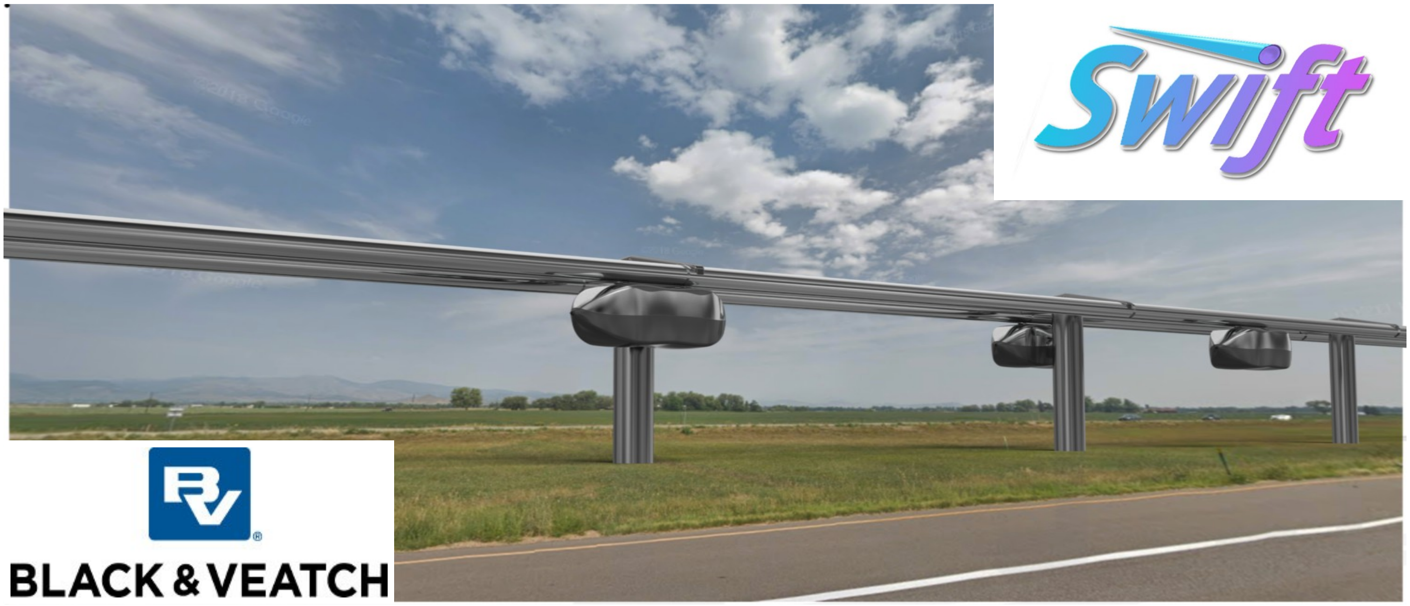


New Transit Options:

Airport-Diridon-Stevens Creek Transit Connection

Request For Information
RFI 2019-DOT-PPT4
City of San Jose

September 30, 2019

Respondent:

Swift Tram, Inc. (Corporation)
3314 Airport Road
Boulder, CO 80301

Carl E. Lawrence
Carl.Lawrence@SwiftTram.com
303 507-7887

Concept

Swift is a suspended-monorail automated people mover with streamlined passenger coaches powered by extremely quiet and energy-efficient electric drives. The roomy 20-passenger coaches provide fast turnarounds with wide doors for personal baggage, strollers, wheelchairs and bicycles. Swift's small and cost-effective guideways handle low-speed local travel and higher speed regional travel, with no technical limits to the size of the transit network. Swift can instantly switch among scheduled, circulator, and on-demand modes as ridership or special events warrant.

Business Plan

Swift Tram, Inc. is a transit system technology supplier providing controls, drive bogies, and coaches. System infrastructure – including the guideways, boarding stations, O&M facilities and renewable energy microgrids – would be engineered, procured and constructed by Black & Veatch, an international EPC firm headquartered in Kansas City. Additional partners covering P3 funding and systems operation will be engaged for any future project proposal and execution.

B. Proposed Concept

Provide a high level description of the concept.

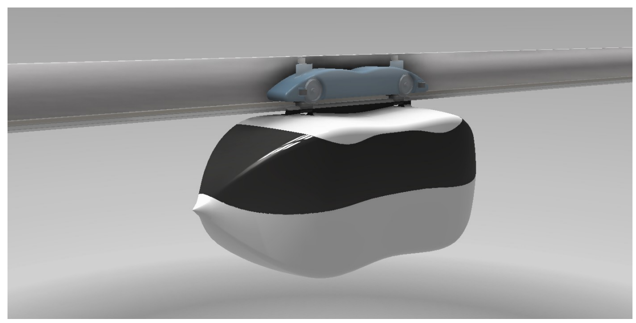
Swift automated people movers (APM) provide a smooth, quiet and roomy sightseeing experience from an elevation of 20 feet. The coaches glide around curves without causing any lateral sway of the passengers. Boarding is rapid and effortless as disembarking riders exit through two large doors on one side of the coach while new passengers enter from the other side. Each coach has standing room for about twenty riders, with seats for an additional eight. Wheelchairs, luggage, strollers and bicycles easily roll over the platform-level thresholds.

Boarding stations accommodate ticketed passengers in a pre-boarding area for instant access to the coaches on arrival. Swift allocates ten seconds to each stop, which is plenty of time to exchange riders, including those with luggage, bicycles, strollers, or ambulatory devices. At some locations, the boarding stations are part of larger terminals and buildings, while at other locations the stations are standalone. The conceptual stations at the airport and the Diridon transit center would be located on the second floor levels, with the coaches passing through the building structures. Standalone stations would have two levels: a lower ground level where the passengers find information and pay fares, and a second level where ticketed passengers wait for coaches to arrive. ADA and bicycle access to the second level would be via an elevator. Passenger access along Stevens Creek Boulevard could be by way of pedestrian bridges that cross to the roadway. Pedestrian ramps would lead from the sidewalks along the boulevard up to the bridge, and Swift boarding platforms would be midway across the bridges, above the median's left-turn lanes.

