

Transit Alternatives Report

JUNE 10, 2016

Santa Clara Valley Transportation Authority

JARRETT WALKER + ASSOCIATES

Table of Contents

1

Introduction 3

Key Points from the Choices Report. 4

Important Cautions 7

Overview of Outcomes 7

2

Goals and Ideas Common to All Alternative Concepts 8

A Consistent Set of Service Categories 9

Incorporating BART into Santa Clara County’s Transit Network 10

Light Rail Assumptions. 11

Greater Focus on Frequent Grid 11

Simplification and Streamlining 11

New Rapid Line to Berryessa BART 12

New Links to San Jose Mineta Airport 12

Weekend and Evening Expansion 13

3

The Alternative Concepts 14

Services Not Shown but Retained 15

Relevant Services Provided by Others 15

Frequencies and Service Spans 15

Network 70. 15

Network 80. 15

Network 90. 15

Introducing the Concept Maps 16

Existing Network Map 17

Network 70 Map. 18

Network 80 Map. 19

Network 90 Map. 20

Background Services Map 21

4

Outcomes: Liberty, Opportunity, and Ridership Potential 22

5

Outcomes: Coverage and Access to Frequency 44

About this Analysis. 45

Coverage of Residents. 45

Coverage of Jobs. 46

Coverage of Current VTA Boardings 47

Coverage of Low-Income People. 48

Coverage of Minority Residents. 49

Title VI Communities 49

A

Appendix: Frequency Tables 50

1 Introduction

The Next Network process, part of VTA's Transit Ridership Improvement Program, aims to improve the design of VTA's bus network structure to meet community goals. These goals include increased ridership, better connections, and improved efficiency.

This *Alternatives Report* is the second report in the Next Network process. The first, the *Choices Report*, explored the existing performance of the agency in the context of what is known about each of the communities it serves. The report studied how ridership data (by stop and by trip) relates to surrounding land uses and demographics, and also to the levels of service provided.

Key Points from the Choices Report

Readers of this report should review the Executive Summary of the *Choices Report*.¹ The following are a few key highlights, but there are many important insights in the Executive Summary that form the basis for the current alternatives and recommendations.

We Know What High Ridership Services Look Like

The causes of high ridership are not a mystery:

¹ VTA Choices Report - <http://bit.ly/1SOQYOL>

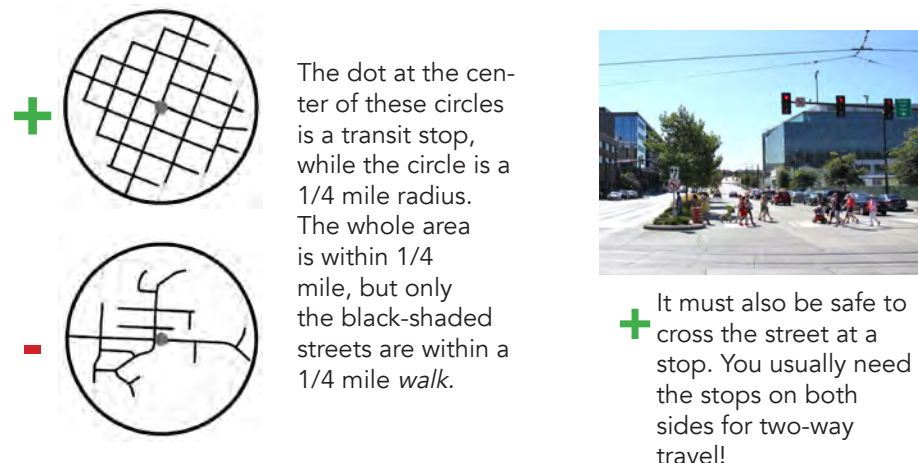
- Like most transit agencies, VTA achieves its highest productivity (ridership / service cost) when it runs high **frequency** services (every 15 min or better all day) along corridors featuring high **density**, reasonable **walkability**, and **linearity** – that is, a direct path of travel without deviations (Figure 1). All other things being equal, long lines are more productive than short ones, because they are useful for travel to more destinations. El Camino Real and Stevens Creek Blvd are among VTA's most productive corridors because they have all of these features. Lowest-performing VTA routes have none of them.

- The power of high frequency lies in its three independent benefits:
 - Transit is always ready when you are. High frequency means that your life is not constrained by the bus schedule, and that you can expect service close to whenever you need it. Spontaneity is possible only with frequent services.
 - Connections between lines are fast, so you can travel with little delay across the entire frequent network.
 - Reliability is less of a worry, because even if there is a disruption, another bus will be along soon.
- High frequency lines are especially productive when they run in a **grid pattern**, as shown in Figure 2, so that frequent lines intersect other frequent lines. This maximizes the number of destinations that can be reached at high frequency.
- As discussed in the *Choices Report*, the relationship between productivity and the aforementioned features is also observed at most similar transit agencies across the world. This is not surprising; how transit interacts with its surrounding urban environment can be explained geometrically based on these features (frequency, density, walkability, linearity, and a high-frequency grid pattern), which

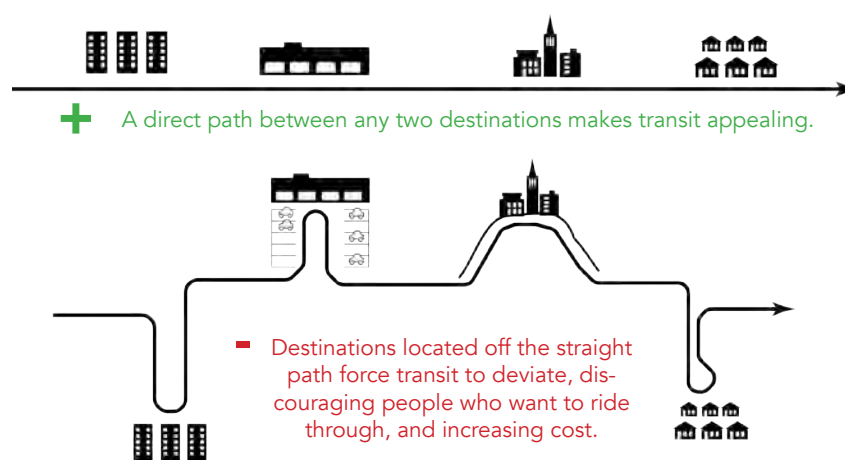
DENSITY How many people, jobs, and activities are near each transit stop?



WALKABILITY Can people walk to and from the stop?



LINEARITY Can transit run in reasonably straight lines?



PROXIMITY Does transit have to traverse long gaps?

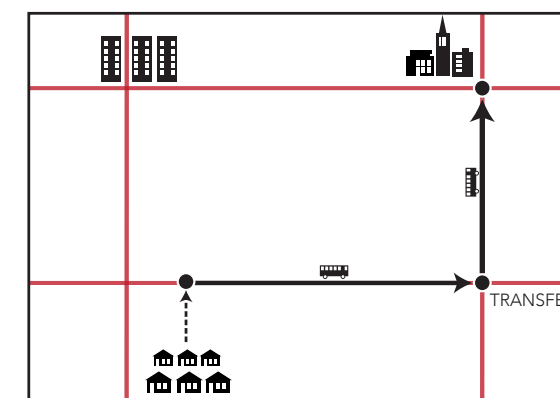
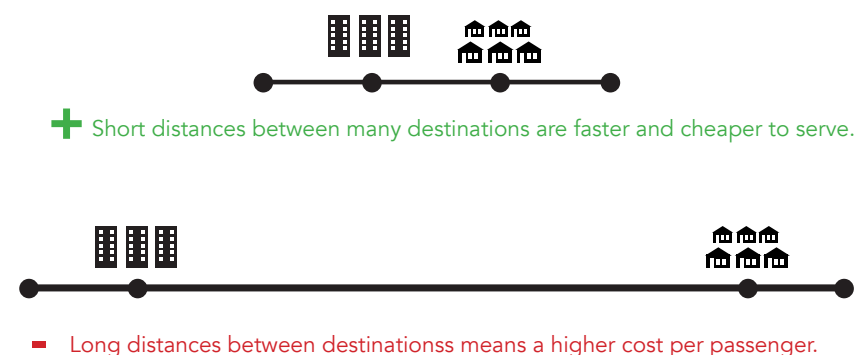


Figure 2: A high-frequency grid structure is most suited to a city with multiple activity centers and corridors, where many people are traveling to many different destinations.

