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Advanced Bus Stops for Bus Rapid Transit

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**California PATH Research Report
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Final Report
Advanced Bus Stops
for
Bus Rapid Transit

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Advanced Bus Stops for Bus Rapid Transit

ABSTRACT

The Santa Clara Valley Transportation Authority (VTA) is planning a bus rapid transit route on the alignment of its busiest existing route, with 30 stops in each direction. This study was conducted to determine how new technology could best be used to improve these bus stops as well as bus stops on other VTA routes and other bus systems. The study focused on bus passengers' needs and preferences, available technologies, and the combination of improvements that would be most valued by passengers.

Passenger activities at the main bus stop were observed, an on-board passenger survey was conducted on the existing route, and a focus group of VTA passengers was convened to gain feedback on potential bus stop improvements. Schedule information, clean surroundings, shelters, benches and lights were found to be what the greatest number of people wanted at bus stops. Also highly valued was the time at which the next bus would arrive. Seventy-three percent of passengers surveyed always felt safe waiting at the bus stop. For the others, emergency alarm buttons or phones and security patrols were what would make the greatest number feel safer.

An investigation of technological improvements available for bus stops found relatively few that are economically feasible. Among the most promising are real-time arrival time signs, electronic fare payment, and various solar powered lights, signs, and beacons. The components of interactive information displays are already available at relatively low cost, but such systems have not yet been developed commercially.

The study found that meeting passengers' needs at bus stops is not primarily a matter of utilizing the latest technology or providing stylish shelters, but rather of continual provision of accurate schedule information, cleaning, repair, and patrolling that lets passengers know that they are valued and respected.

Advanced Bus Stops for Bus Rapid Transit

EXECUTIVE SUMMARY

Study goals

The goals of the research were 1) to determine what improvements at the Santa Clara Valley Transportation Authority's (VTA's) planned bus rapid transit (BRT) stops would be most valued by passengers and 2) to provide helpful information to other transit agencies that might want to improve their bus stops.

The study tasks were to:

- determine passengers' and VTA staff perceptions and values,
- investigate potential improvements to bus stops, and
- match VTA needs to potential improvements.

Planned Bus Rapid Transit Service

The planned BRT service will have 30 stops along the alignment of the present Route 22, VTA's busiest route carrying 28,000 passengers per day. The purpose of the new route is to attract additional trips by providing faster, higher quality service. Possible bus stop improvements that had been identified in previous VTA studies were ticket vending machines; pre-paid waiting areas; information kiosks with trip planning; banners for BRT identification; more bus shelters; better lighting; and better information, including schedules, route maps, fares, and real time arrival information at key stops. Testing the benefits and viability of these suggestions was one of the objectives of this study.

Current Route 22 and 300 Service

Twenty-eight of the current 120 stops in each direction have shelters. Most are provided and maintained by a large advertising company, Clear Channel Communications. The shelters are rectangular, with a solid roof, a light, a bench, metal mesh walls on two sides, a panel on the back wall for the bus schedule and other information and a full length advertising panel on the third side. They are a blue-green that matches one of the colors used on the buses and VTA logo.

An on-board passenger survey conducted by VTA in 2000 found that Route 22 had the highest transfer rate of any route; 15% and 14% percent of passengers transferred to and from the route. 76% of passengers walked to the bus stop, 3% bicycled, 2% were dropped off, 2% transferred from Caltrain, and 1% drove. Similar proportions used these modes from the bus stop to their destination. Half of the trips were shorter than 40 minutes and only 7% were longer than an hour and a half. Given that the entire route takes well over 2 hours, it is clear that most people travel only a small portion of the route.

Most Route 22 passengers were frequent bus passengers: 53% used VTA bus service 6 or 7 days a week, 29% used it 4-5 days a week, 13% used it 1-3 days a week, and only 6% used it less than once a week. Forty-three percent used a monthly flash pass, 12% used a day pass, 12% used 5 other types of passes or tokens, 15% used cash to buy a day pass, and 12% paid a cash fare. Most riders were adults. Seventy-four percent of riders did not have access to an automobile for the trip on which they were surveyed.

Field Observations of Bus Stops

The shelters maintained by the advertising company were generally clean and in good repair, but sometimes the garbage cans were overflowing. The shelters at the transit centers are attractive. However, the Palo Alto transit center had trash on the ground even early in the day.

The study team observed the dwell time at Route 22 stops, the number of passengers boarding and alighting including the number who were slow-moving or had bicycles, the types of fares they paid, and the time the bus was stopped at red lights. Dwell time, defined as the time that the door was open, was highly variable, but averaged between 18 and 26 seconds per stop on the three runs observed; total dwell time ranged from 14 to 20 minutes per run. Total time spent stopped at red lights ranged from 22 to 27 minutes per run. A regression analysis indicated that dwell time depended on the number of passengers boarding, but not on the number alighting or the types of fares paid. A person boarding with a bicycle takes 27 to 36 seconds and a slow-moving person boarding can also take extra time. The fixed time per stop ranged from 9 to 20 seconds.

Passengers waiting for buses were observed at the westbound bus stop at Santa Clara and 1st in downtown San Jose. During the time they were waiting, only 17% were sitting. Eight percent checked the posted schedule; some left and returned later. The most common activity was talking (12%). Five percent smoked, 3% listened to the radio or music, 2% had something to eat or drink and 1% read. Although the average time between buses matched the scheduled frequency, the buses often bunched leaving unpredictable intervals between buses.

VTA Staff Perceptions

Key VTA staff members and driver trainers were interviewed. Managers felt that the BRT shelters should be unique in some way and project an image to attract people who do not now see themselves as “bus riders.” The shelters should look permanent and provide effective protection from both sun and rain. Bulb outs, such as in downtown Mountain View might be useful at stops on The Alameda and King Street to provide more space for shelters and to facilitate re-entering traffic after a stop. Drivers like them, and a recent journal article found that they actually speed traffic, rather than impede it.

Passenger complaints to management about bus stops are that there are no shelters, no lighting, that they need cleaning, or that they have been vandalized. Complaints to drivers are about connections between busses, frequency of busses, high fares, unexpected delays, and dirty bus stops. VTA has a hot line for staff to report vandalism so that it can be quickly repaired. The adopt-a-stop program has helped to keep the stops clean. Staff felt that lighting was important to make people feel secure. CCTV is used at transit centers and on the buses, but would be too expensive for bus stops, because of the large number of stops.

Trainers did not think that fare payment caused delay because so many people use passes. There is some delay caused by people buying day passes. A weekly pass was suggested for visitors and people who could not afford a monthly pass. Passes make for faster boarding than electronic cards that must be passed by a reader because they can be seen from a distance and passengers need not board in single file. However, they may allow more people to ride without valid passes. Trainers did not think that having ticket vending machines would speed boarding because delays are caused by passengers who cannot or do not want to buy a pre-paid ticket. Furthermore, the upkeep for vending machines is high. Trainers thought having an extra person at 1st and Santa Clara between 6 and 9 AM and 3 and 6 PM to direct passengers and give them change would reduce boarding delay. .

Passengers not exiting via the rear door also increase dwell time. Passengers should be educated to do this and drivers should enforce it. People having change ready and bicycles ready to load would also speed boarding.

Although VTA is looking into kiosks for bus stops, some staff felt that they were too expensive and required too much maintenance. Phones connected to the transit information center have been vandalized.

Staff said that there are many homeless people living in bus shelters. Improving the shelters too much might attract more homeless people.

When asked which improvements they would make if they had funds, they answered better shelters with seating for elderly people and people with disabilities, information about when the next bus will arrive, an overall better image, and maintaining everything at the bus stops because people notice when things are not maintained.

Passenger Perceptions and Values—From Publications and Earlier VTA Studies

A literature review on the subject of bus stops found relatively little about the experience of waiting for the bus or what passengers wanted. One study found that passengers wanted bus stop signs with the route number and name, service hours, and time until the next bus. Another study found that bus stop crime in Los Angeles was associated with unkempt surroundings, locations with alleys or convenient escape routes for criminals, and poorly kept-up bus stop facilities. Most bus stop crime occurred at only as few locations, many located in downtown and adjacent neighborhoods. A third study found that security is a concern of some bus patrons and speculated that it may be of sufficient concern to non-bus riders to discourage them from riding the bus. Bus shelter features that people wanted were: benches suitable for mothers with young children, but not for sleeping; the name of stop on the roof--visible from the street and approaching pedestrians; and a route map and area map.

A series of focus groups conducted by VTA in 1997 asked participants about various bus stop improvements. Participants reacted positively to shelters and roving security guards and noted a need for scheduled arrival times, but did not see value in the other improvements. When asked to rank the importance of station, vehicle, and operational improvements, participants overwhelmingly chose operational improvements, especially travel time, frequency, and reliability.

The VTA 2000 On-Board bus passenger survey found that 20% of Route 22 and Route 300 passengers considered the bus stops excellent, and 64% considered them good or excellent.

When asked what three bus service features would make them use VTA more often, 11% of Route 22 passenger responding said better bus stops, 10% said improved security, and 8% said better information. In comparison, 79% said more frequent service, 23% earlier morning service, 33% later evening, 58% more Saturday service, and 50% more Sunday service.

Passenger Perceptions and Values—From This Study

Passengers on Routes 22 and 300 were surveyed regarding where they boarded the bus, how useful they found various types of information, if they felt safe at the bus stop, what would make them feel safer, what they liked to do while waiting for the bus, if various types of bus stop amenities would make waiting more pleasant, and if they would take more bus trips if the stop had more information, was safer, or was more pleasant.

Even though 78% of those surveyed rode the bus four or more days a week, they still found many types of information useful. Schedule information was by far the most useful; 62% found it very useful and almost 80% found it very or somewhat useful. Next most useful was the time when the next bus will arrive. Route maps, connecting routes and transfer points, and the current time of day were judged very useful by over 40% of riders and very or somewhat useful by about 60%. Less useful, but still somewhat useful for a majority of riders, were service updates, fares, and the customer service telephone number. 78% said they would take more bus trips if the bus stops had more information. 55% said they would take more bus trips if bus stops had information in another language beside English. Of those who named another language, 84% named Spanish, 3% Chinese, 2% Tagalog, 1% Vietnamese, 1% Japanese, and less than 1% named each of 10 other South Asian, European, and African languages.

Passengers were asked “Do you always feel safe waiting at this bus stop?” Seventy-three percent answered “Yes” and 27% “no.” There was no difference in the percentage between English and Spanish speakers. The difference between men and women was only 2 percentage points. There was a marked difference in responses depending on age; surprisingly, a smaller proportion of people under 25 always felt safe (61%) than people from 25-65 (76%) and people over 65 (90%). People who own cell phones are no more nor less likely to feel safe than people who do not. The characteristics of the stop at which a person boarded had an effect. People were least likely to feel safe (56%) at the two termini of the route, the Eastridge Transit Center and the Palo Alto Caltrain Station. These are both somewhat isolated from surrounding activities. People boarding at stops on Santa Clara Street and The Alameda in downtown San Jose were also somewhat less likely to feel safe (66% and 60%, respectively). A smaller percentage of people boarding in the late evening always felt safe (59%).

For people who did not always feel safe, the measures most likely to make them feel much safer were means to get help in an emergency—an emergency alarm button or an emergency phone. Security patrols were next most likely to make them feel much safer. Better lighting, knowing when the next bus would arrive, and having a pay phone nearby would make over half of the respondents feel much safer. Fewer than half said a security camera would make them feel much safer. Eighty-seven percent of those who did not always feel safe waiting at their stops said they would take more trips if they felt safer at bus stops.

Passengers were asked what they liked to do at bus stops. Reading and listening to music were the most popular activities followed by talking to fellow passengers and eating or drinking. Some people visited nearby stores or ran errands. Somewhat fewer talked on cell phones or pay

phones. When asked what would make their waiting time more pleasant, the clear favorite was cleaner surroundings. More people were interested in physical comforts, such as benches, better light to read by, and shelter, than in things to do while they waited. Eighty percent of those who answered the question “Would you take more bus trips if waiting time were more pleasant?” said yes.

A focus group was convened to obtain more information on what specific bus stop features passengers wanted and to determine how much they valued each feature relative to other aspects of the bus service. All participants but one used the bus for almost all their transportation. All sometimes used the buses after dark. All but one reported waiting less than 10 minutes at the bus stops they used; one, who worked until late evening, waited 20 to 30 minutes. Three reported reading while waiting for the bus, 5 talking on the phone, 4 talking to other passengers, 2 eating or drinking, and 1 listening to the radio or music. The participants did not want anything fancy or experimental at their bus stops. Over and over the importance of having schedules (or hours of operation and frequency) at each bus stop was stressed. Half of the participants noted this as the improvement that would mean the most to them. They said that schedules are especially important to people who use the bus at night. If they do not know when the last bus comes by, they can wait for a long time for a bus that will never come.

Everyone liked having signs that announced when the next bus would arrive. They also thought that a system map was important so that people could see how to get where they want to go and where they can go on the bus. A clock is also useful. Fare information is useful if there is a special charge, as on the express Route 180.

Cleanliness at the bus stops was also very important. All participants wanted to have lights at the bus stops so that the bus driver can see if anyone is waiting, passengers can read the schedule and other bus information, passengers feel secure, and passengers can read while they wait.

They felt that shelters were important for protection from sun and rain and made them feel safer at night. They liked shelters that one could see into, that seemed to fit into the neighborhood, that were near small shopping centers, and that had nearby greenery. They had negative comments about the stops at Santa Clara and 1st, particularly the westbound stop. This had much to do with the people who congregate around these stops.

Changes in Bus Stop Usage with BRT

If all of the current Route 22 passengers use the BRT there will be much more activity at the stops and many more transfers. Ten stops in each direction will have more than 500 BRT boardings per day. Only 54% of passengers now board or alight at stops that will become BRT stops. Therefore, it is likely that the percentage of current route 22 passengers who both board and alight at stops that will become BRT stops is less than 30%. Therefore, 70% of current Route 22 passengers will either have to walk further or transfer if they use the BRT. Unless they know the detailed schedules of the BRT and non-BRT buses, people boarding at non-BRT stops will not know if they could save time by walking to a BRT stop rather than waiting for the next bus. They also will not know if their trip is likely to be faster if they transfer to a BRT bus or remain on the non-BRT bus. I would help these passengers if VTA could make this information available at non-BRT bus stops and on the web. Because the BRT stops will be further from many people’s homes or destinations than their current bus stops, there will be more incentive to use bicycles to get to and from the bus. If more people take bicycles on the buses

dwell times per stop will increase. Bicycle storage should be considered as part of the BRT bus stop improvements.

Potential Bus Stop Improvements

Surprisingly few *new* products and services for bus stops were found. Among the most promising were real-time bus arrival information systems; electronic fare cards; interactive information displays, and solar powered lights, beacons and information panels. Real-time bus arrival information systems in the United States are rather new. They have been deployed at Los Angeles metro rapid transit bus stops, at 10 bus stops in Portland, at stops on San Francisco's Fillmore route and at bus stops on other smaller systems, such as San Luis Obispo. Some systems, such as that in Portland, have been developed by the transit agency. Other agencies use proprietary systems, such as NextBus. A survey of London bus passengers six months after the real-time bus arrival signs were installed found that the signs were reliable and accurate and that 90% of riders looked at them at least once during their wait for the bus. Over 2/3 of passengers felt that they waited for a shorter time (perceived wait time dropped from 11.9 to 8.6 minutes) and that service reliability had improved since Countdown was implemented even though reliability had actually declined.

