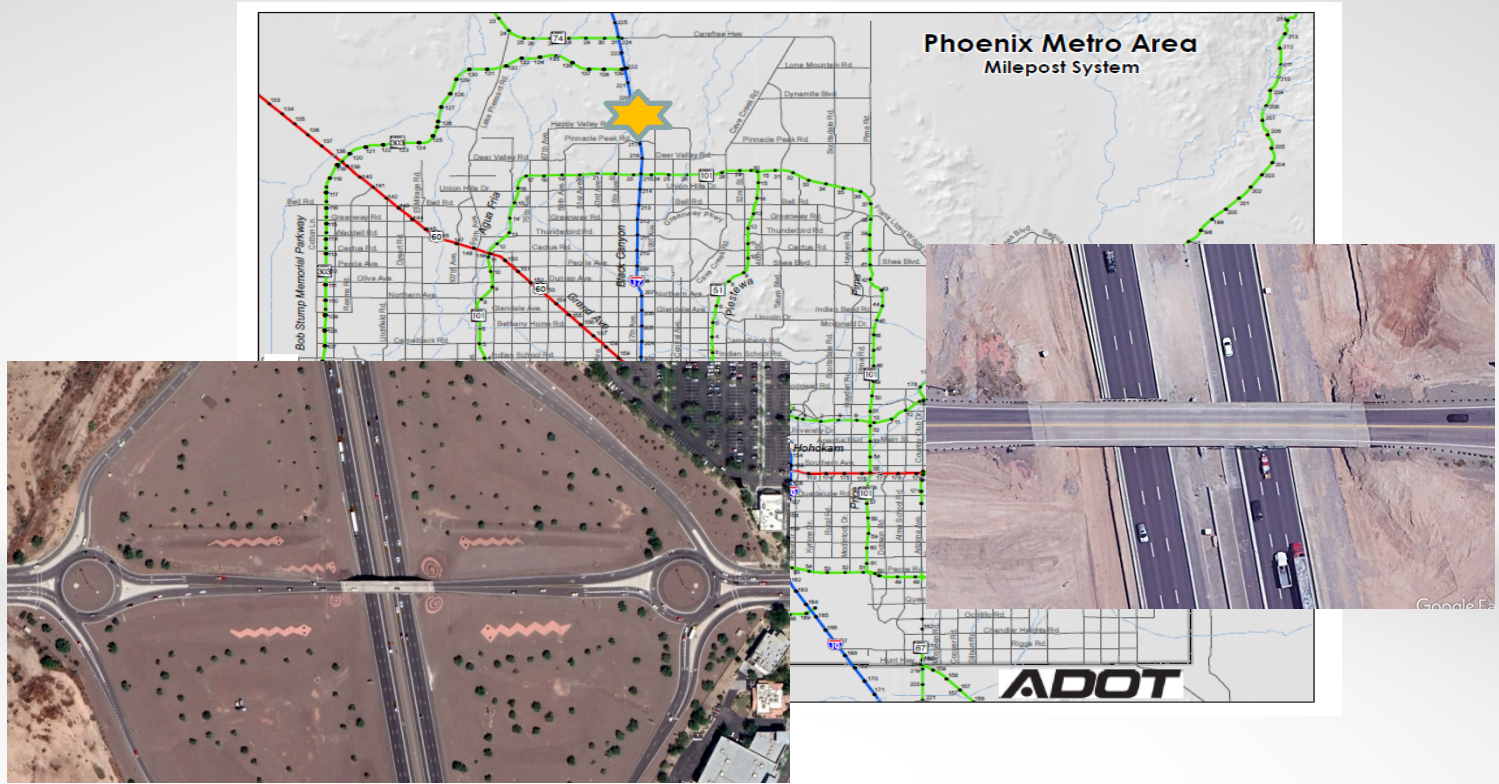




I-17 and Happy Valley Road Diverging Diamond Interchange (DDI)

Sara Howard (ADOT) and Jeremy Neuman (HDR)

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Evolution of the Happy Valley TI