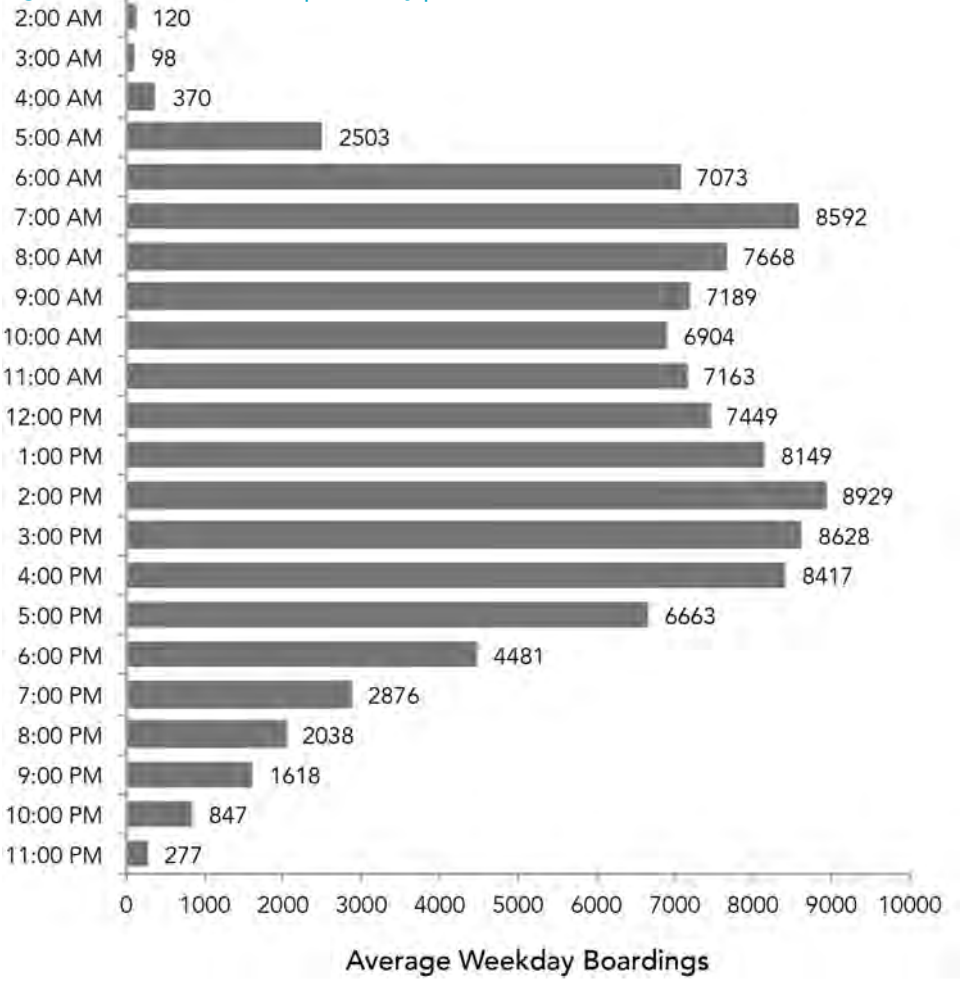
Figure 1: High density, walkability, linearity, and proximity contribute to high ridership potential.

together, create a more useful, and thus higher ridership, system.

Peak-only Commute Service Is a Challenging Task for VTA

- **Peak-only service is expensive.** While it may appear that VTA could grow ridership by investing more in peak commuter express services, the high marginal cost of peak-only service means that very high loads are needed to justify this service in ridership terms. This high marginal cost arises from the inefficiency of very short work shifts, and also of owning, storing, and maintaining a fleet that is used only briefly. Short shifts are especially problematic because under VTA's existing labor contract, part-time labor is cost-prohibitive.
- **Loads are higher midday than peak.** While very high loading could justify peak-only service, this loading is not being achieved today. In the current network, average loads for much of the peak commute

Figure 3: VTA's bus ridership is barely peaked.



period are lower than they are midday, suggesting that on some routes, either the peak service is excessive or the midday service is inadequate.

- **One-way markets are inefficient to serve.** An additional problem for peak-only service in Santa Clara County is that so much commute demand is one-way. Jobs tend to be concentrated in the north and residences in the south, so that transit is busy in one direction but empty in the other. Drivers must be paid to return buses to their starting point. By contrast, corridors with strong two-way demand –such as El Camino Real, Stevens Creek, or Santa Clara-Alum Rock – use capacity more efficiently and consistently, and therefore can succeed in ridership terms even with lower loads.

Peak commute transit is an urgent issue in many cities, but the previous factors mean that while VTA can be *part* of the solution, it cannot be *all* of it. Carpools, vanpools, private-sector microtransit, employer-operated services, municipal services, and a range of other options may need to play a role. In general, **VTA's high operating cost and lack of part-time drivers makes it an efficient provider of all-day, two-way, high capacity service, but a much less efficient provider of peak-only and one-way services.**

Beyond this observation, the Next Network is not studying the peak VTA Express services (100-series route numbers) or proposing revisions to them, with the exception of expresses to BART in Fremont, which must be revised in the context of the BART extension to Berryessa. This is partly because Express service is a small share of VTA's budget (approximately 4%), and also because these services receive some external funding; therefore, they need not be as scrutinized as local services. Changes to peak-only Limited services (300-series) are suggested, but only where they are replaced by proposed new services that do essentially the same thing.

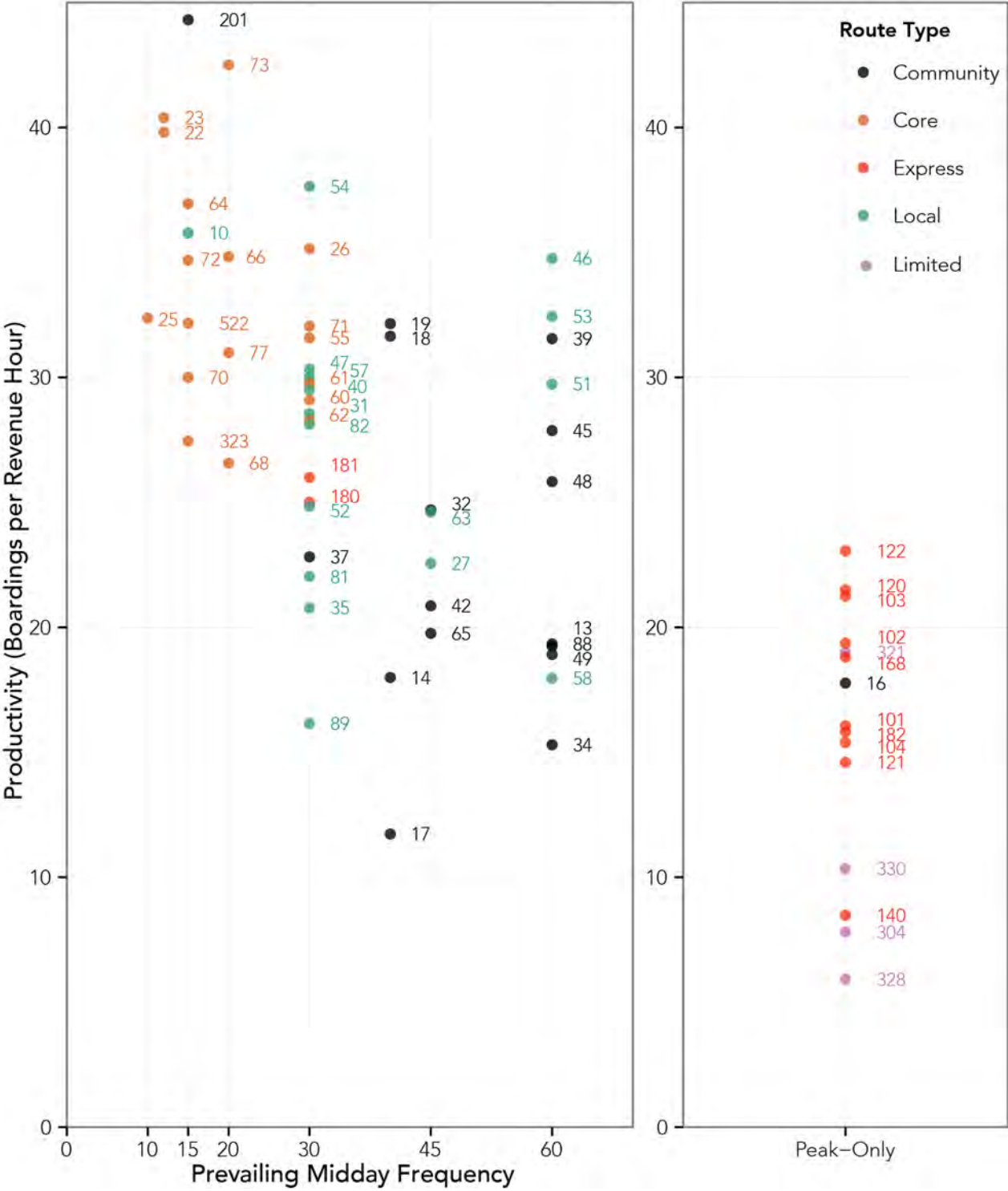


Figure 4: Higher frequency correlates with higher productivity. Peak only routes have lower productivity than most all-day routes.

