Monterey Water Supply Analysis

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Water Supply Analysis Overview

- **Purpose of the Study**
- **Water Supply Gap**
- **How Alternatives Were Chosen**
- **Development of Project Costs**
- **Implementation – Schedule Risk Analysis**

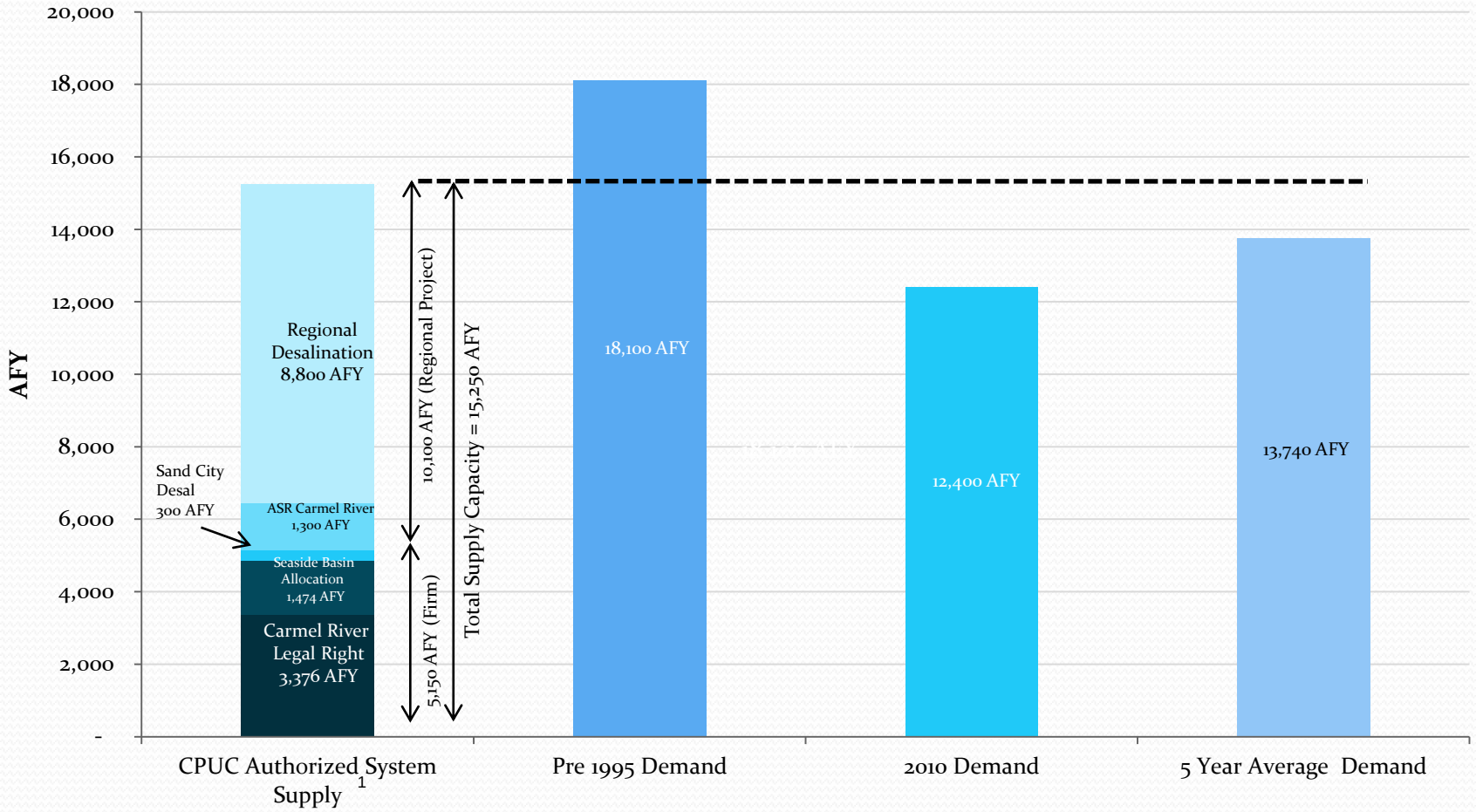
Water Supply Study Goal

- "Apples to Apples" comparison of project alternatives to solve the water supply deficit
- Physical solutions only--Considers all infrastructure needed to deliver water supply deficit
- Considers total capital cost, annualized capital costs, and annual operating costs
- Permitting Schedule Risk Analysis --Can we still meet CDO "cliff"?

