Augmented Chino Basin Program Concept Study

Technical Memorandum

June 2023

Prepared for

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

CBP
CHINO BASIN PROGRAM

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Technical Memorandum

Prepared for: Inland Empire Utilities Agency

Project Title: Chino Basin Program PDR

Project No.: 153489.120

Technical Memorandum

Subject: Augmented Chino Basin Program Concept Study

Date: June 2023

To: Elizabeth Hurst, Chino Basin Program Manager, Inland Empire Utilities Agency
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List of Abbreviations

ACBP	Augmented Chino Basin Program
AFY	acre-feet per year
ASR	Aquifer Storage Recovery
AWPF	advanced water purification facility
CECs	constituents of emerging concern
Chino Basin	Chino Groundwater Basin
fps	feet per second
gpm	gallons per minute
IEUA	Inland Empire Utilities Agency
MWD	Metropolitan Water District
MZ-2	Management Zone 2
MZ-3	Management Zone 3
O&M	operations and maintenance
SWP	State Water Project
SWPC	State Water Project Contractor
TAF	thousand acre-feet
TAFY	thousand acre-feet per year
TDS	total dissolved solids
TM1	Technical Memorandum 1 – Chino Basin Program Assumptions
TM2	Technical Memorandum 2 – PUT, TAKE, and Program Alternatives Development and Evaluation

Section 1: Introduction

Inland Empire Utilities Agency (IEUA) is implementing the Chino Basin Program (CBP), an innovative program to recharge, store, and recover purified water within the Chino Groundwater Basin (Chino Basin). IEUA and the Metropolitan Water District of Southern California (MWD) have partnered on an evaluation to identify potential opportunities to augment the CBP with a larger storage and recovery program with consideration of potential efficiencies in common infrastructure sizing and shared cost and ownership.

IEUA's service area is in one of a few areas of MWD's system that only receives imported water from the State Water Project (SWP), which increases vulnerability to water supply restrictions when the SWP is impacted by drought. MWD is currently evaluating water supply and storage programs in SWP-exclusive areas to increase water supply reliability with the objective of identifying efficiencies in common infrastructure sizing and shared cost and ownership. Storage in the Chino Basin provides a specific opportunity for MWD to store SWP water when available for use during drought conditions when SWP supplies are subject to drought restrictions.

This TM includes concepts for an Augmented CBP (ACBP) to develop an imported water storage and recovery program with incremental sizing from 100 thousand acre-feet (TAF) to 200 TAF and 300 TAF. The concepts include an evaluation of opportunities to leverage the use of common CBP infrastructure, where feasible. The key considerations, foundational assumptions, supply options, and alternatives developed are described in the following sections.

1.1 Overview of Chino Basin Program

CBP is a complex water supply project that will strengthen local water supply reliability and decrease dependence on imported water. The key drivers for CBP include improving basin water quality, developing new local and emergency response supplies, and implementing new critical infrastructure. The CBP also provides another opportunity for the Chino Basin to serve as a central hub of critical Southern California water resources.

On behalf of the Chino Basin stakeholders, IEUA responded to a call from the Proposition 1 Water Storage Investment Program and identified up to 50,000 acre-feet per year (AFY) of locally stored water for ecosystem benefits north of the Delta. An overview of the annual PUT and periodic TAKE cycles is shown in Figure 1-1.

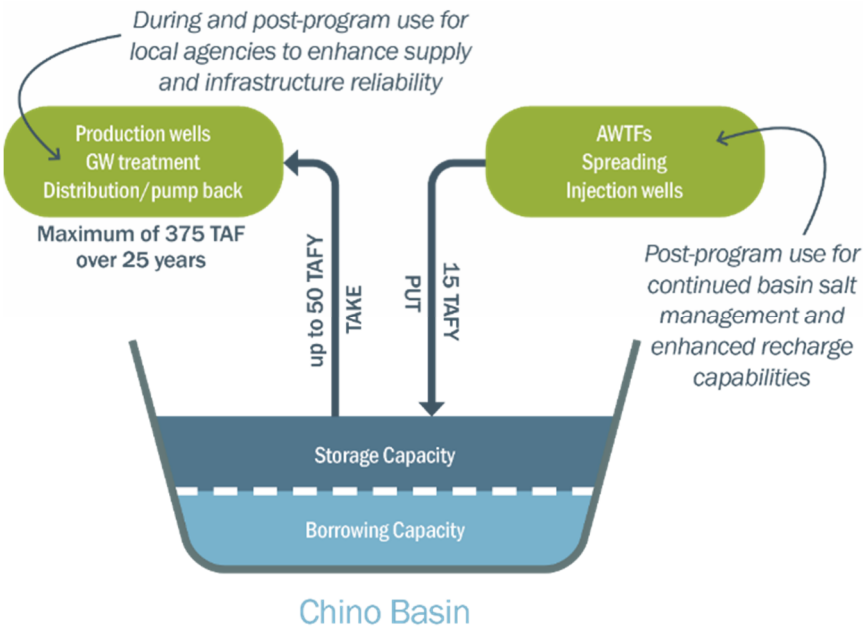


Figure 1-1. CBP Overview
(PUT – TAKE)

A TAKE year commitment includes developing up to 15,000 AFY of PUT year supplies and 100,000 acre-feet (AF) of storage capacity with an additional 100,000 AF of borrowing capacity within the 5 million AF Chino Basin. TAKE water is anticipated to be delivered to MWD, the partnering State Water Project Contractor (SWPC), for use within Southern California via pump-back or in-lieu delivery. An equivalent amount of water would then be exchanged to leave behind water in Lake Oroville for environmental use.

The concept alternatives developed for CBP identify local infrastructure needs with consideration to salinity management within the Chino Basin. The concepts build upon previously developed studies for the region's water supplies and future regulatory requirements. Recycled water, which is an increasingly essential asset to the region particularly with uncertainties with imported water supplies due to climate change, will require an advanced water purification facility (AWPF) in the future to meet regulatory requirements for total dissolved solids (TDS) and other constituents of emerging concern (CECs). As shown in Figure 1-1, the CBP facilities are divided into two main categories: PUT, the components to recharge purified water to the Chino Basin, and TAKE, the components to extract groundwater and convey potable water supply. The selected PUT and TAKE alternatives that were used as a baseline for augmented CBP are presented on Figure 1-2.

W:\GIS\IEUA\CBP\PUT Facilities\CBP_PUTAlternative5-TAKE8.mxd

TAKE Alternative 8 Explanation

Proposed Facilities
- Booster Pump Station
- Delivery Point
- Reservoir
- Distribution Pipeline
- Extraction Well Pipe
- Extraction Well

SAWCo
Cucamonga Valley Water District
Upland
Rialto
Fontana Water Company
Pomona
Monte Vista Water District
Ontario
Chino
Chino Hills
SBVMWD

Royer Nesbit
Edwanda Conservation
Lloyd Michael
San Sevaine 2
San Sevaine 1
Victoria
Lower Day
Agua de Lejos
Weymouth (MWD)
Montclair
Banana
Hickory
Rialto Pipeline
Sandhill

AWPF and Purified Water Pump Station at RP-4
24-in
30-in
RIALTO WWTP
RP1
CCWRF
RP5
WRCRWA
RP4

1 inch = 4,000 feet

Well Field Detail

Prepared by:
Brown AND Caldwell
WSC Water Systems Consulting, Inc.
Author: HF
Date: 3/30/2022
File Name: CBP_PUTAlternative5-TAKE8

N
1 in : 2 miles
0 3,000 6,000 Feet
0 0.75 1.5 Miles

References/Notes:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. Diameters for purified water pipelines to injection wells not shown are 8 inch.
3. The proposed WRCRWA recycled water connection to the IEUA system includes a future direct use of 1,000 AFY by JCSD.

Project:
CBP CHINO BASIN PROGRAM
Preliminary Design Report

Prepared for:
Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

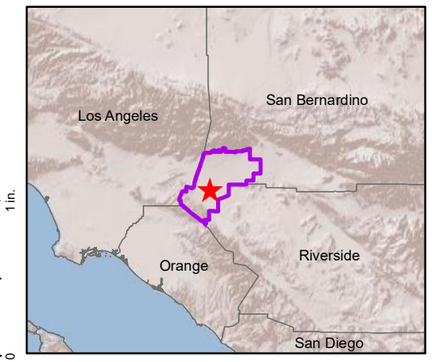
Explanation

PUT Alternative 5
- AWPF Advanced Water Purification Facility
- Proposed Purified Water to Injection Wells
- Proposed Injection Wells (GPM)
- Proposed Recycled Water BPS
- Proposed Recycled Water Pipelines
- Proposed Brine Line Connection

Existing Facilities
- WRP Water Recycling Plant
- WTP Water Treatment Plant
- Recycled Water Pipelines
- Brine Pipelines
- MWD Mainlines

Production Wells
- Chino Desalter
- City of Chino
- City of Chino Hills
- City of Ontario
- City of Pomona
- City of Upland
- Cucamonga Valley Water District
- Fontana Water Company
- Jurupa Community Services District
- Monte Vista Water District
- Recharge Basins

Chino Groundwater Basin and Management Zones



DRAFT PUT Alternative 5
DRAFT TAKE Alternative 8

Figure 1-2

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Section 2: Key Considerations and Assumptions

Key considerations, or maxims, were established prior to the development of ACBP concepts. The maxims set the framework and expectations that this TM would include the development of high-level planning concepts in collaboration with IEUA and MWD. In addition, concepts would be complimentary to CBP and would identify where proposed infrastructure could be upsized to accommodate an increase in storage with consideration to enhancing reliability benefits, such as, the shutdown of the Rialto pipeline. This TM is not intended to endorse or recommend a particular concept. Foundational assumptions and meeting materials developed during workshops with IEUA and MWD are included in Attachment A and Attachment B, respectively.

Note that groundwater modeling, completed in conjunction with the Chino Basin Watermaster, will be required to advance any ACBP concepts. Modeling would be used to confirm program feasibility and assess any potential impacts to the Chino Basin that need to be mitigated. Potential Chino Basin operational considerations include impacts to hydraulic control, existing and planned well pumping sustainability and related hydrogeologic and water quality impacts that could result in material physical injury (MPI) without proper mitigation.

In addition, for consistency, the CBP foundational assumptions and critical success factors that were established as part of **Technical Memorandum 1 – Chino Basin Program Assumptions (TM1)** (Draft Final, January 2022) were used to locate, size, and estimate the need for facilities. TM1 documents the assumptions used to develop and prioritize the PUT and TAKE alternatives.

A summary of key foundational assumptions that were used to develop concepts for this TM include:

- **10-Year Hydrologic Cycle for Imported Water:**
  - 4 wet (PUT)
  - 3 dry (TAKE)
  - 3 average (HOLD or limited PUT)
- **Operational**:
  - PUT-TAKE “symmetry” in alignment with Storage Framework Investigation (WEI, October 2018)
  - PUT for imported water occurs every 4 years of each 10-year cycle, utilizes available spreading basin capacity (priority), incorporate new ASR wells
  - PUT for purified water occurs 10 years of each 10-year cycle, incorporate new injection wells
  - TAKE occurs 3 years of each 10-year cycle and incorporates new ASR wells (imported water) and/or extraction wells (purified water)
  - For any shared infrastructure, align ACBP operations with CBP performance requirements
  - PUT and TAKE operations occur evenly over a year (e.g., 12 months per year) for the PUT and TAKE years, respectively
- **Storage and Recovery**:
  - PUTs must precede TAKEs
  - Program duration is assumed to be 30 years
- **Recharge Basins:**
  - Raw imported water could be recharged at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins

- Enhanced recharge basin maintenance is assumed to maximize recharge basin capacity
- Approximately 12,500 AFY of recharge basin capacity between these five basins with enhanced maintenance
- Note, the 2018 Recharge Master Plan Update (WEI, 2018) included an increase in future replenishment obligations, which are expected to completely utilize the recharge basins in the future (between 2050 to 2070).

The key planning criteria used to size pump stations and pipelines is summarized in Table 2-1 and are consistent with the criteria used for the CBP (see TM1 for more information).

Table 2-1. Pump Station and Pipeline Design Criteria and Planning Assumptions

Parameter	Criteria	Units	Demand Condition
Maximum System Velocity	5	fps	Constant Flow
Hazen Williams Coefficient	120	-	-
Minor Losses (% of friction losses) (bends, valves, etc.)	5	%	-
Low water level plant and booster pump stations	20 ft below grade	-	-
Motor Efficiency	75	%	-
Pump Efficiency	93	%	
Total Pump Station Efficiency	70	%	

In addition, the capacity of each injection well is assumed to be 50 percent of the average pumping rate of nearby production wells. Based on the data included in the Storage Framework Investigation (WEI, October 2018) and the characterization of each management zone, the estimated injection wells capacities for Management Zone 2 (MZ-2) and MZ-3, which are the injection areas selected for the baseline CBP concepts, are 830 and 1,130 gallons per minute (gpm), respectively. The injection well capacities are used to estimate the number of injection wells for the PUT alternatives. The recommended redundancy for injection wells is one standby well for every three active wells.

Section 3: ACBP Concepts

The initial ACBP concepts were developed in collaboration with IEUA and MWD and are based on the foundational assumptions outlined in Section 2. Alternatives were then expanded to include other source supply options. The ACBP concepts were presented to MWD in a workshop on October 12, 2022.

3.1.1 Concept Development Based on Foundational Supply Assumptions

The initial ACBP concepts included the review of incremental increases in storage opportunities within the Chino Basin, which started with 100 TAF (ACBP-1) and increased to 200 TAF (ACBP-2) and 300 TAF (ACBP-3). The PUT and TAKE assumptions for each of the incremental storage concepts is summarized in Table 3-1.

Table 3-1. Initial Augmented CBP (ACBP) Concepts			
ACBP Concept	**Storage (TAF)**	**PUT**	**TAKE**
ACBP-1	100	• 25 TAFY for 4 years • Maximize available spreading basin capacity as feasible to align with extraction • Incorporate new ASR wells, as needed	• Build from an upsized CBP TAKE-8 • Expanded extraction and conveyance infrastructure aligned with PUT locations • Deliver 33 TAFY to Rialto Pipeline
ACBP-2 (Build on ACBP-1)	200	• 50 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Integrate east-west (E-W) pipeline infrastructure to access treated water from Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 33 TAFY to Etiwanda/Upper Feeder
ACBP-3 (Build on ACBP-2)	300	• 75 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Option to modify E-W pipeline from ABCP-2 to access purified water (from Carson AWPF) at Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 66 TAFY to Etiwanda/Upper Feeder

TAFY – thousand acre-feet per year

The ACBP concepts were then expanded to include purified recycled water from MWD's future Pure Water Southern California Program as sub-alternatives for ACBP-2 and ACBP-3, which is shown on Figure 3-1 and summarized in Table 3-2. The PUT and TAKE concepts for ACBP-2A and ACBP-3A include treated imported water from Weymouth Water Treatment Plant which would be recharged and recovered through Aquifer Storage Recovery (ASR) wells for both PUT and TAKE. The PUT and TAKE concepts for ACBP-2B and ACBP-3B include purified water from the Pure Water Southern California program (from the AWPF in Carson via Weymouth) and would be recharged through injection wells for PUT and separate extraction wells for TAKE.

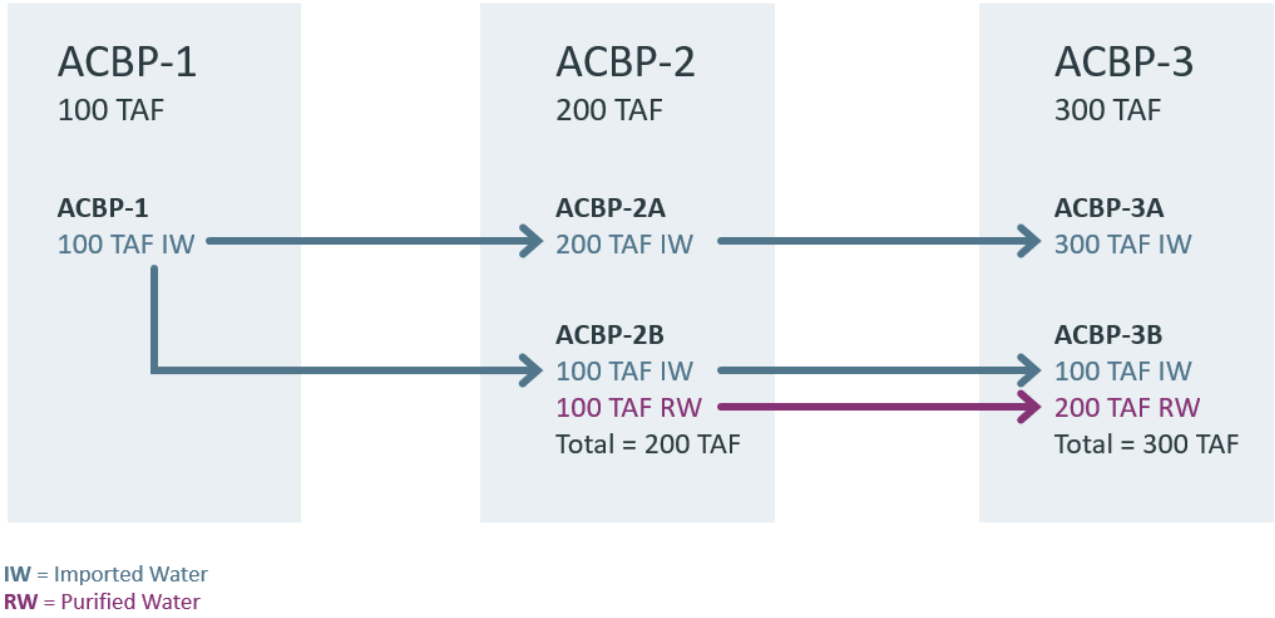

Figure 3-1. Augmented CBP Alternatives - Storage Amounts by Water Type

Table 3-2. Source Supply Sub-Alternatives

ACBP Concept	Storage (TAF)	PUT	TAKE
ACBP-2A (Build on ACBP-1)	200	Treated imported water from Weymouth via ASR wells	Via ASR wells
ACBP-2B (Build on ACBP-1)	200	Purified water from Carson via Weymouth via injection wells	Via extraction wells
ACBP-3A (Build on ACBP-2A)	300	Treated imported water from Weymouth via ASR wells	Via ASR wells
ACBP-3B (Build on ACBP-2B)	300	Purified water from Carson via Weymouth via injection wells	Via extraction wells

A review of PUT mechanisms by supply source was also identified for each ACBP concept, which is summarized in Table 3-3. ACBP-1 is assumed to be the included in all ACBP concepts and is based on 12.5 TAFY recharged via excess capacity in existing recharge basins using raw imported water from the Rialto Pipeline. In addition, ACBP-1 includes 12.5 TAFY of treated imported water recharged via ASR wells. Based on the location of the ACBP-1 concept near the CBP infrastructure, it is assumed that the treated imported water for this concept would be from the Cucamonga Valley Water District (CVWD) Lloyd W. Michael Water Treatment Plant (LMWTP). Treated water would be pumped from MWD's Weymouth Water Treatment Plant for ACBP-2A (25 TAFY) and ACBP-3A (50 TAFY) and would be recharged via ASR wells. The total imported water recharge ranges between 25 TAFY (for ACBP-1) to 75 TAFY (for ACBP-3) and would occur 4 times within the 10-year cycle. Similarly, purified water from Pure Water Southern California (assumed to be conveyed to the Weymouth Water Treatment Plant site) would be pumped from MWD's Weymouth Water Treatment Plant site and recharged via injection wells. The total purified water recharge ranges between 0 (for ACBP-1) to 20 TAFY (for ACBP-3B) and would occur annually for the 10-year cycle.

Table 3-3. PUT Mechanisms by Water Source					
PUT Mechanisms and Water Sources	**ACBP-1**	**ACBP-2A**	**ACBP-3A**	**ACBP-2B**	**ACBP-3B**
Recharge Basins – Raw Imported Water (4 of 10 yrs)					
Rialto	12.5	12.5	12.5	12.5	12.5
ASR – Treated Imported Water (4 of 10 yrs)					
LMWTP	12.5	12.5	12.5	12.5	12.5
Weymouth	0	25	50	0	0
Injection Wells – Purified Water (10 of 10 yrs)					
Carson AWPF	0	0	0	10	20
Total Recharge and Storage					
Imported Water Recharge (TAFY) – 4 of 10 yrs	25	50	75	25	25
Purified Water Recharge (TAFY) – 10 of 10 yrs	0	0	0	10	20
Total Storage (TAFY)	**100**	**200**	**300**	**200**	**300**

An example of the total calculated recharge for ACBP-1: 12.5 TAFY (Rialto) + 12.5 TAFY (LMWTP) = 25 TAFY. This occurs 4 out of 10 years. Therefore, 25 TAFY x 4 years = 100 TAFY within a 10-year cycle.

3.1.2 ACBP Alternatives

Based on the foundational assumptions, supply source options, and proposed recharge mechanisms, planning level alternative concept layouts and infrastructure needs were identified for ACBP-1, ACBP-2A/B, and ACBP-3A/B. The alternative concepts are presented on **Figure 3-2** to Figure 3-6 and a summary of the infrastructure needs is listed in Table 3-4. For conservative planning purposes, the infrastructure required was based on current regulations and will require a more in-depth review as the concepts are developed. A detailed summary of PUT and TAKE facilities is located in Attachment C.

Table 3-4. Summary of Infrastructure					
PUT and TAKE Elements	**ACBP-1 (100 TAF)**	**ACBP-2A (200 TAF)**	**ACBP-3A (300 TAF)**	**ACBP-2B (200 TAF)**	**ACBP-3B (300 TAF)**
Pump Stations	2	+2 (4 total)	Increase capacity of ACBP-2A Pump Stations (4 total)	+2 (4 total)	Increase capacity of ACBP-2B Pump Stations (4 total)
Wells	11	+16 (27 total)	+16 (43 total)	+18 (29 total)	+18 (47 total)
Pipelines (Total)	6.1 mi 12”-48”	27.3 mi 12”-48”	32.9 mi 12”-60”	31.0 mi 12”-48”	46.6 mi 12”-60”
Reservoirs	2	+1 (3 total)	Increase capacity of ACBP-2A reservoirs (3 total)	+1 (3 total)	Increase capacity of ACBP-2B reservoirs (3 total)
Turn-Ins	New Rialto Pipeline	Upsize Upper Feeder CB-5 (2 total)	Further upsize Upper Feeder CB-5 (2 total)	Upsize Upper Feeder CB-5 (2 total)	Further upsize Upper Feeder CB-5 (2 total)

Note: The infrastructure is presented assuming phased implementation starting with ACBP-1, then ACBP-2A, and ultimately ACBP-3A. The plusses shown for ACBP-2A and ACBP-3A are in addition to the prior phases (e.g., ACBP-3A adds 16 wells in addition to the 11 wells for ACBP-1 and 16 wells for ACBP-2A). The same phased implementation assumption applies to ACBP-1, ACBP-2B, and ACBP-3B.

