

APPENDIX H

CRA ESTIMATES

Reno Spaghetti Bowl (PE Alternative # 101, 202, 311) Conceptual Estimate Summary Breakdown Comparison				2/13/2018		2/13/2018	
				Alt 1, PE_101 Rev 1	Alt 2A, PE Rev 3	Alt 3A, PE Rev 6	
Item	Description	Quantity	Unit	Subtotal	Total	Total	
1	Clearing & Grubbing - Summary	1	LS	\$4,239,285	\$2,747,318	\$2,306,569	
2	Removals - Summary	1	LS	\$31,636,420	\$23,197,795	\$18,731,957	
3	Earthwork & Structural Section- Summary	1	LS	\$185,385,786	\$156,457,838	\$117,414,470	
4	Structures/Bridges - Summary	1	LS	\$610,849,523	\$352,931,595	\$313,634,572	
5	Drainage - Summary	1	LS	\$102,954,055	\$66,720,581	\$56,016,681	
6	Signs and Striping - Summary	1	LS	\$39,364,786	\$25,510,810	\$21,418,143	
7	Electrical, ITS, Signalization - Summary	1	LS	\$66,617,330	\$43,172,141	\$34,598,538	
8	Landscaping, Aesthetics, Mitigation, EC - Summary	1	LS	\$36,336,725	\$23,548,440	\$19,770,593	
9	GuardRail, Fence & Protectives - Summary	1	LS	\$24,830,096	\$16,091,434	\$13,509,905	
10	N/A	0	LS	\$0	\$3,924,740	\$2,306,569	
11	N/A	0	LS	\$0	\$0	\$0	
12	Maintenance of Traffic - Summary	1	LS	\$36,336,725		\$19,770,593	
13	Construction Staking - Summary	1	%	\$12,112,242	23,548,440	\$6,590,198	
14	Mobilization - Allowance	5	%	\$60,561,209	\$7,849,480	\$32,950,989	
					39,247,401		
A				\$1,211,224,181	\$783,116,522	\$659,019,778	
	ROW Acquisition + NDOT Support (CONCEPT ROW COST)	1	LS	\$462,832,791	\$225,891,005	\$225,737,346	
	Utility Relocation / Removal	2.00%	% Const	\$24,224,484	\$15,698,960	\$13,180,396	
	Third Party Permits	1.00%	% Const	\$12,112,242	\$7,849,480	\$6,590,198	
B				\$499,169,516	\$246,076,037	\$245,507,939	
	NDOT - Program Administrative - Summary						
	NDOT - Preliminary Engineering (incl. NEPA, PE/FD, PM)	8.00	% Const	\$96,897,935	\$62,795,841	\$52,721,582	
	NDOT - Construction Engineering (incl. Inspection, Testing, CM)	5.00	% Const	\$60,561,209	\$39,247,401	\$32,950,989	
	NDOT - Proposals Stipend	0.54	% Const	\$6,540,611	\$4,238,719	\$3,558,707	
	NDOT - Incentives - (Alternative Delivery Construction)	2.15	% Const	\$26,041,320	\$16,876,382	\$14,168,925	
C	Subtotal (without CRA)			\$190,041,074	\$122,870,982	\$103,400,203	
D	Contingency (By CRA)	-	% Const				
	Escalation to Midpoint of Program Schedule (By CRA)						

SUMMARY OF PRELIMINARY DRAFT CRA RESULTS

Reno Spaghetti Bowl (RSB)

February 14, 2018



GOLDER

Key Assumptions

- Potential delays associated with availability of funding are excluded from the primary results. Funding delay scenarios are addressed via sensitivity analyses.
- Cost escalation rates based on the current NDOT forecast (Dec. 2016).
- Results do not account for future risk management actions to be taken by NDOT.

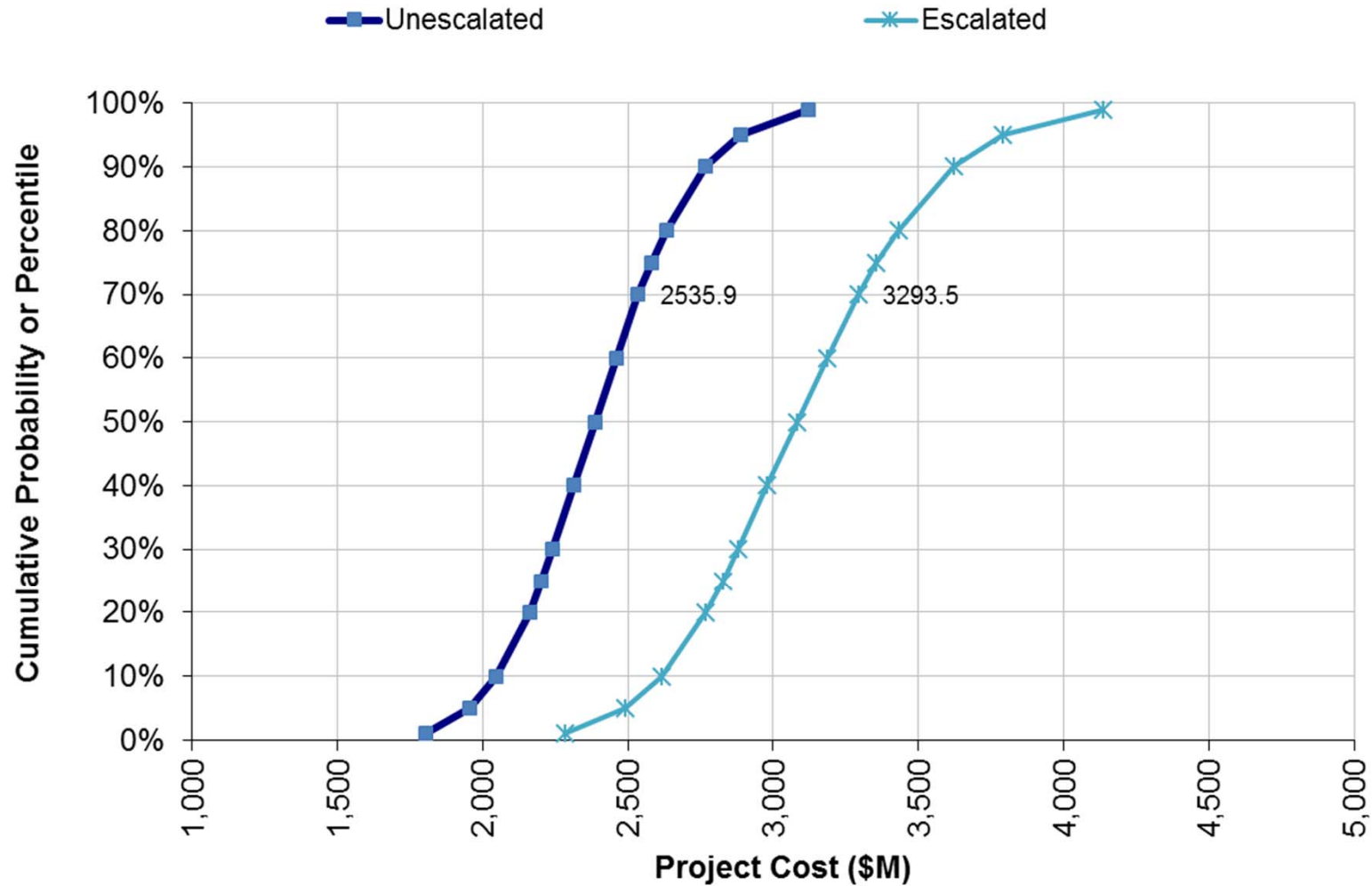
Scenarios Analyzed

- Alternative 1: Unconstrained
 - Alternative 1: Phased
 - Alternative 2A: Unconstrained
 - Alternative 2A: Phased
 - Alternative 3A: Unconstrained
 - Alternative 3A: Phased
-
- Unconstrained scenarios assume the entire project is constructed through a single design-build contract
 - Phased scenarios assume the project is constructed through four sequential phases over a 15 year period

Changes from Previous Update

- The results contained in this summary reflect the following changes from the previous analysis (dated October 30, 2017)
 - Revised cost estimates for Alternatives 2 and 3 (by CH2M, dated February 13, 2018). Note: the estimate for Alternative 1 was not updated and the model was not re-run for this alternative.
 - Risk register updates to reflect applicability of previously-identified risks to Alternative 2. Also includes identification of new risk related to airport direct connector ramps (DES 17) that is specific to Alt. 2.
 - Update to flowchart logic for phased scenarios to reflect 4 phases (rather than 5). The construction durations for each phase were increased by 6 months to reflect the additional scope in each phase.

Alternative 1 Unconstrained: Comparison of Project Cost Results (unescaled and escalated)



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Summary of Results: Alternative 1 Unconstrained

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,969.7	2,416.8	Oct 2019	Sep 2026
Mean	2,398.2	3,102.9	Aug 2020	Aug 2028
Std. Dev.	282.3	395.6	7.7	11.7
10%	2,047.1	2,616.6	Oct 2019	Jun 2027
50%	2,385.0	3,080.5	Jul 2020	Jun 2028
70%	2,535.9	3,293.5	Nov 2020	Mar 2029
90%	2,766.4	3,620.7	Jul 2021	Mar 2030

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Summary of Project Component Costs: Alternative 1 Unconstrained

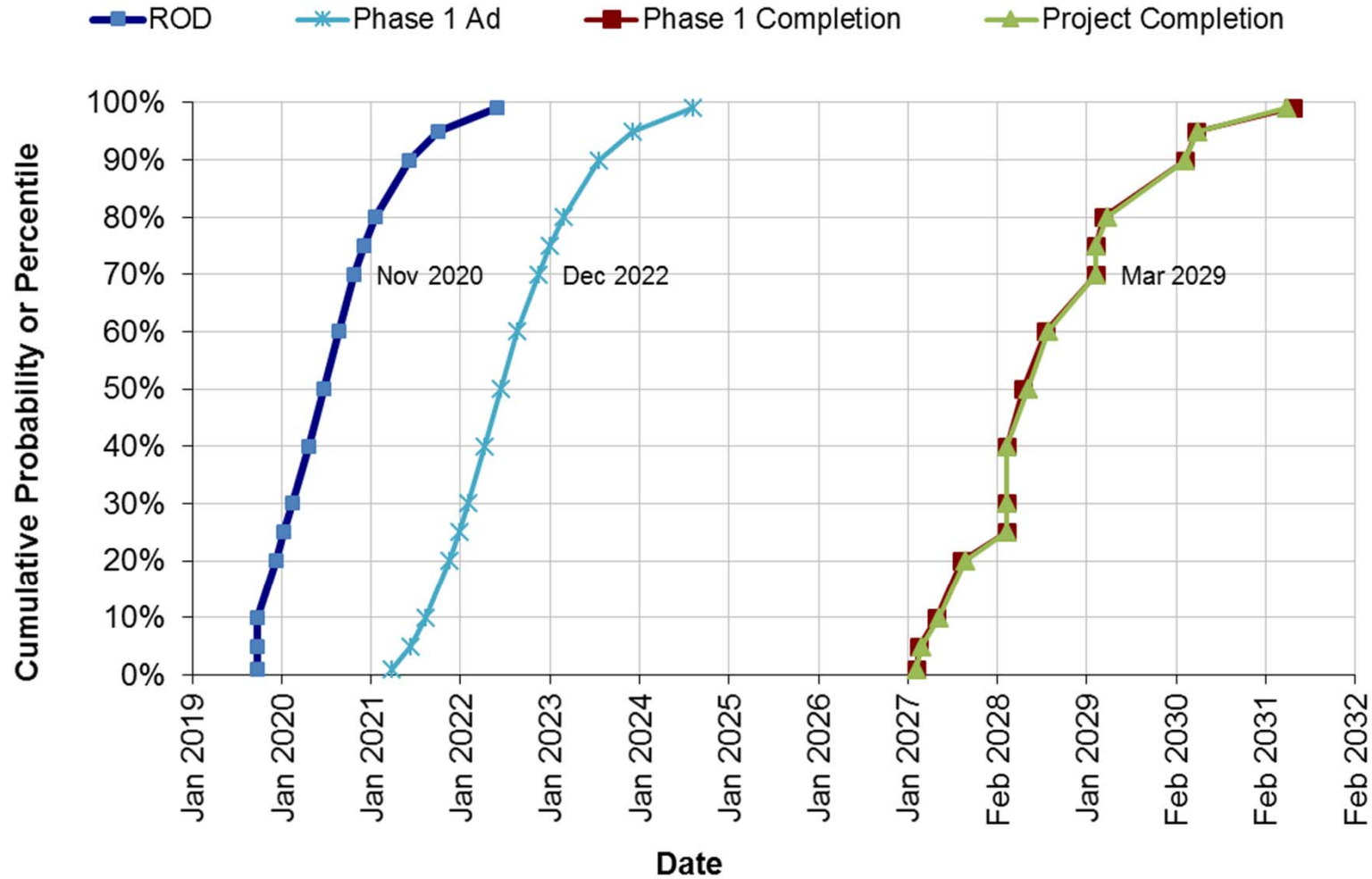
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	109.2	115.3	529.8	631.9	1330.7	1669.6
Mean	152.1	163.8	742.4	916.7	483.8	549.8
Std. Dev.	28.9	32.5	87.2	121.8	34.6	39.7
10%	119.4	127.3	630.0	762.3	1214.4	1615.8
50%	148.0	158.9	738.2	910.4	1486.7	1994.0
70%	163.1	175.8	787.3	977.5	1622.6	2184.2
90%	189.8	206.4	857.4	1078.2	1815.1	2464.7

Notes:

1. component costs are not additive at a given percentile
2. PE costs include preliminary engineering and third party permits
3. ROW costs include utility relocations

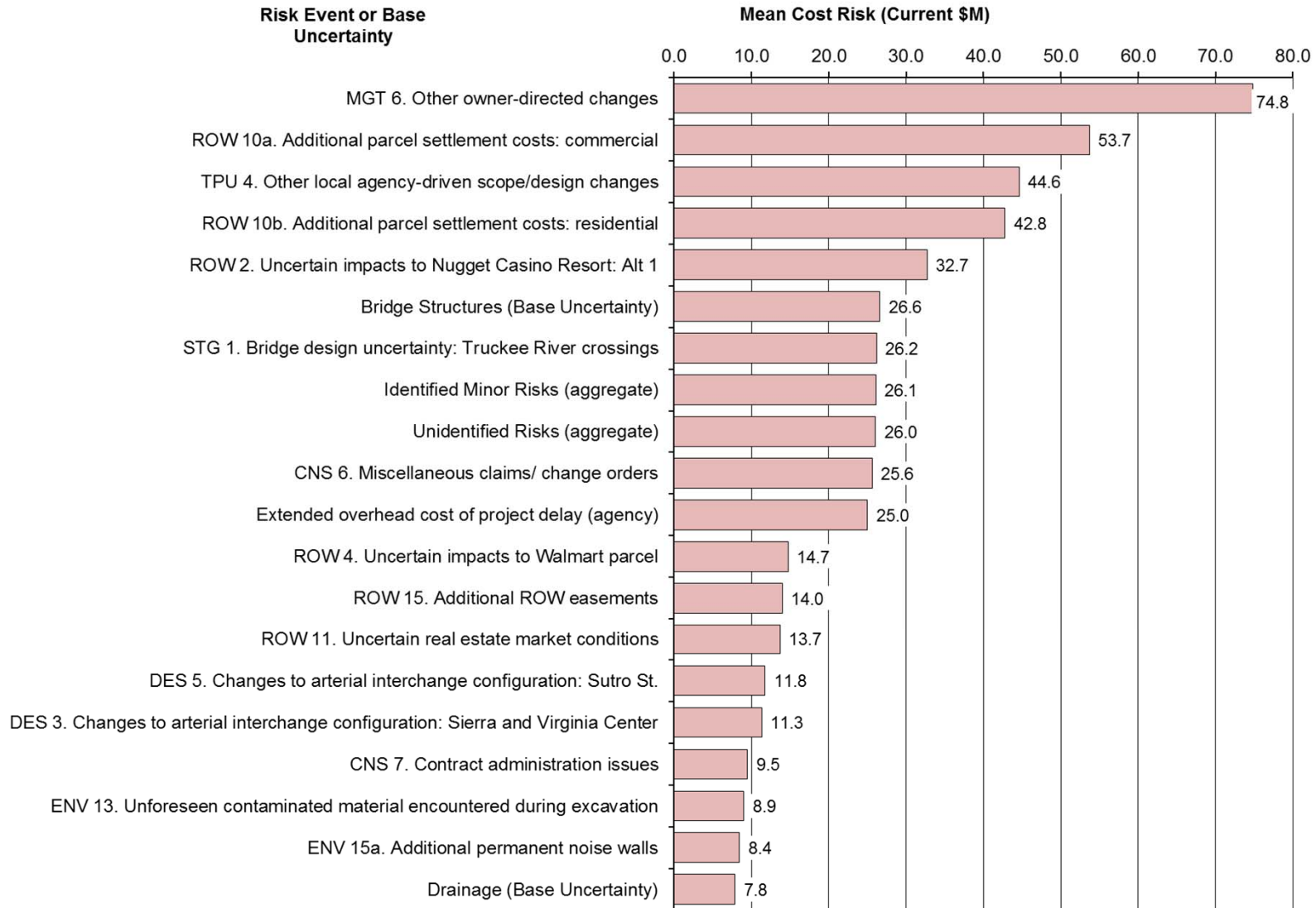
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Summary of Key Milestone Dates: Alternative 1 Unconstrained



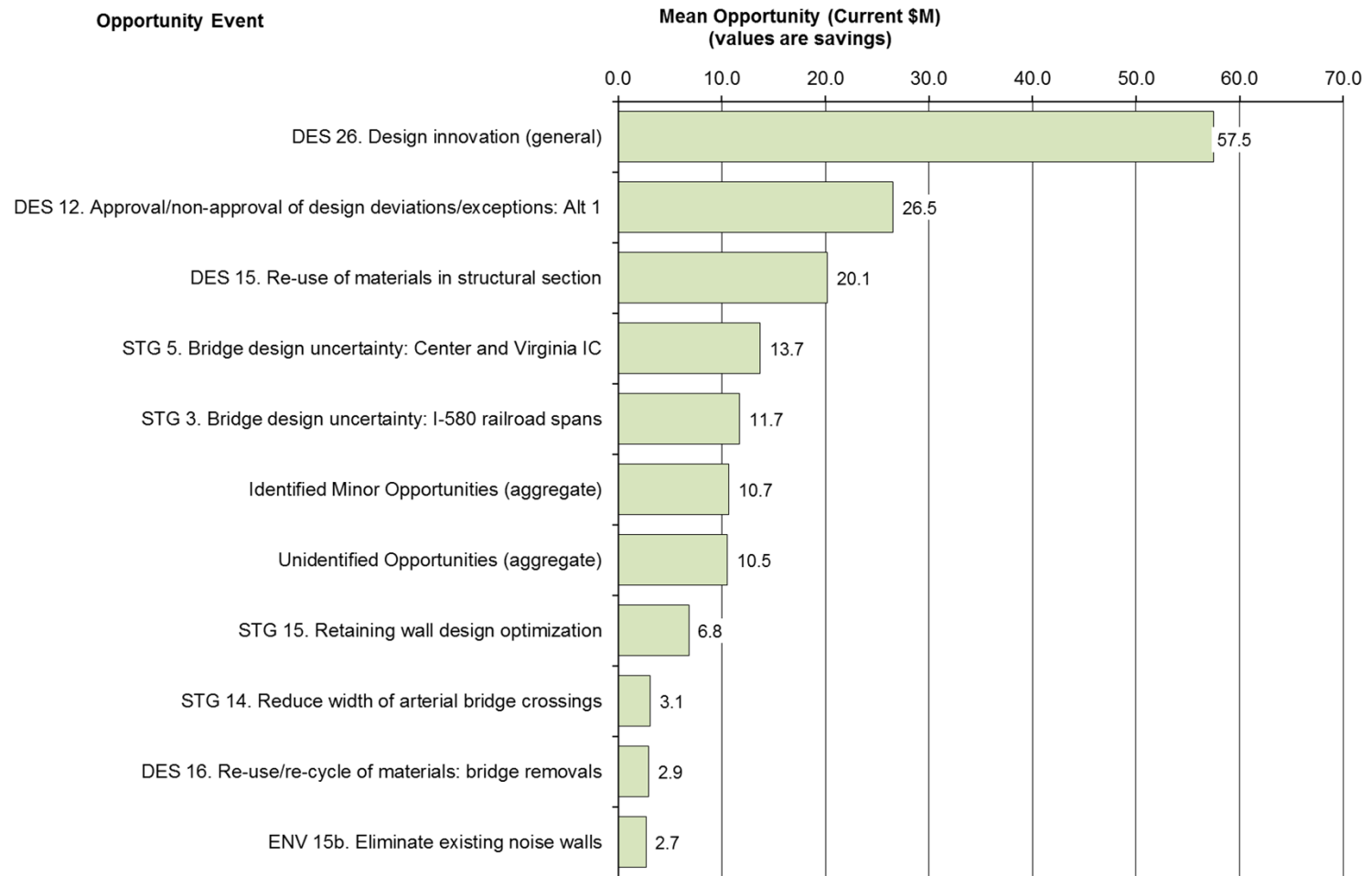
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Most Significant (Top 20) Cost Risks: Alt. 1 Unconstrained



