



INSTITUTE OF TRANSPORTATION ENGINEERS

SOUTHERN CALIFORNIA SECTION

NEWSLETTER

2017 – 2018, Issue No. 6

March 2018

President's Message

Dean Lehman, PE



Dear ITE Southern California Members,

On February 13, we held our joint meeting with ITE Central Coast Section at the City of Thousand Oaks Municipal Service Center. There was a good mix of members from both Sections in attendance. **Steve De George**, Planning and Technology Director with the Ventura County Transportation Commission, gave a presentation on "The New Ventura County Traffic Model". Thank you to **South Coast Lighting & Design** for sponsoring the meeting.

The ITE International Elections ballots close at noon on March 15th, 2018. If you have not yet cast your vote, please do so ASAP.

The next ITE So Cal Section Social event is on March 29th from 5:30 to 8:00 PM at the Golden Road Brewing in Anaheim. Mark your calendars and capitalize on this opportunity to network with your peers in our industry.

Our next meeting is a tri-section meeting/workshop with the Riverside/San Bernardino and San Diego on Friday, March 9th at the Plaza de Magdalena in San Juan Capistrano. This is a new venue for this event and is conveniently located next to the train station. There will be no walk-ins for this event, so please register in advance! The theme is Transportation funding featuring the following speakers and presentations:

- Patricia Chen, LA Metro - SB-1
- Dawn Vettese, SANDAG – Funding Opportunities for the San Diego Region
- Louis Zhao, OCTA - Active Transportation
- Philip Chu, SBCTA - Transportation Funding Overview
- Kiana Valentine - Protecting the State and Local Transportation Funding

Thank you to our workshop sponsors: **Western Systems** and **Psomas**, and our newsletter sponsors: **Trafficware**, **DKS Associates**, **Stantec**, **NDS**, and **Iteris**.

Next Meeting

**Friday, March 9,
9:00 AM – 1:00 PM**

**Tri-Section Workshop with
RSBITE and ITE San Diego**

Plaza de Magdalena
31781 Camino Capistrano
San Juan Capistrano, CA 92675

https://2018_ite_joint_workshop.eventbrite.com

See 2017-2018 Calendar for
Upcoming Section Meetings

Brief Look Ahead

March 2018

- 6th - 8th, West Coast Rail Conference, Los Angeles Metro, www.ushsr.com
- 8th, Transit Oriented Development & Urban Real Estate Conference, Los Angeles Metro, www.tod.org
- 23rd, Statewide Infrastructure Symposium, Wilsey Conference Center, San Francisco, www.caisregion9.org
- 29th, ITE SoCal Happy Hour, Golden Road Brewing, Anaheim, CA (see flyer)

June 2018

- 10th - 13th, National Travel Monitoring Exposition and Conference, Irvine, CA <http://natmec.org>
- 24th - 27th, Western District Annual Meeting, Keystone, Colorado, www.westernite.org

October 2018

- 1st - 3rd, ITS California Annual Meeting, Anaheim Marriot, Anaheim, CA, www.itscalifornia.org
- 1st - 4th, NACTO Designing Cities Conference, InterContinental Downtown Los Angeles, CA, <https://nacto.org/conference/designing-cities-2018-los-angeles/>

ITE Southern California Section
www.socalite.org

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7 Roles for Transportation Professionals to Educate the Public on the Value of SB1

David M. Schwegel, PE (Precision Civil Engineering)



On April 6, 2017, the Legislature Passed SB 1 – The “Road Repair and Accountability Act of 2017” allocating \$54 billion in transportation improvements over the next decade. Shortly after passage, an effort got underway to gather enough signatures to put the repeal of SB 1 on the November 2018 ballot. This underscores the need for Transportation Professionals to educate the public on the value of SB 1 to ensure that it is retained. Per a recent Mobility 21 Summit in Sacramento, the campaign to retain SB 1 will be around \$50 million.