After its review of peak service, the *Choices Report* then discusses several choices facing the agency, but of these, the most important by far is how to balance the competing goals of *ridership* and *coverage*.

The Ridership-Coverage Trade-off

Highest productivity (ridership / service cost) arises from running frequent and attractive service in places where the land use conditions are favorable (dense, walkable, linear, etc). As noted above, long, frequent lines linking this kind of development are consistently VTA's best performers, while those with none of those features tend to be the worst. The same pattern is observed in most comparable transit agencies.

It follows, then, that *if* the only goal of the system were to maximize ridership per unit of cost, VTA would retreat to those transit-favorable corridors and offer no service elsewhere. VTA could increase ridership at no new cost *if* it were willing to do this.

The existing network, by contrast, shows a desire to run some service to all parts of the county, including to places where high ridership is not a realistic expectation, because the conditions that indicate high ridership potential are generally absent. Service to these areas is called *coverage* service, because it is designed to cover the population with some service.

As Figure 5 shows, the balance of investment between high-ridership service and coverage service is a crucial question about how the community wishes to balance these competing values.

High-ridership service tends to correlate with transit goals including:

- **Environmental:** Vehicle trip reduction, Vehicle miles travelled [VMT] reduction. Empty buses are not displacing vehicle trips.
- **Fiscal:** High ridership reduces subsidy per passenger – due to higher fare revenue and many passengers.
- **Urban Development:** Frequent service makes urban styles of high-density development more attractive and livable, and in some cities it is used to justify lower parking requirements for such development.
- **Social:** High ridership service efficiently meets the needs of most, *but not all*, disadvantaged people.

Coverage services are also associated with some common goals that fall under the general rubric of “equity,” but this term is used in many senses, so we will take it apart here:

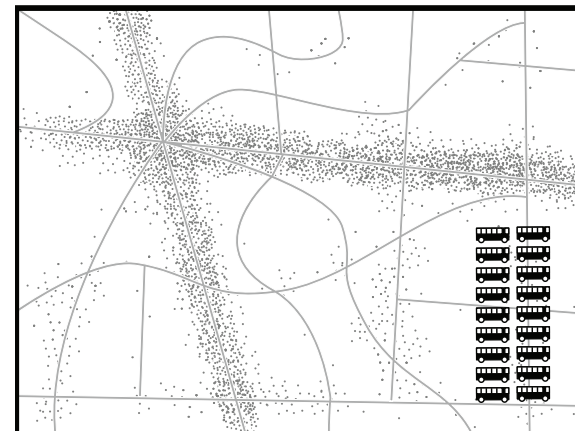
- **Social:** Only coverage service can get to *all* disadvantaged people.

(High-ridership service gets to most, but not all.)

- **Geographic or Jurisdictional Equity:** An expectation that VTA should serve all areas of the county (including all incorporated cities, state and local elective districts, or other geographic units) leads to coverage service, because pure ridership-based planning would not be concerned with these boundaries.

Currently, we estimate that about 70% of VTA's bus network is planned for ridership goals, with the other 30% planned for coverage goals. This did not arise from any policy, but indicates what has evolved through a long series of service revisions.²

The strong interest in increasing transit ridership and farebox recovery – expressed in past regional efforts such as the *MTC Transit Sustainability Study* as well as the input VTA has received from many stakeholders – has led to VTA staff's current desire to review this balance.

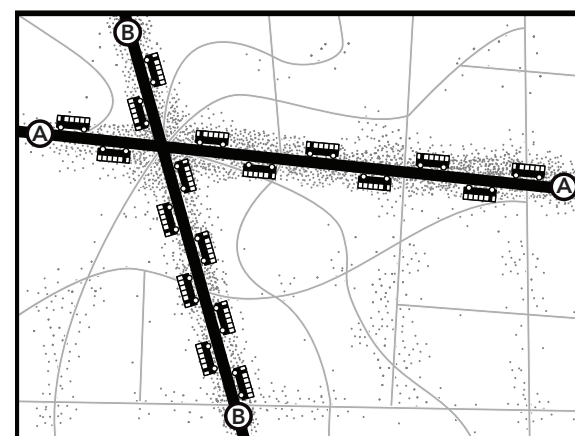


Imagine you are the transit planner for this fictional town. The dots scattered around the map are people and jobs; the streets shown are ones on which transit can be operated. The buses are the resources the town has to run transit.

Before you can plan transit routes, you must first decide what you want transit to do.

Ridership Goal

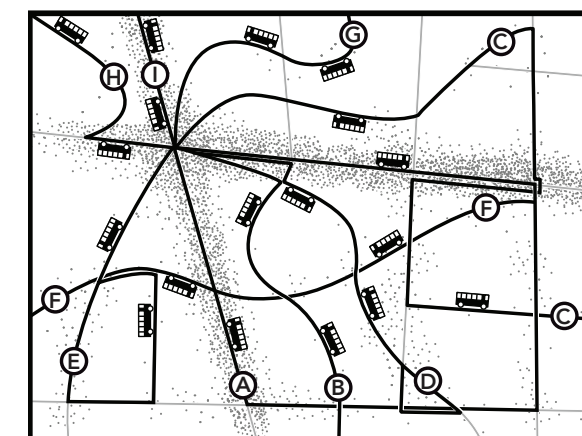
“Think like a business”



This transit network is designed to generate high ridership as efficiently as possible. The transit agency has thought like a business, investing its resources only into the best transit markets.

Coverage Goal

“Access for all”



This network is designed to provide some access to the transit system for all people. The transit agency has divided its resources among many routes throughout the town, none very frequent.

Figure 5: How Ridership and Coverage Goals Produce Opposite Kinds of Network

² When we say that an existing system has a 70/30 ridership/coverage split, what we mean is that about 70% of the service is *where it would be if ridership were the only goal*, while the other 30% is not. Obviously, this requires considerable professional judgment, based on decades of experience studying transit systems across North America and the world.

It is important to note that a ridership-coverage calculation depends on the service area, and implicitly holds all services in the county to the same standard. For example, the most productive corridor in one low-density city might still be a coverage route from a countywide perspective. This perspective is appropriate for a countywide study, because county-level funds are being expended.

Definition of the Alternative Concepts

The three network alternative concepts are primarily focused on exploring various points on the ridership-coverage spectrum that VTA could choose. Because the interest in increasing ridership is so high at both countywide and Bay Area scales, we have been directed to explore possibilities for moving the balance further toward ridership. Other concepts that move the balance toward coverage could also have been drawn.

The three alternative concepts, then, represent three points on the spectrum of possible balance points between ridership goals and coverage goals. They are:

- **Network 70 - 70% Ridership, 30% Coverage:** This concept matches the current split between ridership and coverage goals, but optimizes the network within those limits.
- **Network 80 - 80% Ridership, 20% Coverage**
- **Network 90 - 90% Ridership, 10% Coverage:** This is the most extreme change from the current network, with the highest ridership potential but also the greatest reduction in low-ridership coverage services.