- ▶ Historical interchange configurations
- ▶ Substantial growth in north Phoenix
- ▶ Interchange traffic patterns
- ▶ New interchange requirements

Evolution of the Happy Valley TI




- ▶ 30% Design
 - 5 concepts evaluated
 - Parclo selected as best performing
- ▶ Cost Risk Assessment
 - Top Risks



Mitigation of Project Risk with Innovation

- ▶ Evaluating the DDI
 - Improved interchange operations
 - Reduced many of the project risks

FIGURE 6: HAPPY VALLEY ROAD TI COMPARISON TABLE

	EVALUATION CRITERIA	HDR MODIFIED DDI	DCR PARCLO
OPERATIONS/ ACCESS 	Operational Safety	Reduced number of conflicts	High speed differential between mainline and loop ramp; Separate signage for west and east travel
	Crossroad Intersection Operation	Two-phased signals allowing for better traffic flow	Three-phased signals
	Ramp Operations	Same or better LOS than ParClo dependent on movement; No loops; Allows for ramp metering	Uses loop ramps which have a limited capacity and do not allow for ramp metering
	Frontage Road Access	Full access to all frontage roads; Minor frontage road adjustment at crossroad	
TECHNICAL ELEMENTS 	Geometry	No loops, improved ramp merges at gores, lower crossroad profile with improved SSD	Loops, SSD issues on exit ramps due to loop ramp barrier
	Bridge Length	269'	292'
	Total Bridge Width	128.5' (2 bridges)	148' (2 bridges)
	Design Exceptions	No design exceptions	Two design exceptions (sight distance)
	MOT	Time Savings: 9-months 7-month duration; three-phases of construction, one major traffic shift; demo not on critical path	16-month duration; four-phases of construction; two major traffic shifts; bridge demo on critical path
	Work Zone Safety	Majority of work is completed offline and away from traffic	All work is completed adjacent to live traffic
	Constructability	Builds bridges offline eliminating half-&-half construction; bridge removal schedule risk reduced; lower crossroad profile with shorter tie-in points	Requires half-&-half bridge construction and longitudinal construction joint; higher bridge removal risk; higher crossroad profile extends profile tie-in points
	Change of Access	Not required	Required
	Construction Time	Time Savings: 7-months 17-month duration	24-month duration
	Environmental Document	Group 2 CE validation	Group 2 CE
AGENCY/ PUBLIC / POLICY 	Future Expansion	Future TI expansion potential	Difficult to expand TI with loops
	Bike and Pedestrians	Overall safer for pedestrians and bikes - two-phase signals with reduced wait times; Minimized crossing distance; Simplification of conflicts to one-direction of traffic	Pedestrians and bicyclists have a higher exposure to vehicles
	Park & Ride Ramp Access Compatibility	Improved bus access to P&R through two-phased signal system(s)	Requires buses to traverse through two three-phased signals systems

Significant DDI benefits not previously considered in the DCR






DDI Constructability



Mitigation of Project Risk with Innovation

- ▶ Evaluating the DDI
 - Improved interchange operations
 - Reduced many of the project risks
- ▶ BUT . . . not compatible with at-grade frontage roads