1. Do Social Media Posts. Check out the League of California Cities www.cacities.org for their updated SB 1 Press Toolkit that includes sample posts. Make sure they establish a local connection. Check out the map of projects at <http://rebuildingca.gov/map.html>.
2. Publish Opinion Editorials in response to articles supporting the repeal of SB 1. Consider resonating with current trends, referencing a high-level person of influence, and establishing a local connection.
3. Testify at public meetings on the value of the expedited implementation of SB 1. Personal stories boost the effectiveness of the message.
4. Subscribe to Google Alerts on “SB 1 Implementation” and “SB 1 Repeal”, and spend a few minutes daily following the trends. The daily digest of articles typically gets emailed out late afternoon.
5. Prepare and deliver presentations on what the implementation of SB 1 means for a particular organization. Check out the videos readily available on the Transportation California website at www.transportationca.com. Note that SB 1 has statewide and local components. Check out Caltrans www.dot.ca.gov and the California Transportation Commission for statewide implications. Perform a Google search on the “League of California Cities” and the “California State Association of Counties” for local and regional implications.
6. Prepare articles for publication in Architectural & Engineering (A&E) Newsletters on available

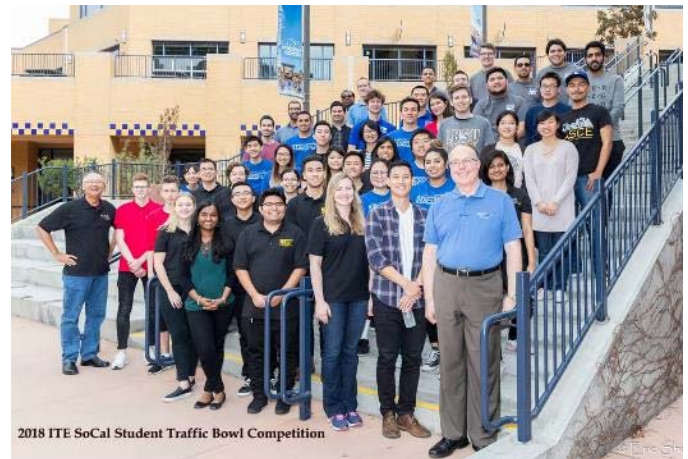
resources for conveying messages on the value of retaining SB 1. Keep an eye on the messaging materials that come out from the Fix Our Roads Coalition around April 6, 2018 – the one-year anniversary of the passage of SB 1.

7. Empower professional colleagues to become subject matter experts on the Implementation of SB 1 now that it has taken effect as of November 1, 2017. It’s the biggest “game changer” to hit Civil/Transportation in California in a quarter of a century. Subject matter experts should familiarize themselves with how local projects are progressing.

The American Road & Transit Builders Association (ARTBA) just came out with a report on the economic and safety benefits of SB 1: https://www.artba.org/wp-content/uploads/2018/02/ARTBA_California_Report_Feb_2018.pdf

Student Traffic Bowl 2018

Kaylinn Pell (LA DOT) and Saly Heng (Kimley-Horn & Associates)



Southern California ITE's Annual Student Traffic Bowl was held at University of California Irvine on February 10th, 2018. There was friendly but fierce competition between the six student chapters in attendance: USC, UCLA, UC Irvine, CSU Long Beach, Cal Poly Pomona and CSU Fullerton. The teams gave it their all but CSU Long Beach was the victor after a tense final jeopardy round against the host chapter UC Irvine. Thank you to all the students who participated and their enthusiastic cheering squads, to the host chapter UC Irvine for showing SoCal ITE that famous anteater hospitality, and to our judges Neelam Dorman, Josh McNeill, and Giancarlo Ganddini. We look forward to a rematch for the “traffic bowl” next year.