Important Cautions

We are presenting three alternatives for public discussion in order to gain insight from the public as to how VTA should balance the competing goals of ridership and coverage, and also to get their feedback on service design ideas that are common to all alternatives. Because of this, the following cautions must be kept in mind.

The Concepts Are Not Proposals

A proposal is something that the proposer recommends. *At this stage, neither VTA nor the consultant is proposing anything.* The result of the public conversation about these concepts will help guide us in developing the actual proposed network, which will be developed later in 2016.

Some features are common to all conceptual networks, as outlined below, but even these are not proposals yet. In designing the concepts, we wanted to highlight the ridership-coverage trade-off, and to do this we tended to make a single choice about matters that were unrelated to that trade-off, and keep that choice constant across all alternatives. That does not mean that different choices could not have been made, and we welcome public comment about these features of the plan.

No Concept is Preferred at this Stage

Neither the consultant nor VTA staff has any preference among these concepts, and has no desire to steer the conversation to a particular result.

The most important word in this report is *if*. Network 70 shows what might happen *if* VTA chooses to retain its current balance of ridership and coverage goals. At the other extreme, Network 90 shows what might happen *if* VTA chooses to shift toward a great focus on ridership as the primary goal. No decision has been made yet. At a Board meeting in April, no Board member expressed any preference.

Because Network 90 is the most different from the existing system, this report puts greater focus on explaining it, including both its upsides and downsides. This can create the illusion that this concept is being promoted. This is not the intent. Network 90 is simply an illustration of what would happen *if* ridership were further emphasized as the top priority.

The Big Picture Matters More than Details

When we sketch network alternatives for public discussion, we do so with less attention to detail than we would when developing a final proposal for implementation.³ Do not judge an entire concept based on some small routing detail that you like or dislike. The point of these concepts is the “big picture” contrast: Which of these networks, with its outcomes positive and negative, best reflects how you would balance the competing priorities?

Overview of Outcomes

The outcomes of transit networks can be measured in several ways, each of which matters to different kinds of public policy or citizen interest. Major points of contrast among the alternatives, discussed in greater detail in Chapters 4 and 5, including the following. As you move to from the existing system to Network 70, and then on to Network 80 and finally 90:

- **Ridership goes up.**
- **More people can reach more opportunities** (employment, shopping, residential, etc.) **in a given amount of time**, so transit is simply more useful for more purposes. Chapter 4 illustrates this impact. This improvement is the essence of how the higher-ridership networks increase ridership, but it also serves other goals. For example, it means greater access to employment and opportunity for

- **Larger and larger areas are unserved**, and these are very obvious when you compare the network maps. However, because there are low-density areas, the number of people and jobs no longer served are much lower than the visual impression the map gives.
- **Some existing riders -- probably including transit dependent riders -- are left with no nearby transit service.** Network 70 keeps virtually all existing riders within 1/2 mile of service, but 1% of riders lose all service within 1/2 mile in Network 80 and 4% in Network 90.
- **The number of people and jobs on the frequent network**, where transit can be used spontaneously because it’s always coming soon, increases dramatically, as shown in Chapter 5. Frequency correlates so strongly with ridership that this also is a reason for high ridership expectations.
- **The number of locations where cities could encourage transit-oriented development is maximized, including but not limited to affordable housing.** All kinds of dense development benefit from frequent transit service, and some cities have policies encouraging density and affordability (through reduced minimum parking requirements, for example) where high-quality transit is available.
- **The network gets simpler**, which is an important element for more spontaneous riders, including tourists. The number of separate lines and patterns (not counting Expresses or peak shuttles) goes from 56 in the existing system to 29 by the time we reach Network 90. Fewer lines mean the network is easier to remember, and more frequent lines mean that you do not have to remember a timetable. Both of these things dramatically improve your ability to keep more of the system in your head, so that you can navigate it spontaneously much as a motorist navigates a remembered street network.

³ The appendix contains detail about frequencies and spans, which had to be developed for purposes of costing. These are included to give a general sense of how frequency and span changes in the different concepts, but at the risk of showing more precision than is intended. Even these tables are general indications, and the spans in particular should not be taken as exact.

2

Goals and Ideas Common to All Alternative Concepts

The alternative concepts are not just for the purpose of illustrating the ridership-coverage tradeoff. They also contain improvements that are recommended, to some degree, regardless of the outcome of the rider-ship-coverage conversation.

A Consistent Set of Service Categories

Bus service can be confusing, and a key goal, in all concepts, is to present the network in a way that is easier to grasp and navigate.

A crucial tool for this purpose is a consistent system of service categories which identify distinctions among services that matter to the customer. These categories can become the basis of brands, though the marketing task of brand refinement is not addressed here. The most important distinctions for these service categories are frequency, duration of service, and speed, since all of these matter enormously to the usefulness of transit.

The categories used in this study are as follows. The colors shown here will be used throughout this study process to refer to these service types:

- **Rapid Bus (orange)** means service that is both *frequent* and *relatively fast*. Frequencies are every 15 minutes or better all day. Stop spacing is very wide, generally 1 mile outside urban core areas, so as to achieve the best possible travel time. Existing Line 522, which runs the length of the county from Palo Alto to Eastridge, is an example. (A further step in expediting these services is a range of Bus Rapid Transit infrastructure, but this is not assumed except where already programmed.) Its goal is always ridership, not coverage.
- **Frequent Bus (red)** means frequent local bus, coming every 15 minutes all day including weekend days. This frequency, even without speed improvements, tends to correlate with higher ridership because using the bus no longer requires planning around the bus schedule, and because connections between services are so easy. Its goal is always ridership, not coverage.
- **30-minute Bus (blue)** runs half hourly at most hours. Some of this service has the potential to grow into Frequent service in the future, or if more resources are available, and in this case its goal is ridership. The category can also be used for coverage purposes, where this frequency is needed but high ridership is not a realistic expectation.
- **60-minute Bus (green)** means a bus once an hour. This service is deployed to provide coverage in areas of very low demand. Its goal is always coverage, not ridership.

These are the dominant categories focused on in this report, because

JARRETT WALKER + ASSOCIATES

they form an interdependent all-day network that is designed for a broad diversity of trip types.

VTA also operates several kinds of more specialized service, which are not a primary focus of this study. The only proposed changes to these services are those arising from BART or light rail changes, or from new Rapid Bus services.

- Limited-stop services. These peak-only services, numbered in the 300s, run mostly from Park-and-Rides to worksites, generally along expressways. Changes to these services arise mostly from being replaced by rail extensions or new Rapid Bus lines, as detailed below.
- Express services (100s). These peak-only services differ from limited-stop services in that they run mostly on freeways (often HOV lanes) and for a higher fare. These are unchanged except for the lines now going to Fremont, which are replaced by the BART extension.
- Intercounty expresses, including Dumbarton Bridge and Highway 17 service, link the County to adjacent urban counties, and are unchanged.
- Caltrain and ACE shuttles are short peak-only routes connecting commuter rail stations to jobsites. They are unchanged.
- VTA service to high-ridership suburban schools: In general, where a VTA line serves a large high school or middle school, this service is retained around bell times even in alternative concepts where service is deleted at other times of day.
- FLEX is a demand responsive transit service, and is unchanged.

Finally, many other transit services operate in the VTA area. Palo Alto and Mountain View both have municipal shuttle systems, and much of Palo Alto is also served by the extensive Stanford shuttle system, the Marguerite. These systems are not shown on our concepts because VTA does not want to speak for those agencies, but the planning process is aware of them.