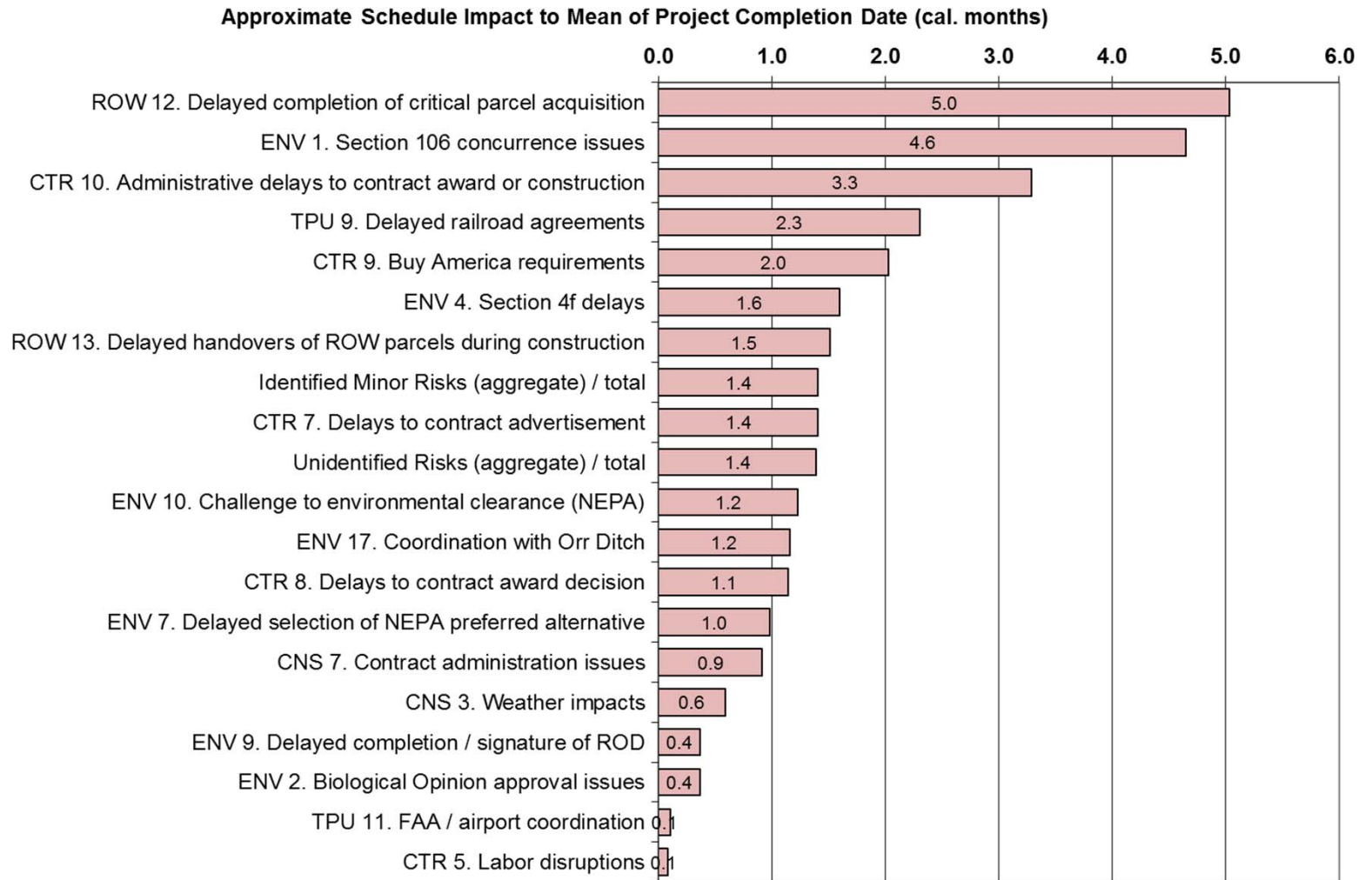
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Most Significant Cost Opportunities: Alt. 1 Unconstrained



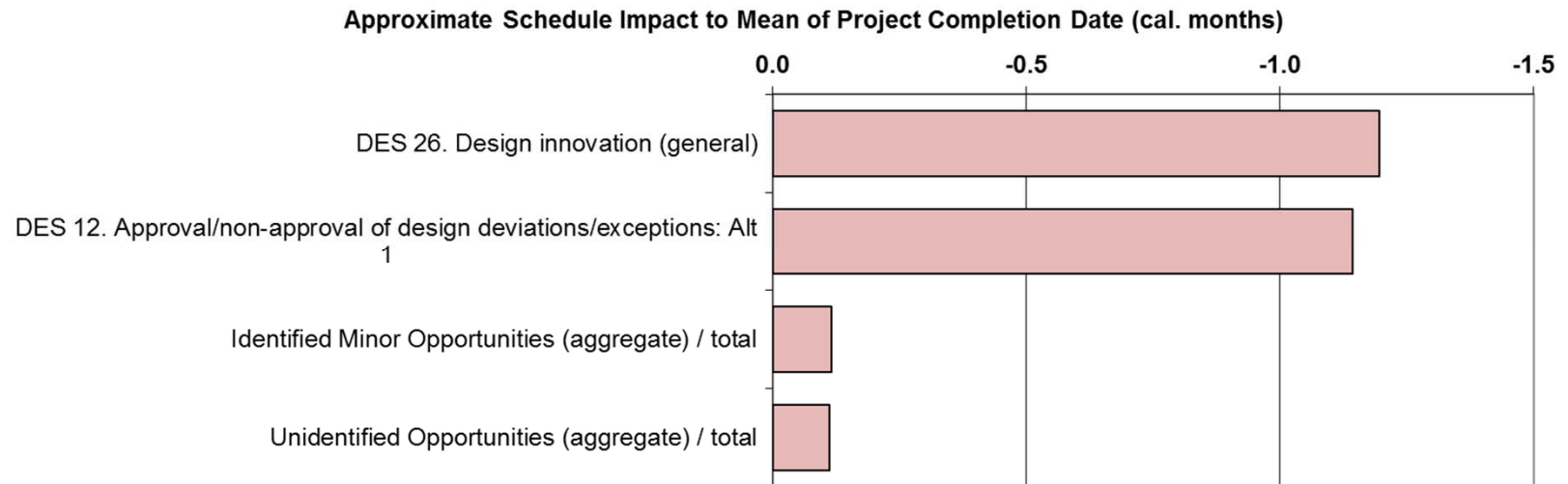
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Most Significant (Top 20) Schedule Risks: Alt. 1 Unconstrained



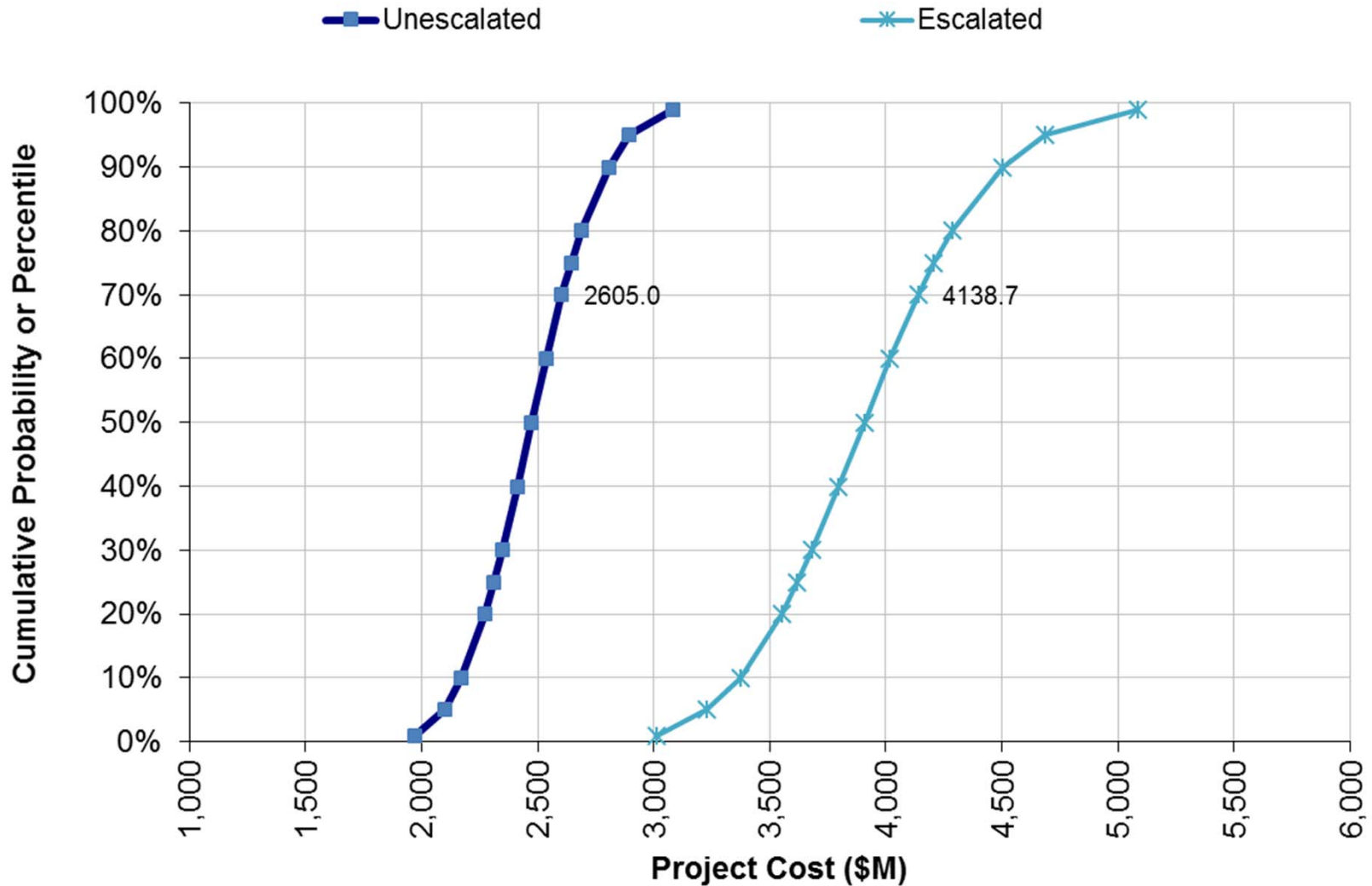
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Most Significant Schedule Opportunities: Alt. 1 Unconstrained



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Alternative 1 Phased: Comparison of Project Cost Results (unescalated and escalated)



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Summary of Results: Alternative 1 Phased

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,970	2,929	Oct 2019	Oct 2036
Mean	2,485	3,928	Aug 2020	Dec 2038
Std. Dev.	243	443	7.8	22.0
10%	2,173	3,376	Oct 2019	Mar 2037
50%	2,475	3,909	Jul 2020	Mar 2039
70%	2,605	4,139	Nov 2020	Jun 2039
90%	2,805	4,501	Jul 2021	Oct 2040

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Summary of Project Component Costs: Alternative 1 Phased

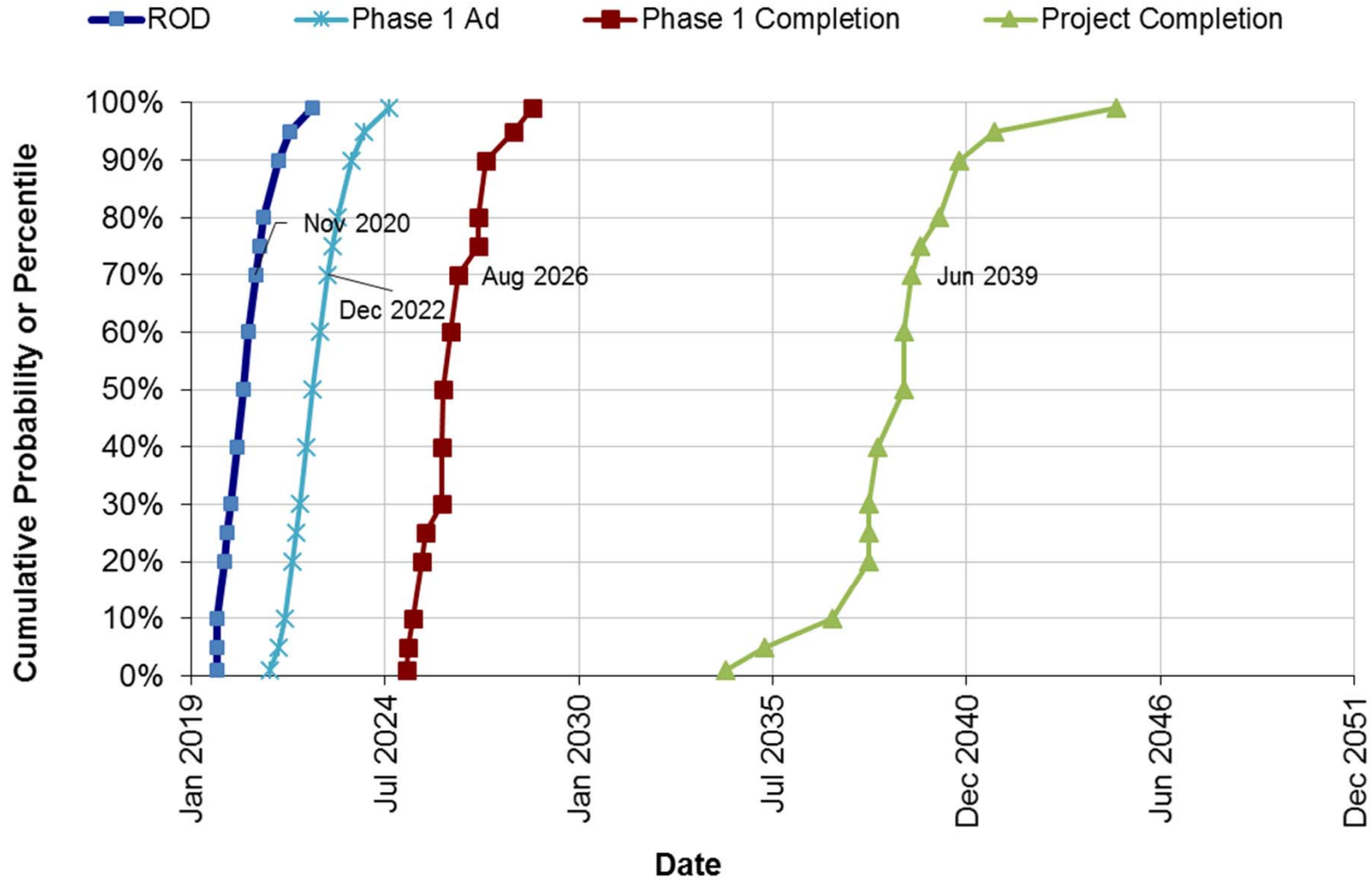
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	109.2	123.3	529.8	779.3	1330.7	2026.8
Mean	142.9	165.1	762.4	1193.4	483.8	549.8
Std. Dev.	23.3	28.1	89.8	189.7	34.6	39.7
10%	115.3	132.3	648.1	962.9	1352.7	2164.2
50%	140.2	161.9	758.9	1178.1	1575.6	2554.0
70%	152.8	176.5	809.0	1283.0	1670.2	2728.8
90%	173.5	202.1	882.3	1439.6	1816.5	2991.2

Notes:

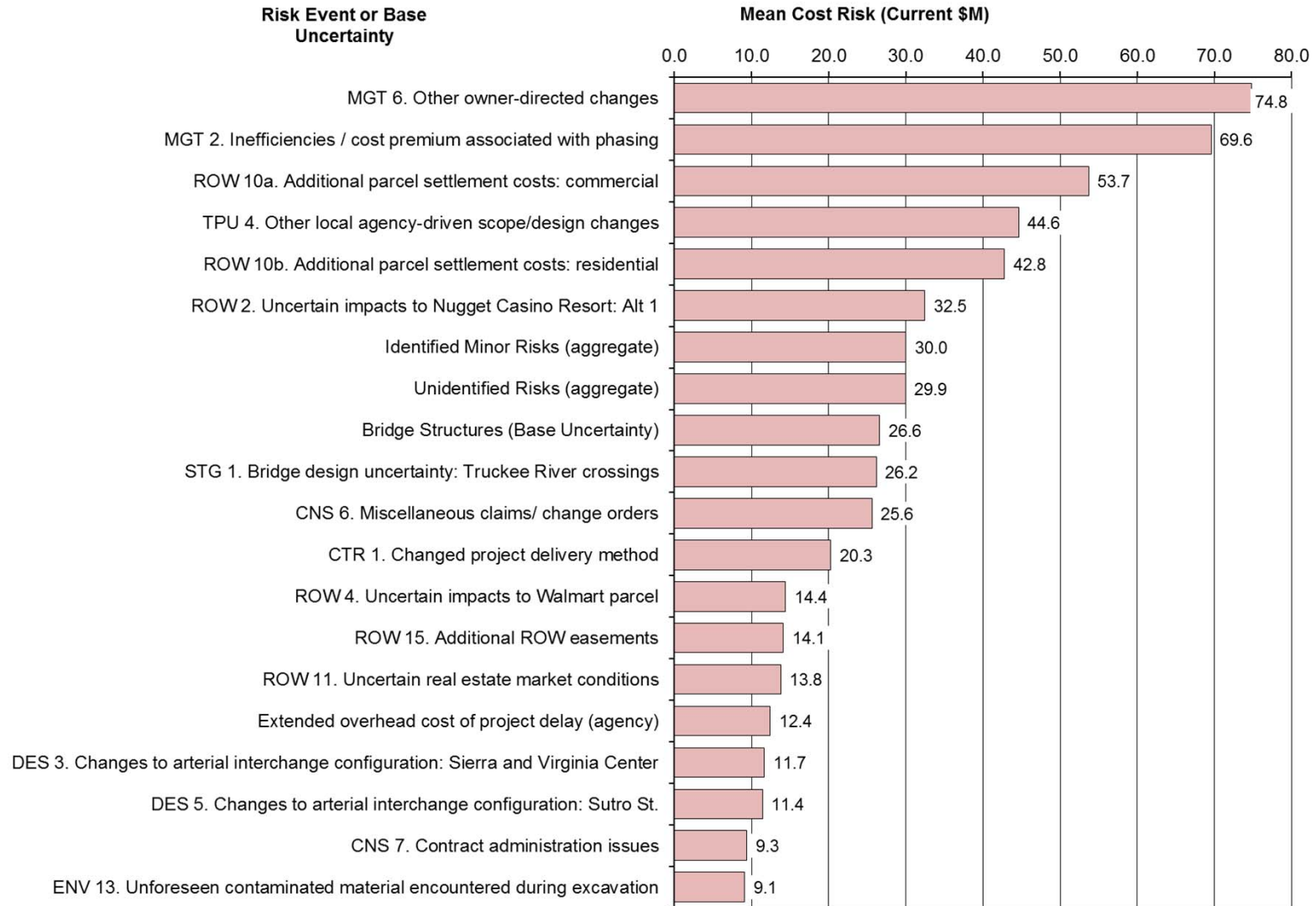
1. component costs are not additive at a given percentile
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3. ROW costs include utility relocations

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Summary of Key Milestone Dates: Alternative 1 Phased

