

Los Angeles Westside Purple Line Extension Project Challenges and Lessons Learned

Ashok Kothari, P.E.

WSP USA, Sr. Vice President

Los Angeles, California

Michael McKenna, P.E.

LACMTA Executive Officer, Program Management

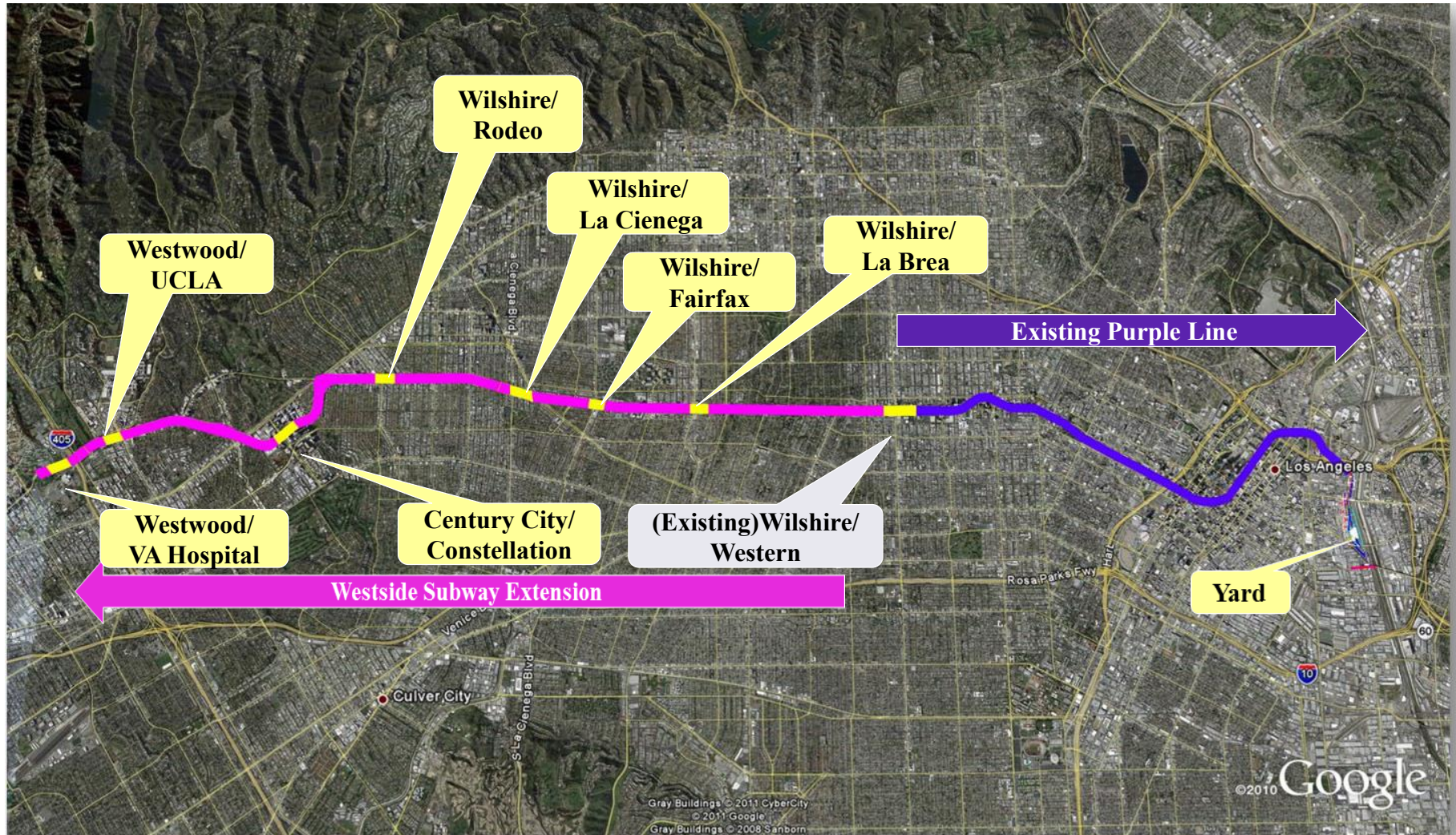
Los Angeles, California



Ashok Kothari, PE

- Currently WSP Project Director, \$8.2 billion Westside Purple Line Ext. Project, Los Angeles, CA since November 2010.
- Head of Programme Management, London Overground Infrastructure, for the £1 billion design-build East London Line Project and £350 million North London Railway (2005 – 2010).
- Ashok has worked on several major rail development and extension projects on the \$3.2 Billion Bay Area Rapid Transit (BART) Extensions Program, in San Francisco, CA where he led the GEC team and supported BART's transition to a Design-Build Project Delivery System (1989 – 2005).
- Ashok worked on the Metropolitan Atlanta Rapid Transit Authority (MARTA) project in Atlanta, GA for over 15 years as Manager of the Project Management Office for a \$1.5 billion project (1974 – 1989).
- As Global Projects Director, Ashok has been actively involved in peer reviews of transit mega-projects worldwide, program management conferences and seminars and has presented many papers.

