IWP Cost Development

COST DEVELOPMENT OBJECTIVES

Objective 1 (for IWPAC):

- Analyze and compare resource & facility options
- Costs reported in 2005 dollars to allow consistent basis for comparison

Objective 2 (for IWPAC Funding Subcommittee):

- Analyze and compare funding options for IWP scenarios
- Costs reported as projected outlays in future years with contingencies and inflation
- Cash-flow analysis

COST DEVELOPMENT OBJECTIVES

Objective 1 - Resource and Facility Options

Estimated capital costs for resources & facilities includes:

- Administration
- Engineering Design
- Rights-of-Way
- Construction
- Regulatory Compliance
- Other Capital Outlays (e.g., payments for Arizona Water Bank)

Costs reported as 2005 dollars

COST DEVELOPMENT OBJECTIVES

Objective 2 – Funding Options

Estimated capital costs for funding analysis includes:

- Capital costs for resources and facilities
- Cost estimating contingencies
- Inflation at a rate of 2.5% per year
- Timing of outlays based on sequencing of resource options in scenarios

Costs reported as future outlays

COST DEVELOPMENT OBJECTIVES

Objective 1 Example (for IWPAC):

- 6 Basin Approach capital costs are ~ $1.9 billion in 2005 dollars

Objective 2 Example (for IWPAC Funding Subcommittee):

- 6 Basin Approach capital costs are ~ $1.952 billion
- Apply 30% contingency on construction costs
- Assume project funding period for Scenario 2: 2010 – 2031
- Assume 2.5% inflation
- Funding costs = capital costs + contingency + inflation
- 6 Basin Approach funding costs for Scenario 2 are ~ $3.113 billion in future dollars

Estimated Costs for IWP Scenario 1

Resource Option	Est. Capital Cost in 2005 Dollars	Est. Outlays in Future Dollars
Arizona Water Bank	$280 Million	**Cash flow analysis not performed for this scenario**
Three Lakes & Tikaboo South Valleys	$55 Million	
Coyote Spring Valley	$35 Million	
Pre-Compact Water Rights	$40 Million	
Virgin River Surface Diversion	$1.13 Billion	
Groundwater – Five Basin Approach	Not Included	
Groundwater – Six Basin Approach	Not Included	
Additional Conservation	Not Included	
Total	**$1.539 Billion**	
Total w/ Contingency	**$1.832 Billion**	

Estimated Costs for IWP Scenario 2

Resource Option	Est. Capital Cost in 2005 Dollars	Est. Outlays in Future Dollars	Period of Outlays
Arizona Water Bank	$280 Million	$330 Million	2005-2018
Three Lakes & Tikaboo South Valleys	$55 Million	$71.7 Million	2005-2008
Coyote Spring Valley	$35 Million	$45.4 Million	2006-2008
Pre-Compact Water Rights	$40 Million	$45.9 Million	2008-2013
Virgin River Surface Diversion	Not Included	Not Included	NA
Groundwater – Five Basin Approach	Not Included	Not Included	NA
Groundwater – Six Basin Approach	$1.952 Billion	$3.113 Billion	2010-2031
Additional Conservation	Not Included	Not Included	NA
Total	**$2.361 Billion**	**NA**	
Total w/ Contingency	**$2.851 Billion**	**$3.606 Billion**	

Estimated Costs for IWP Scenario 3

Resource Option	Est. Capital Cost in 2005 Dollars	Est. Outlays in Future Dollars	Period of Outlays
Arizona Water Bank	$280 Million	$330 Million	2005-2018
Three Lakes & Tikaboo South Valleys	$55 Million	$71.7 Million	2005-2008
Coyote Spring Valley	$35 Million	$45.4 Million	2006-2008
Pre-Compact Water Rights	$40 Million	$45.9 Million	2008-2013
Virgin River Surface Diversion	Not Included	Not Included	NA
Groundwater – Five Basin Approach	$1.787 Billion	$2.82 Billion	2011-2020
Groundwater – Six Basin Approach	Not Included	Not Included	NA
Additional Conservation	Not Included	Not Included	NA
Total	**$2.196 Billion**	**NA**	
Total w/ Contingency	**$2.647 Billion**	**$3.313 Billion**	