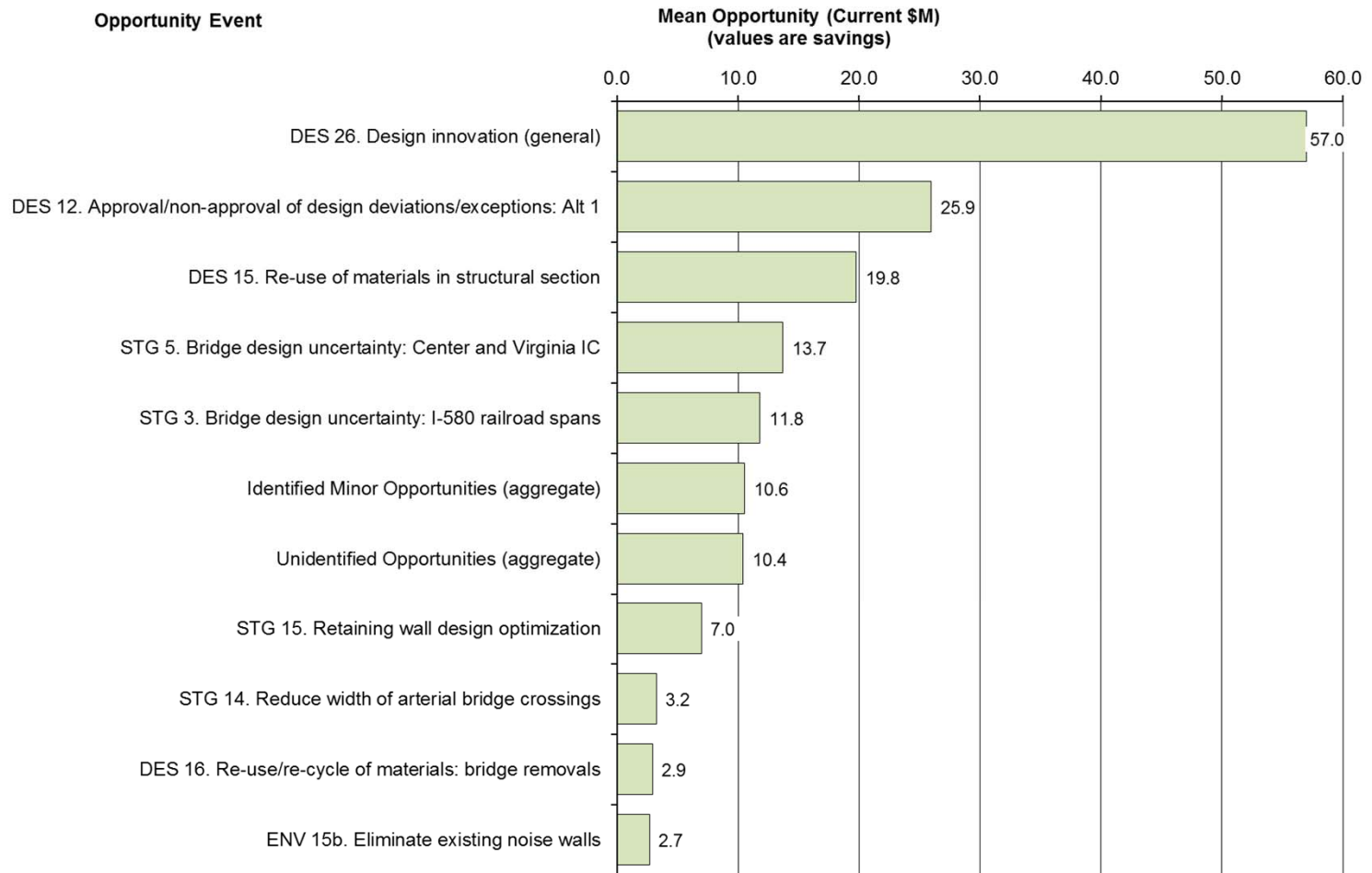


Most Significant (Top 20) Cost Risks: Alt. 1 Phased



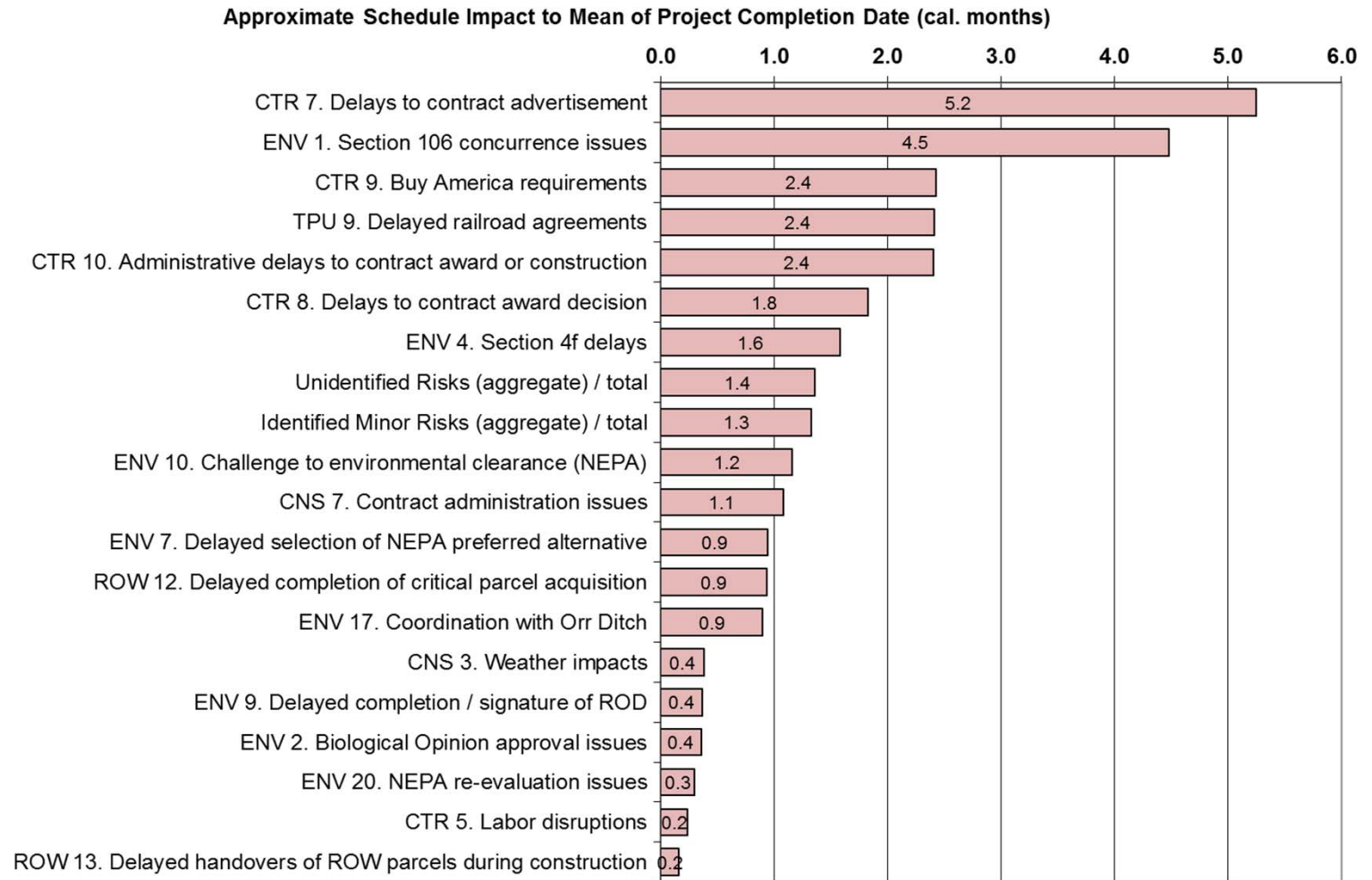
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Most Significant Cost Opportunities: Alt. 1 Phased



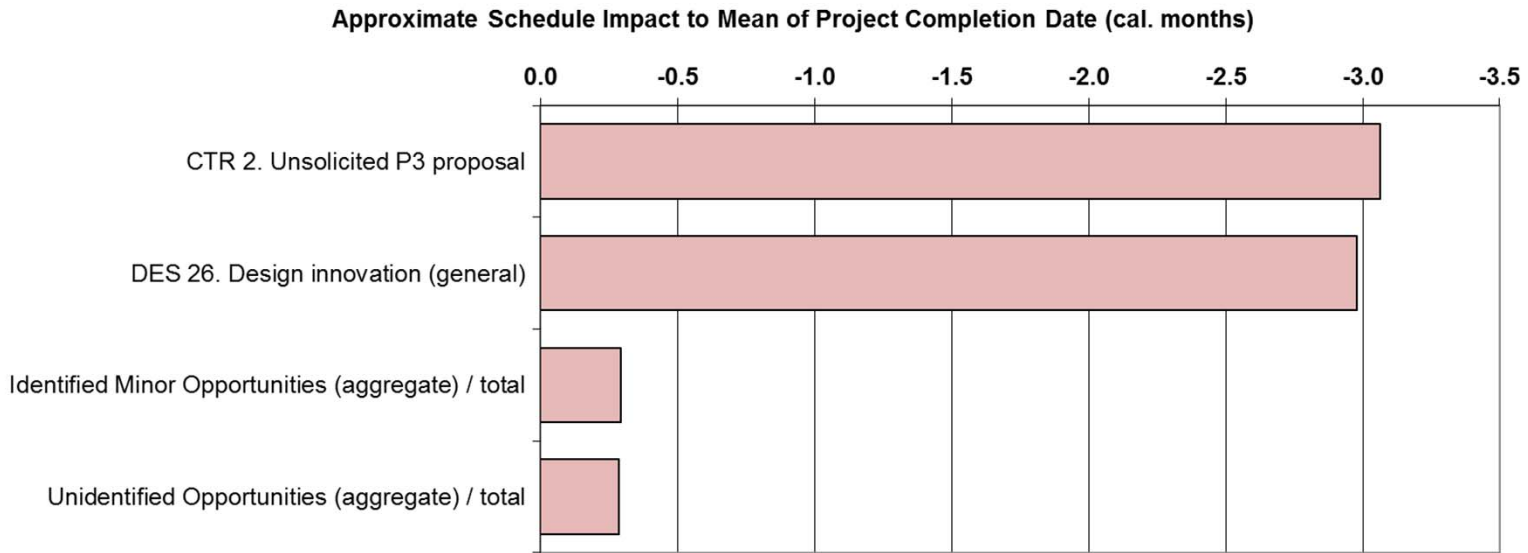
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Most Significant (Top 20) Schedule Risks: Alt. 1 Phased



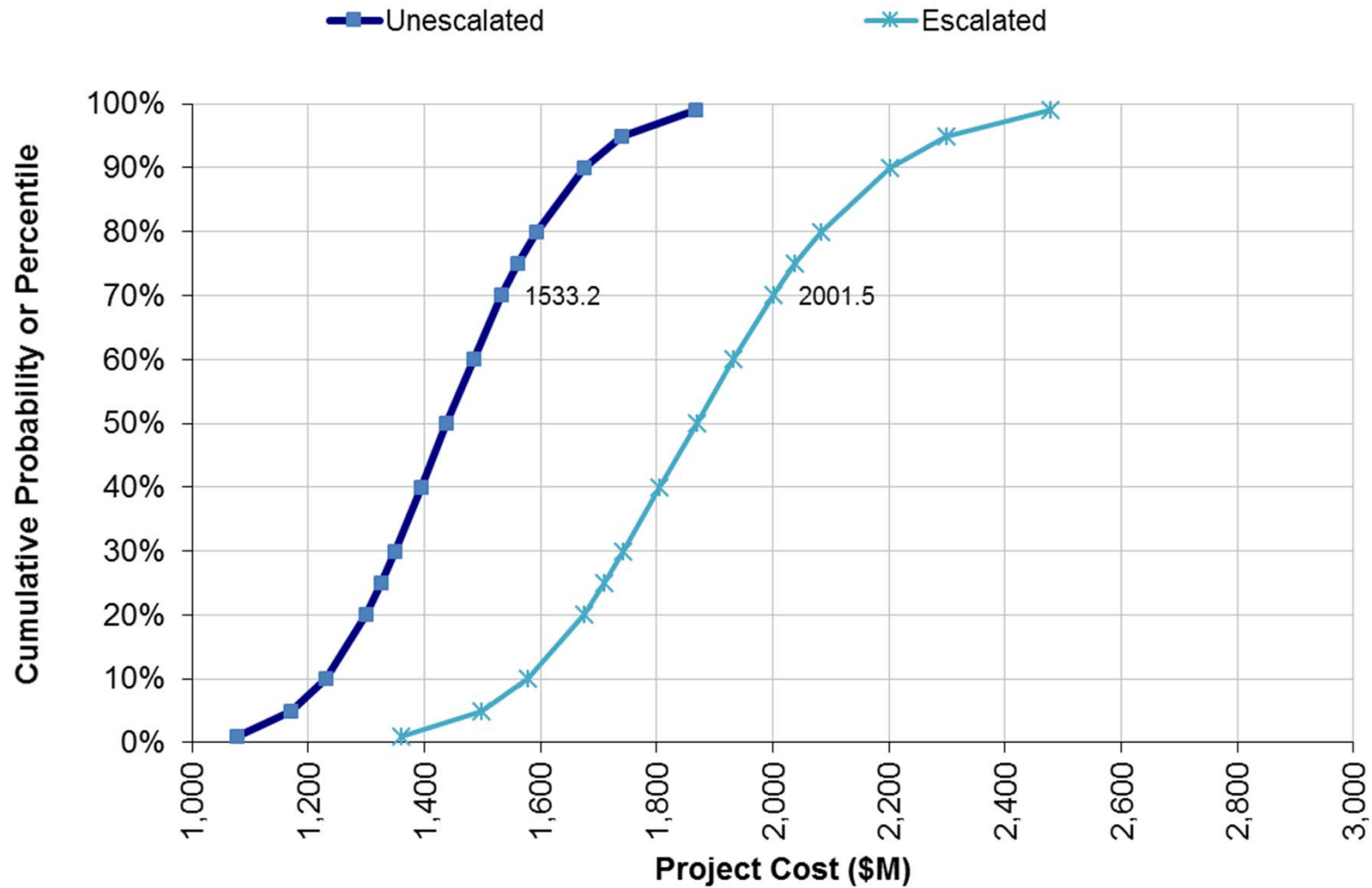
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Most Significant Schedule Opportunities: Alt. 1 Phased



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Alternative 2A Unconstrained: Comparison of Project Cost Results (unescaled and escalated)



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Summary of Results: Alternative 2A Unconstrained

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,158	1,405	Oct 2019	Sep 2025
Mean	1,446	1,880	Aug 2020	May 2028
Std. Dev.	174	244	7.6	12.1
10%	1,230	1,578	Oct 2019	Mar 2027
50%	1,438	1,870	Jul 2020	Mar 2028
70%	1,533	2,001	Nov 2020	Sep 2028
90%	1,675	2,201	Jun 2021	Aug 2029

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Summary of Project Component Costs: Alternative 2A Unconstrained

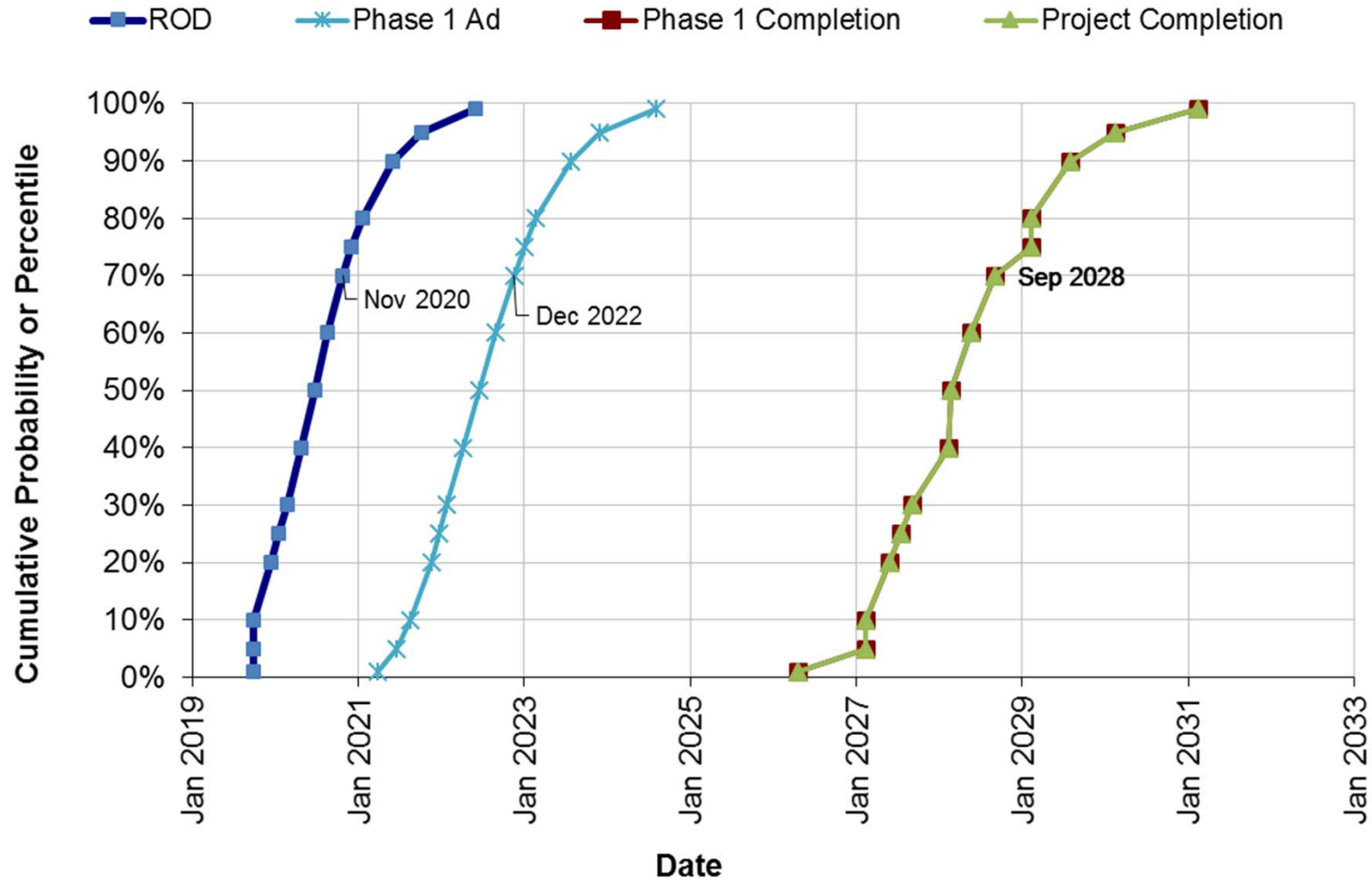
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	70.6	74.6	225.9	269.5	861.0	1060.6
Mean	98.2	105.7	296.8	367.2	483.8	549.8
Std. Dev.	18.7	20.8	39.8	54.2	34.6	39.7
10%	76.8	82.0	246.3	299.7	857.3	1136.0
50%	95.6	102.7	295.0	363.1	1044.6	1397.9
70%	105.8	114.0	317.1	393.7	1125.0	1514.2
90%	122.8	133.2	349.4	438.4	1248.7	1689.8

Notes:

1. Component costs are not additive at a given percentile
2. PE costs include preliminary engineering and third party permits
3. ROW costs include utility relocations

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Summary of Key Milestone Dates: Alternative 2A Unconstrained



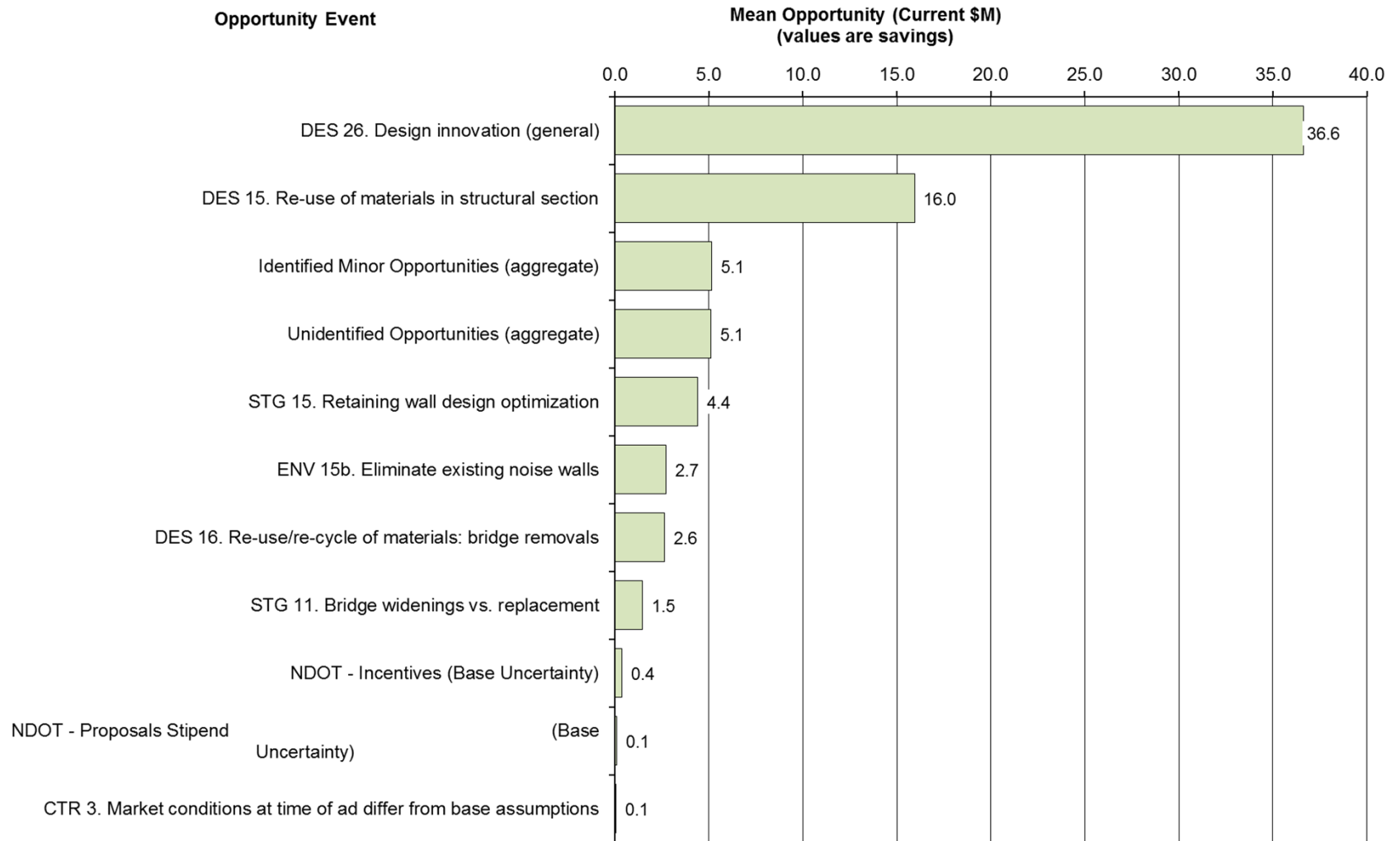
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Most Significant (Top 20) Cost Risks: Alt. 2A Unconstrained



