Arizona VE with an unexpected result

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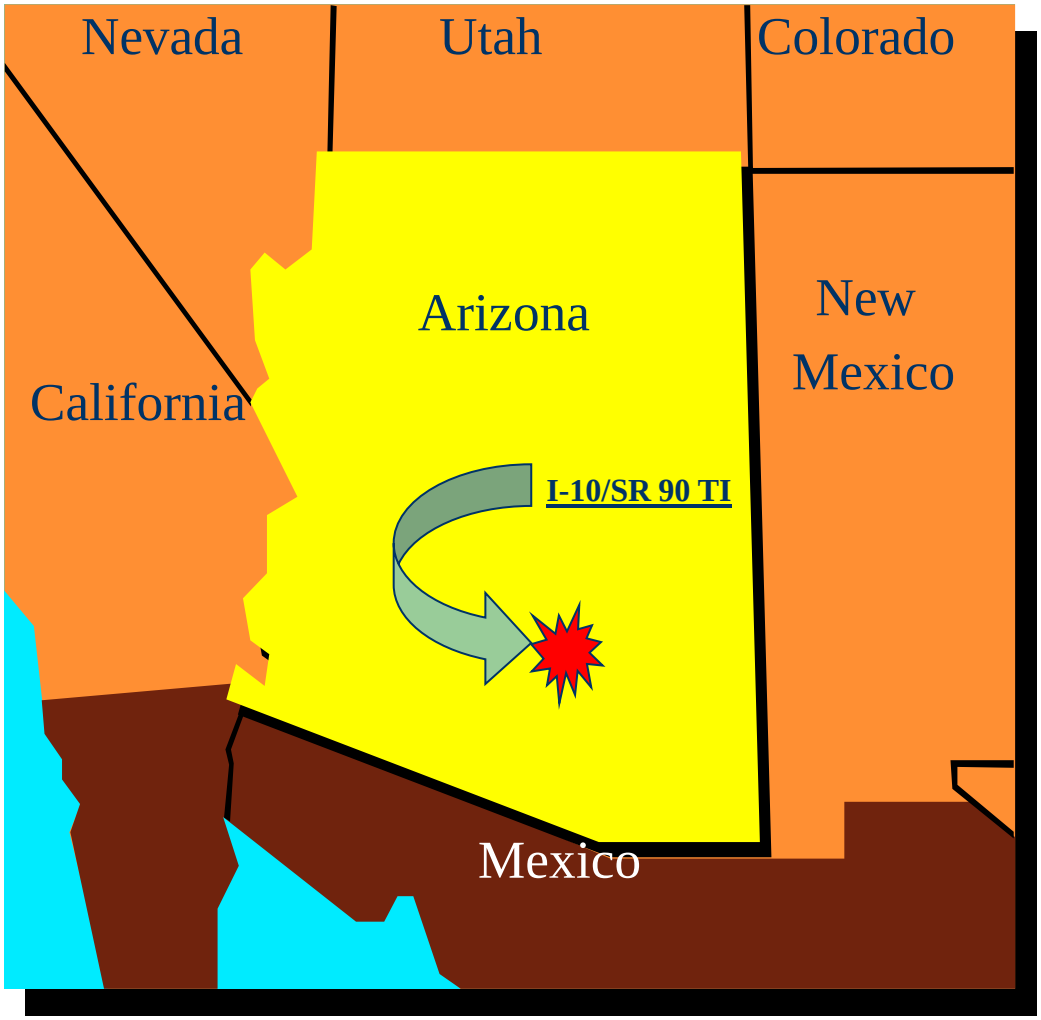
Topic Overview

- *How VE can over-ride perceived constraints*
- *Discovered Un-satisfied Basic Functions*
- *Demonstrated the power of Function Analysis*
- *Used Performance Measurement to Quantify Functions*
- *Proved that VE is not always about Cost Cutting but it is a Value Improvement Methodology*

