

# Transbay Program Phase 2 Downtown Rail Extension (DTX)

## Tunnel Options Study Briefing

April 2018



# Study Purpose and Goals

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- Initiated to address concerns about impacts resulting from cut-and-cover construction
- Goals:
  - Minimize surface disruption and socio-economic impacts
  - Reduce cut-and-cover tunnel extent
  - Identify feasible mined tunnel construction methods for further study
  - Identify major infrastructure constraints

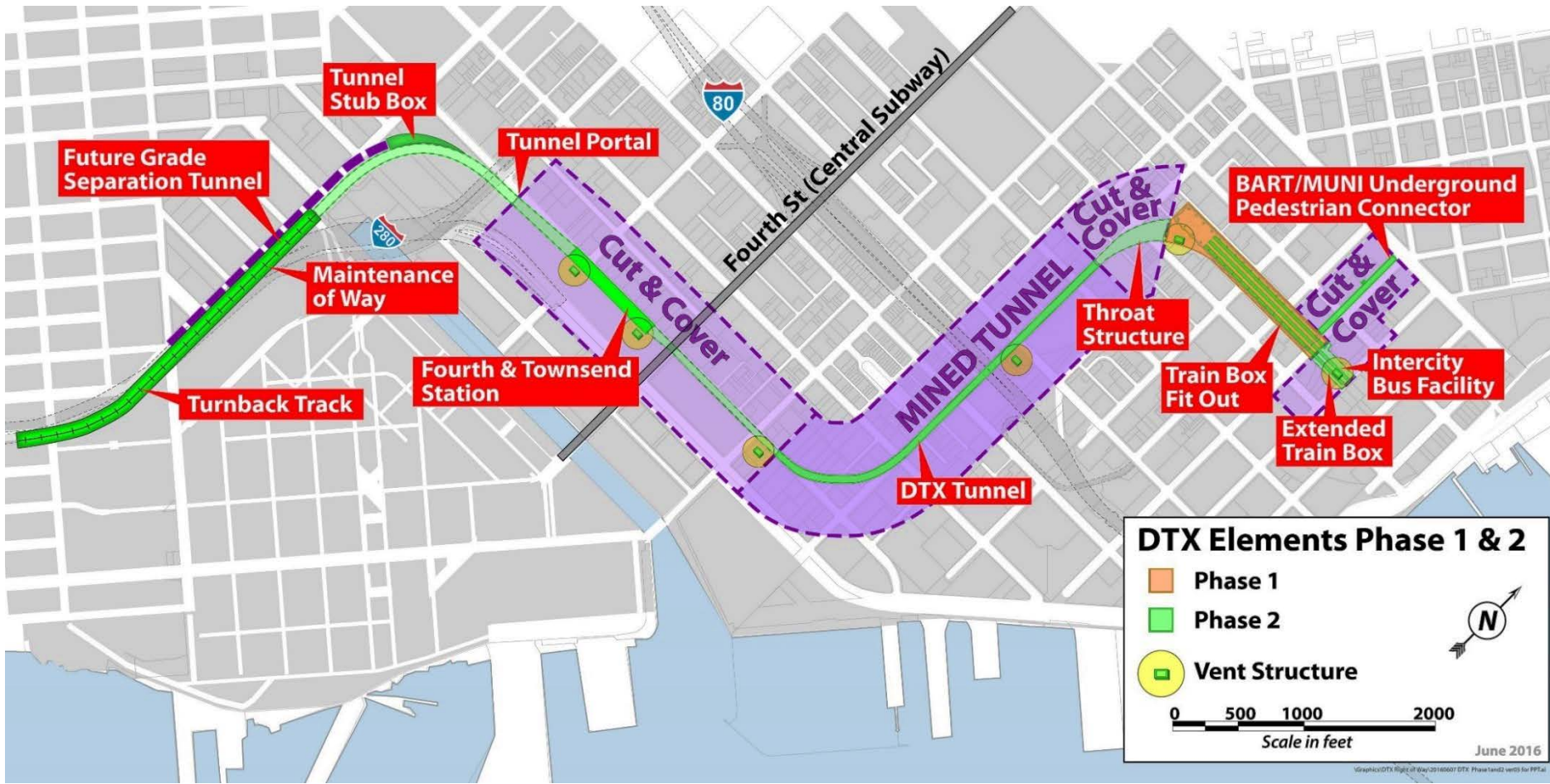
# Work Since Last Update to TJPA Board

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- Further developed mined Howard Street crossing to balance the surface disruption and cost for the Throat structure
- Refined the constructability and schedule for the options
- Confirmed ventilation requirements
- Reviewed configuration of the TBM + SEM tunneling option