Water Supply Gap

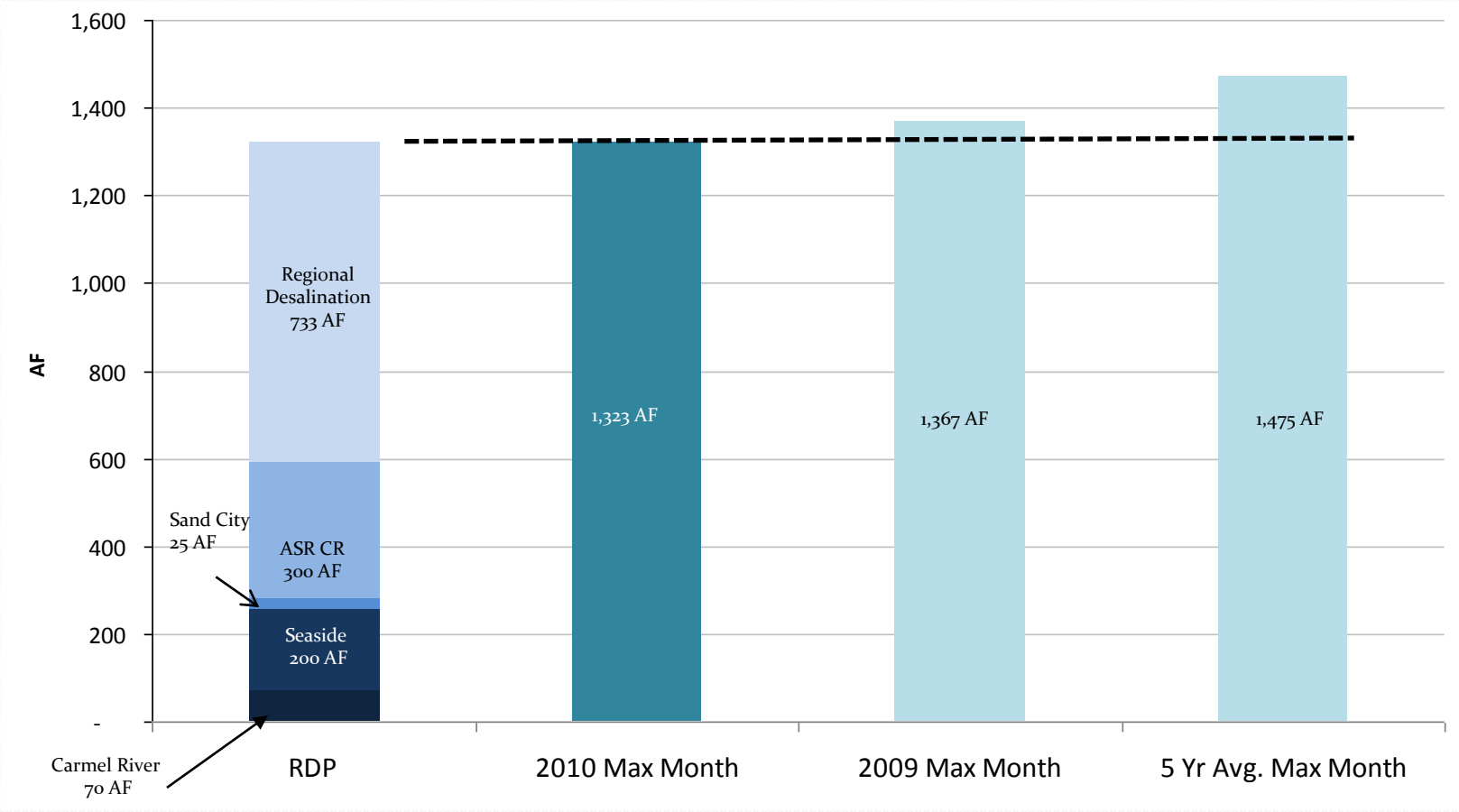
- EIR / CPUC Authorized Replacement Supply = 10,100 AFY
- Replacement supply includes Desal + ASR
- All project alternatives designed to supply 10,100 AFY replacement supply.

Project Supply and System Demand



1. CPUC Authorized amount is based on approved EIR

Project Supply and System Demand – Max. Month



How Alternatives Were Chosen

- Based on widely discussed project elements:
  - Desalination
  - Aquifer Storage and Recovery (ASR)
  - Indirect Potable Reuse aka Groundwater Recharge (GWR)
  - Salinas River
- Project elements packaged to form complete solution (10,100 AFY)
- Considered all physical infrastructure required
- Most of “CAW Only Facilities” are common to all alternatives.