Estimated Costs for IWP Scenario 4

Resource Option	Est. Capital Cost in 2005 Dollars	Est. Outlays in Future Dollars	Period of Outlays
Arizona Water Bank	$280 Million	$330 Million	2005-2018
Three Lakes & Tikaboo South Valleys	$55 Million	$71.7 Million	2005-2008
Coyote Spring Valley	$35 Million	$45.4 Million	2006-2008
Pre-Compact Water Rights	$40 Million	$45.9 Million	2008-2013
Virgin River Surface Diversion	$1.13 Billion	$1.581	2007-2017
Groundwater – Five Basin Approach	Not Included	Not Included	NA
Groundwater – Six Basin Approach	$1.952 Billion	$3.657 Billion	2016-2037
Additional Conservation	Not Included	Not Included	NA
Total	**$3.491 Billion**	**NA**	
Total w/ Contingency	**$4.252 Billion**	**$5.731 Billion**	

Projects Cost Summary - rev1

Project Components	AZ Water Bank ($)	Pre-Compact Water Rights SW 1 ($)	Virgin River Radial Wells SW 2 ($)	Virgin River Surface Diversion SW 3 ($)	Three Lakes Valley Groundwater 3L ($)	Coyote Spring Valley Groundwater CS ($)	Five Basin Approach (Spring) GW 1 ($)	Six Basin Approach (Snake) GW 2 ($)
Yield (AFY) =	**68,200**	**20,000**	**28,000**	**60,000**	**8,000**	**9,000**	**100,000**	**125,000**
Project Cost								
Pumping Stations			50,070,000	88,880,000			44,000,000	55,000,000
Pipelines			142,430,000	218,810,000	27,930,000	1,410,000	1,008,000,000	1,081,000,000
Wells			20,000,000		8,600,000		124,000,000	145,000,000
Treatment			232,520,000	412,990,000	1,200,000		44,400,000	47,400,000
Terminal Reservoir							6,600,000	6,600,000
Power Supply			30,880,000	29,370,000	2,220,000		136,560,000	154,560,000
Hydroturbine Energy Recovery / ROFC			7,690,000	9,280,000	600,000	200,000	18,000,000	18,000,000
Environmental Mitigation			5,220,000	5,490,000	3,220,000	138,000	48,000,000	54,000,000
Halfway Wash Reservoir				129,339,000				
Virgin River Diversion				8,380,000				
Land Acquisition			1,270,000	1,310,000				
340A Pipeline						26,200,000		
Construction Cost	**0**	**0**	**490,080,000**	**903,849,000**	**43,770,000**	**27,948,000**	**1,429,560,000**	**1,561,560,000**
Program Admin 25%	0	0	122,520,000	225,962,250	10,942,500	6,987,000	357,390,000	390,390,000
Acquistion Cost		40,000,000						
Capital Cost	**279,546,000**	**40,000,000**	**612,600,000**	**1,129,811,250**	**54,712,500**	**34,935,000**	**1,786,950,000**	**1,951,950,000**
Annualized Capital Cost ($/AF)	**282**	**138**	**1,505**	**1,296**	**471**	**267**	**1,230**	**1,074**
O&M Cost								
Parts & Labor	12,230,000	3,000,000	2,038,000	3,460,000	154,500	1,350,000	3,240,000	3,488,500
Inter-basin Transfer Fee							600,000	750,000
Pumping Stations - Power			4,335,000	11,085,000			4,527,964	7,358,709
Wells - Power			788,000		445,837	573,000	8,210,514	9,399,654
Treatment - Power			2,779,200	6,686,000	18,000		117,600	133,750
Treatment - Chemicals			8,400,000	19,410,000	18,000		372,000	472,500
Treatment - Resin Repl/Disposal							666,000	693,750
Treatment - Membranes			916,991	1,372,000				
Treatment - Evaporation Ponds			665,520	1,690,000				
Hydropower - Revenues			(381,000)	(1,111,000)			(8,646,177)	(11,198,759)
Reservoir & Diversion Maintenance				2,000,000				
Subtotal	**12,230,000**	**3,000,000**	**19,541,711**	**44,592,000**	**636,337**	**1,923,000**	**9,087,901**	**11,098,104**
Annualized O&M Cost ($/AF)	**179**	**150**	**698**	**743**	**80**	**214**	**91**	**89**
Total Annualized Cost ($/AF)	**461**	**288**	**2,203**	**2,039**	**550**	**481**	**1,320**	**1,163**