Westside Purple Line Extension



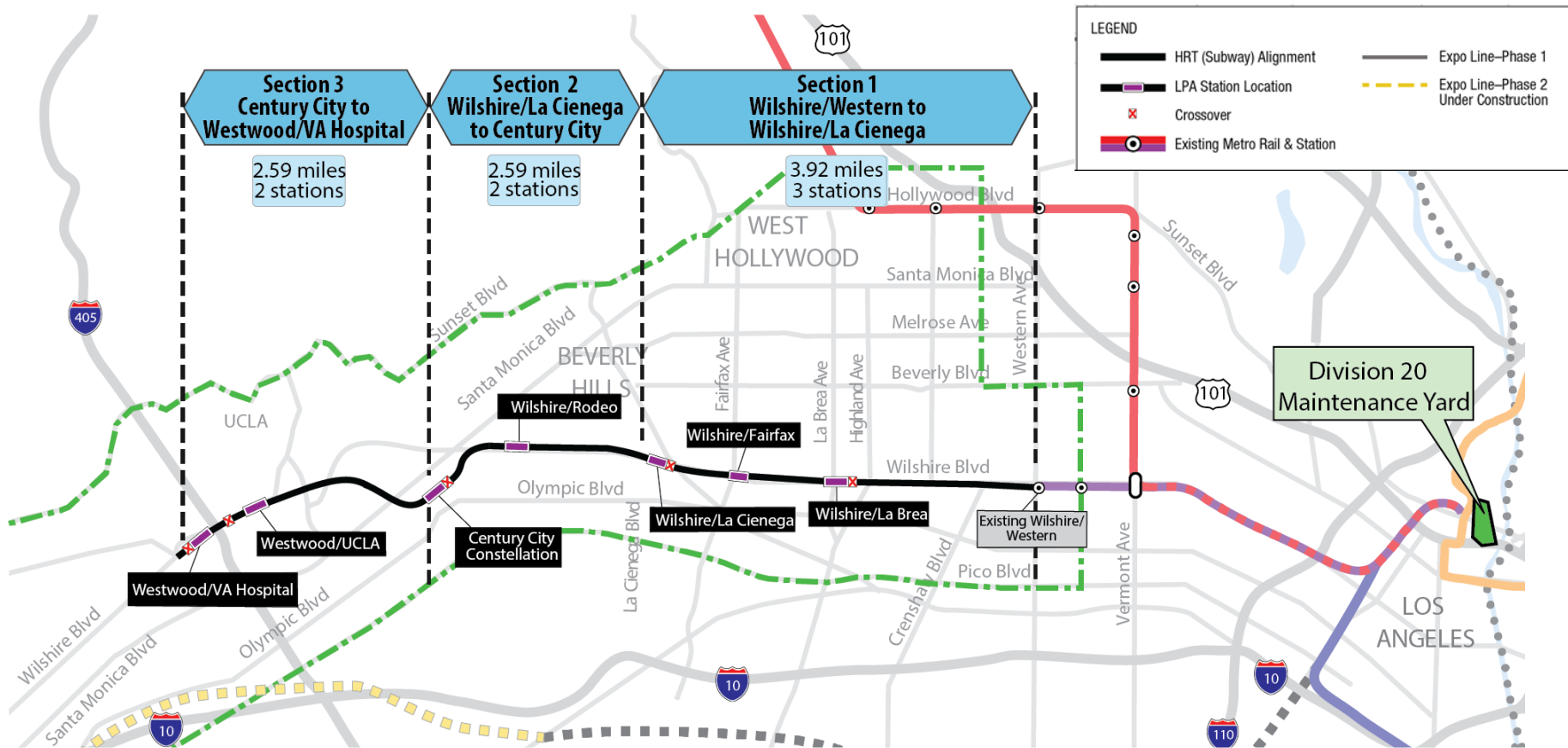
Wilshire/Western to Westwood/VA Hospital Stations

Westside Purple Line Extension - View East Towards Century City and Downtown Los Angeles from Westwood



Subway Under Wilshire Blvd.