Electronic ticketing systems are common on rail systems in the United States and are used on buses in large cities in Europe, and an electronic contact card system is now in use in buses in Hong Kong. But electronic fare systems for buses have not yet been implemented in the United States. The Translink system, currently being tested in the San Francisco Bay Area, is a smart card system that is intended for use on all bus and rail systems in the area. Of 3,500 people participating in a test of the system, 90% were satisfied with the system. VTA is participating in the Translink project which is scheduled to be expanded in late-2003.

Solar cells are now available at moderate cost, and if mounted on the roof of shelters can supply power to bus stop facilities at a lower cost than if a power line were run to the shelter. Solar-powered lights are available at moderate cost, and are already used on some VTA bus shelters; according to VTA and Clear Channel Communication staff, they have not been the object of vandalism. One firm offers a solar-powered, passenger-activated bus stop sign with lighted schedule and a beacon to let the bus driver know that a passenger is waiting.

Interactive information kiosks have been used in rail transit stations and airports for some time, but at a cost of \$5,000 to \$30,000 per unit they are not affordable for large numbers of bus stops. Despite the existence of the component technologies, low-cost interactive displays of schedule and other information have not yet been developed for bus stops. However, the Kowloon Motor Bus Company (KMB) in Hong Kong is developing a Cyber Bus Stop equipped with a touch screen linked to a microcomputer that is linked to the KMB homepage. Passengers can use KMB's point-to-point route search and other information on the KMB website. A web-camera at the bus stop allows management to monitor the bus stop remotely.

Matching Improvements to Needs

Several surveys by VTA and others have found that passengers care more about frequency and reliability of service than about bus stops, so it makes sense to focus most resources on providing frequent, reliable and direct service and limiting bus stop expenditures to those that provide the highest benefits to passengers per dollar spent.

Most of all, passengers want clean surroundings and the schedules of the buses that call at the stop. Somewhat lower in priority but still valued by large majorities are a comfortable place to sit, a shelter, and a light at night, especially to ensure that the driver sees them waiting. Most passengers would find signs that tell when the next bus will come very useful and reassuring.

People who do not always feel safe waiting for the bus would find an emergency phone or alarm button and security patrols most helpful. There are wide differences in the proportions of people who feel safe at different stops. Security patrols should be focused on stops at which the greatest number of people do not feel safe.

Because of their visible location and high usage, special recommendations are given for the stops at Santa Clara and 1st :

- A prepaid waiting area should be considered for operation during peak hours. People transferring from other buses could immediately enter these areas. During congested times, each area could be staffed by a person whose responsibilities were to sell passes, collect fares, check passes and transfers, answer passenger questions, and direct passengers where and when to board. At other times fare transactions could take place on the bus and the prepaid areas would become waiting areas.
- These stops should also have signs giving real-time arrival information.
- Because of crowds at these stops, the signs indicating the stop should be higher than usual.
- Schedule information should be posted outside the waiting area on display panels large enough to be read from a short distance, and should also be posted inside the waiting area. Route maps and fare information, similar to that currently provided by VTA could be mounted on the outside and inside of the waiting area.
- The location of the VTA office building adjacent to the north side bus stop provides an ideal location to test and develop an interactive information display.
- Because some bus passengers are bothered by the activities of non-bus riders congregating at the stop, security patrol efforts should be concentrated there, both to reassure bus riders and discourage loitering by others. The pre-boarding areas could have emergency buttons or phones.

Potential sites for bulb-outs are the westbound stops at King and Story and Alum Rock and King.

Real-time bus arrival signs are most useful where there are many people boarding and where buses are likely to be behind schedule, near the middle and end of the routes. The westbound stops with the highest priority for real time arrival signs would be Santa Clara and 1st, El Camino and Showers, El Camino and Pastoria, Alum Rock and King, and King and Story. The eastbound stops with the highest priority would be Santa Clara and 1st, The Alameda and Naglee, King and Story, King and Alum Rock, Santa Clara and 7th, and El Camino and Castro. It is assumed that the buses would leave their initial stop at either the Palo Alto or Eastridge Transit Center on time. Therefore the signs giving times until departure could display the scheduled departure times, and would not need real-time information.

Although the features will differ from stop to stop, the signs and information display should have a common format that is visually coordinated with the shelter designs at the BRT stops. The BRT route sign should be high enough to be seen over people's heads. This could be combined

with a schedule information sign mounted on the same pole at eye-level that is lit at night, either by conventional or solar power.

All BRT stops should have shelters and sufficient benches to accommodate the increased number of passengers. The focus group participants preferred shelters with glass walls and features that discouraged use by homeless people. Where there will be significant numbers of people alighting and boarding, the stop and shelter should be laid out so that passengers alighting from the rear of the bus can leave the area without getting in the way of those boarding.

Bicycle parking or lockers should be provided where possible and likely to be safe. Where bus stops are located near shops, the possibility of valet parking (such as at the Palo Alto Caltrain station) operated by one of the shops should be investigated.

Security patrols should be concentrated at the stops at which the most people did not feel safe: those on Santa Clara Street and The Alameda in downtown San Jose and the transit centers at East Ridge and the Palo Alto Caltrain station. Alarm buttons could be installed at these stops that would call the security patrol that was making regular rounds of these stops.

Some potential improvements are *not recommended*, because the benefit to passengers would not justify the cost: ticket vending machines, which are expensive and take up valuable sidewalk space; surveillance cameras which are costly to install, are not perceived as effective, and are considered by some an invasion of privacy; banners, which were viewed negatively by the focus group and do not give an impression of permanence; and kiosks which have high costs and low reliability.

Whatever actions VTA takes regarding the BRT bus stops should indicate respect for the passengers. All facilities should be well maintained and clean. Information should be clearly displayed and current. Passengers should not be hassled, pan-handled, or otherwise subjected to socially unacceptable behavior while they wait for the bus. In the words of one focus group participant, bus passengers want "... cleaner, more aesthetic stops and shelters..." that allow them "... to feel more respectable while waiting."

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Advanced Bus Stops for Bus Rapid Transit

1 Introduction

1.1 Goals of the Study

This study was motivated in large part by the plans of the Santa Clara Valley Transportation Authority (VTA) to develop a bus rapid transit (BRT) line along the alignment of the existing Routes 22 and 300. The objective of the new route is to increase ridership by providing a faster, higher quality transit service. It will have approximately 30 bus stops in each direction. One goal of this study was to determine what VTA could and should do with these bus stops to improve service quality. However, the findings are applicable not just to this particular route or agency, but to any agency with similar routes, development densities, and clientele. Therefore, an equally important goal of the study sponsors, Caltrans Divisions of Mass Transit and Research and Innovation, was to provide helpful information to other transit agencies that might want to improve their bus stops.

1.2 Study Tasks

The study had three components. Within the context of VTA's bus rapid transit plans and the existing service, 1) determine passengers perceptions and values, 2) investigate potential improvements to bus stops, and 3) match VTA needs to potential improvements.

This involved several tasks:

- review and analysis of VTA documents and previous studies regarding Routes 22 and 300 and the proposed bus rapid transit service
- field surveys of the Route 22 and 300 stops
- observations of dwell times and traffic delays on Route 22
- observations of passenger activities and bus headways at the westbound 1st and Santa Clara stop
- on-board survey of Route 22 and 300 passengers
- interviews with key VTA staff involved in BRT plans and bus stop facilities
- interviews with VTA trainers and supervisors
- review of the literature on bus stops and bus stop amenities
- Internet review of bus stop information and products
- gathering information on technologies that could be employed at bus stops from ITS and IT publications and at ITS America annual meetings
- presentation of possible bus stop improvements to focus group of VTA passengers and analysis of their responses

- matching of potential improvements to VTA passenger needs and preferences

1.3 Organization of the Report

This report first describes the proposed BRT services and the existing service. Then it discusses VTA staff perceptions and values, passengers' perceptions and values, and the methods by which these were studied. This is followed by a brief discussion of how bus stop usage will change with the proposed BRT service. Then possible bus stop improvements are identified and discussed. The report concludes by matching passengers' preferences with potential improvements and presenting a list of recommended improvements.

2 The Proposed VTA Bus Rapid Transit Service

The ultimate goal of the service is to increase bus ridership (Crain & Associates, 1997). VTA plans to do this by

- reducing travel time by
 - providing signal priority for buses that are behind schedule
 - providing queue jumps at strategic locations
 - minimizing dwell time at stops
- maintaining frequent service
- improving on-time performance
- providing clean and comfortable buses
- providing clean, comfortable, and safe bus stops
- providing real-time schedule information
- establishing a simple, distinctive identity for the rapid bus corridor

This study addresses the last three goals as well as the dwell time at bus stops.

The Crain & Associates study in 1997 found that fare transactions at high volume stops increased dwell times significantly. Suggestions for reducing fare payment times were greater use of passes, ticket vending machines at stops, an “honor system” with roving inspectors to verify fare payment, and pre-paid waiting areas similar to those in Curitiba, Brazil, which patrons pay to enter and from which they can board the bus via all bus doors. The study also suggested kiosks with ticket vending and information, as well as trip planning. It suggested that the minimal bus stop would include a sign, leaning rails or flip sets with trash container, possibly a banner for BRT identification, and street trees if space permitted. The 1999 VTA *Bus Rapid Transit Demonstration Program, Request for Participation* suggested considering ticket vending machines at stops. It also suggested more bus shelters, better lighting, and better passenger information at bus stops including schedules, route maps, fares, and real time arrival information at key stops. Testing the benefits and viability of these suggestions was one of the tasks of the PATH study.

The BRT route will follow the alignment of current Route 22, which extends for 27 miles from the northwest end of the VTA service area at the Menlo Park Caltrain station along major arterials to the eastern limit of its service area at the Eastridge Mall, following El Camino Real, The Alameda, Santa Clara Street, Alum Rock Avenue, and King Road, with a short loop around Santa Clara University. The new route will have 30 stops in each direction. The buses will have priority at signals if they are behind schedule. Queue-jump lanes, short bus-only lanes that allow buses to bypass traffic queues at a red light before entering a far side bus stop, and bulb-outs that extend into the street at the bus stop are being considered at strategic locations.

VTA is also considering bus rapid transit service on Monterey Highway and San Carlos/Stevens Creek. There are 11 other corridors that might benefit from BRT.

3 Current Service on Routes 22 and 300

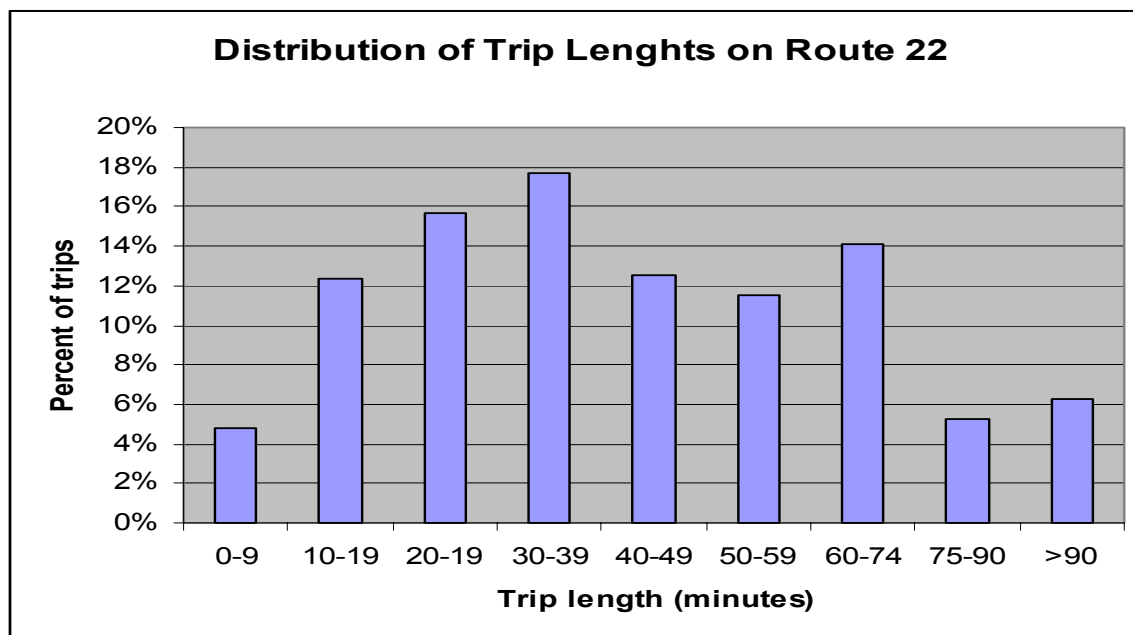
Route 22 is VTA's most used route, with 28,000 passenger trips per day. Frequencies are 9-10 minute during the morning and evening peaks and midday, increasing gradually up to hourly between midnight and 5 AM. There are roughly 120 stops in each direction, spaced an average of 400 yards apart. Travel time from one end of the route to the other ranges from 1 hour and 40 minutes to 2 hours and 16 minutes depending on the traffic conditions at different times of day.

Route 300 follows the same alignment except that it does not make a loop around Santa Clara University and at the southeast end of the route it does not go down King Street to the Eastridge Mall, but instead continues east on Alum Rock to White Road and then circles around White Road, Gay Road, and Capitol Avenue. It has only 30 stops in each direction and runs every half hour between 5:30 AM and 7:45 PM. It has about 1/10 as many passengers as Route 22 despite taking one half hour less from end to end.

3.1 Passenger Trip Characteristics

VTA's 2000 On-Board Passenger Survey found that although both trip origins and destinations on Route 22 were concentrated within a short distance from the route, there were more trips originating and ending far from the route than on other routes. Route 22 had the highest transfer rate of any route; 15% percent of passengers transferred to Route 22 from another VTA rail or bus route and 14% transferred from the route to another VTA route. Seventy-six percent of passengers walked to the bus stop, 3% bicycled, 2% were dropped off, 2% transferred from Caltrain, and 1% drove. Similarly, 73% walked from the bus stop to their destination, 3% bicycled, 1% were picked up, 2% transferred to Caltrain, and 1% drove. Half of the trips were shorter than 40 minutes as can be seen in Figure 1, 5% shorter than 5 minutes. More than a quarter were longer than an hour, and 7% longer than an hour and a half. Given that the entire route takes well over 2 hours, it is clear that most people travel only a small portion of the route.

Figure 1 Distribution of Route 22 Passenger Trip Lengths



3.2 Passenger Characteristics

The 2000 survey found that most Route 22 passengers were frequent bus passengers: 53% used VTA bus service 6 or 7 days a week, 29% used it 4-5 days a week, 13% used it 1-3 days a week, and only 6% used it less than once a week. Forty-three percent used a monthly flash pass, 12% used a day pass, 12% used 5 other types of passes or tokens, 15% used cash to buy a day pass, and 12% paid a cash fare.

On both Route 22 and 300, most riders were adults. Youths accounted for 13% of riders on Route 22 and 11 % on Route 300. Five percent of passengers on both routes were seniors. Seventy-four percent of riders did not have access to an automobile for the trip on which they were surveyed.