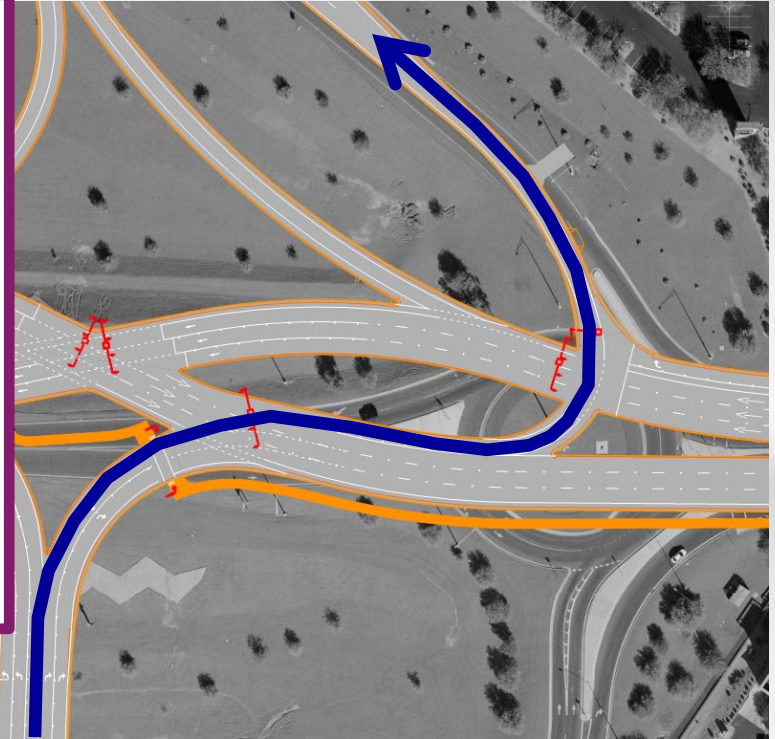
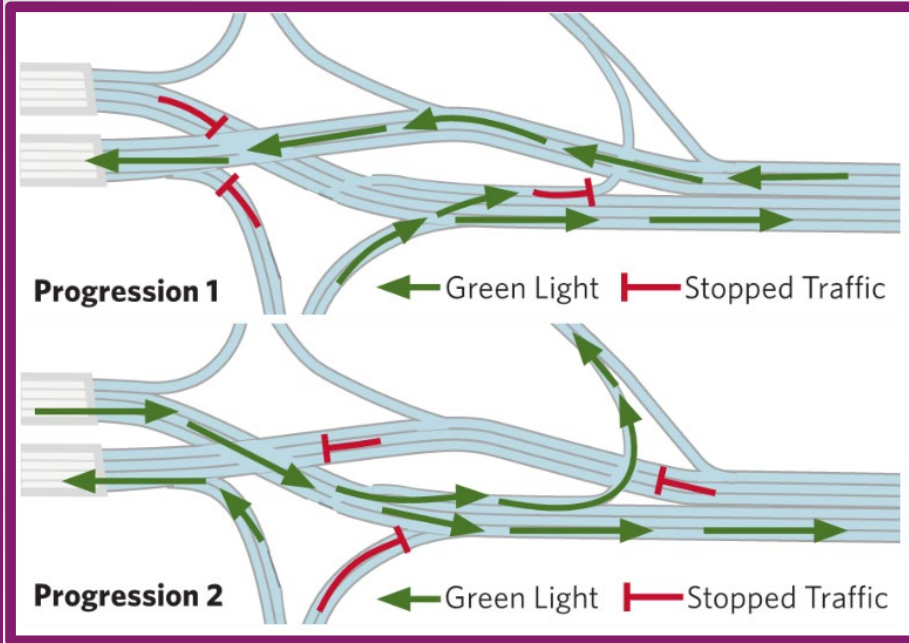
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Modified DDI at Happy Valley – Frontage Roads



Modified DDI at Happy Valley – Frontage Roads



Construction Challenges

- ▶ Aesthetic fence
 - Galvanization vat not large enough for fence sections
 - Design had to be altered to accommodate fabricator means and methods



Construction Challenges

- ▶ Temporary striping on ultimate PCCP



Construction Challenges

- ▶ Signal coordination with adjacent city signals during construction



Construction Successes

- ▶ Field use of KMZs
 - Flexibility to make custom exhibits without needing the designer
 - Easily add different project elements overlays on aerial