As shown on Figure 3-2, the baseline ACBP-1 concept includes 100 TAFY of storage within a 10-year cycle. The water sources include 12.5 TAFY of raw imported water from the Rialto Pipeline and 12.5 TAFY of treated imported water from LMWTP. The water is conveyed to local recharge basins (Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria) and ASR wells within MZ-2. The enhanced infrastructure that is required for the augmented ACBP concepts includes approximately 6.1 miles of pipeline ranging in diameter from 12-inches to 48-inches, 2 pump stations, 11 wells, and 2 reservoirs. A new Rialto Pipeline turn-in would also be required. The augmented ACBP infrastructure would be located within the eastern side of IEUA's service area between MWD's Rialto and Etiwanda pipelines and would overlay the Chino Basin.

The sub-alternative source supply options, which include treated water from Weymouth and purified water from Carson, build on the infrastructure required for ACBP-1. For example, ACBP-2A, which is shown on Figure 3-3, includes the addition of 25 TAFY (4 of 10 years) of treated imported water from Weymouth for ASR. This would increase the total miles of pipeline required from 6.1 miles to 27.3 miles and would range in diameter from 12-inches to 48-inches. The pipeline total includes the east-west pipeline from Weymouth. In addition, 2 pump stations, 16 wells, 1 reservoir, and the upsizing of the Upper Feeder (CB-5) connection would be required. The infrastructure and wells would be located within the same vicinity as ACBP-1, with the exception of the east-west pipeline. The pump stations and storage capacity increase in size and the number of wells double for ACBP-3A (see Figure 3-4) to accommodate the additional supply of 50 TAFY from Weymouth. The east-west pipeline diameter also increases from 48-inches to 60-inches. To accommodate the number of wells, the project area for ACBP-3A extends further east.

The ACBP-2B and ACBP-3B also build on the ACBP-1 concept and include 10 TAFY and 20 TAFY of purified water on an annual basis from Carson AWPF for injection. The following concepts include the addition of an east-west pipeline from Weymouth, which is similar to the ACBP-2A and ACBP-3A concepts. In the ACBP-2B concept shown on Figure 3-5, the total pipeline length required is 31.0 miles and would range in diameter from 12-inches to 48-inches. In addition, 2 pump stations, 18 wells, 1 reservoir, and the upsizing of the Upper Feeder (CB-5) connection would be required. The pump stations and storage capacity increase in size and the number of wells double for ACBP-3B (see Figure 3-6), to accommodate the additional supply of 20 TAFY from Carson. The east-west pipeline diameter also increases from 48-inches to 60-inches. To accommodate the number of wells, the project area for ACBP-3B extends further east.

If MWD proceeds with using recycled water at Weymouth as raw water for direct potable reuse (DPR), then the ACBP-2B and ACBP-3B would be modified and look similar to ACBP-2A and ACBP-3A, or a variation where PUT years occurs more frequently. In addition, other opportunities are being explored for ACBP-1 that extend beyond the Chino Basin into the Cucamonga Basin, which is included under Attachment D. This would allow for additional surface spreading and ASR wells. For all augmented concepts developed, the number of wells may be reduced if purified water may can be injected and extracted at the same well locations, which is dependent on future regulations.

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12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance

Lloyd Michael

Royer Nesbit

Cucamonga Valley Water District

WTP

Etiwanda Debris

CB-13

CB-16

CB-14

CB-07

Upper Day

San Sevaine

Rialto Pipeline (1,936')

CB-15

48-in

42-in

Etiwanda Pipeline (1,936')

Lower Day

Victoria

Cucamonga Basin

Chino Basin

48-in

MZ-2

MZ-3

Banana

Hickory

CB-05

CB-11

CB-01

Upper Feeder (1,283')

AWPF

Fontana Water Company

CB-06

Turner

City of Ontario

Explanation

Proposed CBP TAKE Facilities

- Extraction Well
- Extraction Well Piping
- Potable Reservoir
- Potable Pump Station
- Potable Pipeline
- Raw Reservoir
- Raw Pump Station
- Raw Pipeline
- Rialto Pipeline Turn-in

Proposed ACBP Facilities

- ASR Well
- Potable Pipeline
- Potable Pump Station
- Potable PRV Station
- Potable Reservoir

Proposed CBP PUT Facilities

- AWPF — Advanced Water Purification Facility
- Injection Well
- Purified Water Piping

Existing Facilities

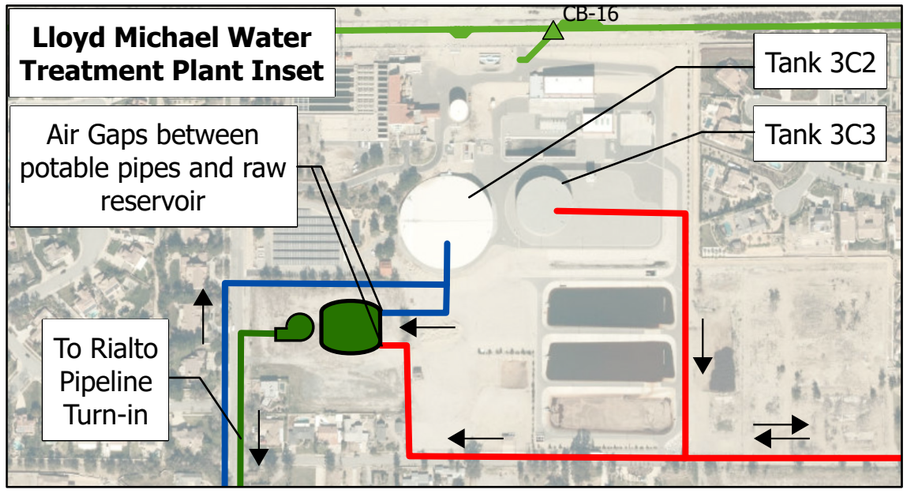
- Recharge Basin
- Channels
- WTP — Water Treatment Plant
- MWD Mainline (Static HGL)
- MWD Turnout

Production Well

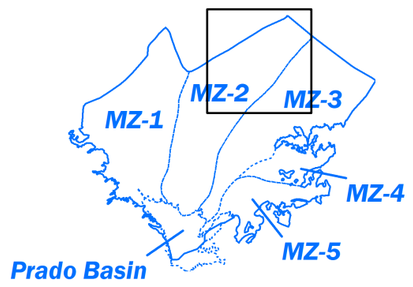
- CVWD
- City of Ontario
- FWC

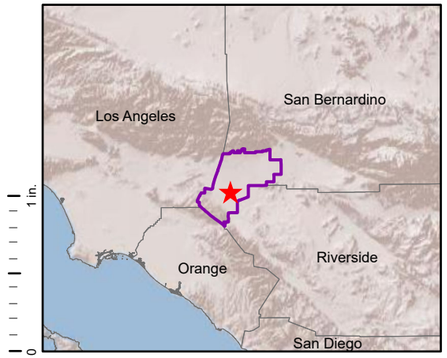
Freeway

Lloyd Michael Water Treatment Plant Inset



Chino Groundwater Basin and Management Zones





Prepared by:

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Author: AWM

WSC

Date: 10/10/2022

File Name: ACBP Alternatives

N

0 1,250 2,500 5,000 Feet

0 0.2 0.4 0.8 Miles

References/Notes:

1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. Piping and tank configuration at Lloyd Michael WTP is shown schematically on the main map. The actual proposed configuration is shown on the Lloyd Michael WTP Inset.
3. Piping and tank configuration at Lloyd Michael WTP to be confirmed by CVWD to verify it will not interfere with operations.

Project:

CBP CHINO BASIN PROGRAM

Preliminary Design Report

Prepared for:

Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

Augmented CBP Alternative 1 - 100TAF Program Source - Rialto Pipeline

Figure 3-2

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12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance

Lloyd Michael

Royer Nesbit

Cucamonga Valley Water District

WTP

WTP

WTP

CB-16

CB-14

CB-13

Etiwanda Debris

CB-07

Upper Day

San Sevaine

Rialto Pipeline (1,936')

CB-15

48-in

42-in

Etiwanda Pipeline (1,936')

Lower Day

Victoria

Cucamonga Basin

Chino Basin

48-in

Potable supply via booster at Weymouth (10.5 miles from edge of page to Weymouth)

36-in

42-in

Optional connection between phase 1 and phase 2 wellfields

Optional connection to Etiwanda Pipeline

42-in

MZ-2

MZ-3

Banana

Hickory

CB-05

CB-11

CB-01

Upper Feeder (1,283')

Fontana Water Company

AWPF

Air Gap between potable pipe and raw reservoir

Turner

CB-06

City of Ontario

Explanation

Proposed CBP TAKE Facilities

- Extraction Well
- Extraction Well Piping
- Potable Reservoir
- Potable Pump Station
- Potable Pipeline
- Raw Reservoir
- Raw Pump Station
- Raw Pipeline
- Rialto Pipeline Turn-in

Proposed ACBP Facilities

- ASR Well
- Potable Pipeline
- Potable Pump Station
- Potable PRV Station
- Potable Reservoir
- Raw Pump Station
- Raw Reservoir
- Raw Pipeline

Proposed CBP PUT Facilities

- AWPF — Advanced Water Purification Facility
- Injection Well
- Purified Water Piping

Existing Facilities

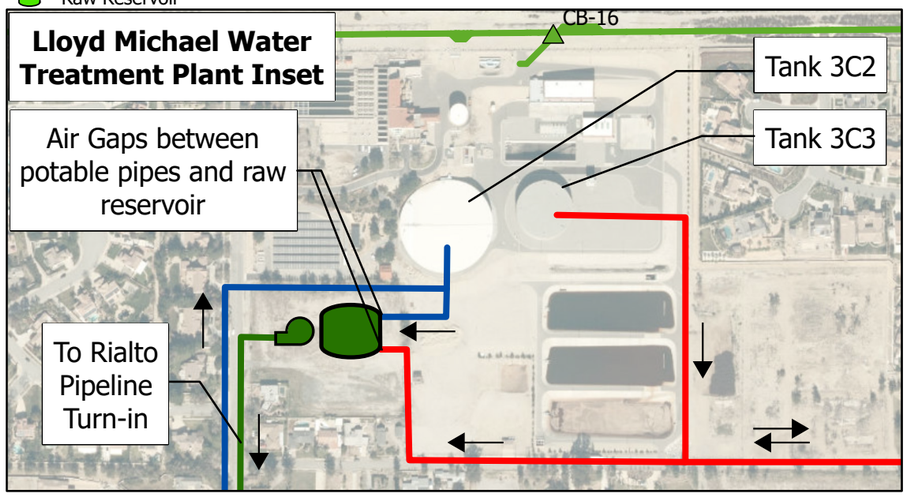
- Recharge Basin
- Channels
- WTP — Water Treatment Plant
- MWD Mainline (Static HGL)
- MWD Turnout

Production Well

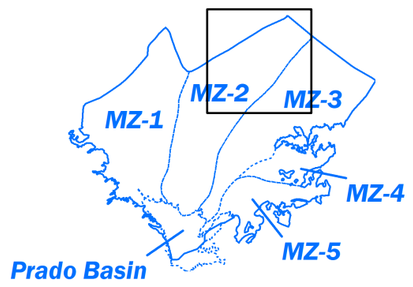
- CVWD
- City of Ontario
- FWC

Freeway

Lloyd Michael Water Treatment Plant Inset



Chino Groundwater Basin and Management Zones



Prepared by:

Brown AND Caldwell

Author: AWM

WSC

Date: 10/10/2022

File Name: ACBP Alternatives

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0 1,250 2,500 5,000 Feet

0 0.2 0.4 0.8 Miles

References/Notes:

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Project:

CBP CHINO BASIN PROGRAM

Preliminary Design Report

Prepared for:

Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

Augmented CBP
Alternative 2A - 200TAF Program
Source - Rialto Pipeline, Weymouth
Figure 3-3

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12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance

Lloyd Michael

Royer Nesbit

Cucamonga Valley Water District

WTP

Etiwanda Debris

CB-13

CB-16

CB-14

CB-07

Upper Day

San Sevaine

Rialto Pipeline (1,936')

CB-15

48-in

42-in

Etiwanda Pipeline (1,936')

Lower Day

Victoria

Cucamonga Basin

Chino Basin

48-in

Potable supply via booster at Weymouth (10.5 miles from edge of page to Weymouth)

54-in

60-in

Optional connection between phase 1 and phase 2 wellfields

Optional connection to Etiwanda Pipeline

60-in

MZ-2

MZ-3

Banana

Hickory

CB-05

CB-11

CB-01

AWPF

Upper Feeder (1,283')

Fontana Water Company

CB-06

Turner

Air Gap between potable pipe and raw reservoir

City of Ontario

Explanation

Proposed CBP TAKE Facilities

- Extraction Well
- Extraction Well Piping
- Potable Reservoir
- Potable Pump Station
- Potable Pipeline
- Raw Reservoir
- Raw Pump Station
- Raw Pipeline
- Rialto Pipeline Turn-in

Proposed ACBP Facilities

- ASR Well
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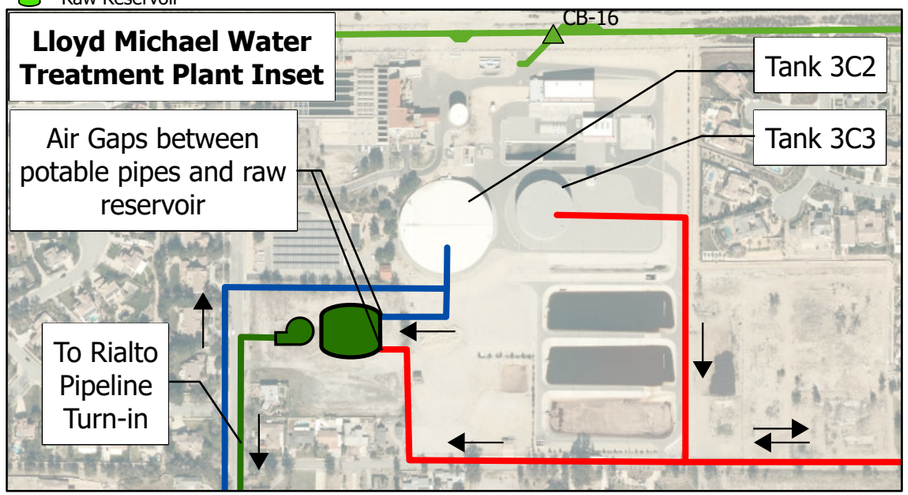

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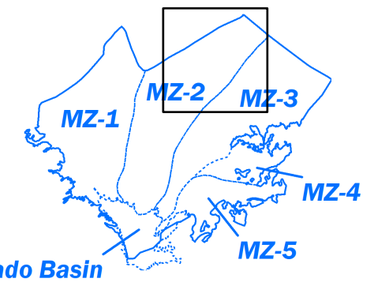

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Brown AND Caldwell

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Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

Augmented CBP
Alternative 3A - 300TAF Program
Source - Rialto Pipeline, Weymouth
Figure 3-4

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12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance

Lloyd Michael

Royer Nesbit

Cucamonga Valley Water District

WTP

Etiwanda Debris

CB-13

CB-16

CB-14

CB-07

Upper Day

San Sevaine

Rialto Pipeline (1,936')

CB-15

48-in

42-in

Etiwanda Pipeline (1,936')

Lower Day

Victoria

48-in

Cucamonga Basin

Chino Basin

Carson AWPF purified supply via booster at Weymouth (10.5 miles from edge of page to Weymouth)

24-in

Optional connection between phase 1 and phase 2 wellfields

Optional connection to Etiwanda Pipeline

42-in

MZ-2

MZ-3

Banana

Hickory

CB-05

CB-11

CB-01

Upper Feeder (1,283')

Fontana Water Company

AWPF

Air Gap between potable pipe and raw reservoir

Turner

CB-06

City of Ontario

Explanation

Proposed CBP TAKE Facilities
- Extraction Well
- Extraction Well Piping
- Potable Reservoir
- Potable Pump Station
- Potable Pipeline
- Raw Reservoir
- Raw Pump Station
- Raw Pipeline
- Rialto Pipeline Turn-in

Proposed ACBP Facilities
- Injection Well
- Purified Pipeline
- Extraction Well
- ASR Well
- Potable Pipeline
- Potable Pump Station
- Potable PRV Station
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Production Well
- CVWD
- City of Ontario
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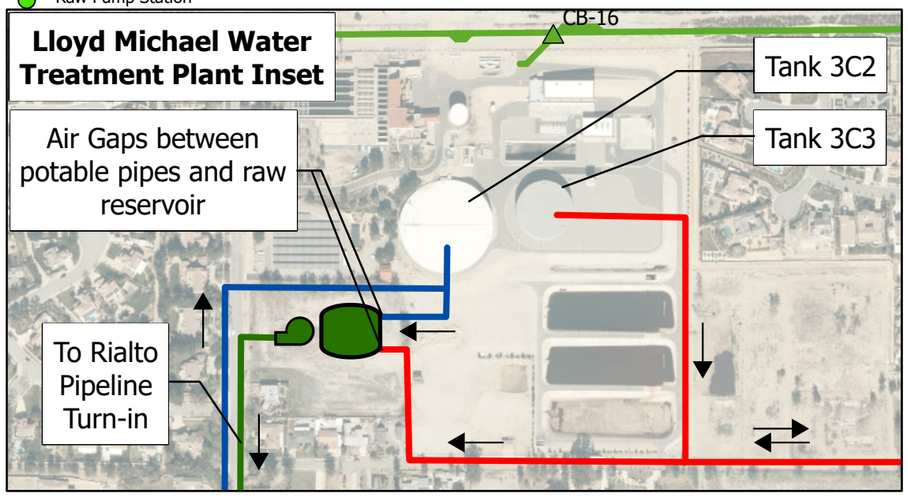
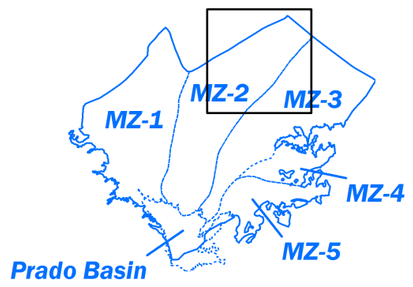
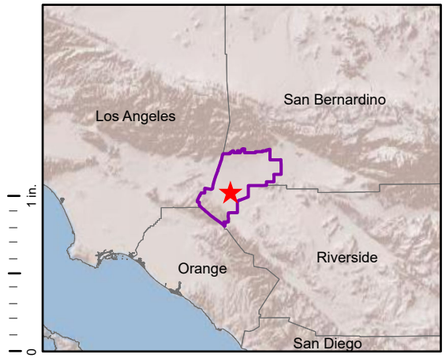
Freeway

Lloyd Michael Water Treatment Plant Inset



Chino Groundwater Basin and Management Zones





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Project:

CBP CHINO BASIN PROGRAM

Preliminary Design Report

Prepared for:

Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

Augmented CBP Alternative 2B - 200TAF Program Source - Rialto Pipeline, Carson

Figure 3-5

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12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance

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WTP

Etiwanda Debris

CB-13

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Upper Day

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Rialto Pipeline (1,936')

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48-in

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Etiwanda Pipeline (1,936')

Lower Day

Victoria

Cucamonga Basin

Chino Basin

48-in

Carson AWPF purified supply via booster at Weymouth (10.5 miles from edge of page to Weymouth)

36-in

Optional connection between phase 1 and phase 2 wellfields

Optional connection to Etiwanda Pipeline

60-in

MZ-2

MZ-3

Banana

Hickory

CB-05

CB-11

CB-01

Upper Feeder (1,283')

AWPF

Fontana Water Company

Air Gap between potable pipe and raw reservoir

Turner

CB-06

City of Ontario

Explanation

Proposed CBP TAKE Facilities
- Extraction Well
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- Raw Pump Station
- Raw Pipeline
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Proposed ACBP Facilities
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- Purified Pipeline
- Extraction Well
- ASR Well
- Potable Pipeline
- Potable Pump Station
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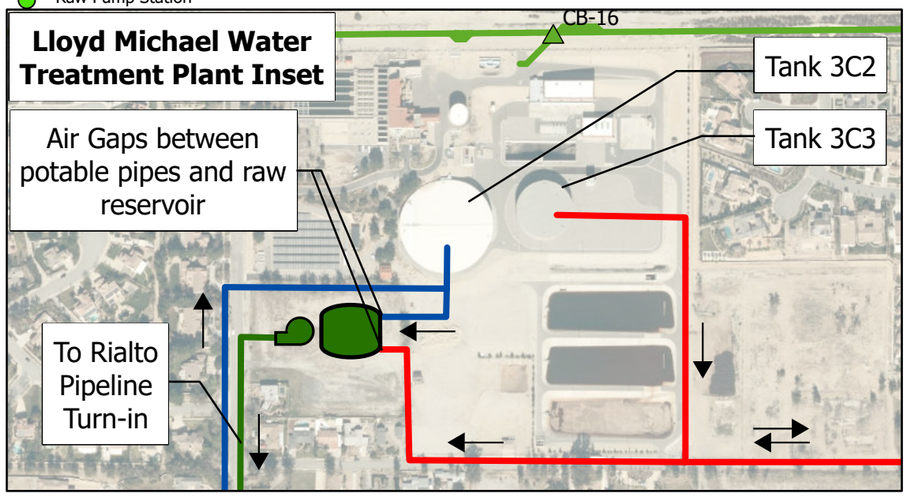
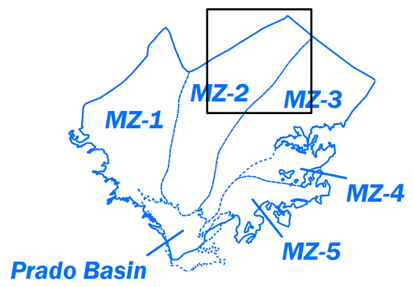
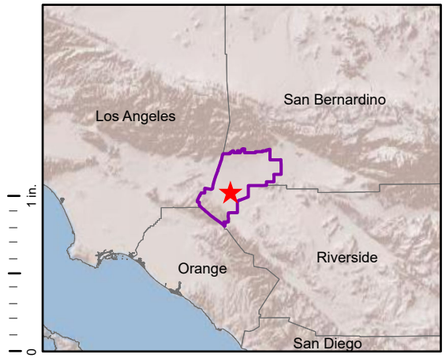
Lloyd Michael Water Treatment Plant Inset



Chino Groundwater Basin and Management Zones





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Project:

CBP CHINO BASIN PROGRAM

Preliminary Design Report

Prepared for:

Inland Empire Utilities Agency A MUNICIPAL WATER DISTRICT

Augmented CBP
Alternative 3B - 300TAF Program
Source - Rialto Pipeline, Carson
Figure 3-6

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Section 4: Summary of Costs

The conceptual level capital and annual operations and maintenance (O&M) costs estimates are summarized in Table 4-1 and Table 4-2. Additional cost schedule details are included in Attachment E. The capital and O&M costs were developed for each major component using a unit cost basis, which is described in further detail in CBP **Technical Memorandum 2 – PUT, TAKE, and Program Alternatives Development and Evaluation (TM2) (Draft Final, October 2021)**.