ITE SoCal Professional Activities

Nora Chin (LA DOT)



ITE-Southern California hosted its first social on February 22, 2018 at Beelman's in Downtown Los Angeles. Many members and interested transportation professionals chatted, exchanged ideas, and snacks. Professional Activities Chairs Nora Chin and Hassan Ahmed plan to host a series of monthly socials, educational and volunteer activities and project site tours throughout the year. Look out for:

- **Monthly Socials** – Occurring monthly where venues alternate between Los Angeles and Orange County.
- **"Dine and Chat"** with a mid-career Engineer or Planner – Group dinner at a delicious restaurant where transportation professionals have an opportunity to learn and chat with an Engineer or Planner focused on exciting topics and projects such as Vision Zero, Automated Vehicle Technologies, Transportation Planning and Policy and or other topics.
- **Volunteer Activities** – This year, we are working with Ciclavia to "Adopt-An-Intersection." Ciclavia, a 501c3 non-profit, temporarily opens streets across Los Angeles County to all Angelenos to bike, walk, skate, dance, and play. The event turns the streets into a park space that connects diverse portions of the city. Come join us and help out!
- **Co-Partner Project Site Tours** – Put on a hard hat and safety vest – let's learn from one another at an actual project site.

These unique and education activities build cohesion and collaboration amongst transportation professionals. Building your network and honing your technical skills

are truly important qualities of the transportation professional and ITE leader.



If you would like to submit a technical article for the ITE SoCal Newsletter, please contact David Schwegel (davidmschwegel1@gmail.com) or Dina Saleh (dzs@iteris.com).

Update from ITE Headquarters

Marianne Saglam (ITE Communications and Media Senior Director)



Check out these hot topics that are trending at ITE:

1. Voting has opened for the 2019 ITE International President and International Vice President – View the first item in Spotlite for details and information on how to vote.
2. National Rural ITS and ITS Arizona Annual Conference + Exhibit, October 21-24, 2018, We-Ko-Pa Conference Center, Fort McDowell, AZ, USA – Call for Abstracts is now open and closes on March 30
<http://nationalruralitsconference.org/>
3. ITE has signed an MOU with the National Parking Association: [ITE/NPA to Jointly Update Key Parking Analysis Tools](#)
4. [FHWA Responds to ITE's Call for More Flexibility on RRFB Rescission Implementation](#)

Volunteer Opportunities with EnCorps*Bethany Orozco and Katherine Simon*

Transition from industry to teaching -- Inspire the next generation of engineers and innovators! The EnCorps STEM Teaching Fellowship is a rigorous on-ramp and exploration of a teaching career — offering you the field experience, knowledge and connections to ensure you thrive. EnCorps Fellow Katherine Simon, former transportation engineer, now teaches engineering and architecture in an LA school. She says, "being an engineer, I knew that I could give back to the community by teaching in high needs areas."

As a professional coming from industry, you are uniquely positioned to inspire and engage students who need you most — those in our country's most disadvantaged schools. No education or teaching experience necessary. Find out more and apply at www.encorps.org, contact Bethany at bethany.orozco@encorps.org or join the next EnCorps 101 webinar at www.encorps.org/webinar.

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@EnCorps in supporting engineers making a transition to #STEM teaching careers <http://encorps.org>

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<https://www.governmentjobs.com/careers/ontario>

Upcoming ITE Webinars

It's Not Just about the Data: Use Brain-Science to Get Your Points Across and Be Memorable (Session 2 in [The ABCs of Communication in Transportation: ITE's Inaugural Online Workshop](#)) - Registration deadline: March 5

March 6, 3:00 - 4:00 p.m. ET

Reliability of Roadway Safety Management Methods: Opportunities to Enhance Traditional Methods

March 27, 3:00 - 4:30 p.m. ET

Safety Data Management, Governance, and Integration - *registration opening soon*

April 19, 3:00 - 4:30 p.m.

Stop Death by PowerPoint! Create Impactful, Brain-Friendly Presentations (Session 3 in [The ABCs of Communication in Transportation: ITE's Inaugural Online Workshop](#)) - Registration deadline: March 5

May 1, 3:00 - 4:00 p.m. ET

Check out the [ITE Learning Hub](http://itelearninghub.org) for a listing of webinars.