# Baseline Concept

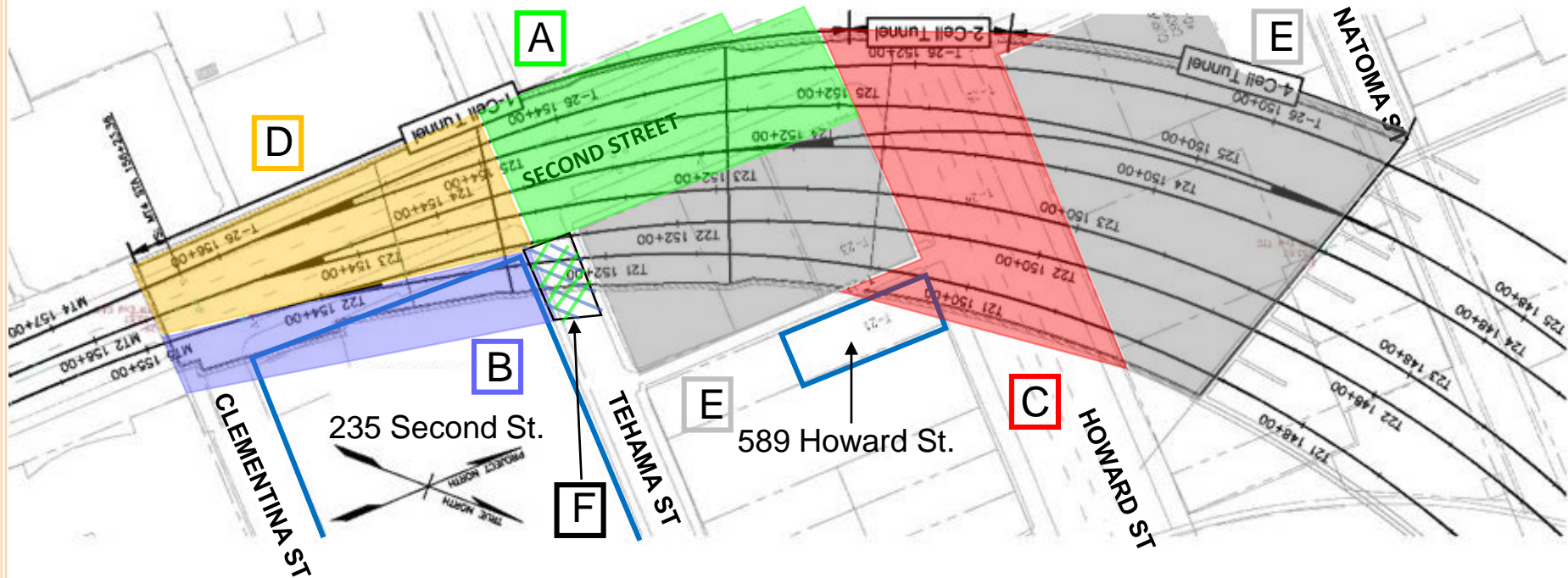


# Tunneling Methods Options

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- Throat:
  - Full mining in the public right-of-way
  - Mining just under Howard St.
  - Mining under 2<sup>nd</sup> St. between Howard St. and Tehama St.
- Second Street:
  - Baseline Sequential Excavation Method (SEM)
  - Twin bore TBM with SEM
- Townsend St. ( 3<sup>rd</sup> St. to 4<sup>th</sup> St.):
  - Soft ground SEM
  - Soft ground TBM with SEM
- 4<sup>th</sup> Street/Townsend Street:
  - SEM & ground improvement
  - TBM with SEM & ground improvement
- 4<sup>th</sup> St & Townsend St. Station:
  - Cut-and-cover

# Throat: North of Clementina St

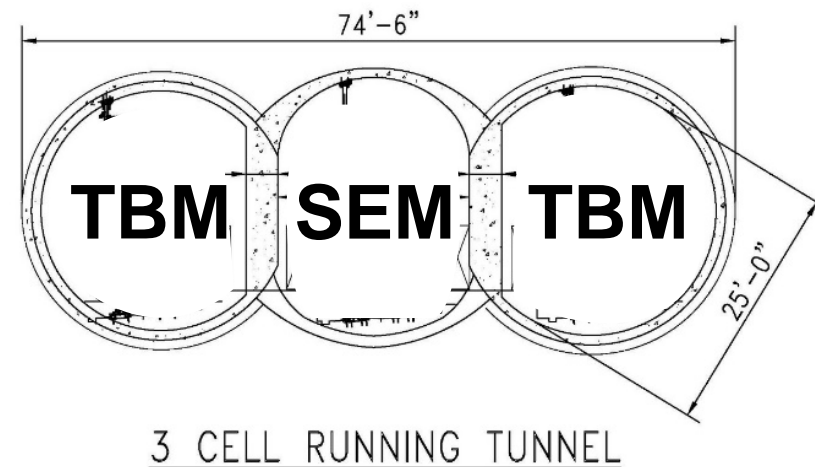
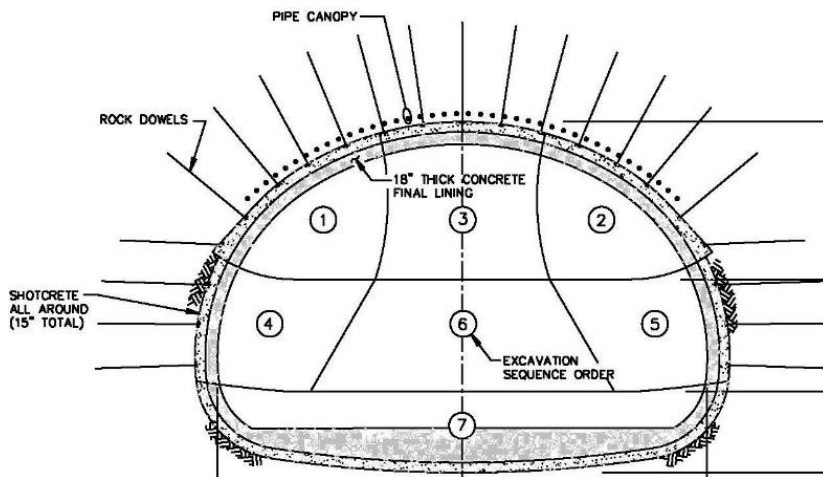


## Options for Partially Mining the Throat

- Add-on Options — [ **A** Pipe Roof Support for Mining under Second Street
- Alternate 1 — [ **B** Extend TBM Mining Below 235 Second St. (Option 1) or Cut-and-Cover (Option 2)
- [ **C** Jacked Box Mining under the Howard Street Crossing
- [ **D** Cut-and-Cover with Decking
- [ **E** Cut-and-Cover outside the public right-of-way (Open Cut)
- [ **F** Cut-and-Cover with Decking (for Add-on Option A) or Extend TBM Mining (for Add-on Option B)