Table 4-1. Conceptual Capital Cost Estimates ($ Million)

	ACBP-1 (100 TAF)	ACBP-2A (200 TAF)	ACBP-3A (300 TAF)	ACBP-2B (200 TAF)	ACBP-3B (300 TAF)
PUT					
Recharge Basin Mods.	$10.46	$10.46	$10.46	$10.46	$10.46
Pump Stations	0.00	29.92	50.64	12.66	20.72
ASR Wells	80.57	197.75	314.94	80.57	80.57
Injection Wells	0.00	0.00	0.00	29.30	58.59
Monitoring Wells	6.28	12.56	18.83	12.56	18.83
Pipelines	0.00	0.00	0.00	88.35	142.81
Pressure Reducing facility	10.46	10.46	10.46	10.46	10.46
Land[a]	3.78	8.35	12.93	5.82	7.86
PUT Subtotal	**$111.55**	**$269.52**	**$418.27**	**$250.17**	**$350.31**
TAKE					
Extraction Wells	$0.00	$0.00	$0.00	$64.45	$128.91
Pipelines	38.09	208.22	330.91	108.75	243.30
Storage	7.81	11.21	14.58	11.21	14.58
Pump Stations	46.61	62.73	78.84	62.73	78.84
Turnouts	8.37	16.74	16.74	16.74	16.74
Land[a]	4.90	7.36	7.36	10.45	13.55
TAKE Subtotal	**$105.79**	**$306.25**	**$448.43**	**$274.34**	**$495.92**
Total Capital Cost	**$217.34**	**$575.77**	**$866.71**	**$524.51**	**$846.23**

a. Implementation markup not included in land cost calculations.

Table 4-2. Conceptual Annual O&M Cost Estimates ($ Million)					
	ACBP-1 (100 TAF)	**ACBP-2A (200 TAF)**	**ACBP-3A (300 TAF)**	**ACBP-2B (200 TAF)**	**ACBP-3B (300 TAF)**
PUT					
Recharge Basin Mods.	$1.25	$1.25	$1.25	$1.25	$1.25
Pump Stations	0.00	3.32	5.61	1.40	2.30
ASR Wells	7.88	19.35	30.81	7.88	7.88
Injection Wells	0.00	0.00	0.00	0.21	0.42
Monitoring Wells	0.04	0.08	0.12	0.08	0.12
Pipelines	0.00	0.00	0.00	0.09	0.09
Pressure Reducing facility	0.10	0.10	0.10	0.10	0.10
PUT Subtotal	**$9.27**	**$24.09**	**$37.90**	**$11.01**	**$12.16**
Fixed[a]	*1.94*	*3.21*	*4.35*	*1.78*	*2.93*
Variable[b]	*7.33*	*20.89*	*33.55*	*9.23*	*9.23*
TAKE					
Extraction Wells	$0.00	$0.00	$0.00	$7.66	$15.32
Pipelines	0.03	0.14	0.16	0.07	0.14
Storage	0.07	0.09	0.12	0.09	0.12
Pump Stations	5.17	6.95	8.74	6.95	8.74
Turnouts	0.04	0.08	0.08	0.08	0.08
TAKE Subtotal	**$5.30**	**$7.26**	**$9.10**	**$14.86**	**$24.40**
Fixed[a]	*0.80*	*1.21*	*1.49*	*1.47*	*2.13*
Variable[b]	*4.50*	*6.06*	*7.61*	*13.39*	*22.27*
Total Annual O&M Cost	**$14.57**	**$31.36**	**$47.00**	**$25.87**	**$36.57**
Fixed[a]	*2.74*	*4.42*	*5.84*	*3.25*	*5.06*
Variable[b]	*11.83*	*26.94*	*41.16*	*22.62*	*31.51*

a. Includes cost for routine and annual maintenance.

b. Includes operations and maintenance costs during put and call years.

The capital cost estimates are Class 5 estimates based on the AACE International Cost Estimate Classification System criteria, which corresponds to a level of project definition of 0 to 2 percent and are suitable for alternatives analysis. The typical accuracy ranges for a Class 5 estimate are -20 to -50 percent on the low end and +30 to +100 on the high end. Capital cost mark-ups include 40 percent contingency (for undeveloped program details), 28 percent for implementation (engineering, administration, and construction management), and escalation to 2022 dollars (from 2019 cost model). For example, the lower and upper range for the ACBP-1 Class 5 estimated cost is $108.67M to $434.68M, respectively, inclusive of noted markups.

The conceptual cost estimates do not include the following:

- Leave behind water, storage fees, storage losses, or Chino Basin Watermaster fees
- Surface water, groundwater, or advanced water treatment
- MPI mitigation
- Periodic equipment replacement/rehabilitation costs
- Wheeling costs
- Outside funding (i.e., grants or other partner contributions)

A conceptual-level net present value (NPV) analysis was also conducted for each of the ACBP alternative concepts. Table 4-3 provides a summary of the NPV costs in 2022 dollars for each of the ACBP alternative concepts. Assumptions used in development of the NPV costs include:

- Escalate capital cost to mid-point of construction (year 2030)
- Finance period/program duration of 30 years
- Capital finance nominal interest rate of 3.00 percent
- Inflation rate for mid-point of construction and future O&M of 3.50 percent
- Discount rate of 2.50 percent

Table 4-3. Summary of Conceptual-Level NPV Analysis

	ACBP-1 (100 TAF)	ACBP-2A (200 TAF)	ACBP-3A (300 TAF)	ACBP-2B (200 TAF)	ACBP-3B (300 TAF)
NPV (2022$), $Mil	$501.71	$1,172.49	$1,747.56	$986.59	$1,508.65

Section 5: Next Steps

In alignment with regional objectives, IEUA will continue to collaborate with MWD and develop concepts that augment CBP and improve water supply reliability in SWP-exclusive areas. As noted in Section 2, groundwater modeling, completed in conjunction with the Chino Basin Watermaster, will be required to advance any ACBP concepts. Modeling would be used to confirm program feasibility and assess any potential impacts to the Chino Basin that need to be mitigated.

Attachment A: Foundational Assumptions

Foundational assumptions:

Objective – Document program hydrologic, operational, and storage and recovery constraints and assumptions for concept development.

- Hydrologic
  - 10-year cycle (4 wet (PUT), 3 dry (TAKE), 3 average [HOLD or limited PUT])
- Operational
  - PUT-TAKE "symmetry" in alignment with Storage Framework Investigation (i.e., assume PUTs and TAKEs are balanced within management zones)
  - PUT
    - PUT occurs 4 years of each 10-year cycle
    - Utilize existing, available spreading basin capacity (priority) to recharge raw imported water
    - Incorporate new ASR wells, as needed, for additional PUT capacity (requires treated imported water)
    - Locate new ASR wells near MWD retail water agency potable systems, or include new, potable pipelines if locally capacity-limited
  - TAKE
    - TAKE occurs 3 years of each 10-year cycle
    - Identify ASR/extraction well locations as a function of recharge location
    - CBP facilities are <u>not</u> available for ACBP during critical dry years (capacity reserved for CBP participating agencies)
- Storage and recovery
  - PUTs must precede TAKEs (i.e., no borrowing capacity)
  - Program duration 30 to 50 years (i.e., 3 to 5 10-year cycles)

Initial concepts:

Objective – Align up to three (3) concept alternatives with the various program sizes and major conveyance elements.

ACBP Concept	Storage (TAF)	PUT	TAKE
ACBP-1	100	• 25 TAFY for 4 years • Maximize available spreading basin capacity as feasible to align with extraction • Incorporate new ASR wells, as needed	• Build from an upsized CBP TAKE-8 • Expanded extraction and conveyance infrastructure aligned with PUT locations • Deliver 33 TAFY to Rialto Pipeline
ACBP-2 (Build on ACBP-1)	200	• 50 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Integrate east-west (E-W) pipeline infrastructure to access treated water from Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 33 TAFY to Etiwanda/ Upper Feeder (or option for up to 66 TAFY to Etiwanda/Upper Feeder)
ACBP-3 (Build on ACBP-2)	300	• 75 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Option to modify E-W pipeline from ABCP-2 to access Carson AWT water at Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 66 TAFY to Etiwanda/ Upper Feeder (or option for up to 100 TAFY to Etiwanda/Upper Feeder)

<u>Notes</u>:
(1) Groundwater modeling required to (a) confirm program feasibility beyond 1 MAF storage in Chino Basin; and (b) assess any impacts and required mitigation (i.e., MPI, net recharge, etc.) for the various ACBP concepts.
(2) Watermaster replenishment obligation may limit available spreading basin capacity after year 2050 (per 2018 RMPU).
(3) Storage volumes (TAF) above are assumed above the base CBP volume.

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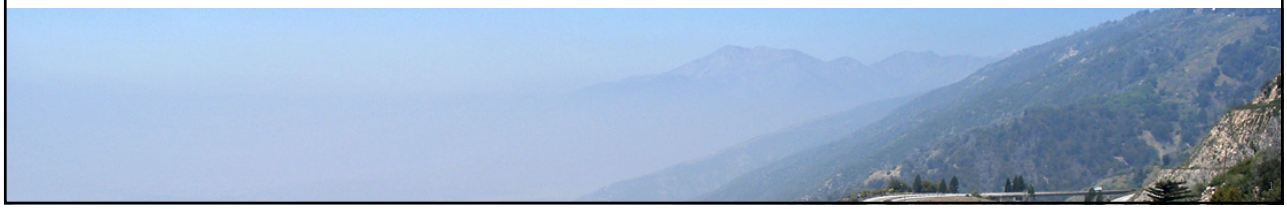
Attachment B: Workshop Materials

Augmented CBP Concept Study
Kick-off Workshop

March 15, 2022



1

Agenda

- Introductions
- Review scope of work
- Round table discussion regarding stakeholder goals and objectives
- Review early “CBP+” concepts
- Review new opportunities for an augmented CBP
- Next steps

2

2

3

Scope of Work

- Conduct project management and administration
- Facilitate kick-off workshop
- Develop concept alternatives
- Conduct concept development workshop
- Prepare technical memorandum (TM)

4

4

5

Round Table Discussion

- MWD storage needs in SWP exclusive areas
- Practical storage limits in the Chino Basin
- Operational and redundancy considerations
- Future program planning and integration
- Storage timing

6

6

Practical Storage Limits in Chino Basin

2.1 Use of Storage Space by the Parties for Their Individual Conjunctive-Use Activities and by Entities Engaged in Storage and Storage and Recovery Programs

An aggregate amount of 800,000 af is reserved for the Parties' conjunctive-use activities (includes Carryover, Excess Carryover, and Supplemental Accounts) and Metropolitan's DYYP. This amount is referred to as the "First Managed Storage Band" (FMSB).

The managed storage space between 800,000 and 1,000,000 af is reserved for Storage and Recovery Programs. Storage and Recovery Programs that utilize the managed storage space above 800,000 af will be required to mitigate potential MPI as if the 800,000 af were fully used. Renewal or extension of the DYYP agreement will require the DYYP to use storage space above 800,000 af.

The allocation of storage space for use by Parties and for Storage and Recovery Programs may be revised in subsequent updates of the SMP.

Note that the use of managed storage greater than 1,000,000 af may be possible provided the storing entity submits a bona fide Storage and Recovery Program application[16], demonstrates that the program has broad mutual benefit, demonstrates that program's mitigation measures will meet the mitigation requirements of the Watermaster to ensure there will be no MPI and other adverse impacts[17], complies with CEQA, and obtains approval from the Watermaster.

2.2 Reservation of Existing Spreading Basin Facilities to Satisfy Watermaster Recharge and Replenishment Obligations

The Parties and IEUA, through the OBMP, have substantially increased storm and supplemental water recharge capacity in the Chino Basin. The increase in supplemental water recharge capacity was done to ensure that Watermaster could meet its future recharge and replenishment obligations pursuant to Court and Regional Board orders. Watermaster will include provisions in storage agreements to prioritize the use of spreading basins to satisfy

[16] A bona fide Storage and Recovery Program application includes the name of the person; the source, quantity and quality of the Supplemental Water; a description of the facilities proposed to be used, operating plan and duration of the proposed Storage and Recovery Program; CEQA documentation; and any other information Watermaster requires to evaluate the application.
[17] Adverse impacts include reductions in net recharge and Safe Yield; and an increase in the groundwater discharge from the Chino North GMZ to the Santa Ana River contributing to a loss of Hydraulic Control.

December 2019
007-019-011.8
2-1

2020 Storage Management Plan 2 – Storage Management Plan Description

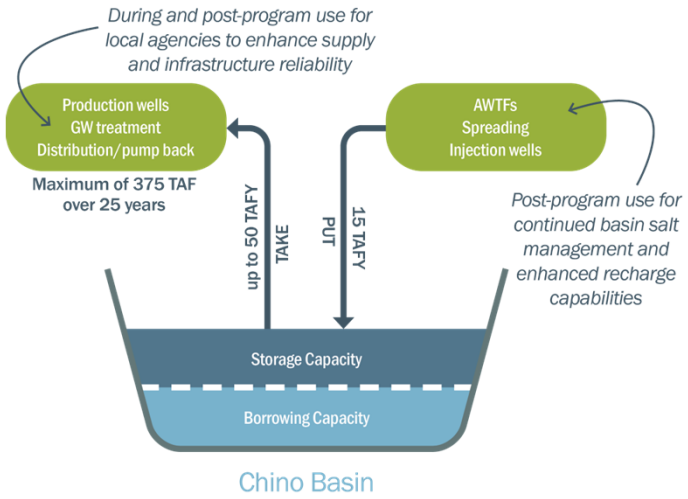
Watermaster's recharge and replenishment obligations over the use of spreading basins for other uses subject to limitations provided in existing agreements with the owners of the facilities.

Source: 2020 Storage Management Plan Final Report (12/11/19) – to be confirmed with CBWM and latest OBMPU activities.

7

7

CBP Overview

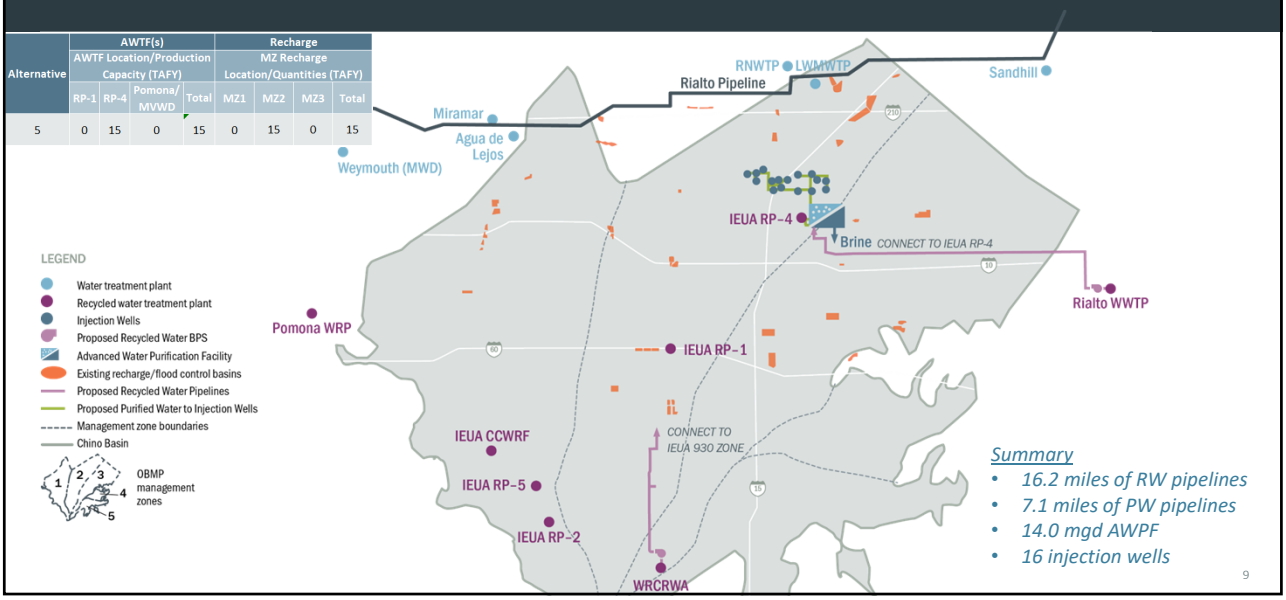


8

8

Alternative PUT-5

Alternative	AWTF(s)				Recharge			
	AWTF Location/Production Capacity (TAFY)				MZ Recharge Location/Quantities (TAFY)			
	RP-1	RP-4	Pomona/ MVWD	Total	MZ1	MZ2	MZ3	Total
5	0	15	0	15	0	15	0	15



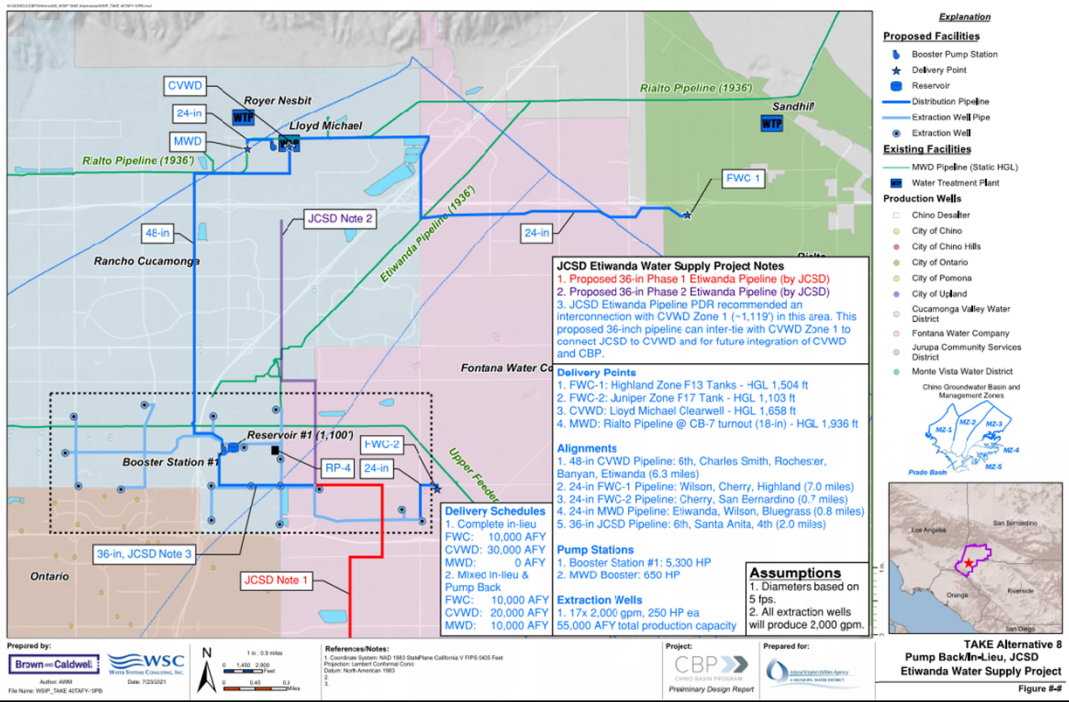
Summary

- *16.2 miles of RW pipelines*
- *7.1 miles of PW pipelines*
- *14.0 mgd AWPF*
- *16 injection wells*

9

9

- X



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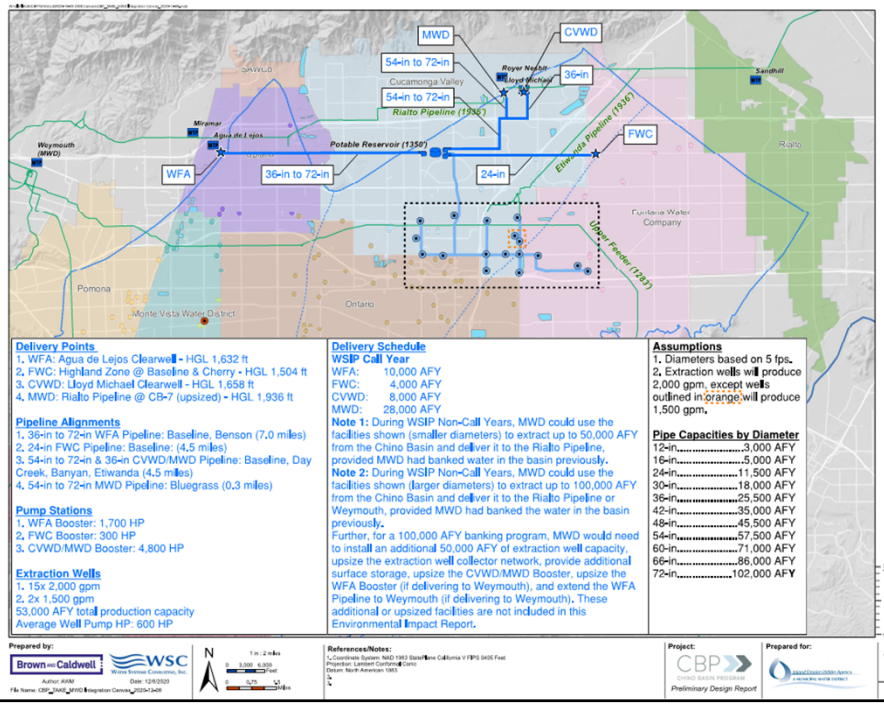
Review Early "CBP+" Concepts