Westside Purple Line Extension Project



The FTA Record Of Decision for the 9-Mile Alignment was issued on August 9, 2012

9 Mile Extension

Westside Purple Line Extension Project Features

- 9.1 mile extension of Metro Purple Line
- 7 new cut and cover stations
- Maintenance of way building – 80,000 sq. ft.
- Twin tunnel boring from three locations using 6 pressure-face TBMs
- \$8.2 billion Project
- 78,700 new daily project trips
- Travel time downtown to VA Hospital Station – 26 minutes
- Crosses seismic faults in two locations
- Unique ground conditions at La Brea tar pits
- Use of Building Information Modelling (BIM): Revit software for 3D computer aided design from PE through Final Design



Westside Purple Line Extension Section 1



Wilshire/La Brea Station

Westside Purple Line Extension Section 2



Wilshire/Rodeo Station

Westside Purple Line Extension Section 3

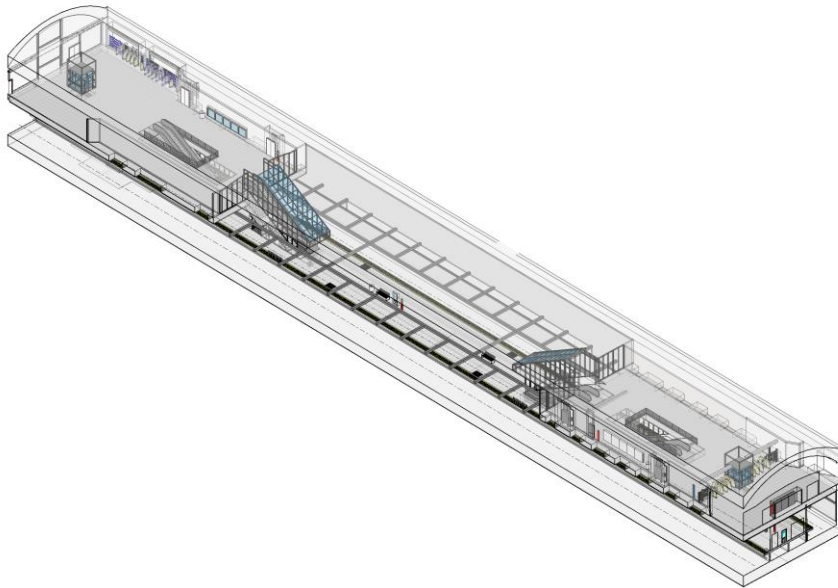


Westwood/UCLA Station

Westside Purple Line Extension

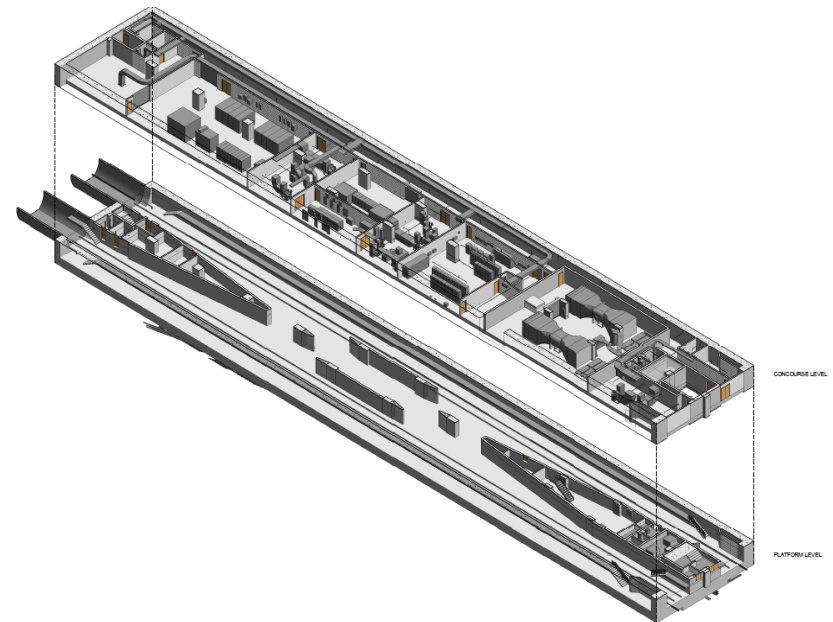
- Standard Circulation Units

- End-Loaded (Typical), Double-End Loaded (UCLA Only)
- 450-ft long , 28-ft wide center platforms as system standard



