Austin WATER | WATER FORWARD
INTEGRATED WATER RESOURCE PLAN

Austin Integrated Water Resource Planning Community Task Force

Packet Index

March 20, 2018

Austin Integrated Water Resource Planning Community Task Force
March 20, 2018 – 4:00 p.m.
Waller Creek Center, Room 104
625 East 10th Street
Austin, Texas 78701

For more information go to:
Austin Integrated Water Resource Planning Community Task Force

AGENDA

Voting Members:

Sharlene Leurig - Chair	Marianne Dwight	Sarah Richards
Jennifer Walker – Vice Chair	Diane Kennedy	Lauren Ross
Todd Bartee	Perry Lorenz	Robert Mace
Clint Dawson	Bill Moriarty	

Ex Officio Non-Voting Members:
Austin Water: Greg Meszaros
Austin Energy: Kathleen Garrett
Austin Resource Recovery: Sam Angoori
Neighborhood Housing and Community Development: Rebecca Giello
Office of Innovation: Kerry O'Connor
Office of Sustainability: Lucia Athens
Parks and Recreation: Sara Hensley
Watershed Protection: Mike Personett

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1. **CALL TO ORDER – March 20, 2018, 4:00 p.m.**

2. **CITIZEN COMMUNICATION**

   The first 10 speakers signed up prior to the meeting being called to order will each be allowed a three-minute allotment to address their concerns regarding items not posted on the agenda.

3. **APPROVAL OF MEETING MINUTES**
   a. Approval of the meeting minutes from the February 13, 2018 Task Force meeting (5 minutes)

4. STAFF BRIEFINGS, PRESENTATIONS, AND OR REPORTS

a. Presentation on Draft Plan Recommendations - City Staff and Consultant Team (45 minutes)
    i. Task Force Discussion and Input (approximately 45 minutes)

5. SUBCOMMITTEE REPORTS

6. VOTING ITEMS FROM TASK FORCE

7. FUTURE AGENDA ITEMS

8. ADJOURN

Note: Agenda item sequence and time durations noted above are subject to change.

The City of Austin is committed to compliance with the American with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request. Meeting locations are planned with wheelchair access. If requiring Sign Language Interpreters or alternative formats, please give notice at least 2 days (48 hours) before the meeting date. Please call Austin Integrated Water Resource Planning Community Task Force, at 512-972-0194, for additional information; TTY users route through Relay Texas at 711.

For more information on the Austin Integrated Water Resource Planning Community Task Force, please contact Marisa Flores Gonzalez at 512-972-0194.

MINUTES

Austin Integrated Water Resource Planning Community Task Force **REGULAR MEETING**
February 13, 2018

The *Austin Integrated Water Resource Planning Community Task Force* convened in a Regular Meeting on February 13, 2018 at Waller Creek Center, Conference Rm 104, 625 E 10th Street, in Austin, Texas.

Members in Attendance:

Sharlene Leurig - Chair	Robert Mace	Lauren Ross
Jennifer Walker – Vice Chair	Todd Bartee	Sarah Richards
William Moriarty	Perry Lorenz	
Diane Kennedy	Clint Dawson	

Ex-Officio Members in Attendance:
Lucia Athens, Chris Herrington, Matt Russell

Staff in Attendance:
Kevin Critendon, Daryl Slusher, Teresa Lutes, Marisa Flores Gonzalez, Joe Smith, Mark Jordan, Prachi Patel, Helen Gerlach, Jeff Fox, Katherine Jashinski

Additional Attendees:
Richard Hoffpauir, John Burke, Ron Anderson, Stefan Schuster, David Briggs, James Dwyer

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1. **CALL TO ORDER**
   Sharlene Leurig, Chair, called the meeting to order at 4:15 p.m.

2. **CITIZEN COMMUNICATION: GENERAL**
   None

3. **APPROVAL OF MEETING MINUTES**
   The meeting minutes from the January 22, 2017 Austin Integrated Water Resource Planning Community Task Force regular meeting were approved on Member Moriarty's motion and Member Lorenz's second on an 5-0-4-2 vote with Member Dawson, Member Ross, Member Richards and Member Leurig abstaining and Member Walker and Member Dwight absent.

4. **STAFF BRIEFINGS, PRESENTATIONS, AND/OR REPORTS**

   a. Presentation on Draft Hybrid Portfolio Scoring was provided by Marisa Flores-Gonzalez, Austin Water and Dan Rodrigo, CDM Smith. This presentation was followed by Task Force discussion and input, followed by questions and answers.

5. **SUBCOMMITTEE REPORTS**
   None

6. **VOTING ITEMS FROM TASK FORCE**
   None

7. **FUTURE AGENDA ITEMS**
   None

Chair Leurig adjourned the meeting at 6:45 pm.

PRESENTATION

Austin WATER

WATER FORWARD
INTEGRATED WATER RESOURCE PLAN

Water Forward Task Force Meeting

March 20, 2018

Agenda

- Updated Schedule Through End Of Plan Development Process
- Presentation of Draft Plan Recommendations
  - Task Force Questions, Discussion, and Input

Updated Schedule Through End Of Plan Development Process

Public Workshop #5

Staff and consultants will be on hand to discuss draft plan recommendations.

Time:

Wednesday March 21, 2018
6:00 p.m. – 8:00 p.m.

Location:

Dawson Elementary School Cafeteria

3001 S 1st St., Austin, TX

Parking:

Available in front, sides and the street. Location within 10 mins walk from bus stops for 1, 5, 10 & 801

This will be a kid-friendly event.

Field Trip to H2Oaks

- Potential Dates: Friday, May 4th or Friday, May 11th
- Group to include Task Force Members, W/WW Commissioners, and AW staff (20-25 people)
- AW to arrange transportation
- Leave from Austin in the AM, arrive mid-morning for tour of ASR and brackish desal facilities, and return to Austin early evening

Updated Schedule

Date	Event	
March 20th	Task Force Meeting	Presentation of and TF input on draft plan recommendations
March 21st	Public Workshop #5	Public input on draft plan recommendations
April 3rd	Task Force Meeting	Presentation of and TF input on draft plan recommendations
May 1st	Task Force Meeting	High level walk through of draft plan report
June 5th	Task Force Meeting	TF input on draft plan report