Swift APM networks consist of an elevated guideway from which the electrically propelled passenger coaches hang. Individual electric-drive bogies, from which the coaches suspend, travel out of sight inside of the guideway tube. This configuration is based on the highly successful APMs deployed by Siemens in Dortmund and Dusseldorf, Germany (pictured here). Swift, in contrast, uses smaller cylindrical guideways, battery-powered drive bogies, and more flexibly deployable aerodynamic vehicles. The Siemens systems and other suspended monorails have proven to be the safest transit mode in the world for over 100 years.

Because of streamlined coaches, efficient electric motors and hard/resilient wheels that run on hard tracks, the Swift APM is extremely energy efficient, requiring only about 11 kW to cruise at 55 mph. The batteries carried in the drive bogies are charged at the boarding stations, and have the capacity to move a fully loaded coach about ten miles. Renewable energy is envisioned to supply the electricity for a Swift system. The standalone stations have a roof and awnings covered with solar PV panels to provide electricity to operate the stations and to charge stations' battery storage systems, which fast-charge the coaches during the passenger loading / unloading stops.

Three operating modes are available on a Swift APM. The *scheduled mode* would be used during peak demand periods with coaches arriving and departing on a published schedule. The *circulator mode* would be used for special events where the coaches would depart when full and only go to a particular destination. The *demand mode* would be used off-peak and take a rider, or riders, to a destination selected upon entry to the boarding platform.



Swift Tram, Inc. manufactures the drive bogies, and produces the control software. Swift provides the passenger and cargo coaches; fabrication is outsourced to an advanced materials coach builder. Engineering, procurement and construction of the guideways will be accomplished by Black & Veatch. In 2019 Black & Veatch was rated 12th in the top 100 Design-Build Firms. If a contract were let to the Swift team, the airport boarding stations and the Diridon transit center Swift platforms, as well the standalone stops, would be designed and built by Black & Veatch,.

The Swift APM concept is the answer to the five high level questions from the *Introduction* section of the RFI :

1. Are there new technologies, project delivery, or operating models that can provide grade-separated, high-capacity, high-speed transit?

Swift APMs are elevated above the traffic, although they could also travel through tunnels. The currently configured coaches carry 20 standees and 8 seated riders. A future, larger coach using two drive bogies could carry 50 to 60 riders. Either coach size is capable of carrying cargo. The three-mile corridor between Diridon and SJC would have a travel time of less than four minutes, with a cruising speed of 55 mph. The track / bogie wheel interface has been engineered for speeds to 125 mph, although such higher speeds require larger, more expensive motors.

In order to maintain faster speeds and provide higher system capacities, Swift APM bogies steer through junctions. There are no mechanical switches at the junctions to slow the system or to create safety concerns. One Swift vehicle can pass through a junction immediately after another, taking a different spur in either direction. The convenience of steering through junctions also accommodates more spur lines and sidings such that no Swift vehicle needs to wait for a clear guideway.

2. Do these systems have lower construction, operations, and/or maintenance cost than traditional systems?

Yes, Swift systems have considerably lower costs than traditional systems. The primary physical and cost component of the Swift system is the elevated guideway. Guideways are fabricated as steel tubes three feet in diameter. There is a slot along the bottom of the tubes though which the bogie attaches to the coach below. There are tracks welded to the interior of the tubes. The guideways are supported by towers that are generally two feet in diameter and 26 feet tall. The guideways span up to 100 feet depending on the soil conditions and other involved infrastructure. Construction of the guideways involves the pouring of concrete piers, setting the towers on the piers, and then securing the guideways in place. The guideways are purely mechanical structures with no other wiring or utilities, and are sourced at approximately 150% the commodity price of steel.

The Swift automated transit network is managed from a central control/security facility. The master computer, known as Prime, provides schedules and destination directives to the computers in the bogies, each known as Pan. Each bogie's Pan also communicates with other Pans within their wide area network (WAN). Command packets are small, thus reducing the overhead cost of communications. CCTV is used to provide situational awareness inside the coaches, on boarding platforms, and at key guideway points to personnel at the control/security facility. Operational staff consists of a few operators/security personnel.

Maintenance costs are very low, as the guideway will probably only require physical inspection and cleaning once a year. The coaches would require cleaning daily and will delivery themselves to the O&M facility on a schedule. The drive bogies are electric and are self-monitored with evolving predictive service software.

3. Can these systems be deployed faster than traditional projects?

The guideways can be installed faster than 100 feet per day with separate crews for the barricades, piers, tower setting and guideway installation. Modifications and expansions of the network is also very rapid, since a guideway section can be pulled and replaced with a junction

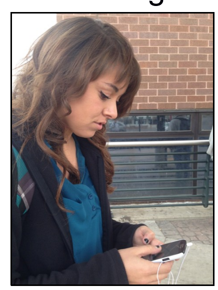
without disturbing the rest of the guideways, for example. A well laid-out guideway alignment will avoid placement of towers in locations that cause other disruptions.

4. Do these systems have viable financial outlooks?

Swift believes that a properly executed project may not require subsidies and could possibly show a farebox-based operations profit. Farebox, concessionaire vendors and advertisement revenues might be enough to support the bulk of a P3 business model, although more data is needed before any commitment could be made. In general, O&M costs and operational expenses are much lower on an automated people mover, and Swift's lower CapEx is expected to significantly reduce the debt service requirements.

5. How will these systems be constructed and deliver service on the specified corridors?

Black & Veatch would engineer, design, procure and construct the guideways for both corridors. They could also design and build all of the standalone stations along the Stevens Creek corridor and the boarding platforms at Diridon and SJC. A yet-to-be-engaged P3 partner would operate the system while Swift manages the system service and maintenance during commissioning.



