Respondent Profile

Created by Elon Musk, founder of Tesla and SpaceX, The Boring Company (TBC) constructs safe, fast-to-dig, low-cost, and zero-emissions transportation tunnels in order to alleviate traffic congestion.

Legal Entity	**TBC - The Boring Company**
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Concept Description	Loop is a high-speed underground public transportation system capable of carrying up to 10,000 people per direction per hour (ppdph) using modified Tesla vehicles.
Business Plan Description	Loop is a fare-collecting public transportation system. TBC will work with the City on a fare strategy and fare payment method that best integrates with the existing transportation network.

Proposed Concept

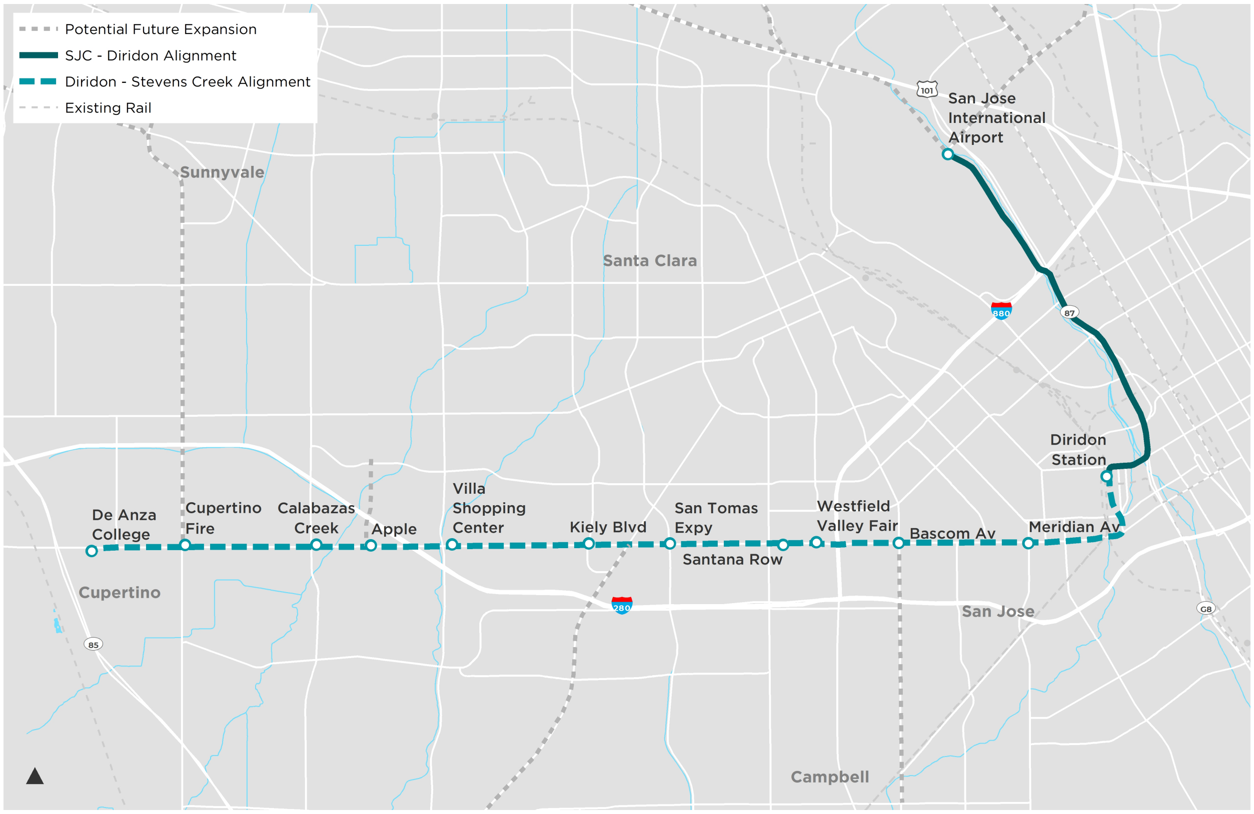
Loop is a high-speed underground public transportation system in which passengers are transported in autonomous electric vehicles (AEVs) at up to 150 miles per hour (mph). Loop AEVs are Tesla vehicles used in a public transportation setting.