Alternatives	
Alternative 1	Marina Desal Project
Alternative 2	Reduced Marina Desal Project with 2,700 AFY GWR
Alternative 3*	Lower Carmel Valley Filtration Plant + Extended ASR System
Alternative 4*	Lower Carmel Valley Filtration Plant + Extended ASR System + 2,700 AFY GWR
Alternative 5*	LCVFP + Desal Plant in Marina + Extended ASR System
Alternative 6*	LCVFP + Sand City Desal Expansion + Extended ASR System
Alternative 7*	LCVFP + Monterey Desal Plant + Extended ASR System
Alternative 8*	Lower Carmel Valley Iron Removal Plant + Monterey Desal Plant + Extended ASR System
Alternative 9	Salinas River Filtration Plant + Extended ASR System
Alternative 10	Deep Water Desalination at Moss Landing
Alternative 11	5 MGD Marina Desal, 2,700 AFY GWR, existing ASR and Conservation or Table 13 Direct Diversion

*** Alternatives promoting an increase in high flow river diversions above those currently permitted may be difficult to permit**

Alternatives 1, 2 & 11

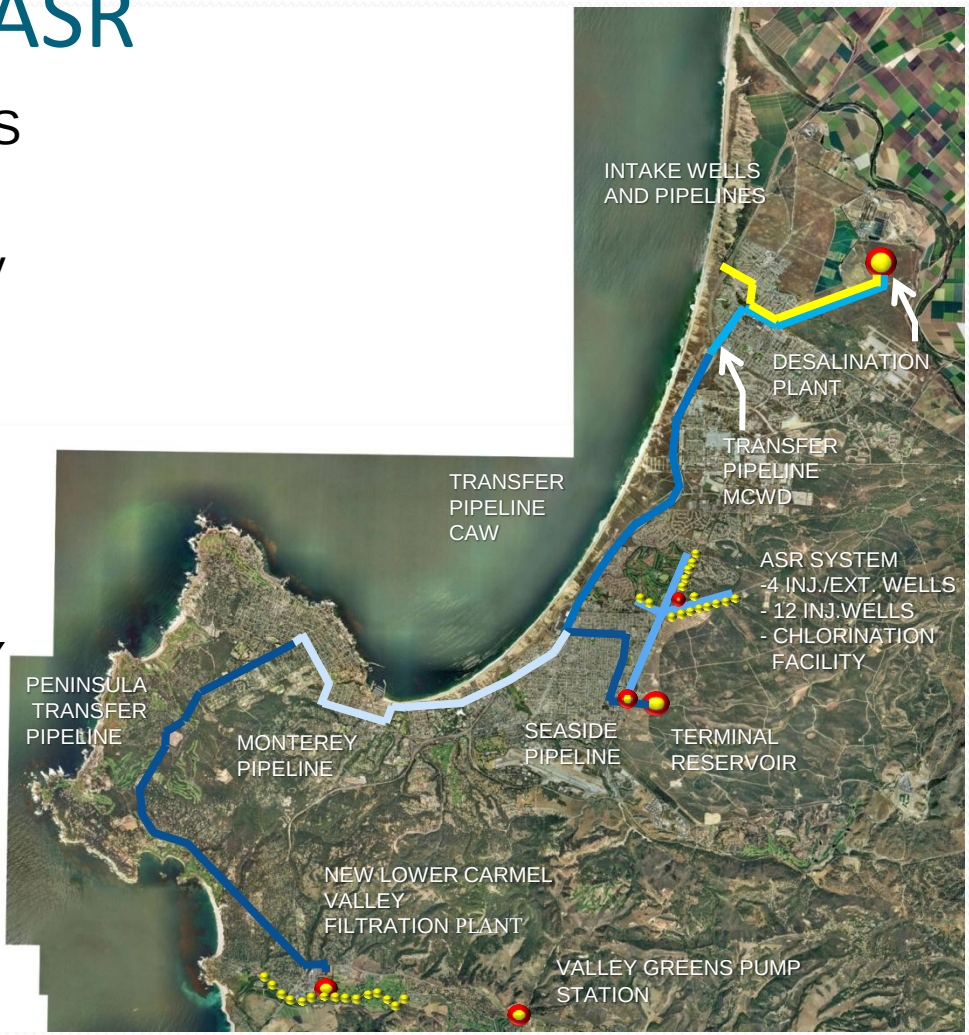
- INTAKE WELLS AND PIPELINES
- DESALINATION PLANT
- CONVEYANCE FACILITIES – by others
- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- GWR SUPPLY FROM MRWPCA (ALTERNATIVES 2 AND 11)
- INCREASED CONSERVATION (ALTERNATIVE 11 ONLY)