- Standard Crossover Units

- Critical ancillary rooms are within the Station box
- Variations of same module are used at all stations



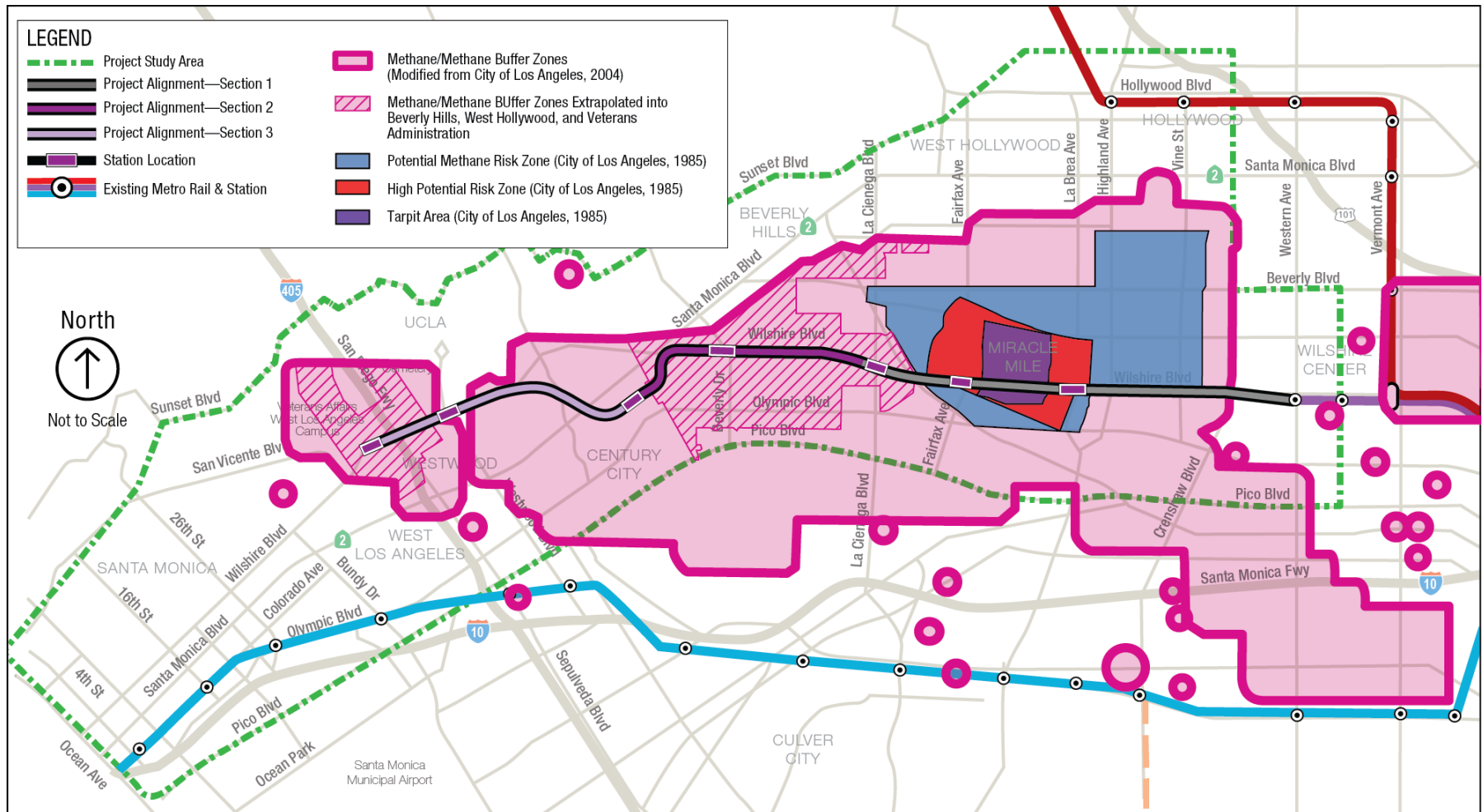
Modular Station Design

Westside Purple Line Extension Project Status of Major Construction Contracts

	Section 1 (3 stations, 3.92 miles)	Section 2 (2 Stations, 2.59 miles)	Section 3 (2 stations, 2.59 miles)
Budget	\$2.82 Billion (FFGA)	\$2.50 Billion (FFGA)	Capital Cost Est. :\$3.48 Billion
No. of Construction Contracts	5	1	3
Advanced Utilities Relocation	3 D/B/B Contracts Complete	3 rd . Party Utilities Relocation In Progress	1 D/B/B Contract (Bids Received 7/17/17, Anticipated Award in October 2017)
Major Construction Contract (s):	C1045 – Stations , Line &, Tunnels: <ul style="list-style-type: none"> •\$1.64 billion D/B Contract •NTP Date: 01/12/2015 •Contractor - Skanska, Traylor, Shea