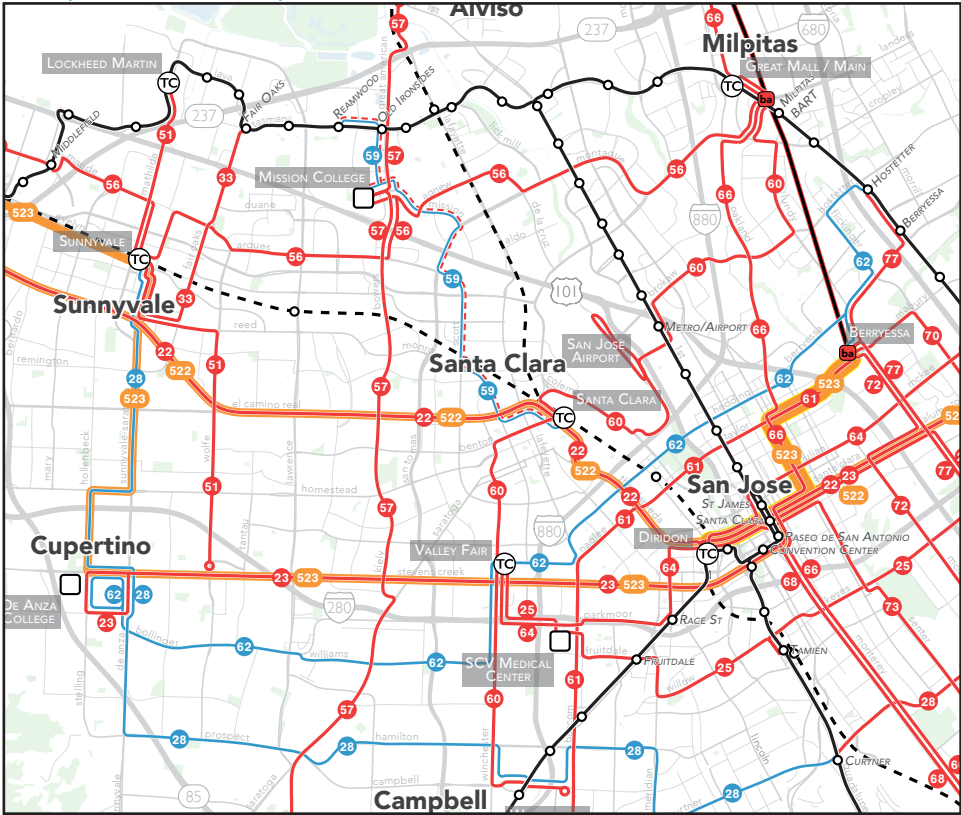
Incorporating BART into Santa Clara County's Transit Network

All alternatives revise the network to integrate well with BART at the new Milpitas and Berryessa stations, and to eliminate services that would compete with BART. All Express service to Fremont BART station is removed and reallocated to connect the same market areas with the new Milpitas and Berryessa stations. Particular focus is on connecting BART with long lines that serve large areas of Santa Clara County, rather than just local shuttles. The goal is to put as much of the county as possible on lines that connect directly to BART, maximizing the potential range of travel between the East Bay and South Bay.

Milpitas BART connections

Milpitas BART becomes the primary connection point for travel from the East Bay to the jobs area of the Golden Triangle. This connection is achieved not just by direct Light Rail trains between Milpitas and Mountain View along the new Tasman line, but also by a new east-west frequent service generally running parallel to and south of the Tasman line (Line 56

Figure 6: Both Milpitas and Berryessa BART stations are well-connected in all concepts. Network 90 is pictured here.



in Figure 6). This new line connects many worksites but also serves pockets of dense housing, such as in the Agnews area of Santa Clara and the northeast part of Sunnyvale.

Milpitas BART would also become the connection point for trips between the East Bay and San Jose Mineta International Airport, discussed further below.

Local service within Milpitas would also shift its focus from the Great Mall to the BART station, though many routes would serve both. This service varies by alternative concept, since some of this market calls for coverage services. However, service along Oakland Road, extending north to Dixon Landing Road, is in all alternative concepts, and it is high-frequency in Network 90 (line 66).

Berryessa BART to Downtown San Jose

Because this phase of BART ends just short of downtown San Jose, a key focus is on providing very frequent service between Berryessa BART and downtown, including San Jose State University and the many connections at Diridon station. The recommended alignment is a frequent Rapid service, generally via Taylor, 10th/11th, Santa Clara St, stopping only at BART, 10th & Taylor, SJSU (7th & Santa Clara), 1st/2nd & Santa Clara (Transit mall), and Diridon station. However, an alternate longer and slower path, via King Street and Alum Rock station, is also noted as a possibility. This alternate alignment was studied as part of the Berryessa Connector Study.

Figure 7 shows these two options. The choice between these options is not related to the choice among the three alternative concepts. Either alignment works with every concept. Note, however, that the longer King Rd option adds 6 minutes of travel time per round trip, which could add up to two buses to the cost of peak service. This would be paid for by somewhat reduced frequency or span somewhere in the network.

Note that frequent service is available to all the areas served, regardless of

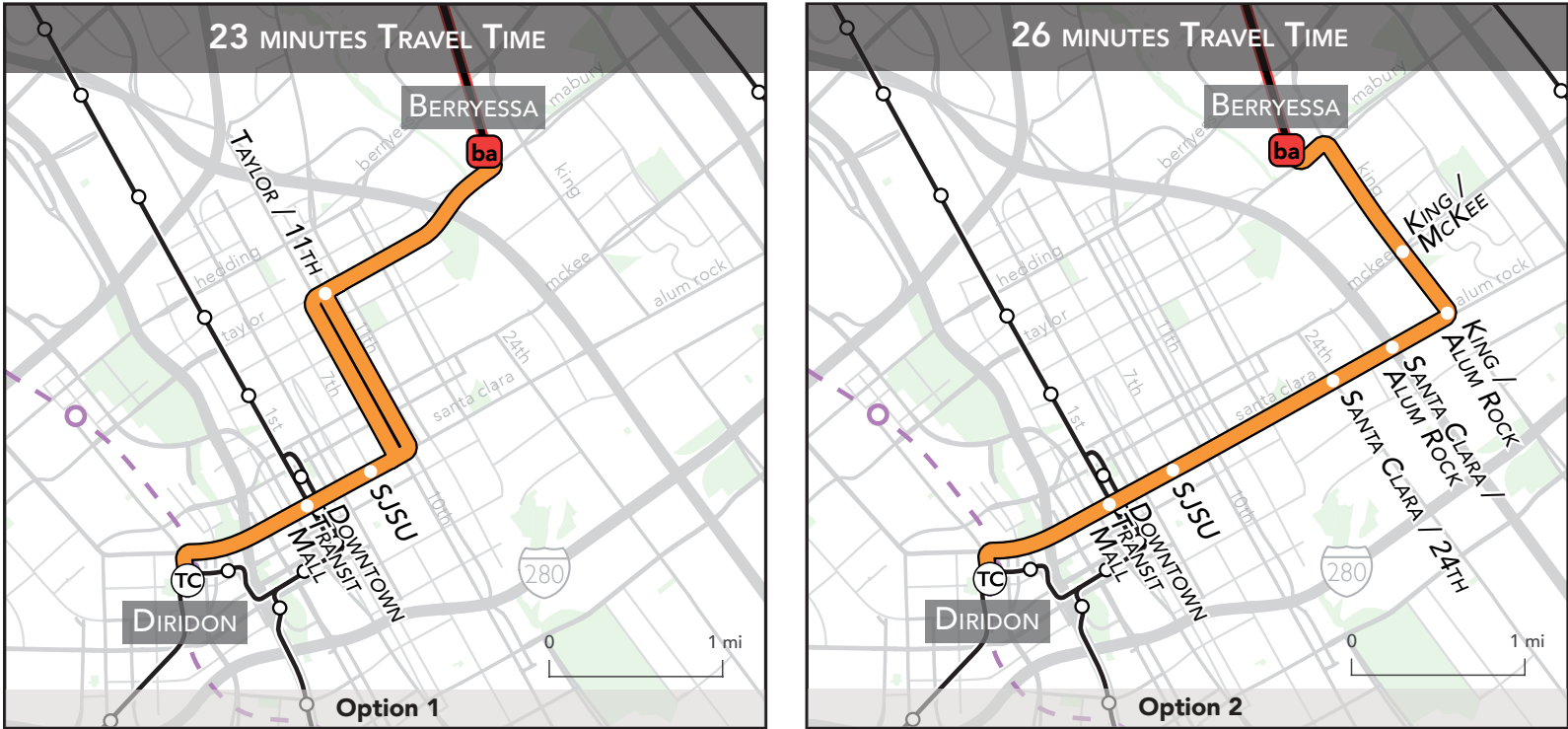


Figure 7: Alternative alignments of the Rapid line from Berryessa BART to Downtown San Jose

which of these options is chosen. All alternative concepts have Rapid Bus service along Santa Clara Avenue and frequent local service along King, Taylor and 10th/11th. The issue is not transit to these areas but merely the question of which path the Rapid link between downtown and BART should follow.