Alternatives 3 and 4 - LCVFP + Extended ASR

- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- NEW LOWER CARMEL VALLEY FILTRATION PLANT
- GWR SUPPLY FROM MCWPCA (ALTERNATIVE 4 ONLY)

Alternative 5 - LCVFP + Desal Plant in Marina + Extended ASR

- INTAKE WELLS AND PIPELINES
- DESALINATION PLANT
- CONVEYANCE FACILITIES – by others
- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- NEW LOWER CARMEL VALLEY FILTRATION PLANT



Alternative 6 - LCVFP + Sand City Desal Expansion + Extended ASR

- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- NEW LOWER CARMEL VALLEY FILTRATION PLANT
- SAND CITY DESALINATION PLANT EXPANSION

Alternative 7 - LCVFP + Monterey Desal Plant + Extended ASR

- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- NEW LOWER CARMEL VALLEY FILTRATION PLANT
- MONTEREY DESALINATION PLANT

Alternative 8 – LCVIRP + Monterey Desal Plant + Extended ASR

- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM
- NEW CARMEL VALLEY IRON REMOVAL PLANT
- MONTEREY DESALINATION PLANT

Alternative 9 – SRFP + Extended ASR

- INTAKE STRUCTURE AND PUMP STATION
- SALINAS RIVER FILTRATION PLANT
- CONVEYANCE FACILITIES – MCWD
- CONVEYANCE FACILITIES – CAW
- TERMINAL RESERVOIR
- ASR SYSTEM

Alternative 10

- INTAKE, INTAKE PUMP STATION, DESALINATION PLANT AND NEW OUTFALL BY DWD AT MOSS LANDING
- CONVEYANCE FACILITIES BY CAW
- TERMINAL RESERVOIR
- ASR SYSTEM

Development of Project Costs

- Capital Cost estimates are consistent with unit costs and methods of the CPUC Joint Committee.
  - Estimates are for the mid-point between most probable cost and highest probable cost
- Economic analysis assumptions based on Capital Recovery Factor Methodology.
  - Engineering/economic tool used to compute an annual cost from a total cost
  - Used 8.5% & 3% for high & low interest rates, and 30 year term

Development of Project Costs (Cont'd)

- O&M costs based on detailed calculations of power, labor, chemical, and maintenance requirements

- Cost per Acre Foot =

$$\frac{\text{(Annualized Capital Cost + O\&M Cost)}}{\text{AFY Water Produced}}$$

Development of Project Costs - Example

$$CRF_{8.5,30} = \left[\frac{i(+i)^n}{(+i)^n - 1}\right] = \left[\frac{0.085(+0.085)^{30}}{(+0.085)^{30} - 1}\right] = 0.093$$