JV •Design Status: Complete •Construction Status: 21.8 % (as of 7/31/17) 	C1120 – Stations, Line & Tunnels: <ul style="list-style-type: none"> •\$1.38 billion D/B Contract •NTP Date: 04/26/2017 •Contractor -Tutor Perini/O&G JV •Design – Started 05/2017 - 14% Complete 	<ul style="list-style-type: none"> • D/B Tunnel Contract – RFQ/RFP Issued 04/19/2017 • D/B Stations Contract – RFQ/RFP issued in September 2017 • CURRENTLY IN PROCUREMENT BLACKOUT PERIOD
Forecast Revenue Service Date	11/08/2023	08/29/2025	03/04/2026

Westside Purple Line – Extension

Methane Risk Zone



La Brea Tar Pits and Gassy Soil

Westside Purple Line Extension Project

Challenge: *Maintaining traffic and pedestrian access during construction of stations and tunnels about 60 feet below one of Los Angeles's busiest streets, Wilshire Blvd.*

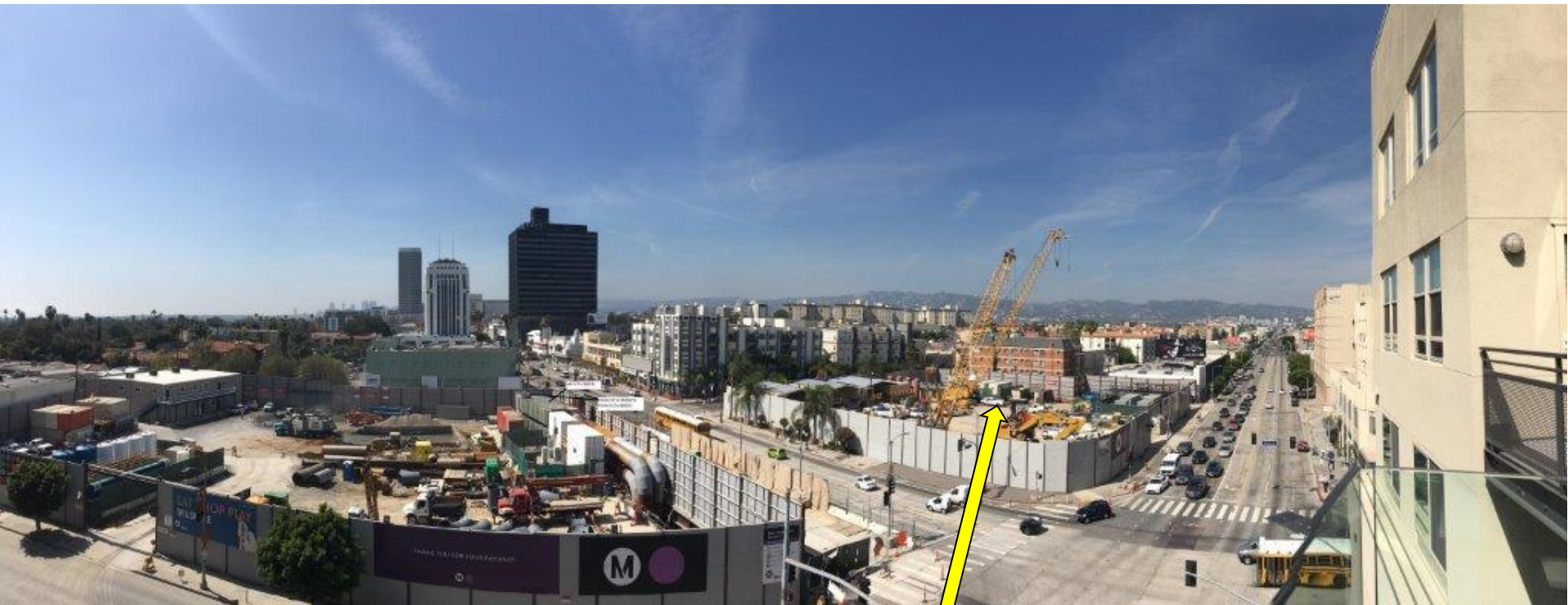
Lesson Learned:

- Include detailed construction planning during PE to:
 - Develop suggested construction sequencing.
 - Identify potential impacts/mitigations and facilitate early third party coordination.
- Identify staging areas
- Obtain peak hour and holiday moratorium exemptions

Challenge – Construction Planning

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Westside Purple Line Extension Section 1



Tunnel Launch Shaft - Former
Metro Customer Care Location

Wilshire/La Brea Station Staging Area

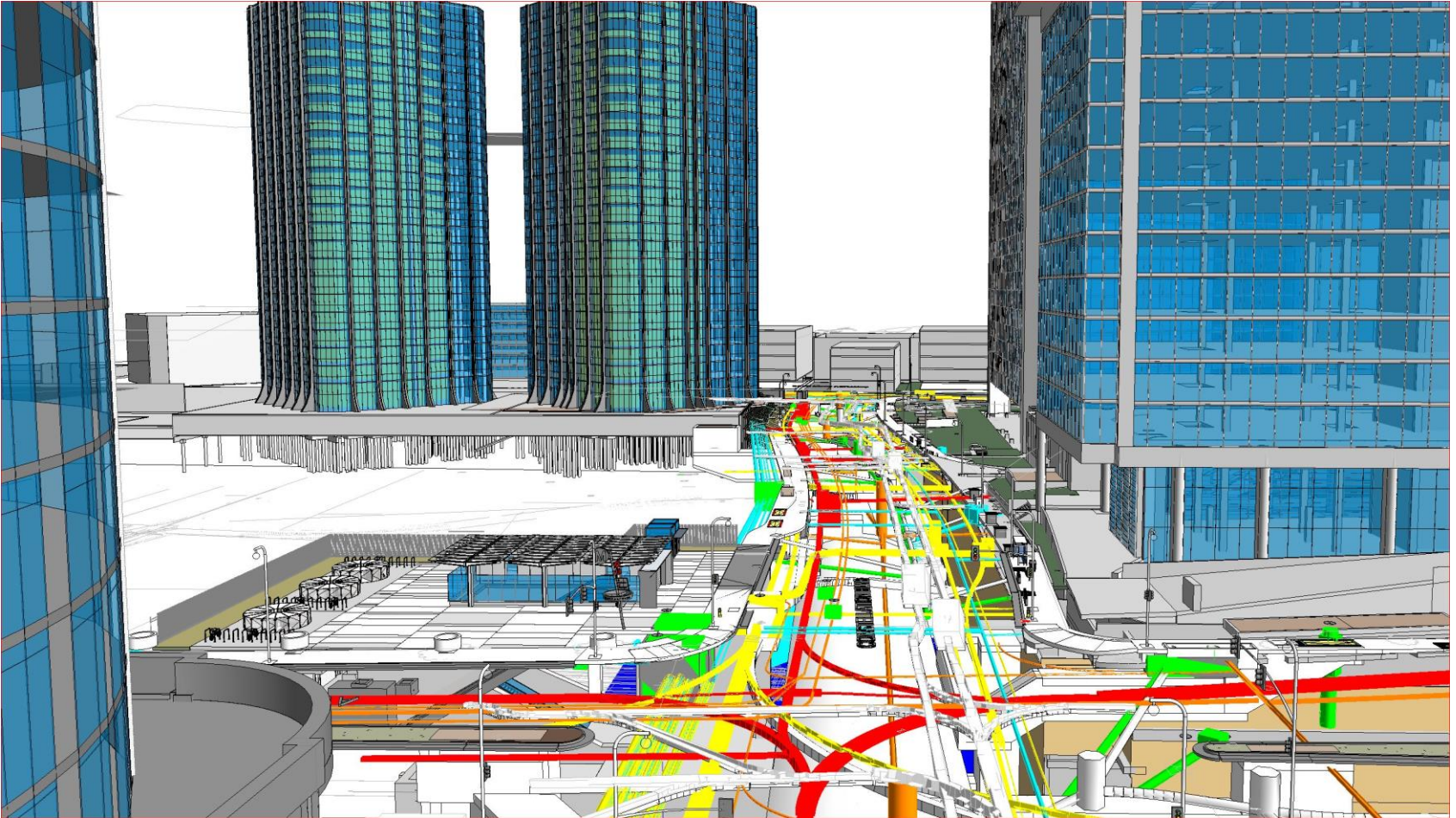
Peak Hour and Holiday Moratorium Exemptions

- City normally requires all lanes on Wilshire Blvd. to be open for traffic during morning and evening commute time.
- Metro worked closely with the City of Los Angeles and prepared Traffic Control Plans and Temporary Signal Plans needed to obtain permits for peak hour exemptions for soldier pile installation
- Metro obtained holiday moratorium permits from the City of Los Angeles for work on streets between Thanksgiving and Christmas.