Other Berryessa BART connections

The frequent link between Berryessa BART and downtown would continue beyond Diridon station as the Stevens Creek Rapid (Line 523 in Figure 6). This means there would be direct service between BART and all destinations along San Carlos Street and Stevens Creek, including Valley Fair/ Santana Row and Cupertino.

All alternatives include other frequent crosstown services to connect Berryessa BART to other destinations both west and south. For example, service extends west along Julian and Naglee to serve Civic Center, Valley Fair/Santana Row, and then via Bascom and Winchester to Campbell. New crosstown service on Hedding is added. Several north-south routes in eastern San Jose are revised to end at Berryessa BART.

Light Rail Assumptions

The Next Network, to be implemented when BART opens, will include both the bus network changes studied here and a revision to the light rail operating pattern. The bus and rail planning processes are happening in parallel but are exchanging information and ideas.

VTA is studying a number of Light Rail alternative service strategies. For the purposes of this work, we have used that project’s “Alternative 2+2” Light Rail service plan, shown in Figure 8, which features:

- New east-west service between Mountain View and Alum Rock, including Milpitas BART. Service on this line would operate every 15 minutes all-day.
- Increased service frequency on the Winchester – Old Ironsides Line to achieve 15-minute all-day frequency on all lines except the Almaden spur line. Combined frequency would be every 7.5 minutes between Tasman and Convention Center (the North First segment) and between Baypointe and Alum Rock (the segment serving Milpitas BART).
- Continued express service between Santa Teresa and downtown San Jose during peak commute periods.

Greater Focus on Frequent Grid

High frequency lines work best when they intersect at right angles so that people can transfer between them in any direction. This is one of the most efficient ways to connect large numbers of possible origins and destinations to each other, which is the key to high ridership.

Most scenarios make some improvements to the frequent grid, though these are vastly more extensive in Network 90 than in the others.

Figure 9 shows the frequent grid on the east side of San Jose as developed in Network 90. The success of existing services on the east side of San Jose is already highly related to their frequent-grid pattern. A key priority of all alternatives is to expand this benefit to other parts of the county.

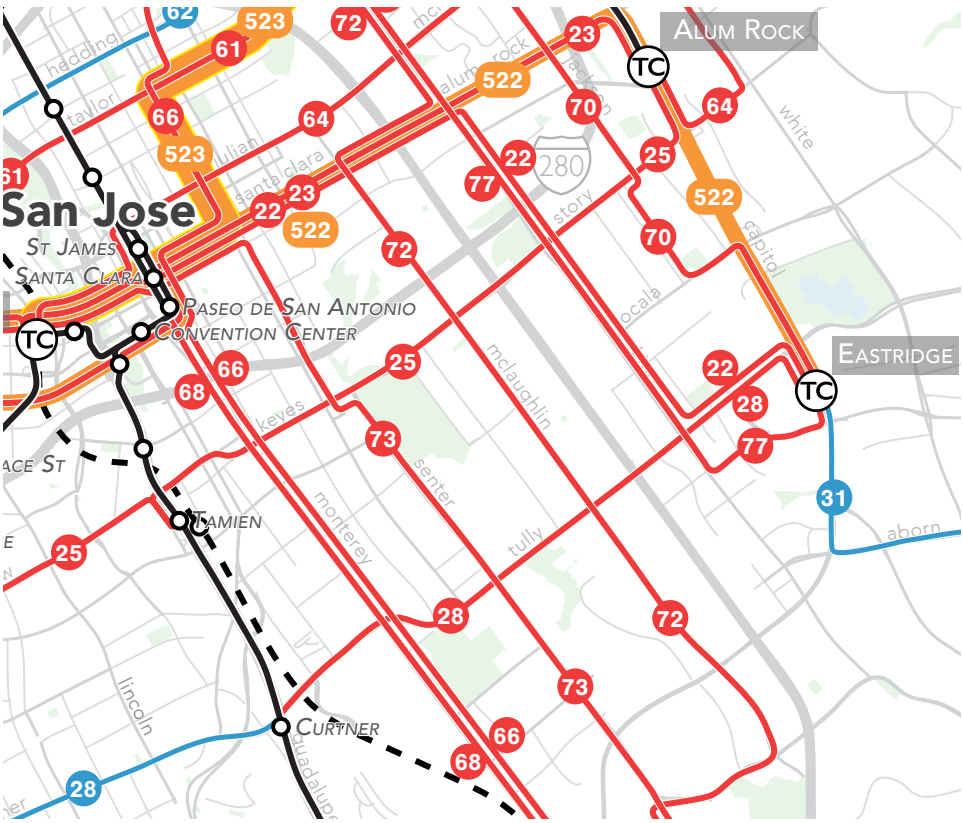
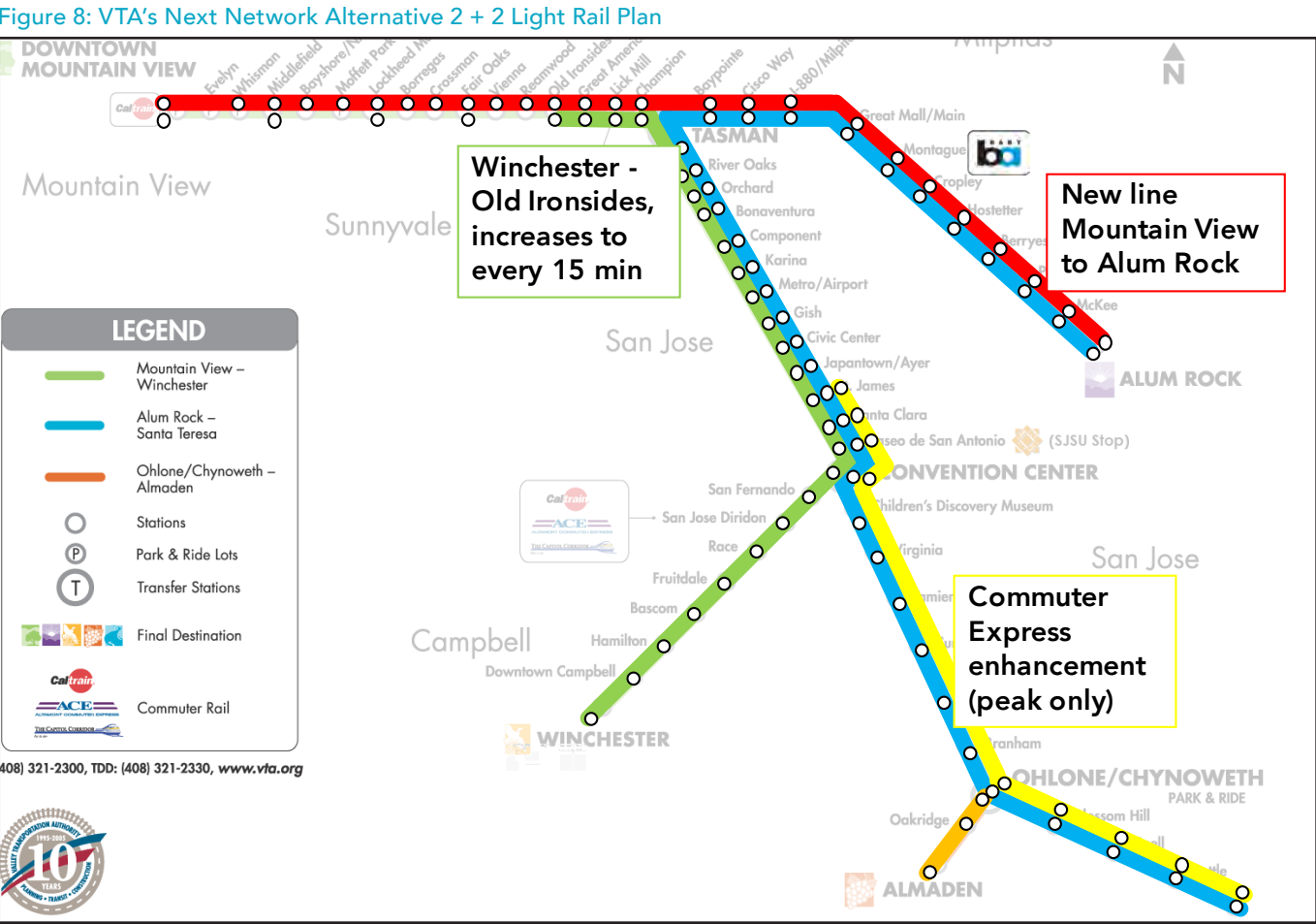


Figure 9: A high frequency grid enables fast connections. This pattern already exists in eastside San Jose and could be widely extended across the county



Simplification and Streamlining

Some aspects of the existing network are conducive to neither ridership nor coverage goals, such as excessive complexity and variation. In all alternatives, every effort is to make the network simpler, and to maximize the efficiency with which each service’s goal – ridership or coverage¹ – is achieved.

