ADDITIONAL NOTES

Elements 1&2: In lieu/ASR: Capital Costs

1. Infrastructure is sized to accommodate In-lieu plus ASR (to allow peak flow for recharge of 5 mgd -- 2.5 mgd out to Soquel Creek and 2.5 mgd to Scotts Valley).
2. All infrastructure costs needed for the in lieu program are included in the in lieu option. The ASR capital costs added to the in-lieu costs for the combined option include only additional elements that would be needed for doing recharge and recovery: i.e., pipeline to Beltz field, additional wells and treatment of the extracted water.
3. In a departure from previous Building Blocks, a pipeline is included to the Beltz Wells in the in lieu option, and 4 wells in Santa Cruz are included in the ASR option. This is to allow flexibility in where the water is moved.

O&M Costs

1. Operations for recharge and for recovery are set at 180 days each for both in lieu and ASR.
2. Flow rates are similar to previous building block scenarios. Cost includes both sending water out to SqCWD and SVWD and later sending water back to SCWD.
3. Average flow rate for costing in lieu returns = 2 mgd, split evenly between Soquel Creek and Scotts Valley.
4. Average flow rate for costing ASR = 2.5 mgd out (same volume would be available for transfer whether it was in lieu or ASR, and this also maintains consistency), split evenly between SqCWD and SVWD. Flow back would be 80% of that volume, or 2 mgd.
5. Well extraction pumping in SVWD or SqCWD is ***not*** included - it is roughly balanced out by the energy savings of not running wells in SqCWD and in SVWD when in lieu water is being sent.
6. Cost and energy use estimates for combined In-lieu and ASR would be higher if less water were directed to in-lieu and instead directed to ASR (e.g., more water injected if more goes to ASR)

Element 3

General assumptions

1. Potable reuse capacity is designed for 3-mgd *product water 365 days a year* based on treating only City of Santa Cruz flows. (I.e., Conservatively assuming SqCWD and SVWD were unavailable.)
2. Infrastructure for potable reuse treatment is identical for all potable reuse alternatives. Treatment is on-site at the WWTP. Costs to treat bleneded water at GHWTP not included (~$2.7M/yr)

Element 3a: DPR

1. DPR water sent to Bay Street Reservoir. Energy calculation uses very conservative estimate that existing pressure pipe will not be changed.(A pipeline improvement would decrease energy needs)
2. NOTE: It is reasonable to assume that this would be investigated and a lower-pressure operating scenario might be found. This could significantly reduce the energy cost per MG.

Element 3b: IPR to Loch Lomond

1. A very significant portion of energy use is embedded in the pumping costs to move water ~800 ft. up to Loch Lomond.

Element 3c: IPR for Groundwater Recharge

1. Groundwater recharge is assumed to occur near the coast.
2. Eight wells included for 3 mgd capacity scenario used here.

Element 3d: Local Desal

1. The City desalination option capacity is 3 mgd.
2. Cost now includes property rights acquisition.
3. An O&M cost element for lifting the water to Bay Street has been added (instead of into the distribution system at a lower point).

Project Elements Summary *29-Sep-15*

	Element	1	2	3a	3b	3c	3d
	Building Block Approach	In-Lieu	ASR and In-Lieu Combined*	DPR Small (3 mgd)	IPR-Loch (3 mgd)	IPR-GW (3 mgd)	Local Desal (3mgd)
a	Capital Cost ($ M)	131	159	89	132	119	147
b	Annual O&M cost ($ M/yr)	2.6	3.7	3.5	5.2	4.2	3.9
c	Total Annualized Cost ($ M/yr)	11.6	14.6	9.6	14.3	12.4	14.0
d	Present Value Costs ($M)	185	237	162	241	207	229
e	Energy Use (MWH/MG)	5.8	6.5	8.3	9.3	8.8	12.5
h	Worst Year Yield (MG)	750	760	810	660	740	810
i	Average Year Yield (MG)	350	380	440	430	380	440
j	Worst year yield unit cost (Total Ann Cost/Wst Yr Yield)	15,500	19,300	11,900	21,600	16,700	17,300
k	Average year yield unit cost (Total Ann Cost/Ave Yr Yield)	33,200	38,500	21,900	33,200	32,600	31,800
l	Worst Year Peak Season Shortage (MG)	480	470	420	570	490	420
m	Worst Year Peak Season Shortage (%)	25%	24%	22%	29%	25%	22%
n	Average Year Peak Season Shortage (MG)	120	90	30	40	90	30
o	Average Year Peak Season Shortage (%)	6%	5%	2%	2%	5%	2%

* Both the costs and yields in this column reflect the combined costs of implementing both in-lieu and ASR.

NOTES:

1 All estimates are preliminary, rounded, and subject to revision and refinement as more detailed analysis is developed

2 Total annualized costs based on amortizing capital outlays using a capital recovery factor of 0.0688 (reflecting a 30-year bond term at a 5.5% rate of interest to estimate the annual payment), and adding annual O&M costs (updated approach v July)

3 Present Value Costs calculated based on capital outlays occuring in first year, followed by 30 years of annual O&M expense, discounted to present worth using a 2.5% real discount rate. No inflation escalation included

4 ASR costs and yields reflect the *combined* cost and yields associated with adding ASR to the In-lieu program. Energy use for the combined ASR and In-Lieu elements reflect a volume-weighted average across the two elements.

5 Potential for revenues from water sales, cost sharing, and grant funding are not reflected.

6 All Element 3 options scaled at 3 mgd, reflecting potential reuse production based soley on City of Santa Cruz effluent flows.

7 see additional notes on following page

C = Averaged Costs (All BBs)

	-30%	Mean	+30%
Worst Yr	11,935	17,050	22,165
Avg Yr	22,307	31,867	41,427
	median	32,900	1.03

C' = Averaged Costs (Element 3 BBs)

	-30%	Mean	+30%
Worst Yr	11,813	16,875	21,938
Avg Yr	20,912	29,875	38,837
	median	32,200	1.08

C'' = Averaged Costs (Element 1 & 2 BBs)

	-30%	Mean	+30%
Worst Yr	12,180	17,400	22,620
Avg Yr	25,095	35,850	46,605
	median	35,850	1