3.3 Field Surveys of Bus Stops

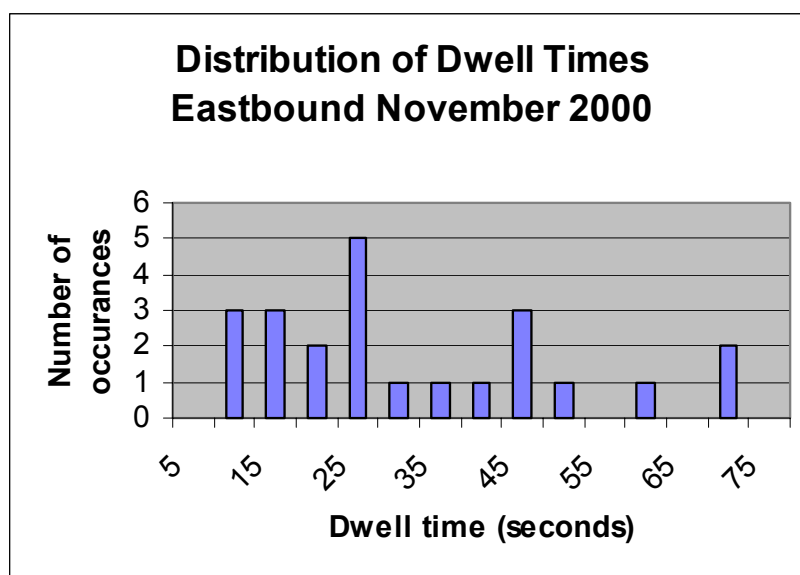
3.3.1 Conditions of Bus Stops

A field survey of Route 22 bus stops found that the shelters maintained by Clear Channel were generally clean and in good repair, but some of the garbage cans at the stops were observed to be overflowing. At the Palo Alto Caltrain stop there was trash on the ground even early in the day.

3.3.2 Dwell Time Observations

The study team observed the dwell time at stops, the number of passengers boarding and alighting, how many had bicycles or were slow-moving, and the types of fares they paid. They also recorded the time the buses were stopped at red lights. These observations were made on three runs: eastbound departing midday from the Palo Alto Caltrain station on a September weekday and a November weekday in 2000 and westbound in November. Dwell time was defined as the time that the door was open. It did not include time to pull out or wait for a red light. Dwell time is highly variable, as is shown by the frequencies of various dwell times on the eastbound November run shown in Figure 2.

Figure 2 Distribution of Dwell Times



The totals of all dwell times on the three runs were 20, 20, and 14 minutes, with average dwell times per stop of between 26, 18, and 24 seconds, as shown in Table 1. For each run, total dwell time was less than the total delay from red lights.

Table 1 Dwell Times and Times Stopped at Red Lights

	Eastbound November	Westbound November	Eastbound September
Number of stops	45	65	36
Average time per stop (seconds)	26	18	24
Total time at stops (minutes)	19.5	19.5	14.4
Number of stops for red lights	37	44	40
Average time per stop (seconds)	37	37	33
Total time stopped for red lights (minutes)	22.8	27.1	21.7

A regression analysis was performed on each run to assess what determined dwell times; the results are shown in Table 2. The coefficient multiplied by the variable to which it applies indicates the magnitude of the effect. A small P-value indicates that the variable is significant because the probability that it does *not* have an effect on dwell time is small. The number of passengers getting on the bus was significant in all cases, as was a person with a bicycle getting on or off. A slow-moving person getting on or off was also somewhat significant. The number of people getting off was not significant. Surprisingly, the number of boarding passengers paying cash versus using a pass was not significant. This may be because most cash passengers got on in small numbers and the driver closed the door and pulled out as soon as they were on board, often before they had paid. At stops with many passengers boarding, most people used passes or transfers.

Based on the experience on these runs, a person with a bicycle getting on the bus takes 17-36 seconds longer than a person boarding without a bike; getting off with a bicycle takes 33 additional seconds. The number of passengers boarding, while clearly significant, has a rather small effect, roughly 2-4 seconds per passenger. The fixed time per stop is significantly higher than the time per boarding passenger. When the route is converted to a bus rapid transit route the dwell times per stop will increase because there will be more people boarding per stop, but the total dwell time will be reduced because there will be fewer stops incurring the fixed time per stop.

Table 2 Determinants of Dwell Time

a. Eastbound - September 2000 – 11:47 AM (37 observations)

	Coefficients	t Stat	P-value
Fixed time per stop	11	3.71	0.001
Passengers on	3	3.77	0.001
Passengers off	1	0.72	0.476
Bicycle on	17	1.76	0.088
Bicycle off	34	2.38	0.024
Slow-moving person on	15	1.11	0.275
Slow-moving person off	10	1.05	0.303

b. Eastbound – November 2000 -- 11:49 AM (36 observations)

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Fixed time per stop	20	4.89	0.0000
Passengers on	2	1.17	0.2510
Passengers off	0	-0.02	0.9825
Bicycle on	37	2.18	0.0375
Bicycle off	33	2.15	0.0400

c. Westbound – September 2000 – 11:05 AM (65 observations)

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Fixed time per stop	9	3.65	0.0006
Passengers on	4	5.40	0.0000
Passengers off	0	0.12	0.9056

ed.

3.4 What Passengers Do at Bus Stops

Passengers waiting for buses were observed at the most highly used bus stop in downtown San Jose during the late morning and early afternoon on 4 weekdays and a Saturday in January 2001. This stop is served by 3 routes, with headways of 10, 15, and 30 minutes. The stop is in front of the VTA customer service center, which has an overhanging roof that shelters those waiting. There are four benches that can each accommodate three to four people. One schedule is posted. On the days of the observations, a security officer who was stationed inside the VTA office came outside periodically to patrol the area.

Of the 876 people observed, 68% were male, 6% appeared to be high-school age, 10% college age, 18% over 60, and 66% between college and retirement age. Only 1% had children with them. There were always 2 or 3 people who did not get on any bus and appeared to be homeless.

Over 90% of the passengers arrived at the bus stop on foot, 4% transferred from another bus, 3% rode bicycles or skate boards. During the time they were waiting, only 17% were sitting. Eight percent checked the posted schedule; some left and returned later. The most common activity was talking (12%). Five percent smoked, 3% listened to the radio or music, 2% had something to eat or drink and 1% read.

On one day there was a fight between a homeless person and a passenger, which made many of the passengers extremely nervous. The security officer came out and broke up the fight.

Most people just stand and wait for the bus. They may be reluctant to read or leave the stop because they do not know when their bus will arrive. Although the average time between buses matched the scheduled frequency, the buses often bunched leaving unpredictable intervals between buses.

4 VTA Staff Perceptions and Values

4.1 Interviews with VTA BRT and Management Staff

Four key VTA staff members involved with the BRT plans and bus stop facilities met with the study team to discuss the BRT improvements. They felt that the BRT shelters should be unique in some way. VTA buses have an image problem, and the BRT will need a different image to attract people who do not now see themselves as “bus riders.” “Super-shelters” that are bigger, better lit, have better information including real-time bus arrival time, and are cleaner would help change the image. The idea is to replicate train features, but at a lower cost than rail. The shelters should look permanent and provide effective protection from both sun and rain.

They noted the limited sidewalk space available at some stops and the need for bulb-outs at such locations to separate bus patrons from pedestrians. VTA already has some bulb outs in downtown Mountain View. The City of San Jose would like them on The Alameda; they could also be useful at stops on King Street. Drivers like them, and a recent journal article found that they actually speed traffic, rather than impede it.

Passenger complaints about bus stops are that there are no shelters, no lighting, that they need cleaning, or that they have been vandalized. Some shelters need daily cleaning, some 4 to 5 times a week, and some only twice a week. Vandalism is an on-going problem. There is a lot of graffiti. VTA changed the glass to metal mesh to cut down on the etching problem. VTA has a hotline for vandalism, primarily for use by VTA staff. When vandalism is reported in the morning, work orders are sent out for clean up and repair on the same day. VTA has an adopt-a-stop program to help keep shelters clean, with about 300 participants.

VTA has a contract with Clear Channel Communications to install and maintain shelters. (The right hand wall of these shelters as one faces the street is a full length advertising panel.) VTA gets a share of the advertising revenue from the shelters and has been negotiating to install more shelters.

The shelters have lights. Advertisers who want light on the advertisements can pay for it. Some stops have solar-powered lights activated by push buttons. VTA staff say that motion sensing lights might look like they do not work, so it is better to have a button to push. The solar units have not been vandalized. VTA tries to locate bus stops near street lights. People want light more for security than for reading.

For security, VTA has CCTV at the transit centers. They also have CCTV on the buses and have had no problems with the cameras being vandalized. They are ambivalent about putting CCTV at bus stops because there are too many locations to cover. The light rail stations have guards on duty at all times and phones, which also give passengers the option of dialing the transit information center. They would like to have phones at bus stops but this has not yet been implemented.

On the question of how much fare payment increases dwell time, one staff person thought it might cause delay at peak travel times when people want to buy day passes. Another thought that it did not slow the buses down because so many people use passes. Forty percent of riders have monthly passes and 40% have day passes. VTA is using the Translink electronic fare card sponsored by the Metropolitan Transportation Commission (MTC) on its light rail system. Translink could be incorporated into current VTA fare boxes. Translink is especially useful for people who transfer between transit systems, but 95% of VTA ridership is entirely within the

VTA service area. Passes make for faster boarding than electronic card that must be passed by a reader because they can be seen from a distance and passengers need not board in single file. However, they may allow more people to ride without valid passes. One thing that increases dwell time is that drivers do not enforce passengers exiting through the rear door. People with disabilities may not be able to exit in the rear.

When asked what kind of information was needed at bus stops, they mentioned system maps, frequencies of service, fares, a hotline number for complaints, and the time when the next bus will arrive. There should not be so much advertising at the stop that people can not find the schedule and fare information. VTA is looking into integrating kiosks into their transit centers, but one staff person said that kiosks required too much maintenance and were too expensive for use at regular bus stops. There may also be problems making them usable by blind people so that they comply with the Americans with Disabilities Act. A better way to communicate with passengers is through cell phones and personal digital assistants. VTA tried putting a pay phone in Palo Alto with direct dial to the information center but the phone was repeatedly vandalized. Information in the bus shelter information panels is currently changed when the schedules change in January and June by the bus shelter contractor.

VTA bus stop signs use the colors in the VTA logo. They are made of reflectorized materials that deter graffiti. They are affixed to light poles whenever possible because underground utility lines can be punctured when bus stop poles are installed. VTA staff said that VTA has signs in Spanish, Vietnamese and Chinese, as well as English. They make new signs twice a year. There are 5000 bus stop signs.

When asked which improvements they would make if they had funds, one answered better shelters with seating for elderly people and people with disabilities. Another mentioned real-time information about when the next bus will arrive and an overall better image. Still another said that everything at the bus stops must be maintained—people notice when things are not maintained. The system should be standard and simple and should utilize only technologies that have already been proven to work.

4.2 Interviews with Driver Trainers

The study staff also met with 5 bus driver trainers, their supervisor, and the director of technical training. When asked about delay at stops, the trainers said that at some stops where there are many transfers buses had longer dwell times during certain hours of the day. People who pay with coins slow things down, as do people in wheelchairs. Proximity cards would help people board more smoothly. One person thought that eliminating the fare box and instituting an “honor system” was the most important improvement that could be made. A fare inspector would be needed because the driver should not be responsible for checking fares. They did not think that having ticket vending machines would speed boarding because delays are caused by passengers who cannot or do not want to buy a pre-paid ticket. Furthermore, the upkeep for vending machines is high. They thought having an extra person at 1st and Santa Clara between 6 and 9 AM and 3 and 6 PM to direct passengers and give them change would reduce boarding delay. They thought that VTA could have a weekly pass, which would be good for visitors and people without enough money to buy a monthly pass.

When the bus is crowded and people are getting off, even if they exit via the rear door, it takes time for those remaining on the bus to move to the rear and make room for people boarding. They thought that bus passengers should be educated in proper bus riding, such as moving to the

rear of the bus if standing, exiting from the rear of the bus, having correct change ready before boarding, and how to signal the driver to stop when waiting at the bus stop. They thought this might be communicated via a kiosk. When asked about having separate waiting areas for different routes that call at the same stop, they said that this might not work because curb space was limited.

They liked “bulb outs”, but said that delivery trucks sometimes used them. They also like queue jumps.

When asked what passengers complain about, they said connections between busses, frequency of busses, high fares, unexpected delays, and dirty bus stops. They thought that the adopt-a-stop program has helped to keep the stops clean.

Regarding problems at bus stops, they thought passengers care most about safety and that sufficient lighting was important. In Gilroy there are solar powered lights with switches, which passengers like. They did not think an emergency button would work because people would abuse it. Late at night, they would like to be able to let passengers off at non-designated stops if passengers felt safer there than at the designated stop. They thought that an emergency phone might be good but that the risk of vandalism is high. They thought that informational computers at each stop would be even more likely to be vandalized. Security cameras might help.

They said that there are many homeless people living in bus shelters. Improving the shelters too much would attract more homeless people. However, they thought that nicer shelters that could accommodate more people would be good. The shelters could have lighting so the driver could see people who were waiting. The shelters could have surveillance equipment. They suggested announcements when the bus was approaching that said “The next bus arrives in ___ minutes,” “Please have exact change”, “Please prepare your bicycle for loading on the bus” and so forth. The shelter should have a map with the routes served by the stop and connecting routes and transfer points (a complete system map would be too confusing) with the times of the first and last bus on each route. They thought that music might be a good idea at shelters, but that TV might distract people from getting their buses. Interactive information screens would work at transfer points but not at isolated locations where they could be vandalized.

4.3 Interview with Shelter Provider Staff

Clear Channel Communications has a 15 year contract with the VTA to build and maintain all transit shelters except those in Palo Alto. In 2002, there were 569 such shelters and VTA was interested in adding more. VTA wants better maintenance, but Clear Channel Communications must be careful of cost. Some shelters are cleaned once a week, some 3 times week.

Clear Channel Communication’s revenue comes from the sale of the advertising space on the bus shelters. Unsold space can be used for non-profit organizations. They provides space in the shelter for route information. Although electronic screens are used in Europe to provide this information, they consider computer screens too expensive for application in the US. In the bus shelters they provide in Oakland there is a panel with spaces for public notices.

The shelters’ primary function from Clear Channel Communications’ point of view is advertisement. It is aimed not primarily at bus patrons but at people walking or driving by. They do not want anything on the bus shelter that distracts attention from the advertisements.

There is not much vandalism to the shelters.

5 Passenger Perceptions and Values

5.1 Previous Research on Bus Stops

A literature review on the subject of bus stops found relatively little about the experience of waiting for the bus or what passengers wanted. *Customer Information at Bus Stops, Synthesis of Transit Practice 17* cited a survey of bus riders in Milwaukee in the mid 1970s which found that route number and name of the service were what riders considered the most important information on signs at bus stops, followed by service hours and time until the next bus. A follow-up survey after new signs had been installed found that 3% of riders had started using the bus as a result of the new bus stop signs, and another 5% used the bus more frequently.

The same study found that transit industry people are concerned by the absence of conclusive evidence that investment in improved information at bus stops will be cost-effective in terms of increased demand. The biggest cost is not display case hardware, but installation and ongoing upkeep of information in the field. Replacing out-dated information is considered the most difficult, time consuming, and expensive part of the program. In most transit agencies this is done by personnel with primary responsibilities in other areas.

A study of safety at bus stops in Los Angeles (Loukaitou-Sideris and Liggett, 2000) found that bus stop crime was associated with unkempt surroundings, locations with alleys or convenient escape routes for criminals, and poorly kept-up bus stop facilities. Locating them near open-front retail establishments (not liquor stores or check cashing establishments) can increase visibility and make them safer. Most bus stop crime in Los Angeles occurred at only a few locations, many located downtown and in adjacent neighborhoods.

A study of bus stop designs and perceptions of crime by the Federal Transit Administration (Lusk, 2002) found that security is a concern of some bus patrons. It may be of sufficient concern to non-bus riders to discourage them from riding the bus. Bus shelter features that people wanted were: benches suitable for mothers with young children, but not for sleeping; the name of stop on the roof--visible from the street and approaching pedestrians; a route map and area map. Shelters should face the street and be adjacent to the street. People liked shelters with clear glass and 1 or 2 sides open.