11

- X



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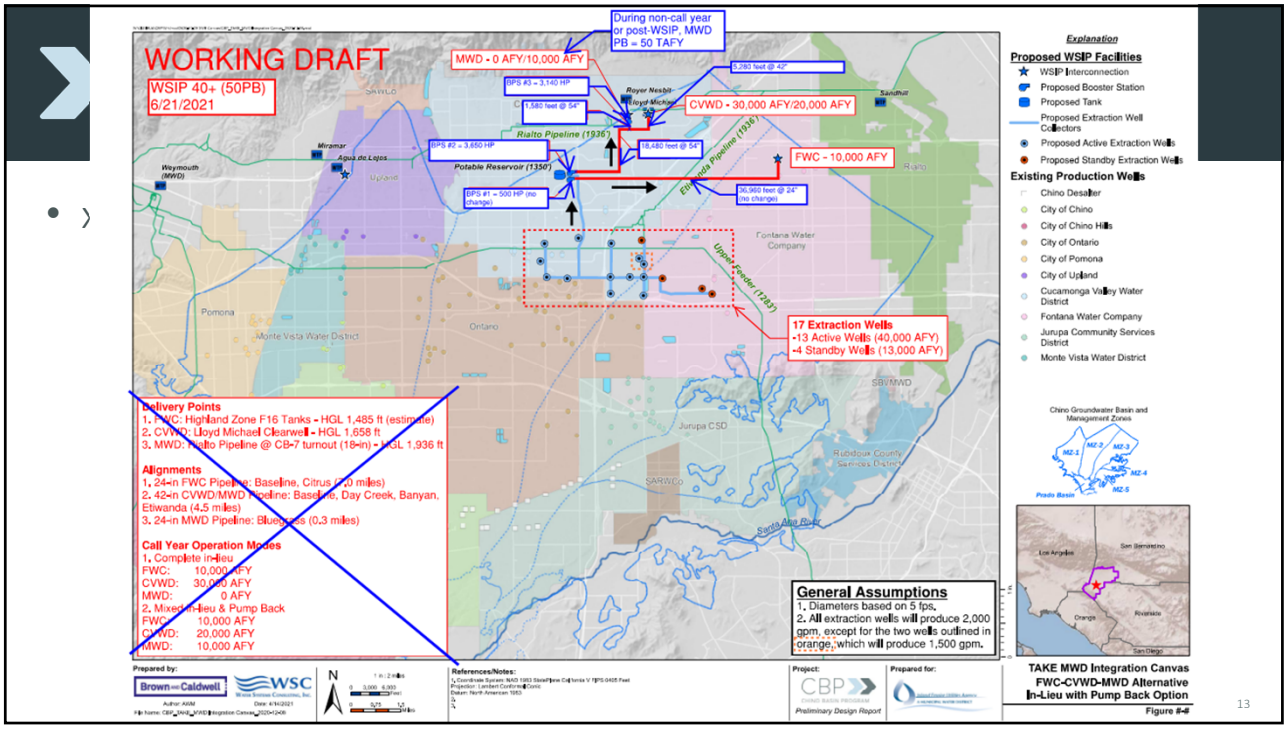
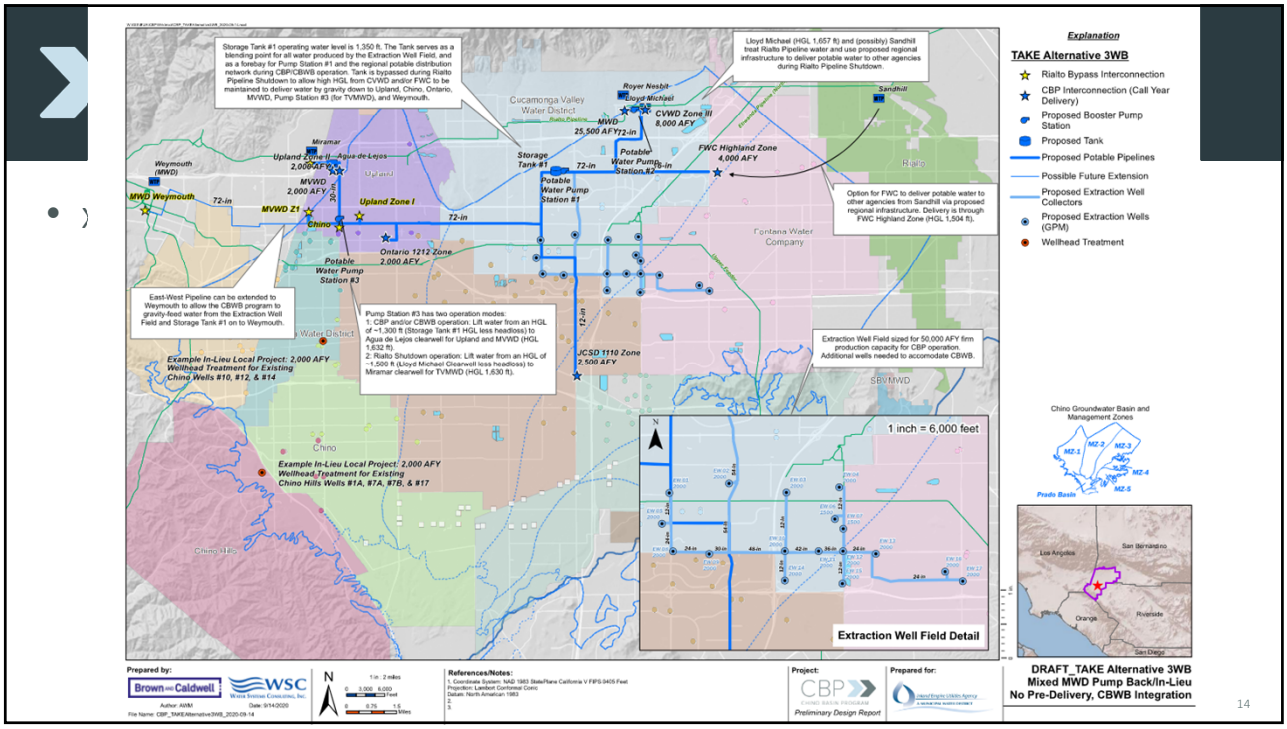

WORKING DRAFT
WSIP 40+ (50PB)
6/21/2021
During non-call year or post-WSIP, MWD PB = 50 TAFY
MWD - 0 AFY/10,000 AFY
CVWD - 30,000 AFY/20,000 AFY
FWC - 10,000 AFY
17 Extraction Wells
•13 Active Wells (40,000 AFY)
•4 Standby Wells (13,000 AFY)
Delivery Points
1. FWC: Highland Zone F16 Tanks - HGL 1,485 ft (estimate)
2. CVWD: Lloyd Michael Clearwell - HGL 1,658 ft
3. MWD: Rialto Pipeline @ CB-7 turnout (18-in) - HGL 1,936 ft
Alignments
1. 24-in FWC Pipeline: Baseline, Citrus (7.0 miles)
2. 42-in CVWD/MWD Pipeline: Baseline, Day Creek, Banyan, Etiwanda (4.5 miles)
3. 24-in MWD Pipeline: Bluegrass (0.3 miles)
Call Year Operation Modes
1. Complete in-lieu
FWC: 10,000 AFY
CVWD: 30,000 AFY
MWD: 0 AFY
2. Mixed In-lieu & Pump Back
FWC: 10,000 AFY
CVWD: 20,000 AFY
MWD: 10,000 AFY
General Assumptions
1. Diameters based on 5 fps.
2. All extraction wells will produce 2,000 gpm, except for the two wells outlined in orange, which will produce 1,500 gpm.
Explanation
Proposed WSIP Facilities
Existing Production Wells
TAKE MWD Integration Canvas
FWC-CVWD-MWD Alternative
In-Lieu with Pump Back Option
Figure #-#
13

13


Storage Tank #1 operating water level is 1,350 ft. The Tank serves as a blending point for all water produced by the Extraction Well Field, and as a forebay for Pump Station #1 and the regional potable distribution network during CBP/CBWB operation. Tank is bypassed during Rialto Pipeline Shutdown to allow high HGL from CVWD and/or FWC to be maintained to deliver water by gravity down to Upland, Chino, Ontario, MVWD, Pump Station #3 (for TVMWD), and Weymouth.
Lloyd Michael (HGL 1,657 ft) and (possibly) Sandhill treat Rialto Pipeline water and use proposed regional infrastructure to deliver potable water to other agencies during Rialto Pipeline Shutdown.
East-West Pipeline can be extended to Weymouth to allow the CBWB program to gravity-feed water from the Extraction Well Field and Storage Tank #1 on to Weymouth.
Pump Station #3 has two operation modes:
1: CBP and/or CBWB operation: Lift water from an HGL of ~1,300 ft (Storage Tank #1 HGL less headloss) to Agua de Lejos clearwell for Upland and MVWD (HGL 1,632 ft).
2: Rialto Shutdown operation: Lift water from an HGL of ~1,500 ft (Lloyd Michael Clearwell less headloss) to Miramar clearwell for TVMWD (HGL 1,630 ft).
Option for FWC to deliver potable water to other agencies from Sandhill via proposed regional infrastructure. Delivery is through FWC Highland Zone (HGL 1,504 ft).
Extraction Well Field sized for 50,000 AFY firm production capacity for CBP operation. Additional wells needed to accomodate CBWB.
Example In-Lieu Local Project: 2,000 AFY
Wellhead Treatment for Existing
Chino Wells #10, #12, & #14
Example In-Lieu Local Project: 2,000 AFY
Wellhead Treatment for Existing
Chino Hills Wells #1A, #7A, #7B, & #17
1 inch = 6,000 feet
Extraction Well Field Detail
Explanation
TAKE Alternative 3WB
DRAFT_TAKE Alternative 3WB
Mixed MWD Pump Back/In-Lieu
No Pre-Delivery, CBWB Integration
14

14

15

Opportunities for an Augmented CBP

- MWD conveyance options and criteria
  - Rialto, Etiwanda and Upper Feeders
  - Hydraulic, water quality and operational constraints
- Other regional partner(s)
  - TVMWD
  - Western MWD

16

16

Water Quality

Table 5-2. Blended Water Quality

Constituent	CBP Blended Extraction Wells[a]	Rialto Pipeline[b]	CBP/Rialto Pipeline Blend[c]	Mills Treatment Plant Effluent	Primary *(Secondary)* MCL
TDS (mg/L)	235.6	254.0	252.8	272.0	*(500.0)*
Nitrate-N (mg/L)	3.3	0.4	0.6	0.6	10.0
Hardness (mg/L)	146.7	94.0	97.6	92.0	-
EC (µS/cm)	384.4	457.0	452.1	516.0	*(900.0)*
pH	7.8	8.1[d]	8.1	8.5	-
Calcium (mg/L)	45.1	20.0	21.8	18.0	-
Magnesium (mg/L)	7.7	11.0	10.8	12.0	-
Sodium (mg/L)	19.6	52.0	49.8	62.0	-
Potassium (mg/L)	1.8	N/A	N/A	2.8	-
Bicarbonate (mg/L)	178.7	72.0	79.2	70.0	-
Chloride (mg/L)	9.4	72.0	67.8	85.0	*(250.0)*
Sulfate (mg/L)	15.1	33.0	31.8	40.0	*(250.0)*
Perchlorate (µg/L)	2.4	0[e]	0.2	N/A	6.0
Hexavalent Chromium (µg/L)	3.4	0[e]	0.2	N/A	10.0[f]

Notes:

a. Based on 5-10 years water quality data of nearby production wells.

b. Rialto Pipeline water quality assumed to be equivalent to Devil Canyon Afterbay water quality as provided in MWD Bulletin 132-13 from April 2015, Table 4-1.

c. Calculated by mass balance of typical Rialto Pipeline flowrate (614 mgd) and maximum proposed CBP flowrate (50.0 TAFY, 44.64 mgd). CBP water would account for approximately 6.8% of the combined flow.

d. CVWD LWMWTP Master Plan, October 2010

e. No data, which suggests that these constituents were not sampled because not typically present in surface water. For this analysis, they were assumed to be zero.

f. The hexavalent chromium MCL was rescinded but is anticipated to be re-proposed at this same level in the future. Total chromium has an MCL of 60 µg/L.

17

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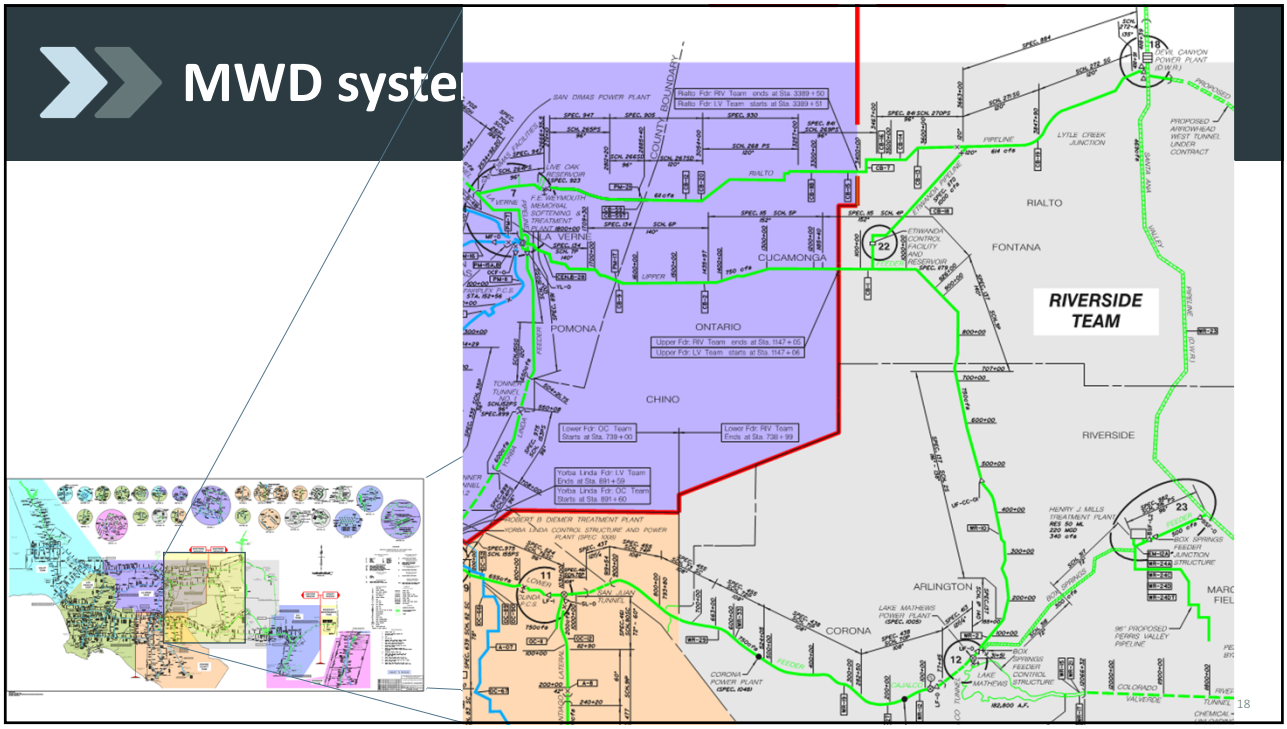
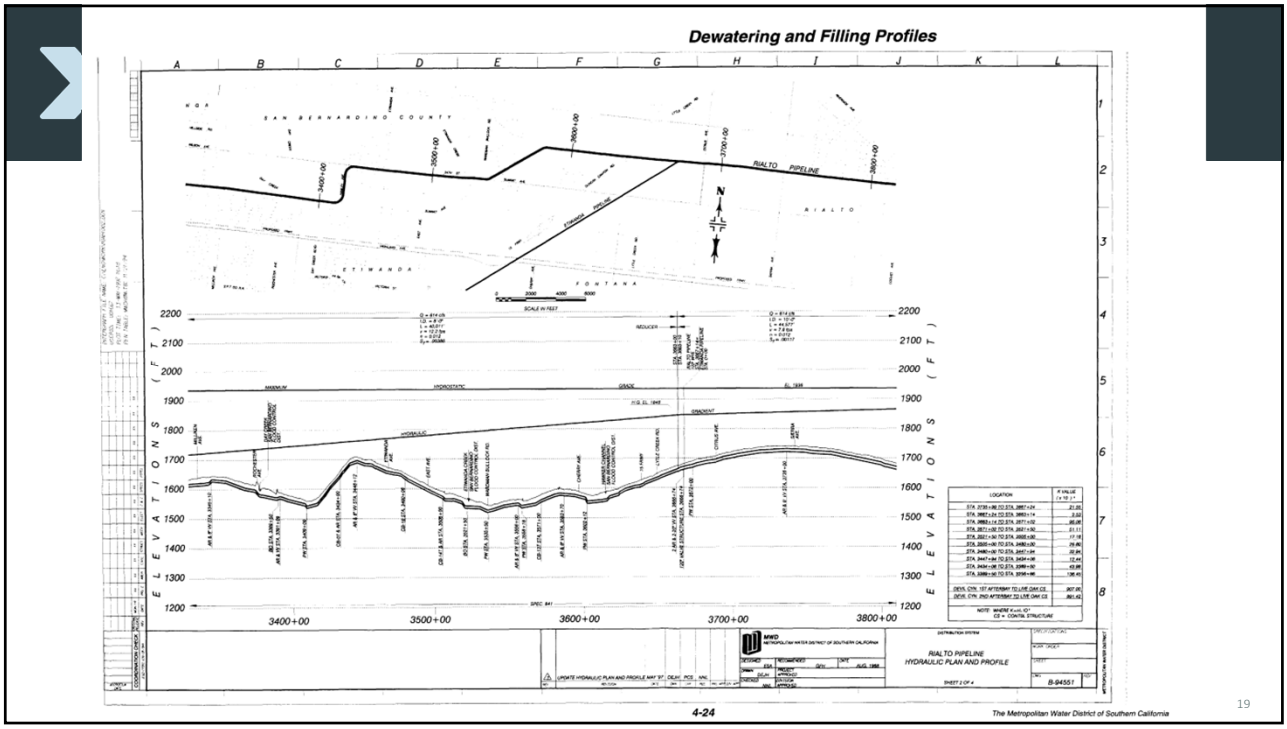
MWD syste

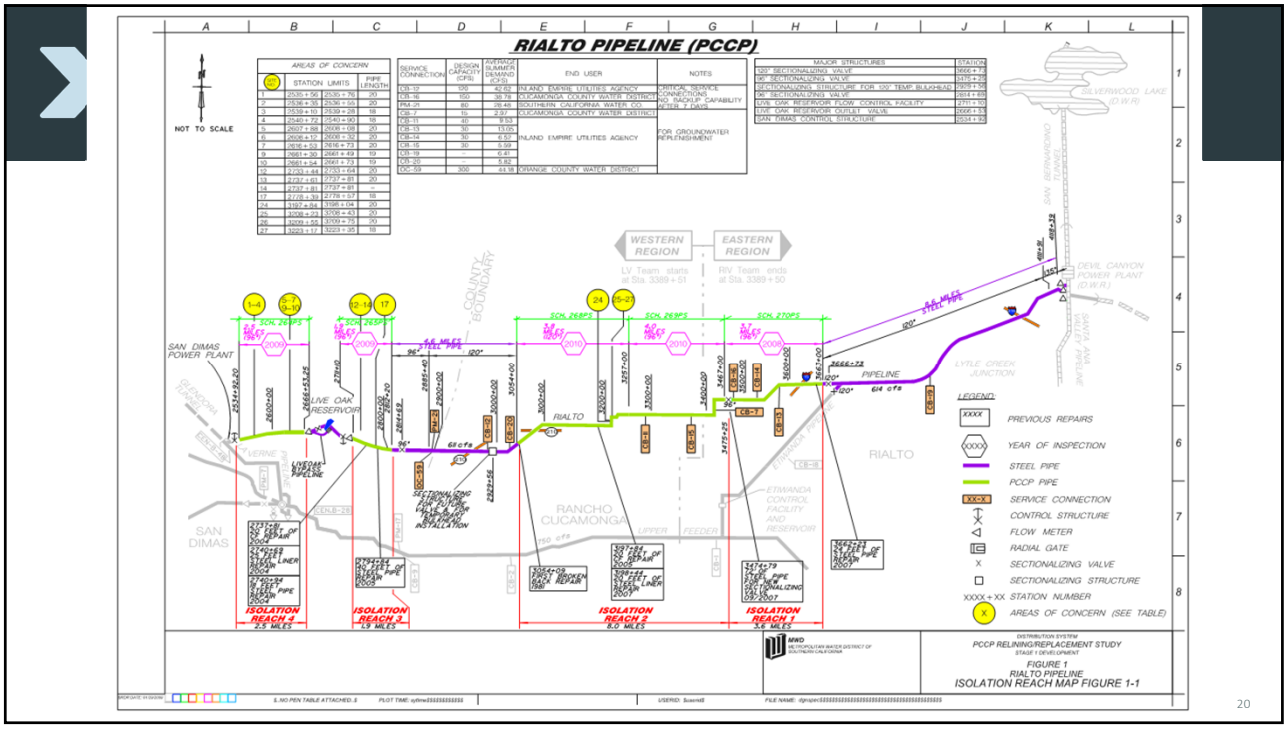


18

18


Dewatering and Filling Profiles
RIALTO PIPELINE
HYDRAULIC PLAN AND PROFILE
4-24
The Metropolitan Water District of Southern California
19

19


RIALTO PIPELINE (PCCP)
AREAS OF CONCERN
MAJOR STRUCTURES
LEGEND:
PREVIOUS REPAIRS
YEAR OF INSPECTION
STEEL PIPE
PCCP PIPE
SERVICE CONNECTION
CONTROL STRUCTURE
FLOW METER
RADIAL GATE
SECTIONALIZING VALVE
SECTIONALIZING STRUCTURE
XXXX + XX STATION NUMBER
AREAS OF CONCERN (SEE TABLE)
ISOLATION REACH 4 2.5 MILES
ISOLATION REACH 3 1.9 MILES
ISOLATION REACH 2 8.0 MILES
ISOLATION REACH 1 3.6 MILES
PCCP RELINING/REPLACEMENT STUDY
FIGURE 1
RIALTO PIPELINE
ISOLATION REACH MAP FIGURE 1-1
20