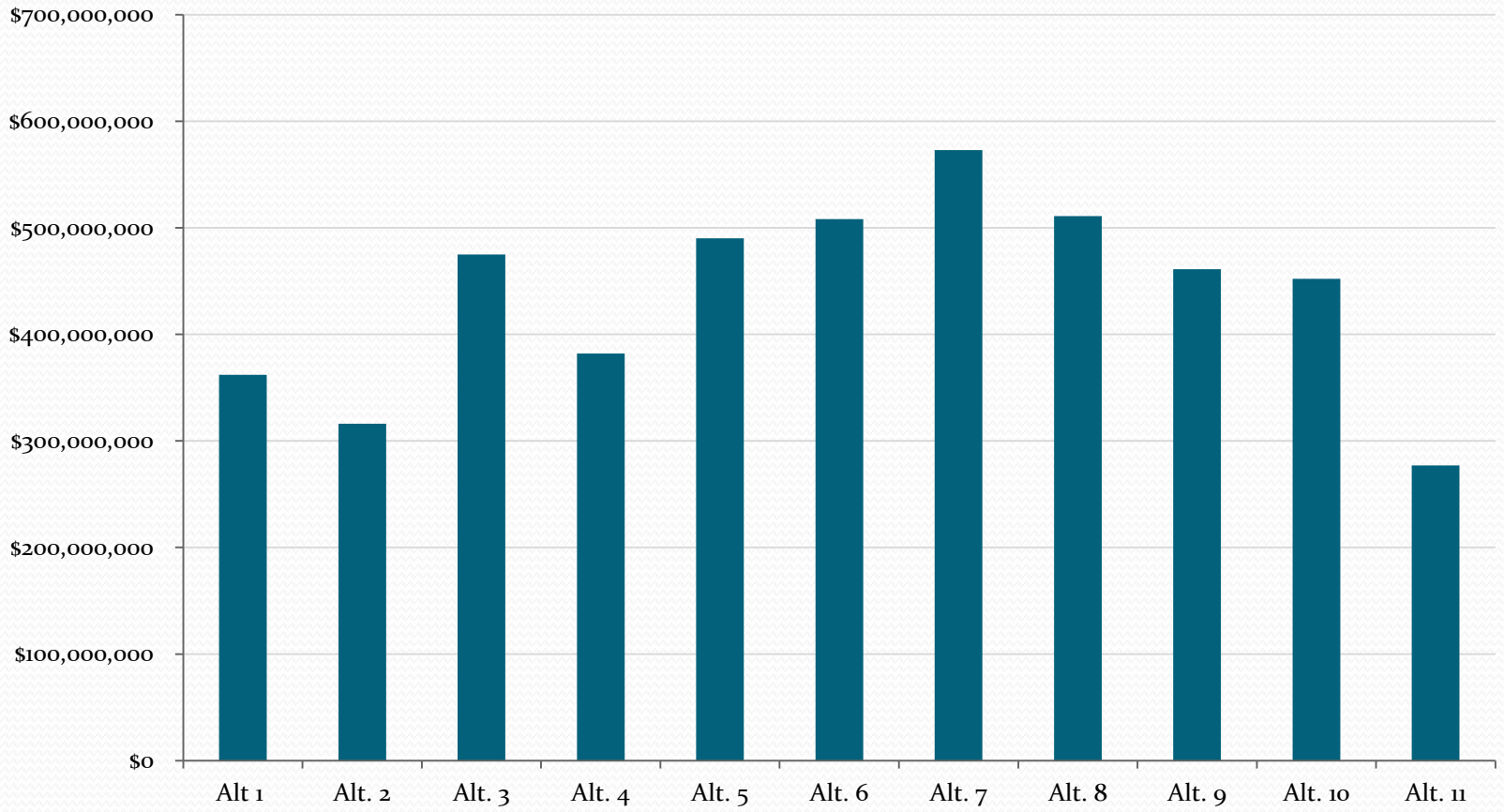
For Alternate No.1

$$\text{Total Annual Cost(TAC)} = (CRF_{8.5,30}) * (\text{Total Project Cost}) + (\text{O \& M Cost})$$

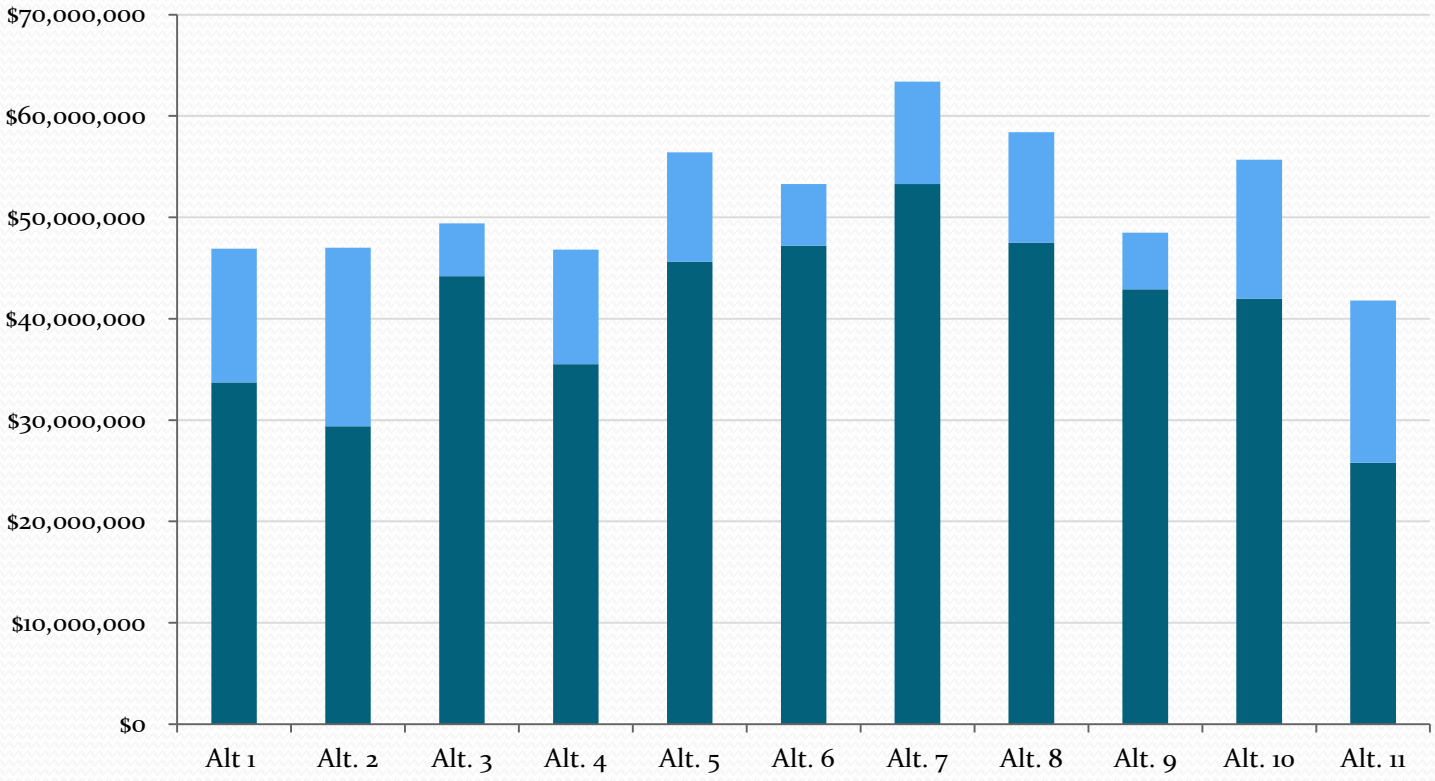
$$\text{TAC} = 0.093 * 362\text{M} + 13.2\text{M} = \$46.9M$$

