Framing Questions: Topics of Interest			
Colorado River Water Supply	**Upper Basin Demands**	**AZ On-River Demand**	**CAP Water Uses**
Return to historical 10 year average pre-2010 for normal snowpack and precipitation	Impact of Utah Pipeline	Impact of proposed water transfers to non-river entities	Impact of AZ state mandate for M&I to reduce CU by 10%
High end of possible inflow (Observed Hydrology)	High end of future UB use (2016 UCRC Schedule)	Increased ag CU due to dry conditions (Upper range = 2008-2019 CU can be compared to 0.1% growth)	Sensitivity analysis of slow vs. fast contract use and utilization
Realistic estimate of future inflow (Stress Test Hydrology)	Representation of UB use (2008-2018 Interim Guidelines Schedule)	Similar to AZ baseline modeling assumptions	Overlap between moderate and aggressive in LTSC creation
High vs. low flow	Decrease in tributary streamflow for ag diversion (2008-2018 Upper Basin CU)	Impacts of on-river transfers	High vs. low CAP demand
Conservative hydrology (GCM or stress test)	Similar to AZ baseline modeling assumptions	Increase in demands/ag CU due to climate change	Influence of climate change on demand (increased)
Wettest vs Driest, and a median in between	UB demands at 2016 UCRC and 1988-2018 estimates (Stress test?)	Growth of on-river communities and tribal areas	Exploration of all utilization and demand components options
Increased temperatures and dry soil conditions vs. wetter conditions to show full range	Growth based on recent trends (more people moving to UB?)	Future of on-river ag	Balance current and future demand with growth opportunity
Future effects of climate variability (GCM downscaling)	Significant conservation at M&I level	Possible conversion of P4 on-river ag use to M&I use with decreases in P1-P3 on-river ag use	How further reductions in CAP supply impact users
Better understanding of length of time in shortage and at what tier	Cloud seeding boosting Water supply in UB	Ability for users to sign long and mid term contracts for on-river water	How new sources of water can be integrated into CAP supply
Range of dry enough vs. wetter (pluvial removed and stress test vs. observed and paleo conditioned)	Impact of reduced energy production on Hoover and CRSP contract holders	Export of on-river supply to central/southern AZ (future demand and desire?)	Full range of CAP demands: slower build-up with underutilized long-term contracts vs. faster build-up with fully utilized long-term contracts
Consideration of new future conditions hydrology (temperature adjusted)	Range of UB demands: most recent schedule vs. conservative projections (current use and much lower demands than 2016 UCRC schedule)	Consideration of a lower growth rate (0.05%) and alternative on-river use projection (near-term growth of 100 KAF)	Cost of CAP water (increase in mid to long term planning horizon)
	Understanding of future UB demand (accuracy)		Consideration of excluding policy responses to shortage
	How future demand affects equalization rules in reservoirs (post-2026)		
	Consideration of new UB trends use (linear trends of past 40 years and guidelines period extended) vs. UCRC 2016 schedule		

Scenario Themes					
1	**2**	**3**	**4**	**5**	**6**
Drier and increased temperatures	Wetter conditions	Median hydrology (in-between wet and dry)	Future effects of climate variability	Drier and increased temperatures	Wetter conditions
UB M&I Conservation (Low use)	High end of future UB use	UB growth based on recent trends (Low use)	Decrease in tributary streamflow for ag diversion (Intermediate UB demand)	UB growth based on recent trends (Low use)	(Intermediate UB demand)
Increased ag CU due to dry conditions	Growth of on-river communities and tribal areas	Conversion of on-river ag use to on-river M&I use	Increase in demands/ag CU due to climate change	Conversion of on-river ag use to on-river M&I use	Increase in demands/ag CU
Contract allocation and utilization (slow/medium/fast)	Contract allocation and utilization (slow/medium/fast)	Contract allocation and utilization (slow/medium/fast)	Contract allocation and utilization (slow/medium/fast)	Contract allocation and utilization (slow/medium/fast)	Contract allocation and utilization (slow/medium/fast)

Materials developed through the pre-meeting submissions and MAWG Members' Meeting.

Scenario Theme	1
Drier and increased temperatures	
UB M&I Conservation (Low use)	
Increased ag CU due to dry conditions	
Contract allocation and utilization (slow/medium/fast)	

Scenario Components (Highlight Selection)			
Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Observed 113 Direct natural flow hydrology traces from 1906-2018 **(Median Annual Inflow = 14.50 MAF)**	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development **(2030 Consumptive Use = 5.03 MAF)**	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.112 MAF)**	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 **(Median Annual Inflow = 13.60 MAF)**	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects **(2030 Consumptive Use = 5.33 MAF)**	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.132 MAF)**	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Stress-test 31 traces from 1988-2018 including the drought from 2000 to present **(Median Annual Inflow = 12.72 MAF)**	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) **(2030 Consumptive Use = 5.11 MAF)**	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.096 MAF)**	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Paleo Resampled 1,244 historical traces derived from tree-ring analyses **(Median Annual Inflow = 14.83 MAF)**	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin **(2030 Consumptive Use = 5.01 MAF)**	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period **(2030 Consumptive Use = 1.135 MAF)**	
Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets **(Median Annual Inflow = 12.73 MAF)**	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) **(2030 Consumptive Use = 4.46 MAF)**		
Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record **(Median Annual Inflow = 14.58 MAF)**	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period **(2030 Consumptive Use = 3.92 MAF)**		