Passengers would use either a kiosk or a smart device to pay for access to the boarding platforms at each of the stops. At Diridon, once riders are on the boarding platform, they will choose the correct coach to board based on electronic signage and audio announcements.

Project Goals

Swift is confident that its system will achieve the overarching goal of creating fast, frequent, reliable, grade-separated new routes in the Silicon Valley transit system emanating from Diridon Station.

Passenger Experience Expectation

1. *Quick and intuitive transfers to/from other modes at Diridon*.   Additional new passenger ramps will connect the train platforms to the Swift platforms above the trains. The Swift platforms would replace a portion of the current train platform canopies.

2. *Short travel times between Diridon and SJC*:   Travel time would be less than four minutes with a selected cruise speed of 55 miles per hour.

3. *Frequent Headways.*   The practical limitation in frequency of headways is the

passenger loading area capacity. Swift is designed to load 20 passengers in ten seconds per direction per loading platform. Swift vehicles can "platoon," virtually negating any capacity limitation except absolute room on the guideway, and number of coaches.

4. *Meet ADA requirements.* Swift floors are at the same level as the boarding platforms, with a gap of less than one inch. Kiosks feature Braille, and there are both visual signage and audio announcements about incoming vehicles at Swift passenger platforms.

5. *Reliable service that is predictable and/or frequent.* Swift drive bogies use reliable components with known mean-time-between-failures, and the guideways have no moving parts. The similar systems built by Siemens have shown exceptional reliability. The Swift system is still in development. We anticipate extremely high reliability based on our design philosophy and engineering analysis. Performance and reliability will be validated in the project's testing phases.

6. *Reduce roadway vehicle traffic and air pollutant emissions*. Historically, when any form of rail replaces buses, ridership doubles. Based on the attractiveness of suspended monorails in Germany and Japan, Swift assumes our ridership will quadruple that of buses. Privately owned vehicle traffic should be reduced by a corresponding amount.

   Swift is powered electrically so there are no local emissions. Swift can be powered 100% by clean renewable energy on its own microgrid, or it can run on power purchased from renewable energy developments (power purchase agreements (PPAs). If the system is grid-tied and does not engage in a PPA, it will run on PG&E's mixed traditional fuel and renewable resources. Swift coaches all have on-board batteries that charge at each stop. Swift systems do not use any fossil fuels, unless the City chooses to grid tie without procuring clean energy. In any case, Swift coaches and drive bogies do not emit carbon, nor generate pollution; they can be routed right through buildings, e.g. mezzanine second-story levels of buildings.

Corridor Goals

Airport Connector

1. *Integrate Diridon Station and SJC as a single facility from the passenger's perspective*. The short ride (less than 4 minutes) from SJC to Diridon compares favorably with on-airport automated people mover experiences; arrival at Diridon for boarding other modes and enjoying downtown San Jose will be perceived as a seamless experience.

2. *Quick and intuitive transfers to/from airport terminals*. Swift is designed to

arrive and depart from interior spaces at the airport terminals. Intuitive multilingual signage should be adequate for transfer communications.

3. *Provide SJC passengers and employees with a fast and convenient link to local and regional transit systems.* Both passengers and employees can easily make the 4-minute ride and connect to other modes at Diridon.

4. *Allow for quick, level boarding for passengers with luggage. Provision for airport baggage handling and other amenities at Diridon for airport passengers is desirable.* The Swift coach floors are level with the boarding platforms and have about an inch gap, which is easily crossed by luggage, wheelchairs, strollers and bikes. Dedicated cargo coaches can be included in the system to accommodate checked baggage from Diridon to SJC, and the system's computers can be programmed to interface with SJC and airlines' baggage handling systems. Additional non-passenger, cargo/baggage loading platforms could be included in any future projects, as well as dedicated cargo coaches for UPS, FedEx and other carrier delivery services with airport access.

5. *Support and improve economic productivity through faster travel connections between downtown San Jose and SJC*. Foregoing lost time stuck in highway traffic, alone, will be a major contributor to economic productivity in the region. Add in less stress in the commute – indeed a commute that sparks joy featuring panoramic views – and it's conceivable that the Swift system will make a major contribution to economic development. Frequent riders will make new business connections and friends.

6. *Expand SJC's geographic market reach, in turn mitigating capacity constraints at the two other major Bay Area airports*. SJC's attractiveness will improve markedly with the addition of a Swift APM and the inclusion of Diridon as part of the SJC amenities. Swift's speed, connectivity, and convenience will definitely increase SJC's attractiveness over its current level relative to SFO and OAK. SJC can become a hub of airline activity and passenger movement into the City.

7. *Serve as a national showcase of a state-of-the-art transit link between airport and rail service hubs.* Installation of the Swift system will naturally draw U.S. and global visitors to view and ride on the system. The system is a great real-world illustration of Silicon Valley's commitment to innovative technology. This 'showcase' is another example of how the system will stimulate the economy. Visitors will want to stay for a few days and enjoy all that San Jose offers.

Stevens Creek Line

1. *Link major sites in the corridor to each other via fast, frequent, and reliable transit.* Swift will meet these criteria, including bypassing intermediate

stations/stops for express service depending on passenger destinations as defined by passenger e-tickets. Diridon to Monta Vista (8.25 miles) will take approximately 12.5 minutes, including the five stops along the way.

2. *Link major sites in the corridor to the rest of the Bay Area via fast, frequent, and reliable transit to Diridon Station.* Swift will connect passengers expeditiously to Caltrain, VTA, Amtram, AceTrains, and eventually BART and High Speed Rail by means of its rapid, reliable service with very short headways.

3. *Support higher-density development in the corridor by providing the transit capacity needed to attract mode shift away from private vehicle usage.*
Swift's presence will encourage transit-oriented development (TOD) and higher density multi-use development in San Jose and Cupertino. Swift's zero-emissions and quiet qualities will enable its coaches to route right into buildings – an attractive and novel feature that will benefit hotels, retail, residential, and restaurant destinations.