5.2 VTA 1997 Focus Groups

A series of focus groups conducted by the VTA in 1997 (Strategic Decisions, 1997) asked participants about various bus stop improvements including shelters, ticket vending machines, information kiosks, bike lockers, expanded safety and security, improved signage, and improved boarding areas. Participants reacted positively to shelters and roving security guards and noted a need for scheduled arrival times, but did not see value in the other improvements. Some felt that the ticket machines and kiosks would just give people something to vandalize.

When asked to rank the importance of station, vehicle, and operational improvements, participants overwhelmingly chose operational improvements, even though all were concerned about security. Travel time, frequency, and reliability were the most important operational characteristics.

5.3 VTA 2000 On-Board Bus Passenger Survey

Most VTA passengers considered the service good. Twenty-five percent of Route 22/300 passengers considered the schedule information excellent, and 69% considered it good or excellent. Twenty percent considered the bus stops excellent, and 64% considered them good or excellent. This is a slightly higher percent than for all passengers, probably indicating better bus stops on Route 22. However, the proportion considering security and safety good or excellent was only 60%, whereas it was 64% for all VTA bus passengers. This likely reflects the location of the busiest Route 22 stops in downtown locations that passengers perceive as less safe.¹

When asked what three bus service features would make them use VTA more often, 11% of Route 22 passenger responding said better bus stops, 10% said improved security, and 8% said better information. In comparison, 79% said more frequent service, 23% earlier morning service, 33% later evening, 58% more Saturday service, and 50% more Sunday service.

5.4 2002 Route 22 Bus Passenger Survey

Passengers on twenty-four Route 22 runs and twelve Route 300 (a limited stop version of Route 22) runs were surveyed in May and June of 2002. The runs were at all times of day on weekdays and weekends in both directions. Thus the responses were more representative of Route 22 and 300 passengers than the bus stop observations. Questionnaires were offered in either English or Spanish as passengers sat down on the bus and collected as they left. A fair number of passengers did not appear to speak or read either of these languages. Sixty percent of the 958 completed surveys were in English and 40% in Spanish. The age, gender, trip frequency proportions of survey respondents were similar to those found in bus passenger surveys that VTA had conducted in previous years.

Passengers were asked where they boarded the bus, how useful they found various types of information, if they felt safe at the bus stop, what would make them feel safer, what they liked to do while waiting for the bus, if various types of bus stop amenities would make waiting more pleasant, and if they would take more bus trips if the stop had more information, was safer, or was more pleasant. They were also asked if they owned a cell phone, pager or personal digital assistant or if they had access to the internet at work or at home. Over 50% of people responding to the question regarding electronic devices had one or more. Sixty-three percent of people responding to the internet question had access to the internet, 40% at home, 32% at work, and 17% at other locations. Many had access at more than one location. The percentages were much lower among Spanish speakers than among English speakers.

5.4.1 Information

Even though 78% of those surveyed rode the bus four or more days a week, they still found many types of information useful, as shown in Table 3. Schedule information was by far the most useful; 62% found it very useful and almost 80% found it very or somewhat useful. Next most useful was the time when the next bus will arrive. Route maps, connecting routes and transfer points, and the current time of day were judged very useful by over 40% of riders and very or somewhat useful by about 60%. Less useful, but still somewhat useful for a majority of riders, were service updates, fares, and the customer service telephone number. The survey asked if people were interested in a map of activities close to the bus stop. About half felt this

¹ See Section 5.4.2

would be very or somewhat useful. More people were interested in information about health services, businesses, and parks and recreation, less in movies and entertainment, family activities and government services. People were also asked “What other information would you like to have at this bus stop?” The most common response was schedule information, indicating some lack of understanding of the survey, but also reinforcing the importance of schedules to bus patrons.

Table 3 How Useful Is Bus Stop Information?

Information type	Very useful to me		Very or somewhat useful to me	
	Number	Percent of all surveyed	Number	Percent of all surveyed
Schedule	598	62%	753	79%
Time when the next bus will arrive	474	49%	646	67%
Route maps	402	42%	605	63%
Connecting routes and transfer points	392	41%	574	60%
Current time of day	379	40%	558	58%
Updates on bus services	326	34%	545	57%
Fares	325	34%	496	52%
Customer service phone number	310	32%	500	52%
Map of activities close to the bus stop	277	29%	468	49%
• Medical and health services	360	38%	551	58%
• Shops and businesses	330	34%	492	51%
• Parks and recreation	309	32%	488	51%
• Movies and entertainment	256	27%	445	46%
• Activities for children and families	248	26%	443	46%
• Government services	243	25%	422	44%
Information about other transit agencies	265	28%	477	50%
Bus web address	211	22%	406	42%

Of 761 responses, 78% said they would take more bus trips if the bus stops had more information. The percentage was the same regardless of whether the stop at which passengers boarded had a shelter or not or whether it was a heavily used stop.

Fifty-five percent of 762 respondents said they would take more bus trips if bus stops had information in another language beside English. Of the 217 people who named another

language, 84% named Spanish, 3% Chinese, 2% Tagalog, 1% Vietnamese, 1% Japanese, and less than 1% named each of 10 other South Asian, European, and African languages.

5.4.2 Safety

Passengers were asked “ Do you always feel safe waiting at this bus stop?” Seventy-three percent of the 725 who answered the question answered “Yes” and 27% “no.” Demographics seemed to have some bearing on how people answered, but the differences may be due to times at which people traveled or which stops they used—the sample size was too small to determine this. There was no difference between Spanish and English speakers. A higher proportion of men (76%) always felt safe. There was a marked difference in responses depending on age. Surprisingly, a smaller proportion of people under 25 always felt safe (61%) than people from 25-65 (76%) and people over 65 (90%). People who own cell phones are neither more nor less likely to feel safe than people who do not.

The characteristics of the stop at which a person boarded had an effect. Of people boarding at stops with shelters, only 68% always felt safe. People boarding at the busiest stops also were less likely to always feel safe (63%). This is apparently because the busiest stops tend to have shelters and the busiest stops are those most likely to have non-passengers around. People were least likely to feel safe (56%) at the two termini of the route, the Eastridge Transit Center and the Palo Alto Caltrain Station. These both have attractive shelters, but are somewhat isolated from surrounding activities. People boarding at stops on Santa Clara Street and The Alameda in downtown San Jose were also somewhat less likely to feel safe (66% and 60%, respectively). On the other hand, people boarding at stops on El Camino Real which passes through generally residential and neighborhood commercial areas were more likely to feel safe (77%). People boarding earlier in the day also felt safer. Of people surveyed who boarded between 6-10 AM, 78% always felt safe. Of people who boarded midday, 76% always felt safe; of those who boarded during the PM peak, 72% always felt safe, and of people who boarded later in the evening only 59% always felt safe.

Table 4 What Would Make People Who Do Not Always Feel Safe Waiting at Their Bus Stops Feel Safer?

	Much safer	Much or somewhat safer	No safer	No response
	Percent of people who do not always feel safe waiting at their bus stops (N=199)			
Emergency alarm button	59%	80%	3%	17%
Emergency phone	59%	78%	2%	20%
Security patrols	57%	79%	6%	15%
Better lighting	55%	76%	7%	17%
Knowing time of next bus	55%	73%	6%	21%
Pay phone nearby	54%	75%	7%	18%
Security camera	49%	75%	6%	19%

People who did not always feel safe were asked what would make them feel safer. Their responses are shown in Table 4. All of the measures listed, better lighting, security cameras, alarm buttons, emergency phone, information on when the next bus would arrive, a pay phone nearby and security patrols, would make at least 75% of these people feel at least somewhat safer. The measures most likely to make them feel much safer were means to get help in an emergency—an emergency alarm button or an emergency phone. Security patrols were next most likely to make them feel much safer. Better lighting, knowing when the next bus would arrive, and having a pay phone nearby would make over half of the respondents feel much safer. A security camera was considerably less likely to make them feel safer; fewer than half said it would make them feel much safer.

Although it may seem logically inconsistent for people who always felt safe waiting at the bus stop to feel safer, these people also answered the question regarding what would make them feel safer. Their responses were different. They apparently did not expect to have an emergency. The measures most likely to make them feel safer were a pay phone nearby (54% much safer, 17% somewhat safer), knowing when the next bus would arrive (53%, 18%) and better lighting (52%, 20%). Security patrols ranked much lower with them than with the people who did not always feel safe; only 40% would feel much more safe and 20% somewhat more safe. Like the people who did not always feel safe, they were least interested in security cameras; only 39% would feel much safer and 22% somewhat safer.

People were asked what else would make them feel safer at the bus stop. This elicited 40 comments, many of which related to service characteristics rather than safety measures. The largest number, 8, related to preventing people who were not bus passengers from hanging out at the bus stops. These people were variously characterized as drunks, transients, homeless, and bums. One respondent complained about being harassed by drunks. Two respondents complained of security patrol and police harassment. One felt that a security camera would be an invasion of privacy. Two respondents noted a need for more light and making lights functional.

The survey responses suggest that the more active security measures such as security patrols and emergency buttons and phones should be deployed at the stops at which people are most likely not to feel safe because non bus riders congregate there. The measures that are likely to reassure people, such as lighting and information on when the next bus will arrive, might be deployed at all of the bus stops.

When asked if they would take more trips if they felt safer at bus stops, 87% of those who did not always feel safe waiting at their stops said yes. Of the people who always felt safe waiting, 76% said they would take more trips if they felt safer.

5.4.3 Comfort

Passengers were asked what they liked to do at bus stops. Their responses are shown in Table 5. The distribution of activities is not the same as observed at the Santa Clara and 1st Street stops or in the focus group. This is probably because the survey was a much broader sample that better represented all of the people who use Routes 22 and 300. Reading and listening to music were the most popular activities followed by talking to fellow passengers and eating or drinking. Some people visited nearby stores or ran errands. Somewhat fewer talked on cell phones or pay phones. Only 16 people mentioned liking to do other things. Four mentioned smoking and four mentioned day dreaming, praying and thinking.

Table 5 What Do You Like to Do While You Wait For the Bus?

	Number	Percent of all surveyed
Read	456	48%
Listen to music	426	45%
Talk to fellow passengers	250	26%
Eat or drink	223	23%
Visit nearby stores or run errands	193	20%
Talk on a cell phone	169	18%
Talk on a pay phone	126	13%
Check a pager	90	9%
Use a computer	72	8%

Table 6 What Would Make Your Waiting Time at the Bus Stop More Pleasant?

	Much more pleasant		Much or somewhat more pleasant		No more pleasant	
	Number	Percent	Number	Percent	Number	Percent
Cleaner surroundings	410	71%	540	94%	37	6%
More comfortable benches	364	68%	479	90%	54	10%
A bus shelter	332	66%	459	92%	39	8%
More benches	363	66%	487	89%	61	11%
Better light to read by	354	65%	494	91%	51	9%
A bigger bus shelter	305	63%	425	88%	57	12%
More trees and flowers	281	55%	437	86%	73	14%
Scrolling sign with headlines and announcements	253	52%	394	82%	89	18%
Newspaper stands	241	51%	392	84%	77	16%
Community bulletin board	208	47%	364	82%	79	18%
Something to entertain children	196	36%	350	64%	126	23%
Public art or poetry	186	38%	309	62%	100	20%
Internet access	170	43%	261	66%	136	34%\

Then they were asked what would make their waiting time at the bus stop more pleasant. Their responses are shown in Table 4. The clear favorite was cleaner surroundings. More people were interested in physical comforts, such as benches, better light to read by, and shelter, than in things to do while they waited. Eighty-nine people answered the question “Other things that would make waiting time more pleasant” Most mentioned the bus service itself, information they would like, cleanliness, shelters, benches, and preventing non-bus riders from congregating or sleeping at bus stops. A couple mentioned no smoking; a few mentioned coffee and soft drink vending machines or water fountains, a few mentioned music, and one mentioned a bathroom.

Eighty percent of those who answered the question “Would you take more bus trips if waiting time were more pleasant?” said yes.

5.5 2003 Bus Passenger Focus Group

To get more information on what specific bus stop features passengers wanted and to determine how much they valued each feature relative to other aspects of the bus service, a focus group was convened. Participants were recruited via an advertisement in the free San Jose Metro newspaper that offered a free 1-month VTA pass to focus group participants. Thirteen people agreed to attend, eight actually attended. The group appeared to be quite representative of VTA passengers, except that there were no Spanish speakers. The bus stops they used were not primarily on Route 22.

Before the meeting convened, participants filled out a short questionnaire regarding the frequency and location of their bus trips, their waiting time, and what they usually did while they waited for the bus. Then they were shown slides of 20 existing bus stops and asked to note their comments on handouts with the same pictures. This was followed by a discussion of these bus stops and the other bus stops that participants used. They were shown slides of some possible improvements that could be made to bus stops and were again asked to note comments on handouts with the same pictures. Then they discussed how bus stops could be improved and which types of improvements would be most useful. Finally, they were asked what kinds of improvements were most important to them and how important they were relative to other bus service characteristics, such as service frequency and travel time.

All but one participant used the bus for almost all their transportation. All sometimes used the buses after dark. All but one reported waiting less than 10 minutes at the bus stops they used; one, who worked until late evening, waited 20 to 30 minutes. Three reported reading while waiting for the bus, 5 talking on the phone, 4 talking to other passengers, 2 eating or drinking, and 1 listening to the radio or music.

5.5.1 Information

Like the VTA management, participants did not want anything fancy or experimental at their bus stops. Over and over the importance of having schedules (or hours of operation and frequency) at each bus stop was stressed. Half of the participants noted this as the improvement that would mean the most to them. They said that schedules are especially important to people who use the bus at night. If they do not know when the last bus comes by, they can wait for a long time for a bus that will never come. One participant noted that the schedule signs on El Camino were recently taken down because of schedule changes, and they have not yet been replaced (as of June 19, 2003). Another said that sometimes people steal the schedules.

Everyone liked having signs that announced when the next bus would arrive; knowing when the bus would arrive would reduce stress and made the waiting more pleasant, regardless of the surroundings. They also thought that a system map was important so that people could see how to get where they want to go and where they can go on the bus. A clock is also useful. Fare information is useful if there is a special charge, as on the express Route 180. However, only one participant listed “next bus” signs among the bus stop improvements that would make the most difference to her, and none mentioned system maps or fare information.

Three participants had cell phones; one reported using it to call VTA information, but said that the information service was not available at all hours. Another said that there were too many menus, and it took too long to get information by phone. One participant noted getting inaccurate information over the phone.

When asked about the value of having an interactive electronic terminal with schedule and other information available at the stop, one participant suggested that it be able to print out schedules; another suggested that it could show when the next bus was coming, as the terminals in the light rail station do.

The only participant with a personal digital assistant was the one who did not use transit regularly. This was not discussed as a means of obtaining information.

5.5.2 Cleanliness

Cleanliness at the bus stops was also very important to some participants. They noticed some overflowing trash cans in the slides of existing stops and mentioned that this was not unusual. Two participants mentioned keeping the stops clean as the bus stop improvement that would make the most difference to them. Three mentioned it as an improvement that would attract new bus riders.

5.5.3 Lighting

All participants wanted to have lights at the bus stops. Some noted that many stops did not have lights and that lights in the shelters were not working. (The advertising firm that owns and maintains most of the shelters claims that all have lights). Lights are useful for several reasons: 1) they allow the bus driver to see if anyone is waiting at the stop—this was of great concern to everyone because they feared being passed by at night, 2) they allow people to see whatever schedule information is available at the stop, 3) they provide a sense of security, and 4) they allow people to read while they wait. Participants were generally enthusiastic about a pole-mounted solar-powered beacon with lighted schedule information that was activated by the passenger pressing a lighted button.