# Second Street

- Baseline SEM Concept in Preliminary Engineering drawings
- Twin bore Tunnel Boring Machine (TBM) with SEM mining between bores



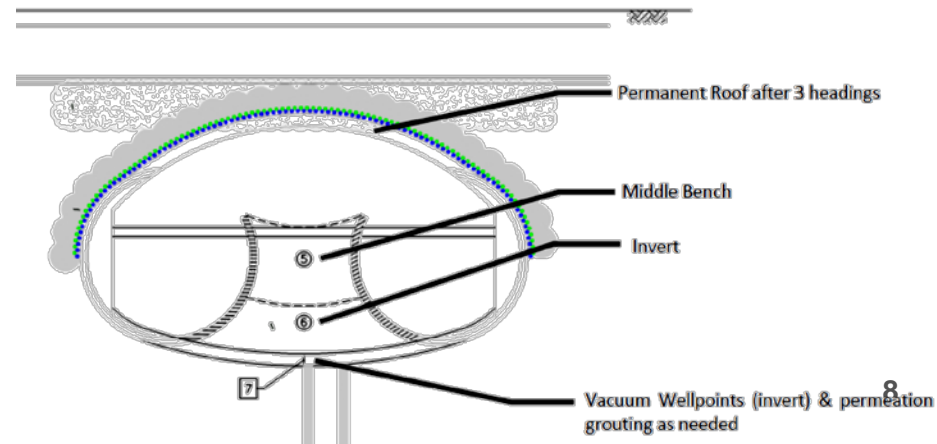
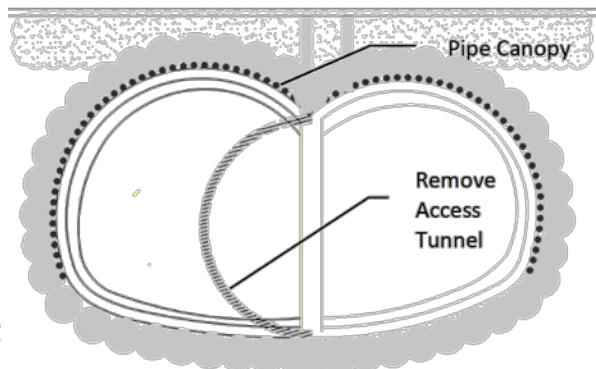
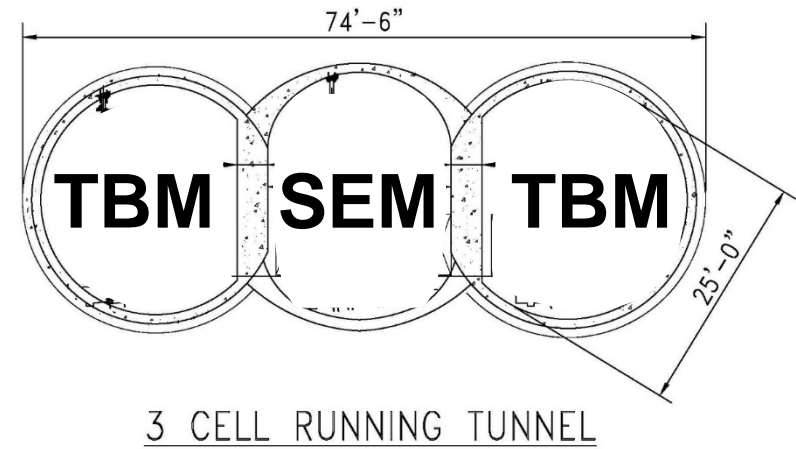