Continued on next slide…

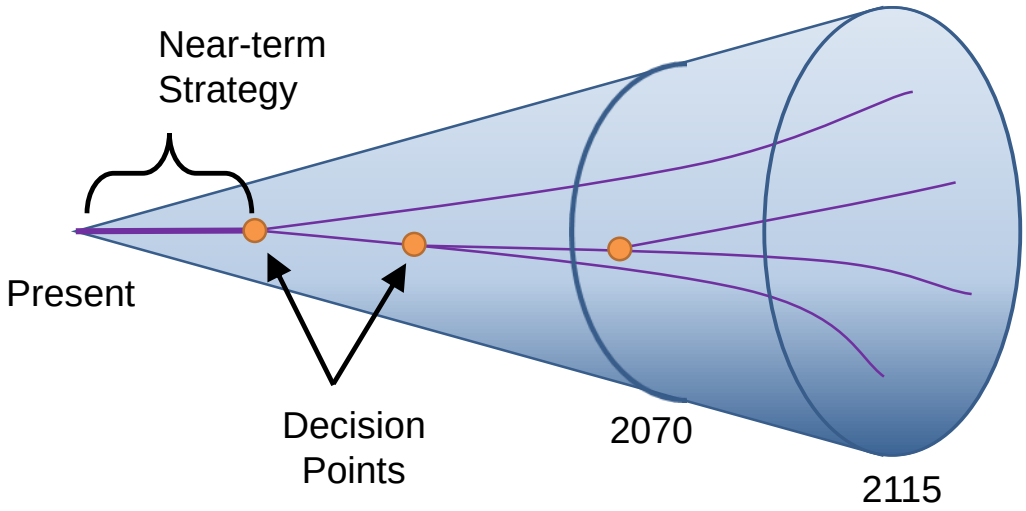
Updated Schedule

Date	Event	
Summer 2018	Boards and Commissions Outreach	Presentation of plan recommendations • W/WW Commission • Resource Management Commission • Joint Sustainability Commission • Environmental Commission
August 2018	Task Force Meeting	TF review of revised plan report
September 2018	Task Force Meeting	Recommendation for action on final plan
September/ October 2018	W/WW Commission Meeting	Review and recommendation for action on final plan
October/ November 2018	City Council Meeting	Action on final plan

Draft Plan Recommendations

Some Key Points About Austin's Integrated Water Resource Plan

- We're implementing an adaptive management approach
- This process is about incremental changes we can make to get closer to our desired future
- The plan is anticipated to be updated on a five year cycle to allow new data to inform planning assumptions
- Future updates to the plan will allow us to build on the work we do today and learn from our actions



Draft Plan Recommendations: 2020 to 2025

- Dual Plumbing Ordinance
  - Ordinance development will require dual plumbing in new development (applicability to be determined)
- Alternative Water Incentive
  - Enhancement of existing rebate programs to provide incentives for alternative water use
    - To include lot-scale rainwater harvesting, lot and community scale stormwater harvesting, lot scale blackwater reuse, and lot scale graywater harvesting
  - Implementation will target existing development

Draft Plan Recommendations: 2020 to 2025

- Centralized and Decentralized Reclaimed Water
  - AW will continue implementation of the centralized reclaimed water (purple pipe) system master plan with consideration of potential expansion
  - Initial steps for decentralized reclaimed options will include additional refinement of geospatial analysis and potential project identification
    - Decentralized reclaimed includes community scale distributed wastewater reuse and community scale sewer mining
- Aquifer Storage and Recovery
  - Initial steps will include further study for pilot and full project, further modeling for operational considerations, land acquisition, legal and permitting considerations, and piloting

Draft Plan Recommendations: 2025 to 2030

- Development-focused Water Use Benchmarking and Budgeting
  - Initially this option will require submittal of water use estimates for new development
  - Potential approaches to implement this requirement will be evaluated
  - If the best approach will require an ordinance, process will include stakeholder outreach and Boards and Commissions and Council action
- Landscape Transformation Incentive
  - Enhancement of existing rebate programs to provide incentives for regionally appropriate landscapes
  - Implementation will target existing development

Draft Plan Recommendations: 2025 to 2030

- Centralized and Decentralized Reclaimed Water
  - Implementation may include design and construction of decentralized reclaimed projects.
- Aquifer Storage and Recovery
  - Evaluation of pilot, potentially leading to preliminary design of a full-scale ASR facility
  - Note that to date, only preliminary costs for an ASR pilot are include in the AW capital improvements plan (CIP). CIP costs and operations and maintenance costs will need to be added in future budgets.

Draft Plan Recommendations: 2030 to 2035

- Development-focused Water Use Benchmarking and Budgeting
  - Option will be expanded to require that new development meet a benchmark water budget usage (compliance mechanism and applicability to be determined)
- Irrigation Efficiency Incentive
  - Implementation of an incentive could include expansion of current irrigation rebate programs to include irrigation system controllers that make flow data accessible and are capable of responding to leaks and high flow situations
  - Implementation will target existing development

Draft Plan Recommendations: 2030 to 2035

- Landscape Ordinance
  - Ordinance development could include implementing turf grass area, irrigated area, and/or irrigation area limitations (applicability to be determined)
  - Implementation would target new development
- Alternative Water Ordinance
  - Development of an ordinance to require use of alternative water (applicability to be determined)
  - Alternative waters may include lot-scale rainwater harvesting, lot and community scale stormwater harvesting, lot scale blackwater reuse, lot scale graywater harvesting, or centralized or decentralized reclaimed water

Draft Plan Recommendations: 2030 to 2035

- Aquifer Storage and Recovery
  - Target timeframe to begin construction of full-scale ASR facility
- Indirect Potable Reuse
  - Pending a successful outcome of earlier outreach, study, and permitting, target timeframe to move forward with design and construction

Draft Plan Recommendations: 2035 to 2040

- Aquifer Storage and Recovery
  - Target timeframe for option to be brought online and to begin storing water
- Indirect Potable Reuse
  - Target timeframe for option to be brought online

Draft Plan Recommendations: Beyond 2040

- Brackish Groundwater Desalination
  - Initial steps - location of a potential aquifer and potentially water quality testing
  - Later steps - permitting, land acquisition, design, and construction of facilities
- Off Channel Reservoir
  - Initial steps - further study of infrastructure requirements for this option
  - Later steps - permitting, land acquisition, design, and construction of facilities

Discussion Goals

- Input on plan recommendations
  - Are the recommendations clear?
  - Are you comfortable with the recommendations?
- Input on implementation timeline and adaptive management plan
  - Is the phasing of options clear?
  - Is the rationale behind the phasing understandable?
  - Are you comfortable with the implementation timeline?