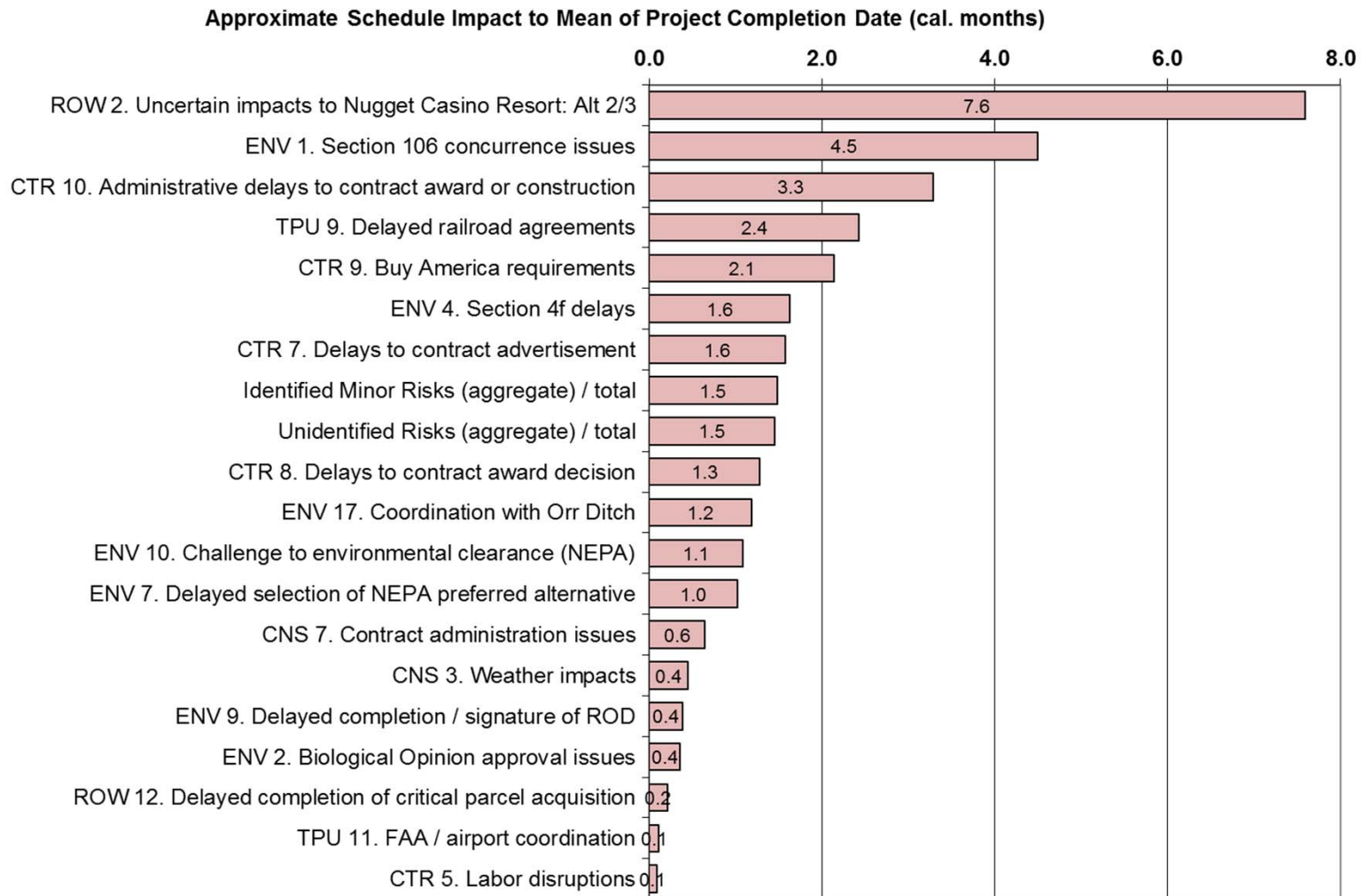
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Most Significant Cost Opportunities: Alt. 2A Unconstrained



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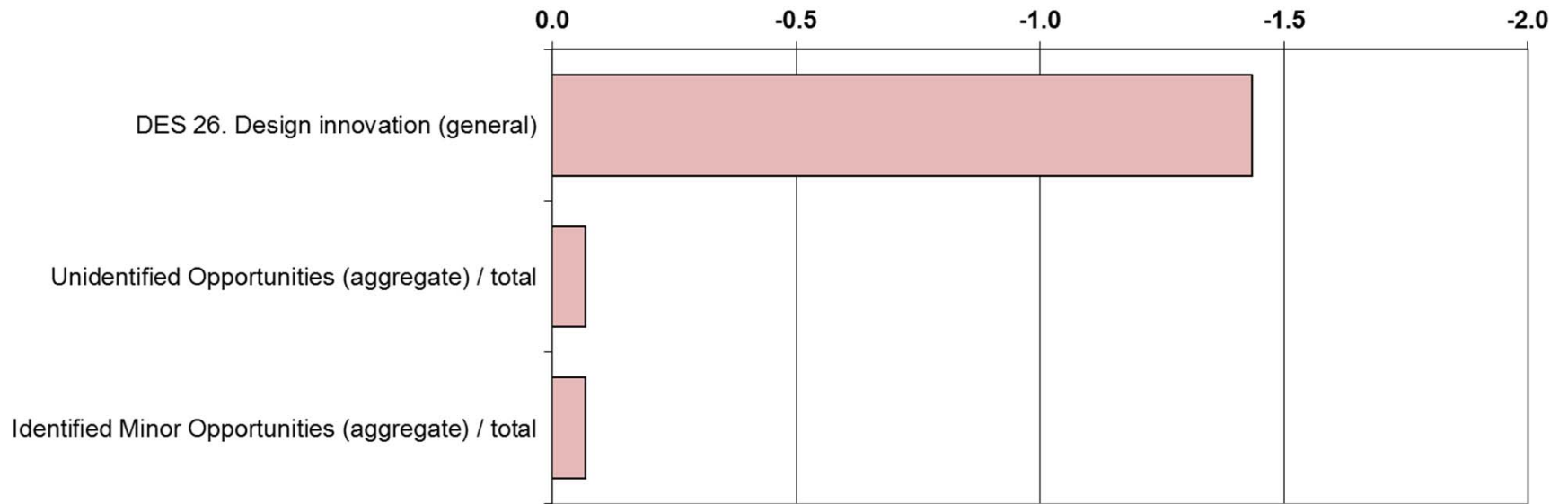
Most Significant (Top 20) Schedule Risks: Alt. 2A Unconstrained



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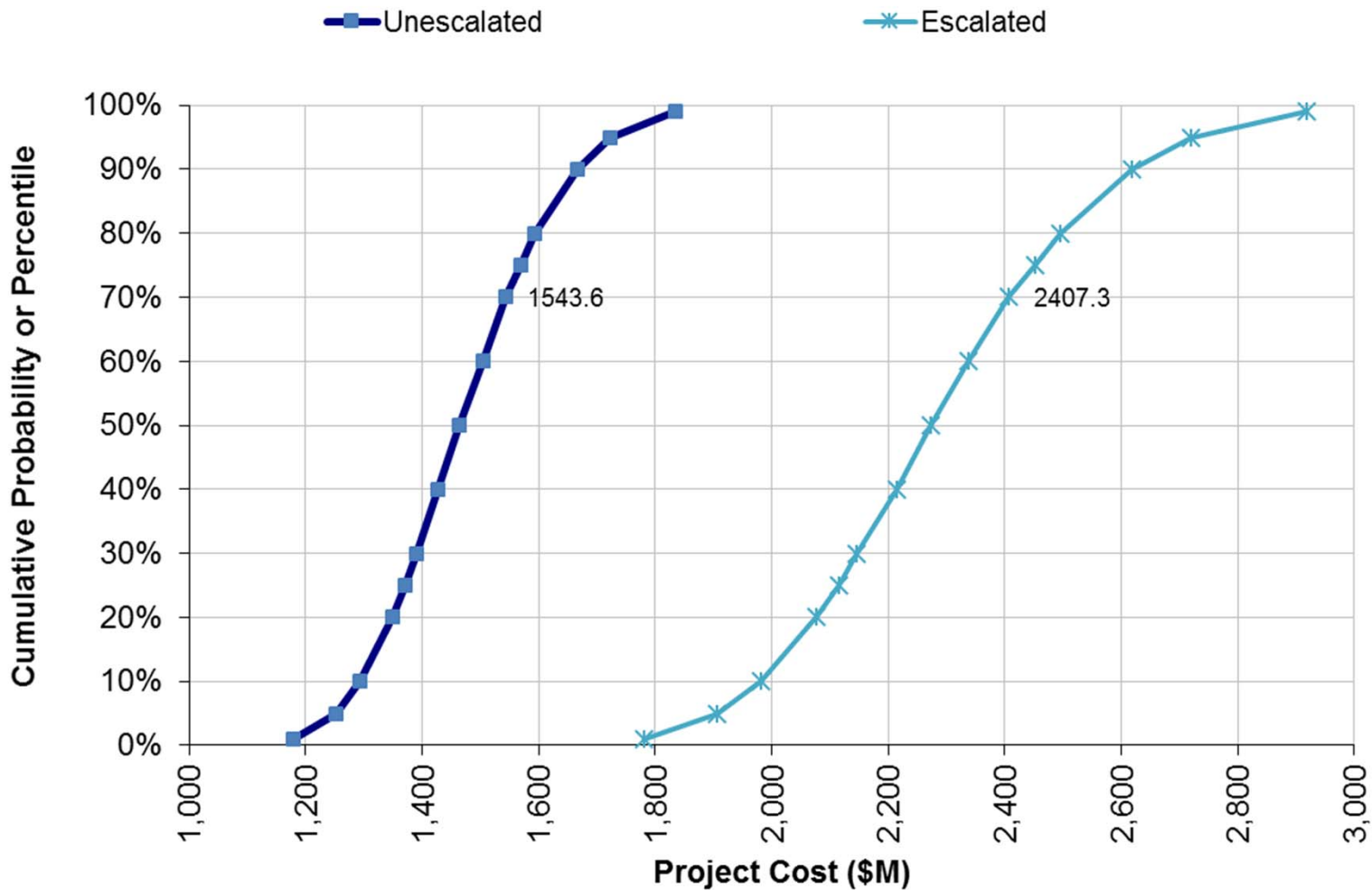
Most Significant Schedule Opportunities: Alt. 2A Unconstrained

Approximate Schedule Impact to Mean of Project Completion Date (cal. months)



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Alternative 2A Phased: Comparison of Project Cost Results (unescalated and escalated)



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Summary of Results: Alternative 2A Phased

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,158	1,684	Oct 2019	Oct 2035
Mean	1,472	2,289	Aug 2020	Jan 2038
Std. Dev.	143	249	7.7	18.5
10%	1,294	1,981	Oct 2019	May 2036
50%	1,462	2,272	Jul 2020	Mar 2038
70%	1,544	2,407	Nov 2020	Aug 2038
90%	1,665	2,618	Jul 2021	Aug 2039

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Summary of Project Component Costs: Alternative 2A Phased

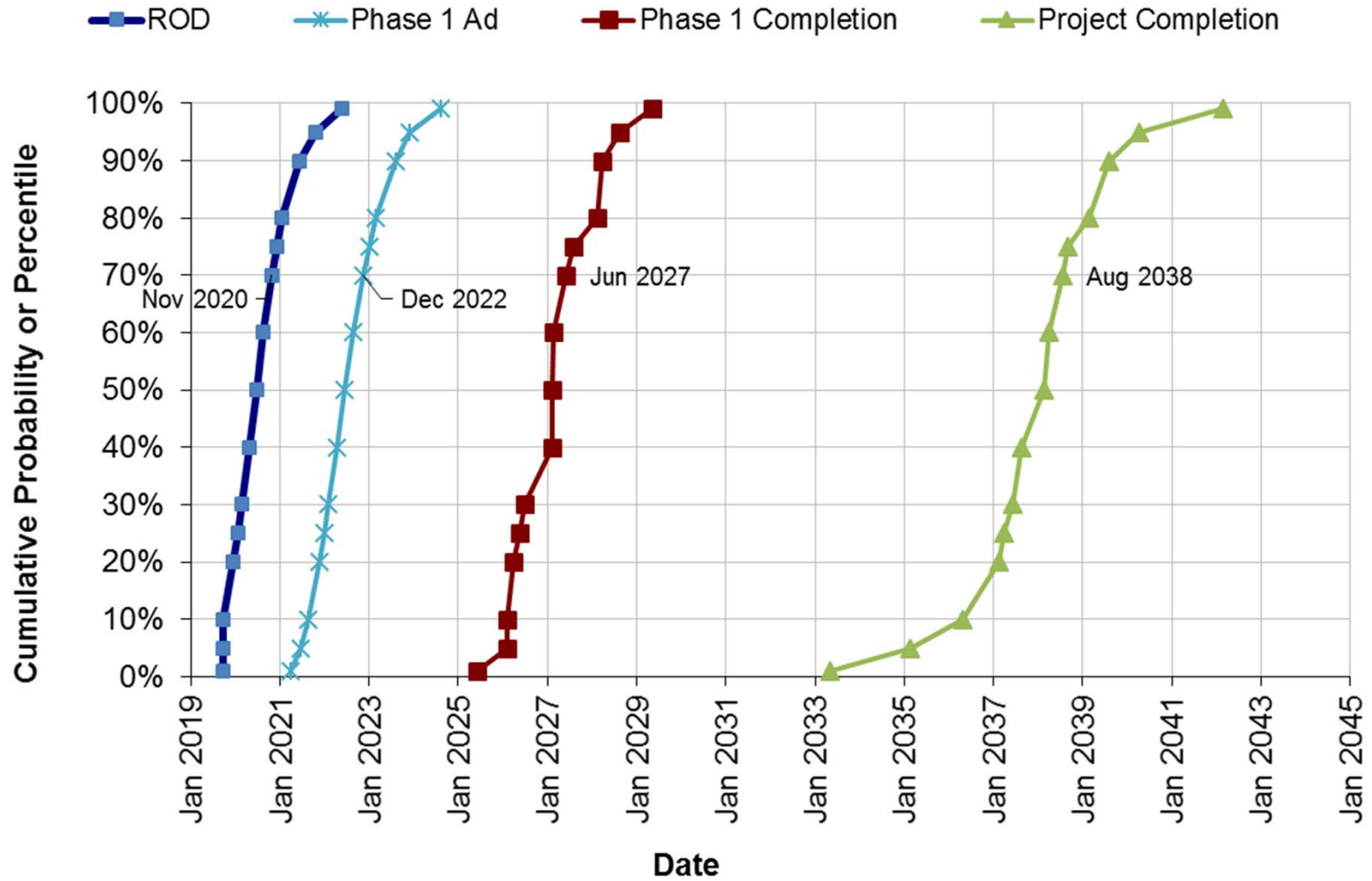
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	70.6	78.7	225.9	319.1	861.0	1286.2
Mean	92.5	105.3	305.7	460.3	483.8	549.8
Std. Dev.	14.9	17.5	40.9	76.8	34.6	39.7
10%	74.6	84.5	253.9	365.8	931.4	1469.8
50%	90.8	103.3	303.7	454.2	1066.4	1710.3
70%	98.8	112.4	326.6	496.2	1132.7	1822.5
90%	112.3	128.4	359.1	561.7	1225.7	1992.3

Notes:

1. Component costs are not additive at a given percentile
2. PE costs include preliminary engineering and third party permits
3. ROW costs include utility relocations

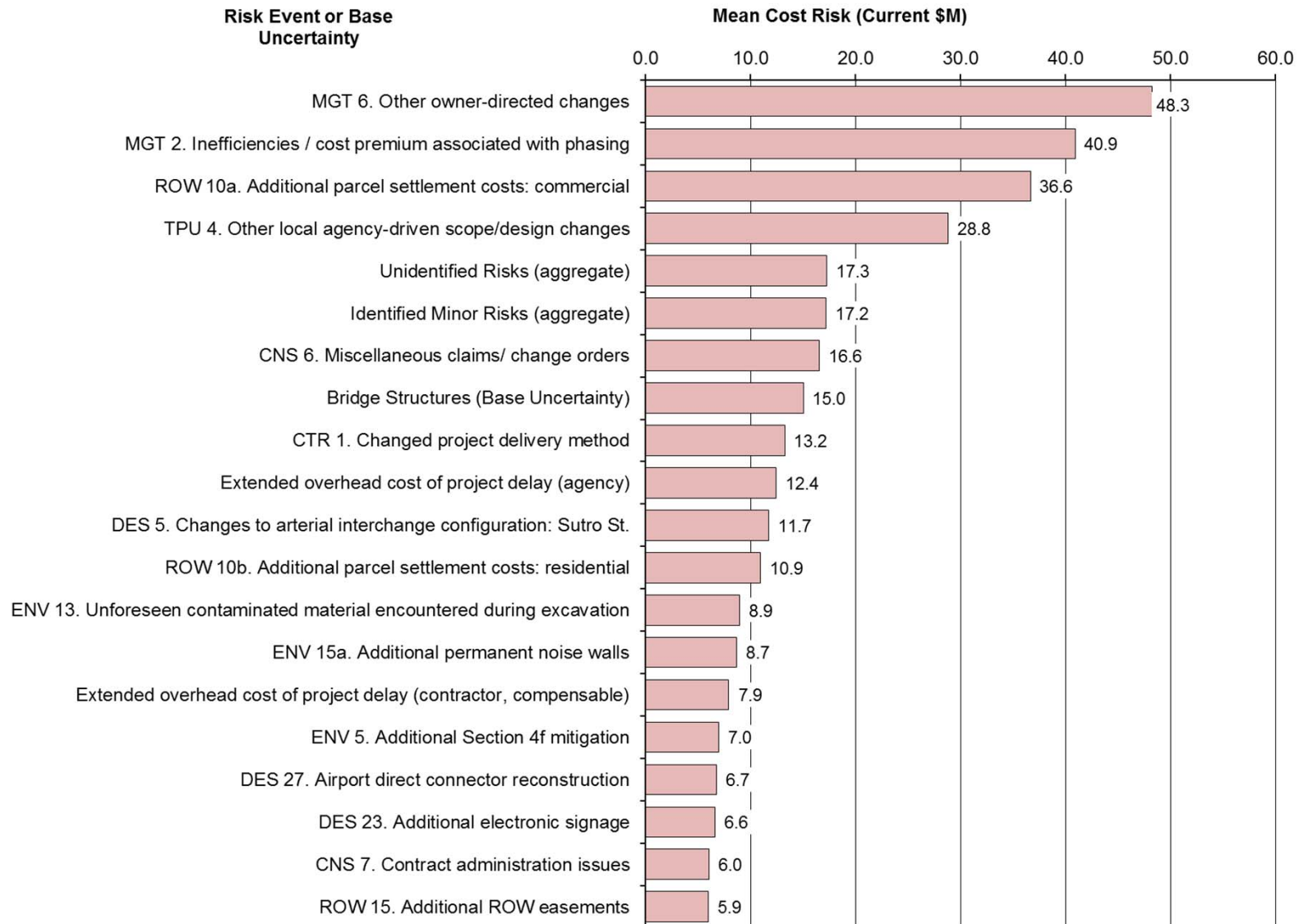
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Summary of Key Milestone Dates: Alternative 2A Phased