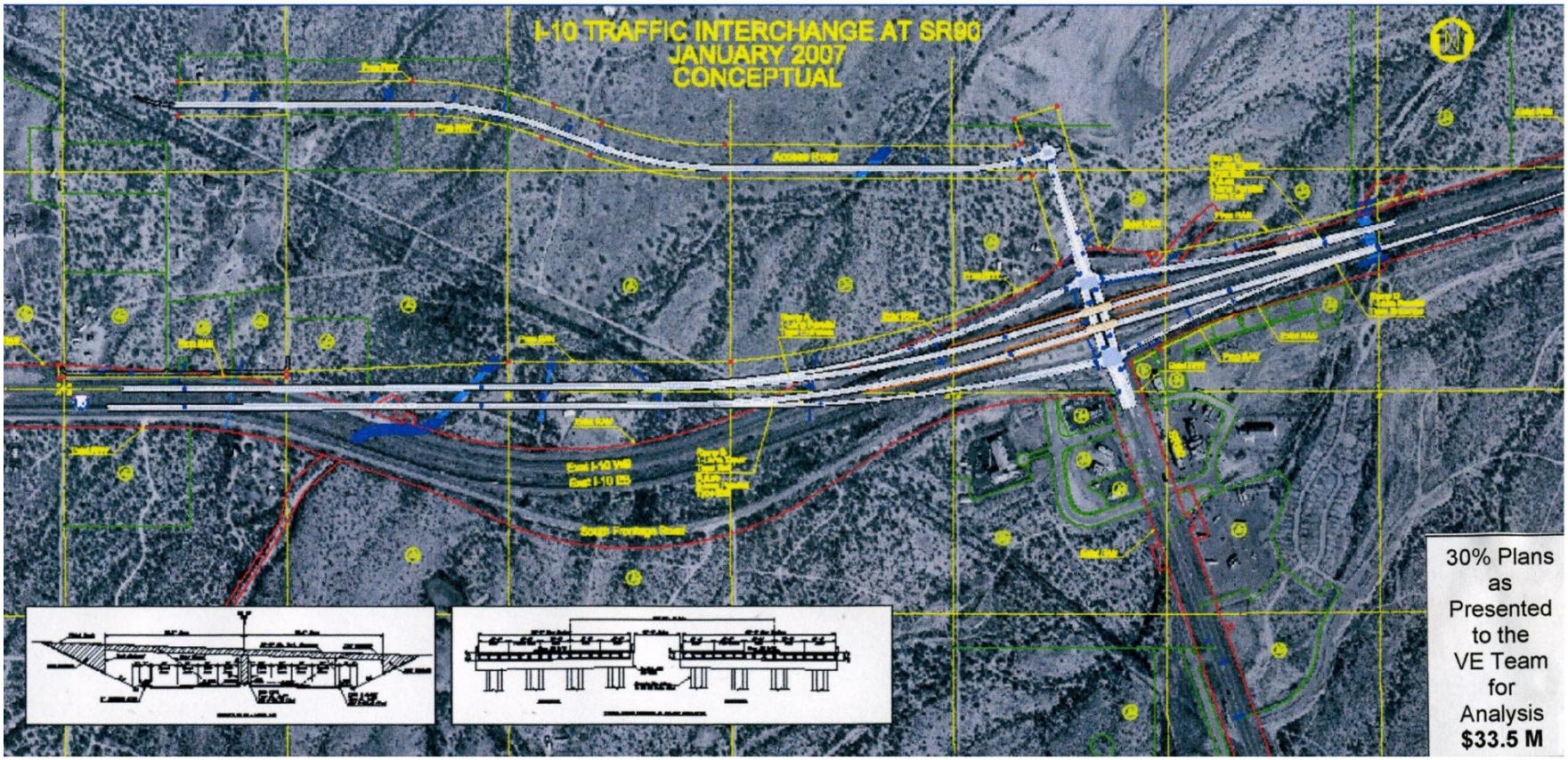
Project Location



Project Description

- This project is in the ADOT Safford District, in Cochise County. The I-10/SR 90 TI is a major interchange for travel between Tucson and Sierra Vista/Fort Huachuca. This interchange and SR 90 is also a critical route to the Kartchner Caverns State Park. It is anticipated that growth and development along the corridor will continue and this project is necessary to ensure safe and efficient traffic movement in the future.