¹ Efficient provision of coverage generally means using coverage resources to reach as many residents, jobs, and activity destinations as the resources will allow. The measure of coverage is typically in the form of: “__% of residents and jobs are within __ feet of transit service.” This is why coverage services tend to have low frequencies, as they divide a limited resource over a large number of route segments.

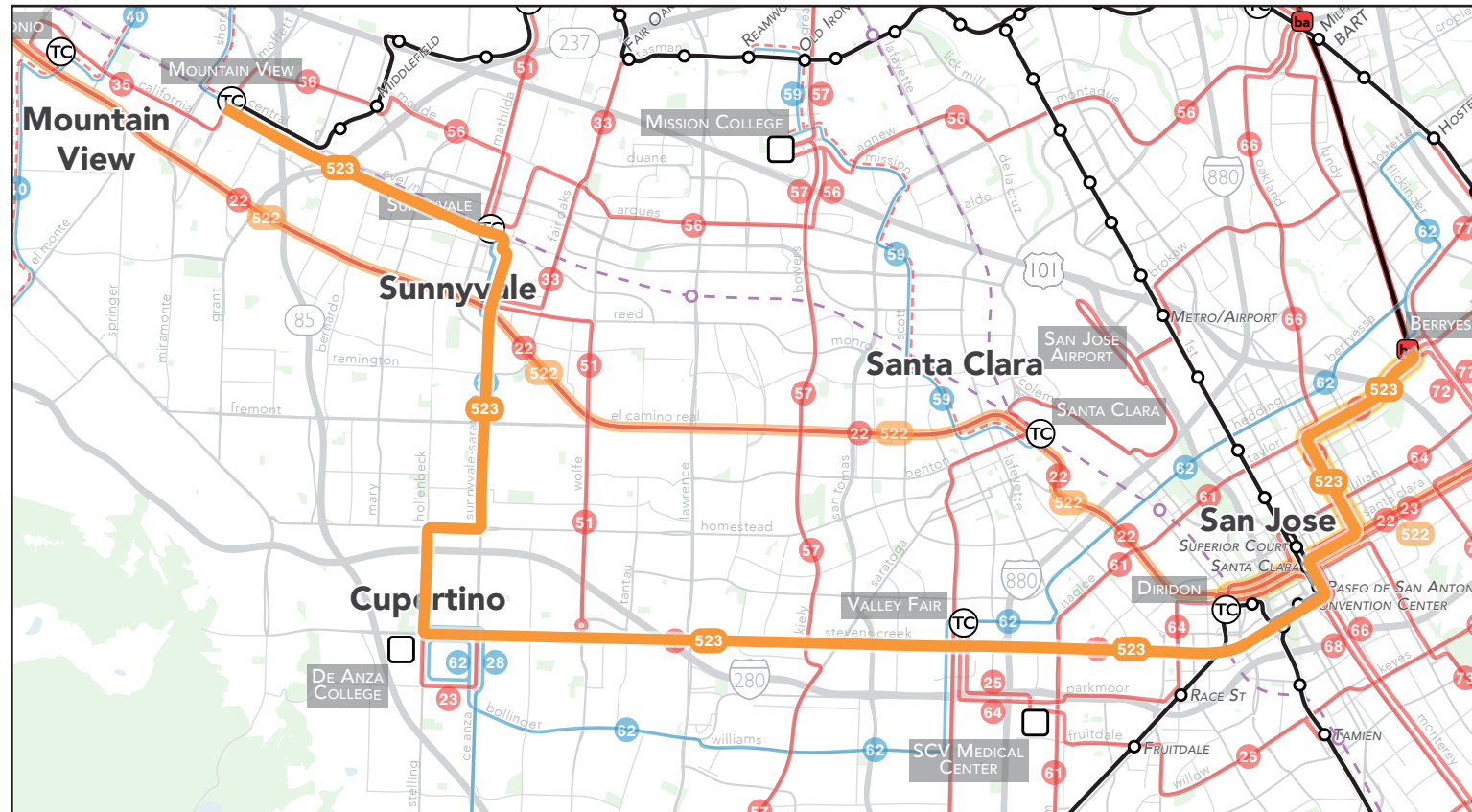


Figure 10: New Rapid Line 523 connects Berryessa BART to Mountain View in Network 90 (above) and 80, and to Sunnyvale in Network 90.

New Rapid Line to Berryessa BART

Berryessa BART – Downtown SJ – Stevens Creek – Cupertino – Sunnyvale – (Mountain View)

All scenarios include a new Rapid Line 523, providing fast service with very widely spaced stops, comparable to existing Line 522, along El Camino and Alum Rock. This service extends west from Berryessa BART across downtown San Jose, Diridon station, and San Carlos St to Valley Fair/Santana Row, then via Stevens Creek to Cupertino. In a new move, the line does not end there, but turns north to end at downtown Sunnyvale. In Networks 80 and 90, it continues from Sunnyvale via Evelyn Street to downtown Mountain View, as can be seen in Figure 10.

This line is meant to address a significant gap in the VTA network, which is the lack of frequent north-south service in the western part of the county. The issue is especially acute because Cupertino is one of the fastest growing cities, and is growing with a mixture of jobs and housing which is relatively favorable to transit. However, while Cupertino has good transit from the east, it is difficult to get to via transit at adequate frequency from

Sunnyvale, Mountain View, and Palo Alto.

As always, the new line is not just to connect points along the line, but to expand the range of places that are connected with one high-frequency transfer.

Rapid bus service is essentially Bus Rapid Transit without an exclusive lane. Buses are still in mixed traffic, but their wide stop spacing supports much faster service, and the rapid stops become logical nodes for further infrastructure improvement. These lines become logical top candidates for future improvements that make transit faster and more reliable, such as off-board fare collection, signal priority, and exclusive-lane segments.

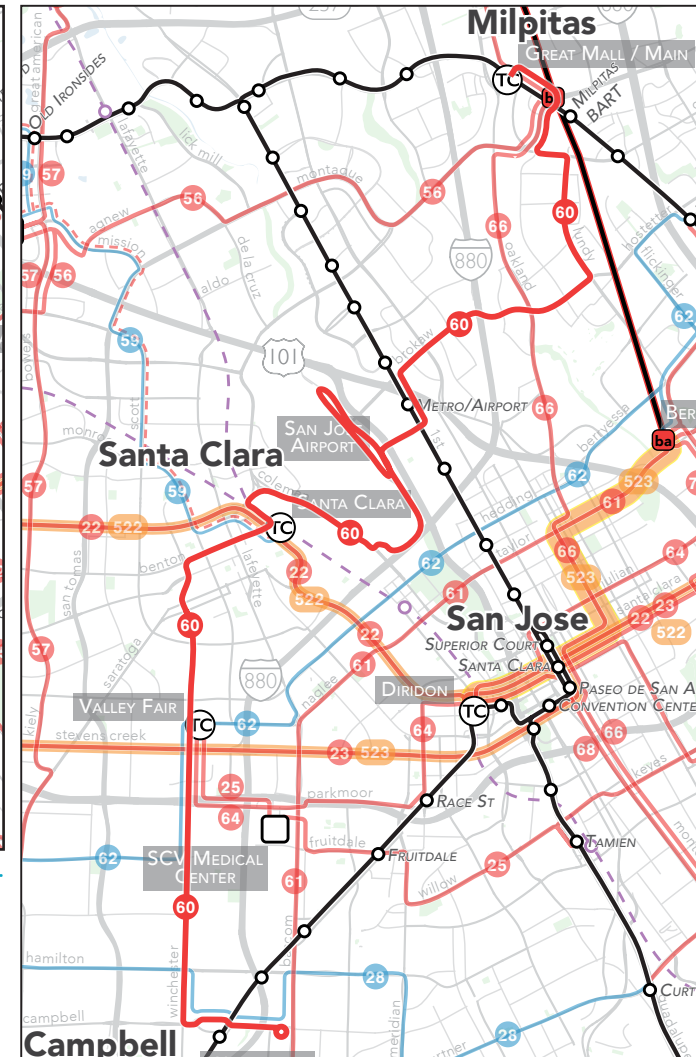


Figure 11: In all concepts, Line 60 connects Campbell to Valley Fair through the airport all the way to Milpitas BART.