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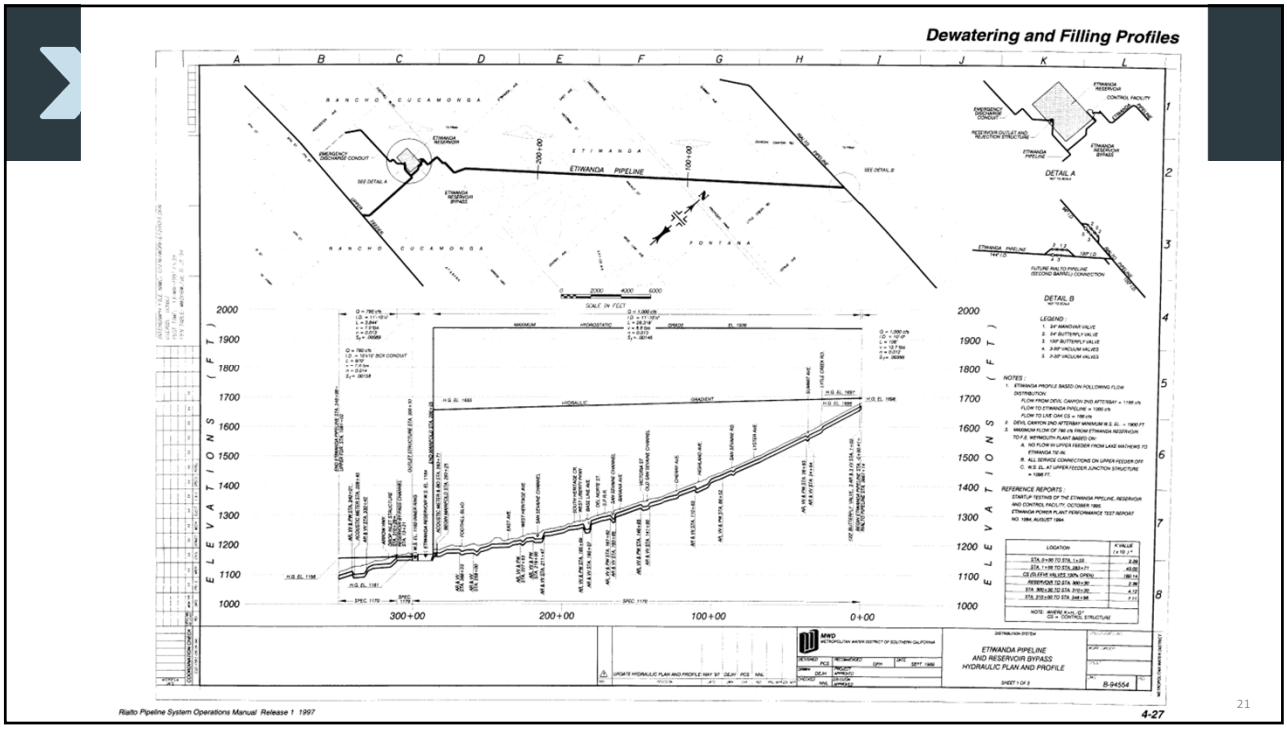
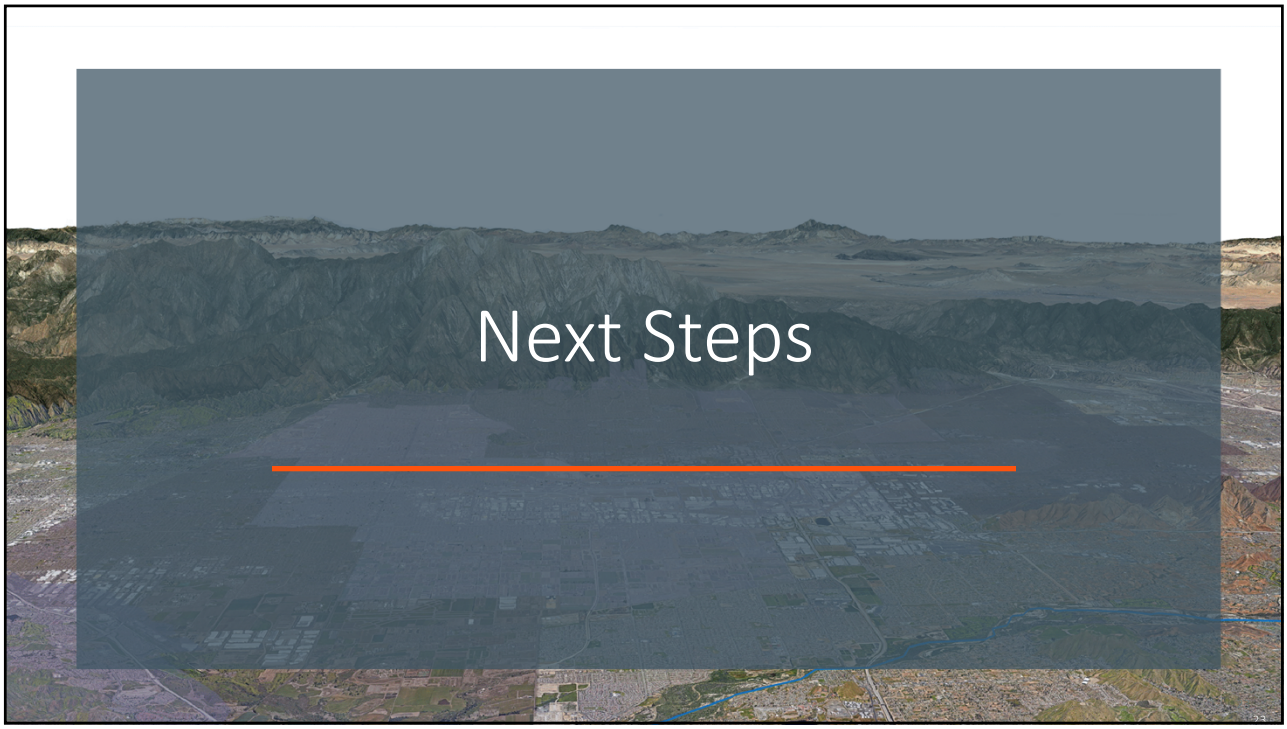

Dewatering and Filling Profiles
ETIWANDA PIPELINE
ETIWANDA PIPELINE AND RESERVOIR BYPASS
HYDRAULIC PLAN AND PROFILE
Rialto Pipeline System Operations Manual Release 1 1997
4-27
21

21


7. Hydraulic Plans and Profiles
RANCHO CUCAMONGA
FONTANA
UPPER FEEDER
CALIFORNIA SPEEDWAY
MATCH LINE STA 1229+00
MATCH LINE STA 800+00
UPPER FEEDER HYDRAULIC PLAN AND PROFILE
MWD Upper Feeder System Operations Manual (DSM-UPF-W02C07R01)-09/07
7-3
22

22



23

Next Steps

- Review action items
- Develop concept alternatives
- Conduct ad hoc coms with this group to refine alternatives
- Conduct follow-up workshop

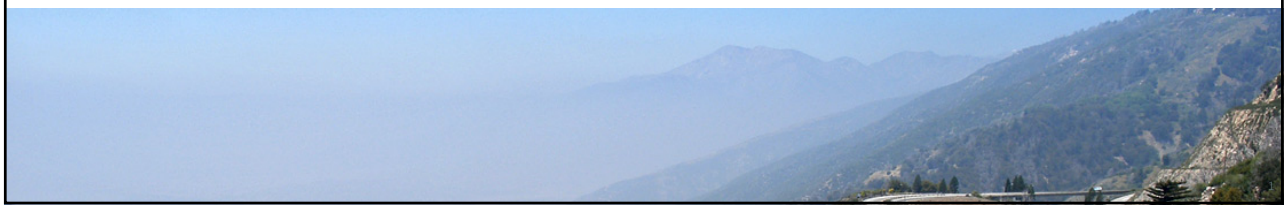
24

24

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

Augmented CBP Concept Study
Concept Development Workshop

October 12, 2022



1

Agenda

- Introduction
- Purpose and objectives of augmented CBP
- Foundational assumptions and initial concepts
- Alternative concept layouts
- Summary of infrastructure and costs
- Comments and questions
- Next steps

2

2

3

Purpose and Objectives

- Evaluate opportunities to augment CBP with larger storage and recovery programs
- Consider potential partnering opportunities (i.e., MWD)
- Identify efficiencies in common infrastructure sizing and shared cost and ownership
- Maximize storage opportunities within the Chino Basin, which aligns with the OBMP benchmark of providing a "*broad mutual benefit*"

4

4

Study "Maxims"

- Collaborative study between MWD and IEUA
- Vet out high-level concept planning
- Not intended to endorse a particular concept
- Complimentary to CBP – tie back to early "CBP+" concepts
- Help answer – how can we upsize CBP investments today?
- Reliability benefits – supply and Rialto operations (i.e., shutdown)

5

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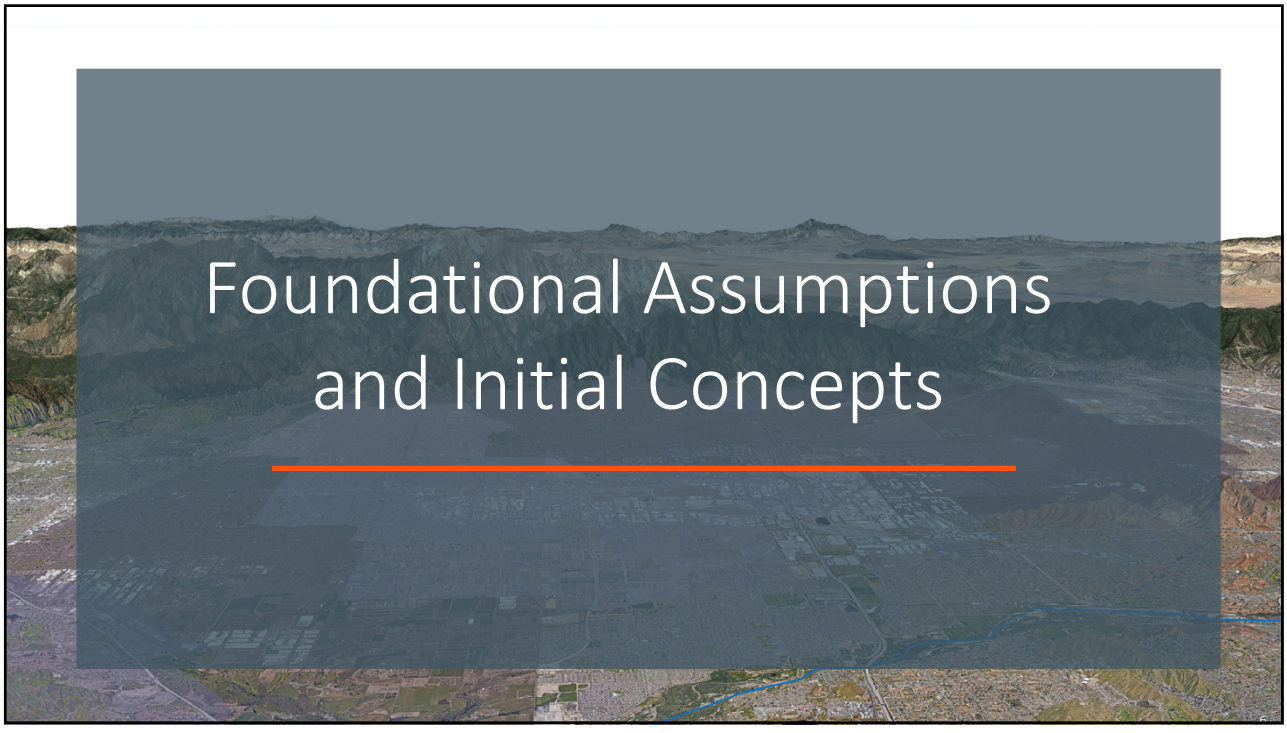

6

Foundational Assumptions

- Hydrologic:
  - 10-year cycle (4 wet (PUT), 3 dry (TAKE), 3 average [HOLD or limited PUT])
- Operational:
  - PUT-TAKE "symmetry" in alignment with Storage Framework Investigation
  - PUT Imported Water occurs every 4 years of each 10-year cycle, utilizes available spreading basin capacity (priority), incorporate new ASR and/or injection wells
  - PUT Purified Water occurs every year, incorporate new injection wells
  - TAKE occurs 3 years of each 10-year cycle and incorporate new ASR wells (imported water) and/or extraction wells (purified water)
  - For any shared infrastructure, align ACBP operations with CBP performance requirements
- Storage and Recovery:
  - PUTs must precede TAKEs
  - Program duration is 30 to 50 years

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Initial Concepts Based on Foundational Assumptions

ACBP Concept	Storage (TAF)	PUT	TAKE
ACBP-1	100	• 25 TAFY for 4 years • Maximize available spreading basin capacity as feasible to align with extraction • Incorporate new ASR wells, as needed	• Build from an upsized CBP TAKE-8 • Expanded extraction and conveyance infrastructure aligned with PUT locations • Deliver 33 TAFY to Rialto Pipeline
ACBP-2 (Build on ACBP-1)	200	• 50 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Integrate east-west (E-W) pipeline infrastructure to access treated water from Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 33 TAFY to Etiwanda/Upper Feeder
ACBP-3 (Build on ACBP-2)	300	• 75 TAFY for 4 years • Expanded ASR well capacity to recharge additional 25 TAFY • Option to modify E-W pipeline from ABCP-2 to access purified water (from Carson AWPF) at Weymouth WTP for PUT supply	• Expanded extraction (through ASR wells) and conveyance infrastructure • Deliver up to 33 TAFY to Rialto Pipeline and up to 66 TAFY to Etiwanda/Upper Feeder

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Sub Alternatives - Source Supply Options

ACBP Concept	Storage (TAF)	PUT	TAKE
ACBP-2A (Build on ACBP-1)	200	Treated imported water from Weymouth via ASR wells	Via ASR wells
ACBP-2B (Build on ACBP-1)	200	Purified water from Carson via Weymouth via injection wells	Via extraction wells
ACBP-3A (Build on ACBP-2A)	300	Treated imported water from Weymouth via ASR wells	Via ASR wells
ACBP-3B (Build on ACBP-2B)	300	Purified water from Carson via Weymouth via injection wells	Via extraction wells

9

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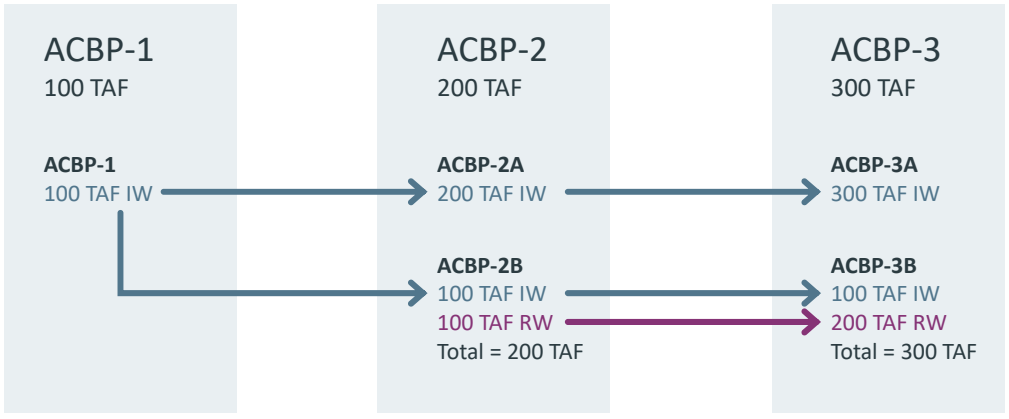
ACBP Alternatives – Storage Amounts and Water Type



IW = Imported Water
RW = Purified Water

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ACBP PUT Mechanisms and Water Sources

PUT Mechanisms and Water Sources	ACBP-1	ACBP-2A	ACBP-3A	ACBP-2B	ACBP-3B
Recharge Basins – Raw Imported Water (4 of 10 yrs)					
Rialto	12.5	12.5	12.5	12.5	12.5
ASR – Treated Imported Water (4 of 10 yrs)					
LMWTP	12.5	12.5	12.5	12.5	12.5
Weymouth	0	25	50	0	0
Injection Wells – Purified Water (10 of 10 yrs)					
Carson AWPF	0	0	0	10	20
Total Recharge and Storage					
Imported Water Recharge (TAFY) – 4 of 10 yrs	25	50	75	25	25
Purified Water Recharge (TAFY) – 10 of 10 yrs	0	0	0	10	20
Total Storage (TAF)	**100**	**200**	**300**	**200**	**300**

Notes:

- Recharge assumed at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria. Enhanced recharge basin maintenance assumed to maximize recharge basin capacity.
- The 2018 RMPU included an increase in future replenishment obligations, which are expected to completely utilize the recharge basins in the future (between 2050-2070).
- Raw imported water and treated imported water assumed 4 of 10 years; purified water assumed 10 of 10 years.

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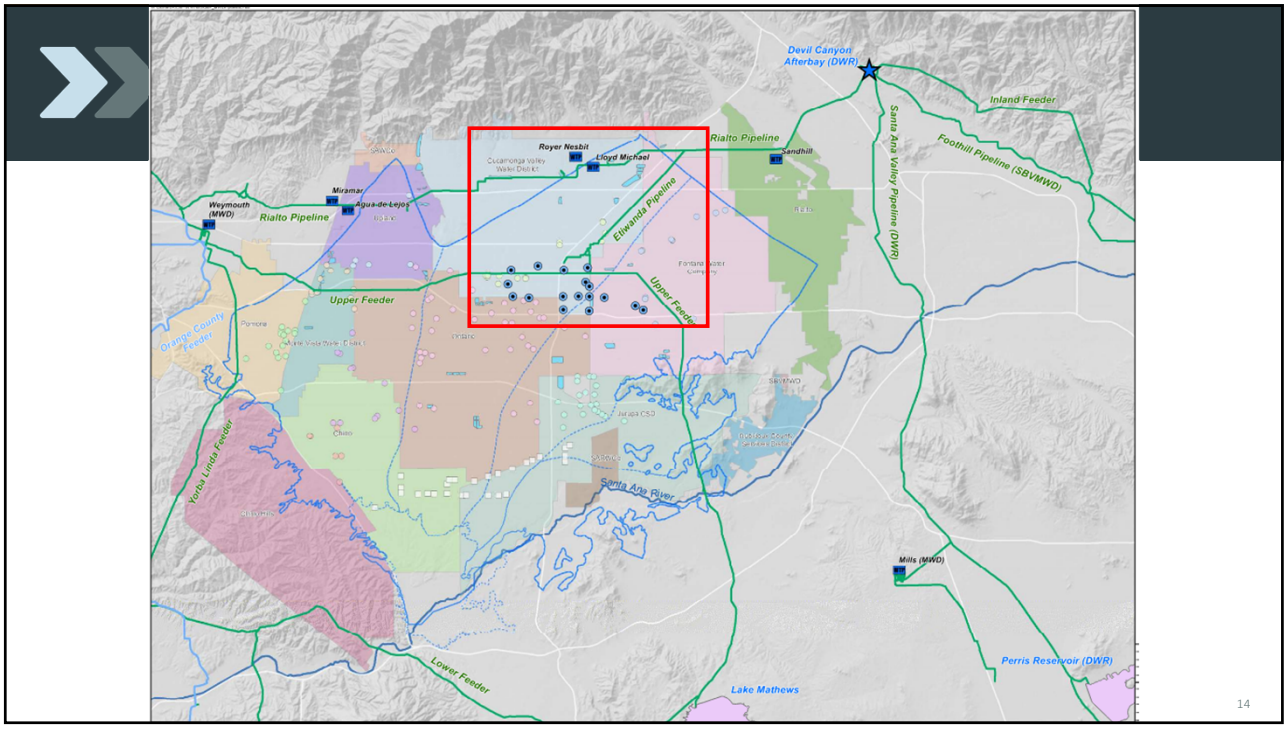
Key Assumptions

- Injection Ratio: Extraction ratio approximately ~50% (may be optimized)
- Supply Availability (PUT years): Assume availability 12 months of the year with conservative option of 9 months to be considered for imported water options (impact infrastructure sizing)
- Modeling: Required as part of next steps to verify assumptions