5.5.4 Shelters and Benches

Much of the slide presentations to the group involved shelters, and people had definite ideas about them. When asked “how important is a shelter to you” one participant replied “very important when it’s raining and you’re unprepared...when it’s very hot in the sun”. Another said it made him feel safer at night, especially if it were well-lit. But another person said that a schedule is more important than a shelter, and this seemed to be the consensus. No one named a shelter as the bus stop improvement that would make the most difference to him or her. However, one person did mention a bench as being important to her. The features they liked at shelters were the ability to see inside the shelter, maps and schedules, spaciousness, placement that seems to fit into the neighborhood, trees, and proximity to small shopping centers. (See

Figures 3 through 17) A shelter with trees around it got several positive comments, such as “welcoming”, “shady”, and “green”, but one woman thought it felt too closed in. Most of the shelters were VTA’s standard metal mesh design, but one was larger and had clear glass panels. They described it as “bigger”, “better”, and “good.” They were generally positive about the stops except for the two main stops downtown. The stop on the north side of 1st and Santa Clara was described as “dark and dingy with a lot of bums around.” Five participants noted that it smelled bad. The stop on the south side of 1st and Santa Clara has two shelters, additional benches and pay phones. The shelters and benches are next to the street, so that pedestrians walk behind them. One person thought the stop looked dangerous, but others liked the pay phones. When asked if it mattered if the shelters or benches were next to the street so that pedestrians walked behind them or set back so that pedestrians walked in front of them, they noted that the driver was more likely to see them with the former.

Focus group members were generally positive about six alternate bus shelter designs shown in Figures 17. Two had dividers between seats on the benches. Most people thought this was a good idea to prevent homeless people from sleeping in the shelters. They liked those that had a lot of glass, to provide visibility and prevent homeless people hanging out in them. The shelter that got the most positive responses was a glass enclosed box with a flat roof and a long bench with a backrest. Interestingly, its shape was basically the same as the existing VTA standard shelter. One shelter had an advertising panel like the current VTA shelters; most participants did not seem to mind this, but one person thought it limited visibility. The existing shelters do not have full walls in the direction from which the bus will come so that passengers can see the bus coming from inside the shelter.

5.5.5 Security

Security did not rank high among participants’ concerns, even though all used the buses at night. When asked what would make them feel more secure, their immediate response was lights. Shelters with clear glass were also mentioned. Two participants noted problems with drug users who hang out around the bus and train stops downtown. One young man reported being approached by people asking if he wanted to buy or sell drugs. One woman felt she looked like an easy target for having her purse snatched. When asked if closed circuit TV would make them feel safer, the answer was universally “no” because the assailant or thief would be long gone by the time help would arrive. The response was more positive regarding having some kind of panic button to push. It was suggested that overuse by neighborhood children could be prevented by having it activated by a bus pass. Most agreed that uniformed guards that patrolled from time to time would be the most effective means of preventing illegal activities.

5.5.6 Fare Payment

All participants currently use some kind of pass. Initially only two people expressed interest in using Translink, the electronic fare card that is being planned for the Bay Area, but after one participant who had been involved in testing it explained how it worked, there was more interest. A frequent traveler discount was suggested.

5.5.7 Entertainment

When asked what would make waiting more pleasant the group remained silent. The consensus was that all they wanted was good service and reasonable fares, no frills.



Figure 3 Palo Alto Caltrain Station Bus Shelter

Attractive design and landscaping. Trash on the ground at 10 AM



Figure 4 King and Story Road - Eastbound

The focus group liked the location of this stop near a shopping center.



Figure 5 Non-standard design

The focus group liked this shelter better than the standard shelters.



Figure 6 Standard Design on El Camino

One focus group participant thought it was well integrated into the neighborhood.



Figure 7 View of the westbound 1st and Santa Clara stop from across the street

This was the stop that drew the most critical comments from the focus group.



Figure 8 Westbound 1st and Santa Clara stop

The focus group participants thought this stop was dark and dingy. It was not clear to some exactly where the buses would stop. Several thought it smelled bad and needed to be cleaned.



Figure 9 Eastbound stop at 1st and Santa Clara

Focus group participants liked the pay phones. One person thought the stop looked dangerous



Figure 10 Narrow version of the standard design
Quite clean even in the late afternoon.



Figure 11 – Same stop from the other direction

Focus group participants liked the schedule posted on the pole and the fact that there was no graffiti.



Figure 12 Westbound stop on Santa Clara

The focus group participants described this as “welcoming”, “shady”, and “green”, but one woman thought it felt too closed in. They liked the pole with schedule.



Figure 13 Westbound stop on King Street

The focus group described this stop as pleasant and clean but felt it needed a posted schedule.



Figure 14 Another westbound stop on King Street

What people noticed most about this stop was the overflowing trash.

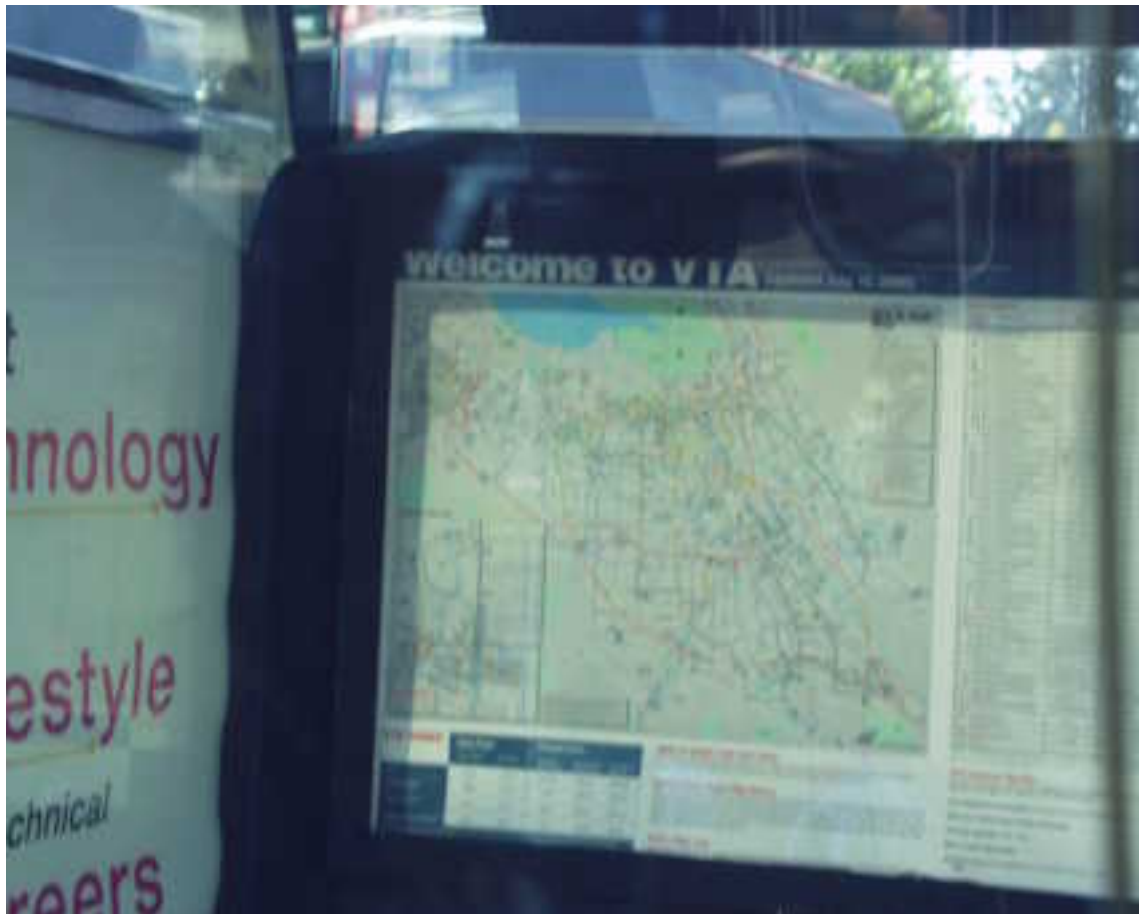


Figure 15 Typical information display

The focus group had generally positive comments about the information display.



Figure 16 Eastridge Transit Center

Attractive but remote from stores.

1.



2.



3.



4.



5.



6.



Figure 17 – Shelter designs shown to focus group

Focus group participants liked number 4 best. They also liked 2 and 3. They thought that 5 was too small.

6 Changes in Bus Stop Usage and Needs with BRT

VTA is planning 30 stops on the BRT route, only 25% of the current 120 stops on Route 22. Fewer stops will mean more passengers boarding at each stop, more transfers, and some new decisions for people boarding at non-BRT stops. The increased transferring will make the bus stops a larger part of the bus riding experience.

6.1 Bus stop use with BRT

With fewer stops the number of people boarding or alighting at the BRT stops will increase dramatically at many stops, requiring more space for queuing up to board and to prevent alighting passengers from slowing down boarding. Tables 3 and 4 show the proposed BRT stops and the potential boardings and alightings per day if all Route 22 passengers use the BRT route. It assumes that passengers at non-BRT stops catch the BRT at the next downstream BRT stop and alight at the closest BRT upstream stop. The tables do not include Route 300 passengers. Stops with shading now have shelters.

Table 3 Projected Boardings and Alightings at Westbound BRT Stops

Westbound		Current		New		Percent increase	
Stop		On	Off	On	Off	On	Off
EASTRIDGE	TRANSIT CENTER	895	0	895	0	0%	--
KING	TULLY	285	81	1090	326	282%	302%
KING	OCALA	253	60	550	188	117%	213%
KING	STORY	681	353	940	604	38%	71%
ALUM ROCK	KING	296	285	699	571	136%	100%
SANTA CLARA	20TH	159	67	653	177	311%	164%
SANTA CLARA	13TH	121	78	278	195	130%	150%
SANTA CLARA	7 TH	286	274	472	587	65%	114%
SANTA CLARA	1 ST	1164	1650	1336	1835	15%	11%
SANTA CLARA	MONTGOMERY	152	180	351	359	131%	99%
THE ALAMEDA	JULIAN	78	92	154	269	97%	192%
THE ALAMEDA	TAYLOR	238	282	325	757	37%	168%
SANTA CLARA	TRANSIT CENTER	81	190	258	190	219%	0%
EL CAMINO	BENTON	6	27	6	422	0%	1463%
EL CAMINO	MADISON	0	0	365	46	--	--
EL CAMINO	SCOTT	124	150	158	233	27%	55%
EL CAMINO	SAN TOMAS	22	24	84	69	282%	188%
EL CAMINO	BOWERS	197	231	224	535	14%	132%
EL CAMINO	LAWRENCE	139	226	379	346	173%	53%
EL CAMINO	WOLFE	145	185	271	246	87%	33%
EL CAMINO	FAIR OAKS	141	189	191	462	35%	144%
EL CAMINO	PASTORIA	187	142	417	269	123%	89%
EL CAMINO	BERNARDO	167	120	260	120	56%	0%
EL CAMINO	SYLVAN	87	76	87	207	0%	172%
EL CAMINO	CASTRO	212	247	374	761	76%	208%
EL CAMINO	SHOWERS	275	320	773	558	181%	74%
EL CAMINO	CHARLESTON	39	53	280	352	618%	564%
EL CAMINO	PAGE MILL	45	97	243	97	440%	0%
EL CAMINO	CALIFORNIA	109	239	109	381	0%	59%
PALO ALTO	DEPOT	100	828	0	1231	-100%	49%

In 2000 only three westbound stops, Santa Clara and 1st, King and Story, and the Eastridge Transit Center had more than 500 boardings per day on Route 22. If all of the Route 22 passengers used the BRT, another 5 stops would have more than 500 boardings per day: King and Tully, King and Ocala, Alum Rock and King, Santa Clara and 7th and El Camino and Showers. Only 2 stops, Santa Clara and 1st and the Palo Alto Depot had more than 500 alightings. With the BRT, another 7 stops would have more than 500 people alighting per day: King and Story, Alum Rock and King, Santa Clara and 7th, The Alameda and Taylor, El Camino and Bowers, El Camino and Castro, and El Camino and Showers. The biggest increases in activity will occur at the King Street stops, Santa Clara and 7th, the stops near Santa Clara University, El Camino and Charleston, and El Camino and Showers.

Table 4 Projected Boardings and Alightings at Eastbound BRT Stops

Eastbound		Current		New		Percent increase	
Stop		On	Off	On	Off	On	Off
PALO ALTO	DEPOT	678	57	1107	0	63%	-100%
EL CAMINO	CALIFORNIA	263	90	391	90	49%	0%
EL CAMINO	PAGE MILL	77	34	77	365	0%	974%
EL CAMINO	ARASTRADERO	75	39	511	369	581%	846%
EL CAMINO	SHOWERS	241	159	526	565	118%	255%
EL CAMINO	CASTRO	202	184	700	369	247%	101%
EL CAMINO	AMERICANA	53	97	224	97	323%	0%
EL CAMINO	BERNARDO	89	93	89	164	0%	76%
EL CAMINO	HOLLENBECK	195	183	317	384	63%	110%
EL CAMINO	REMINGTON	174	135	409	188	135%	39%
EL CAMINO	WOLFE	200	142	244	261	22%	84%
EL CAMINO	HALFORD	254	165	391	385	54%	133%
EL CAMINO	KIELY	260	222	581	257	123%	16%
EL CAMINO	SAN TOMAS	54	35	108	151	100%	331%
EL CAMINO	SCOTT	134	114	264	114	97%	0%
EL CAMINO	MADISON	36	52	36	442	0%	750%
EL CAMINO	BENTON	18	23	342	23	1800%	0%
SANTA CLARA	TRANSIT CENTER	165	47	165	273	0%	481%
THE ALAMEDA	NAGLEE	283	229	701	297	148%	30%
THE ALAMEDA	HANCHETT	54	52	206	138	281%	165%
SANTA CLARA	CAHILL	119	178	310	285	161%	60%
SANTA CLARA	1 ST	1482	1181	1599	1319	8%	12%
SANTA CLARA	7 TH	284	308	504	501	77%	63%
SANTA CLARA	13TH	76	147	203	267	167%	82%
SANTA CLARA	21ST	86	153	155	544	80%	256%
KING	ALUM ROCK	255	264	502	605	97%	129%
KING	STORY	370	666	561	854	52%	28%
KING	HAVANA	50	205	105	545	110%	166%
KING	TULLY	38	240	133	704	250%	193%
EASTRIDGE	TRANSIT CENTER	0	811	0	811	--	0%

Ten eastbound BRT stops would have more than 500 boardings per day, compared with 2 Route 22 stops in 2000. Ten would have more than 500 people alighting per day, compared with 3

Route 22 stops. The biggest increases would be the King Street stops, Santa Clara and 7th, Santa Clara and 21st, stops near Santa Clara University, and El Camino and Scott, Castro, Shower, and Arastradero.

Not only will more people be boarding and alighting from the BRT route at these stops, there will be more people transferring from the routes that serve the current stops on Route 22 that will not become BRT stops.

6.2 Effects of Fewer Stops on Passenger Transfers

Only 54% of eastbound and westbound passengers board at stops that will become BRT stops.² The percentages are the same for people alighting. It is likely that the percentage of current route 22 passengers who both board and alight at stops that will become BRT stops is less than 30%. Therefore, 70% of current Route 22 passengers will either have to walk further or transfer if they use the BRT.