$$\$/AFY = \frac{\$46{,}900{,}000}{11{,}800\,AFY} = \$3{,}970/AFY$$

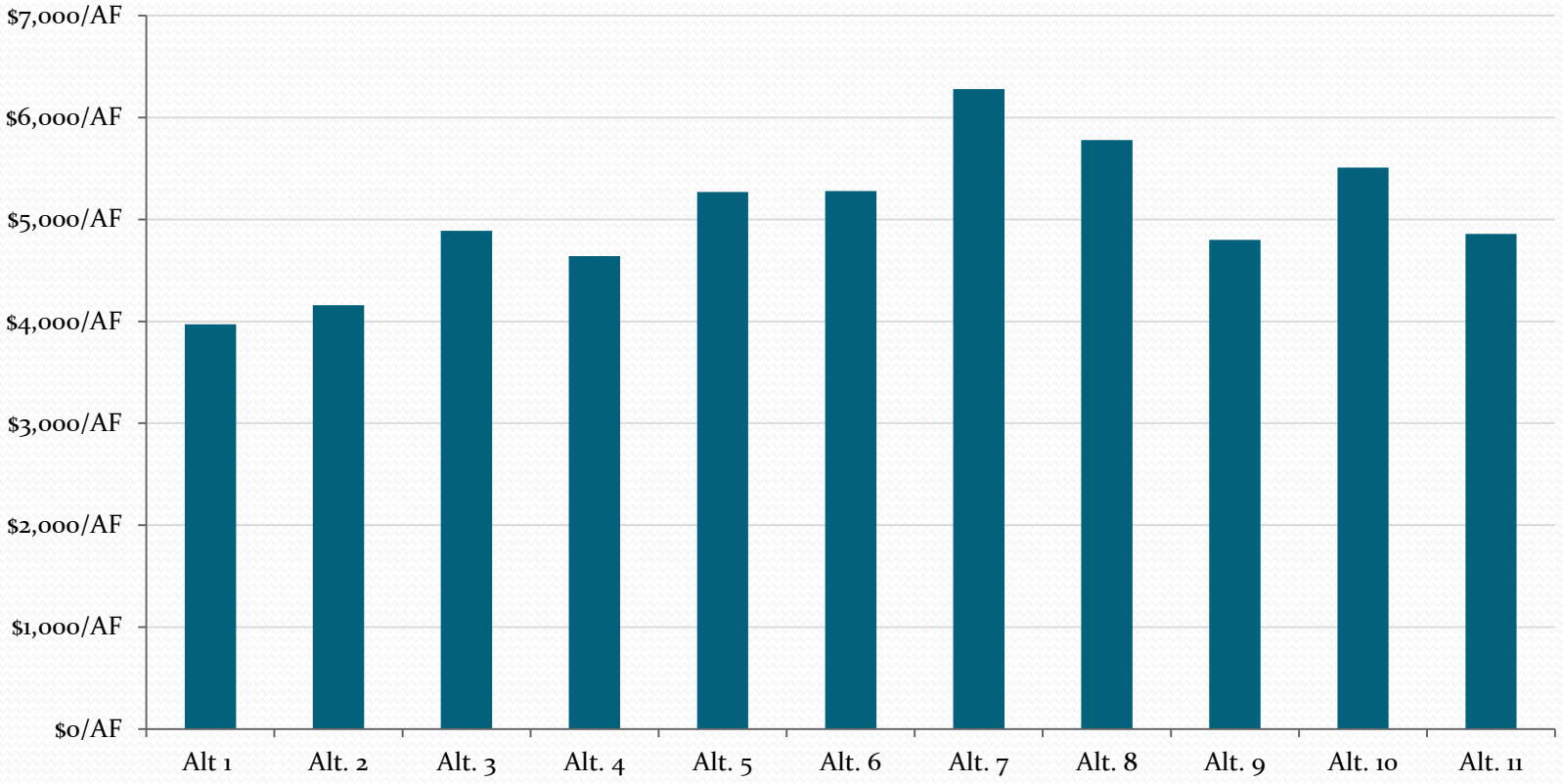
Total Capital Costs



Total Annualized Capital and O&M/Annual Costs



Unit Costs ($/AF)



Implementation – Schedule Risk Analysis

- Evaluated Schedule Risk of not meeting the 2017 CDO "cliff".
  - Pass or fail analysis – Can we meet the CDO deadline.
- Schedule for each alternative is "best case scenario"
  - Considered critical path items
  - Considered most optimistic path for permitting
- Risk Factors Considered
  - Technical Issues
  - Environmental and Regulatory Permits
  - Other Implementation Activities