12

Alternative Concept Layouts

13



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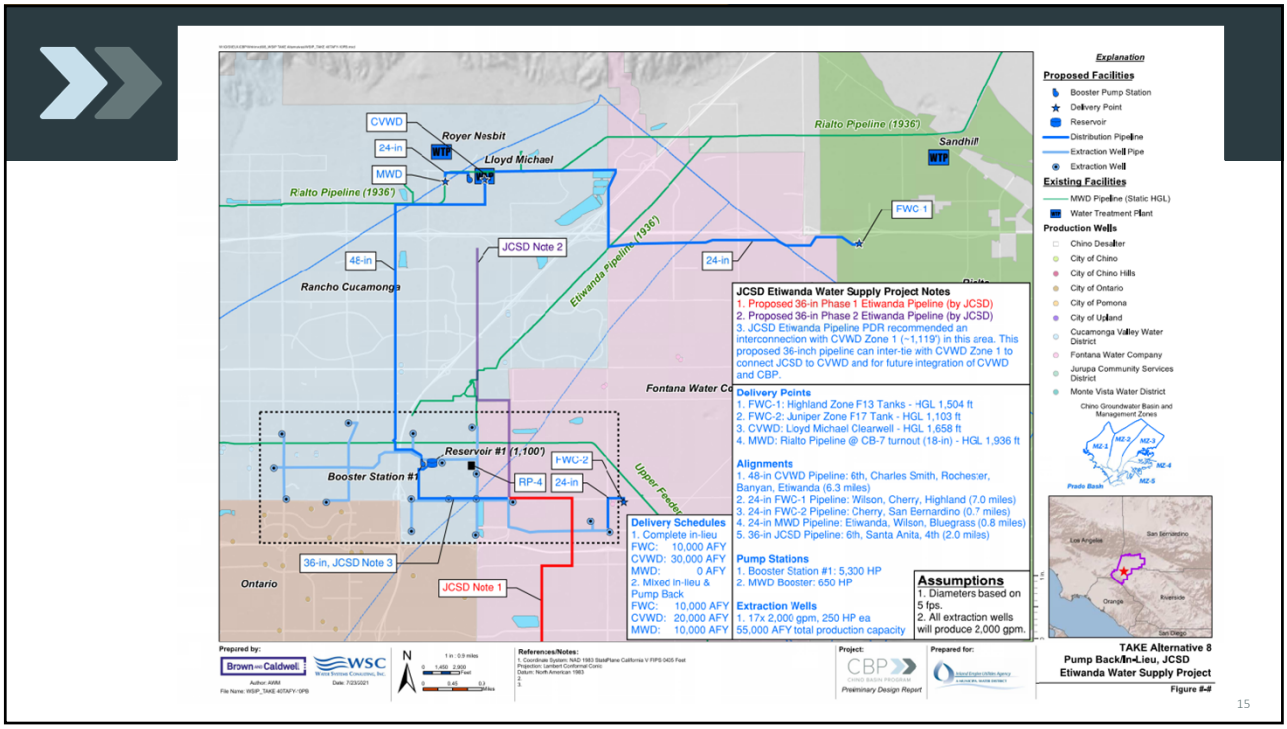
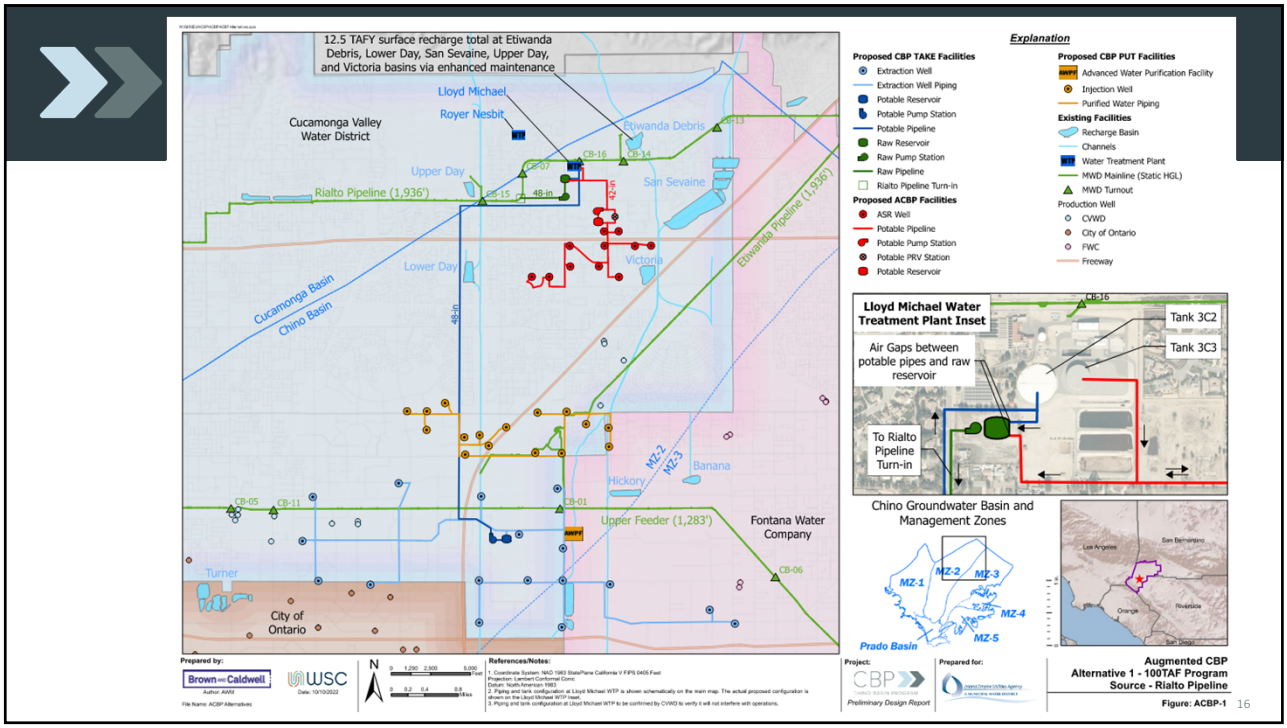

CVWD
Royer Nesbit
24-in
WTP
Lloyd Michael
MWD
Rialto Pipeline (1936')
Rialto Pipeline (1936')
Sandhill
WTP
FWC 1
JCSD Note 2
48-in
Rancho Cucamonga
Etiwanda Pipeline (1936')
24-in
Fontana Water Co
Reservoir #1 (1,100')
Booster Station #1
FWC-2
RP-4
24-in
Upper Feeder
36-in, JCSD Note 3
Ontario
JCSD Note 1
JCSD Etiwanda Water Supply Project Notes
1. Proposed 36-in Phase 1 Etiwanda Pipeline (by JCSD)
2. Proposed 36-in Phase 2 Etiwanda Pipeline (by JCSD)
3. JCSD Etiwanda Pipeline PDR recommended an interconnection with CVWD Zone 1 (~1,119') in this area. This proposed 36-inch pipeline can inter-tie with CVWD Zone 1 to connect JCSD to CVWD and for future integration of CVWD and CBP.
Delivery Points
1. FWC-1: Highland Zone F13 Tanks - HGL 1,504 ft
2. FWC-2: Juniper Zone F17 Tank - HGL 1,103 ft
3. CVWD: Lloyd Michael Clearwell - HGL 1,658 ft
4. MWD: Rialto Pipeline @ CB-7 turnout (18-in) - HGL 1,936 ft
Alignments
1. 48-in CVWD Pipeline: 6th, Charles Smith, Rochester, Banyan, Etiwanda (6.3 miles)
2. 24-in FWC-1 Pipeline: Wilson, Cherry, Highland (7.0 miles)
3. 24-in FWC-2 Pipeline: Cherry, San Bernardino (0.7 miles)
4. 24-in MWD Pipeline: Etiwanda, Wilson, Bluegrass (0.8 miles)
5. 36-in JCSD Pipeline: 6th, Santa Anita, 4th (2.0 miles)
Delivery Schedules
1. Complete in-lieu
FWC: 10,000 AFY
CVWD: 30,000 AFY
MWD: 0 AFY
2. Mixed In-lieu & Pump Back
FWC: 10,000 AFY
CVWD: 20,000 AFY
MWD: 10,000 AFY
Pump Stations
1. Booster Station #1: 5,300 HP
2. MWD Booster: 650 HP
Extraction Wells
1. 17x 2,000 gpm, 250 HP ea
55,000 AFY total production capacity
Assumptions
1. Diameters based on 5 fps.
2. All extraction wells will produce 2,000 gpm.
Explanation
Proposed Facilities
Booster Pump Station
Delivery Point
Reservoir
Distribution Pipeline
Extraction Well Pipe
Extraction Well
Existing Facilities
MWD Pipeline (Static HGL)
Water Treatment Plant
Production Wells
Chino Desalter
City of Chino
City of Chino Hills
City of Ontario
City of Pomona
City of Upland
Cucamonga Valley Water District
Fontana Water Company
Jurupa Community Services District
Monte Vista Water District
Chino Groundwater Basin and Management Zones
MZ-1
MZ-2
MZ-3
MZ-4
MZ-5
Prado Basin
Prepared by:
Brown and Caldwell
WSC
Prepared for:
Project:
CBP
Preliminary Design Report
TAKE Alternative 8
Pump Back/In-Lieu, JCSD
Etiwanda Water Supply Project
Figure 8-8

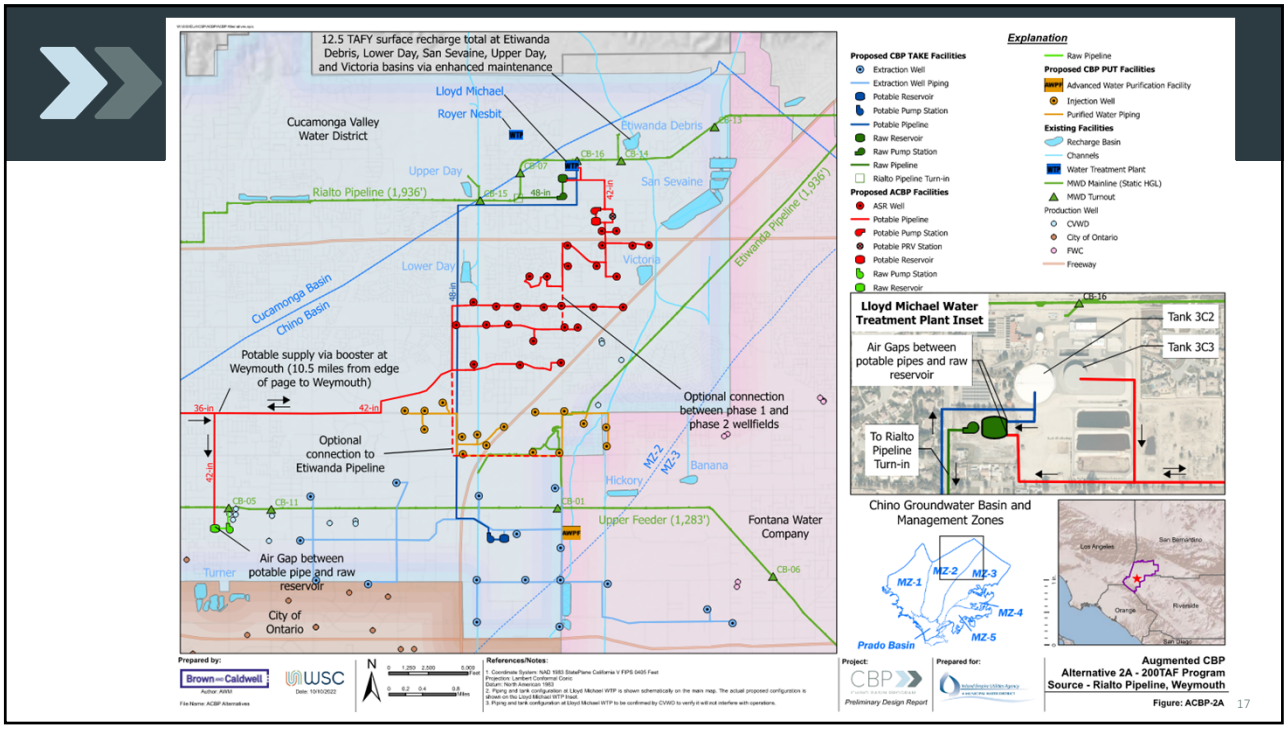
15

15


12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance
Lloyd Michael
Royer Nesbit
Cucamonga Valley Water District
Etiwanda Debris
CB-13
CB-16
CB-14
CB-07
WTP
Upper Day
Rialto Pipeline (1,936')
CB-15
48-in
42-in
San Sevaine
Etiwanda Pipeline (1,936')
Lower Day
Victoria
Cucamonga Basin
Chino Basin
48-in
MZ-2
MZ-3
Banana
Hickory
CB-05
CB-11
CB-01
NMPF
Upper Feeder (1,283')
Fontana Water Company
CB-06
Turner
City of Ontario
Explanation
Proposed CBP TAKE Facilities
Extraction Well
Extraction Well Piping
Potable Reservoir
Potable Pump Station
Potable Pipeline
Raw Reservoir
Raw Pump Station
Raw Pipeline
Rialto Pipeline Turn-in
Proposed ACBP Facilities
ASR Well
Potable Pipeline
Potable Pump Station
Potable PRV Station
Potable Reservoir
Proposed CBP PUT Facilities
Advanced Water Purification Facility
Injection Well
Purified Water Piping
Existing Facilities
Recharge Basin
Channels
Water Treatment Plant
MWD Mainline (Static HGL)
MWD Turnout
Production Well
CVWD
City of Ontario
FWC
Freeway
Lloyd Michael Water Treatment Plant Inset
CB-16
Tank 3C2
Tank 3C3
Air Gaps between potable pipes and raw reservoir
To Rialto Pipeline Turn-in
Chino Groundwater Basin and Management Zones
MZ-1
MZ-2
MZ-3
MZ-4
MZ-5
Prado Basin
Prepared by:
Brown and Caldwell
WSC
Prepared for:
Project:
CBP
Preliminary Design Report
Augmented CBP
Alternative 1 - 100TAF Program
Source - Rialto Pipeline
Figure: ACBP-1

16

16


12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance
Lloyd Michael
Royer Nesbit
Cucamonga Valley Water District
Etiwanda Debris
Upper Day
Rialto Pipeline (1,936')
San Sevaine
Lower Day
Victoria
Etiwanda Pipeline (1,936')
Cucamonga Basin
Chino Basin
Potable supply via booster at Weymouth (10.5 miles from edge of page to Weymouth)
Optional connection between phase 1 and phase 2 wellfields
Optional connection to Etiwanda Pipeline
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Hickory
Upper Feeder (1,283')
Fontana Water Company
Air Gap between potable pipe and raw reservoir
Turner
City of Ontario
Explanation
Proposed CBP TAKE Facilities
Extraction Well
Extraction Well Piping
Potable Reservoir
Potable Pump Station
Potable Pipeline
Raw Reservoir
Raw Pump Station
Raw Pipeline
Rialto Pipeline Turn-in
Proposed ACBP Facilities
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Potable Pipeline
Potable Pump Station
Potable PRV Station
Potable Reservoir
Raw Pump Station
Raw Reservoir
Proposed CBP PUT Facilities
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Injection Well
Purified Water Piping
Existing Facilities
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Channels
Water Treatment Plant
MWD Mainline (Static HGL)
MWD Turnout
Production Well
CVWD
City of Ontario
FWC
Freeway
Lloyd Michael Water Treatment Plant Inset
Air Gaps between potable pipes and raw reservoir
Tank 3C2
Tank 3C3
To Rialto Pipeline Turn-in
Chino Groundwater Basin and Management Zones
MZ-1
MZ-2
MZ-3
MZ-4
MZ-5
Prado Basin
Augmented CBP
Alternative 2A - 200TAF Program
Source - Rialto Pipeline, Weymouth
Figure: ACBP-2A
17

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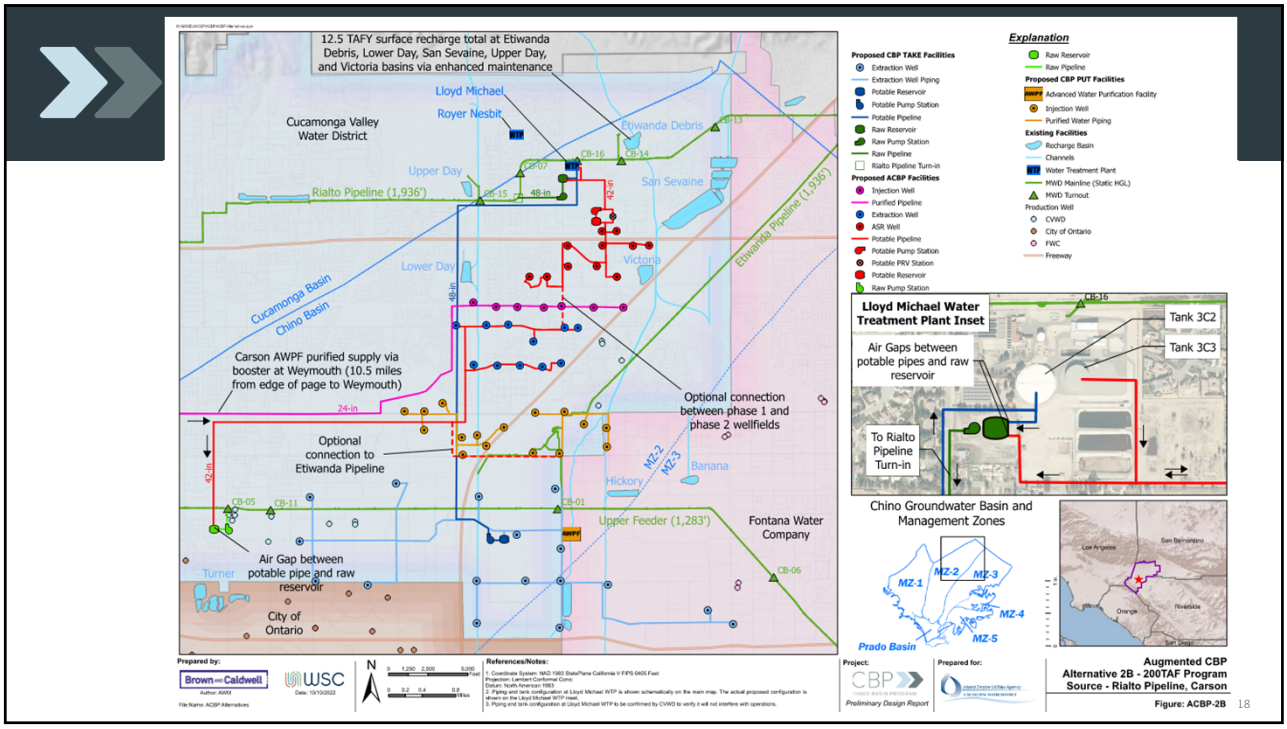
12.5 TAFY surface recharge total at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria basins via enhanced maintenance
Lloyd Michael
Royer Nesbit
Cucamonga Valley Water District
Etiwanda Debris
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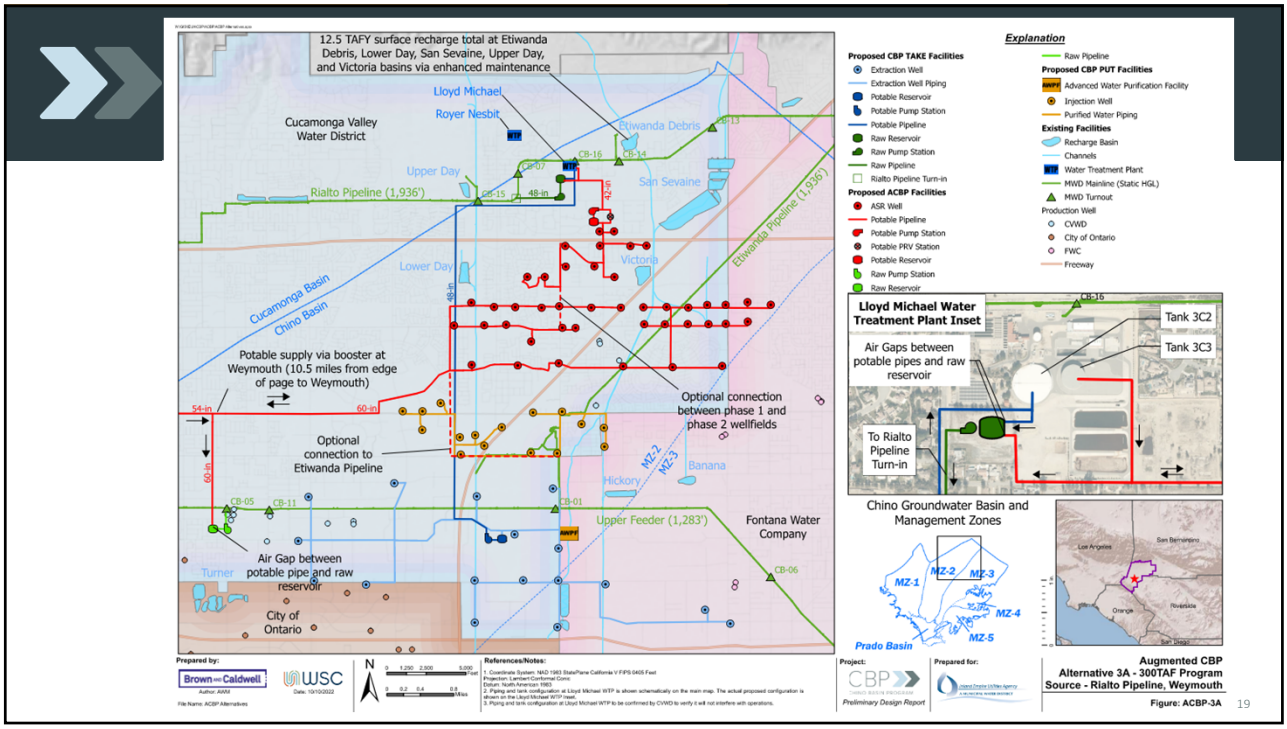
MZ-3
MZ-4
MZ-5
Prado Basin
Augmented CBP
Alternative 2B - 200TAF Program
Source - Rialto Pipeline, Carson
Figure: ACBP-2B
18

18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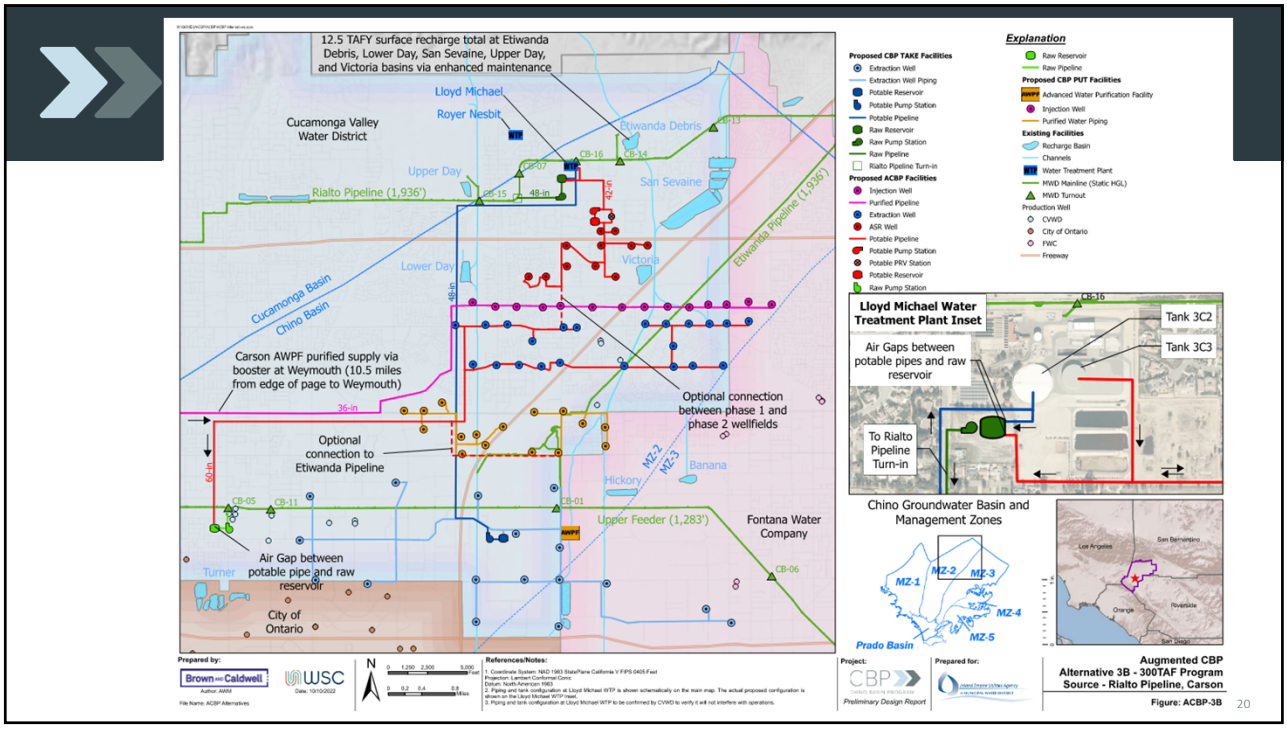
MZ-5
Prado Basin
Prepared by:
Brown and Caldwell
WSC
References/Notes:
Project:
CBP
Preliminary Design Report
Prepared for:
Augmented CBP
Alternative 3A - 300TAF Program
Source - Rialto Pipeline, Weymouth
Figure: ACBP-3A
19