- Parking lot for other/future items

BACKUP MATERIALS

Draft Outline of Plan Recommendations

Hybrid Portfolio Planning Context

- Plan development targeted at being adaptable for a variety of potential futures as a way to deal with climate, drought, and other uncertainties
- Planning context for identified needs and strategies to meet the needs
    - Focus was on Scenario B – Period of Record (Observed Hydrology) adjusted to reflect the potential future effects of climate change
    - Hybrid Portfolios were developed to meet identified Type 1, 2, and 3 needs

Core Colorado River Supplies

- Colorado River supply will continue to be Austin's core supply in the future
- Action steps to protect and enhance this supply include:
    - Continued participation in the Lower Colorado River Authority/City of Austin Water Partnership
    - Continue to engage on potential water supply development in the basin, which may include regional partnerships as a way to implement supply or demand management options
    - Continued communication and information sharing with other entities in the basin
    - Continued participation in LCRA's Water Management Plan update processes
    - Continued participation in the Texas Water Development Board-administered Regional Water Planning process
    - Broaden our understanding of basin-wide issues, including both upstream and downstream issues
    - Share information and work with others to study potential future climate change impacts

Implementation of Best Management Practices

- Continue to implement best management practices and options identified as implementation components
    - Best management practice options
        - Require or incentivize government-recognized energy and water efficiency-labeled residential and commercial fixtures
            - Included in baseline assumptions in portfolios
        - Incentivize or require toilet, urinal, and bathroom faucet aerator efficiencies
            - Included in baseline assumptions in portfolios
        - Lake Austin Operations
            - Implementation during drought periods
    - Options identified as implementation components
        - Water rates and fees to promote water use efficiency while maintaining affordability
        - Customer education enhancements
        - Use of social media programs and web-based content to promote conservation

Hybrid 1 Portfolio Makeup for Each Planning Horizon

Portfolio Makeup		Average Drought	2040 Yield Target	2070 Yield Target	2115 Yield Target
Future Additional Portfolio Elements					
D1	AMI	Both	3,882	5,766	9,371
D2	Water Loss Control	Both	9,326	10,918	13,064
D3	CII Ordinances	Both	1,063	1,063	1,063
D4	Benchmarking	Both	5,953	11,670	25,228
D5	Landscape Ordinance	Both	3,038	7,428	15,050
D6	Landscape Incentive	Both	321	633	929
D7	Irrigation Incentive	Both	205	427	394
D8	Lot Scale Stormwater Harvesting	Both	329	869	2,275
D9	Lot Scale Rainwater Harvesting	Both	1,550	4,032	9,251
D10	Lot Scale Gray Water Harvesting	Both	2,126	5,617	12,667
D11	Lot Scale Wastewater Reuse	Both	1,323	3,672	7,875
D12	AC Condensate Reuse	Both	1,084	2,711	5,150
S1	Aquifer Storage and Recovery	Drought	60,000	60,000	90,000
S2	Brackish Groundwater Desal	Both	-	5,000	16,000
S3	Direct Non-Potable Reuse	Both	12,000	25,000	54,600
S4	Direct Potable Reuse	Drought	-	-	-
S5	Indirect Potable Reuse	Drought	11,000	20,000	20,000
S6	LCRA Additional Supply	Both	-	-	-
S7	New Off Channel Reservoir	Both	-	25,000	25,000
S8a	Seawater Desal (Import Option)	Both	-	-	-
S8b	Conventional Groundwater (Import Option)	Both	-	-	-
S9	Community Scale Distributed Wastewater Reuse	Both	3,154	14,467	30,049
S10	Community Scale Sewer Mining	Both	1,000	2,211	5,284
S11	Community Scale Stormwater	Both	158	236	504
S12	Community Scale Rainwater	Both	-	-	-
	Remaining Regional Supply	Both	N/A	N/A	N/A
Existing Portfolio Elements					
	DCP Implementation	Drought	N/A	N/A	N/A
	COA Run of River	Both			
	LCRA Firm Supply	Both			
	Remaining Regional Supply	Both			

Adaptive Management Plan - High Level Implementation Steps

Several options will need to be implemented in the near term to ramp up over time to meet future planning horizon goals. This will include demand management, decentralized, and centralized reclaimed system options.

Demand Management Options

- Advanced Metering Infrastructure and Water Loss Control
    - AW will continue implementation of these utility initiatives
- CII Ordinances and AC Condensate Reuse Ordinance
    - Options recently adopted into code
    - AW will continue to monitor these options
- Dual Plumbing Ordinance
    - Implementation will include stakeholder and Boards and Commissions outreach and input. This option will include development of an ordinance to require dual plumbing in new development (applicability to be determined) pending Boards and Commissions and Council action
- Development-focused Water Use Benchmarking and Budgeting
    - First phase – Information submittal and voluntary conservation program participation
        - Initially this option will require submittal of water use estimates for new development. As a first step, potential approaches to implement this requirement will be evaluated. If the best approach will require an ordinance, the process will include stakeholder outreach and Boards and Commissions and Council action
        - As part of this program, City staff will provide potential water use efficiency and alternative water recommendations and information on available incentive and rebate programs. This information will tie into the development of databases to be used to develop benchmarks for efficient water usage for various development types. Implementation of the measure will look for ways to tie into the Service Extension Request (SER) and Austin Energy Green Building (AEGB) programs as well as AMI customer portals for residential and commercial.
    - Second phase – Requirement that new development meet established water budget
        - Prior to 2040, this option will be expanded to include requirement of water use estimate submittals for new development concurrent with preliminary plan submittal to be reviewed by City staff and a requirement that new development meet a benchmark water budget (compliance mechanism to be determined).
- Irrigation Efficiency Incentive
    - Incentive program development will include stakeholder and Boards and Commissions outreach and input and will target existing development
    - Implementation of an incentive could include expansion of current irrigation rebate programs to include irrigation system controllers that make flow data accessible and are capable of responding to leaks and high flow situations
- Landscape Transformation Incentive and Ordinance
    - Initially implementation will focus on the incentive approach targeting existing development
    - Incentive program development will include stakeholder and Boards and Commissions outreach and input.
    - Implementation of an incentive could include increasing WaterWise landscape rebates for single family residential and multifamily residential and implementing a new WaterWise landscape rebate for commercial properties beyond City of Austin Land Development Code requirements
    - Later steps will include development of a landscape transformation ordinance, which will include stakeholder outreach and Boards and Commissions and Council action
    - Implementation of an ordinance could include implementing turf grass area, irrigated area, and/or irrigation area limitations