Preliminary Traffic Control Plan at Fairfax Station

Challenge: Ensure Section 1 Utility Relocation Work Does Not Delay the Design Build Contractor



Perform utility relocation work at three stations in advance of main design build contract work to “clear the way”

Challenge: Mitigate Potential Delays Caused by Changed/Unforeseen Conditions

On the Advanced Utility Relocation (AUR) Contracts, the Contractor found changed conditions and unforeseen obstacles when trenches were opened, threatening the construction schedule.

Lessons Learned: To provide a timely resolution of conflicts & issues:

- A field engineer assigned to observe night shift work and facilitate resolution quickly of conflicts discovered during construction.
- Completed potholing prior to all AUR contracts.
- Ensure up to date engineering CAD models are available at the site office.
- Keep Project As-Builts up to date for timely preparation of record drawings.

Night Shift

Issue arises in field

Night Shift

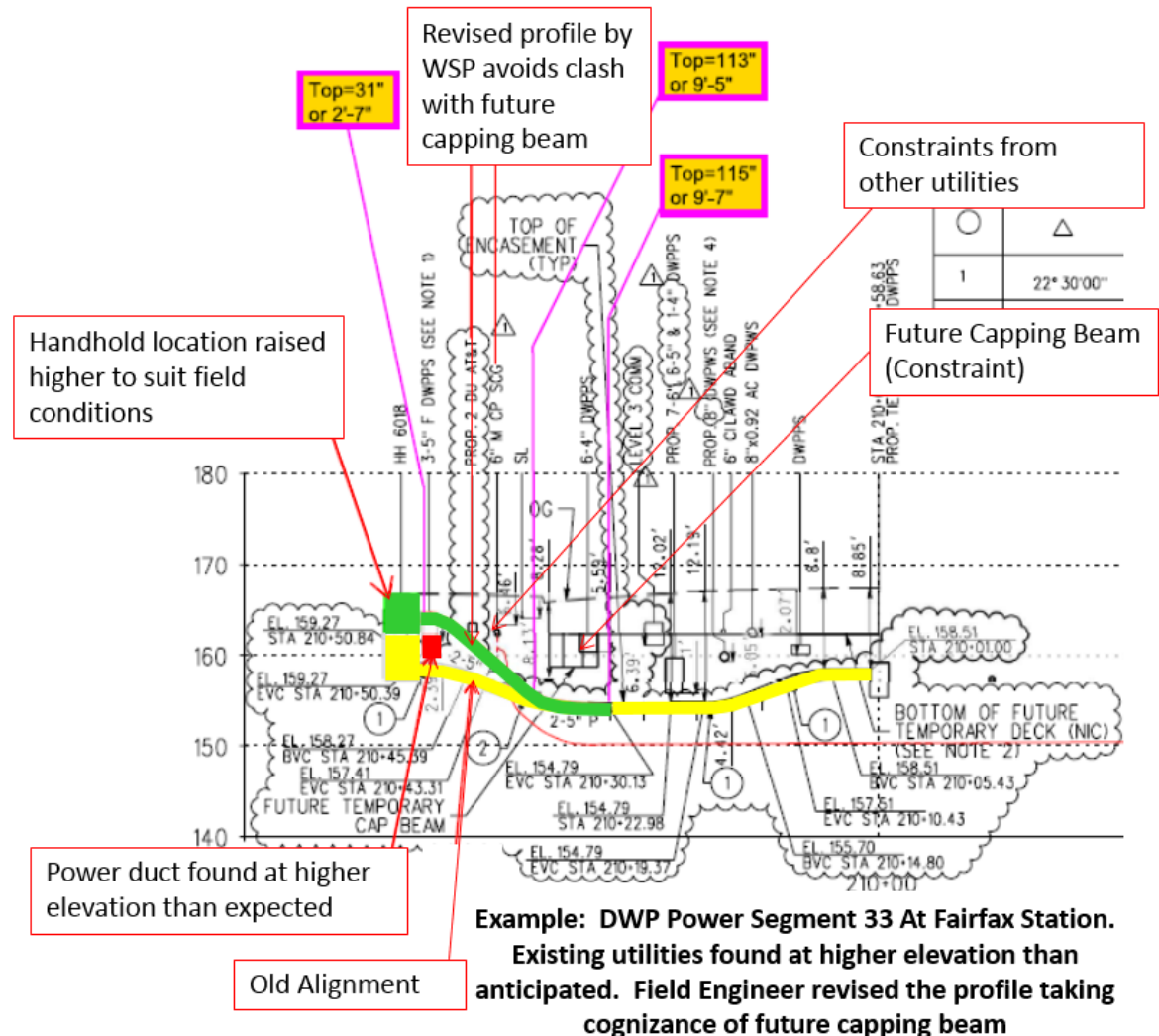
Field Engineer reviews issue, prepares draft response