6.3 Information for People Boarding at Non-BRT Stops

Unless they know the detailed schedules of the BRT and non-BRT buses, people boarding at non-BRT stops will not know if they could save time by walking to a BRT stop rather than waiting for the next bus. For each non-BRT bus stop, VTA could calculate the expected time saving (if any) by walking to the nearest BRT stop rather than waiting for the non-BRT bus. This information could be posted at the stop if the expected time saving is significant.

Passengers also will not know if their trip is likely to be faster if they transfer to a BRT bus or remain on the non-BRT bus. This information for each non-BRT route destination can be posted at that stop.

Both types of information should be posted on the VTA website so that people can also plan their trip from work or home.

6.4 Increased Incentive for Bicycle Use

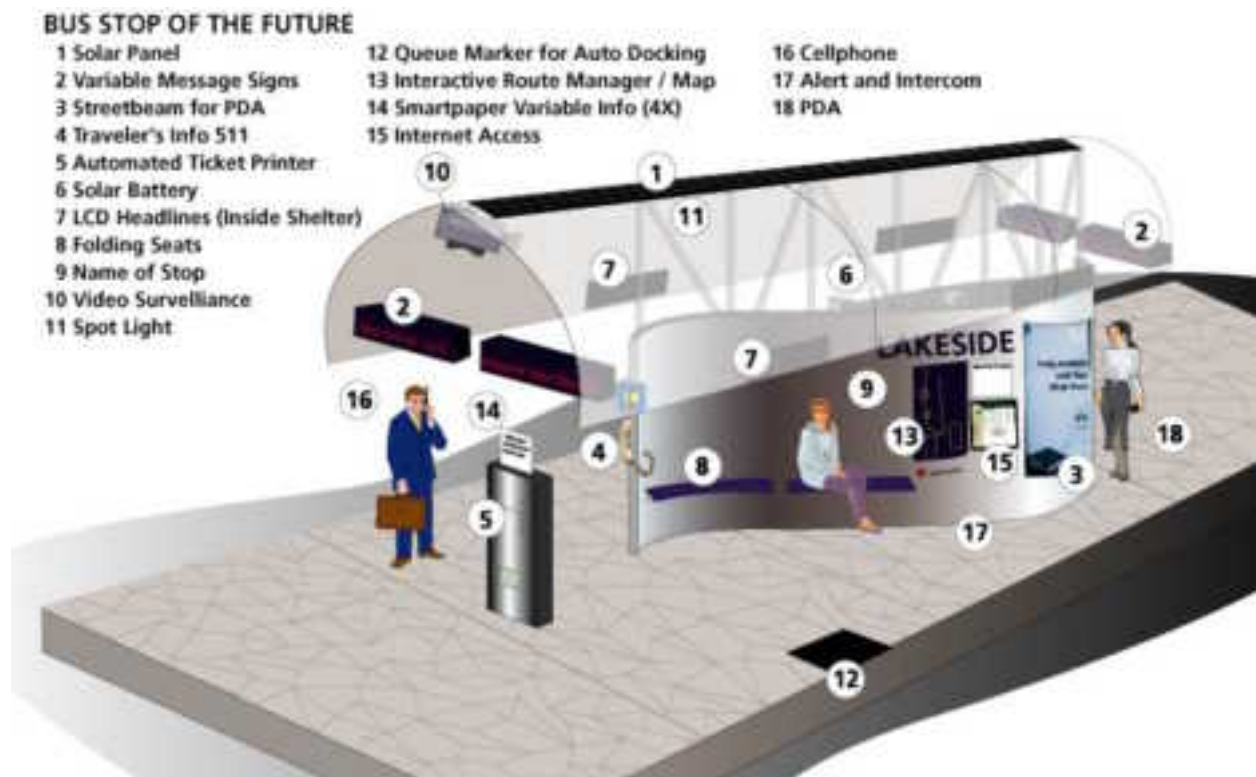
Because the BRT stops will be further from some passengers' homes or work than their current bus stops, there will be more incentive to use bicycles to get to and from the bus. Bicycle storage should be considered as part of the BRT bus stop improvements. VTA should consider installing some sort of secure bicycle parking at locations where people with bicycles board. Anyone who has a long trip to the bus at one end of his or her bus trip but not at the other end, might use a bicycle parking facility if it was secure—some people take their bicycles with them on the bus because they fear that their bikes will be stolen if left at the bus stop. If there are more bicycle riders putting their bikes on the buses, dwell times will increase and more bicycle storage will be needed on the buses.

² Based on J. Unites 2/20/02 spreadsheet showing Route 22 bus stop pairs sorted by passengers boarding

7 Potential Bus Stop Improvements

Figure 18 shows many of the bus stop features currently available. The shelter's electrical components are powered by a solar panel and battery. There are variable message signs that display the time when the next buses will arrive and other important information about the bus service. The shelter has a "Streetbeam" feature which can beam information, such as schedules and maps, to people's personal digital assistants (PDA's), such as Palm Pilots. The shelter has a telephone with a direct connection to the 511 traveler information number. There is an automatic ticket printer; alternatively this could be a machine that dispenses and adds value to an electronic fare card. On the panel inside the shelter is an LCD headline display of the type often seen in banks and other public places. There are folding seats. Note that the curved design of the panel on which the seats are mounted makes the seats less attractive for sleeping. The name of the stop "Lakeside" is prominently displayed. An interactive route planner is available for people to find out how best to get to their desired destination. There is internet access and a loudspeaker and /intercom for announcements. There is a video camera for surveillance. At the curb is an automatic docking system for the buses coupled with a marker so that passengers know where the bus door will be when the bus stops.

Figure 18 - Possible Bus Stop Amenities

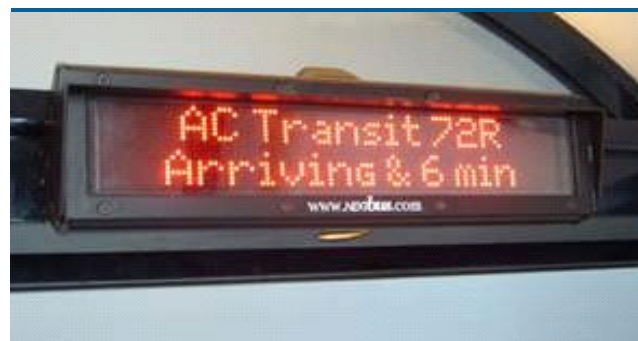


Surprisingly few *new* products and services for bus stops were found. Among the most promising were real-time bus arrival information systems; electronic fare cards; interactive information displays, and solar powered lights, beacons and information panels.

7.1 Real-time Bus Arrival Signs at Bus Stops

Such systems have been employed throughout Europe. London's Countdown system began operation in the early 1990s. In Lyon, France, 500 bus stops are equipped with LCD displays for displaying estimated waiting times. Such systems in the United States are rather new. They have been deployed at Los Angeles metro rapid transit bus stops, at 10 bus stops in Portland, at stops on San Francisco's Fillmore route and at bus stops on other smaller systems, such as San Luis Obispo. Some other systems, such as Seattle, have real time bus arrival information available on the Internet, but not at bus stops. Most systems use GPS-based automatic vehicle location systems. The arrival information is generally displayed on LED dynamic message signs. They display the route and either the number of minutes until the next bus or the arrival time of the next bus. The method by which expected arrival time is estimated varies depending on the communications and vehicle tracking equipment available and the nature of the bus operations. Some systems, such as those used in Seattle and Portland, have been developed by the transit agency. Other agencies use proprietary systems, such as NextBus. Capital costs for signs in the US range from \$3,500 to \$10,000 per sign (Schweiger, 2003). Costs for arrival time prediction models range from \$300,000 to \$500,000. The NextBus system costs are on the order of \$7,000 per bus and \$4,000 per stop for installation and service for 5 years (this includes the GPS unit on the bus), but are less if the bus is already equipped with GPS.

Figure 19 Examples of arrival time signs



The installed systems appear to be popular with riders. A survey of London bus passengers six months after the Countdown signs were installed found that they were reliable and accurate and that 90% of riders looked at them at least once during their wait for the bus. Over 2/3 of passengers felt that they waited for a shorter time (perceived wait time dropped from 11.9 to 8.6 minutes) and that service reliability had improved since Countdown was implemented even though reliability had actually declined. Passengers valued Countdown at an average of more than 31 cents (Schweiger, 2003).

The bus arrival time display, if visible to passers by, serves the added function of informing people who do not use transit about the frequency of the bus service.

7.2 Electronic Fare Payment Systems

Electronic ticketing systems are common on rail systems in the United States and are used on buses in large cities in Europe, and an electronic contact card system is now in use in buses in Hong Kong. But electronic fare systems for buses have not yet been implemented in the United States. The Translink system, currently being tested in the San Francisco Bay Area, is a smart

card system that is intended for use on all bus and rail systems in the area. Over 3,500 people participated in the test of the system, and 90% were satisfied with the system. In a survey of Bay Area transit riders, nearly 70% said they would be very likely to try TransLink. VTA is one of the agencies participating in the Translink project. The Metropolitan Transportation Commission (MTC) and Bay Area transit operators expect to begin the expansion of TransLink® in late-2003.

7.3 Solar-power for Lights, Beacons, Information Panels, and Communications

Solar cells are now available at moderate cost, and if mounted on the roof of shelters can supply power to bus stop facilities at a lower cost than if a power line were run to the shelter. In London 40 bus stops will be using power captured by a specially-fitted canopy and stored in batteries.

Solar-powered lights are available at moderate cost, and are already used on some VTA bus shelters. According to VTA and Clear Channel Communication staff, they have not been the object of vandalism.

One firm offers a solar-powered, passenger-activated bus stop sign with lighted schedule and a beacon to let the bus driver know that a passenger is waiting, at a cost of \$1,500 plus installation (Figure 20)(<http://www.carmanah.com/>). It also offers a solar light that can be used with existing transit signs at stops. These might be used for stops for a feeder service for the bus rapid transit route.

Figure 20 Solar-powered beacon and illuminated schedule display (left and center) and solar-powered light to illuminate existing sign and schedule display



Solar power could also be used for a emergency button, a computer terminal, or any other device with low power needs.

7.4 Conventional Information Displays

For small shelters with relatively small numbers of people waiting, the type of information currently used in VTA shelters is adequate. But where there are crowds, something more visible and larger may be needed. Figure 22 shows freestanding information signs in downtown Berlin. The signs are high enough to be seen from a distance when there is a crowd and the schedule information in the three bottom panels is large enough to read from a few feet away.

Figure 21 Information displays at a bus stop in downtown Berlin



7.5 Interactive Information Displays

Interactive information kiosks have been used in rail transit stations and airports for some time, but at a cost of \$5,000 to \$30,000 per unit they are not affordable for large numbers of bus stops.

Despite the existence of the component technologies, low-cost interactive displays of schedule and other information have not been yet been developed for bus stops. However, the Kowloon Motor Bus Company (KMB) in Hong Kong is developing a Cyber Bus Stop equipped with a touch screen linked to a microcomputer that is linked to the KMB homepage. Passengers can use KMB's point-to-point route search and other information on the KMB website. A web-camera at the bus stop allows management to monitor the bus stop remotely (<http://www.kmb.com.hk/english.php?page=next&file=news/service/news1q02/news2002011801.html>) In Glasgow a similar system is planned, with journey planners and real time arrival information. (Platt, 2003)

Many transit websites, like the KMB website, already have a wide variety of information available, and some have trip planners. Houston Metro (<http://www.hou-metro.harris.tx.us/latest/tripplan.asp>) emails directions users within 72 hours. Helsinki, Finland has a trip planner developed by Novo which markets trip planning software or hosts the trip planning service.

(<http://www.novogroup.com/index.asp?id=589ace088cbb46538b03b1740ccd9843>, In 2000, 44 properties had automated trip planning features on their websites. They are listed at http://www.transitweb.its.dot.gov/RESULT_FEATURES.ASP If the website were viewable at the bus stops, passengers could have a wide range of information available in many languages. This could include the information that the bus passenger survey found to be most important to riders:

- bus schedule
- arrival time of the next 2 buses on each route served at the stop
- current time
- fares for a particular trip
- route maps noting this bus stop for all routes served at the stop and for the system as a whole
- connecting routes and transfer points
- upcoming schedule or fare changes

Except for the bus arrival information, this information is changed infrequently, so little bandwidth would be needed for transmitting it to the bus stop, and a fast internet connection would not be needed. The user could select various types of information via a simple touch screen. The information could be displayed on a large, vandal-resistant display panel that could be read from two or three feet away and that could be viewed by other passengers as well as by the user. The advantages of an interactive, centrally controlled system would be that it could provide a wide range of information in a limited space and it could be easily updated. A disadvantage is that only one person (or possibly more if there were multiple terminals) could interact with the system at any time. This could cause conflicts between passengers, but people are accustomed to waiting their turn for an automatic teller machine, a pay phone, and the like. Furthermore, people would likely use the system only when making a non-routine trip.

Given that an agency already has a website, the components of the system are a computer, touch screen, display panel, internet connection and power at each bus stop. The display could be a conventional display, or something like E Ink (<http://www.eink.com/>) or Smart Paper (<http://www.gyriconmedia.com/smartpaper/index.asp>) which are visible in all light conditions and require little power. Options for internet connections will vary with location, as will installation and service costs. Wireless connections may be an option. Wireless web browsing is already available via mobile telephones and could be used at a bus stop.

Figure 22 Sign Using SmartPaper



7.6 Bus Shelters

Shelters are manufactured in many styles and sizes as can be seen in Figure 17. Features include bench design, information display panels, lighting, trash can, and sign giving the stop name. Costs range from \$30,000 to \$50,000 plus maintenance costs. Below is a picture of a Los Angeles bus rapid transit shelter.

Figure 23 BRT shelter in Los Angeles



8 Matching Bus Stop Improvements with Needs

The “Bus Stop of the Future” in Figure 18 in Section 7 has many attractive features, but all have costs, some quite substantial. Several surveys by VTA and others have found that passengers care more about frequency and reliability of service than about bus stops. So it makes sense to focus most resources on providing frequent, reliable and direct service and limiting bus stop expenditures to those that provide the highest benefits to passengers per dollar spent.

There are many things that most passengers would find useful or pleasant at bus stops, but there are clear priorities. First of all, they want clean surroundings and the schedules of the buses that call at the stop. Somewhat lower in priority but still valued by large majorities are a comfortable place to sit, a shelter, and a light at night, especially to insure that the driver sees them waiting. Most passengers would find signs that tell when the next bus will come very useful and reassuring.

The great majority of Route 22 passengers always feel safe while waiting for the bus, but those who do not would find an emergency phone or alarm button and security patrols most helpful. There are wide differences in the proportions of people who feel safe at different stops. Security patrols should be focused on stops at which the greatest number of people do not feel safe.

Route maps, connecting routes and transfer points, and the current time of day are also valued, as is greenery around bus stops. Much further down the list are other types of information, entertainment, and security cameras.

8.1 Recommended BRT Stop Improvements

Approximate cost information was taken into account in making these recommendations. However, costs in specific instances may be such that some recommendations are not cost-effective, or are not cost-effective in some locations.

Ranking high in terms of cost-effectiveness are 1) maintenance to keep bus stops clean, 2) current, easy-to read, schedule information, 3) benches, and 4) lighting. These should be provided at all stops.

The other facilities appropriate to each BRT stop will depend on stop’s usage and environment. Usage at each BRT stop can be estimated from the information in Table 3. Because of their visible location and high usage, special recommendations are given for the stops at Santa Clara and 1st. Then, for each type of recommended improvement, the locations where it would be appropriate are noted. This is followed by possible improvements that are not recommended.