- Alternative Water Incentives and Ordinance
    - This option includes incentives and ordinances targeting alternative water use, to include lot-scale rainwater harvesting, lot and community scale stormwater harvesting, lot scale blackwater reuse, and lot scale graywater harvesting
    - Initially implementation will focus on the incentive approach targeting existing development
    - Incentive program development will include interdepartmental, stakeholder, and Boards and Commissions outreach and input
    - Later steps will include development of an alternative water ordinance, which will include stakeholder outreach and Boards and Commissions and Council action

<u>Supply Options</u>

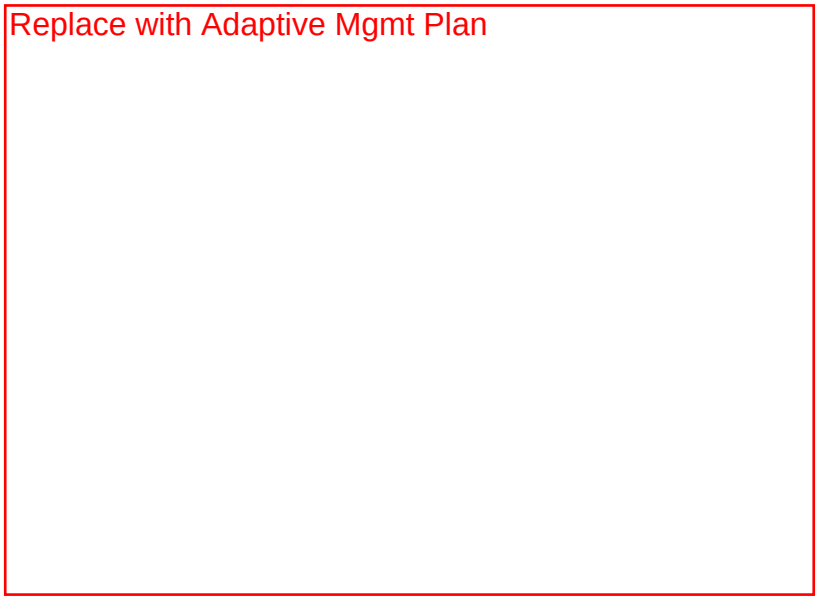
- Centralized and Decentralized Reclaimed Water
    - This includes the Centralized Reclaimed Water (Purple Pipe) System and decentralized reclaimed options: community scale distributed wastewater reuse and community scale sewer mining.
    - AW will continue implementation of the centralized reclaimed water (purple pipe) system master plan with consideration of potential expansion
    - Initial steps for decentralized reclaimed options will include additional refinement of geospatial analysis and potential project identification. Later steps will include design and construction of decentralized reclaimed projects.
    - Implementation of both centralized and decentralized reclaimed options will be informed by and will coordinate with one another.
- Aquifer Storage and Recovery (Carrizo-Wilcox)
    - Initial steps will include further study for pilot and full project, further modelling for operational considerations, land acquisition, legal and permitting considerations, and piloting
    - Later steps will include evaluation of pilot, potentially leading to preliminary design and construction of a full-scale ASR facility
    - To date, only preliminary costs for an ASR pilot are include in the AW capital improvements plan (CIP). CIP costs and operations and maintenance costs will need to be added in future budgets.
- Indirect Potable Reuse
    - Initial steps will build on previously performed feasibility studies for IPR and will include further study of potential option configuration, further evaluation of Lady Bird Lake inflows, and infrastructure requirements, and permitting and operational considerations
- New Off Channel Reservoir
    - Initial steps will include further study of infrastructure requirements for this option
    - Later steps will include permitting, land acquisition, design, and construction of facilities
- Brackish Groundwater Desalination
    - Initial steps will include location of a potential aquifer and potentially water quality testing
    - Later steps will include permitting, land acquisition, design, and construction of facilities
- Other options that progressed through screening but were not included in Hybrid 1 could be considered at a future point as the plan is reevaluated on a five-year cycle
    - Options include community-scale rainwater harvesting, direct potable reuse, additional LCRA supply, import options like seawater desal and conventional groundwater

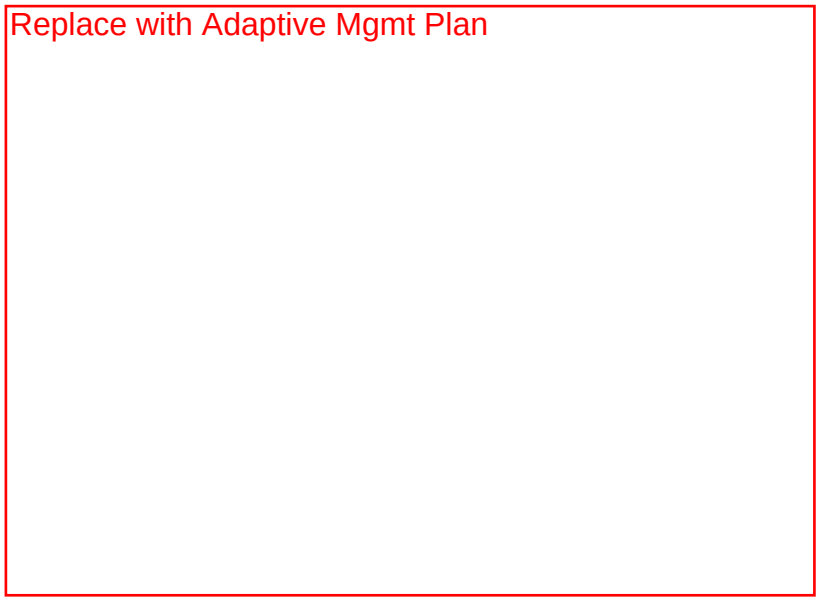
Future Steps

- Post plan adoption, convene the Water Forward Task Force on a quarterly basis to support ongoing plan implementation efforts
- Determine funding and resource requirements to implement plan strategies and programs
- Update Integrated Water Resource Plan, plan recommendations, and adaptive management plan on a five-year cycle

Metrics to Monitor Conditions and Implementation Success

- Demands
    - How are water demands tracking with plan projections?
- Supplies
    - Ratio of supply capacity to demand
- Project implementation tracking
    - Progression of projects and programs compared to estimated project milestones
    - Estimated savings from implemented demand management options
    - Estimated yield from implemented supply options


Replace with Adaptive Mgmt Plan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DRAFT WATER FORWARD REPORT
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Assumptions for Estimated Savings by Option

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Option – AC Condensate Ordinance

Assumptions

Assumed total square footage per sector will scale with MF Units and or COM/COA Employment projections, with per unit/per employee square footage rate estimated from ECAD Ordinance Audit data available from Austin Energy. AC Condensate production estimated using the rule of thumb of 0.5-0.6 gallons/hour produced per 1000 sq. ft. of conditioned area (per SAWS AC Condensate Collection Manual). Finally, total square footage was scaled to 2015 percentage of MF/COM/COA buildings greater than 50,000 sq. ft. (equivalent to an average cooling load of 200 tons) from aforementioned ECAD Audit data and held constant into future. Assumed 80% average cooling capacity factor and operation during 9 months of year, per SAWS AC Condensate Collection Manual guidance.