Loop is often mistaken for a subway system, but there are many distinctions between the two. One key distinction is that Loop is an “express” public transportation system and more resembles an underground highway than a subway system. Through the use of a Main Artery Tunnel with side tunnels for AEV entry/exit, passengers travel directly to their final destination without stopping. As an example, if a train-line had 100 stops, the train would typically stop at each station, so the trip between Stop 1 and Stop 100 would be long. In contrast, Loop passengers travel directly to their destination, anywhere between Stop 1 to Stop 100, without stopping at the intermediate stations. Moreover, the express system allows Loop’s AEVs to travel faster than conventional subway cars (up to 150 mph vs. up to 65 mph).

The City’s Automated Gateway Transit Study Final Report issued on March 3, 2017 describes a Personal Rapid Transit (PRT) system capable of carrying between 1-6 passengers at 15-25 mph with a practical line capacity of 1,000 to 2,500 people per hour per day (pphpd), expandable to 10,000 pphpd. Loop can meet or exceed those capacity numbers.

TBC will work with the City to finalize a build alignment. TBC’s tunnels will be constructed under existing public right of way and/ or within TBC-owned or controlled properties. The City proposes two stations for the San Jose International Airport (SJC) to Diridon Station alignment and up to twelve stations for the Diridon Station to Stevens Creek alignment. Loop will enable express trips between any stations along the alignment; in other words, a passenger can travel from SJC directly to De Anza College without making any intermediate stops along the alignment. Figure 1 below provides the conceptual project alignment for both the 3.2-mile SJC – Diridon alignment and 8.4-mile Diridon – Stevens Creek alignment, which generally follows the City-proposed concepts. TBC can construct one, or both projects, depending on the needs of the City. Ticketing scenarios are flexible and can be optimized to make transfers between existing public transportation systems and the Loop system as convenient as practicable.

Figure 1 – Conceptual Alignments



Physical and Operational Elements

Loop's physical structures, including Main Artery Tunnels, Tunnel Spurs, Stations, AEVs, Maintenance Terminal, and Operations Control Center, support Loop operations.

Main Artery Tunnels

The Main Artery Tunnels are the primary pathways for passenger travel within AEVs. Each Main Artery Tunnel includes the physical tunnel itself, along with the interior infrastructure:

- **Tunnel Drive Surface**: Concrete or asphalt surfaces are built into the interior of the tunnel to serve as a driving surface for the AEV rubber tires.
- **Primary and Backup Lighting**: Fully configurable LED lighting installed throughout the tunnel allows "cool lighting backgrounds" for passenger comfort and enjoyment, and vehicle signaling for increased safety (e.g., vehicles stop when LED lights turn red). Unlike many subsurface transportation systems, the tunnel is brightly illuminated (as opposed to dim or pitch-black) during nominal transportation.
- **Primary, Backup, and Auxiliary Power**: The primary and backup systems power the tunnel interior infrastructure. The auxiliary power system consists of low-power 110V outlets installed throughout the tunnel to support certain service/maintenance operations (e.g., power tools).

- **Video System**: Cameras are positioned throughout the tunnel for increased safety and security such that there are no blind spots inside of the illuminated tunnel.
- **Cellular Service System**: Cell phone service is made available throughout the tunnel via remote unit antennas to provide passengers with cellular reception throughout their journeys.
- **Intercom/Public Address (PA) System**: Intercoms and PAs (equivalent to a call-box) are installed periodically through the tunnel for contingency communication, both locally (intercom to Operations Control Center) and globally (PA to entire tunnel).
- **WiFi Access Points**: WiFi coverage is provided throughout all tunnels and stations.
- **Remote Data System**: Sensors are placed throughout the tunnel to measure temperature, pressure, voltages, air flow, gas levels (e.g., oxygen, carbon monoxide, methane, etc.), and AEV position.
- **Ventilation System**: The ventilation system consists of a series of booster fans and is designed conservatively for worst case (and highly unlikely) vehicle fire loads.

Tunnel Spurs

Tunnel spurs are side tunnels that connect the Main Artery Tunnels to stations and have the same interior infrastructure as the Main Artery Tunnels. They are functionally similar to highway on- and off-ramps.