8.1.1 Special Recommendations for Stops at Santa Clara and 1st

Far more people board at these two stops than at others. Unfortunately, these stops, particularly the westbound stop, also received the most negative comments from the passenger focus group. Therefore, they should have the highest priority for improvement. (Figures 7-9)

8.1.1.1 Consider Prepaid Waiting Area

These are the only stops at which prepaid boarding areas might make sense. They would speed boarding during congested periods and would separate bus passengers from loiterers, who sometimes bother bus patrons. People transferring from other buses could immediately enter these areas, take a seat and wait for the bus. During congested times, each area could be staffed by a person whose responsibilities were to sell passes, collect fares, check passes and transfers,

answer passenger questions, and direct passengers regarding where and when to board. Having a pleasant, knowledgeable, and authoritative person present would give the BRT service an image of quality and would be reassuring to new transit users. At less congested times fare transactions could take place on the bus and the prepaid areas would become simply waiting areas.

Precision docking might be useful in helping the driver line up with the opening to the area.

The design of such waiting areas is beyond the scope of this project. However, the bus stop literature and VTA focus groups suggest that they should have glass walls, should be lit at night, should be clean, and should not be frequented by people other than bus riders. Careful monitoring will be needed initially to determine the level of maintenance needed to keep them clean and free of trash and to limit their use to bus riders.

8.1.1.2 Real-time Bus Arrival Times

Because of its high usage and visibility to non-transit users, these stops are also good candidates for signs giving real-time arrival information. Signs should be mounted high enough that they can be easily seen from anywhere nearby, including the inside of the waiting area. They should show the arrival times of all buses calling at these stops. For buses that layover at these stops, they should show departure times.

8.1.1.3 Conventional Information Displays

Because of crowds at these stops, the signs indicating the stop should be higher than usual, as shown in Figure 21. Schedule information should be posted outside the waiting area on display panels large enough to be read from a short distance, and should also be posted inside the waiting area. Route maps and fare information, similar to that currently provided by VTA could be mounted on the outside and inside of the waiting area.

8.1.1.4 Interactive Information Display

The location of the VTA office building adjacent to the north side bus stop provides an ideal location to test and develop an interactive information display as described in Section 7.5. An Internet connection and power would be available inside the building. Extending these to the outside of the building should not be too costly. The display could initially link to the VTA website. Over time the website and information display could be enhanced with new functions and translations of basic information into other languages.

8.1.1.5 Safety/security

Because people waiting at these stops are more likely than those at other stops to not feel safe because of non-bus riders congregating at the stop, security patrol efforts should be concentrated there, both to reassure bus riders and discourage loitering by others. The pre-boarding areas could have emergency buttons or phone. If they were equipped with web cams and wireless connections, they and the adjacent areas could also be monitored regularly by someone stationed in the VTA offices on the north side of this intersection. It is important that the waiting areas not become night time homeless shelters or venues for drug dealing.

8.1.2 Potential Sites for Bulb-outs

The westbound stop at King and Story is the third busiest stop and will be even busier when it becomes a BRT stop. It does not have a shelter, only four benches. A bulb-out would provide

room to accommodate a shelter and additional benches. The westbound stop at Alum Rock and King also has limited space (Figures 10 and 11), and boardings could more than double. See *TCRP Report 65, Evaluation of Bus Bulbs*

8.1.3 Real-time Bus Arrival Signs

Signs with real time bus arrival times are most useful where there are many people boarding and where buses are likely to be behind schedule. Because buses tend to get off schedule as they progress along the route, the stops nearer the end of the route should have priority over equally busy stops nearer the start of the route. Using these criteria the westbound stops with the highest priority for real time arrival signs would be Santa Clara and 1st, El Camino and Showers, El Camino and Pastoria, Alum Rock and King, and King and Story. The eastbound stops with the highest priority would be Santa Clara and 1st, The Alameda and Naglee, King and Story, King and Alum Rock, Santa Clara and 7th, and El Camino and Castro. If funding permits, real-time arrival time signs should be considered for all stops with more than 500 people boarding per day. It is assumed that the buses would leave their initial stop at either the Palo Alto or Eastridge Transit Center on time. Therefore the signs giving times until departure could display the scheduled departure times, and would not need real-time information.

8.1.4 Route Signs and Conventional Information Displays

Although the features will differ from stop to stop, the signs and information display should have a common format that is visually coordinated with the shelter designs at the BRT stops. *TCRP Synthesis 17, Customer Information at Bus Stops* has examples of many different sign and schedule layouts and *TCRP Report 12, Guidelines for Transit Facility Signing and Graphics* has information on types of signs and sign standards. Both are available from TCRP OnLine <http://www.tcrponline.org/bin/publications.pl>.

The BRT route sign should be high enough to be seen over people's heads. This could be combined with a schedule information sign mounted on the same pole at eye-level. If power is available at the shelter, both could be lit. If no power is available a solar light such as discussed in section 7.3 could be considered.

8.1.5 Shelters

All BRT stops should have shelters and sufficient benches to accommodate the increased number of passengers. Where there will be significant numbers of people alighting and boarding, the stop and shelter should be laid out so that passengers alighting from the rear of the bus can leave the area without getting in the way of those boarding. Bicycle parking or lockers should be provided where possible and likely to be safe. Where bus stops are located near shops, the possibility of valet parking (such as at the Palo Alto Caltrain station) operated by one of the shops could be investigated.

As noted in section 5.5.4, people who participated in the focus group generally liked shelters that have a lot of glass. The shelter that got the most positive responses, number 4 in Figure 17, was a glass enclosed box with a flat roof -- a shape remarkable similar to the existing VTA standard shelter. It had a long bench with a backrest, but some focus group participants were concerned about homeless people sleeping in the shelters and thought benches with dividers might be a good idea as shown in numbers 2 and 6 in Figure 17.

In developing a design for the shelters and signs input should be sought from bus passengers and potential bus passengers to make sure that will meet their needs and attract them.

8.1.6 Security/safety

The stops at which the highest proportions of people did not always feel safe were the two termini of the route, the Eastridge Transit Center and the Palo Alto Caltrain Station and stops on Santa Clara Street and The Alameda in downtown San Jose. The measures most important to people who did not always feel safe were emergency alarm button or phone and security patrols. One security patrol could operate along The Alameda and Santa Clara Street in downtown San Jose. Perhaps the Eastridge Transit Center could be patrolled by the shopping center security force. Alarm buttons could be installed at these stops that would call the security patrol that was making regular rounds of these stops.

Lights at the bus stops ranked high in terms of safety with respondents to the 2002 bus passenger survey and with the 2003 focus group. All shelters should have lights. If there is no power, solar lighting can be used.

8.2 Not Recommended

8.2.1 Ticket Vending Machines

Ticket vending machines are expensive and take up valuable sidewalk space.

A high percentage of VTA patrons already use passes, and cash fare payment does not seem to increase dwell time. Furthermore, the Translink fare card is likely to be available for VTA passengers sometime in the future. Passengers can be encouraged to use Translink through pricing policies that make Translink always more economical than passes or cash and that do not require too large a monetary outlay at one time. Convenient locations for buying and adding value to Translink cards is also important. These might be a stores located near BRT stops, at the Palo Alto and Eastridge Transit Centers and the VTA office at Santa Clara and 1st.

8.2.2 Surveillance Cameras

These ranked lower than other safety/security measures in the 2002 bus passenger survey and with people in the focus group, who felt that they do not actually increase safety. Although they may be useful in prosecuting someone after a crime has been committed, and thus might act as a deterrent to crime, unless someone is watching them, they are not likely to be effective in preventing crime. Furthermore, some people feel they invade their privacy.

8.2.3 Banners

When shown pictures of banners that might be used to identify or promote BRT, the focus group was quite negative. It may be that banners do not have the image of permanence that people want to associate with bus stops.

8.2.4 Kiosks

Kiosks with electronic data (from \$30,000 installed) do not appear to be good investments for the planned route because of their high cost and space requirements. Many of the functions that they could provide, such as trip planning and schedules and fares information in several languages, this could be provided with a system as described in sections 7.5 and 8.1.1.4.

9 Final Words

Whatever actions VTA takes regarding the BRT bus stops, they should indicate respect for the passengers. Any lights, emergency buttons, or real-time signs should be maintained in working

order. The shelters and benches should be in good repair and clean. The information should be clearly displayed and current. The area around the stop and the shelter should be trash-free. VTA should make sure that their passengers are not hassled, pan-handled, or otherwise subjected to socially unacceptable behavior while they wait for the bus. Out of date schedules, trash, burned-out lights, and drug dealing at bus stops tell passengers that they are not very important and do not make them feel good about riding the bus.

Of course, the type of maintenance described above has costs. Perhaps the advertising company that maintains the shelters can be held responsible for more maintenance and cleaning of the area *around* the shelter. VTA or police patrols could be redeployed to the areas at which passengers feel least safe. Police can be motivated to put a higher priority on keeping downtown bus stop locations free of undesirable behavior.

Respect for passengers is the key. In the words of one focus group participant, bus passengers want "... cleaner, more aesthetic stops and shelters..." that allow them "... to feel more respectable while waiting."

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Appendix A
BUS PASSENGER SURVEY
June 2002

What would make your bus stop better?

Researchers at the University of California are studying ways to improve bus stops. Please help by filling out this short questionnaire. Just return it to the person who gave it to you before you leave the bus. We do not need your name; all results are anonymous. Your bus service will not be affected if you do not wish to participate. Thank you very much!

1) How often do you ride a bus? (Please mark the box next to your answer)

4-7 days a week | 1 to 3 days a week | 1 to 3 days a month | First time on bus

2) Where did you get on this bus? (Please identify the location of the bus stop)

(Street) _____ (Cross street) _____

3) What information do you want to see at this bus stop? (Please mark the items you think are either very useful or somewhat useful to you, and those that would be most useful to new users.)

	Very Useful To Me	Somewhat Useful To Me	Useful for New Users of This Stop	Comments
a) Schedule				
b) Route Maps				
c) Fares				
d) Connecting routes & transfer points				
• e) When next bus will arrive	•	•	•	•
• f) Current time of day	•	•	•	•
g) Customer Service phone #				
• h) Updates on bus services	•	•	•	•
• i) Bus company web site address	•	•	•	•
• j) Other transit agency information	•	•	•	•
• k) Map of activities close to bus stops	•	•	•	•
Types of activities:				
• 1. shops and businesses	•	•	•	•
• 2. movies & entertainment	•	•	•	•
• 3. government services	•	•	•	•
• 4. activities for children & families	•	•	•	•
• 5. parks and recreation	•	•	•	•
• 6. medical and health services	•	•	•	•

• 4) What other information would you like to have at this bus stop?

5) Would you take more bus trips if bus stops had more information at them? Yes No

6) Would you take more bus trips if bus stops had information in another language besides English? Yes No 6b. If yes, what language?

7) Do you always feel safe waiting at this bus stop? Yes No

8) What would make you feel safer at this stop?	Much Safer	Somewhat Safer	No Safer	Comments
• a) Better lighting	•	•	•	•
• b) Security Camera	•	•	•	•
• c) Knowing time of next bus	•	•	•	•
• d) Pay phone nearby	•	•	•	•
• e) Security patrols	•	•	•	•
• f) Emergency phone	•	•	•	•
• g) Emergency alarm button	•	•	•	•
• h) What else would make you feel safer at this bus stop?				

• (Please turn the page over)

9) Would you take more bus trips if you felt safer at bus stops? Yes No

10) What do you like to do while you wait for the bus? (Please mark all that apply)

• a) listen to music <input type="checkbox"/>	• b) talk on a pay phone <input type="checkbox"/>
• c) read <input type="checkbox"/>	• d) check pager <input type="checkbox"/>
• e) talk to fellow passengers <input type="checkbox"/>	• f) Visit nearby stores or run errands <input type="checkbox"/>
• g) eat or drink <input type="checkbox"/>	• h) Use a computer <input type="checkbox"/>
• i) talk on a cell phone <input type="checkbox"/>	• j) Other <input type="checkbox"/>

11) What would make your waiting time more pleasant?

	Much More Pleasant	Somewhat More Pleasant	No More Pleasant	Comments
• a) More benches	•	•	•	•
• b) More comfortable benches	•	•	•	•
• c) Cleaner surroundings	•	•	•	•
• d) More trees and flowers	•	•	•	•
• e) Better light to read by	•	•	•	•
• f) Scrolling sign with headlines and announcements	•	•	•	•
• g) Something to entertain children	•	•	•	•

• h) Internet access	•	•	•	•
• i) Newspaper stands	•	•	•	•
• j) Community bulletin boards	•	•	•	•
• k) Public art or poetry	•	•	•	•
• l) A bus shelter	•	•	•	•
• m) A bigger bus shelter	•	•	•	•
• n) Other things that would make waiting time more pleasant at this bus stop?				
•				

12) Would you take more bus trips if waiting time were more pleasant? Yes No

13) What is your age? Under 18 18-25 years 25-64 years Over 65 years

14) Are you? Male Female

15) Do you use the internet? a) At home b) At work or school c) Other locations d) Do not use the internet

16) Do you own any of the items? (Please mark all that apply)

a) 1-way pager <input type="checkbox"/>	b) cell phone <input type="checkbox"/>	c) Palm Pilot or other Personal Digital Assistant (PDA) <input type="checkbox"/>	d) 2-way pager (e.g. Blackberry)? <input type="checkbox"/>	e) f) portable or laptop computer? <input type="checkbox"/>	f) other wireless device? <input type="checkbox"/>	g) none <input type="checkbox"/>
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17) Do you have any other comments suggestions for improving your bus stop?

Thank You!

For more information or questions, you may contact Partners for Advanced Transit and Highways, University of California at Berkeley, Richmond Field Station, Bldg 452, 1357 S. 46th Street, Richmond, CA 94804-4698 or call (510) 231-9409



Appendix B

Bus Stop Focus Group Transcription

June 19, 2003

7:00-9:00 pm

Administrators
Joy Dahlgren
Rachel Finson

Participants
Andy
Carolyn
Delece
Doug
Gregg
Margaret
Shaunda
Wendy

The ----- symbol indicates the beginning of a new discussion topic.

Rachel/Joy: INTRODUCTION – WELCOME

Rachel: Specifically this focus group is about bus stop shelters and what we're looking to do is to try to assist BTA and other transit agencies in understanding what works and doesn't work about bus stop shelters, what will make it more pleasant for you to wait, and what will attract more riders who might be more willing to take a bus if they felt more comfortable about the bus stop. So we're going to be going through, showing you some existing current conditions, and then we're going to talk to you about some improvements and again we'll get your feedback along the way on what works and what doesn't about these bus stops. I'm going to start by going around the room. First of all, is everyone here a bus rider?

All say "yes."

Rachel: Let us know why you're riding it, if it's for career purposes only, for recreation, if the bus is your only form of transportation or if you go back and forth between the car and bus. Let us know if there is a shelter at your current stop, whether it's an actual shelter or whatever is there. That would be helpful. Do they have schedule information at these stops and things like that.

Doug: I take the bus everywhere. It's my only mode transportation. I stay here in San Jose on the weekdays and on the weekends I go to Morgan Hill. The bus stops in Morgan Hill...they don't have any bus stops or schedules or any seats or lights.

Delece: I take the bus everywhere. Mostly I depend on it to go to work and stuff. There's no seating at my bus stop; you just stand there and you wait.

Rachel: Is there a shelter?

Delece: No.

Margaret: I take the bus occasionally. My husband and I share a car, so if he needs to use it I take the bus. I also bike. I use the bus to supplement my bike in getting around. Sometimes there's a shelter at my stop.

Rachel: What kind of shelters are there

Margaret: The one that I usually use has a shelter, but sometimes not. Sometimes it's just a sign.

Andy: I use mostly unsheltered bus stops.