- Actual implementation time equals Critical Path + Risk Factors

Schedule Basics

- All alternatives would require modification of CPUC's EIR. If external project is included, CEQA documentation of external project must be completed before CPUC EIR modification can be included.

- All alternatives would require reapplication and approval of CPCN. If water purchase is involved, water purchase agreements must be negotiated before CPCN can be approved.

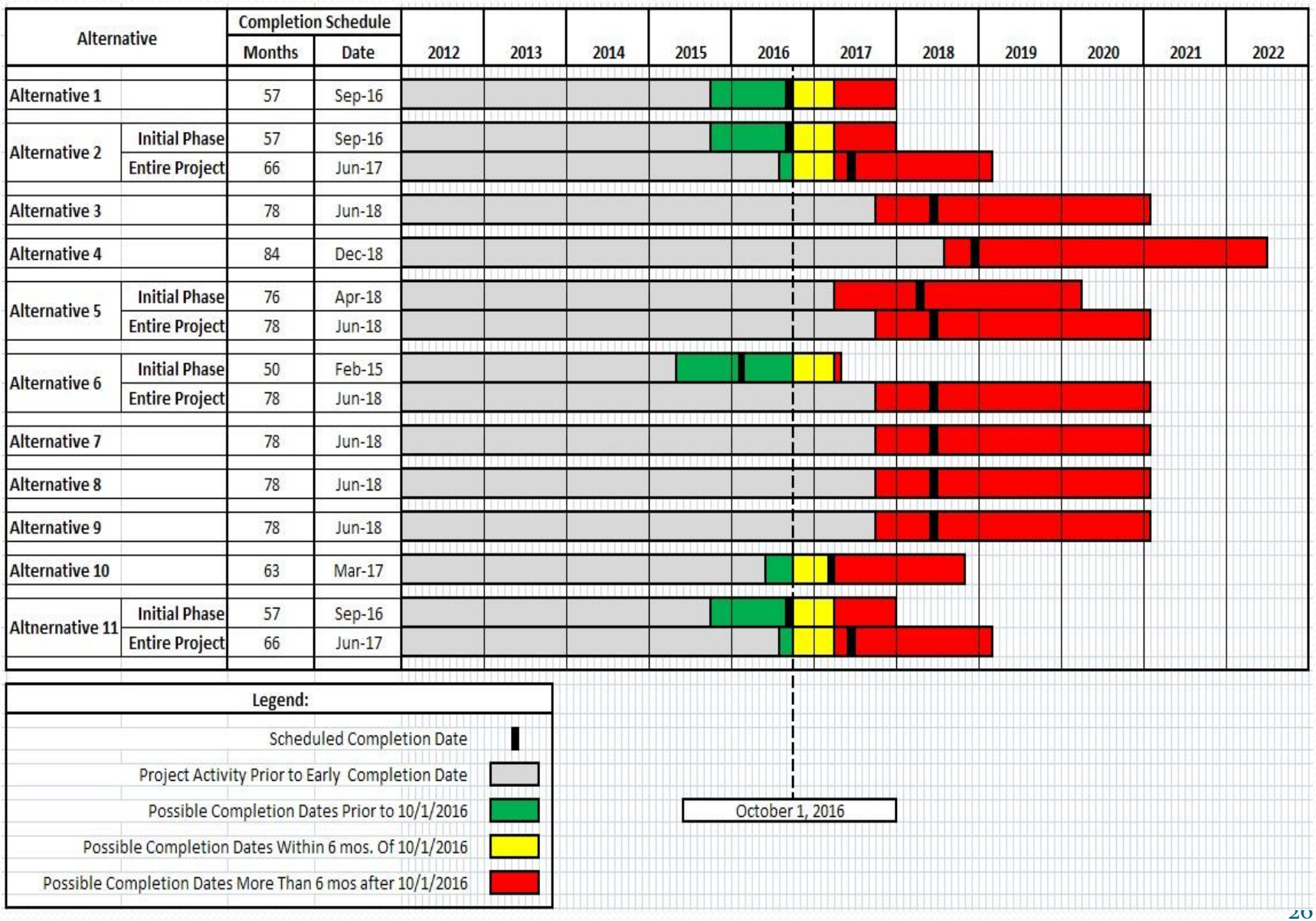
- All alternatives require Coastal Development Permit. This will not be granted until CPCN is approved.

