficiency Management Plans (WEMP) |
| DM 20 | Voluntary non residential audit program | HARC | IND01 | Voluntary Industrial audit and retrofit |
| DM 9 | Asian restaurant efficiency | HARC | BUS11 | Asian restaurant efficiency |
| DM 10 | Smart rinse retrofit | HARC | BUS10 | Smart rinse retrofit |
| DM 11 | Government Buildings Audits | HARC | PUB02 | Mandatory government facility water audits |
| DM 16 | Commercial laundry washing machine rebate | HARC | BUS03 | Commercial Laundry new machines |
| DM 17 | Schools audit program | HARC | SCH02 | Mandatory school water audits |
| WSUD rainwater tanks | | | | |
| WSUD 1 | 75% Roof Water Collection | Alluvium | Option 1 | Change the minimum roof area connected to rainwater tanks to 75% |
| WSUD 2 | Rainwater tanks for small blocks <250m2 | Alluvium | Option 2 | Rainwater harvesting and reuse for compact blocks (<250 m2) |
| WSUD 3 | Certification of installation of rainwater tanks | Alluvium | Option 3 | Rainwater tank installation: certified |

| ISF ID | ISF description | Specialist Report | Specialist ID | Specialist description |
|---|---|-------------------|-------------------|---|
| | | | | plumbing connections, pumps and diverters |
| WSUD 4 | Ongoing monitoring and repair of rainwater tanks | Alluvium | Option 4 | Rainwater tank maintenance: pumps and diverters replacement program |
| WSUD fixtures and fittings | | | | |
| WSUD 5 | Outdoor water efficiency taps <12l/s | Alluvium | Option 5 | Include a maximum 12L/min flow requirement for outdoor plumbing fixtures |
| WSUD 6 | Indoor efficient fixtures four-star (not showers) | Alluvium | Option 6 | Mandatory minimum four-star WELS ratings for plumbing fixtures |
| WSUD 7a | Apartment appliances water efficient | ISF Option | Based on Option 7 | Mandatory minimum four-star WELS ratings for appliances in apartments |
| WSUD 7 | Combined WSUD 5, 6, 7a | Alluvium | Option 7 | Demand Management (combination of options 5 and 6 plus mandatory minimum four-star WELS ratings for appliances in apartments) |
| Irrigation Efficiency | | | | |
| IRR1 | Irrigation upgrades at top 20 parks (by opportunity to save water) | Hydroplan | N/A | Top 20 parks/fields |
| IRR2 | Irrigation upgrades at second 20 parks (by opportunity to save water) | Hydroplan | N/A | Second 20 parks/fields total irrigation upgrade |
| IRR3 | Irrigation upgrades at third 20 parks (by opportunity to save water) | Hydroplan | N/A | Parks 41-60 cumulatively over 80% of water savings covered by options 1,2&3 |
| IRR4 | Irrigation at parks 61-109 (by opportunity to save water) | Hydroplan | N/A | Parks 61-109 remaining sites that can save water |
| IRR 1, 2 & 3 | Irrigation upgrades at top 60 parks (by opportunity to save water) | ISF Option | N/A | Combination of options IRR 1, 2 and 3 |
| Stormwater harvesting (not included in viable options) | | | | |
| SWH 1 | Lake Tuggeranong - stormwater harvesting scheme | GHD | N/A | Lake Tuggeranong scheme |
| SWH 2 | INRN expansion - stormwater harvesting scheme | GHD | N/A | Inner North Reticulation Network (INRN) expansion scheme |