Proposed 30% Plan



Expectations

The VE Teams Expectations were:

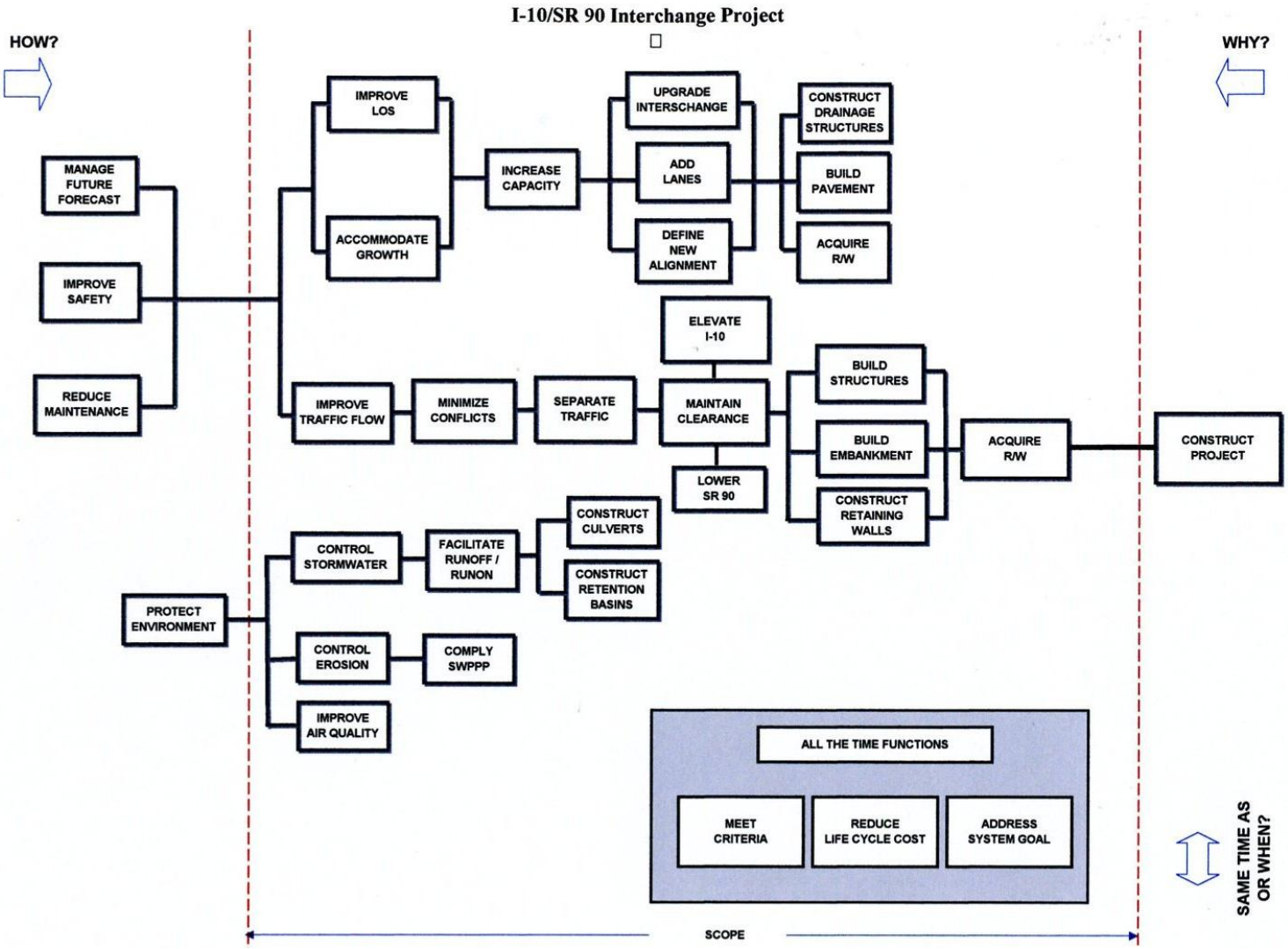
1. **Improve project performance requirements**
2. **Identify all possible Life Cycle cost savings**

Constraints

The Project Constraints were identified as:

1. **Present Funding Level**
2. **Maintaining 2-Lanes open on I-10 during Construction**
3. **Environmental Assessment**
4. **Traffic volumes**
5. **Pavement design**
6. **Local property access**

Function Analysis System Technique (F.A.S.T.) Diagram



Basic Functions

1. **Improve I-10 Safety (Alignment and Super-elevations)**
2. **W.B. Climbing Lane (Speed Differential)**
3. **Accommodate SR-90 Growth (Pro-actively)**