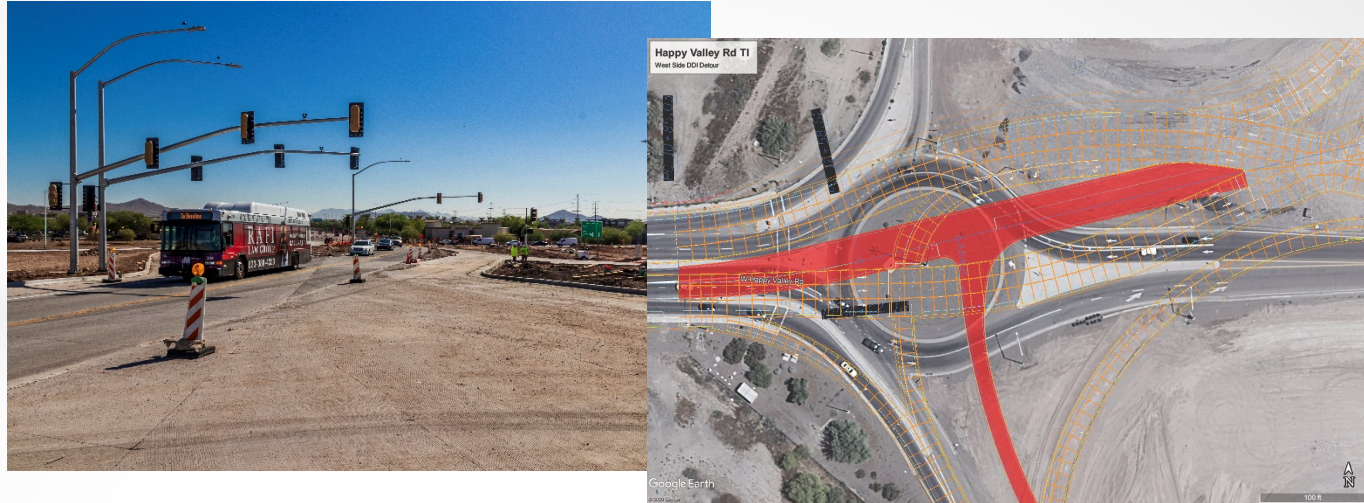
Construction Successes

- ▶ Fill material
 - Reduced needed fill material by using roadway waste deep in embankment



Construction Successes

- ▶ Coordination with Phoenix Transit
 - Park and Ride & Bus Rapid Transit



Lessons Learned

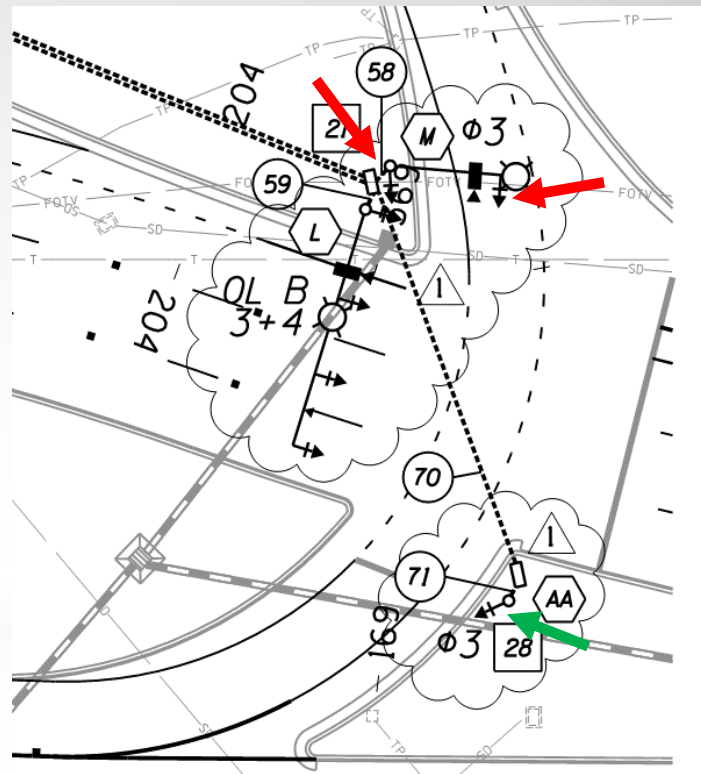
- ▶ Signals
 - DDI ramp right-turn signal visors



Lessons Learned

► Signals

- Frontage Road left-turn signal visibility



Lessons Learned

- ▶ Signing placement
 - Initial sign placement on spring forms allowed for adjustment before permanent installation



Lessons Learned

- ▶ Additional Signage
 - No turn on Red (Per Arizona Revised Statute A.R.S.28-545.A.3(c))



Questions?