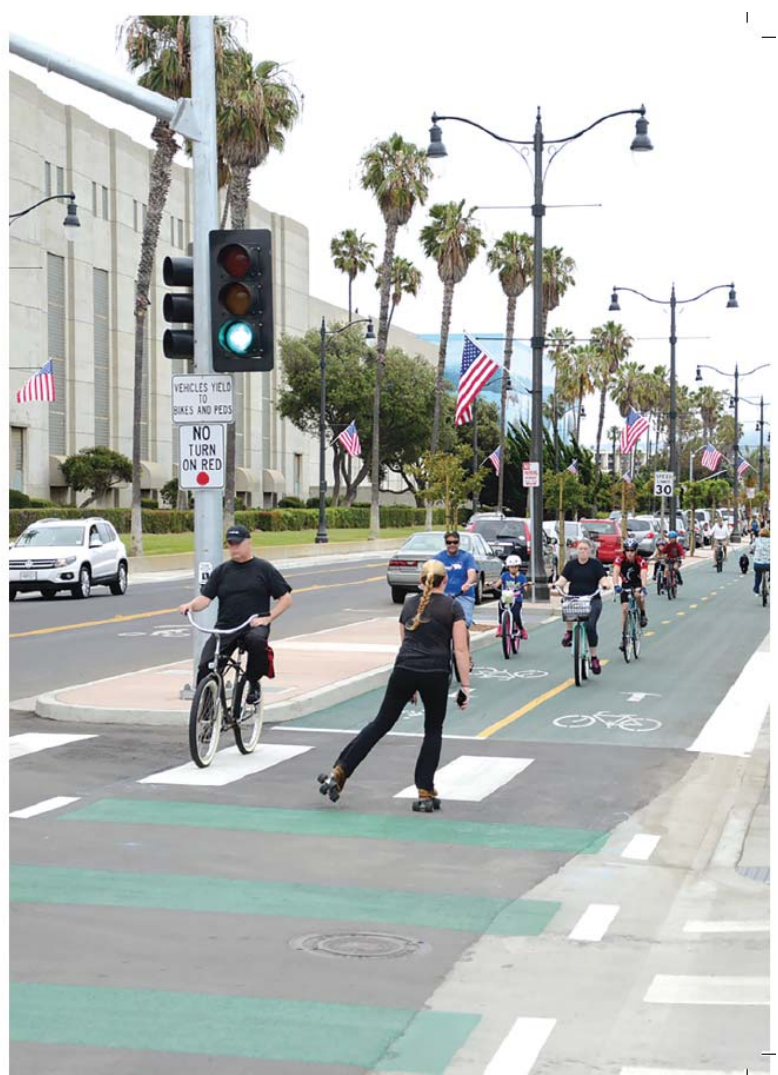


Helping communities get back on their feet, and bicycles

Communities should be designed for people, not cars. But Southern California evolved when cars were king. It is time to take back our streets and make our cities safer, healthier, and more sustainable. We are doing our part, working with transportation agencies to develop regional safety plans, integrate multi-modal networks, and design dedicated bicycle and pedestrian pathways.

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THE PEAK OF TRANSPORTATION



SAVE THE DATE!!

2018 Joint Western and Texas Districts Annual Meeting

June 24 - 27, 2018

Keystone Resort and Conference Center

www.itekeystone2018.com



Keystone, Colorado

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ite



Minneapolis 18

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August 20 - 23



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ITE AWARDS PROGRAM



The ITE Awards Program kicked off on January 2 with an updated website, submission process, and brochure. **This year the award deadlines have changed.** All district and section awards will need to be submitted to ITE by **April 1, which means submittals to the districts and sections will need to be by March 1.** Wilbur Smith, Transportation Achievement, District/Section Communications, and HSIS deadline is April 1.

In addition to making the deadlines consistent, we have also streamlined the submittal requirements for most awards. Again, this is in the interest of making the entire submittal process easier for award submitters. To help further facilitate this new process, ITE is now using OpenWater as a platform for award submittal and judging. The system will work in concert with other aspects of the annual meeting to have one platform where users are able to enter information. This is now the only way that ITE will be able to submit awards from this point forward.

The list of awards along with past recipients is located at www.ite.org/awards.