4. *Support urban integration and human-scale activation of Stevens Creek Blvd by attracting users to walk, bike, and transit to stops on the corridor.*
Swift is proud to have been motivated in great part by a desire to provide 'highest, best' land use, due to the system's elevated fixed guideway design. By removing so many cars from traffic, at-grade land can be better allocated to pedestrians, diners, bicyclists, recreation, music, performance, and small-scale outdoor kiosk commerce, making for a more human scale and casually interactive sidewalk and street culture, This kind of incidental social interaction has been shown to increase civility and reduce anxiety.

Key Swift features

- Theoretically infinite expandability due to Swift's unique hierarchical control protocols.

- Visually stunning design which supports San Jose's image as the world's hub for innovation

- ADA compliance with level boarding and very small, one-inch coach / platform gap.

- Extreme energy efficiency, making renewable/on-site energy feasible, and allowing for onboard batteries.

- Quick installation, as much as 100 feet of guideway per day, minimizing disruption to area traffic and businesses, and maximizing public safety.

- 20-25 passengers per coach; a second generation, larger coach will carry 50-60 people.

- 2500 passenger throughput per hour per direction per boarding platform.
- Local service at 35 mph, regional service at 55 mph and intercity service at 125 mph.

C. Physical Elements

a. Describe the guideway.

i. What does it look like for a person walking by, and for a person using the system?

The guideway is a three foot diameter cylindrical steel tubes supported by similar steel towers. In most instances the guideways are painted sky blue with the towers painted to match the local environment. The guideways are about 26 feet high, allowing the suspended passenger coaches to clear all the traffic below. At this altitude, these small guideways will have minimal impact on the viewshed.

Since the passenger coaches are hanging below the guideways, riders only see the guideway with upper vertical peripheral vision. The compelling views of the panoramic surrounding environment and the City below is completely unobstructed.

ii. How is it grade-separated?

Towers support the guideway, and the passenger coaches hang below the guideways. The guideways are generally 26 feet above grade and the bottom of the passenger coaches over 17 feet above the roadways. In a below-grade configuration, the guideway would be affixed to the tunnel's ceiling, and there would be no support towers.

iii. What are its right-of-way needs?

The guideways are supported on two foot diameter towers. Between the towers the spans are 100 feet or less, depending on soil conditions and location of infrastructural or other obstructions to avoid. Since the electric drive bogies that carry the coaches are only charged at passenger stations, there is no need for any electrical infrastructure within the guideway path's right-of-way, another feature that facilitates future expandability.

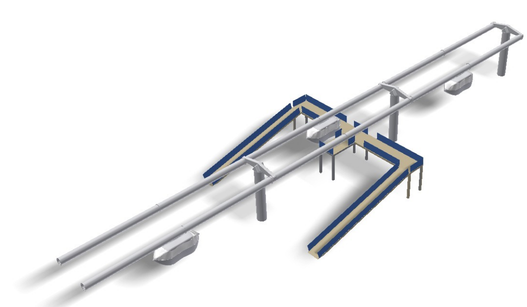
b. Describe the stations/passenger access points.

i. What do they look like for a person walking by, and for a person using the system?

There will be passenger boarding areas integrated into the second levels of the airport terminal and the Diridon station. Any access fees will be paid prior to entering the actual boarding area, which will be inside of the building. Since the coaches are bidirectional, coaches will travel into the airport terminal and leave in the opposite direction. When a coach arrives, the arriving passengers will leave through one side of the coach as new passengers board from the other side. At Diridon station, the coaches will enter the boarding platform and either leave in the opposite direction back to SJC or continue through to the Stevens Creek Boulevard route. Access to the Swift platforms at Diridon will be via pedestrian ramps parallel to the trains below. Along the Stevens Creek line, the boarding stations might be on elevated pedestrian walkways that cross the boulevard. Access to the actual boarding areas will be limited to ticketed riders. People simply using the elevated pedestrian walkways can pass by the secure Swift boarding areas. There may be a rain canopy over the Swift boarding platforms.

ii. What are the right-of-way and land needs for a station/access point?

The stations on the SJC side of Diridon will be within the established structures and there should be no ROW issues. The pedestrian walkway bridge access points along Stevens Creek will require some ROW and land for the ramps on what is now sidewalks or parking areas. The midpoints of the bridges are supported by one-foot square columns and will require the use of land probably located in the median center turn lanes. Road traffic would move under the boarding platforms and between the support columns.



iii. How will stations/access points integrate with the surrounding urban fabric on the Stevens Creek Line?

Swift suggests ramps flying over Stevens Creek Boulevard from the north sidewalk and the south sidewalk, converging in a boarding platform above the road traffic turn lane. Stylistically, the City could choose from a range of configurations for the ramps, from a straight-line functional design to a modern, fluid design. The style might be a lively and positive exercise of public input; integration with the surrounding urban fabric is a matter of taste.

iv. How will the system integrate with existing transit systems?

Arriving passengers will walk down (ADA: wheel down) the ramp to grade level to catch a bus. Departing passengers will walk / wheel from street level to the Swift boarding platform. In the San Jose configuration, Swift stations and boarding platforms are close enough to termini of other modalities that transfers will be quick and convenient.

v. How will the proposed system connect with rail platforms at Diridon Station?

Swift boarding platforms will be above the trains and aligned east-west, perpendicular to the trains. Passengers can leave a train and walk up a ramp to access the Swift. The riders will reach the west end of the Swift platform and be able to move north and south, behind the Swift coaches, to reach the coach they desire.

vi. How will the proposed system connect with airport facilities and parking at SJC?

Swift boarding stations at SJC will be integrated into one of the upper levels of the terminal and would be accessible from inside the terminal. Additional Swift boarding platforms will be in the parking structure.

vii. How do the system's vehicles operate within the network?

All Swift coaches respond automatically to instructions from the central computer, Prime, (likely housed at a control / O&M center at SJC, or in remodeled Diridon station). All drive bogies have onboard Pan computers for time-based geolocation, speed and other controls, communications, security, and fare functions, as well as batteries for power. Each Pan computer is in constant communications with all other Pans within their immediate area.

viii. Is there level boarding?