Performance Matrix

PERFORMANCE MATRIX — ADOT

I-10 & SR 90 T.I. Improvements

Criteria	Unit of Measurement	Criteria Weight	Concept	Performance Rating 1	2	3	4	5	Total Performance	Ideas Included
I-10 Safety	Accident Exposure	10	No Build	■					20	
			30% Design	■	■	■	■		40	
			Ultimate 15%	■	■	■	■	■	50	
			VE Recommended	■	■	■	■	■	50	1,3,7,42
WB Climbing Lane	Speed Differential	8	No Build	■					8	
			30% Design	■					8	
			Ultimate 15%	■	■	■	■		32	
			VE Recommended	■	■	■	■	■	40	1,5A
SR-90 Capacity	Numger of Lanes	4	No Build	■	■				8	
			30% Design	■	■	■	■		16	
			Ultimate 15%	■	■	■	■	■	20	
			VE Recommended	■	■	■	■		16	41
I-10 Future Growth	LOS	7	No Build	■					7	
			30% Design	■	■				14	
			Ultimate 15%	■	■	■			21	
			VE Recommended	■	■	■			21	1
Aesthetics	Public Acceptance	2	No Build	■	■				4	
			30% Design	■	■	■			6	
			Ultimate 15%	■	■	■			6	
			VE Recommended	■	■	■			6	
Life Cycle Cost	Future Maintenance	9	No Build	■					9	
			30% Design	■	■				18	
			Ultimate 15%	■	■				18	
			VE Recommended	■	■	■			27	30,5A,1
Local Access	Landowner Expectations	5	No Building	■	■	■	■		20	
			30% Design	■	■	■			15	
			Ultimate 15%	■	■	■	■		20	
			VE Recommended	■	■	■	■		20	41,18,19,20
Constructability	Traffic Interference	9	No Building	■	■	■	■	■	45	
			30% Design	■	■	■			27	
			Ultimate 15%	■	■	■	■		36	
			VE Recommended	■	■	■	■	■	45	
Maintainability	Crew Safety	9	No Build	■					9	
			30% Design	■	■	■			27	
			Ultimate 15%	■	■	■			27	
			VE Recommended	■	■	■	■		36	

OVERALL PERFORMANCE	Total Performance	% Performance Improvement	Cost $xM
No Build	65		NA
30% Design (Baseline)	129	-	33.5
Ultimate 15% Design	174	35	40 ±
VE Recommendation (Modified 15% Design)	196	52	<40±