2017-2018 CALENDAR

INSTITUTE OF TRANSPORTATION ENGINEERS
SOUTHERN CALIFORNIA SECTION



<p>AUGUST 2017</p> <p>ITE Annual Steak Fry Wed. Aug 23, 2017 Dinner – 5:30pm</p> <p>Police Academy Rock Garden, Los Angeles</p>	<p>SEPTEMBER</p> <p>Regular ITE Meeting Wed. Sept 27, 2017 Lunch – 11:30am</p> <p>Monterey Hill Restaurant, Monterey Park</p>	<p>OCTOBER</p> <p>Joint Meeting with OCTEC Thurs. Oct 26, 2017 Lunch – 11:30am</p> <p>Orange County Mining Company, Orange</p>
<p>NOVEMBER</p> <p>Joint Meeting with Riverside- San Bernardino Section Wed. Nov 15, 2017 Lunch – 11:30am</p> <p>The Restaurant at Kellogg Ranch, Cal Poly Pomona</p>	<p>DECEMBER</p> <p>Holiday Mixer with RSB ITE & OCTEC Wed. Dec 6, 2017 Appetizers – 5:30pm</p> <p>Los Coyotes Country Club, Buena Park</p>	
<p>JANUARY 2018</p> <p>Joint Meeting with City Traffic Engineers Wed. Jan 17, 2018 Lunch – 11:30am</p> <p>Monterey Hill Restaurant, Monterey Park</p>	<p>FEBRUARY</p> <p>Joint Meeting with Central Coast Section Revised Tues. Feb 13, 2018 Lunch – 11:30am</p> <p>City of Thousand Oaks Municipal Service Center</p>	<p>MARCH</p> <p>Joint Workshop with RSBITE and ITE San Diego Fri. March 9, 2018 Revised 9:00a – 1:00p Workshop, 12:00p Lunch</p> <p>Revised Plaza de Magdalena, San Juan Capistrano</p>
<p>APRIL</p> <p>Regular ITE Meeting Wed. April 11, 2018 Lunch – 11:30am</p> <p>Revised Los Angeles County Public Works, Alhambra</p>	<p>MAY</p> <p>Student Chapter Night Co-sponsored by OCTEC Wed. May 16, 2018 5:30p Student Job Fair, 6:30p Dinner</p> <p>Knott's Berry Farm Resort Hotel, Buena Park</p>	<p>JUNE</p> <p>Mini-Workshop/Annual Business & Joint Meeting with ITS SoCal Wed. June 13, 2018 8:30a – 12:00p Workshop, 12:00p Lunch, 1:00p Business</p> <p>Monterey Hill Restaurant, Monterey Park</p>

NOTE: Some information is subject to change. Last Updated – February 26, 2018.



SOUTHERN CALIFORNIA,
RIVERSIDE/SAN BERNARDINO
& SAN DIEGO SECTIONS

Joint MEETING

*Join ITE Southern California, Riverside/San Bernardino,
& San Diego Sections for this informative, valuable Friday program.*

DATE: Friday March 9, 2018

TIME: 9 AM to 1 PM

PLACE: Plaza de Magdalena
31781 Camino Capistrano,
San Juan Capistrano, CA 92675

Early Registration (RSVP by 3/2)

Professionals \$50
Students \$25

Late Registration (Must RSVP by 3/7)

Professionals \$55
Students \$25

No Walk-Ins on March 9

For Student Registration, please contact
Ed Alegre (AlegreE@metro.net) for the Promotional Code.

Program

SB-1 Funding Overview
Patricia Chen, LA Metro
9:45 – 10:15 AM

SB 1 Funding Opportunities for the San Diego Region
Dawn Vettese, SANDAG
10:20 – 10:50 AM

Active Transportation Program
Louis Zhao, OCTA
10:55 – 11:25 AM

Transportation Funding Overview (The “Alphabet Soup”)
Philip Chu, SBCTA
11:25 – 11:55 AM

Protecting State and Local Transportation Funding
Kiana Valentine, California State Association of Counties
12:30 – 1:00 PM

Thank you to our sponsors!