Yes. Swift coach floors are at the same level as the boarding platform, and the gap is about an inch.

ix. How will the system be designed to be compatible with "Complete Streets" if the system is aerial?

Swift is the ultimate compatible system for Complete Streets. Swift's location in low-sky air space means that Swift coaches cannot collide with cars, trucks, bicyclists, or pedestrians. Swift frees up areas below for "highest, best" land use (e.g., bike and scooter lanes, pedestrian and community space, al fresco restaurant dining), by displacing automobiles.

x. If the main guideway is aerial or underground, how do passengers get to grade level?

Passengers get to grade level from an aerially configured Swift coach by taking the stairs, an elevator, or an escalator at SJC. At all other locations, passengers get to grade level via ramps. From underground, passenger movement is the same, but in the reverse vertical direction.

c. Describe the vehicles.

i. What do they look like for a person walking by, and for a person using the system?

The coaches are streamlined capsules about 25 feet long with pointed ends, two doors per side, and windows above the beltline. The color schemes are selected by the customers. The City may wish to offer San Jose residents an opportunity to provide design schemes.

The doors are three feet wide to easily accommodate wheelchairs, luggage, strollers, and bicycles. The standard configuration of the interior is an open floor plan with a semicircular bench seat at each end. There may be a center kiosk to support electronic signage, video images, or a water dispenser. The coaches can be outfitted as the City wishes, and can reflect input from public meetings. A typical configuration for San Jose might include a mixture of seats, standing room, and space to accommodate ADA passengers.

ii. How many passengers and how much baggage can fit in a vehicle?

Passenger capacity: 20 plus the equivalent of their regular-sized carryon wheelie bags, backpacks or large purses. Strollers and bikes are expected, which in multiples could take the passenger count down somewhat.

iii. How do passengers board and alight from the vehicle? How long does it take?

Passengers board and alight by walking through sliding doors on each side of the coach. Sliding doors for arriving passengers open to the arrival platform first. A few seconds later, the sliding doors on the other side of the coach open to allow boarding passengers to enter. Ten seconds after the first doors open, the coach is on its way.

iv. What is the top speed, and how quickly is it achieved?

Local route vehicles generally travel at 35 mph, while regional travel is set at 55 mph. Intercity systems are being designed for 125 mph. It is assumed that the Diridon to SJC will run at 55 mph – the same as the Stevens Creek line. Swift vehicles are designed for a comfortable acceleration for standing passengers – 1g or 10 meters per second squared. At this acceleration, it takes 25 seconds to reach 55 mph, about the same as the average car. (It would only take 15.65 seconds to reach 35 mph)

v. Are vehicles autonomously operated?

Swift vehicles only operate automatically, although many of the functions may almost appear autonomous – they are not. The automated transit network is managed from a central control/security facility. The master computer, known as Prime, provides schedules and destination directives to the computers in the bogies, each known as Pan. Each bogie's Pan also communicates with other Pans within their wide-area network. Command packets are small, thus reducing the overhead requirements for communications. CCTV is used to provide situational awareness and security inside the coaches, on boarding platforms, and at key guideway points to personnel at the control/security facility. Operational staff consists of a few operators/security personnel.

vi. What do vehicles do when they are not operating?

Vehicles will be rotated through the O&M facility at SJC for daily cleaning and scheduled maintenance. During off peak periods the non-operating vehicles will be stationed throughout the network to be available for immediate call to service for on-demand requests.

vii. Do the vehicles require space off the guideway for storage?

Swift coaches require no more than parking space on the guideway at the O&M facility for cleaning and scheduled maintenance between deployments. Storage will be adjacent to boarding platforms throughout the network in order to rapidly meet all on-demand requests day or night.

viii. How are vehicles powered?

Vehicles are powered by electricity which can come from local solar PV or other available renewable resources, or from grid (PG&E)-supplied electricity, or from (hopefully clean) power purchase agreements (PPAs) – grid-distributed electrons. Energy is stored in batteries at stations to recharge batteries onboard the drive bogies at each stop. If the system operates on its own microgrid, power management occurs via Prime computer software. If the system is grid-tied, the system operator will coordinate electricity demand with PG&E. If the system has its own renewable energy supply on a grid switchable microgrid, excess generation can be sold to PG&E to provide an auxiliary revenue stream.

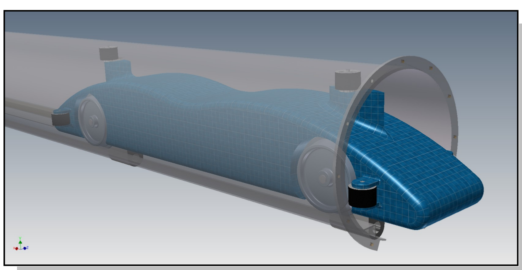
ix. Do the vehicles require a maintenance facility? If so, describe the facility requirements.

An operations and maintenance facility is anticipated on the airport grounds unless there is room at Diridon after the renovation. The O&M facility needs to be at least 10,000 square feet and have at least two stories. The upper floor is where the vehicle will be cleaned and maintained.

x. Do the vehicles need to move or be moved on order to be redistributed to meet demand on a regular basis? Describe how this is performed and how often.

The system is designed to continually dispatch vehicles throughout the network in order to meet current and anticipated demand. The algorithms are either scheduled mode, circulator mode or on-demand mode, and each mode requires a different procedure for staging and distribution of vehicles.

d. Provide pictures or renderings of all physical elements of the system.



D. *Operational Elements*

a. Describe the operational model.

i. Can the vehicle travel outside the grade-separated guideway?

No, Swift vehicles are captive to the guideway. This segregation from other spaces and modalities is part of what guarantees the safety of the system and its passengers, and enhances safety compared to any at-grade modality. Guideway extensions can be added easily to accommodate new stops or uses, for example a freight handling facility.

ii. What is the potential travel time from SJC to Diridon?