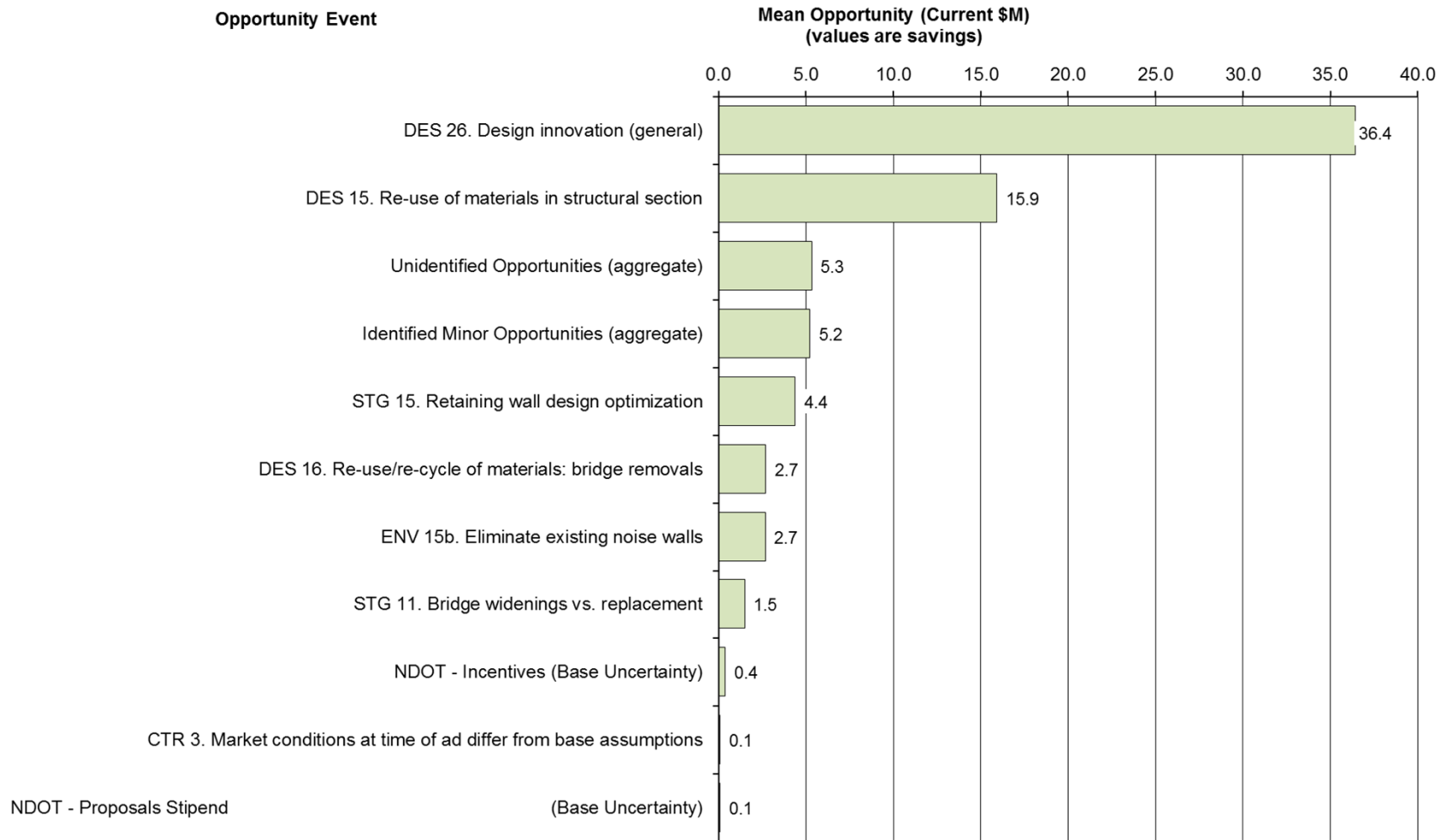
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Most Significant (Top 20) Cost Risks: Alt. 2A Phased



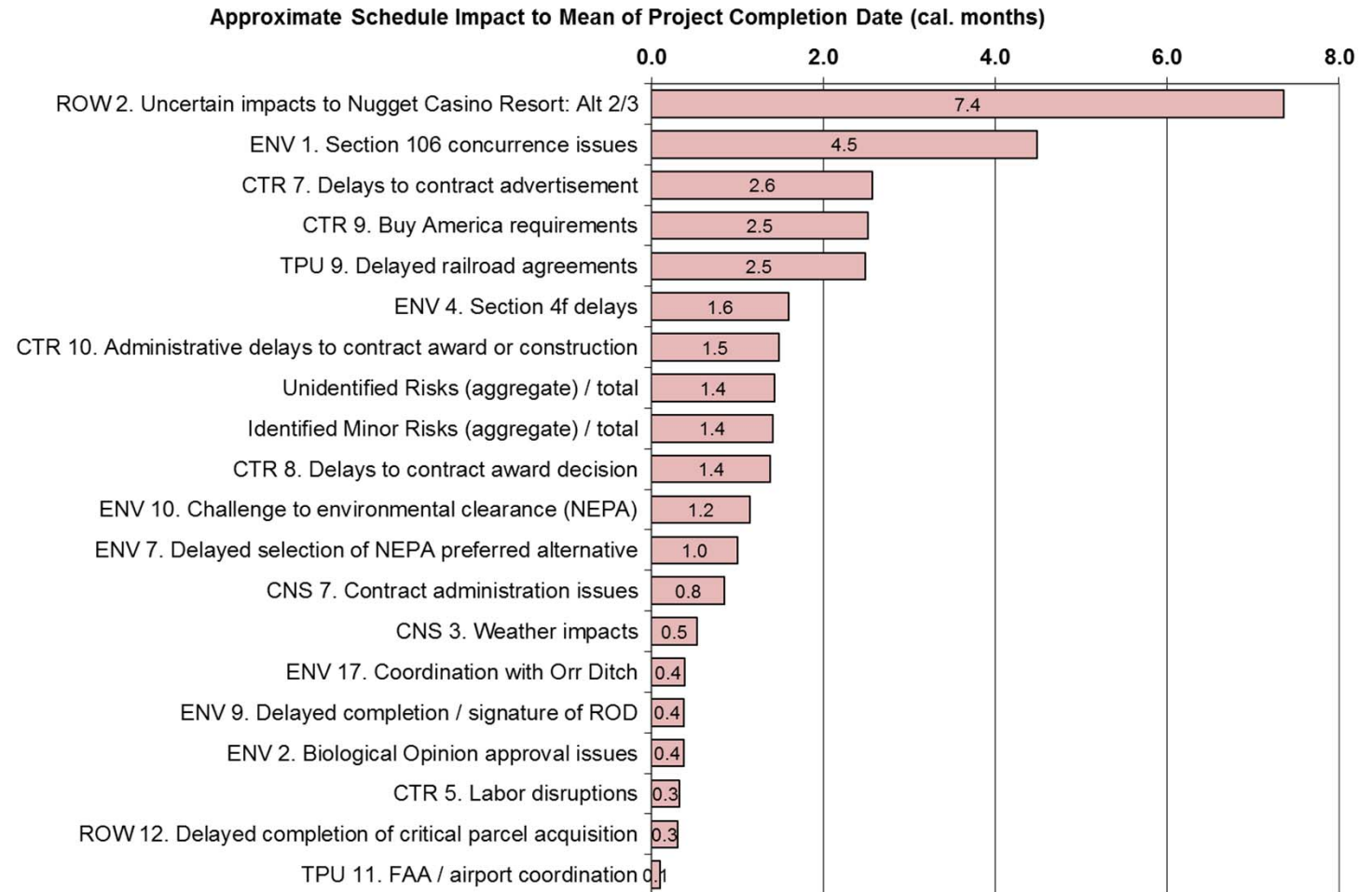
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Most Significant Cost Opportunities: Alt. 2A Phased



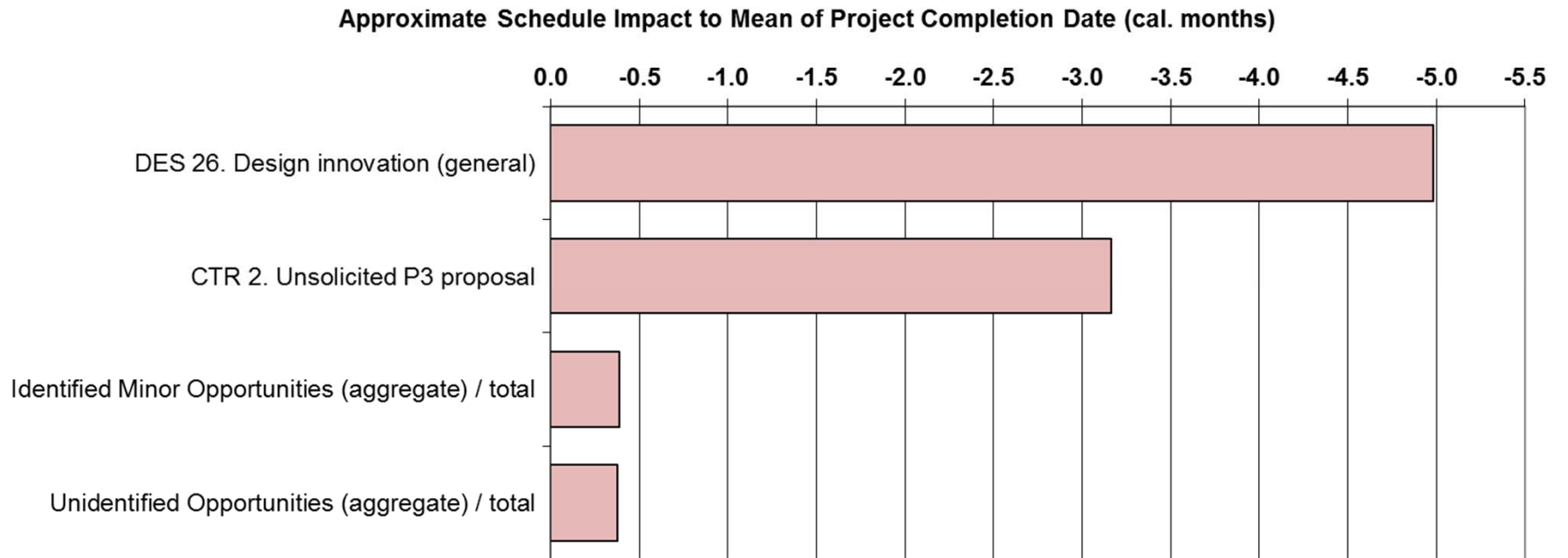
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Most Significant (Top 20) Schedule Risks: Alt. 2A Phased



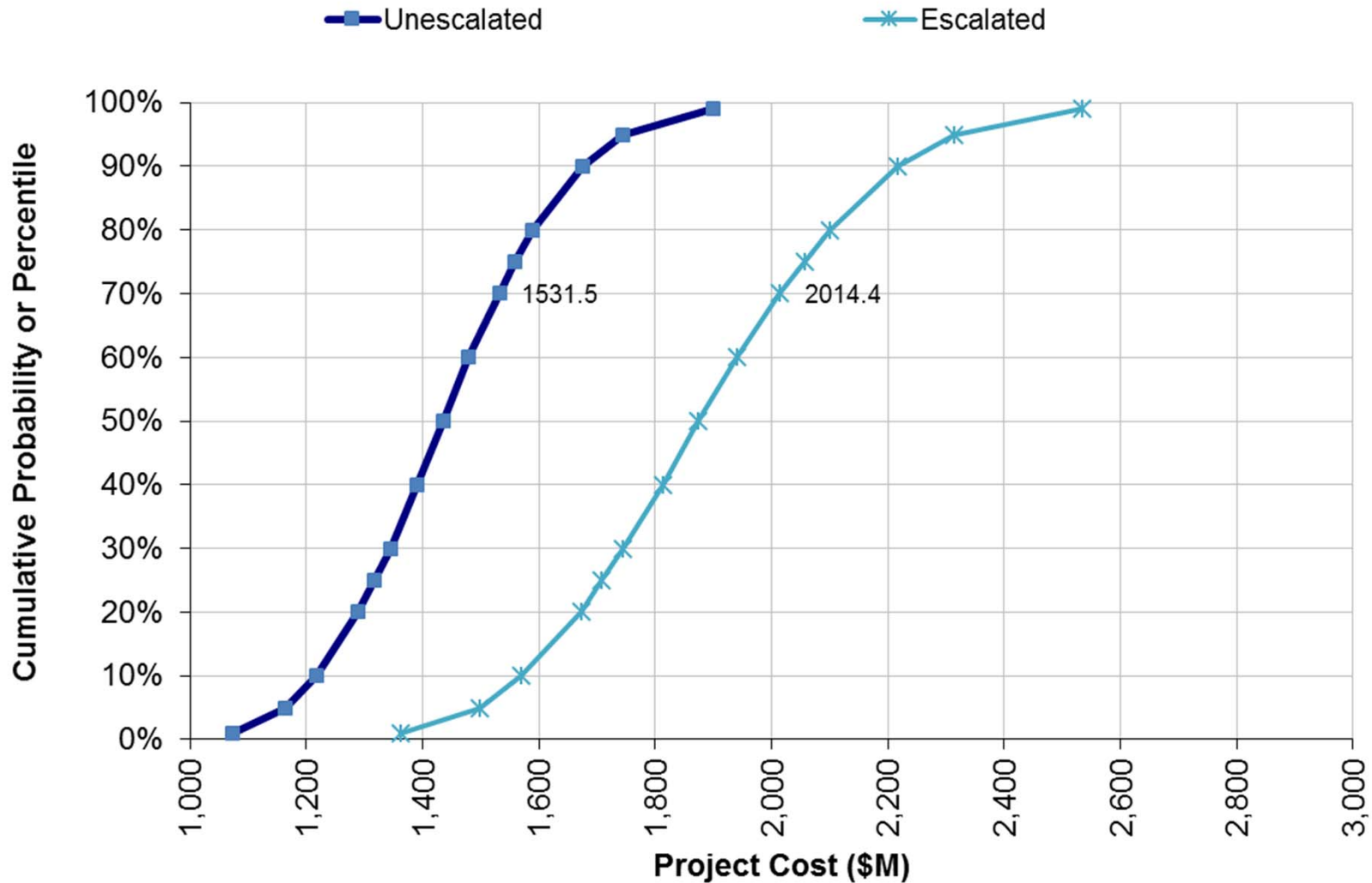
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Most Significant Schedule Opportunities: Alt. 2A Phased



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Alternative 3A Unconstrained: Comparison of Project Cost Results (unescaled and escalated)



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Summary of Results: Alternative 3A Unconstrained

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,008	1,222	Oct 2019	Sep 2025
Mean	1,442	1,888	Aug 2020	Oct 2028
Std. Dev.	178	252	7.8	12.3
10%	1,216	1,569	Oct 2019	Jun 2027
50%	1,435	1,873	Jul 2020	Jul 2028
70%	1,531	2,014	Nov 2020	Mar 2029
90%	1,675	2,217	Jul 2021	Mar 2030

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Summary of Project Component Costs: Alternative 3A Unconstrained

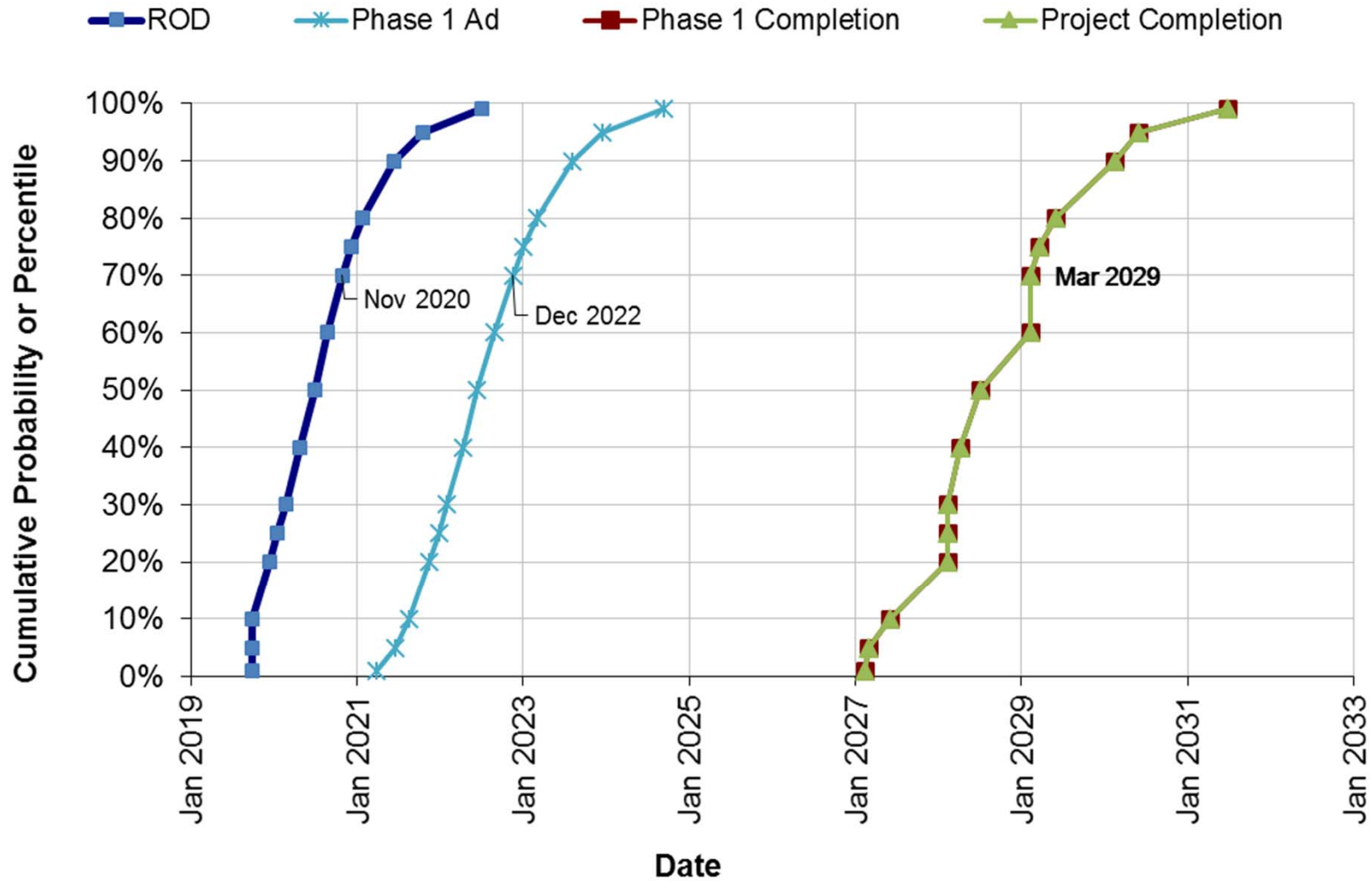
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	59.3	62.6	225.7	269.3	722.9	890.4
Mean	98.2	105.7	296.8	367.2	483.8	549.8
Std. Dev.	18.7	20.8	39.8	54.2	34.6	39.7
10%	76.8	82.0	246.3	299.7	857.3	1136.0
50%	95.6	102.7	295.0	363.1	1044.6	1397.9
70%	105.8	114.0	317.1	393.7	1125.0	1514.2
90%	122.8	133.2	349.4	438.4	1248.7	1689.8

Notes:

1. Component costs are not additive at a given percentile
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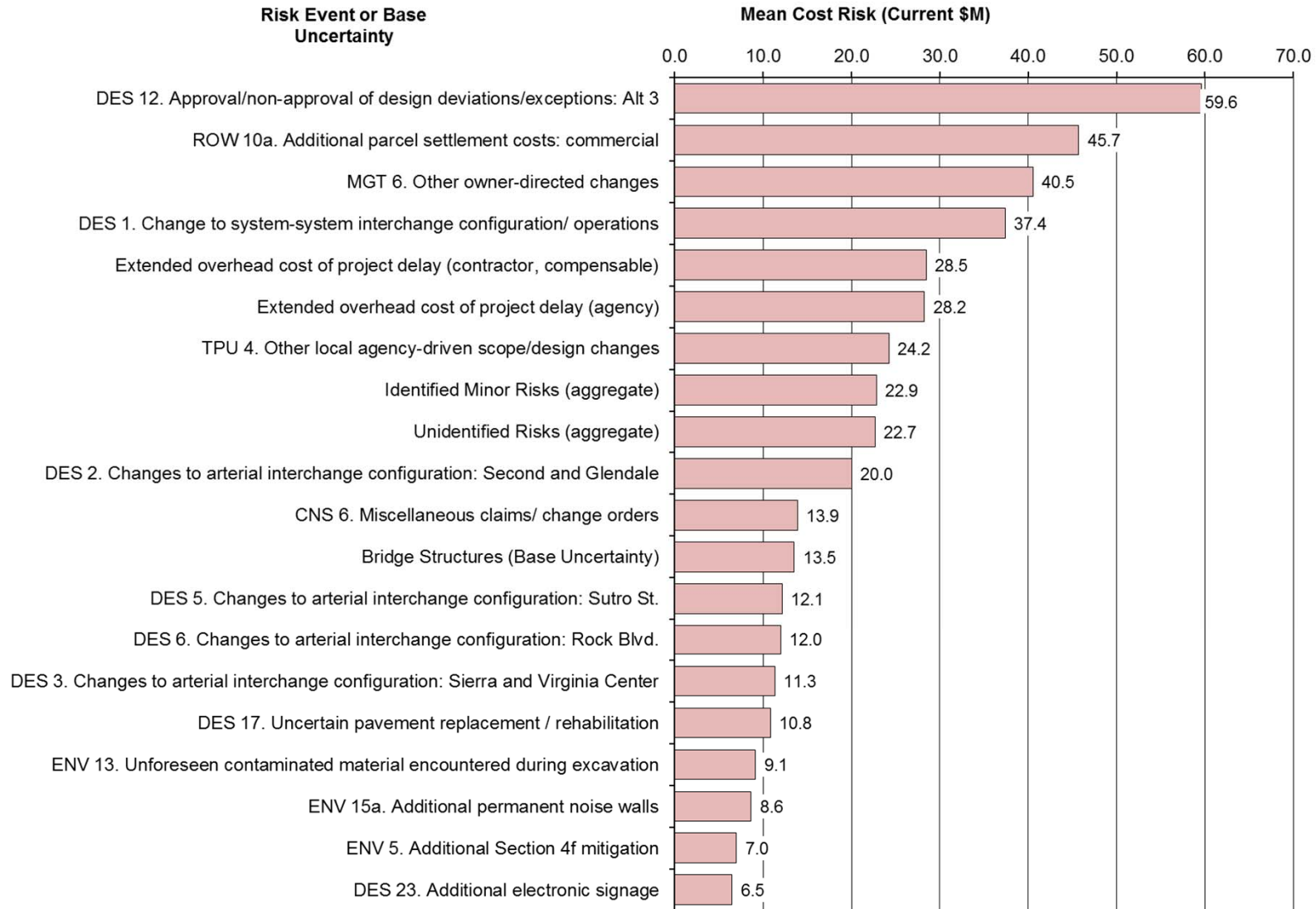
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Summary of Key Milestone Dates: Alternative 3A Unconstrained