# Townsend St. between 3<sup>rd</sup>-4<sup>th</sup> Sts.

- Soft ground SEM with ground treatment



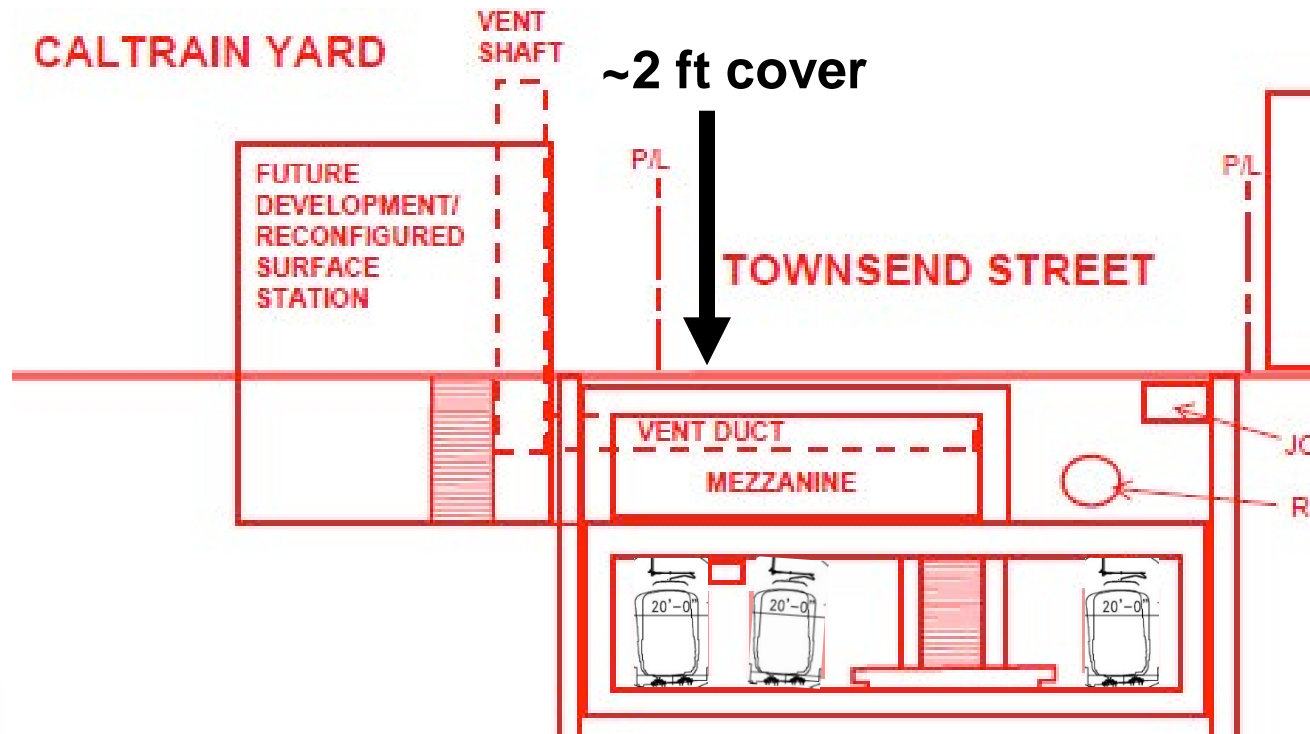
- Twin bore TBM with SEM and ground treatment





# 4<sup>th</sup> & Townsend Street Station

- Cut-and-cover construction (with decking) necessary due to low ground cover and soil conditions
- Aligned with Townsend St. with a center platform between northernmost tracks and mezzanine connection with surface