Gregg: The bus is my only means of transportation. I have two jobs so I work 6 am to 11 pm), and I commute on the bus to each job. There's no shelter at none of these. There's a bench at one of them (at Capital and Allamont), but other than that there's no shelter.

Wendy: I mostly take light rail, so there's kind of a shelter and when I do take the bus there's only a bench (no light or garbage can).

Carolyn: I don't drive yet in America, but I will. I take the bus everywhere; I start work at a really early time at the San Jose Airport and so I use the light rail and bus. I'm looking for another job, so I have to phone up and get the information about where I'm going and write it down. Sometimes there's bus shelters and sometimes not, but they're never in good condition

Shaunda: I take the bus everywhere; I take the Caltrain also. There's no shelter on some stops and no time schedules at all the stops.

Rachel: How many take buses after dark?

All raise hands.

Joy: I will show pictures of bus stops, and I will pose questions as we go along. Everyone please write down any questions you might have. We'll discuss them when I get through with the slides. *Shows slides.*

1. Palo Alto bus stop
2. typical bus stop with ads
3. another stop on El Camino with a shelter and with an information panel
4. a stop with matching garbage can
5. a shelter with wooden bench
6. main stop downtown
7. stop with people waiting behind the shelter
8. stop with lots of greenery

9. another stop

Joy: Do any of you wait at stops that have signs?

Margaret: They took all the signs down recently in El Camino.

Wendy: A good sign would encourage people to ride the bus. Otherwise you don't know when you're waiting in the evening when the next bus is coming.

Joy: Do most stops have lights...that work?

All: No.

Doug: No, most have lots of graffiti all over them.

10. narrow stop

11. stop with a bench close to street

12. stop with a typical information display

13. stop with lots of trash cans

Joy: Do people usually use these garbage cans?

Wendy: No, they are usually overflowing. I've adopted two stops, so I'm aware of the garbage.

14. another shelter where people walk behind it

15. stop next to a shopping center

16. end of the line stop

Rachel: We're getting the sense that there aren't many shelters out there. How important is a shelter to you?

Gregg: Very important when it's raining and you're unprepared (when you have no time to check the weather forecast). In the sun, it's hot and it becomes overwhelming.

Doug: Especially at night when you're waiting for the last bus, there's a sense of security with a light. I feel safer when it's well-lighted.

Rachel: Everybody lit up when we asked about information. Is it more important to have good information or a shelter?

All: Bus schedule is more important.

Doug: Then you would know of how much time you have to wait. They're good when you leave the house in a hurry and don't have time to check the schedule. Sometimes I'm late and I run out there and don't know when the bus is coming and I wait out there for hours.

Gregg: A detailed map is good for people new to the area.

Wendy: Many of us have cell phones with automated info—it's excellent.

Rachel: In terms of an information sign, what kind of info do you want to know?

Wendy: Just a schedule. It's good to know it comes every thirty or sixty minutes, but how long ago did it pass? If you don't know the schedule, then you won't know if your bus has passed.

Joy: Are the buses usually on schedule?

Delece: Sometimes. Sometimes they don't show up (like if one bus breaks down), and they don't dill in and you have to wait for the next time it comes.

Rachel: Does BTA have an automated information?

Wendy: Yes.

Rachel: Do all of you use automated information?

Several people: Yes.

Margaret: I use it, but it's a pain because you have to go through all those menus. I would like BTA to have a next bus feature like in San Francisco.

Gregg: You miss the bus by the time you're done (with the automated info).

Wendy: It's a decent system.

Rachel: Are there schedules at bus stops?

All: No.

Delece: Downtown is the only place that I know.

Margaret: They used to have them in El Camino, but they took them down a couple months ago, and I really miss that.

Rachel: As we pointed out in the slides, sometimes the shelter is in the back with people walking in front. Sometimes there's a shelter in front with people walking in back. Does that make a difference in your comfort level while you're sitting and waiting? I guess most of you don't sit and wait because you don't have shelters...

Margaret: If the stop is not set back, then people who aren't taking the bus can walk behind it. Then the bus driver will know who's waiting for the bus and who isn't. If the stop is moved up, I'm nervous about whether the driver will see me or not; if the shelter is at an angle then the driver can see me.

Wendy: If they could tilt them to face them with the bus coming...

Doug: There are no schedules or lights for six or seven stops way out in Morgan Hill; I would prefer if they were there.

Joy: I'm going to show a group of shelters. I want to get a sense of what you think are good and bad features. The first slide has advertisements and divided seats (do you like this or prefer a bench?). The second slide shows a bench with different sized seats, and the last slide is a standard BTA shelter.

Rachel: What is good about the shelters you're looking at (*shows slide of all stops*)?

Doug: They're in a clean neighborhood. If you're in the middle of no where, it is better to be in a shelter like that—that's clean and lighted.

Gregg: My only concern is that I see many homeless people at bus stops—this makes me feel uncomfortable.

Margaret: #1 slide is on the corner, so it's difficult to tell where the bus will pull up, and there are no schedules, nothing that says what route it is.

Rachel: I'm hearing a bit of a concern that drivers don't see the passengers all the time...

Doug: The bus driver can't see inside of the shelter.

Delece: On the #3 and #4 slides you can see passengers.

Rachel: Have you all been left behind because a driver didn't see you?

All: Yes.

Andy: Part of the reason is that body language at stops is ambiguous. A driver might say you didn't give a sign that you wanted to get on the bus, and drivers say that anyone can wait at a stop and they're not obligated to leave the stop when the bus pulls up. The driver won't necessarily know who is going to ride the bus.

Gregg: Sometimes at a stop, three or four buses will come, and I wave the bus by to tell them I'm not going to take it.

Rachel: Which stop do you like?

Most: #4

Margaret: #4 is OK. With #3 if it's raining with wind, I would be concerned that there's not enough protection.

Wendy: #2 is pretty, has good visibility; it's a good shelter from the wind and rain, and it has a garbage can.

Rachel: Do we agree that #2 is OK?

All: Yes.

Margaret: At the stop with different widths, it is strange or awkward when you want to sit down.

Wendy: It looks like only there people can be there.

Rachel: What would make you feel more secure?

Wendy: Lights

Rachel: Are all of you waiting at stops with no lights at all—where you have to jump out at the driver to tell them you're waiting?

Most say "yes."

Rachel: Is there anything about a shelter that would make you feel better?

Margaret: Clear glass—sometimes shelter have opaque stuff. Also, ads block visibility.

Wendy: I don't like ones with metal holes; it gives me a headache.

Doug: Some people break the glass to take the ads, so some other type of glass would be good. I've been to shelters with broken glass (and nothing else).

Joy: *Shows Translink card and introduces the purpose of this card.* How many of you use passes?

All: I do.

Margaret: I use a day pass and single ride passes.

Rachel: Monthly passes? *3 say yes.*

Rachel: Day passes? *4 say yes.*

Andy: I get a semester pass that's charged through my tuition at a discount.

Joy: How many of you would use this?

Only Andy raises his hand.

Margaret says "yes."

Margaret: It's good for affluent users; for people watching their budget (which is most bus riders) we would feel uncomfortable.

Gregg: Now that I better understand how card works, I might consider it. I've sometimes had to overpay for the bus (when I didn't have the correct change), and sometimes I've been short of change and I've been embarrassed, so Translink would be useful.

Andy: I was a pilot tester for this card. In Golden Gate, they charge by zone. If you're unfamiliar with the are (which zone you are in) it can be hard. In Marin County you have to pay when you get off...

Joy: *Shows LED sign for L.A. train. Shows stop with a computer terminal. Shows stop with seats attached.*

Rachel: Is this better than what you have now?

Doug: On the Morgan Hill route, there's just a stop with a pole and a sign that says the 68—I would prefer if it had a seat. Drivers passing the stop may only see a poll and might pass up passengers. That happened to me on the way here; I was the last person to board, and the bus driver shut the door on me. The light turned green and he took off...

Joy: *Shows stop with solar powered unit; explains that at night you can push a button and a beacon lights up so that a driver won't pass you by.* Is that good?

Many: Yes.

Andy: There are some stops in the middle of nowhere that light up when you stand there; I read about these lights in the BTA newsletter.

Rachel: Would it make you feel secure if there was a bright sign?

All: Yes.

Gregg: It'd be better than nothing.

Joy: *Shows sign with real time info. Shows "Ride ON" sign.*

Carolyn: A clock would be a good addition.

Joy: *Shows sign in Berlin. Shows an idea for stops with banners that BTA may use for a special bus service.*

Joy: One of the things I'd like to talk a little about is having computer terminals at bus stops. And now the technology is almost here (we have wireless, etc.) With interaction, you can get all kinds of information. A person could get a schedule in Spanish; you can have a lot of languages. You could also have some kind of entertainment. The big problem is who chooses what information you're going to get.

Margaret: Honestly, I just want my bus to come; all the other stuff is nice, but I just want better service.

Joy: What do you mean by better service?

Margaret: I want the bus to be frequent and fast; having a nice stop is nice (should be pleasant for people to be at) but I don't want to wait for a half an hour wondering where my bus is. If the agency could focus on that, it would be great.

Rachel: How do others feel about what Margaret is saying?

Wendy: Knowledge of what time the bus is coming is most important. We've all stayed at bus stops that stink and are uncomfortable, but if we know what time the bus was coming we wouldn't be uncomfortable.

Carolyn: Buses in Berlin are clean, on time, and have a video sign on the bus that tells you what stop your at.

Wendy: Yes, it's hard to know where you're at when you can't see out the windows (at night when the bus is brightly lit inside and it's dark outside.)

Gregg: Four dollars is really hard for me to afford. If nicer bus stops will raise bus fares, then it's not worth it.

Rachel: So it's not worth it to have improved bus stops for higher fares? Is that the general feeling?

All say "yes."

—10 minute break—

Rachel: *Starts the second half.* So it's important to have a schedule, to know the fare?

All say "yes."

Delece: On bus 180 you pay with a day pass plus 85 cents...I didn't know about that.

Rachel: How important are maps at bus stops?

Margaret: *Shows her collection of system and local bus maps.* Sometimes when last bus has come by, you have to figure out another way to get around. System maps can provide you with alternative ways of getting home. I get the specific maps because sometimes with the system map it's hard to tell where the buses go and stop.

Joy: So a system map is more important than a map of that particular route?

Margaret: Both are important.

Rachel: Margaret, why you're carrying all those maps?

Margaret: A couple maps are ones I use frequently (I'm tired of missing the bus while calling up "transit info"), and I have the other maps to show BTA board members; they are handy if you're not familiar with the routes.

Doug: The things that gets me is you get on a bus and you need that bus' schedule, and you get every other bus schedule except that one.

Shaunda: I carry maps because I go to San Francisco and Los Gatos and when you call the info line I am given the wrong information.

Rachel: You don't trust information at bus stops?

Shaunda: Right. *Others nod in agreement.*

Gregg: Sometimes people steal bus schedules. Also, the first time I started to ride the bus, I called the info system (to get bus information), they didn't know about my bus, and they gave me inaccurate information.

Wendy: I've never had a problem with calling them, but they've changed hours so they can hang up on you if you've been on hold and they close.

Rachel: We're hearing that all of you use phones and maps at some point. Do you go on the internet to check schedules?

Wendy: No.

Andy: If I take a route that I'm unfamiliar with, I can look online.

Rachel: What if there could be a computer terminal at the bus stop where you could access information?

Gregg: It would be good if you could print out a schedule. Instead of having to carry maps around, you could carry little printed maps.

Doug: In the light rail stations, a terminal tells you when the next bus is coming (I would like bus stops to be similar to train stops).

Rachel: So if you could have bus stops with information similar to what you get at a light rail station, that would be good?

Doug: Yes.

Margaret: An announcement on the bus of what stop you're at would be good. I used a new route and wasn't familiar with it and wasn't sure if I was at my destination yet. Also, there was a young woman who got on the bus and had no idea where she was. She had to go to the DMV;

she was totally at the mercy of the driver's knowledge. If someone tells here to get off at a certain street, she would know if its 10 minutes away or...

Rachel: While you're waiting, what would make it more pleasant?

Wendy: A seat

Doug: On Friday and Saturday nights I take the train and see people smoking crack, so it would be more pleasant if there were more undercover security or cops at the stops.

Wendy: I often wait at a stop in a bad area.

Rachel: What makes you feel insecure at a bus stop?

Delece: All the dope fiends.

Doug: People walking up asking if I'm sober, if I got anything.

Wendy: I've been out at dark, and I feel like a target. I've got my bag, and I'm just a mom and anyone could take what they want...

Rachel: Would security cameras make you feel better?

Majority Answer: No.

Doug: If I take someone's purse, by the time I'm gone it's too late – the camera is useless

Delece: I would feel a little more secure with cameras.

Gregg: Undercover security guards are the police's concern; uniformed security guards like transit security would be a plus. I see them occasionally on the bus; the guards automatically calm down youth that get on the bus.

Rachel: Having a visible presence of security guards is better than having cameras?

Most: Yes.

Joy: We found that people felt least secure downtown at light rail stations where there were shelters because of the people there...

Rachel: Would a panic button make you feel more secure?

Carolyn: Can you imagine the neighborhood kids?

Wendy: How quick can anyone respond? If they're going to take your purse or hurt you, it's done, they're gone.

Gregg: I recently picked up a new job (tow trucking), and on all our cars there's a panic button we can use; it shows our location. There was a time when a passenger fell off the bus, and the driver couldn't get out of his seat and I got off the bus to help him (and was late to my appointment because the bus drove off). So if the button could be used well it could work.

Rachel: How many of you carry cell phones?

3 people raise their hands.

Rachel: If you had a cell phone and could call 911, would you feel more secure?

Wendy: Yes, I'd use 911.

Doug: There needs to be a way to keep everyone (like little kids) from pushing the button. If you can activate it with a bus pass that you could push against a sensor...

Rachel: ...some way to keep everyone else from using it...?

Doug: Yes.

Gregg: If you have a security problem, sometimes they're prioritized.

Carolyn: I'd want elderly people to be able to use a panic button. Also, I can see the frustration if there's a queue at the computer terminal...

Margaret: If it's night and there's nothing around and it's not well-lit, I feel isolated. Sometimes lighting can make a difference and other times the light is not functional.

Joy: Do you feel better if the stop is near a shopping center?

Margaret: If you're by a restaurant that's open, so long as it's not too unsavory, then yes.

Wendy: But you could be at a stop where no one's around,

Rachel: Give us the top one or two things that BTA could do to improve situations at bus stops.

Doug: Schedule at stops, lowered prices.

Delece: Schedule at the stops, light, lower rates

Andy: Provide the hours of operation for each line, and a system map (something that tells you when a bus is used only during certain hours).

Margaret: Real time arrival info, route map and information at the stop and on the bus announcing where you're at.

Gregg: Cleanliness at the stops, a sense of security, lights would help.

Wendy: Schedules at stops, some kind of frequent rider program for fares. Some business and apartment complexes have programs like the eco program where these people pay nothing—those of us with big rents have to pay a big price—I've paid for my whole family for the whole year and coming up with \$1,200 in one chunk is hard.

Carolyn: Scheduling information, just have the main cross streets in bold type, route information, security, lower prices. I'm just looking for a service that works.

Shaunda: Scheduling and light.

Margaret: One thing we haven't talked about is that at a lot of bus stops (in Palo Alto) there are no toilets. I wish BTA or the City of Palo Alto would install a toilet there. This is a huge indignity. Even a coin-operated toilet would be better. People wait a long time and have to go in the bushes or the tunnel. There is a toilet that only drivers can use; I'm friends with the bike station manager there, so I've been able to use it.

Joy: CLOSING COMMENTS