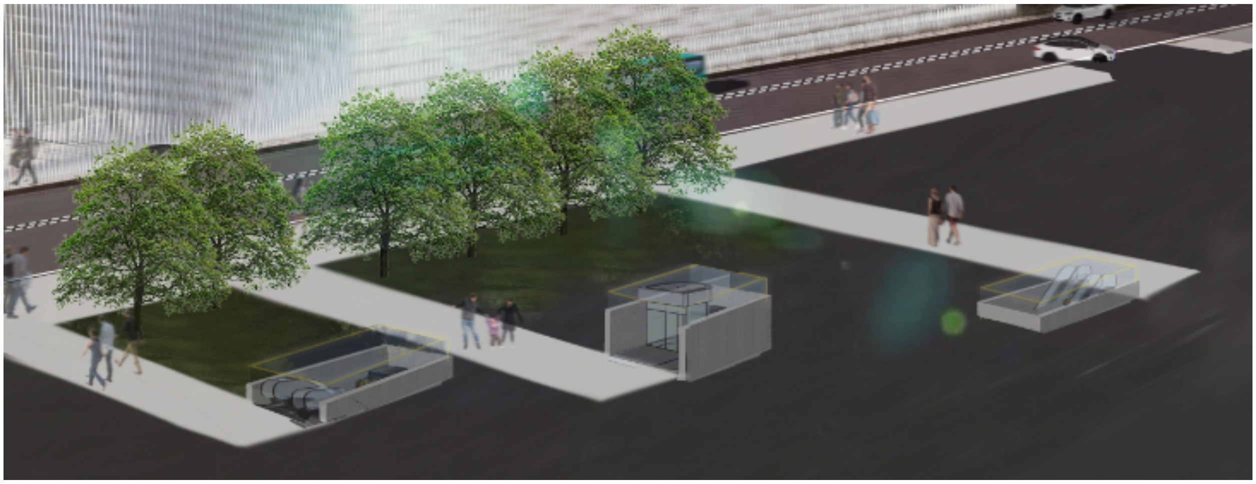
Stations

Stations are where passenger boarding/alighting will occur. Two types of stations are available: subsurface stations and surface stations. Passengers board below-grade in subsurface stations or at-grade in surface stations.

Subsurface Stations

Passengers will enter subsurface stations through surface access points, similar to typical subway entrances. Each access point will provide station access via a combination of elevators, escalators, and/or stairs directly to platforms where passengers will board AEVs. Final design of subsurface stations will comply with applicable building and fire and life safety codes, such as the installation of automatic sprinkler systems and minimum number of egress points as required by the International Building Code (IBC). The exact building and fire and life safety code for compliance is determined as station design progresses. Figure 3 provides a conceptual rendering of a potential surface footprint of a subsurface stations.

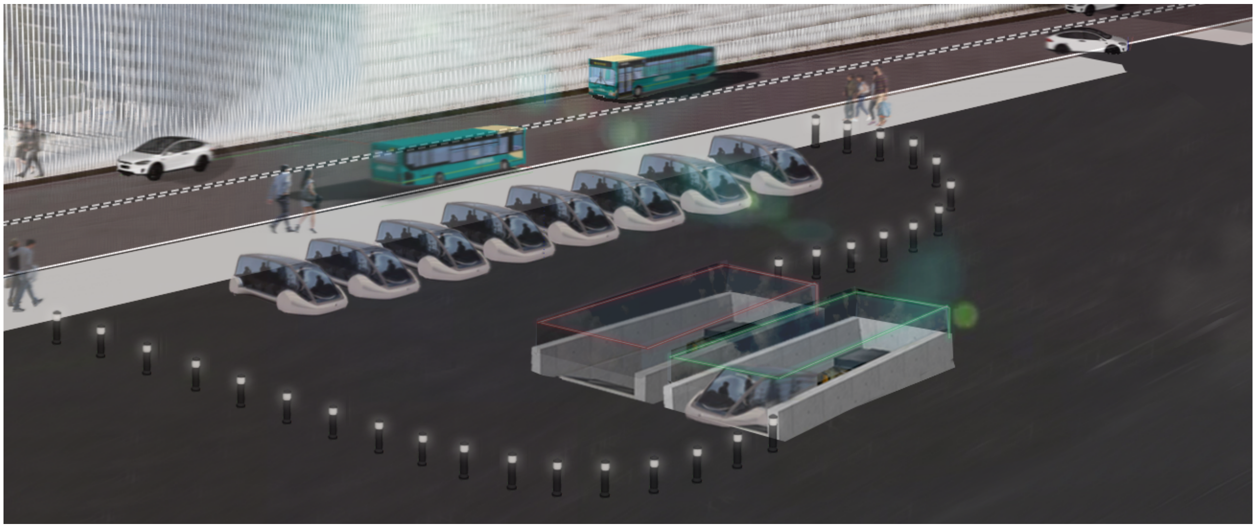
Figure 2 – Conceptual Rendering of the Surface Footprint of a Subsurface Station