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MARCH 9
SAN JUAN CAPISTRANO

Must RSVP by March 7

Click here to register

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www.rsbite.org
www.sandiegoite.org

Note: Program subject to change

Speaker Biographies

SB-1 Funding Overview | Patricia Chen, LA Metro

Patricia has 24 years of experience guiding Metro's multimodal programs to improve mobility throughout Los Angeles County. She coordinates Metro's policy development and planning activities surrounding state funding programs. Recently, the emphasis has been on the development of policies for the implementation of Senate Bill 1 (SB1), the new state transportation funding package approved in April 2017 that will generate approximately \$5 billion per year for new and expanded transportation programs across California. Patricia is serving this year as the Moderator for the Regional Transportation Planning Agencies (RTPA) Group. In this role, she facilitates discussions between planning and programming agencies throughout the state and staff of the California Transportation Commission and Caltrans. These discussions help to develop effective and practical policies and programs for achieving state and regional goals.

SB 1 Funding Opportunities for the San Diego Region | Dawn Vettese, SANDAG

As a Senior Programming Manager with the SANDAG TransNet Department, Dawn serves as a technical resource to the agency regarding transportation funding and policy that may impact SANDAG and the San Diego region. Dawn previously served over 20 years with the California Department of Transportation in both headquarters the San Diego district in a variety of roles including transportation finance and program/project management. Dawn earned her Bachelor of Science in Business Administration, Project Management from Colorado Technical University.

Active Transportation Program | Louis Zhao, OCTA

Louis Zhao is the Section Manager of Discretionary Funding Programs at the Orange County Transportation Authority (OCTA). Louis received his Bachelors of Arts from the University of California, Irvine in Environmental Design and Masters of Arts at the University of California, Los Angeles in Urban Planning. He is responsible for programming state and federal funds, streets and roads calls for projects, non-motorized transportation calls for projects, active transportation programs, and discretionary grant applications for OCTA.

Transportation Funding Overview (The "Alphabet Soup") | Philip Chu, SBCTA

Philip Chu is a Senior Management Analyst (III) in the Department of Fund Administration with San Bernardino County Transportation Authority (SBCTA) where he manages the programming of various Federal, State and Local transportation funds such as the Federal FAST Act, State Senate Bill 1 and San Bernardino County's Measure I Transportation Sales Tax. Prior to his tenure at SBCTA, Philip was an Associate Planner with San Luis Obispo Council of Government (SLOCOG) where he managed long range region-wide transportation projects including the development of the San Luis Obispo Regional Traffic Model, Regional Park & Ride Lot Study and "Community 2050" the Regional Vision Plan. He is also an adjunct faculty at Cal Poly Pomona Civil Engineering Department and Cal State San Bernardino Public Administration Department. Philip holds a Bachelor of Science degree in City and Regional Planning and a Master degree in Public Policy from California Polytechnic State University San Luis Obispo.

Protecting State and Local Transportation Funding | Kiana Valentine, California State Association of Counties

Kiana Valentine is a Senior Legislative Representative with the California State Association of Counties for housing, land use, transportation, and tribal gaming issues. In this capacity, Ms. Valentine performs legislative and budget advocacy on behalf of California's 58 counties at the state and federal levels as well as provides technical expertise on related implementation and administrative issues. She also staffs the County Engineer's Association of California and works closely with county public works departments to inform legislative, budget, and administrative proposals. Kiana holds her Master of Public Policy and Administration from CSU, Sacramento and attended CSU, Chico to earn her undergraduate degree in Political Science and International Relations. Kiana has experience working with Congress, both in Washington D.C. and in California district offices, the State Legislature, and California's counties.

ITE - Southern California Section

OC Happy Hour

*happy
hour*



MAR 29 2018

**GOLDEN ROAD BREWING
2210 E. ORANGEWOOD AVENUE
ANAHEIM, CA 92806**

5:30 PM - 8:00 PM

The Single-Bore Subway

January 2018

Can Single-Bore Tunneling Transform Urban Subway Construction?