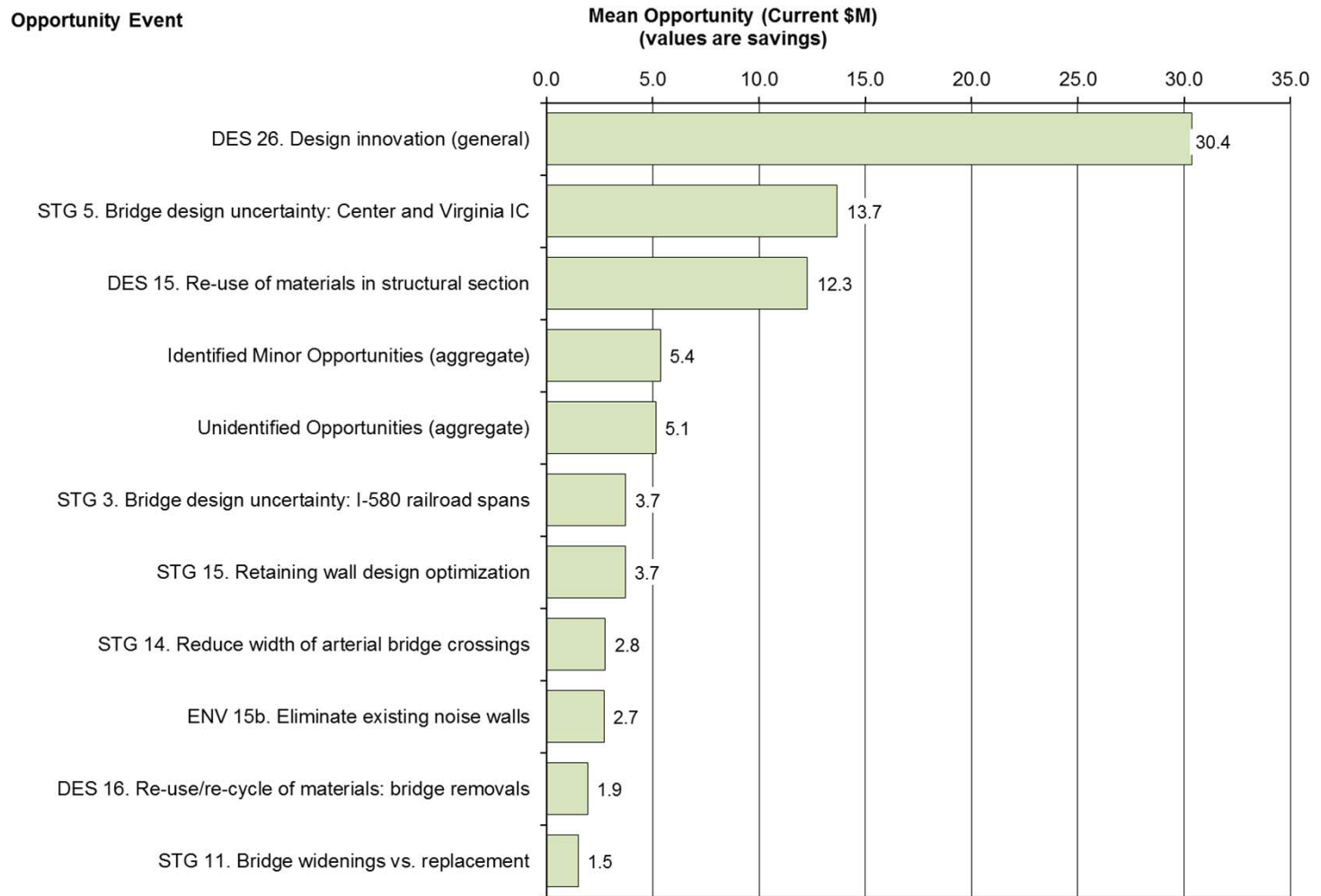
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Most Significant (Top 20) Cost Risks: Alt. 3A Unconstrained



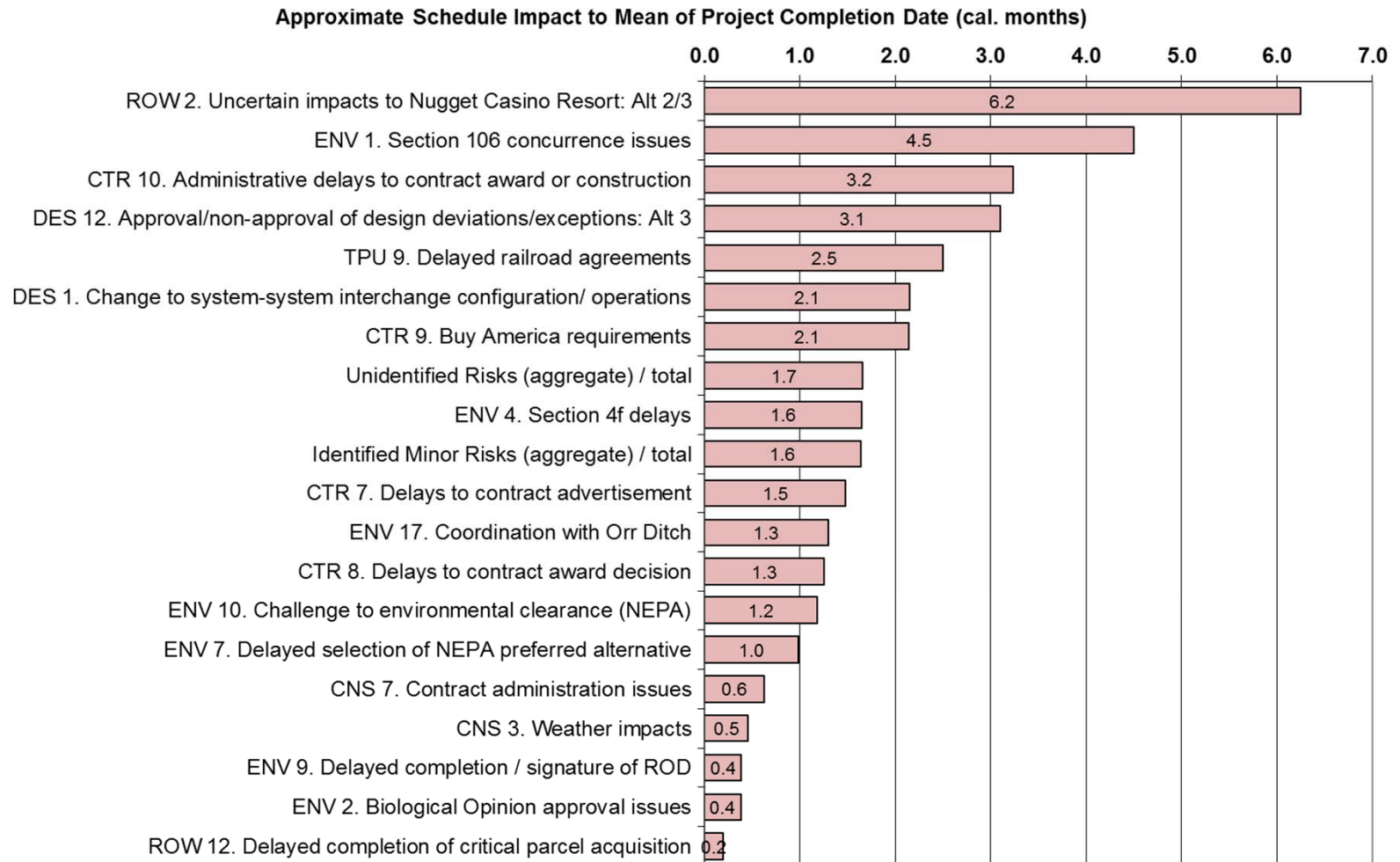
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Most Significant Cost Opportunities: Alt. 3A Unconstrained



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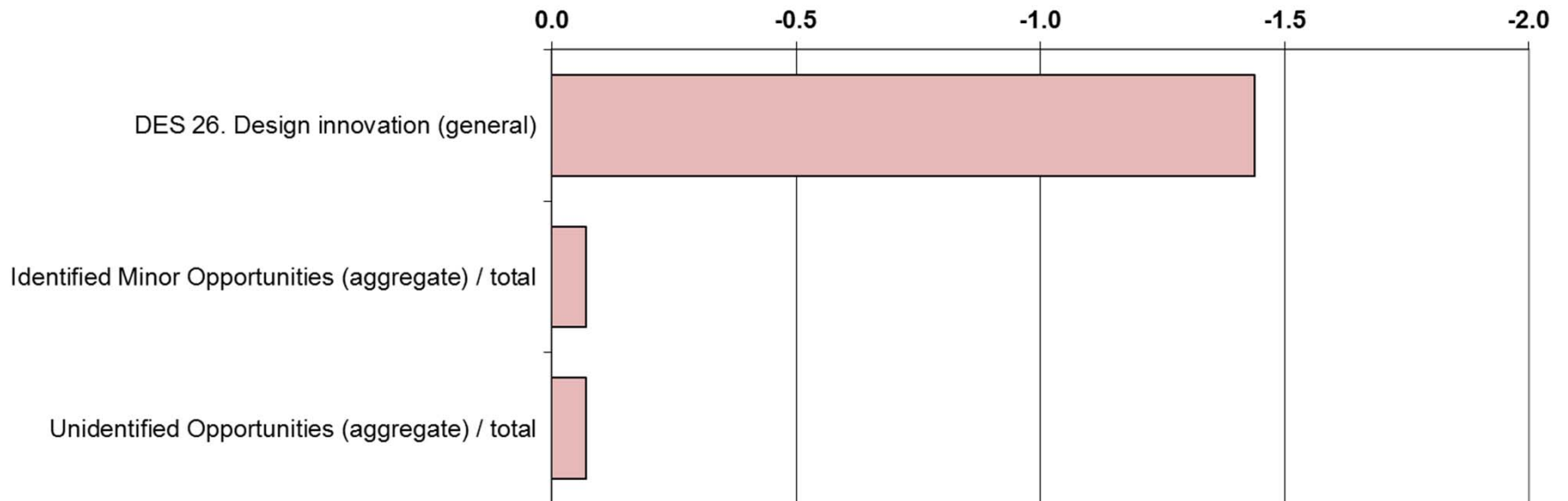
Most Significant (Top 20) Schedule Risks: Alt. 3A Unconstrained



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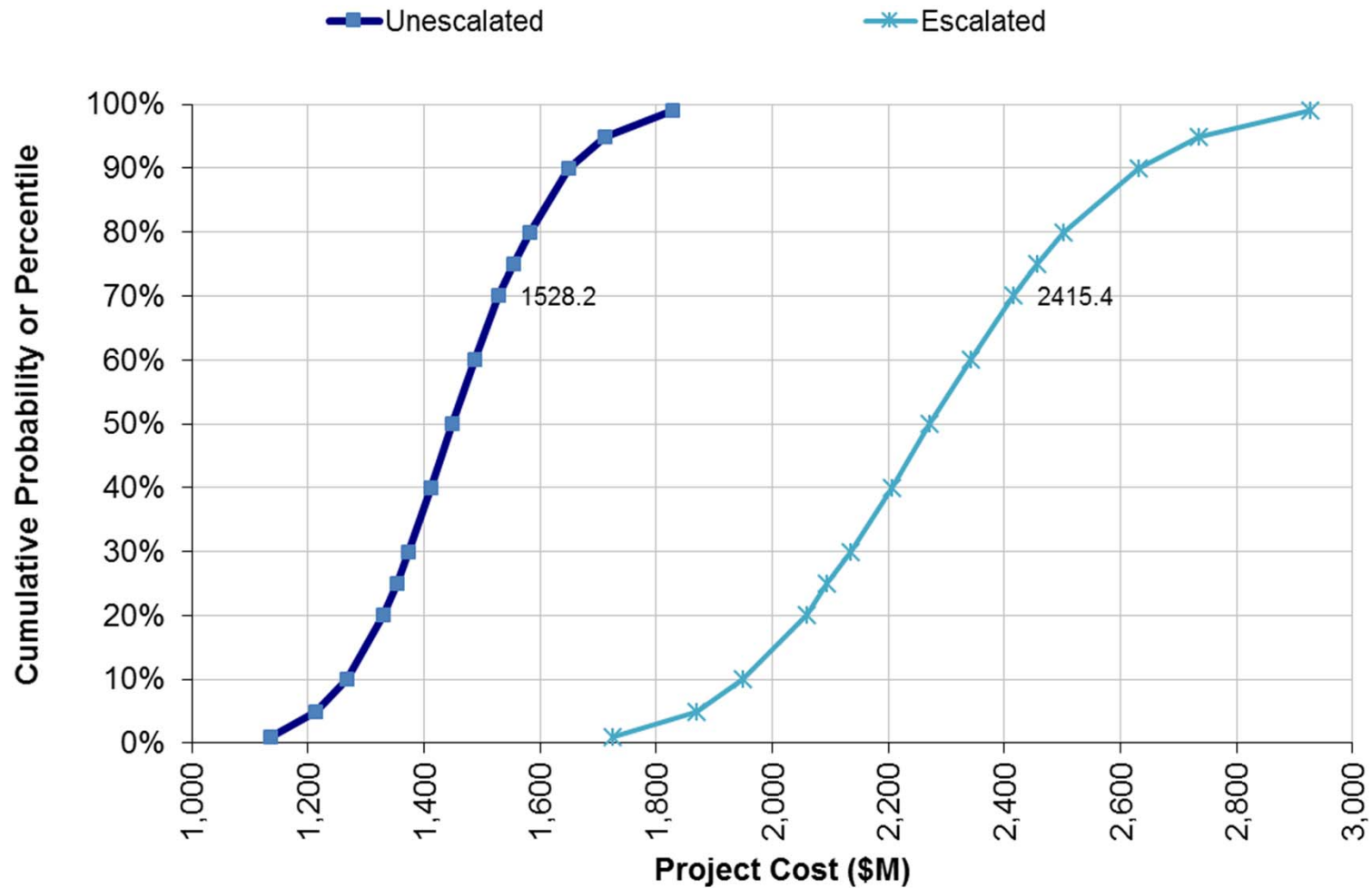
Most Significant Schedule Opportunities: Alt. 3A Unconstrained

Approximate Schedule Impact to Mean of Project Completion Date (cal. months)



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Alternative 3A Phased: Comparison of Project Cost Results (unescalated and escalated)



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Summary of Results: Alternative 3A Phased

	Total (2017 \$M)	Total (YOE \$M)	ROD Date	Project Completion Date
Base (no risk)	1,008	1,465	Oct 2019	Oct 2035
Mean	1,454	2,282	Aug 2020	Jul 2038
Std. Dev.	149	263	7.8	18.9
10%	1,267	1,950	Oct 2019	Mar 2037
50%	1,447	2,271	Jul 2020	Jul 2038
70%	1,528	2,415	Nov 2020	Mar 2039
90%	1,648	2,631	Jul 2021	Mar 2040

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Summary of Project Component Costs: Alternative 3A Phased

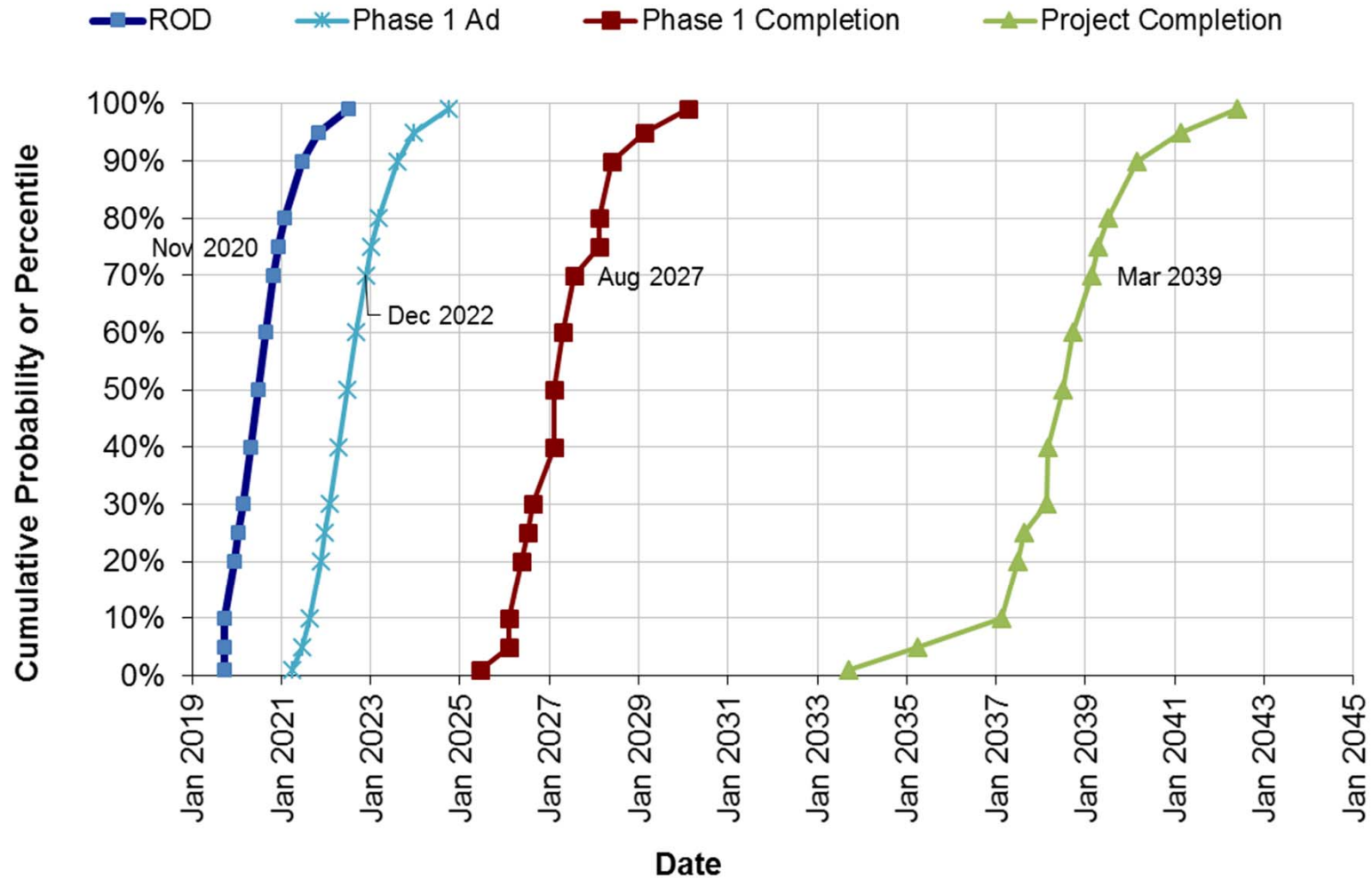
	PE (2017 \$M)	PE (YOE \$M)	ROW (2017 \$M)	ROW (YOE \$M)	Construction (2017 \$M)	Construction (YOE \$M)
Base (no risk)	59.3	66.1	225.7	318.9	722.9	1079.8
Mean	78.8	89.9	315.8	476.8	483.8	549.8
Std. Dev.	12.7	14.9	44.6	82.7	34.6	39.7
10%	63.3	71.8	259.8	373.9	900.6	1433.9
50%	77.4	88.3	313.7	470.4	1053.5	1708.2
70%	84.3	96.2	338.2	515.2	1125.7	1825.6
90%	96.0	109.9	375.0	586.7	1221.5	2004.1

Notes:

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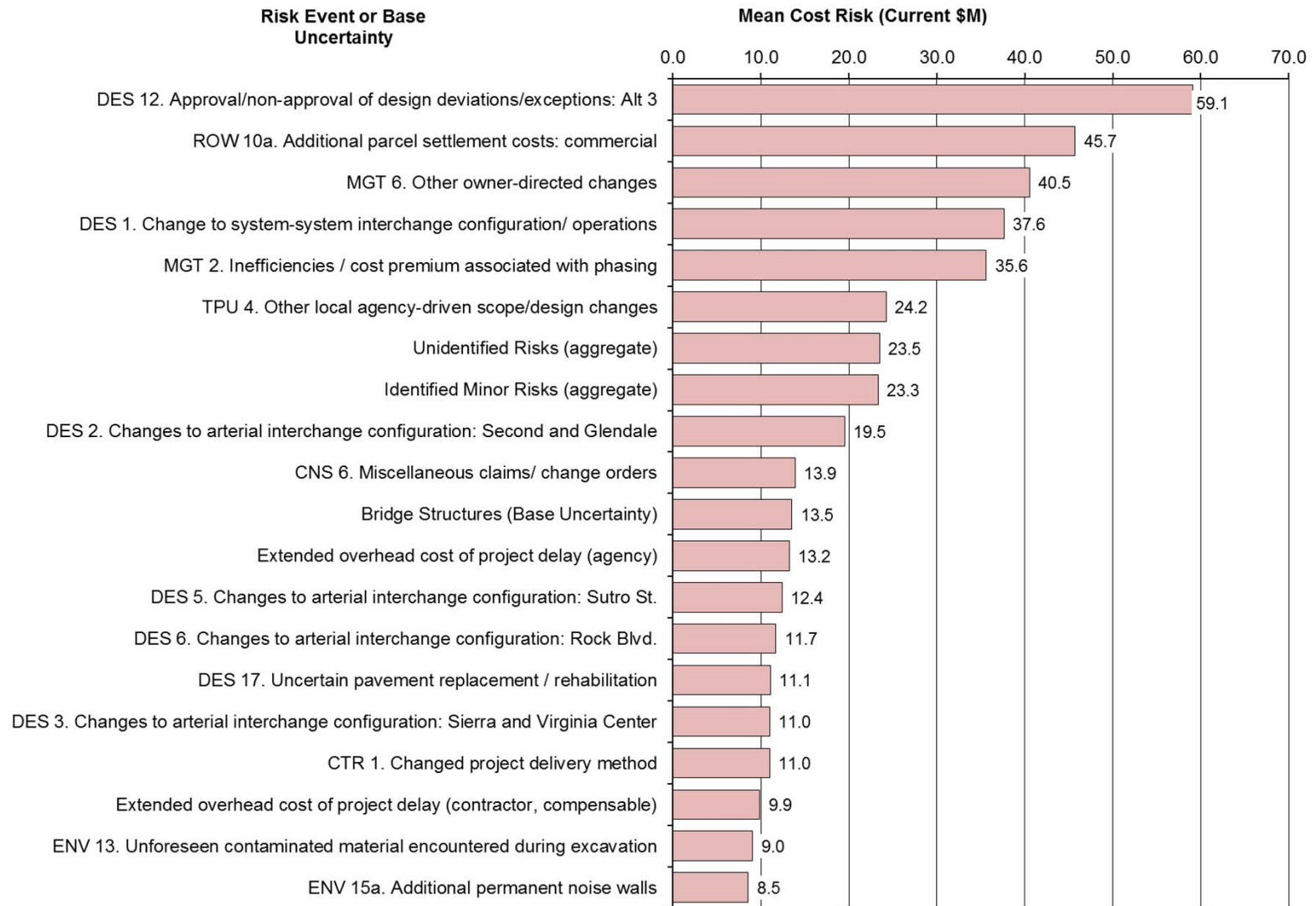
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Summary of Key Milestone Dates: Alternative 3A Phased



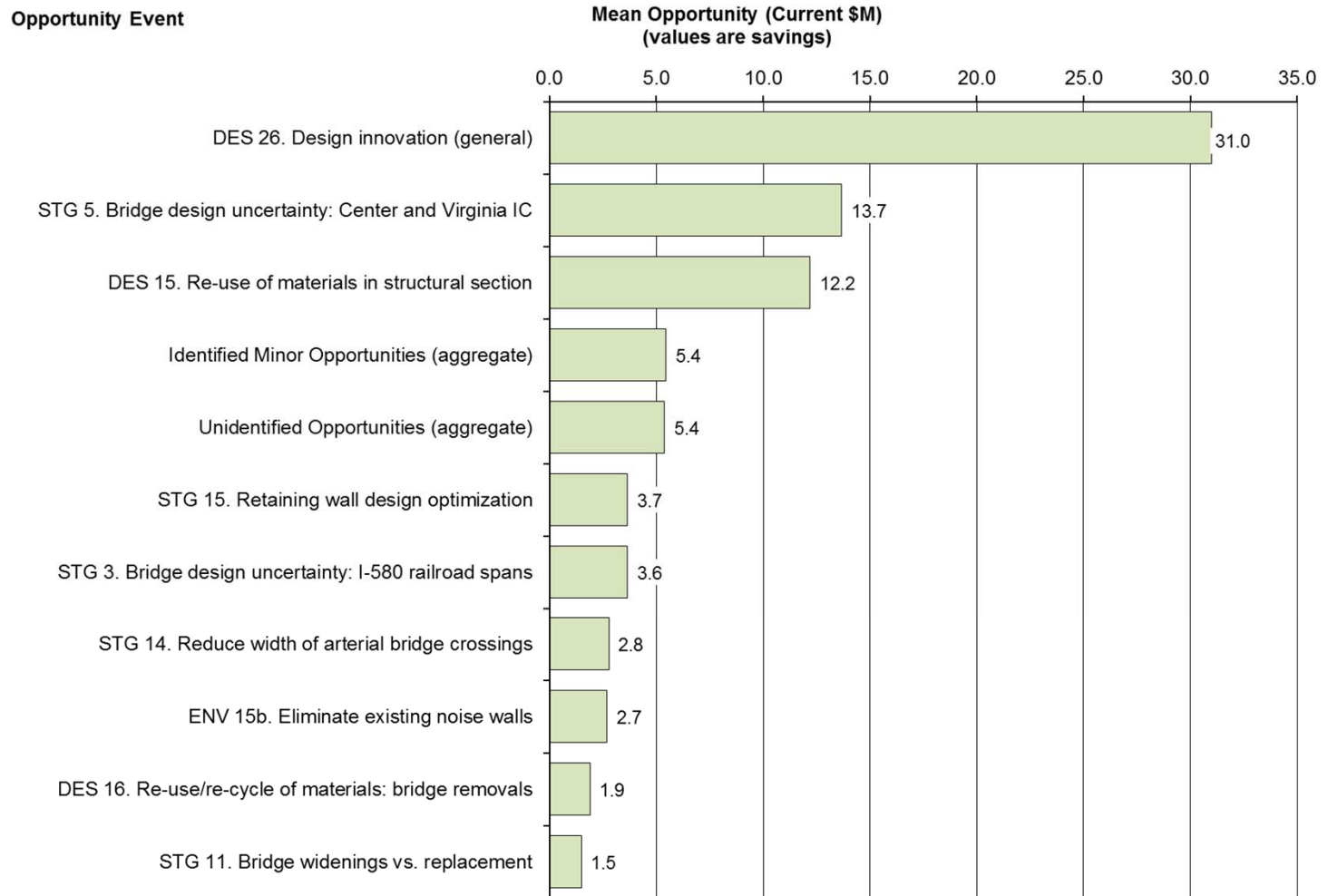
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Most Significant (Top 20) Cost Risks: Alt. 3A Phased



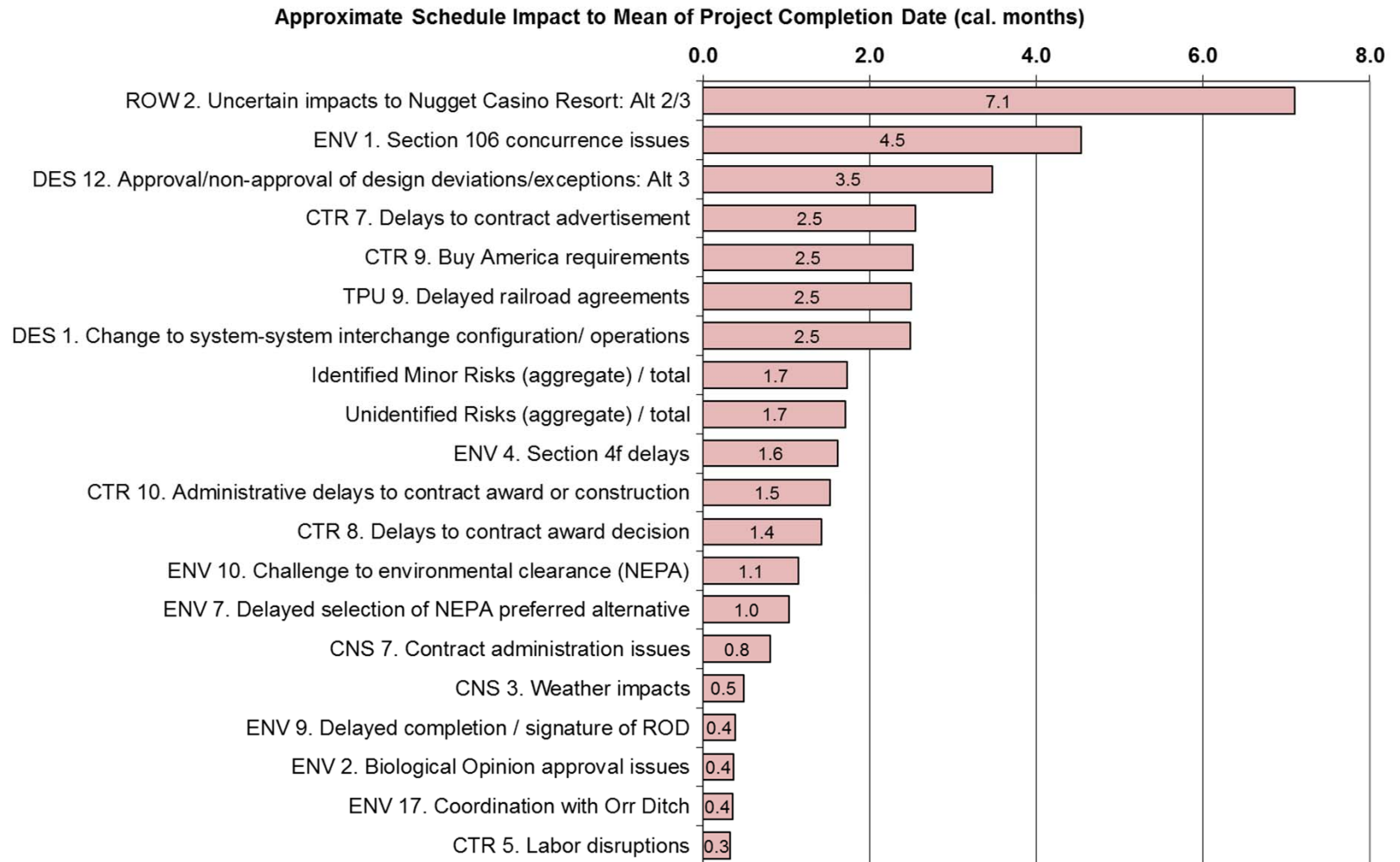
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Most Significant Cost Opportunities: Alt. 3A Phased



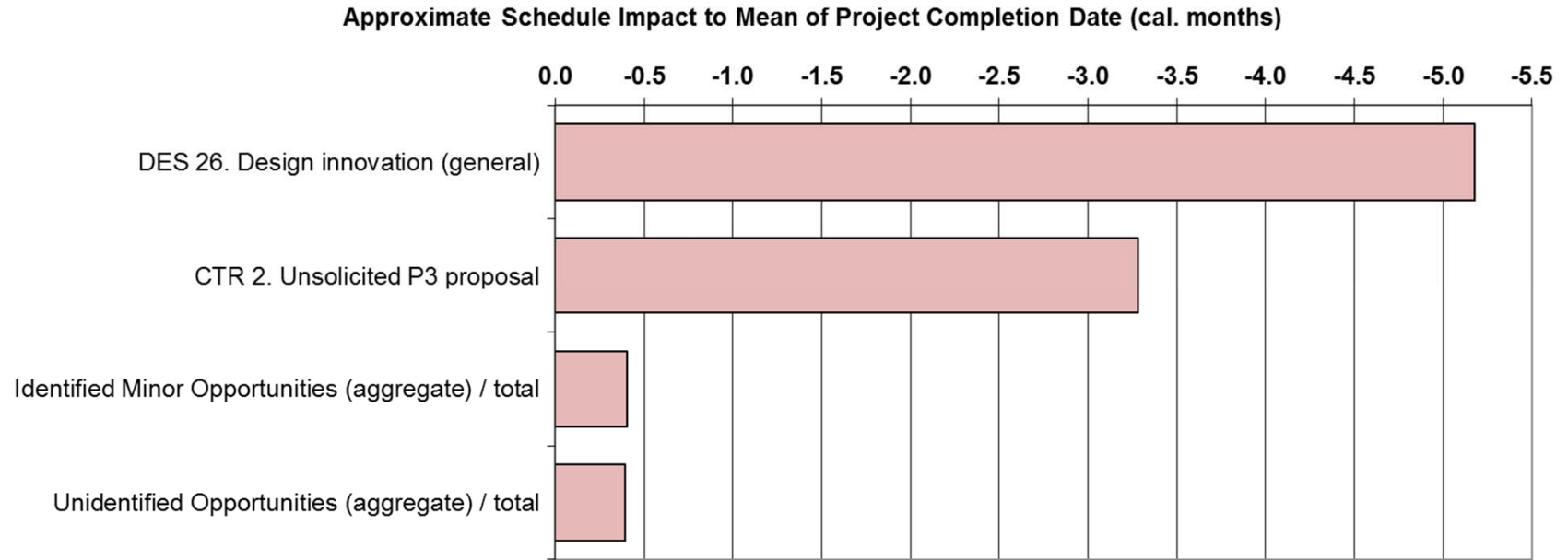
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Most Significant (Top 20) Schedule Risks: Alt. 3A Phased



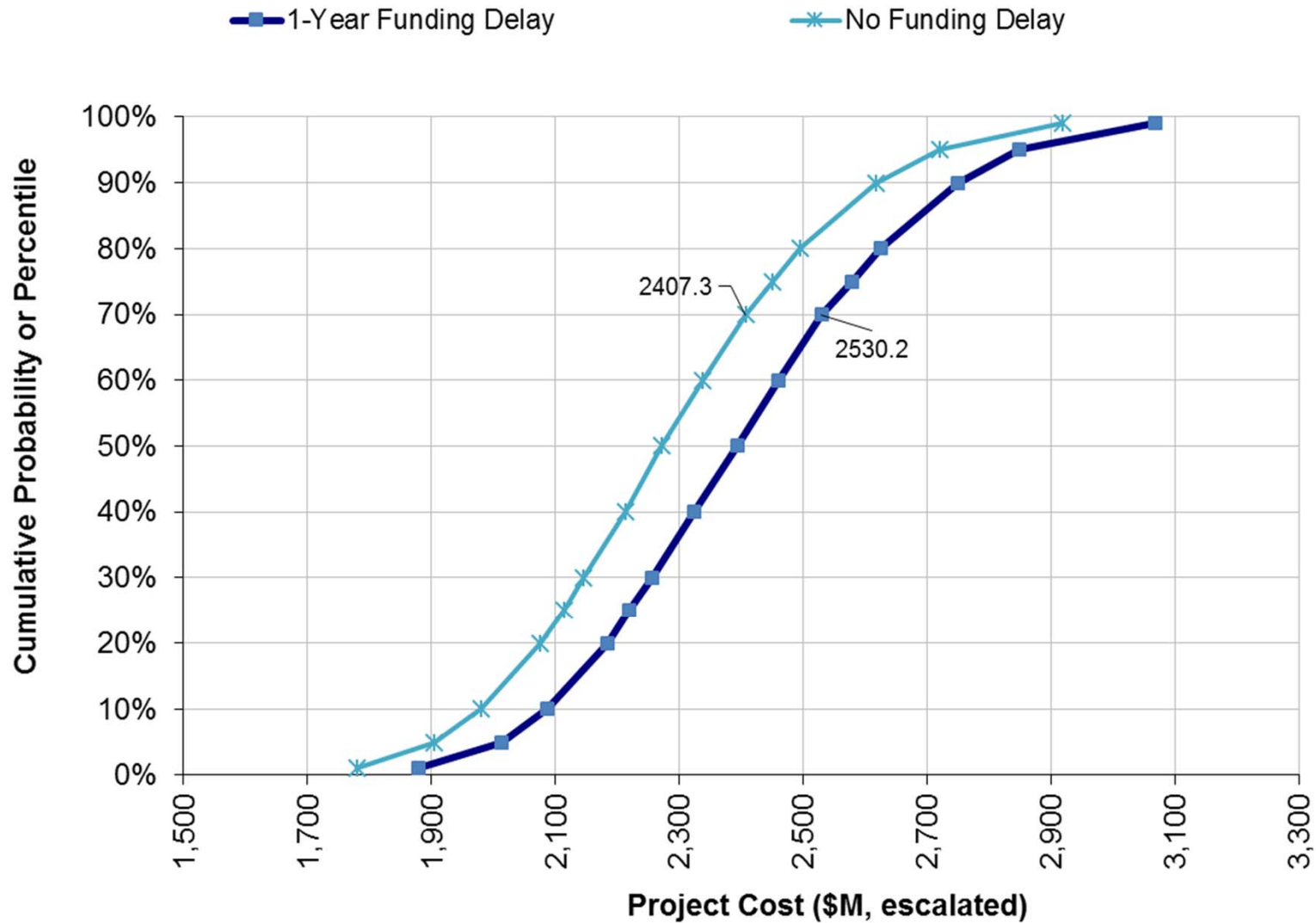
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Most Significant Schedule Opportunities: Alt. 3A Phased



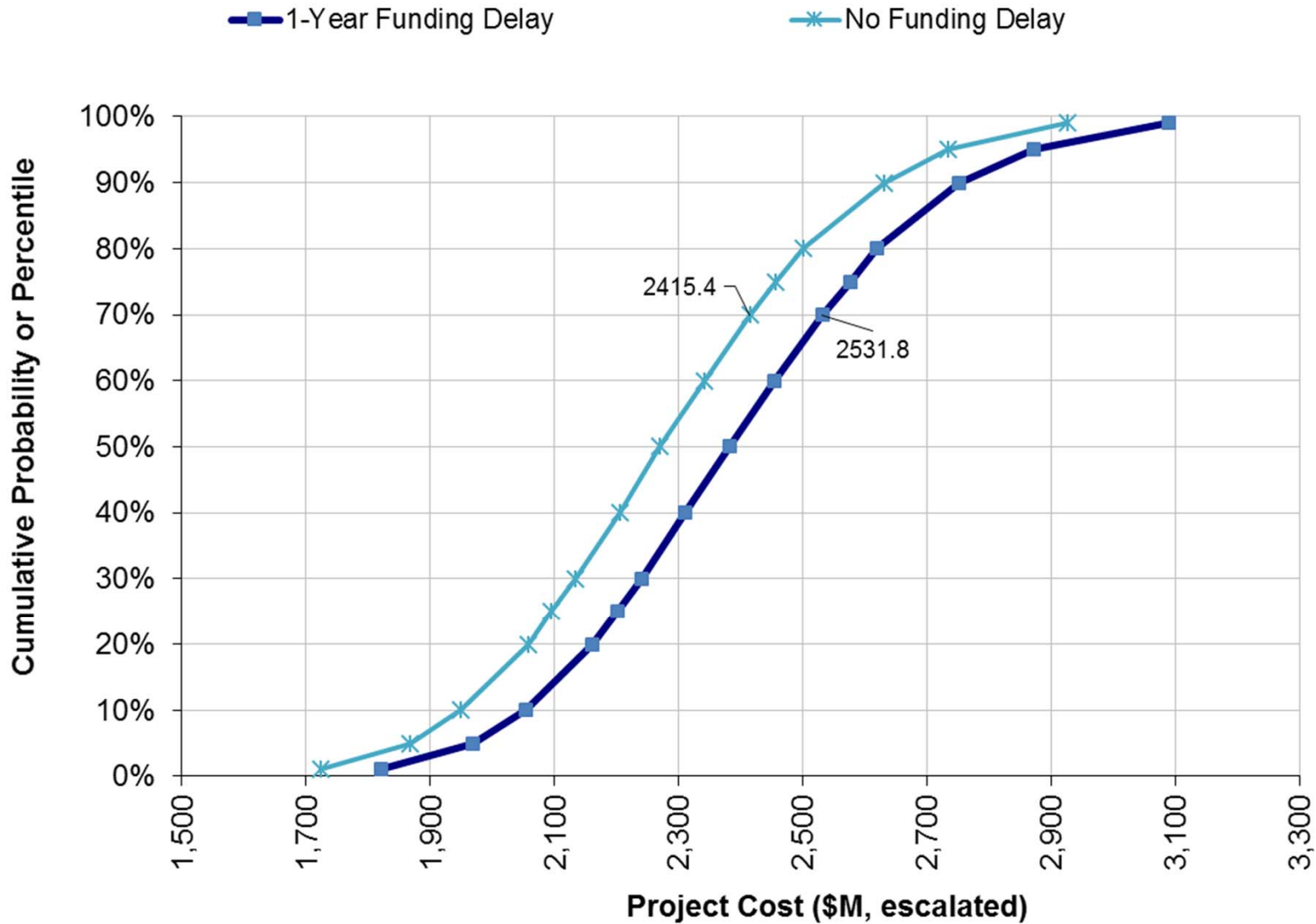
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Sensitivity Analysis: One-year funding delay (Alt. 2A Phased)



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Sensitivity Analysis: One-year funding delay (Alt. 3A Phased)