Surface Stations

Surface stations allow for passenger loading and unloading at designated passenger pick up/drop off areas at the surface. Each tunnel will be connected to the surface through a set of ramps, one designated for inbound AEVs and one for outbound AEVs. Inbound AEVs will emerge from tunnels onto the surface and complete their trips to the designated surface station area. Likewise, an AEV departing a station will enter the tunnel through the outbound ramp. Figure 4 provides a conceptual rendering of a potential surface station configuration.

Figure 3 – Conceptual Rendering of a Surface Station



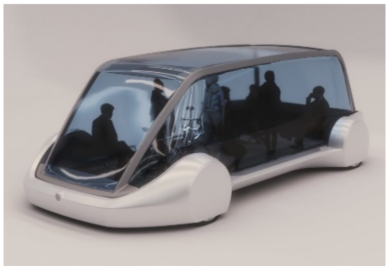
Autonomous Electric Vehicles (AEVs)

AEVs carry passengers between stations within the Main Artery Tunnels. AEVs are based on existing production Tesla vehicles and include Standard and High-occupancy classes. Figure 5 provides images of each type of AEV that can be used in the Loop system.

Figure 4 – AEV Types

Standard-Capacity AEV
(Tesla Model 3)

Standard-Capacity AEV
(Tesla Model X)



High-Occupancy AEV

Maintenance Terminal

Inspection and maintenance of AEVs occurs in the Maintenance Terminal, which mirrors an existing Tesla Service Center. The location of the Maintenance Terminal is flexible and subject to land availability and to the preference of the City. Alternatively, AEVs can be driven or hauled on trailers to a nearby off-campus TBC maintenance and inspection location.

Operations Control Center (OCC)

The OCC serve as the primary location for Loop system management, safety and security monitoring, and emergency identification and notification. OCC operators trained in response protocols will manage all operational safety and AEV dispatch within Loop.

The OCC can be located either in an elevated office within one of the Loop stations or at another designated secure location on- or off-location.

Current Projects

TBC has experience in the design, construction, and operation of tunnel boring machines and Loop technology in the projects listed below.

Loop System R&D Test Tunnel – Hawthorne, California

TBC designed and constructed an R&D Test Tunnel in Hawthorne, California, currently used for Loop system testing. The 1.14-mile tunnel runs beneath public right of way (Hawthorne Airport and 120th Street) between two stations, both on TBC-owned private property. TBC reduced average tunneling costs below public industry standards through a number of innovations and improvements, including:

- Internalizing concrete segment production, large portions of the boring machine manufacturing, and geotechnical and concrete testing;
- Performing engineering, project management, and construction in-house;
- Converting a diesel locomotive to an all-electric 25-ton locomotive (using Tesla Model 3 hardware);

- Developing alternative methods of muck removal and reuse, including as bricks and pavers; and,
- Streamlining environmental, planning, and construction permit approvals for Loop technology in an urban environment.

Using these cost reduction measures, the R&D Test Tunnel cost approximately $10 million, including internal tunnel infrastructure. Although this is an R&D tunnel, the cost is drastically lower when compared to other United States tunnel and people-mover projects (more than approximately $150 million per mile).

Las Vegas Convention Center Loop

TBC is contracted to design, construct, and operate a Loop system for the Las Vegas Convention Center (LVCC). LVCC Loop will connect the existing campus (North/Central/South Halls) with a new exhibit hall and meeting room space. LVCC Loop is currently under construction, scheduled to be put into operation by January 2021, and is anticipated to reduce travel times between the new exhibit hall and the existing North/Central halls from 15 minutes (via walking) to roughly 1 minute.