Day Shift

Solution reviewed by Engineering team in office and finalized

Same Day

Solution sent to Contractor



Westside Purple Line Extension Field Engineering Support

Challenge: Do Not Underestimate the Impact of Construction on the Community

The team procured Night Time Noise Variance Permits ahead of appointing construction contractors. However strict compliance (no complaints) with these permits is vital as they must be renewed every six months.

Westside Approach:

- All staging sites have 20 ft. high noise barriers on perimeters
- Specified that all Westside contractors are to use noise blankets around construction site and equipment at night to meet City noise standards (ambient + 5 dBA).
- Required contractors to install low impact back up alarms (Brigade – White Noise) on construction vehicles owned by subcontractors.
- Developed a detailed noise control plan and performed noise compliance oversight.

Noise Barrier Wall – S. Fairfax Yard

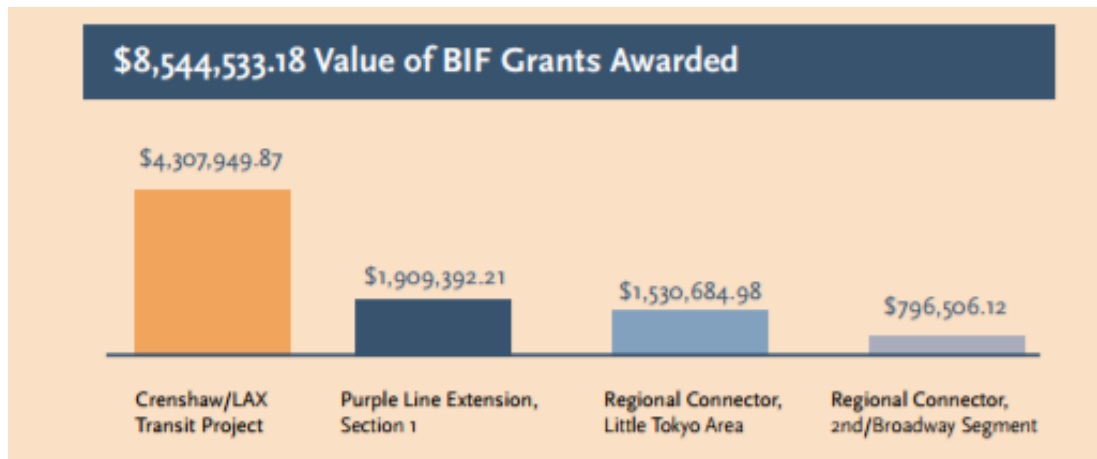


C1045 170727 1204pm STS Badger Potholing Behind Sound Barriers on Wilshire W of Western facing NW

Sound Mitigation, Section 1

Challenge: Do Not Underestimate the Impact of Construction on the Community

- Metro has instituted programs to minimize the impact of construction on small businesses near construction alignment:
 - Business Interruption Fund (BIF) for “mom and pop” businesses along Metro rail construction projects authorizes maximum \$50,000 grant based on demonstrated business revenue loss.
 - Metro marketing and community engagement campaign “Eat Shop Play”



as of April 2017

Business Interruption Fund

Eat Shop Play

- Metro marketing and community engagement campaign to bring focused attention to businesses impacted by construction.
- Goal: make it easy for consumers to eat at local restaurants, shop at local stores and play at local destination.
- Online tools, traditional media and promotional materials available.
- Participation is free for businesses along the alignment.



Westside Purple Line Extension

- Construction of Wilshire/Fairfax Station through paleo zone
- Construction of Wilshire/Rodeo Station at Beverly Hills golden triangle
- Construction of Wilshire/UCLA Station under 8 lanes of traffic on Wilshire Blvd. (800 cars/hour/lane – peak periods)
- Tunneling through gassy ground and tar sands
- Systems integration at existing termination station, Wilshire/Western
- Sequential opening (Revenue Service) for three sections:
 - Section 1 – 2024
 - Section 2 – 2025
 - Section 3 - 2026