19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Project:
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Source - Rialto Pipeline, Carson
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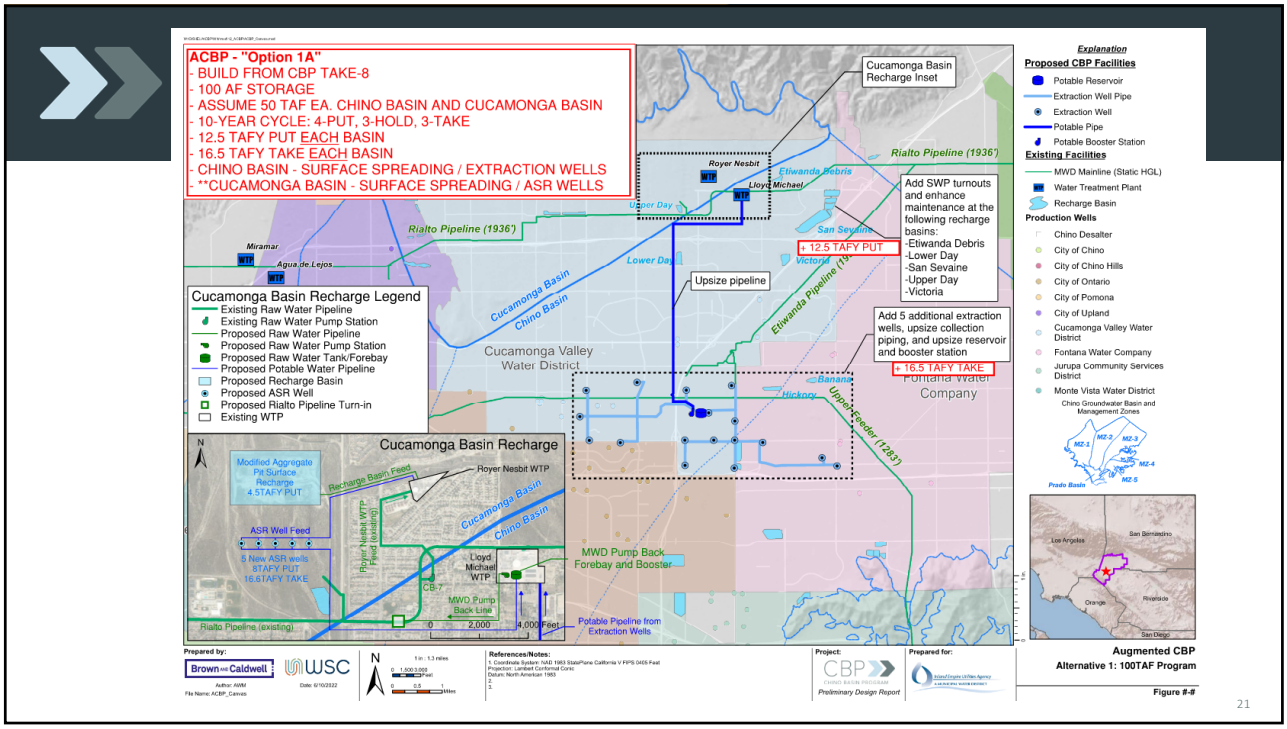
20

20



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Summary of Infrastructure

PUT and TAKE Elements	ACBP-1 100 TAF-IW	ACBP-2A 200 TAF-IW	ACBP-3A 300 TAF-IW	ACBP-2B 200 TAF-100 IW, 100 RW	ACBP-3B 300 TAF-100 IW, 200 RW
Pump Stations	2	+2 (4 total)	Increase capacity of ACBP-2A Pump Stations (4 total)	+2 (4 total)	Increase capacity of ACBP-2B Pump Stations (4 total)
Wells	11	+16 (27 total)	+ 16 (43 total)	+18 (29 total)	+18 (47 total)
Pipelines (Total)	6.1 mi 12”-48”	32.5 mi 12”-48”	38.1 mi 12”-60”	36.2 mi 12”-48”	51.8 mi 12”-60”
Reservoirs	2	+1 (3 total)	Increase capacity of ACBP-2A reservoirs (3 total)	+1 (3 total)	Increase capacity of ACBP-2B reservoirs (3 total)
Turn-Ins	New Rialto Feeder	Upsize Upper Feeder CB-5 (2 total)	--	Upsize Upper Feeder CB-5 (2 total)	--

Note:

- ACBP-1 also includes raw imported water recharge at Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria.

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Cost Development Assumptions

- AACEI Class 5: - 50% to + 100% level of accuracy for concept level
- 40% contingency; 28% implementation (engineering, admin, CM)
- Concepts/cost opinion do not include:
  - Any leave behind water
  - Surface water (CVWD) or AWT (Carson) treatment – conveyance infrastructure only
  - Wheeling costs
  - Storage fees or Watermaster mitigation
  - Storage losses
  - Groundwater treatment – locate in good WQ; plan space for potential, future wellhead treatment
  - Outside funding (i.e., grants or other partner contributions)

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Conceptual Capital Cost Opinion

ACBP Conceptual Alternatives Cost Summary

Parameter	ACBP-1	ACBP-2A	ACBP-2B	ACBP-3A	ACBP-3B
Capital cost ($M 2022) [1]	*(100 TAF-IW)*	*(200 TAF-IW)*	*(200 TAF-100 IW, 100 RW)*	*(300 TAF-IW)*	*(300 TAF-100 IW, 200 RW)*
PUT					
Recharge basin modifications	$10.46	$10.46	$10.46	$10.46	$10.46
Pump stations	$0.00	$29.92	$12.66	$50.64	$20.72
ASR wells	$80.57	$197.75	$80.57	$314.94	$80.57
Injection wells	$0.00	$0.00	$29.30	$0.00	$58.59
Monitoring wells	$6.28	$12.56	$12.56	$18.83	$18.83
Pipelines	$0.00	$0.00	$88.35	$0.00	$142.81
Pressure reduction facility	$10.46	$10.46	$10.46	$10.46	$10.46
Land [2]	$3.78	$8.35	$5.82	$12.93	$7.86
Subtotal	$111.55	$269.52	$250.17	$418.27	$350.31
TAKE					
Extraction wells	$0.00	$0.00	$64.45	$0.00	$128.91
Pipelines	$42.71	$212.83	$113.37	$335.53	$247.92
Storage	$7.81	$11.21	$11.21	$14.58	$14.58
Pump stations	$54.09	$70.21	$70.21	$86.32	$86.32
Turnouts	$8.37	$16.74	$16.74	$16.74	$16.74
Land [2]	$4.90	$7.36	$10.45	$7.36	$13.55
Subtotal	$117.88	$318.34	$286.43	$460.53	$508.02
Total capital cost	**$229.44**	**$587.86**	**$536.61**	**$878.80**	**$858.33**

Notes:
Common infrastructure from CBP TAKE-8 integrated.

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Conceptual Annual O&M Cost Opinion

ACBP Conceptual Alternatives Cost Summary

Parameter	ACBP-1	ACBP-2A	ACBP-2B	ACBP-3A	ACBP-3B
Annual O&M cost ($M)	*(100 TAF-IW)*	*(200 TAF-IW)*	*(200 TAF-100 IW, 100 RW)*	*(300 TAF-IW)*	*(300 TAF-100 IW, 200 RW)*
PUT					
Recharge basin maintenance	$1.25	$1.25	$1.25	$1.25	$1.25
Pump stations	$0.00	$3.32	$1.40	$5.61	$2.30
ASR wells	$7.88	$19.35	$7.88	$30.81	$7.88
Injection wells	$0.00	$0.00	$0.21	$0.00	$0.42
Monitoring wells	$0.04	$0.08	$0.08	$0.12	$0.12
Pipelines	$0.00	$0.00	$0.09	$0.00	$0.09
Pressure reduction facility	$0.10	$0.10	$0.10	$0.10	$0.10
Subtotal	$9.27	$24.09	$11.01	$37.90	$12.16
Fixed [3]	*$1.94*	*$3.21*	*$2.46*	*$4.35*	*$2.83*
Variable [4]	*$7.33*	*$20.89*	*$8.55*	*$33.55*	*$9.33*
TAKE					
Extraction wells	$0.00	$0.00	$7.66	$0.00	$15.32
Pipelines	$0.03	$0.14	$0.07	$0.16	$0.14
Storage	$0.07	$0.09	$0.09	$0.12	$0.12
Pump stations	$6.00	$7.78	$7.78	$9.57	$9.57
Turnouts	$0.04	$0.08	$0.08	$0.08	$0.08
Subtotal	$6.13	$8.09	$15.69	$9.94	$25.23
Fixed [3]	*$0.91*	*$1.32*	*$1.58*	*$1.60*	*$2.24*
Variable [4]	*$5.22*	*$6.78*	*$14.11*	*$8.33*	*$23.00*
Total annual O&M cost	**$15.40**	**$32.19**	**$26.70**	**$47.83**	**$37.40**
Fixed [3]	*$2.85*	*$4.53*	*$4.04*	*$5.95*	*$5.07*
Variable [4]	*$12.55*	*$27.66*	*$22.66*	*$41.88*	*$32.33*

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Conceptual Unit Cost Opinion

ACBP Conceptual Alternatives Cost Summary

Parameter	ACBP-1	ACBP-2A	ACBP-2B	ACBP-3A	ACBP-3B
Unit Costs	*(100 TAF-IW)*	*(200 TAF-IW)*	*(200 TAF-100 IW, 100 RW)*	*(300 TAF-IW)*	*(300 TAF-100 IW, 200 RW)*
TAKE deliveries (AFY)	33,333	66,667	66,667	100,000	100,000
Amortized capital cost ($M) [5]	$13.18	$33.76	$30.82	$50.47	$49.29
Annual O&M cost ($M)	$15.40	$32.19	$26.70	$47.83	$37.40
Total annual cost ($M)	$28.58	$65.95	$57.52	$98.30	$86.69
Unit cost ($/AF) [6]	**$857.41**	**$989.19**	**$862.74**	**$982.99**	**$866.88**

Notes:
(1) Includes 40% contingency and 28% implementation markups and escalation to $2022 (from $2019 cost model).
(2) Implementation markup not included in land cost calculations.
(3) Includes cost for routine annual maintenance.
(4) Includes operations and maintenance costs during put and call years.
(5) Amortization based on 3% rate over 25-year period.
(6) Unit cost during a TAKE year.

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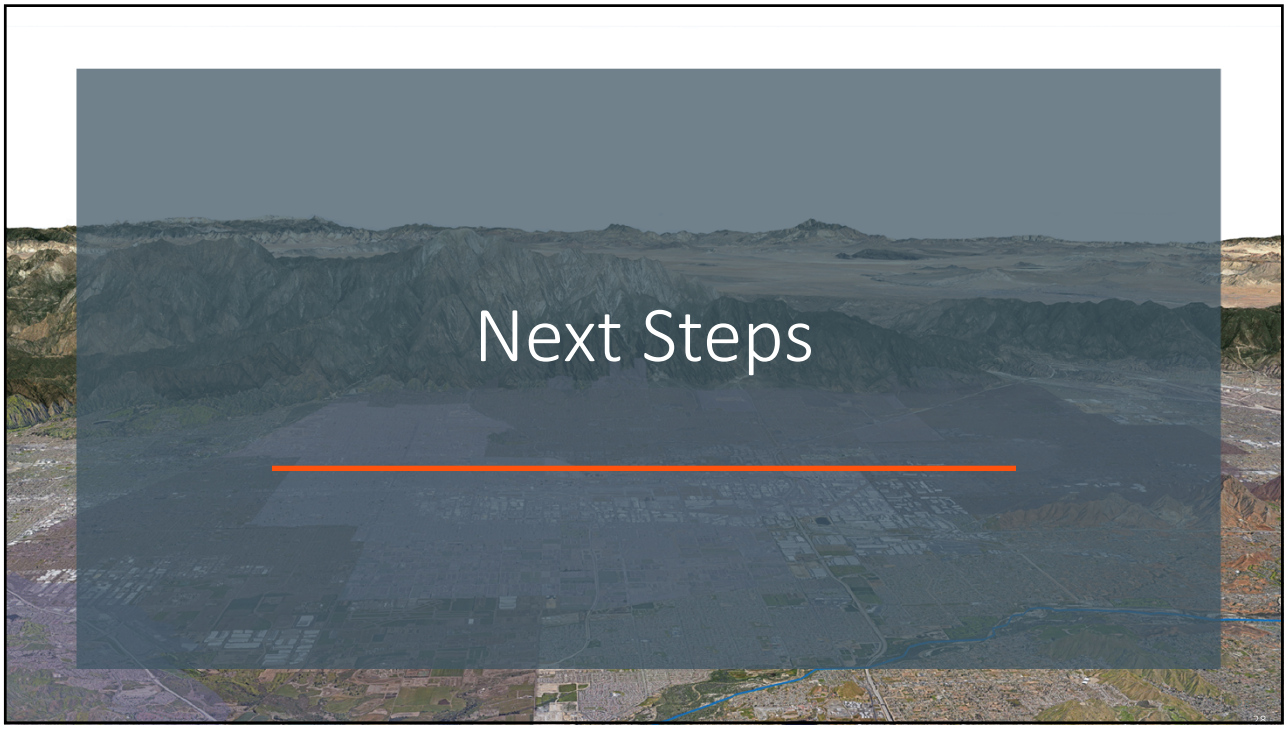

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Next Steps

- Finalize concept alternatives
- Develop technical memorandum

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Attachment C: Detailed PUT and TAKE Facilities Table

Attachment C: Detailed PUT and TAKE Facilities Table

PUT and TAKE Elements		ACBP Alternatives				
		ACBP-1	**ACBP-2A**	**ACBP-3A**	**ACBP-2B**	**ACBP-3B**
		100 TAF-IW	**200 TAF-IW**	**300 TAF-IW**	**200 TAF-100 IW, 100 RW**	**300 TAF-100 IW, 200 RW**
PUT - Recharge Basins						
Turn-outs		Expanded capacity	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1
Recharge Basins		Etiwanda Debris, Lower Day, San Sevaine, Upper Day, and Victoria with enhanced maintenance				
PUT - Treated Imported Water (LMWTP)						
Pipelines	Potable (for PUT and TAKE)	5.2 mi 12"-42"	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1
PRV	Potable (for PUT)	1 (33 TAFY)				
Wells	ASR Wells (for PUT and TAKE)	11				
PUT - Treated Imported Water (Weymouth)						
Pump Stations	Weymouth Booster		2,600 HP / 25 TAFY	4,400 HP / 50 TAFY		
Pipelines	Potable (for PUT and TAKE)		21.2 mi 12"-42"	26.8 mi 12"-60"		
Wells	ASR Wells (for PUT and TAKE)		16	16 additional (32 total)		
PUT - Purified Water (Carson AWPF via Weymouth)						
Pump Stations	Weymouth Booster				1,100 HP / 10 TAFY	1,800 HP / 20 TAFY
Pipelines	Purified Water				17.0 12-24"	18.8 mi 12"-36"
Wells	Injection Wells				7	7 additional (14 total)
TAKE - Rialto Pump Back						
Pipelines	Extracted groundwater	Included with PUT	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1	Includes ACBP-1
	Rialto Pump Back (includes 10 TAFY CBP)	Increase 0.9 miles 24" (CBP) to 0.9 miles of 48"				
Pump Stations	Potable Pump Station (for pump back)	1,600 HP / 33 TAFY				
	Rialto Pump Back (Includes 10 TAFY CBP)	Inc 650 HP/10 TAFY to 3,100 HP/43 TAFY				
Reservoirs	Potable Reservoir (for pump back)	1.3 MG				
	Rialto Pump Back (includes 10 TAFY CBP)	1.6 MG				
Turn-in	Rialto Pump Back	1 - 48" turn-in				
TAKE - Upper Feeder Pump Back						
Wells	Extraction Wells		ASR Wells Included with PUT	ASR Wells Included with PUT	11	11 additional (22 total)
Pipelines	Extracted groundwater		Included with PUT	Included with PUT	7.9 mi 12"-42"	22.7 mi 12"-60"
Pump Stations	Upper Feeder Pump Back		1,400 HP / 33 TAFY	2,800 HP / 67 TAFY	1,400 HP / 33 TAFY	2,800 HP / 67 TAFY
Reservoirs	Upper Feeder Pump Back		1.25 MG	2.5 MG	1.25 MG	2.5 MG
Turn-in	Upper Feeder Pump Back		1 - 42" turn-in (modify CB-5)	1 - 60" turn-in (modify CB-5)	1 - 42" turn-in (modify CB-5)	1 - 60" turn-in (modify CB-5)
Summary						
Pump Stations		2	4	4 (upsize 2)	4	4 (upsize 2)
Wells		11	27	43	29	47
Pipelines		6.1 mi 12-48"	27.3 mi 12"-48"	32.9 mi 12"-60"	31.0 mi 12-48"	46.6 mi 12"-60"
Reservoirs		2	3	3 (upsize 1)	3	3 (upsize 1)
Turn-ins		1	2	2 (upsize 1)	2	2 (upsize 1)

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Attachment D: ACBP Alternative – Cucamonga Basin

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ACBP - "Option 1A"
- BUILD FROM CBP TAKE-8
- 100 AF STORAGE
- ASSUME 50 TAF EA. CHINO BASIN AND CUCAMONGA BASIN
- 10-YEAR CYCLE: 4-PUT, 3-HOLD, 3-TAKE
- 12.5 TAFY PUT EACH BASIN
- 16.5 TAFY TAKE EACH BASIN
- CHINO BASIN - SURFACE SPREADING / EXTRACTION WELLS
- **CUCAMONGA BASIN - SURFACE SPREADING / ASR WELLS

Cucamonga Basin Recharge Inset

Royer Nesbit WTP

Etiwanda Debris

Lloyd Michael WTP

Upper Day

Rialto Pipeline (1936')

Add SWP turnouts and enhance maintenance at the following recharge basins:
-Etiwanda Debris
-Lower Day
-San Sevaine
-Upper Day
-Victoria

San Sevaine

+ 12.5 TAFY PUT

Miramar WTP

Agua de Lejos WTP

Lower Day

Victoria

Upsize pipeline

Cucamonga Basin

Chino Basin

Etiwanda Pipeline (19

Add 5 additional extraction wells, upsize collection piping, and upsize reservoir and booster station

+ 16.5 TAFY TAKE

Cucamonga Valley Water District

Fontana Water Company

Banana

Hickory

Upper Feeder (1283')

MWD Pump Back Forebay and Booster

Potable Pipeline from Extraction Wells

Cucamonga Basin Recharge Legend

- Existing Raw Water Pipeline
- Existing Raw Water Pump Station
- Proposed Raw Water Pipeline
- Proposed Raw Water Pump Station
- Proposed Raw Water Tank/Forebay
- Proposed Potable Water Pipeline
- Proposed Recharge Basin
- Proposed ASR Well
- Proposed Rialto Pipeline Turn-in
- Existing WTP

Cucamonga Basin Recharge

N

Modified Aggregate Pit Surface Recharge 4.5TAFY PUT

Recharge Basin Feed

Royer Nesbit WTP

Cucamonga Basin

Chino Basin

ASR Well Feed

5 New ASR wells
8TAFY PUT
16.6TAFY TAKE

Royer Nesbit WTP Feed (existing)

Lloyd Michael WTP

CB-7

MWD Pump Back Line

Rialto Pipeline (existing)

0 2,000 4,000 Feet

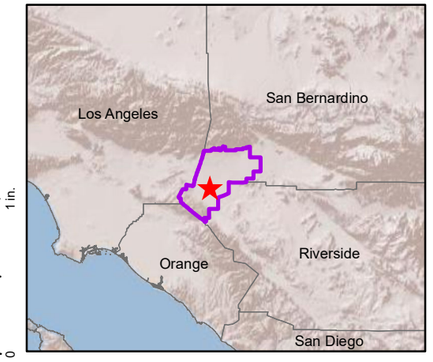
Explanation

Proposed CBP Facilities
- Potable Reservoir
- Extraction Well Pipe
- Extraction Well
- Potable Pipe
- Potable Booster Station

Existing Facilities
- MWD Mainline (Static HGL)
- Water Treatment Plant
- Recharge Basin

Production Wells
- Chino Desalter
- City of Chino
- City of Chino Hills
- City of Ontario
- City of Pomona
- City of Upland
- Cucamonga Valley Water District
- Fontana Water Company
- Jurupa Community Services District
- Monte Vista Water District

Chino Groundwater Basin and Management Zones



Prepared by:
Brown AND Caldwell
Author: AWM
File Name: ACBP_Canvas

WSC
Date: 6/10/2022

N
1 in : 1.3 miles
0 1,500 3,000 Feet
0 0.5 1 Miles

References/Notes:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Project:
CBP
CHINO BASIN PROGRAM
Preliminary Design Report

Prepared for:
Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

Augmented CBP
Alternative 1: 100TAF Program

Figure #-#

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Attachment E: Cost Estimating Details

AUGMENTED CHINO BASIN PROGRAM
PRELIMINARY ALTERNATIVES - CONCEPTUAL COST ESTIMATES (PRELIMINARY DRAFT)
Conceptual-Level Cost Estimate - Preliminary Draft (Rev. 2023.06.20)

Net Present Value (NPV) and Unit Water Cost Evaluation

Concept:	ACBP-1		
Present year:	2022		
Mid-point construction	2030	set to present year for no esc. to mid-pt	
Finance period/program duration:	30	years	
Capital finance nominal interest rate:	3.00%		
Inflation rate, APY	3.50%		
Discount rate, APY	2.50%		
Capital cost (2022$):	$217.34	Mil	
Put annual O&M cost - fixed (2022$):	$1.94	Mil	
Put annual O&M cost - variable (2022$):	$7.33	Mil	
Take annual O&M cost - fixed (2022$):	$0.80	Mil	
Take annual O&M cost - variable (2022$):	$4.50	Mil	
NPV (2022) =	**$501.71**	**$Mil**	

Notes:
(1) Capital costs escalated to mid-pt construction (year 2030).
(2) CBWM fees not included.
(3) Storage losses not included.
(4) GW treatment or MPI mitigation not included.
(5) LWMWTP treatment cost not included.
(6) CVWD wheeling fees not included.
(7) Equipment replace/rehab costs not included
(8) Present value of future mid-point of construction.