Dugout Loop to Dodger Stadium

TBC is working with the City of Los Angeles and the Dodgers baseball organization to develop a Loop high-speed transportation tunnel system connecting Dodger Stadium to a Los Angeles Metro Red Line station in the East Hollywood neighborhood in Los Angeles. The 3.6-mile trip is anticipated to take 4 minutes, enabling fans and event-goers to avoid heavily congested Los Angeles roadways. The project is currently undergoing environmental review under CEQA, with the City of Los Angeles Bureau of Engineering serving as lead agency.

Washington, D.C. to Baltimore Loop Tunnel Project

TBC is working with federal, state, and local officials to obtain permits to construct a 34-mile Loop high-speed transportation tunnel system between Washington, D.C. and Baltimore. The project is currently undergoing project development and regulatory review under the National Environmental Protection Act (NEPA), with the Federal Highway Administration (FHWA) serving as lead agency.

Chicago O’Hare Express System

TBC won a competitive bid to exclusively negotiate the design, construction, and operation of a high-speed underground transportation system providing express service from Chicago’s O’Hare International Airport to Chicago Central Business District. TBC won this bid against three competing organizations, including a joint Amtrak-Kiewit consortium. The 18-mile, twin tunnel Loop system will reduce passenger travel time from 45 minutes to 12 minutes. The project is in contract negotiation and under NEPA review, with FHWA serving as lead agency.

Concept Requirements

Construction Requirements

Tunnel construction will require a Tunnel Boring Machine (TBM) launch shaft and a TBM retrieval shaft, which typically later become stations. Earth pressure balance tunneling boring machines are used to construct the tunnels. The location of the TBM launch shaft and retrieval shaft will depend on the number of TBMs used to construct the project. Construction staging and associated equipment is typically kept within the TBC and/or City owned or controlled property boundaries.

Operational Requirements

Operational requirements are largely driven by code requirements, project-specific features, and station design. Loop can be flexibly designed to integrate with existing infrastructure and to complement existing transportation systems.

Maintenance Requirements

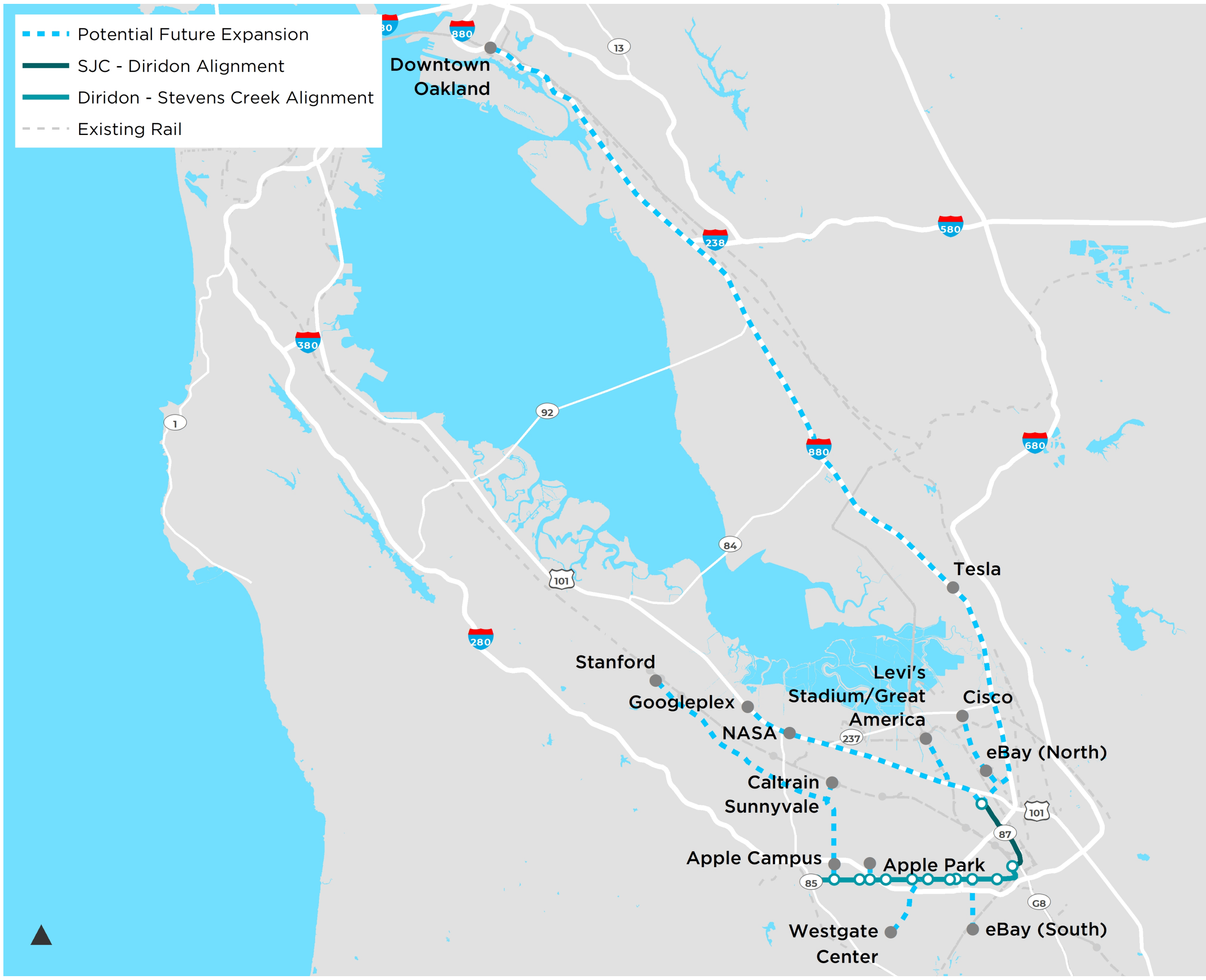
Loop vehicles operate on a flat, paved drive surface. As such, operation does not involve rails, electrified third rail, or overhead catenary wires. Maintainability activities for Loop are kept at a minimum.