Scenario Theme	2
Wetter conditions	
High end of future UB use	
Growth of on-river communities and tribal areas	
Contract allocation and utilization (slow/medium/fast)	

Scenario Components (Highlight Selection)			
Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Observed 113 Direct natural flow hydrology traces from 1906-2018 (Median Annual Inflow = 14.50 MAF)	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development (2030 Consumptive Use = 5.03 MAF)	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.112 MAF)	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 (Median Annual Inflow = 13.60 MAF)	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects (2030 Consumptive Use = 5.33 MAF)	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.132 MAF)	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Stress-test 31 traces from 1988-2018 including the drought from 2000 to present (Median Annual Inflow = 12.72 MAF)	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) (2030 Consumptive Use = 5.11 MAF)	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.096 MAF)	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Paleo Resampled 1,244 historical traces derived from tree-ring analyses (Median Annual Inflow = 14.83 MAF)	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin (2030 Consumptive Use = 5.01 MAF)	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period (2030 Consumptive Use = 1.135 MAF)	
Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets (Median Annual Inflow = 12.73 MAF)	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) (2030 Consumptive Use = 4.46 MAF)		
Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record (Median Annual Inflow = 14.58 MAF)	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period (2030 Consumptive Use = 3.92 MAF)		

Scenario Theme	#3
Median hydrology (in-between wet and dry)	
UB growth based on recent trends (Low use)	
Conversion of on-river ag use to on-river M&I use	
Contract allocation and utilization (slow/medium/fast)	

Scenario Components (Highlight Selection)			
Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Observed 113 Direct natural flow hydrology traces from 1906-2018 (Median Annual Inflow = 14.50 MAF)	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development (2030 Consumptive Use = 5.03 MAF)	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.112 MAF)	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 (Median Annual Inflow = 13.60 MAF)	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects (2030 Consumptive Use = 5.33 MAF)	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.132 MAF)	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Stress-test 31 traces from 1988-2018 including the drought from 2000 to present (Median Annual Inflow = 12.72 MAF)	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) (2030 Consumptive Use = 5.11 MAF)	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.096 MAF)	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Paleo Resampled 1,244 historical traces derived from tree-ring analyses (Median Annual Inflow = 14.83 MAF)	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin (2030 Consumptive Use = 5.01 MAF)	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period (2030 Consumptive Use = 1.135 MAF)	
Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets (Median Annual Inflow = 12.73 MAF)	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) (2030 Consumptive Use = 4.46 MAF)		
Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record (Median Annual Inflow = 14.58 MAF)	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period (2030 Consumptive Use = 3.92 MAF)		

Scenario Theme	#4
Future effects of climate variability	
Decrease in tributary streamflow for ag diversion (Intermediate UB demand)	
Increase in demands/ag CU due to climate change	
Contract allocation and utilization (slow/medium/fast)	

Scenario Components (Highlight Selection)			
Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Observed 113 Direct natural flow hydrology traces from 1906-2018 (Median Annual Inflow = 14.50 MAF)	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development (2030 Consumptive Use = 5.03 MAF)	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.112 MAF)	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 (Median Annual Inflow = 13.60 MAF)	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects (2030 Consumptive Use = 5.33 MAF)	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.132 MAF)	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Stress-test 31 traces from 1988-2018 including the drought from 2000 to present (Median Annual Inflow = 12.72 MAF)	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) (2030 Consumptive Use = 5.11 MAF)	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) (2030 Consumptive Use = 1.096 MAF)	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Paleo Resampled 1,244 historical traces derived from tree-ring analyses (Median Annual Inflow = 14.83 MAF)	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin (2030 Consumptive Use = 5.01 MAF)	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period (2030 Consumptive Use = 1.135 MAF)	
Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets (Median Annual Inflow = 12.73 MAF)	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) (2030 Consumptive Use = 4.46 MAF)		
Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record (Median Annual Inflow = 14.58 MAF)	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period (2030 Consumptive Use = 3.92 MAF)		

Scenario Theme	5	Scenario Components (Highlight Selection)			
		Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Drier and increased temperatures		Observed 113 Direct natural flow hydrology traces from 1906-2018 **(Median Annual Inflow = 14.50 MAF)**	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development **(2030 Consumptive Use = 5.03 MAF)**	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.112 MAF)**	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
UB growth based on recent trends (Low use)		Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 **(Median Annual Inflow = 13.60 MAF)**	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects **(2030 Consumptive Use = 5.33 MAF)**	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.132 MAF)**	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Conversion of on-river ag use to on-river M&I use		Stress-test 31 traces from 1988-2018 including the drought from 2000 to present **(Median Annual Inflow = 12.72 MAF)**	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) **(2030 Consumptive Use = 5.11 MAF)**	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.096 MAF)**	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Contract allocation and utilization (slow/medium/fast)		Paleo Resampled 1,244 historical traces derived from tree-ring analyses **(Median Annual Inflow = 14.83 MAF)**	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin **(2030 Consumptive Use = 5.01 MAF)**	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period **(2030 Consumptive Use = 1.135 MAF)**	
		Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets **(Median Annual Inflow = 12.73 MAF)**	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) **(2030 Consumptive Use = 4.46 MAF)**		
		Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record **(Median Annual Inflow = 14.58 MAF)**	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period **(2030 Consumptive Use = 3.92 MAF)**		