SJC to Diridon travel time is slightly less than 4 minutes with a peak cruise velocity of 55 mph.

iii. What is the potential frequency of the service?

The only frequency constraint is the amount of time it takes to load passengers at each platform. Swift vehicles can platoon, allowing them to almost fill an entire section of guideway, like a train. Because Swift bogies can steer through junctions, there is no time wasted operating a switch and verifying its position, another benefit for facilitating frequent coach arrivals.

iv. What is the potential passenger carrying capacity?

Swift coaches carry up to 28 passengers. A single platform can realistically board about 2,500 riders per hour per direction. The theoretical limit is about 6,000 riders per boarding platform per hour.

v. How can capacity scale up if demand exceeds initial supply?

Capacity scaleup can occur by deploying either more 28 passenger coaches, or by adopting larger, 55-passenger double-bogie Swift coaches.

vi. What is the dwell time for a vehicle at a station?

The dwell time is ten seconds. This is enough time for all the passengers to exit the coach and all new passengers to enter the coach, even if only using the doors on one side.

vii. What is the reliability of the service?

The reliability has not yet been calculated or measured. All of the critical components will have well documented mean-time-between-failures and the overall design philosophy is focused on reliability. For example, a coach door test fixture has been designed, fabricated, and tested in order to research reliability through repeated operations.

viii. Can the service be ticketless? If so, how will fares be collected?

Yes, Swift's service can be ticketless. Fares and other pass / pay schemes will be an integral part of the system's management software. Fares will be collected via smartphone apps and at station kiosks. Swift can integrate with City systems to allow for fare discounting (e.g., for students, disabled, seniors, other definable class of passenger, and off-peak travelers), and to allow for charging a premium for higher class of service (e.g., on-demand coaches, peak travel time use if desired, and for roomy first-class limousine-like interior coaches).

E. Current Status of Concept Technology

a. Provide a description of the current development status of your concept.

Computer models have been completed for the coach and bogie. Full scale physical mockup models have been built for the bogie and the coach. Fabrication drawings have been delivered to the guideway fabricator for quotation. The drive motors and controllers have been sourced, and we have evaluated and qualified composite manufacturers who are interested in manufacturing our coaches.

b. Include a schedule for development of a fully deployable system, if applicable. Identify key assumptions for this schedule.

The major tasks yet to be completed include:

- Final structure analysis of the guideways, towers and foundations.
- Testing of the bogie steering through junctions.
- Prototyping and testing of a fully operational drive bogie.
- Detailed design of the coaches including HVAC and glazing.
- Completion of the system control software, which has been designed but not written.

These major tasks can be completed concurrently with the infrastructure layout and design, which is expected to take about a year. Preproduction runs of the bogies and coaches can take place during the second year as the infrastructure elements are proceeding through the building departments and other agencies. Field testing of the bogies and coaches will take place during the third year on the initial sections of installed guideway.

b. Include examples of successful similar implementations, if available.

Siemens has built similar implementations in Dusseldorf and Dortmund Germany. Although these systems used older control technologies, the physical attributes of their technologies are very similar to Swift. Swift staff have had in-depth meeting with the Dortmund operations personnel and management. Siemens also offered an opportunity to study their operations, and Swift accepted. Additionally, much insight can be gained by viewing videos of these “H-Bahn21” systems available online: http://h-bahn.info/en/ .

c. Identify areas of notable risk that would be investigated further.

There are no necessary breakthroughs required for the construction and implementation of a Swift APM network. What remains is fundamental engineering and programming, therefore technological risk is minimal. The single innovative exception is the untried steering system for the bogies; theoretically the steering should function flawlessly, yet it has never been tested at any speed. Swift has compiled a combination of innovative incremental improvements to technologies that have been deployed for more than 100 years. Swift's modern composite materials, smart controls and communications, and state-of-art battery charging and power management, have been pulled into a single momentous innovation.

Seasoned professionals with relevant experience and impressive credentials comprise the Swift team, so there is no appreciable risk there. Swift and Black & Veatch plan to leverage the San Jose joint venture into further development of both the Swift transit system and Swift's organizational capacity through attraction of investment. The selection of Swift and Black & Veatch for this project would provide the leverage both organizations seek to develop the ability to deliver such projects worldwide.

F. Concept Requirements

a. Describe key requirements for implementation of the system and estimate length of time required to implement the system.

First year: Finalize guideway engineering. Design boarding stations. Build prototype bogies and coaches. Continue software development on scale models.

Second year: Earn building departments' and other authorities' approvals for infrastructure construction. Test and refine bogie and coaches. Continue software development.

Third year: Construct guideways and boarding stations. Test and commission vehicles and software. Continue software development.

Fourth year: Continue support of operations to ensure all issues are addressed prior to final acceptance.

b. Could the system function in either an aerial or underground configuration? Could it transition between aerial and underground? What are the maximum allowable grades for the system to ascend/descend?

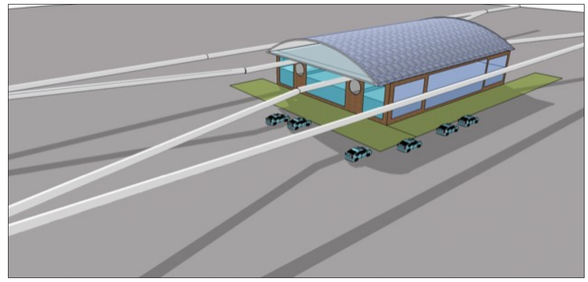
Yes, the Swift system can travel between aerial and underground at any point where the guideway carries bogies and coaches. The Swift system can even be installed under bridges to traverse rivers and bays. The guideway tracks and bogie wheels have been designed for grades up to seven percent.

c. Could the system be extended in the future?

Yes, the guideways have been engineered to allow for the exchange of any section without disturbing the adjacent sections. Thus a straight section can easily be exchanged with a junction section to add a spur or a whole new line.