# 4<sup>th</sup> & Townsend Street Station Traffic Decking

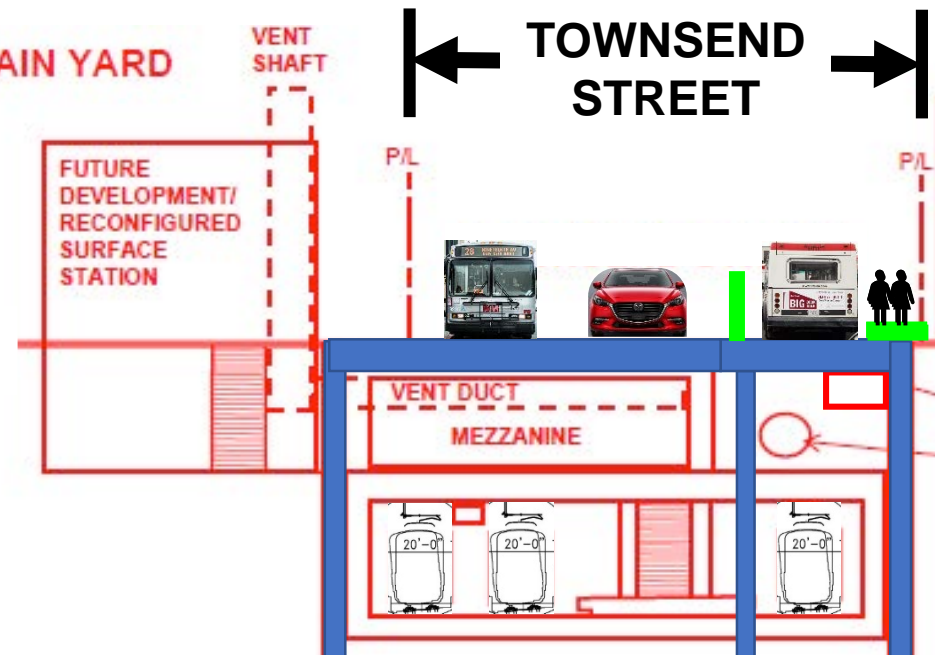
- Minimizes traffic disruption during cut-and-cover construction
- Investigating use from 4<sup>th</sup> St. to just west of 5<sup>th</sup> St.
- Installation:
  - Weekends (Fri PM – Mon AM)
  - Nights at non-residential areas
  - Maintain normal traffic flow during week
  - Sequence to maintain local business access