Estimated Savings-

Average Weather Demand Met By Option in 2115 Summary (Acre

Note: Drought yields to be determined. Yields are subject to change dependent on implementation approach and portfolio context. Annual cumulative volume represents the total volume produced from all systems.

	SFR	MFR	Non-Residential
Annual Cumulative Volume (AF/Year)	-	1,770	3,380
Annual Average System Volume (Gal/Year)	-	109,774	125,463

Option – Advanced Metering Infrastructure

Assumptions

Implementation of an AMI program is assumed to entail high-resolution usage reporting for all participants as well as customer-side leak identification and notification. To this end, AMI is expected to produce savings primarily from reducing the occurrence of large customer-side leak events (100 - 550 Gallons per day, per 2015 REUWS2 study). Previous studies have shown a reduction of large customer-side leak volumes of approximately 50% from this type of implementation (Naphade, 2011). Therefore, we assume a total 15% reduction in total estimated leak volume for this analysis. Note that by 2020, it is assumed that AMI implementation will have reached 20% of all customers. Therefore, savings in 2020 represent 20% of the total estimated savings potential produced by this option.

Estimated Savings-

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	210	170	200	10	0	590
2040	1,280	1,120	1,370	110	0	3,880
2070	1,820	1,710	2,080	150	0	5,760
2115	2,670	3,170	3,310	230	0	9,380

Average Weather Cumulative Total Water Savings (in AF over 100 year planning period):

TOTAL	163,630	166,910	190,630	14,000	0	535,170

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	720	620	760	60	0	2,160

Option – CII Ordinance for Cooling Towers and Steam Boilers

Assumptions –

Assumed 400 cooling towers that currently have 3 cycles of concentration will have 5 cycles of concentration when in compliance. The average tonnage is assumed at 375 which translates to 6750 gallons per day for blowdown under current conditions. Under future conditions, blowdown is estimated to reduce to 3375 gallons per day. Water savings are assumed for 9 months of operation. The following table shows the demand reductions associated with the cooling tower retrofits throughout the entire planning horizon.

Estimated Savings

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	0	40	950	70	0	1,060
2040	0	40	950	70	0	1,060
2070	0	40	950	70	0	1,060
2115	0	40	950	70	0	1,060

Average Weather Cumulative Total Water Savings (in AF over 100 year planning period):

TOTAL	0	3,540	91,460	7,080	0	102,080

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	0	40	950	70	0	1,060

Option – Development-focused Water Use Benchmarking and Budgeting

Assumptions –

No savings are assumed for the water estimate submittal action; however this is a critical step to getting to the water budgeting measure which has more substantial savings potential. At the 2040 planning horizon, savings are assumed at 10% for the residential (SFR/MFR), COM, and City of Austin (COA) sectors for new development. An assumption of 10% savings is maintained for the 2070 and 2115 planning horizons. The underlying assumption is that Advanced Metering Infrastructure (AMI) messaging is fully implemented and utilized for the water budgeting action.

Estimated Savings –

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	0	0	0	0	0	0
2040	2,400	2,260	2,050	70	0	6,780
2070	4,370	4,430	4,310	340	0	13,450
2115	8,880	10,030	9,290	1,480	0	29,680

Average Weather Cumulative Total Water Savings (in AF over 100 year planning period):

TOTAL	405,200	431,990	407,220	47,710	0	1,292,120

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	5,330	5,680	5,360	630	0	17,000

Option – Irrigation Efficiency Incentive

Assumptions –

The program incentivizes adoption of smart irrigation controllers to improve irrigation system efficiency by identifying leaks and zones with high flows and reducing excessive watering related to improper irrigation scheduling , with 8% savings associated with improved irrigation system performance based on previous literature review and adjustment for one-day-a-week watering restrictions. Base case irrigation system usage (per year) was assumed as the median of MF/COM billing data for 2015 and average of Base Year Irrigation Demand per SF Household from Disaggregated Demand Model. Number of eligible irrigation systems were projected for each planning horizon using ratio of parcels with registered irrigation systems to total parcels for each sector (assumed constant during planning period) and growing with total number of existing parcels in each planning horizon. Some percentage of these systems are likely to abandoned (i.e., not in-use) which reflects a caveat of this estimation process. Therefore, reported savings represent the maximum savings potential. Participation rates for all three sectors are projected to reach 20% by 2040 and 30% by 2070. Participation is assumed to remain constant beyond 2070 due to assumed saturation of smart irrigation system controllers in the marketplace by the 2070 planning horizon.

Estimated Savings –

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	20	10	10	0	0	40
2040	140	40	70	0	0	250
2070	310	90	170	0	0	570
2115	310	90	170	0	0	570

Average Weather Cumulative Total Water Savings (in AF over 100 year planning period):

TOTAL	22,190	6,230	12,220	0	0	40,640

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	230	60	130	0	0	420

Option – Landscape Transformation Incentives

Assumptions –

Savings Forecast: Incentive would only apply to existing customers who have satisfied rebate requirements similar to those in effect now. Assuming average conversion of 900 sq. ft. per single family residential (SFR) participant and assuming 5 Gallons reduction of demand per sq. ft. converted, from previous AW Landscape Transformation Rebate data. Currently existing MFR/COM participants are assumed to convert 30% of their improved landscape on average (improved landscape assumed to be 50% of total pervious cover on parcel) from turf to water-saving vegetation. Future COM/MF parcels are assumed to develop in accordance with the existing Landscape Ordinance, which requires plant selection from the City of Austin Preferred Plant List for landscaped areas. This requirement does not apply to SFR parcels. The same savings per square foot of converted area are assumed as for the SFR sector.
Program Participation: Participation rates for all three sectors assumed to reach 10% by 2040, 20% by 2070 and 30% by 2115.