Year	Storage Year No.	Balance (AF)	Put (AF)	Put O&M [$Mil, 2022$]	Take (AF)	Take O&M [$Mil, 2022$]	Ann. O&M [$Mil, 2022$]	Finance Year No.	PV of F-Cap		F-O&M	PV of F-O&M
2022								0	$217.34			
…								…				
2032	1	25,000	25,000	$9.27	0	$0.80	$10.08	10	$234.89	*(8)*	$14.21	$11.10
2033	2	50,000	25,000	$9.27	0	$0.80	$10.08	11			$14.71	$11.21
2034	3	75,000	25,000	$9.27	0	$0.80	$10.08	12			$15.22	$11.32
2035	4	100,000	25,000	$9.27	0	$0.80	$10.08	13			$15.76	$11.43
2036	5	100,000	0	$1.94	0	$0.80	$2.74	14			$4.44	$3.14
2037	6	100,000	0	$1.94	0	$0.80	$2.74	15			$4.60	$3.17
2038	7	100,000	0	$1.94	0	$0.80	$2.74	16			$4.76	$3.20
2039	8	66,667	0	$1.94	33,333	$5.30	$7.24	17			$13.00	$8.54
2040	9	33,333	0	$1.94	33,333	$5.30	$7.24	18			$13.45	$8.62
2041	10	0	0	$1.94	33,333	$5.30	$7.24	19			$13.92	$8.71
2042	11	25,000	25,000	$9.27	0	$0.80	$10.08	20			$20.05	$12.23
2043	12	50,000	25,000	$9.27	0	$0.80	$10.08	21			$20.75	$12.35
2044	13	75,000	25,000	$9.27	0	$0.80	$10.08	22			$21.47	$12.47
2045	14	100,000	25,000	$9.27	0	$0.80	$10.08	23			$22.23	$12.60
2046	15	100,000	0	$1.94	0	$0.80	$2.74	24			$6.26	$3.46
2047	16	100,000	0	$1.94	0	$0.80	$2.74	25			$6.48	$3.50
2048	17	100,000	0	$1.94	0	$0.80	$2.74	26			$6.71	$3.53
2049	18	66,667	0	$1.94	33,333	$5.30	$7.24	27			$18.33	$9.41
2050	19	33,333	0	$1.94	33,333	$5.30	$7.24	28			$18.98	$9.50
2051	20	0	0	$1.94	33,333	$5.30	$7.24	29			$19.64	$9.60
2052	21	25,000	25,000	$9.27	0	$0.80	$10.08	30			$28.28	$13.48
2053	22	50,000	25,000	$9.27	0	$0.80	$10.08	31			$29.27	$13.61
2054	23	75,000	25,000	$9.27	0	$0.80	$10.08	32			$30.29	$13.75
2055	24	100,000	25,000	$9.27	0	$0.80	$10.08	33			$31.35	$13.88
2056	25	100,000	0	$1.94	0	$0.80	$2.74	34			$8.83	$3.82
2057	26	100,000	0	$1.94	0	$0.80	$2.74	35			$9.14	$3.85
2058	27	100,000	0	$1.94	0	$0.80	$2.74	36			$9.46	$3.89
2059	28	66,667	0	$1.94	33,333	$5.30	$7.24	37			$25.86	$10.37
2060	29	33,333	0	$1.94	33,333	$5.30	$7.24	38			$26.77	$10.47
2061	30	0	0	$1.94	33,333	$5.30	$7.24	39			$27.70	$10.58
			300,000	$146.18	300,000	$64.58	$210.77					

AUGMENTED CHINO BASIN PROGRAM
PRELIMINARY ALTERNATIVES - CONCEPTUAL COST ESTIMATES (PRELIMINARY DRAFT)
Conceptual-Level Cost Estimate - Preliminary Draft (Rev. 2023.06.20)

Net Present Value (NPV) and Unit Water Cost Evaluation

Concept:	ACBP-2A		
Present year:	2022		
Mid-point construction	2030	set to present year for no esc. to mid-pt	
Finance period/program duration:	30	years	
Capital finance nominal interest rate:	3.00%		
Inflation rate, APY	3.50%		
Discount rate, APY	2.50%		
Capital cost (2022$):	$575.77	Mil	
Put annual O&M cost - fixed (2022$):	$3.21	Mil	
Put annual O&M cost - variable (2022$):	$20.89	Mil	
Take annual O&M cost - fixed (2022$):	$1.21	Mil	
Take annual O&M cost - variable (2022$):	$6.06	Mil	
NPV (2022) =	**$1,172.49**	**$Mil**	

Notes:
(1) Capital costs escalated to mid-pt construction (year 2030).
(2) CBWM fees not included.
(3) Storage losses not included.
(4) GW treatment or MPI mitigation not included.
(5) LWMWTP treatment cost not included.
(6) CVWD wheeling fees not included.
(7) Equipment replace/rehab costs not included
(8) Present value of future mid-point of construction.

Year	Storage Year No.	Balance (AF)	Put (AF)	Put O&M [$Mil, 2022$]	Take (AF)	Take O&M [$Mil, 2022$]	Ann. O&M [$Mil, 2022$]	Finance Year No.	PV of F-Cap	F-O&M	PV of F-O&M
2022								0	$575.77		
…								…			
2032	1	50,000	50,000	$24.09	0	$1.21	$25.30	10	$622.27 *(8)*	$35.69	$27.88
2033	2	100,000	50,000	$24.09	0	$1.21	$25.30	11		$36.94	$28.15
2034	3	150,000	50,000	$24.09	0	$1.21	$25.30	12		$38.23	$28.43
2035	4	200,000	50,000	$24.09	0	$1.21	$25.30	13		$39.57	$28.71
2036	5	200,000	0	$3.21	0	$1.21	$4.42	14		$7.15	$5.06
2037	6	200,000	0	$3.21	0	$1.21	$4.42	15		$7.40	$5.11
2038	7	200,000	0	$3.21	0	$1.21	$4.42	16		$7.66	$5.16
2039	8	133,333	0	$3.21	66,667	$7.26	$10.47	17		$18.79	$12.35
2040	9	66,667	0	$3.21	66,667	$7.26	$10.47	18		$19.45	$12.47
2041	10	0	0	$3.21	66,667	$7.26	$10.47	19		$20.13	$12.59
2042	11	50,000	50,000	$24.09	0	$1.21	$25.30	20		$50.35	$30.72
2043	12	100,000	50,000	$24.09	0	$1.21	$25.30	21		$52.11	$31.02
2044	13	150,000	50,000	$24.09	0	$1.21	$25.30	22		$53.93	$31.33
2045	14	200,000	50,000	$24.09	0	$1.21	$25.30	23		$55.82	$31.63
2046	15	200,000	0	$3.21	0	$1.21	$4.42	24		$10.09	$5.58
2047	16	200,000	0	$3.21	0	$1.21	$4.42	25		$10.44	$5.63
2048	17	200,000	0	$3.21	0	$1.21	$4.42	26		$10.80	$5.69
2049	18	133,333	0	$3.21	66,667	$7.26	$10.47	27		$26.51	$13.61
2050	19	66,667	0	$3.21	66,667	$7.26	$10.47	28		$27.44	$13.74
2051	20	0	0	$3.21	66,667	$7.26	$10.47	29		$28.40	$13.88
2052	21	50,000	50,000	$24.09	0	$1.21	$25.30	30		$71.02	$33.86
2053	22	100,000	50,000	$24.09	0	$1.21	$25.30	31		$73.50	$34.19
2054	23	150,000	50,000	$24.09	0	$1.21	$25.30	32		$76.08	$34.52
2055	24	200,000	50,000	$24.09	0	$1.21	$25.30	33		$78.74	$34.86
2056	25	200,000	0	$3.21	0	$1.21	$4.42	34		$14.23	$6.14
2057	26	200,000	0	$3.21	0	$1.21	$4.42	35		$14.72	$6.20
2058	27	200,000	0	$3.21	0	$1.21	$4.42	36		$15.24	$6.26
2059	28	133,333	0	$3.21	66,667	$7.26	$10.47	37		$37.40	$15.00
2060	29	66,667	0	$3.21	66,667	$7.26	$10.47	38		$38.70	$15.14
2061	30	0	0	$3.21	66,667	$7.26	$10.47	39		$40.06	$15.29
			600,000	$346.89	600,000	$90.74	$437.63				

AUGMENTED CHINO BASIN PROGRAM
PRELIMINARY ALTERNATIVES - CONCEPTUAL COST ESTIMATES (PRELIMINARY DRAFT)
Conceptual-Level Cost Estimate - Preliminary Draft (Rev. 2023.06.20)

Net Present Value (NPV) and Unit Water Cost Evaluation

Concept:	ACBP-3A	
Present year:	2022	
Mid-point construction	2030	set to present year for no esc. to mid-pt
Finance period/program duration:	30	years
Capital finance nominal interest rate:	3.00%	
Inflation rate, APY	3.50%	
Discount rate, APY	2.50%	
Capital cost (2022$):	$866.71	Mil
Put annual O&M cost - fixed (2022$):	$4.35	Mil
Put annual O&M cost - variable (2022$):	$33.55	Mil
Take annual O&M cost - fixed (2022$):	$1.49	Mil
Take annual O&M cost - variable (2022$):	$7.61	Mil

NPV (2022) = **$1,747.56** **$Mil**

Notes:
(1) Capital costs escalated to mid-pt construction (year 2030).
(2) CBWM fees not included.
(3) Storage losses not included.
(4) GW treatment or MPI mitigation not included.
(5) LWMWTP treatment cost not included.
(6) CVWD wheeling fees not included.
(7) Equipment replace/rehab costs not included
(8) Present value of future mid-point of construction.

Year	Storage Year No.	Balance (AF)	Put (AF)	Put O&M [$Mil, 2022$]	Take (AF)	Take O&M [$Mil, 2022$]	Ann. O&M [$Mil, 2022$]	Finance Year No.	PV of F-Cap		F-O&M	PV of F-O&M
2022								0	$866.71			
…								…				
2032	1	75,000	75,000	$37.90	0	$1.49	$39.39	10	$936.71	*(8)*	$55.56	$43.41
2033	2	150,000	75,000	$37.90	0	$1.49	$39.39	11			$57.51	$43.83
2034	3	225,000	75,000	$37.90	0	$1.49	$39.39	12			$59.52	$44.26
2035	4	300,000	75,000	$37.90	0	$1.49	$39.39	13			$61.60	$44.69
2036	5	300,000	0	$4.35	0	$1.49	$5.84	14			$9.45	$6.69
2037	6	300,000	0	$4.35	0	$1.49	$5.84	15			$9.78	$6.76
2038	7	300,000	0	$4.35	0	$1.49	$5.84	16			$10.13	$6.82
2039	8	200,000	0	$4.35	100,000	$9.10	$13.45	17			$24.14	$15.86
2040	9	100,000	0	$4.35	100,000	$9.10	$13.45	18			$24.98	$16.02
2041	10	0	0	$4.35	100,000	$9.10	$13.45	19			$25.86	$16.17
2042	11	75,000	75,000	$37.90	0	$1.49	$39.39	20			$78.38	$47.83
2043	12	150,000	75,000	$37.90	0	$1.49	$39.39	21			$81.12	$48.30
2044	13	225,000	75,000	$37.90	0	$1.49	$39.39	22			$83.96	$48.77
2045	14	300,000	75,000	$37.90	0	$1.49	$39.39	23			$86.90	$49.25
2046	15	300,000	0	$4.35	0	$1.49	$5.84	24			$13.33	$7.37
2047	16	300,000	0	$4.35	0	$1.49	$5.84	25			$13.80	$7.44
2048	17	300,000	0	$4.35	0	$1.49	$5.84	26			$14.28	$7.52
2049	18	200,000	0	$4.35	100,000	$9.10	$13.45	27			$34.05	$17.48
2050	19	100,000	0	$4.35	100,000	$9.10	$13.45	28			$35.24	$17.65
2051	20	0	0	$4.35	100,000	$9.10	$13.45	29			$36.47	$17.82
2052	21	75,000	75,000	$37.90	0	$1.49	$39.39	30			$110.56	$52.71
2053	22	150,000	75,000	$37.90	0	$1.49	$39.39	31			$114.43	$53.22
2054	23	225,000	75,000	$37.90	0	$1.49	$39.39	32			$118.43	$53.74
2055	24	300,000	75,000	$37.90	0	$1.49	$39.39	33			$122.58	$54.27
2056	25	300,000	0	$4.35	0	$1.49	$5.84	34			$18.81	$8.12
2057	26	300,000	0	$4.35	0	$1.49	$5.84	35			$19.47	$8.20
2058	27	300,000	0	$4.35	0	$1.49	$5.84	36			$20.15	$8.28
2059	28	200,000	0	$4.35	100,000	$9.10	$13.45	37			$48.03	$19.26
2060	29	100,000	0	$4.35	100,000	$9.10	$13.45	38			$49.71	$19.45
2061	30	0	0	$4.35	100,000	$9.10	$13.45	39			$51.45	$19.64
			900,000	$532.98	900,000	$113.31	$646.29					

AUGMENTED CHINO BASIN PROGRAM
PRELIMINARY ALTERNATIVES - CONCEPTUAL COST ESTIMATES (PRELIMINARY DRAFT)
Conceptual-Level Cost Estimate - Preliminary Draft (Rev. 2023.06.20)

Net Present Value (NPV) and Unit Water Cost Evaluation

Concept:	ACBP-2B		
Present year:	2022		
Mid-point construction	2030	set to present year for no esc. to mid-pt	
Finance period/program duration:	30	years	
Capital finance nominal interest rate:	3.00%		
Inflation rate, APY	3.50%		
Discount rate, APY	2.50%		
Capital cost (2022$):	$524.51	Mil	
Put annual O&M cost - fixed (2022$):	$1.78	Mil	
Put annual O&M cost - variable (2022$):	$9.23	Mil	
Take annual O&M cost - fixed (2022$):	$1.47	Mil	
Take annual O&M cost - variable (2022$):	$13.39	Mil	
NPV (2022) =	**$986.59**	**$Mil**	

Notes:
(1) Capital costs escalated to mid-pt construction (year 2030).
(2) CBWM fees not included.
(3) Storage losses not included.
(4) GW treatment or MPI mitigation not included.
(5) LWMWTP treatment cost not included.
(6) CVWD wheeling fees not included.
(7) Equipment replace/rehab costs not included
(8) Present value of future mid-point of construction.

Year	Storage Year No.	Balance (AF)	Put (AF)	Put O&M [$Mil, 2022$]	Take (AF)	Take O&M [$Mil, 2022$]	Ann. O&M [$Mil, 2022$]	Finance Year No.	PV of F-Cap	F-O&M	PV of F-O&M
2022								0	$524.51		
…								…			
2032	1	35,000	35,000	$11.01	0	$1.47	$12.48	10	$566.87 *(8)*	$17.61	$13.76
2033	2	70,000	35,000	$11.01	0	$1.47	$12.48	11		$18.22	$13.89
2034	3	105,000	35,000	$11.01	0	$1.47	$12.48	12		$18.86	$14.03
2035	4	140,000	35,000	$11.01	0	$1.47	$12.48	13		$19.52	$14.16
2036	5	150,000	10,000	$1.78	0	$1.47	$3.25	14		$5.26	$3.72
2037	6	160,000	10,000	$1.78	0	$1.47	$3.25	15		$5.45	$3.76
2038	7	170,000	10,000	$1.78	0	$1.47	$3.25	16		$5.64	$3.80
2039	8	113,333	10,000	$1.78	66,667	$14.86	$16.64	17		$29.86	$19.62
2040	9	56,667	10,000	$1.78	66,667	$14.86	$16.64	18		$30.90	$19.82
2041	10	0	10,000	$1.78	66,667	$14.86	$16.64	19		$31.99	$20.01
2042	11	35,000	35,000	$11.01	0	$1.47	$12.48	20		$24.84	$15.16
2043	12	70,000	35,000	$11.01	0	$1.47	$12.48	21		$25.71	$15.31
2044	13	105,000	35,000	$11.01	0	$1.47	$12.48	22		$26.61	$15.46
2045	14	140,000	35,000	$11.01	0	$1.47	$12.48	23		$27.54	$15.61
2046	15	150,000	10,000	$1.78	0	$1.47	$3.25	24		$7.42	$4.10
2047	16	160,000	10,000	$1.78	0	$1.47	$3.25	25		$7.68	$4.14
2048	17	170,000	10,000	$1.78	0	$1.47	$3.25	26		$7.95	$4.18
2049	18	113,333	10,000	$1.78	66,667	$14.86	$16.64	27		$42.12	$21.62
2050	19	56,667	10,000	$1.78	66,667	$14.86	$16.64	28		$43.59	$21.84
2051	20	0	10,000	$1.78	66,667	$14.86	$16.64	29		$45.12	$22.05
2052	21	35,000	35,000	$11.01	0	$1.47	$12.48	30		$35.04	$16.70
2053	22	70,000	35,000	$11.01	0	$1.47	$12.48	31		$36.26	$16.87
2054	23	105,000	35,000	$11.01	0	$1.47	$12.48	32		$37.53	$17.03
2055	24	140,000	35,000	$11.01	0	$1.47	$12.48	33		$38.85	$17.20
2056	25	150,000	10,000	$1.78	0	$1.47	$3.25	34		$10.47	$4.52
2057	26	160,000	10,000	$1.78	0	$1.47	$3.25	35		$10.84	$4.57
2058	27	170,000	10,000	$1.78	0	$1.47	$3.25	36		$11.22	$4.61
2059	28	113,333	10,000	$1.78	66,667	$14.86	$16.64	37		$59.41	$23.83
2060	29	56,667	10,000	$1.78	66,667	$14.86	$16.64	38		$61.49	$24.06
2061	30	0	10,000	$1.78	66,667	$14.86	$16.64	39		$63.65	$24.30
			600,000	$164.15	600,000	$164.64	$328.80				

AUGMENTED CHINO BASIN PROGRAM
PRELIMINARY ALTERNATIVES - CONCEPTUAL COST ESTIMATES (PRELIMINARY DRAFT)
Conceptual-Level Cost Estimate - Preliminary Draft (Rev. 2023.06.20)

Net Present Value (NPV) and Unit Water Cost Evaluation

Concept:	ACBP-3B		
Present year:	2022		
Mid-point construction	2030	set to present year for no esc. to mid-pt	
Finance period/program duration:	30	years	
Capital finance nominal interest rate:	3.00%		
Inflation rate, APY	3.50%		
Discount rate, APY	2.50%		
Capital cost (2022$):	$846.23	Mil	
Put annual O&M cost - fixed (2022$):	$2.93	Mil	
Put annual O&M cost - variable (2022$):	$9.23	Mil	
Take annual O&M cost - fixed (2022$):	$2.13	Mil	
Take annual O&M cost - variable (2022$):	$22.27	Mil	
NPV (2022) =	**$1,508.65**	**$Mil**	

Notes:
(1) Capital costs escalated to mid-pt construction (year 2030).
(2) CBWM fees not included.
(3) Storage losses not included.
(4) GW treatment or MPI mitigation not included.
(5) LWMWTP treatment cost not included.
(6) CVWD wheeling fees not included.
(7) Equipment replace/rehab costs not included
(8) Present value of future mid-point of construction.

Year	Storage Year No.	Balance (AF)	Put (AF)	Put O&M [$Mil, 2022$]	Take (AF)	Take O&M [$Mil, 2022$]	Ann. O&M [$Mil, 2022$]	Finance Year No.	PV of F-Cap	F-O&M	PV of F-O&M
2022								0	$846.23		
…								…			
2032	1	45,000	45,000	$12.16	0	$2.13	$14.29	10	$914.58 *(8)*	$20.16	$15.75
2033	2	90,000	45,000	$12.16	0	$2.13	$14.29	11		$20.86	$15.90
2034	3	135,000	45,000	$12.16	0	$2.13	$14.29	12		$21.59	$16.06
2035	4	180,000	45,000	$12.16	0	$2.13	$14.29	13		$22.35	$16.21
2036	5	200,000	20,000	$2.93	0	$2.13	$5.06	14		$8.19	$5.80
2037	6	220,000	20,000	$2.93	0	$2.13	$5.06	15		$8.48	$5.85
2038	7	240,000	20,000	$2.93	0	$2.13	$5.06	16		$8.77	$5.91
2039	8	160,000	20,000	$2.93	100,000	$24.40	$27.33	17		$49.05	$32.24
2040	9	80,000	20,000	$2.93	100,000	$24.40	$27.33	18		$50.77	$32.55
2041	10	0	20,000	$2.93	100,000	$24.40	$27.33	19		$52.55	$32.87
2042	11	45,000	45,000	$12.16	0	$2.13	$14.29	20		$28.44	$17.35
2043	12	90,000	45,000	$12.16	0	$2.13	$14.29	21		$29.43	$17.52
2044	13	135,000	45,000	$12.16	0	$2.13	$14.29	22		$30.46	$17.69
2045	14	180,000	45,000	$12.16	0	$2.13	$14.29	23		$31.53	$17.87
2046	15	200,000	20,000	$2.93	0	$2.13	$5.06	24		$11.55	$6.39
2047	16	220,000	20,000	$2.93	0	$2.13	$5.06	25		$11.96	$6.45
2048	17	240,000	20,000	$2.93	0	$2.13	$5.06	26		$12.37	$6.51
2049	18	160,000	20,000	$2.93	100,000	$24.40	$27.33	27		$69.20	$35.52
2050	19	80,000	20,000	$2.93	100,000	$24.40	$27.33	28		$71.62	$35.87
2051	20	0	20,000	$2.93	100,000	$24.40	$27.33	29		$74.12	$36.22
2052	21	45,000	45,000	$12.16	0	$2.13	$14.29	30		$40.11	$19.12
2053	22	90,000	45,000	$12.16	0	$2.13	$14.29	31		$41.52	$19.31
2054	23	135,000	45,000	$12.16	0	$2.13	$14.29	32		$42.97	$19.50
2055	24	180,000	45,000	$12.16	0	$2.13	$14.29	33		$44.47	$19.69
2056	25	200,000	20,000	$2.93	0	$2.13	$5.06	34		$16.29	$7.04
2057	26	220,000	20,000	$2.93	0	$2.13	$5.06	35		$16.86	$7.11
2058	27	240,000	20,000	$2.93	0	$2.13	$5.06	36		$17.45	$7.18
2059	28	160,000	20,000	$2.93	100,000	$24.40	$27.33	37		$97.61	$39.15
2060	29	80,000	20,000	$2.93	100,000	$24.40	$27.33	38		$101.02	$39.53
2061	30	0	20,000	$2.93	100,000	$24.40	$27.33	39		$104.56	$39.91
			900,000	$198.71	900,000	$264.31	$463.02				

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