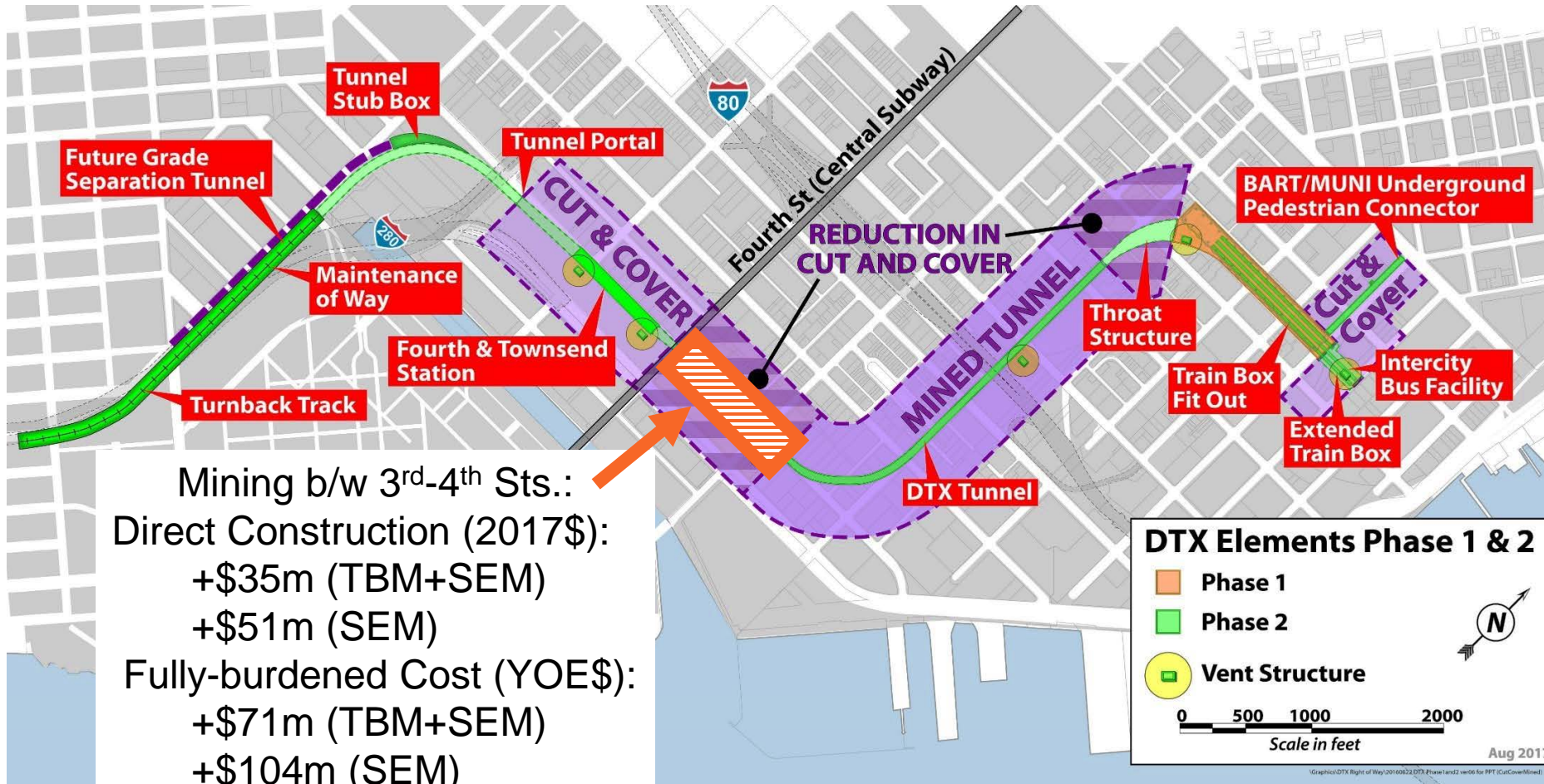
*Hollywood Blvd/Highland, Los Angeles*

# Townsend Street Station Traffic Decking

- Decking will ultimately conflict with roof slab from 4<sup>th</sup> to 5<sup>th</sup> Sts.
- Develop staged decking removal plan to minimize traffic impacts
- Removal:
  - Over weekends
  - Nights at non-residential areas
  - Sequence to maintain local business access



# Cost Premium Above Baseline for Maximum Reduction in Cut-and-Cover



Mining b/w 3<sup>rd</sup>-4<sup>th</sup> Sts.:  
 Direct Construction (2017\$):  
 +\$35m (TBM+SEM)  
 +\$51m (SEM)  
 Fully-burdened Cost (YOE\$):  
 +\$71m (TBM+SEM)  
 +\$104m (SEM)