Estimated Savings –

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	0	0	0	0	0	0
2040	290	10	11	0	0	311
2070	840	21	22	0	0	883
2115	1,880	31	33	0	0	1,944

Average Weather Cumulative Total Water Savings (in AF over 100 year planning period):

TOTAL	82,010	1,750	1,840	0	0	85,600

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	850	20	20	0	0	890

Option – Landscape Transformation Ordinance

Assumptions –

Savings Forecast: Ordinance would only apply to new construction parcels. Average Single Family (SF) transformed landscape area assumed as product of average SF parcel size (6300 sq. ft.), average SF pervious area (70% per COA Watershed Protection Department), maximum recommended turf grass area (50% per Austin Homebuilders' Association Sensible Landscape Guidance Document) and average proportion of yard scape that is turf grass (1500 sq. ft. of turf per 1900 sq. ft. of total yard area per AW Conservation staff). This results in an average converted area of ~1800 sq. ft. per SF parcel.

Significant outdoor water savings have been achieved to date through the combined effect of the existing landscape ordinance for COM/MF development, in effect since 1982 and most recently revised in 2010, recent market trends that have shifted toward native and adaptive plant palettes, and City water codes including the Water Conservation Code. A new Landscape Transformation Ordinance is assumed to entail further requirements to reduce irrigation water use by 10% as compared to similar existing development. This reduction could be achieved through a variety of mechanisms, including reduction of irrigated area, installation of drought tolerant plants, and reductions of turf area. The total number of parcels were estimated and projected into the future by assuming a constant ratio of 9 multi-family (MF) units per parcel and 56 commercial (COM) employees per parcel, from historical data.

Note: The above assumptions were developed for the high-level strategic integrated water resource plan (IWRP) development process. Should this option be incorporated into IWRP plan recommendations, actual new ordinance details would need to be developed through subsequent implementation processes with future additional stakeholder and public input opportunities.

Estimated Savings –

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	0	0	0	0	0	0
2040	2,490	280	460	0	0	3,230
2070	6,440	770	810	0	0	8,020
2115	13,510	1,320	1,750	0	0	16,580

Average Weather Water Savings - Cumulative Total (in AF over 100 year planning period):

TOTAL	614,280	66,350	82,120	0	0	762,750

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	6,750	730	900	0	0	8,380

Option – Water Loss Control Utility Side

Assumptions –

ILI of 2.7 by 2020 reducing to 2.0 by 2040 and maintaining the 2.0 to 2115. No assumptions are made for reduction of losses between the diversions and treatment plant. Yield is calculated as a function of baseline demands.

Estimated Savings –

Average Weather Water Savings Summary (in AF per year):

Savings estimates are subject to change dependent on implementation approach and portfolio context.

YEAR	SFR	MFR	COM	COA	NRW	TOTAL
2020	0	0	0	0	3,110	3,110
2040	0	0	0	0	9,330	9,330
2070	0	0	0	0	10,920	10,920
2115	0	0	0	0	13,060	13,060

Average Weather Water Savings - Cumulative Total (in AF over 100 year planning horizon):

TOTAL	0	0	0	0	975,680	975,680

Average Weather Annual Average Water Savings (in AF per year):

TOTAL	0	0	0	0	10,160	10,160

Option – Alternative Water Ordinances and Incentives – Lot Scale Rainwater, Stormwater, Graywater and Blackwater

Lot Scale Rainwater Harvesting - Assumptions

Option	Scenario	Sector				End Use	Saturation rate in 2115	Type of development
		SFR	MFR	COM	COA			
Lot scale Rainwater Harvesting	Outdoor	Y				IRR	40%	All New
	Outdoor		Y			IRR	10%	
	Outdoor			Y		IRR	10%	
	Dual Pipe	Y				IRR, TL, CW		
	Dual Pipe		Y			IRR, TL	20%	
	Dual Pipe			Y		IRR, TL, HVC	20%	
	Potable	Y				ALL		

Implementing rainwater harvesting in new developments provides an opportunity to plumb the residence or building with internal connections for toilet flushing or clothes washing, where used indoor treatment is required.
Three scenarios are considered for simplicity. These are:
1. A proportion of newly constructed SFR, MFR and COM buildings have a rainwater tank supplying outdoor end uses.
2. A proportion of newly constructed SFR, MFR and COM buildings have a rainwater tank supplying outdoor end uses and indoor (non-potable) end uses via dual reticulation.
3. A proportion of newly constructed SFR buildings have a rainwater tank supplying all end uses (i.e. potable supply).
All scenarios assume back-up supply from the centralized water distribution system.

Lot Scale Rainwater Harvesting - Estimated Savings

Option	Scenario	2020 Yield (AF/Yr)	2040 Yield (AF/Yr)	2070 Yield (AF/Yr)	2115 Yield (AF/Yr)
Lot scale Rainwater Harvesting	Outdoor	-	937	2410	5088
	Outdoor	-	54	151	425
	Outdoor	-	82	209	498
	Dual Pipe	-	-	-	-
	Dual Pipe	-	195	556	1562
	Dual Pipe	-	281	706	1678
	Potable	-	-	-	-

Lot Scale Stormwater Harvesting - Assumptions

Option	Scenario	Sector				End Use	Saturation rate in 2115	Type of development
		SFR	MFR	COM	COA			
Lot scale Storm water Harvesting	Outdoor		Y			IRR	20%	All New
	Outdoor			Y		IRR	20%	
	Dual Pipe		Y			IRR, TL, CW		
	Dual Pipe			Y		IRR, TL, CW, HVC		

Implementing stormwater harvesting in new developments provides an opportunity to plumb the building with internal connections for toilet flushing, clothes washing or to cooling towers. Retrofitting existing buildings with internal connections to a dual supply source can be cost prohibitive and/or practically difficult, and so it is assumed for the purposes of this study that stormwater harvesting at the lot scale for existing development would be used solely for irrigation/landscaping. Where used for irrigation/landscaping only, it is assumed that there will be filtration. Where used to supply indoor non-potable end-uses, UV Disinfection is assumed. Storage is assumed to be an underground tank/cistern. All scenarios assume back-up supply from the centralized water distribution system.
Two scenarios are considered for simplicity. These are:
1. A proportion of newly constructed MFR and COM buildings have an underground stormwater harvesting tank supplying outdoor end uses.
2. A proportion of newly constructed MFR and COM buildings have an underground stormwater harvesting tank supplying outdoor end uses and indoor (non-potable) end uses via dual reticulation.