Swift has a unique strength regarding system expansion, which relates to a proprietary characteristic of the control system software. The control and communication technologies will allow for continued expansion of the network since the central controller (Prime) sends limited and time-based directions to the bogie computers (Pan). The Pan computers on each of the bogies can operate somewhat as an autonomous "swarm" within a local area, thus reducing the demand on the communications backbone. For regional networks, additional Primes will be installed to handle regional control.

d. Could stations be added to the system in the future?



Yes, stations can be added to the system in the future, and the system itself can grow virtually endlessly due to dual-computer system management featuring central system intelligence in the Prime computer complemented by distributed intelligence in Pan computing on each drive bogie.

d. What are the maintenance requirements for the guideway, vehicles, stations, etc.?

The guideways – continuously monitored by cameras – will require periodic staff inspections and possibly cleaning inside, which can normally be achieved using the robotic maintenance bogie. Drive bogies will perform regular self-diagnostics, and undergo scheduled / proactive maintenance based on the length of their performance duty cycles discovered in testing. The vehicles will require daily cleaning and bi-monthly inspection of drive components until more knowledge is gained regarding the wear modes. The stations will require daily or twice-daily cleaning.

G. Costs

a. What is the cost per mile to deliver the fixed infrastructure needed to operate the system, not including stations and land acquisition costs?

The best estimate for guideways' materials and construction labor is about $5M per mile. The O&M facility would be about $1.25M.

b. What is the incremental cost of a station and/or access point?

The Stevens Creek pedestrian bridge boarding concepts will cost approximately $100K each. The boarding stations inside Diridon and SJC may cost about the same, although the actual cost will really depend on the suitability of the SJC terminal and parking structures for Swift's purposes, and the renovation project in the works for Diridon. Integrating Swift's requirements into the Diridon renovation design would likely save in comparison to a retrofit.

c. What is the cost of the vehicle fleet needed to begin operations?

The controls and communications would cost between $600K and $900K. Five coaches would cost between $530K and $800K, and six drive bogies (one for each coach, and a spare / maintenance bogie) would be between $620K and $1.125M total. The grand total cost of the Swift controls & communications, coaches, and drive bogies would be between $1.75M and $2.825M.

d. Summarize the capital costs for delivering the full system for each potential project, Airport Connector and Stevens Creek Line. Assume six stations on the Stevens Creek Line and three stations on the Airport Connector, plus Diridon station for both routes.

The CapEx is estimated to be roughly $10M per mile installed. The three miles between SJC and Diridon would then total about $30M and Stevens Creek line would reach about $90M.

e. Provide a high-level estimate of the ongoing operations and maintenance costs, as well as equipment replacement costs and schedules.

The operations and maintenance staff with management would total about 20, for an annual cost of about $2.5M. Materials and supplies may add another $100K.

The guideway is being engineered for a 50 year life while the bogies should be good for 25 years. The passenger coaches will likely need replacement after ten years.

H. Business Plan

a. Describe the business plan to deliver and operate the proposed project. The City is looking for innovative ways to fund and operate new transit systems.

Swift, with Black & Veatch, a funding partner, and an operations partner plan to form a joint venture for this project. Swift would supply the rolling stock and controls. Black & Veatch would design and build the infrastructure. The funding partner would put the capital structure together, and the operations partner would provide the long-term O&M. This consortium would offer a public-private-partnership (P3) to provide a complete DBFOM (Design, Build, Finance, Operate and Maintain) project.

b. Who will operate the system once constructed?

Assuming a P3 is used, then the consortium's operations partner would cover operations for the term of the P3. If a P3 is not used, Swift can operate and maintain the system for a period of time, perhaps a year, while training City staff or a designated contractor in system O&M.

c. What is the passenger fares strategy?

Swift can deploy a variety of fare methods via its software control system and station access infrastructure, depending on the outcome of detailed talks with City staff in public safety, public works, and with Caltrans. The City may wish to open the public engagement process to data-gathering about how best to manage fare optimization while also meeting social equity goals and desired public debt limits. Here are some fare strategies to consider, all of which can be built into intelligent ticketing, managed by Swift's Prime computer:

1. *Flat fare*: all passengers are charged the same fare.
2. *Distance-based or zonal fare*: A fare determined by the distance or number of zones a trip covers.
3. *Time-based fare*: A fare that depends on when a trip begins and how it lasts.
4. *Quality-based fare*: A fare related to which service a passenger receives, e.g. express, short-turn or local services.
5. *Cost-based fare*: A fare based on operating cost, e.g. air-conditioning cost or staff wages.

6. *Route-based fare*: A fare associated with which zones a bus goes through, such as CBD, residential zones, workplaces, or tourist destinations.
7. *Patron-based fare*: A fare that depends on types of passengers, such as students, senior citizens, or disabled passengers.
8. *Market- or consumer-based fare*: A fare that depends on the frequency of use and willingness to pay, such as passes and discounted tickets purchased by businesses, educational institutions / school districts, and social service agencies.

d. What are the expected fares for passengers to use the system?

APTA reports that most fares hover in the $2 - $4 range, but there is significant variation. San Jose may wish to ask Altrans staff to model the desired capacity against surveyed willingness to pay fares at various price points. The City will likely want to engage in talks with private partners in the P3 to determine the optimal ratio of public capitalization and private capitalization. Similarly, modeling of expected income from operations can help the City to decide on its fare strategy. Most cities recover just 36% of operating expenses in fares, leaving the rest to taxpayer-funding or other investment. The City has the capacity to incentivize the private partner to increase ridership over time, resulting in further economy-of-scale-lowering of operating expenses per ride.

e. What is the strategy to maximize ridership?

Swift staff believe that the adoption rate for Swift ridership will rival that of the uptake of ride-sourcing this past decade, as Swift is expected to quickly prove time-efficient, cost effective, and enjoyable. Swift and the City will cooperate to optimize for frequency. Swift's availability and intelligence to manage scheduled, on-call, and special event service will further win riders. Swift's Prime intelligence can also deploy demand management strategies, lowering fares to increase ridership during relatively slow demand periods, perhaps by targeting demographics whose time may sometimes be flexible, e.g. seniors.

f. Can capital and operations costs be funded through passenger fares?