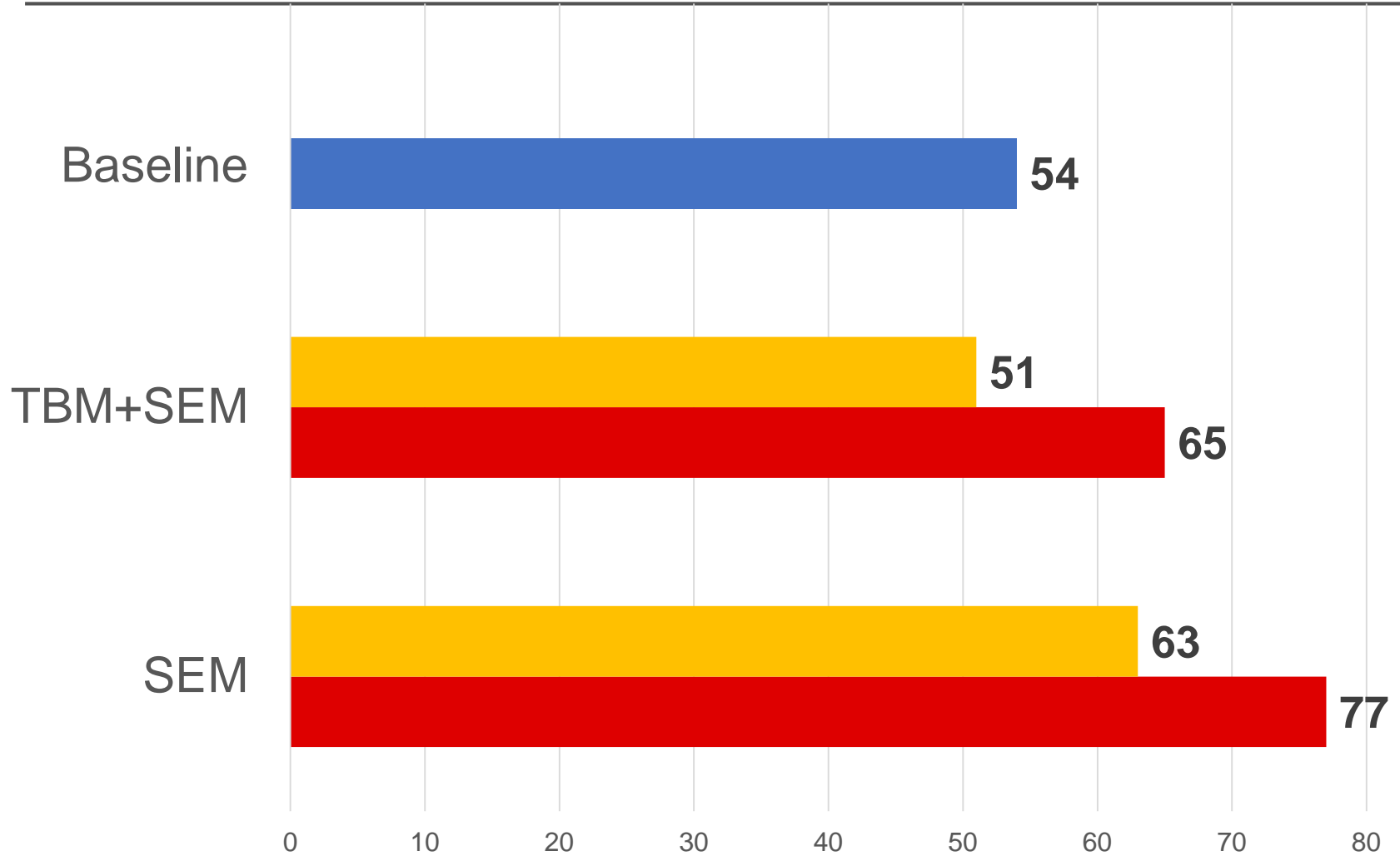


# Cost Premium of Eliminating or Reducing Cut-and-Cover in the Public ROW at the Throat

Location	Direct Construction Cost (2018\$)	Fully-burdened Cost (YOE\$)
Entire Throat (Howard St, 2nd to Clementina St.)	+\$217m	+\$461m
Howard Street Crossing	+\$108m	+\$208m
Howard & 2nd St to Tehama Streets	+\$178m	+\$343m



# Relative Tunneling Schedules (Months)



# Recommendations

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Proceed with 30% Preliminary Engineering for:

- The TBM+SEM concept between Clementina Street and Fourth and Townsend Street Station. (+\$71m)
- Maintain cut-and-cover construction with decking for the Fourth and Townsend Street Station.
- Extending single-bore TBM tunneling beyond 235 Second St., maintaining undisturbed sidewalk and lane of traffic in front of 235 Second Street. (+\$23m)
- Maintaining cut-and-cover construction with decking on Second Street between Howard and Clementina Streets.
- Mining the Howard Street crossing. (+\$208m)
- Performing a value engineering exercise at the conclusion of the 30% design phase.



# Questions?

**TJPA**  
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