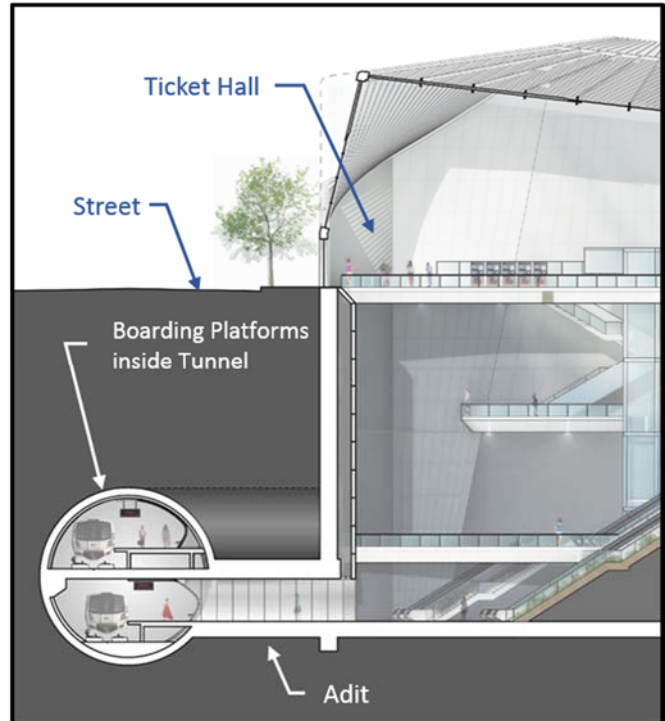
By Dennis Ratcliffe

The Santa Clara Valley Transportation Authority (VTA) is evaluating a tunneling methodology that would use a single, large diameter tunnel to construct its next BART extension through the downtown core in San José California. This evaluation of the single-bore method has revealed a number of unique advantages and opportunities for urban subway construction.

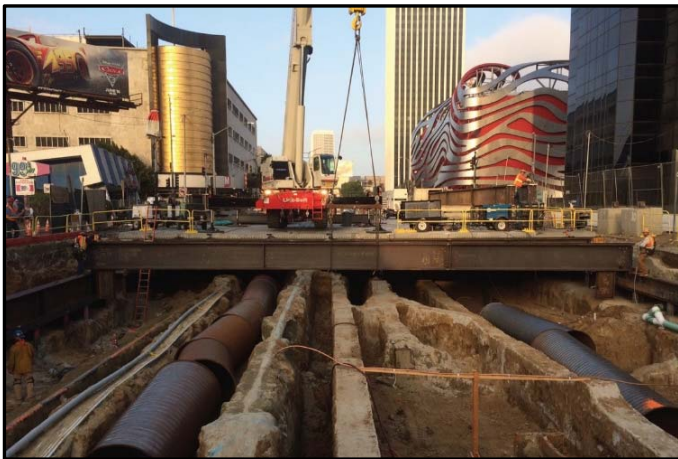
The single-bore method compartmentalizes the large diameter tunnel into separate trainways. In this method, the tunnel and boarding platforms are constructed completely independently of the station structures. This configuration is made possible by recent innovations in large-bore tunneling equipment and related control technologies.

The single-bore proposed for San José would use one 45 ft. diameter tunnel boring machine (TBM) to construct a 5-mile long circular tunnel structure. The boarding platforms will be constructed one above the other inside the tunnel bore without construction disruption at the surface.

The station entrances (ticketing halls) which include ticketing, fare gates, station agent booth, and vertical circulation elements are constructed off-street (two entrances per station). The connection between the tunnel and the ticketing halls can also be constructed without disruption at the surface by mining an access corridor (or Adit) between the tunnel and the bottom of the ticketing hall.



Downtown San José: Single-Bore Station Configuration



Los Angeles: Purple Line street closures near Wilshire/Fairfax

Why is this important?