VALUE=PERFORMANCE / COST

30% Plans (Baseline) Value=129/33.5=3.9

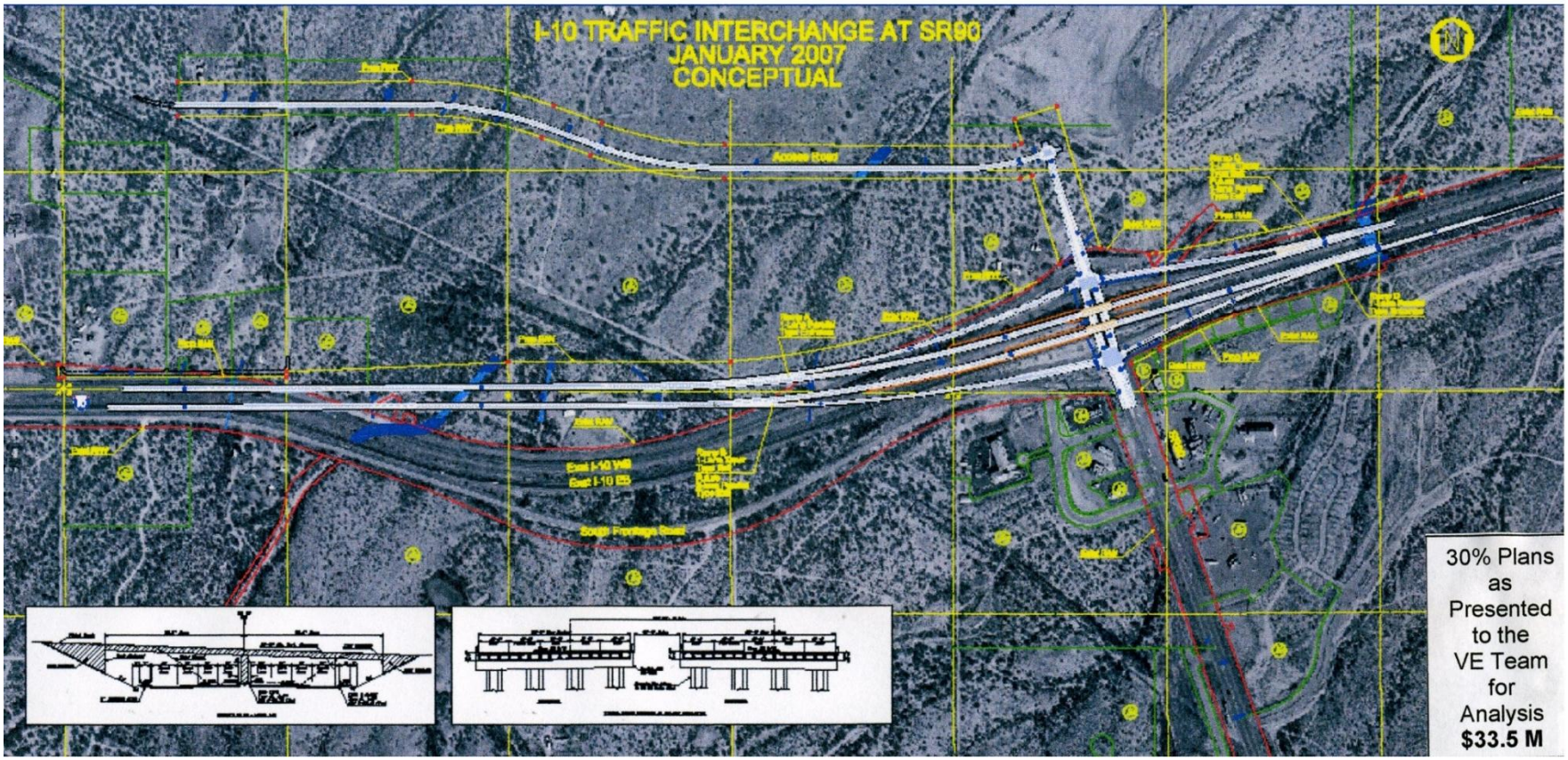
15% Plans (Ultimate) Value =174/40=4.4

VE Recommended Modified 15% Plans= 196/<40=>4.4

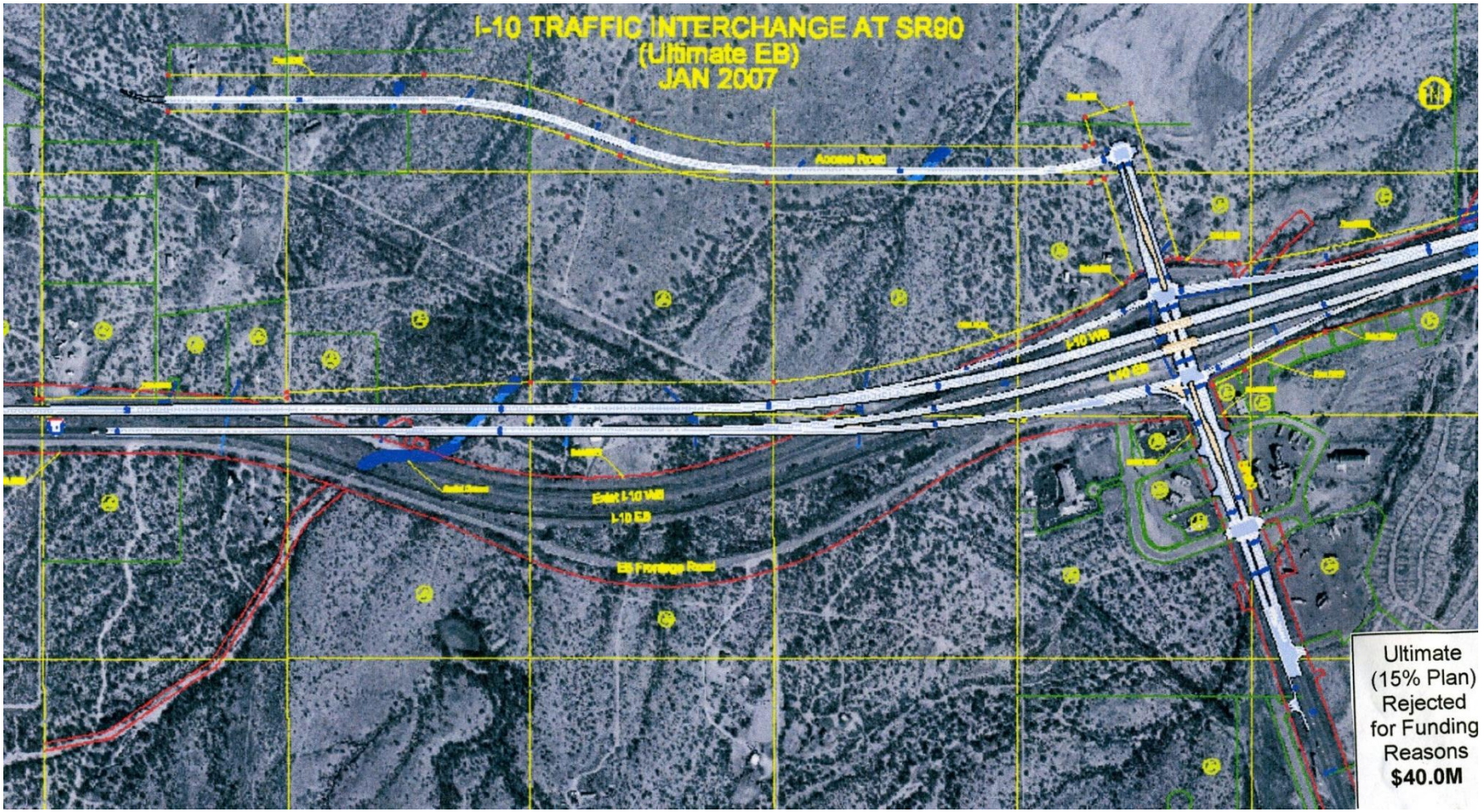
Performance and Value Improvement Opportunities