Lot Scale Stormwater Harvesting - Estimated Savings

Option	Scenario	2020 Yield (AF/Yr)	2040 Yield (AF/Yr)	2070 Yield (AF/Yr)	2115 Yield (AF/Yr)
Lot scale Storm water Harvesting	Outdoor	-	180	496	1391
	Outdoor	-	149	373	885
	Dual Pipe	-	-	-	-
	Dual Pipe	-	-	-	-

Lot Scale Gray water Harvesting (Graywater) - Assumptions

Option	Scenario	Sector				End Use	Saturation rate in 2115	Type of development
		SFR	MFR	COM	COA			
Gray Water Harvesting	Outdoor	Y				IRR	10%	All New
	Outdoor		Y			IRR		
	Outdoor			Y		IRR		
	Dual Pipe	Y				IRR, TL, CW	10%	
	Dual Pipe		Y			IRR, TL, CW	20%	
	Dual Pipe			Y		IRR, TL	15%	

Graywater is not considered for outdoor end uses in Critical Water Quality Zones, floodplains, or the Edwards Aquifer Recharge Zone.

Two scenarios are considered for simplicity. These are:
1. A proportion of newly constructed SFR, MFR and COM buildings have a graywater diversion system supplying outdoor end uses. Graywater diversion is untreated, and therefore cannot be stored and can only be used to supply sub-surface irrigation

2. A proportion of newly constructed SFR, MFR and COM buildings have a graywater treatment system supplying outdoor and indoor end uses.

All scenarios assume back-up supply from the centralized water distribution system.

Gray water Harvesting (Graywater) - Estimated Savings

Option	Scenario	2020 Yield (AF/Yr)	2040 Yield (AF/Yr)	2070 Yield (AF/Yr)	2115 Yield (AF/Yr)
Gray water Harvesting	Outdoor	-	244	631	1336
	Outdoor	-	-	-	-
	Outdoor	-	-	-	-
	Dual Pipe	-	571	1461	2860
	Dual Pipe	-	991	2702	6832
	Dual Pipe	-	321	823	1638

Lot Scale Wastewater Reuse (Blackwater) - Assumptions

Option	Scenario	Sector				End Use	Saturation rate in 2115	Type of development
		SFR	MFR	COM	COA			
Building Scale Wastewater Reuse	Dual Pipe		Y			IRR, TL, CW		All New
	Dual Pipe			Y		IRR, TL, CW, HVC		

Blackwater reuse is not considered for outdoor end uses in Critical Water Quality Zones, floodplains, or the Edwards Aquifer Recharge Zone. This option assumes back-up supply from the centralized water distribution system.

One scenario is considered for simplicity. This is:

1. A proportion of newly constructed MFR and COM buildings have a blackwater treatment system supplying outdoor and non-potable indoor end uses.

Note that for higher saturation scenarios, 50% and higher, there would need to be consideration given to the minimum dry weather flows that must be retained in the centralized wastewater system to maintain the necessary scouring velocities.

Building Scale Wastewater Reuse (Blackwater) – Estimated Savings

Option	Scenario	2020 Yield (AF/Yr)	2040 Yield (AF/Yr)	2070 Yield (AF/Yr)	2115 Yield (AF/Yr)
Building Scale Wastewater Reuse	Dual Pipe	-	-	-	-
	Dual Pipe	-	1,323	3,672	7,875

Net Diversion Metrics Summary - from WAM Results

20-Mar-18

Hybrid #1

Hydrologic Condition	Demand Projection	Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
Stationary	2020	143,547	105,598	143,547	37,949	0.264	0.736
Stationary	2040	161,397	113,642	160,677	47,755	0.297	0.704
RCP 8.5	2040	161,582	113,583	160,931	47,999	0.298	0.703
Stationary	2070	207,018	137,068	202,448	69,950	0.346	0.662
RCP 8.5	2070	207,397	136,755	203,030	70,642	0.348	0.659
Stationary	2115	285,188	177,619	279,283	107,569	0.385	0.623
RCP 8.5	2115	279,984	176,188	276,942	103,796	0.375	0.629
			Geometric Mean		60,453	0.318	0.681

Hybrid #2

Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
143,547	105,598	143,547	37,949	0.264	0.736
161,292	113,642	160,719	47,650	0.296	0.705
161,293	113,547	160,931	47,747	0.297	0.704
203,685	137,068	202,398	66,617	0.329	0.673
201,247	136,153	202,748	65,094	0.321	0.677
279,044	177,619	279,143	101,425	0.363	0.637
261,947	177,496	276,622	84,451	0.305	0.678
	Geometric Mean		56,179	0.296	0.698

Max Conservation

Hydrologic Condition	Demand Projection	Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
Stationary	2020	143,519	107,008	143,519	36,511	0.254	0.746
Stationary	2040	159,351	113,418	158,631	45,933	0.290	0.712
RCP 8.5	2040	159,629	113,418	158,920	46,211	0.291	0.711
Stationary	2070	201,685	134,744	198,171	66,941	0.338	0.668
RCP 8.5	2070	202,461	134,744	199,096	67,717	0.340	0.666
Stationary	2115	281,393	184,433	277,787	96,960	0.349	0.655
RCP 8.5	2115	276,576	184,433	275,267	92,143	0.335	0.667
			Geometric Mean		56,962	0.303	0.696

Min Cost

Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
143,523	103,526	143,523	39,997	0.279	0.721
173,944	118,420	171,032	55,524	0.325	0.681
174,563	118,420	171,146	56,143	0.328	0.678
231,752	147,016	228,114	84,735	0.371	0.634
231,056	146,744	227,714	84,312	0.370	0.635
314,579	192,368	330,067	122,211	0.370	0.612
288,911	190,592	326,029	98,319	0.302	0.660
	Geometric Mean		65,684	0.318	0.673

Notes:

All results are for the period of record simulation, February 1940 through December 2016. January 1940 is excluded because of a 1-month lag in discharging return flows in the WAM which results in zero return flows for January 1940.

Average Annual Diversion from the River is the summation of all water diverted by Austin to meet municipal demand that is derived from the City's water rights and LCRA supplies. The summation includes the river diversions to refill the ASR and OCR (if present in the portfolio). The ASR has a small loss rate associated with it, and the OCR has evaporative losses. Therefore, it is possible for the Averge Annual Diversion from the River to be slightly higher than the Average Annual Total Demand when diversions to offset ASR losses and OCR evaporation are considered.

The Average Annual Total Demands are the average of derived from simulated monthly demands. The monthly demand change according to Austin's implementaiton of drought contingency plan (DCP) measures in response to combined storage in lakes Buchanan and Travis. Simulations with lower lake levels will have lower monthly and annual averge demands.

For example, for demand projections in 2115 with climate adjustment are 6% higher than for demand projections in 2115 with a stationary climate. However, simulated lake levels are lower with climate trend adjustments to the stationary hydrologic condtions. Therefore, average annual total demands are lower in the climate adjusted simulation.

The Geometric Mean is calculated for 2020 Stationary, 2040 RCP 8.5, 2070 RCP 8.5, and 2115 RCP 8.5. Results for 2040 Stationary, 2070 Stationary, and 2115 Stationary are provided for informational purposes only.