*** Costs does not include contingencies**

Annualized cost factor (30 yr amort) = $i / (1 - (1 + i)^{-n})$ = 0.0688

Annualized Capital Cost ($/AF) = (Capital Cost * Ann. factor) / yield

Annualized O&M Cost ($/AF) = O&M Cost / yield

interest rate, i = 5.5%

years financed, n = 30

Inter-basin Transfer Fee ($/AF) = $6

SNWS O&M Cost factor ($/AF) = $150

AZ Bank Recovery Cost factor ($/AF) = $50

AZ Bank O&M Cost ($) = (150+50)x40000 + 150x28200

Projects Cost with Augmentation

AZ Water Bank

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
AZ Bank	**68,200**		**280**	**12.2**	**282**	**179**	**461**

SW 1 - Pre-Compact Water Rights

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
SW 1	20,000		40	3.0	138	150	288
Augmentation	*14,000*			*2.1*	*0*	*150*	*150*
Total	**34,000**	**0**	**40**	**5.1**	**81**	**150**	**231**

SW 3 - Virgin River Surface Diversion

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
SW 3	60,000	904	1,130	44.6	1,296	743	2,039
Augmentation	*42,000*			*6.3*	*0*	*150*	*150*
Total	**102,000**	**904**	**1,130**	**50.9**	**762**	**499**	**1,261**

SW 2 - Virgin River Radial Well Diversion

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
SW 2	28,000	490	613	19.6	1,505	698	2,203
Augmentation	*19,600*			*2.9*	*0*	*150*	*150*
Total	**47,600**	**490**	**613**	**22.5**	**885**	**472**	**1,358**

3L - Three Lakes Valley Groundwater

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
Three Lakes	8,000	44	55	0.6	471	80	550
Augmentation	*5,600*			*0.8*	*0*	*150*	*150*
Total	**13,600**	**44**	**55**	**1.5**	**277**	**109**	**385**

CS - Coyote Spring Valley Groundwater

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
Coyote Spring	9,000		35	1.9	267	214	481
Augmentation	*6,300*			*0.9*	*0*	*150*	*150*
Total	**15,300**	**0**	**35**	**2.9**	**157**	**187**	**345**

GW 1 - Five Basin Approach (Spring Valley)

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
GW 1	100,000	1,430	1,787	9.1	1,230	91	1,320
Augmentation	*70,000*			*10.5*	*0*	*150*	*150*
Total	**170,000**	**1,430**	**1,787**	**19.6**	**723**	**115**	**838**

GW 2 - Six Basin Approach (Snake Valley)

Project	Yield (AFY)	Const. Cost ($ million)	Capital Cost ($ million)	O&M Cost ($ million/yr)	Annualized Cost ($/AF)		
					Capital	O&M	Total
GW 2	125,000	1,562	1,952	11.1	1,074	89	1,163
Augmentation	*87,500*			*13.1*	*0*	*150*	*150*
Total	**212,500**	**1,562**	**1,952**	**24.2**	**632**	**114**	**746**

*** Costs does not include contingencies**

Annualized cost factor (30 yr amortization) = $i / (1 - (1 + i)^{-n})$ = 0.0688

Annualized Capital Cost ($/AF) = (Capital Cost * Ann. factor) / yield i = 5.5% interest rate

Annualized O&M Cost ($/AF) = O&M Cost / yield n = 30 years financed

SNWS O&M Cost factor ($/AF) = $150

AZ Bank Recovery Cost factor ($/AF) = $50

AZ Bank O&M Cost ($) = (150+50)x40000 + 150x26900 = $12 million