1. Build Ultimate(15% Plan)Now (Idea N0.1)
2. Shift TI Structures North (Idea No.2)
3. Build WB 3rd Lane and use it for EB Detour (Idea No.5)
4. Shift SR-90 West to reduce lowering of SR-90 profile (Idea No.13)
5. Detention Basin between Church and Exist. I-10 (Idea No.14A)
6. Re-align CBC under Exist. EB I-10 and South Frontage Rd. (Idea No.17)
7. Shift I-10 Bridges West (Idea No.26A)
8. PCCP on I-10 Mainline Ramp to Ramp and Appropriate Locations
   (Idea No.30)
9. Increase Funding to Build VE Recommendations (Idea No.36)
10. Lower Access Road Profile (Idea No.43)

Proposed 30% Plan



Modified 15% - Ultimate Plan



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Summary of Results

Overall Performance	Total Performance	% Performance Improvement	Cost $xM	% Cost Increase
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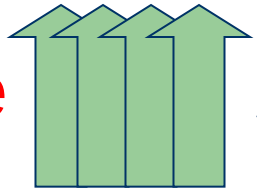
Ultimate 15% Design	174	35%	40	20%
VE Recommendation (Modified 15% Design)	196	52%	38	13%
				VALUE = PERFORMANCE / COST
				30% Plans (Baseline) Value = 129/33.5 = **3.9**
				15% Plans (Ultimate) Value = 174/40 = **4.4**
				VE Recommended Modified 15% Plans Value = 196/38 = **5.2**

VE Results

- Total number of original ideas developed by the VE Team: **43**
- Number of ideas developed into Recommendations: **10**
- Number of Design Suggestions: **8**
- Potential **Cost Increase** identified: Approx. **$ 5-7M**. This potential cost increase is dependent upon ADOT decisions after discussions with the Designer. The Approx. $5-7 million figure includes provisions for **building the missing functional element**, namely the W.B. Climbing Lane and increased initial expenses that will provide **improved Life Cycle Cost savings** from reduced maintenance and increased pavement life.

Lesson Learned

- The technique makes it possible to evaluate and rate the effectiveness of various alternatives and measure the aggregate effect of the alternatives relative to the project specific baseline performance expectations.
- Value=Function/Cost
- Value=Performance  / Cost 

VE is not always a Cost Saving methodology

VE is a Value Improvement methodology

Thank You

Any Questions?

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Problems cannot be solved with the same level of awareness that created them

- Albert Einstein