Schedule Basics (Cont'd)

- Land acquisition or design can't start until CPCN is approved.
- ASR system can't be constructed until water rights are secured.
- No construction in Coastal Zone without CDP.
- Schedule risk is different for each alternative. Schedule risk affects accuracy of predicting the schedule.

Summary of Schedule Analysis of Alternatives

Alternative		Completion Schedule	
		Months	Date
Alternative 1		57	Sep-16
Alternative 2	Initial Phase	57	Sep-16
	Entire Project	66	Jun-17
Alternative 3		78	Jun-18
Alternative 4		84	Dec-18
Alternative 5	Initial Phase	76	Apr-18
	Entire Project	78	Jun-18
Alternative 6	Initial Phase	50	Feb-15
	Entire Project	78	Jun-18
Alternative 7		78	Jun-18
Alternative 8		78	Jun-18
Alternative 9		78	Jun-18
Alternative 10		63	Mar-17
Altnernative 11	Initial Phase	57	Sep-16
	Entire Project	66	Jun-17



RBF's Recommended Alternative

- Alternative 1 is fastest project with lowest schedule risk, and lowest unit cost of water
- Secure CPUC approval of 10 mgd desalination plant, but start with initial phase of 7.5 mgd
  - Phase 1 project will be have sufficient capacity to meet existing demands
  - Initial capital cost savings of $30 – 40 million
  - Design to allow future rapid plant expansion from 7.5 mgd to 10 mgd if needed
- Delay final desalination plant expansion as long as possible to allow other water supply options to be explored as future project(s)

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Monterey Water Supply Analysis

Monterey Peninsula Water Forum

October 26, 2011

AF = Acre-feet
AFY = Acre-feet per year
ASR = Aquifer, Storage and Recovery
GWR = Groundwater Replenishment
LCVFP = Lower Carmel Valley Filtration Plant
LCVIRP = Lower Carmel Valley Iron Removal Plant
MGD = Million gallons per day

Alternative	Components	Capital Cost	Annualized Cost ($M/YR)	Unit Cost ($/AF)	Estimated Completion Date	Schedule Risk
1	10 MGD Marina Desal + 1,300 AFY ASR	$362M	$46.9	$3,970	2016	Low
2	6.5 MGD Marina Desal* + GWR	$316M	$47	$4,160	2017	Medium
3	LCVFP + 6,900 AFY ASR	$475M	$49.4	$4,890	2018	High
4	LCVFP + 6,900 AFY ASR + GWR	$382M	$46.8	$4,640	2018	Severe
5	LCVFP + 3.5 MGD Marina Desal* + 5,500 AFY ASR	$490M	$56.4	$5,270	2018	High
6	LCVFP + Sand City Desal Expansion* (from 0.3 MGD to 1.0 MGD) + 6,500 AFY ASR	$508M	$53.3	$5,280	2018	High
7	LCVFP + 3 MGD Monterey Desal + 5,200 AFY ASR	$573M	$63.4	$6,280	2018	High
8	LCVIRP + 5 MGD Monterey Desal + 5,100 AFY ASR	$511M	$58.4	$5,780	2018	High
9	35 MGD Salinas River Filtration Plant + 6,900 AFY ASR	$461M	$48.5	$4,800	2018	High
10	10 MGD Deep Water Desalination at Moss Landing	$452M	$55.7	$5,510	2017	Medium
11	5 MGD Marina Desal* + GWR + 2,700 AFY ASR and 1,500 AFY additional conservation or Table 13 Carmel River direct diversion	$277M	$41.8	$4,860	2017	Medium

*** Starred components could be phased for completion prior to estimated project completion date.**

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