Loop vehicles are based on production Tesla vehicles, and as such will meet or exceed manufacturer-recommended maintenance. Light maintenance can be conducted within Loop stations, eliminating the need for dedicated maintenance facilities.

Expansion Opportunities

Loop is designed with expandability in mind. Any potential future alignments can be connected to the existing network, enabling a one-seat-ride from origin to destination. For example, if Loop is expanded to the north to Apple Park or to Oakland International Airport, a transfer-free ride from SJC to any of the expanded locations is possible. Figure 5 below provides a map of potential expansion possibilities.

Figure 5 – Potential Expansions Possibilities



Costs and Business Plan

TBC delivers projects on a firm-fixed price basis so that potential cost overruns are not passed on to the customer. After construction, TBC operates and maintains its project for an annual firm-fixed price. TBC is amenable to other financing structures on a case-by-case basis if a subsequent request for proposal (RFP) process occurs. TBC will provide detailed values as part of a subsequent RFP process.

As stated previously, TBC designed and constructed the 1.14-mile Hawthorne R&D Test Tunnel for less than $10 million, demonstrating lower costs than traditional public transit systems. Although future diligence is required to estimate project cost, TBC can state that its price per tunnel-mile will be substantially below traditional pricing for fixed guideway APM systems.

Project costs are primarily driven by the quantity and size of stations, quantity and type of AEVs, final tunnel length, subsurface geology, and operation and maintenance duration. TBC will work with the City on a fare strategy and fare payment method that best integrates with the existing transportation network.

Impacts

Loop is designed to integrate into existing environments and to avoid impacts typically associated with traditional transportation systems. Loop does not divide existing communities by requiring contiguous right-of-way acquisition typical to at-grade or above-grade rail or highway systems; as such, existing surface structures, roadways, and pedestrian or bicycle facilities would be unaffected by Loop. Loop stations can occupy a very small surface footprint and, as a result, integrate easily into busy city-centers, parking garages, and residential communities. Loop can also connect existing transportation system hubs and other important locations throughout the region.

TBC projects undergo stringent environmental reviews at the state and federal level. TBC's in-house environmental team and outside consultants have worked closely with local, state, and federal stakeholders in conducting environmental reviews and outreach efforts pursuant to the California Environmental Quality Act (CEQA) and National Environmental Protection Act (NEPA). In addition, TBC has hosted over 1,000 students and stakeholders at its Hawthorne R&D Test Tunnel to provide meaningful opportunities to key stakeholders to better understand Loop and TBC's research and development efforts. TBC will work with the City and key stakeholders to determine the ultimate scope of environmental review and outreach efforts for the proposed project.