Fares would likely need to be high to fund both CapEx and OpEx for the system. With high capacity and deployment of auxiliary revenue streams such as advertising, concessions, and microgrid electricity sales, however, it's not inconceivable. Typically, fares will partially fund OpEx only. Nationally, fare recovery average 36% of OpEx. Swift's OpEx is dramatically less expensive than the operating expenses of buses with drivers, which presents exciting possibilities for both covering costs of the initial system and for funding system expansion.

g. Describe opportunities or strategies to maximize farebox recovery and/or offset operations and maintenance costs.

Swift suggests San Jose consider charging a premium for on-call private coaches, for 'first class' accommodations on board if that is a City design choice. The City could engage in off-peak fare discounting to boost ridership by those with flexible schedules. The City can generally promote riding the Swift to achieve the many goals of efficient travel, carbon and pollution reduction, Vision Zero, and reduced private car

VMT. San Jose can also use Swift's attractiveness to charge premium advertising rates on board, on coach exteriors, at stations and on platforms, on support towers, and even on guideways. The City might even consider seeking revenue via stadium-style 'naming rights' contracts, e.g. The Cisco Swift.

I. Impacts

a. What are potential negative impacts during construction?

Swift's construction impacts will need to be integrated with City Public Works operations. We expect those impacts to be minimal in comparison to that of other infrastructural improvements. Our EPC partner Black & Veatch will supervise all planning, permitting, and construction activities. At street grade, Swift's impacts are essentially construction and installation of pier footings for the support towers. Hence, disturbance to existing buried infrastructure (water, wastewater, electric, cable, telecom, fiber) is minimal, approximately every 100 feet or somewhat less. After construction of the footings, steel towers and their associated upper crossmembers for bidirectional guideway service will be installed onto the footers by cranes, and will be secured onsite. The next operation is the installation of the guideway sections between these towers, which will also involve crane lifting of the steel 50-foot sections.

Swift's construction impacts will be taking place primarily in existing right-of-way, where previous environmental impact statements (EISs) or environmental assessments (EAs) have already occurred; it's likely that environmental analysis in such areas will quality for categorical exclusion (CE) under the National Environmental Policy Act (NEPA), if environmental analysis is a factor at all. Black & Veatch's environmental department can take the lead on any required new environmental analysis, or the City, or Caltrans can take the lead, as will be discussed and negotiated in the final contract. Because of its light footprint at grade, Swift's construction impacts are manageable and short-lived; construction on a given block will take a matter of days, not weeks or months as with highway construction.

b. What are potential negative impacts during operations?

Swift does not anticipate significant negative impacts during operations, but our communication & control system and central control & monitoring personnel will continually monitor for load demand, on-board incidents, safety, and emergencies, many of which require agile Prime response algorithms and real-time communications with City agencies. We encourage the City to develop rapid response plans for any incidents that might occur on the Swift system and in the system's access areas. Swift does not even create much audio impact in the environment (indeed, company founders considered calling the quiet system "The Woosh"). We anticipate that Swift will integrate seamlessly into normal life in the San Jose metro area, but there may be some initial public distraction due to Swift as an innovative City feature. This shock will be more than offset, we're guessing, by the buzz that will be created by this new symbol of Silicon Valley's innovativeness.

c. How can negative impacts be mitigated?

Construction Phase negative impacts mitigation: Black & Veatch will work hand-in-glove with the general contractor and the City's Public Works department to manage impacts during the construction phase, with the goals of achieving Vision Zero and minimizing disruption to area businesses, street and bike traffic, and pedestrians.

Operations Phase (Ongoing): Swift will work with the City to manage any impacts. The City of San Jose may wish to delay or omit the addition of digital advertising to Swift coach exteriors for some period of time until most City residents become accustomed to seeing coaches full of people traveling overhead. (In other cities where overhead conveyances have been part of the scenery for a long time, distraction does not seem to be a public safety factor of concern.) Swift expects no major impacts to City operations; indeed, the City may elect to power the system with its own renewable energy resources (backed up by battery storage, or grid-tied); conceivably Swift's power and/or batteries could be a peak power backup for the City. Swift expects that any negative impacts will be more than outweighed by positive impacts of economic development, improved on-street multimodal traffic movement, many fewer lost hours due to traffic delays, improved public health due to fewer emissions and less pollution, reinvigorated community life at street level, and new jobs in Swift construction, operations and maintenance.

d. What might the community outreach and engagement strategy look like?

Swift is pleased to participate in public meetings to introduce its concept, speak about system features and benefits, and consider public input about fares, routing, access, interoperability, and any other topics of interest relating to system design, San Jose coach design, control and communications software issues, and other matters of public interest, convenience, and necessity. Black & Veatch is also pleased to participate in public meetings regarding construction, procurement and engineering issues, and its commitment to contracting locally with small businesses, women-owned businesses, and veteran-owned businesses. Swift partner company Rebecca English & Associates can provide public meeting facilitation services in conjunction with City staff. We suggest a series of meetings that combine the functions of public information and public input. Input will be compiled, analyzed, and presented publicly. We recommend that a summary report be posted on the San Jose website. Introduction of a Swift system to the community will proceed much more smoothly, and the system will have a much greater chance to meet or exceed public expectations if community residents have opportunities to provide input. In addition, public capital funding (whether taxation or bonding) will have a greater chance of succeeding with the public fully engaged. Swift and any facilitator(s) will develop the public meeting agendas with the City to assure capture of all relevant public input, from the amount and kind of capital raise, financing arrangements, coach exterior appearance, coach interior designs, types of service, and fare variations. The facilitator will use forced-choice and other methods to help the public understand the tradeoffs between farebox recovery revenue and public financing of operations and maintenance.

About SwiftAPM: SwiftAPM.com

About Black & Veatch: https://www.bv.com/who-we-are