Max Reliability

Hydrologic Condition	Demand Projection	Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
Stationary	2020	143,547	104,723	143,547	38,824	0.270	0.730
Stationary	2040	166,329	116,682	167,437	49,646	0.297	0.702
RCP 8.5	2040	165,655	116,026	167,667	49,629	0.296	0.700
Stationary	2070	212,727	141,662	215,204	71,065	0.330	0.666
RCP 8.5	2070	206,877	139,185	215,430	67,693	0.314	0.673
Stationary	2115	291,113	186,456	303,398	104,657	0.345	0.640
RCP 8.5	2115	259,670	173,796	301,031	85,875	0.285	0.669
			Geometric Mean		57,851	0.291	0.693

Min Implementation

Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
143,523	104,120	143,523	39,404	0.275	0.725
167,184	114,694	166,463	52,489	0.315	0.686
167,245	114,694	166,539	52,551	0.316	0.686
221,607	139,327	217,964	82,280	0.377	0.629
221,426	139,121	217,994	82,305	0.378	0.628
315,164	183,047	311,985	132,117	0.423	0.581
308,496	181,053	308,106	127,442	0.414	0.587
	Geometric Mean		68,268	0.341	0.654

Max Local Control

Hydrologic Condition	Demand Projection	Average Annual Diversion from River, ac-ft	Average Annual Return Flow to River, ac-ft	Average Annual River Demand, ac-ft	Net Diversion (Diversion minus Return Flow), ac-ft	Net Diversion divided by Avg. Annual Demand	Return Flow divided by Avg. Annual Diversion
Stationary	2020	143,560	104,876	143,560	38,684	0.269	0.731
Stationary	2040	162,870	113,613	162,150	49,258	0.304	0.698
RCP 8.5	2040	163,062	113,613	162,354	49,449	0.305	0.697
Stationary	2070	210,173	136,364	206,529	73,809	0.357	0.649
RCP 8.5	2070	210,431	136,198	206,932	74,234	0.359	0.647
Stationary	2115	286,764	173,638	282,859	113,126	0.400	0.606
RCP 8.5	2115	281,582	171,746	280,722	109,836	0.391	0.610
			Geometric Mean		62,843	0.328	0.670

The tables above show the modeled estimates based on various scenarios for planning, each of which have assumptions about effluent production and reuse.

Actual future diversions and return flows will depend on future conditions and strategy implementation.

Austin Water - Demand Assumptions for Water Forward Modeling
DRAFT - SUBJECT TO CHANGE, 7/27/2017

	DEMAND CATEGORY / PARAMETER All Demands in units of acre-feet per year.	Year 2020	Year 2040	Year 2070	Year 2115	Climate Adjusted Demands Year 2040	Year 2070	Year 2115
[1]	**Firm Demands**					**2.0%**	**4.0%**	**6.0%**
[2]	City of Austin Municipal Baseline Demand (Avg Year)	153,853	207,453	296,992	467,392	211,602	308,872	495,436
[3]	City of Austin Municipal Direct Reuse (Avg Year)	3,816	3,816	3,816	3,816	3,816	3,816	3,816
[3a]	City of Austin Parks and LBL Evap	1,415	1,415	1,415	1,415	1,443	1,472	1,500
[4]	**City of Austin Baseline + Reclaimed + Parks + LBL Evap Demand Total**	**159,084**	**212,684**	**302,223**	**472,623**	**216,862**	**314,159**	**500,752**
[5]	Fayette County (Power generation downstream of lakes)	20,000	20,000	20,000	20,000	20,000	20,000	20,000
[6]	Sim Gideon / Lost Pines Demand	0	0	0	0	0	0	0
[7]	Llano County (Power generation near/upstream of lakes)	5,500	11,300	20,000	20,000	11,300	20,000	20,000
[8]	**LCRA - Power Plant Demand**	**25,500**	**31,300**	**40,000**	**40,000**	**31,300**	**40,000**	**40,000**
[9]	Fayette County	9,000	9,000	9,000	9,000	9,000	9,000	9,000
[10]	Travis County	9,000	9,500	9,500	9,500	9,500	9,500	9,500
[11]	**City of Austin - Power Plant Demand**	18,000	18,500	18,500	18,500	18,500	18,500	18,500
[12]	Municipal Firm Contract Demand	65,684	97,170	143,046	169,000	99,113	148,768	179,140
[13]	LCRA New Contracts (Region K Table 5-19)	2,877	19,154	33,654	45,000	19,537	35,000	47,700
[14]	Domestic lakeside use	5,000	5,000	5,000	5,000	5,000	5,000	5,000
[15]	LCRA Firm Irrigation	4,800	7,400	10,000	10,000	7,548	10,000	10,000
[16]	BRA - HB 1437 Demand	6,386	25,000	25,000	25,000	25,000	25,000	25,000
[17]	Manufacturing and Mining Demand	16,253	18,277	20,300	24,000	18,642	21,112	25,440
[18]	Other (Conveyance and Emergency Release)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
[19]	**Other Municipal, Industrial, Misc Firm Demands**	**106,000**	**177,000**	**242,000**	**283,000**	**179,840**	**249,880**	**297,280**
[20]	**Total Firm Demand, Rows 4+8+11+19:**	**308,584**	**439,484**	**602,723**	**814,123**	**446,502**	**622,540**	**856,532**
[21]	STPNOC ROR + LCRA Backup	102,000	102,000	102,000	102,000	102,000	102,000	102,000
[22]	Corpus Christi Garwood Water Rights	35,000	35,000	35,000	35,000	35,000	35,000	35,000
	Interruptible Agricultural Demand							
[23]	Garwood Irrigation Demand (Dry - 90th Percentile)	89,700	85,300	79,200	69,300	90,369	86,546	77,258
[24]	Gulf Coast Irrigation Demand (Dry - 90th Percentile)	147,400	113,400	103,900	88,600	136,928	127,371	111,875
[25]	Lakeside Irrigation Demand (Dry - 90th Percentile)	135,500	128,100	119,300	106,700	137,464	131,580	121,074
[26]	Pierce Ranch Irrigation Demand (Dry - 90th Percentile)	27,000	25,600	24,100	22,300	26,091	25,608	24,390
[27]	**Total Interruptible Agricultural Demand, Rows 23+24+25+26:**	**399,600**	**352,400**	**326,500**	**286,900**	**390,852**	**371,106**	**334,597**

Note: All other surface water demands in the water availability model are represented at full water right authorization levels.