Conventional subway construction entails the use of cut-and-cover techniques that involve removing the street surface, relocating and protecting existing utilities, and excavating down from the street level. This method is highly disruptive to auto and pedestrian traffic, and has significant negative impacts on existing businesses. The conventional subway construction approach attempts to reduce these impacts by using two smaller TBM's to construct the trackways in separate running tunnels between stations, but this method still requires cut-and-cover methods to construct the stations. For the subway planned in San José, using cut-and-cover techniques would require the downtown station excavations to be approximately 1,800 feet long, 60 feet deep, and would extend from curb to curb.

The single-bore method avoids most of these in-street impacts because the tunnel, trackways, and boarding platforms are all constructed below ground without disruption at the surface. **Also, because the ticketing hall facilities are constructed off-street, the construction disruption for these facilities is limited and comparable to construction of any high-rise building with a basement.** The underground connection between the ticketing halls and the boarding platforms can also be constructed without disruption at the surface through the use of mining techniques such as ground freezing.

San José is typical of urban revival now being experienced all across the country. Millennials are leading a trend toward urban living for both work and home, and cities are responding by creating housing, workplaces, and entertainment destinations in their urban core. Millennials are seeking a lifestyle that is not dependent on the automobile, especially without long commutes behind the wheel. Convenient public transit is a key attribute of their ideal urban lifestyle, and in the urban setting this means constructing a subway.

How does Single-Bore address the major issues?

Disruption – The principal problem of subway construction in the downtown core stems from the disruption to the auto and pedestrian infrastructure caused by cut-and-cover construction methods. In most cases the subway station is needed at the most vibrant area of the city – the very location that will be most negatively affected by its construction. Because the single bore method can be constructed almost entirely underground, it avoids this problem. To understand the advantages, one must simply compare five years of construction disruption using the conventional methods to five years of continued business and economic development while subway construction continues underground relatively unnoticed using the single-bore approach.

Costs - Most cities that are considering transit subways tend to be older with aging utility infrastructure beneath the streets, with little as-built information. This poses significant construction risks when using cut-and cover methods, and frequently requires extensive replacement and upgrades extending far beyond the excavation site when these utilities are disturbed. The costs stemming from these risks and utility impacts are sometimes so great they may offset the costs associated with the additional excavation associated with the single-bore method. Because there is limited business disruption, there is little need to establish business subsidies during construction. (Los Angeles MTA had to establish a Business Interruption Fund for the Crenshaw/LAX Transit Project.)

Streetscape – Conventional cut-and-cover subway stations typically have relatively narrow stairway/escalator passages located on the sidewalk leading to the ticketing mezzanine below the roadway. This arrangement compromises the sidewalk width and generally degrades the streetscape. Unless these facilities are enclosed with a lockable head houses, these areas attract unwanted activities during off hours. Because the single-bore method constructs all the ticketing facilities off-street behind the sidewalk, the sidewalk width is not impaired and the ticketing hall can be fully enclosed and secured in the same way as any other building in the downtown core.

Joint Development – The single-bore method has significant potential for joint development in the downtown core because all transit-related facilities are contained in a basement-like structure. This leaves a substantial area on the first floor and the full area on the floors above available for additional public or private sector development. This is doubly valuable as the ticketing hall facility can itself become a downtown destination, not merely a point of transit to other destinations.

Safety – The single-bore method also has safety advantages over conventional cut-and-cover methods. Because the entire ticketing hall is maintained as a place of safety, evacuation from a train fire is simplified. Passengers reach the point of safety as soon as they leave the back of the boarding platform. Also, since the running tunnels are constructed in separate chambers, passengers that are evacuating the train mid-tunnel can reach the non-incident tunnel through frequently spaced fire doors.

A promising Future for Single-Bore

If San José constructs its downtown subway using the single bore method, it will be the first of its kind in North America, and the first in the world for a high-volume heavy-rail transit subway. Demonstrating its viability here will position the nation as a leading innovator in transit, and will enable the construction of effective transit in many city centers where it would otherwise be impractical.

BART's success as a high-capacity regional transit system has pushed ridership to its physical capacity limits. Inevitably, a second crossing of San Francisco Bay will have to be constructed. Given the relatively high development densities in San Francisco and Oakland, the single-bore configuration in this crossing would provide significant benefits by expanding this successful system without the negative impacts of construction.

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