Scenario Theme	6	Scenario Components (Highlight Selection)			
		Colorado River Hydrology	**Upper Basin Demands**	**Arizona On-River Uses**	**Long-term Contract Utilization**
Wetter conditions		Observed 113 Direct natural flow hydrology traces from 1906-2018 **(Median Annual Inflow = 14.50 MAF)**	1999 Schedule Schedule prepared by UCRC to represent future Upper Basin development **(2030 Consumptive Use = 5.03 MAF)**	0.1% Growth Trend Future growth in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.112 MAF)**	Slow All current long-term contracts and future NIA reallocations are fully utilized by 2055
(Intermediate UB demand)		Pluvial-removed 88 Non-pluvial hydrology traces from 1931-2018 **(Median Annual Inflow = 13.60 MAF)**	2007 UCRC Schedule Schedule prepared by UCRC to represent full buildout of Upper Basin projects **(2030 Consumptive Use = 5.33 MAF)**	0.2% Growth Trend Future growth in AZ on-river uses based on 0.2% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.132 MAF)**	Medium All current long-term contracts and future NIA reallocations are fully utilized by 2045
Increase in demands/ag CU		Stress-test 31 traces from 1988-2018 including the drought from 2000 to present **(Median Annual Inflow = 12.72 MAF)**	Basin Study Current Projected Upper Basin demands projected into the future based on current use from the Basin Study (2012) **(2030 Consumptive Use = 5.11 MAF)**	0.1% Declining Trend Future decline in AZ on-river uses based on 0.1% trend (starting from 2015-2019 average) **(2030 Consumptive Use = 1.096 MAF)**	Fast All current long-term contracts and future NIA reallocations are fully utilized by 2035
Contract allocation and utilization (slow/medium/fast)		Paleo Resampled 1,244 historical traces derived from tree-ring analyses **(Median Annual Inflow = 14.83 MAF)**	2016 UCRC Schedule Schedule prepared by UCRC updated from 2007 to reflect updated project development buildout plans in Upper Basin **(2030 Consumptive Use = 5.01 MAF)**	Average 2008-2019 AZ on-river uses based on average use from 2008-2019 period **(2030 Consumptive Use = 1.135 MAF)**	
		Downscaled GCM-Projected 112 synthetic traces produced from modeled climate datasets **(Median Annual Inflow = 12.73 MAF)**	Interim Guidelines Period Trend Extended Upper Basin demands projected into the future based on uses from the Interim Guidelines period (2007-present) **(2030 Consumptive Use = 4.46 MAF)**		
		Paleo-conditioned 500+ traces that combine tree-ring hydrology length of record with statistics associated with the gauged record **(Median Annual Inflow = 14.58 MAF)**	Average 2008-2018 Upper Basin demands based on average use from 2008-2018 period **(2030 Consumptive Use = 3.92 MAF)**		

Scenario Themes											
1		2		3		4		5		6	
Themes	**Components Selected**	**Themes**	**ComponentsSelected**	**Themes**	**Components Selected**	**Themes**	**Components Selected**	**Themes**	**Components Selected**	**Themes**	**Components Selected**
Drier and increased temperatures	Stress Test	Wetter conditions	Paleo-Conditioned	Median hydrology (in-between wet and dry)	Pluvial-removed	Future effects of climate variability	Downscaled-GCM	Drier and increased temperatures	Pluvial-removed	Wetter conditions	Paleo-Conditioned
UB M&I Conservation (Low use)	GL Extended	High end of future UB use	2016 UCRC	UB growth based on recent trends (Low use)	GL Extended	Decrease in tributary streamflow for ag diversion (Intermediate UB demand)	2016 UCRC	UB growth based on recent trends (Low use)	Average	(Intermediate UB demand)	2016 UCRC
Increased ag CU due to dry conditions	0.1% Growth	Growth of on-river communities and tribal areas	0.2% Growth	Conversion of on-river ag use to on-river M&I use	0.1% Growth	Increase in demands/ag CU due to climate change	0.2% Growth	Conversion of on-river ag use to on-river M&I use	Average	Increase in demands/ag CU	0.1% Growth
Contract allocation and utilization (slow/medium/fast)	Medium	Contract allocation and utilization (slow/medium/fast)	Medium	Contract allocation and utilization (slow/medium/fast)	Medium	Contract allocation and utilization (slow/medium/fast)	Fast	Contract allocation and utilization (slow/medium/fast)	Medium	Contract allocation and utilization (slow/medium/fast)	Medium