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APPENDIX I

SELECTION CRITERIA DATA



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria	Unit of Measure	No Build	Alternative 1	Alternative 2	Alternative 3
PARKS	Acres				
CULTURAL RESOURCES					
Total Change In Setting/Feeling, Prpoerties	Each				
Total Demolition to Resources, Parcels	Each				
Total No Adverse Effect, Parcels	Each				
INSTITUTIONAL	Each				
COMMERCIAL DISPLACEMENTS	Each				
RESIDENTIAL DISPLACEMENTS	Each				
RENO/SPARKS INDIAN COLONY IMPACTS					
Residential Impacted Properties	Each				
Commercial Impacted Properties	Each				
HAZARDOUS MATERIALS					
Low, Medium and High Risk Sites	Each				
ACCESS					
SAFETY					
TRAFFIC OPERATIONS					
COST					
BENEFIT-COST					

* All information is Preliminary and Subject to Change



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Parks	Alternative 1				Alternative 2				Alternative 3			
	Description of Impact	Units		% Impacted	Description of Impact	Units		% Impacted	Description of Impact	Units		% Impacted
		Park Acres	Acres			Park Acres	Acres			Park Acres	Acres	
Evans Park		2.1	0	0%				0%				0%
Fisherman's Park #1	ROW Acquisition	3.99	0.64	16%				0%				0%
Fisherman's Park #2		5.60	0.33	6%				0%				0%
Fisherman's Park #2 (south)	ROW Acquisition	0.0388	0.01	26%				0%				0%
Governor's Bowl Park	ROW Acquisition	7.4	4.4	59%	ROW Acquisition	7.43	1.2	16%	ROW Acquisition	7.43	1.4	19%
Sage Street Park - City (west)	ROW Acquisition	0.54	0.54	100%	ROW Acquisition	0.54	0.41	76%	ROW Acquisition	0.54	0.24	44%
Sage Street Park - NDOT (east)	ROW Acquisition	0.50	0.50	100%	ROW Acquisition	0.50	0.36	72%	ROW Acquisition	0.50	0.2	40%
Bandstand Park	ROW Acquisition	0.3	0.06	20%				0%				0%
Lillard Park	ROW Acquisition	0.7	0.7	100%				0%				0%
Sparks Memorial Park	ROW Acquisition	0.5	0.1	20%				0%				0%

* All information is Preliminary and Subject to Change



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Cultural Resources	Alternative 1		Alternative 2		Alternative 3	
	Description of Impact	No.	Description of Impact	No.	Description of Impact	No.
1331 Plumb Lane, Reno, NV	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
1995 Second Street, Reno, NV	No Adverse Effect	1	No Adverse Effect	1	No Adverse Effect	1
825 Sierra Street, Reno, NV	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
821 Center Street	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
820 Center Street	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
127 8th Street	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
729 Evans Avenue	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
708 Center Street	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
1752 4th Street	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
1755 4th Steet	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
814 Victorian Ave	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
905 Victorian Ave	Demolition to Resources	1	No Adverse Effect	1	No Adverse Effect	1
2644 Prater Way	Demolition to Resources	1	Demolition to Resources	1	Change in Setting/Feeling	1
121 18th Street	Change in Setting/Feeling	1	No Adverse Effect	1	Change in Setting/Feeling	1
2406 Prater Way	Change in Setting/Feeling	1	No Adverse Effect	1	No Adverse Effect	1
Mineral Manor	Demolition to Resources	1	Demolition to Resources	1	Demolition to Resources	1
RSIC	Change in Setting/Feeling	1	Change in Setting/Feeling	1	Change in Setting/Feeling	1
	Total Change In Setting/Feeling	13	Total Change In Setting/Feeling	6	Total Change In Setting/Feeling	8
	Total Demolition to Resources	3	Total Demolition to Resources	2	Total Demolition to Resources	1
	Total No Adverse Effect	1	Total No Adverse Effect	9	Total No Adverse Effect	8

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Institutional Impacts	Alternative 1				Alternative 2				Alternative 3			
	APN	Owner	No.	% Impacted	APN	Owner	No.	% Impacted	APN	Owner	No.	% Impacted
	007-183-09	Bd of Regents NV Sys Higher Ed UNR		10	004-061-12	RTC		5	004-061-12	RTC		5
	007-183-10	University of Nevada		10	004-293-07	NDOT		5	007-183-10	University of Nevada		20
	007-214-26	City of Reno		10	004-293-09	NDOT		1	007-191-13	University of Nevada		5
	007-221-05	City of Reno - Evans Park		10	007-191-13	University of Nevada		5	007-193-26	City of Reno		10
	007-222-09	University of Nevada		100	007-222-09	University of Nevada		100	007-214-26	City of Reno		100
	007-222-10	University of Nevada		100	007-222-10	University of Nevada		10	007-235-01	NDOT - 8th Street Park		10
	007-222-11	University of Nevada		10	007-235-01	NDOT - 8th Street Park		10	008-030-04	University of Nevada		30
	007-241-27	NDOT		10	008-030-04	University of Nevada		1	008-171-36	City of Reno - Sage Street Park		40
	008-030-04	University of Nevada		10	008-161-43	Washoe County - NE Wells; between 8th/9th		1	008-211-38	NDOT - Governors Bowl Park		30
	008-161-43	Washoe County - NE Wells; between 8th/9th		10	008-171-36	City of Reno - Sage Street Park		75	008-213-01	NDOT - Sage Street Park		40
	008-171-36	City of Reno - Sage Street Park		100	008-211-38	NDOT - Governors Bowl Park		20	008-213-02	Housing Authority City of Reno		5
	008-211-38	NDOT - Governors Bowl Park		100	008-211-41	NDOT		60	008-360-41	City of Reno		10
	008-211-41	NDOT		100	008-213-01	NDOT - Sage Street Park		75	008-381-34	City of Reno		100
	008-213-01	NDOT - Sage Street Park		100	008-213-02	Housing Authority City of Reno		25	008-381-35	City of Reno		100
	008-213-02	Housing Authority City of Reno		100	008-214-09	Housing Authority City of Reno		25	008-381-38	City of Reno		50
	008-214-09	Housing Authority City of Reno		50	008-360-41	City of Reno		10	008-381-39	City of Reno		15
	008-360-41	City of Reno		10	008-381-34	City of Reno		20	012-291-03	NDOT		10
	008-381-34	City of Reno		100	008-381-35	City of Reno		100	012-291-04	City of Reno		5
	008-381-35	City of Reno		50	008-381-38	City of Reno		50	013-341-23	NDOT - RTC Bus Maintenance Facility		15
	008-381-38	City of Reno		50	008-381-39	City of Reno		20	013-343-04	Washoe County - Wooster High School		0.1
	008-381-39	City of Reno		100	012-291-03	NDOT		2	015-210-34	Reno-Tahoe Airport		0.005
	008-382-01	TMWA		100	012-291-04	City of Reno		25	015-361-01	Reno-Tahoe Airport		20
	008-382-02	TMWA		100	012-292-04	City of Reno		5	020-221-29	NDOT		100
	012-291-03	NDOT		30	013-341-23	NDOT - RTC Bus Maintenance Facility		100	032-125-09	City of Sparks		100
	012-291-04	City of Reno		100	013-343-04	Washoe County - Wooster High School		1	032-171-33	RTC - Victorian Ave Bus Station		10
	012-292-04	City of Reno		15	015-210-34	Reno-Tahoe Airport		0.005	032-172-21	NDOT - Nugget Viaduct		100
	012-292-05	City of Reno - Fishermans Park 2		10	020-221-29	NDOT		100	032-172-23	NDOT - Nugget Viaduct		100
	012-301-16	City of Reno - Fishermans Park 1		10	026-841-01	NDOT		100	032-201-17	NDOT - Nugget Viaduct		100
	012-301-21	USA TTEE - Walmart		30	026-841-02	NDOT		100	032-220-28	UPRR		5
	012-302-10	USA TTEE - W of I-580 S of River		10	032-166-03	TMWA		10	032-220-79	UPRR		10
	012-302-13	City of Reno - Fishermans Park 2		10	032-166-11	City of Sparks		5	032-220-80	UPRR		100
	012-302-23	USA TTEE - NW quad 2nd/Galetti/I580		10	032-166-15	City of Sparks		10	035-012-12	Bd of Regents NV Sys Higher Ed UNR		2
	013-341-11	Reno-Tahoe Airport		10	032-171-33	RTC - Victorian Ave Bus Station		5				
	013-341-23	NDOT - RTC Bus Maintenance Facility		100	032-172-21	NDOT - Nugget Viaduct		100				
	013-343-04	Washoe County - Wooster High School		10	032-172-23	NDOT - Nugget Viaduct		100				
	013-351-04	Reno-Tahoe Airport		10	032-201-17	NDOT - Nugget Viaduct		100				
	015-210-34	Reno-Tahoe Airport		0.1	032-220-28	UPRR		2				
	015-361-01	Reno-Tahoe Airport		10	032-220-79	UPRR		10				
	015-361-02	Reno-Tahoe Airport		10	032-220-80	UPRR		100				
	020-221-29	NDOT		100	035-012-12	Bd of Regents NV Sys Higher Ed UNR		2				
	032-125-09	City of Sparks		100								
	032-166-03	TMWA		10								
	032-166-11	City of Sparks		100								
	032-166-12	City of Sparks		10								
	032-166-15	City of Sparks		100								



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Institutional Impacts	Alternative 1				Alternative 2				Alternative 3			
	APN	Owner	No.	% Impacted	APN	Owner	No.	% Impacted	APN	Owner	No.	% Impacted
	032-171-33	RTC - Victorian Ave Bus Station		100								
	032-171-35	RTC - Bandstand Park		10								
	032-172-21	NDOT - Nugget Viaduct		100								
	032-172-23	NDOT - Nugget Viaduct		100								
	032-194-10	City of Sparks		10								
	032-194-20	City of Sparks - Sparks Memorial Park		30								
	032-194-21	City of Sparks		100								
	032-195-01	City of Sparks - Lillard Park		100								
	032-201-17	NDOT - Nugget Viaduct		100								
	032-202-32	City of Sparks		100								
	032-202-34	City of Sparks		100								
	032-220-28	UPRR		10								
	032-220-79	UPRR		10								
	032-220-80	UPRR		30								
		Total Impacted	59			Total Impacted	40			Total Impacted	32	

* All information is Preliminary and Subject to Change



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Commerical Displacements	Alternative 1		Alternative 2		Alternative 3	
	Description of Impact	No.	Description of Impact	No.	Description of Impact	No.
	I-80 Corridor (west leg)	34	I-80 Corridor (west leg)	10	I-80 Corridor (west leg)	17
	I-80 Corridor (east leg)	54	I-80 Corridor (east leg)	17	I-80 Corridor (east leg)	24
	I-580 Corridor (south leg)	5	I-580 Corridor (south leg)	4	I-580 Corridor (south leg)	6
	US 395 Corridor (north leg)	3	US 395 Corridor (north leg)	1	US 395 Corridor (north leg)	1
	Total Impacted	96	Total Impacted	32	Total Impacted	48

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Residential Displacements	Alternative 1		Alternative 2		Alternative 3	
	Description of Impact	No.	Description of Impact	No.	Description of Impact	No.
	I-80 Corridor (west leg)	127	I-80 Corridor (west leg)	160	I-80 Corridor (west leg)	4
	I-80 Corridor (east leg)	85	I-80 Corridor (east leg)	15	I-80 Corridor (east leg)	15
	I-580 Corridor (south leg)	33	I-580 Corridor (south leg)	4	I-580 Corridor (south leg)	8
	US 395 Corridor (north leg)	135	US 395 Corridor (north leg)	135	US 395 Corridor (north leg)	138
	Total Impacted	380	Total Impacted	314	Total Impacted	165

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Reno/Sparks Indian Colony Impacts

Commercial Properties	Alternative 1				Alternative 2				Alternative 3			
	APN	Description of Impact	No. Units	% Impacted	APN	Description of Impact	No. Units	% Impacted	APN	Description of Impact	No. Units	% Impacted
	012-301-21	USA TTEE - Walmart	1	30								
	012-302-10	USA TTEE - W of I-580 S of River	1	10								
	Total Impacted		2		Total Impacted		0		Total Impacted		0	

Residential Properties	Alternative 1				Alternative 2				Alternative 3			
	APN	Description of Impact	No. Units	% Impacted	APN	Description of Impact	No. Units	% Impacted	APN	Description of Impact	No. Units	% Impacted
	012-302-23	USA TTEE - NW quad 2nd/Galetti/I580	1	10								
	Total Impacted		1		Total Impacted		0		Total Impacted		0	

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Hazardous Materials	Alternative 1		Alternative 2		Alternative 3	
	Description of Impact	No. Units	Description of Impact	No. Units	Description of Impact	No. Units
	Low Risk Sites	20	Low Risk Sites	7	Low Risk Sites	10
	Medium Risk Sites	13	Medium Risk Sites	10	Medium Risk Sites	12
	High Risk Sites	34	High Risk Sites	19	High Risk Sites	25
	No rating	2				
	Total	69	Total	36	Total	47

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Access (Freeway)					Existing Access
Interchange Name	Ramp	Fwy			
Plumb/Villanova - Split Diamond IC	NB off	580		At-grade weave	1
	NB on	580		At-grade weave	1
	SB off	580		At-grade weave	1
	SB on	580		At-grade weave	1
Mill - NB Parclo-Diamond IC	NB off	580		At-grade weave	1
	NB on	580		At-grade weave	1
	SB off	580		At-grade weave	1
	SB on	580		At-grade weave	1
2nd/Glendale - NB Parclo-Diamond IC	NB off	580		At-grade weave	1
	NB on	580		At-grade weave	1
	SB off	580		At-grade weave	1
	SB on	580		At-grade weave	1
	to EB on	80	access via 580	At-grade weave	1
	to WB on	80	access via 580	At-grade weave	1
	frm EB off	80	access via 580	At-grade weave	1
	frm WB off	80	access via 580	At-grade weave	1
Oddie - NB Parclo-Diamond IC	to EB on	80	Access via 395	At-grade weave	1
	to WB on	80	Access via 395	At-grade weave	1
	frm EB off	80	Access via 395	At-grade weave	1
	frm WB off	80	Access via 395	At-grade weave	1
	NB off	395		At-grade weave	1
	NB on	395		At-grade weave	1
	SB off	395		At-grade weave	1
	SB on	395		At-grade weave	1
McCarran - Diamond IC	NB off	395		At-grade weave	1
	NB on	395		Braided	1
	SB off	395	Via slip ramp from Clear Ac		1
	SB on	395		At-grade weave	1
Clear Acre - Diamond IC	NB off	395		Braided	1
	NB on	395		At-grade weave	1
	SB off	395		At-grade weave	1
	SB on	395		At-grade weave	1
Total					75

Alternative 1		Access Provided
Remarks	Ramp Interaction?	
Reconstructed to Plumb Lane only	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Revised to a Diamond IC	At-grade weave	1
	Braided	1
	Braided	1
	At-grade weave	1
Revised to a Diamond IC	Braided	1
	Braided	1
	Braided	1
	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Braided with system IC	Braided	1
Maintain Parclo IC	Braided	1
	At-grade weave	1
	At-grade weave	1
	Braided	1
Maintain existing IC	At-grade weave	1
	Braided	1
	Via slip ramp from Clear Acre	1
	At-grade weave	1
Maintain Diamond IC	Braided	1
	At-grade weave	1
	At-grade weave	1
Eliminated - access via N McCarran Slip		0
Total		72

Alternative 2		Access Provided
Description of Impact	Ramp Interaction?	
Reconstructed to Plumb Lane only	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Maintain Parclo IC	At-grade weave	1
	At-grade weave	1
	Braided	1
	At-grade weave	1
Revised to a Parclo IC, NB & SB	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	Braided	1
access via 580	At-grade weave	1
access via 580	At-grade weave	1
access via 580	At-grade weave	1
access via 580	At-grade weave	1
Eliminated - access via Kietzke		0
Eliminated - access via Wells		0
Eliminated - access via Wells		0
Eliminated - access via Kietzke		0
Revised to a Diamond IC	Braided	1
	At-grade weave	1
	At-grade weave	1
	Braided	1
Maintain existing IC	At-grade weave	1
Maintain existing IC	Braided	1
Eliminate slip - access via Clear Acre & McCarran		0
Maintain existing IC	At-grade weave	1
Maintain existing IC	Braided	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Total		66

Alternative 3		Access Provided
Description of Impact	Ramp Interaction?	
Maintain existing IC	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Eliminated - Combined with 2G		0
Eliminated - Combined with 2G		0
Eliminated - Combined with 2G		0
IC revised to a mid-block "button-hook" configuration	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Access via 395	At-grade weave	1
Access via 395	At-grade weave	1
Access via 395	At-grade weave	1
Access via 395	At-grade weave	1
Revised to a Parclo, NB & SB	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Maintain existing IC	At-grade weave	1
Maintain existing IC	Braided	1
Eliminate slip - access via Clear Acre & McCarran		0
Maintain existing IC	At-grade weave	1
Maintain existing IC	Braided	1
	At-grade weave	1
	At-grade weave	1
	At-grade weave	1
Total		62

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Traffic Safety

Parameter	No-Build	Alternative 1	Alternative 2	Alternative 3
Conflict Points	60	68 13%	57 -5%	51 -15%
Weaving Vehicles*				
Daily (veh/day)	438,458	51,176 -88%	191,409 -56%	392,420 -10%
AM Peak Hour (veh/hour)	31,416	3,467 -89%	13,399 -57%	28,658 -9%
PM Peak Hour (veh/hour)	36,902	4,687 -87%	17,658 -52%	34,561 -6%
Fatal & Injury Crash Rate (per MVMT)	0.362	0.308 -15%	0.313 -13%	0.317 -12%
Total Crash Rate (per MVMT)	1.081	0.922 -15%	0.967 -11%	0.984 -9%

* Assessment of the core system/service interchange area proposed for modifications, I-80 from Wells to Pyramid, I-580/US 395 from Mill to Oddie

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RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Traffic Operations

Overall Network Performance Measures

Parameter	2040 No-Build		2040 Alternative 1		2040 Alternative 2		2040 Alternative 3	
	AM	PM	AM	PM	AM	PM	AM	PM
Total vehicle-miles traveled (VMT)	297,984	355,374	319,167 7%	391,623 10%	330,419 11%	403,487 14%	320,291 7%	393,221 11%
Total travel time, All Vehicle Types (VHT)	9,025	15,841	8,968 -1%	10,471 -34%	7,883 -13%	10,723 -32%	8,546 -5%	10,642 -33%
Average speed [mph], All Vehicle Types	33.0	22.5	35.6 8%	37.4 66%	41.9 27%	37.6 67%	38.3 16%	37.0 64%
Average delay time per vehicle (mins), All Vehicle Types	2.1	4.2	1.8 -15%	1.3 -68%	1.1 -51%	1.4 -67%	1.5 -31%	1.3 -68%

Percentage of Freeways and Spaghetti Bowl Ramps Operating at Various Speeds in 2040

Travel Speed	No Build Alternative		Alternative 1		Alternative 2		Alternative 3	
	AM	PM	AM	PM	AM	PM	AM	PM
< 25 mph	6%	32%	2%	0%	0%	0%	0%	0%
25 to 50 mph	32%	33%	18%	15%	7%	8%	10%	14%
> 50 mph	62%	36%	80%	85%	93%	92%	90%	86%

Intersection Analysis Summary

	2040 Conditions			
	No-Build	Alternative 1	Alternative 2	Alternative 3
Average Intersection Delay	77	51	28	25
Percent of Intersections at LOS D or Better	61%	74%	88%	92%
Percent of Intersections at LOS E or F	39%	26%	12%	8%

Hot Spot Comparisons

Hot Spot Location	Worst Case Peak Period	2040 Conditions - Average Speed (mph)			
		No-Build	Alternative 1	Alternative 2	Alternative 3
EB I-80 to SB I-580 Ramp Movement	AM	7	50 614.3%	54 671.4%	54 671.4%
NB I-580 to EB I-80 Ramp Movement	PM	4	48 1100.0%	50 1150.0%	39 875.0%
EB I-80 to NB I-580 Ramp Movement	PM	9	55 511.1%	55 511.1%	50 455.6%
WB I-80 to NB I-580 Ramp Movement	PM	10	55 450.0%	52 420.0%	52 420.0%
NB US-395 between Oddie and McCarran	PM	39	49 25.6%	55 41.0%	50 28.2%
NB I-580, Virginia On-Ramp Merge	PM	10	61 510.0%	63 530.0%	64 540.0%

* All information is Preliminary and Subject to Change



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Cost	Alternative 1	Alternative 2	Alternative 3
Total Project Cost	\$ 4,193,000,000	\$ 2,407,000,000	\$ 2,415,000,000

* All information is Preliminary and Subject to Change

** Based on Cost Risk Assessment, February 2018. Costs are for the constrained alternatives, 70% Std. Dev., escalated 2017 \$.



RENO SPAGHETTI BOWL PROJECT
SELECTION PROCESS - ALTERNATIVES EVALUATION CRITERIA
Summary of Data

Evaluation Criteria - Benefit Cost

PENDING

* All information is Preliminary and Subject to Change