New Links to San Jose Mineta Airport

The current network serves the airport with a dedicated shuttle, Line 10, which goes only to Santa Clara Caltrain station and the Metro-Airport Light Rail station. As a result, relatively few places are one transfer from the airport and many are two transfers away.

All concepts combine this line into a long crosstown so that many more places can be reached in zero transfers from the airport, and most of the county can be reached in one transfer. This line (Line 60 in Figure 11) extends from Campbell north via Winchester Avenue (past Santana Row/Valley Fair) to downtown Santa Clara and Santa Clara station, then to the airport, then onward via Metro-Airport LRT station and Brokaw Road to Milpitas BART. The line is high-frequency in Networks 80 and 90 while in Network 70 the portion between the Metro-Airport LRT station and Milpitas BART is every 30 minutes outside of peak periods.

Again, the key value of this line is not just where it goes, but where you can connect to from it. Areas that are currently two transfers from the airport, would now be just one transfer away, including all of Milpitas, much of western San Jose, most of Cupertino, and other points along the busy Stevens Creek/San Carlos Street corridor. These connections are mostly frequent in all scenarios, though of course most frequencies are lowest in Network 70 and highest in Network 90.

Weekend and Evening Expansion

The ridership on a specific transit trip is not just a feature of that trip. People ride transit because of the total service offering, including frequency and duration. Many people depart without knowing when they can return, so an early ending of service means being stranded. This is why it is important not to cut trips just because ridership is low on that trip. It is the entire schedule that determines the entire ridership.

What’s more, a person’s decision about whether to rely on transit in a sustained way depends on whether it’s available for their needs consistently.

Transit achieves high ridership by focusing on a broad spectrum of possible customers, but it is logical to focus on lower income customers in particular, because they have a greater motive to seek alternatives to driving. These people are more likely to work in services, retail, and entertainment, where the standard work day is not “nine to five” but can begin and end at many times. These jobs include shifts that end in the late evening, and people will not take transit to these jobs if they cannot get home. They also tend to extend across the weekend, so that a person may work 5-6 days a week including the weekends.

These are some of the reasons that judicious evening and weekend service can be a good investment.

All alternative concepts attempt to improve evening and weekend service, though the extent of this varies by alternative and service type. The biggest change is that the entire Frequent Network (however extensive it may be in each concept) is also frequent all weekend. These routes usually have some service late into the evening.

The table below shows the overall shift from weekday to weekend service in the alternative concepts. The Existing system uses 82% of all its revenue hours for weekday service, while the alternative concepts shift up to 5% of their revenue hours to weekend service.

	Existing	Network 70	Network 80	Network 90
Weekday	82%	78%	78%	77%
Weekend	18%	22%	22%	23%

3

The Alternative Concepts

The maps starting on page 18 show the alternative concepts, in which the focus is on the all-day network pattern, though peak frequencies are noted. Again, these are not proposals, but concepts to illustrate the ridership-coverage spectrum.

Services Not Shown but Retained

The following peak-only services are not shown but would be retained in all concepts, except as noted.

- Caltrain and ACE shuttles are all retained.
- VTA Express (100s) lines to Fremont are all deleted, replaced by new connections to BART stations in Santa Clara County. All other VTA Express routes are retained.
- Limited service (300s) lines are unchanged except where new service of equal value replaces it. These proposals are tentative and are not related to the specific alternatives presented in this report, except as noted.
 - 304 Santa Teresa - Monterey Highway - San Jose - De La Cruz - Arques/Scott - Sunnyvale: unchanged
 - 321 Great Mall - Lockheed: replaced by new Mountain View - Milpitas LRT and new Line 56, which links Milpitas and Great Mall to all the Line 321 destinations not served by Light Rail, with the same or better frequency and longer duration
 - 323 Stevens Creek: entirely replaced by the Rapid Line 523, which offers the same service at higher frequency and longer duration
 - 328 Lawrence Expressway Almaden - Campbell - Lockheed: unchanged
 - 330 San Tomas Expressway Almaden - Tasman: Unchanged from Almaden to Old Ironsides. Service between there and Milpitas, which is duplicating the new Mountain View - Milpitas - Alum Rock LRT line, is deleted.
 - 354 Sunnyvale - Cupertino (previously planned): replaced by Rapid Line 523 and other services, depending on the alternative concept.
- Service to major high schools, middle schools, colleges, and universities: Where existing service covers bell times at these schools, but no service is shown on these maps, peak-only service around bell times – adequate to capacity needs – would be evaluated. Note that this service is never just for school students. Under Federal law it is always open to the entire public

Relevant Services Provided by Others

Again, some gaps on these maps, especially in the North County, partly reflect important roles played by other transit operators. In particular, Palo Alto and Mountain View both have municipal shuttle services. Stanford University and several parts of Palo Alto also receive extensive service from the Stanford shuttle system, the Marguerite. Many other shuttles operated by employers and other private parties are obviously not shown.

Frequencies and Service Spans

An important aspect of the concepts that is not visible on the maps is the frequency and service span. These are typically more generous in the scenarios’ Frequent Networks than is the case today, along with substantial expansion of weekend service in all scenarios, though Network 70 has the least of this and Network 90 the most.

Another key difference is the frequency of the two Rapid lines, including the crucial link between downtown San Jose and the Berryessa BART station. These are as follows:

Prevailing all-day frequency for Rapid Lines, by Concept*

Rapid Line	Existing	Network 70	Network 80	Network 90
522 Palo Alto - Eastridge	15	15	10	10
523 BART - Downtown	n/a	7.5/15	5/10	5
523 West of Downtown	15	15	10	10

*Where peak and midday differ, peak is shown before midday, e.g. 15/30.

Detail on frequencies and spans for each concept appears in “Appendix: Frequency Tables” on page 50. Note, however, that these are approximations for the purposes of conceptual design, and will be refined in final design.

Network 70

This concept maintains the current approximate split of goals: 70% of the service is devoted to the goal of ridership, with the rest devoted to coverage. The ridership service includes all Frequent Network service (orange and red) and much of the half-hourly network (blue). The extensive network of hourly lines (green) maintains coverage to virtually the entire area that is covered now, though various kinds of streamlining are

suggested.

Network 80

This concept shifts the split of goals: 80% of the service is devoted to the goal of ridership, with 20% devoted to coverage. The high-ridership network includes all Frequent Network service (orange and red) and most of the half-hourly network (blue).

There are fewer green lines, and those that remain are reduced to peak-only or otherwise limited in cost. This is necessary to get the greatest possible coverage while shifting 10% of the budget away from the coverage purpose to the ridership purpose.

With these resources, Network 80 expands the frequent network by bringing the following segments up to 15-minute all day service:

- Milpitas BART - San Jose Airport (Line 60)
- The north-south line between Alviso and Saratoga, via Bowers, Great America Parkway, etc. (Line 57)
- Tully in southeast San Jose (part of Line 28)

All three lines are intended to maximize grid connections, expanding the range of destinations that can be reached in one transfer. For example, high frequency service along Great America Parkway serves not just that corridor, but also points east and west along all the frequent lines it crosses, including Tasman (Light Rail), El Camino Real, and Stevens Creek.

Network 90

With 90% of resources devoted to the goal of ridership, Network 90 is certainly the most radical of the three. VTA service disappears from low-density areas all over Santa Clara County, although most residents and jobs (as opposed to land area) continue to be served. (Chapter 4 on page 22 reviews these outcomes.)

This alternative concept will trigger significant opposition from people who value the lower ridership services being deleted. (Remember that school peak-hour services at middle schools, high schools, colleges, and universities, not shown, would be evaluated.) This concept would probably trigger efforts to bring other resources to bear on the problem of lifeline access to low-density areas.

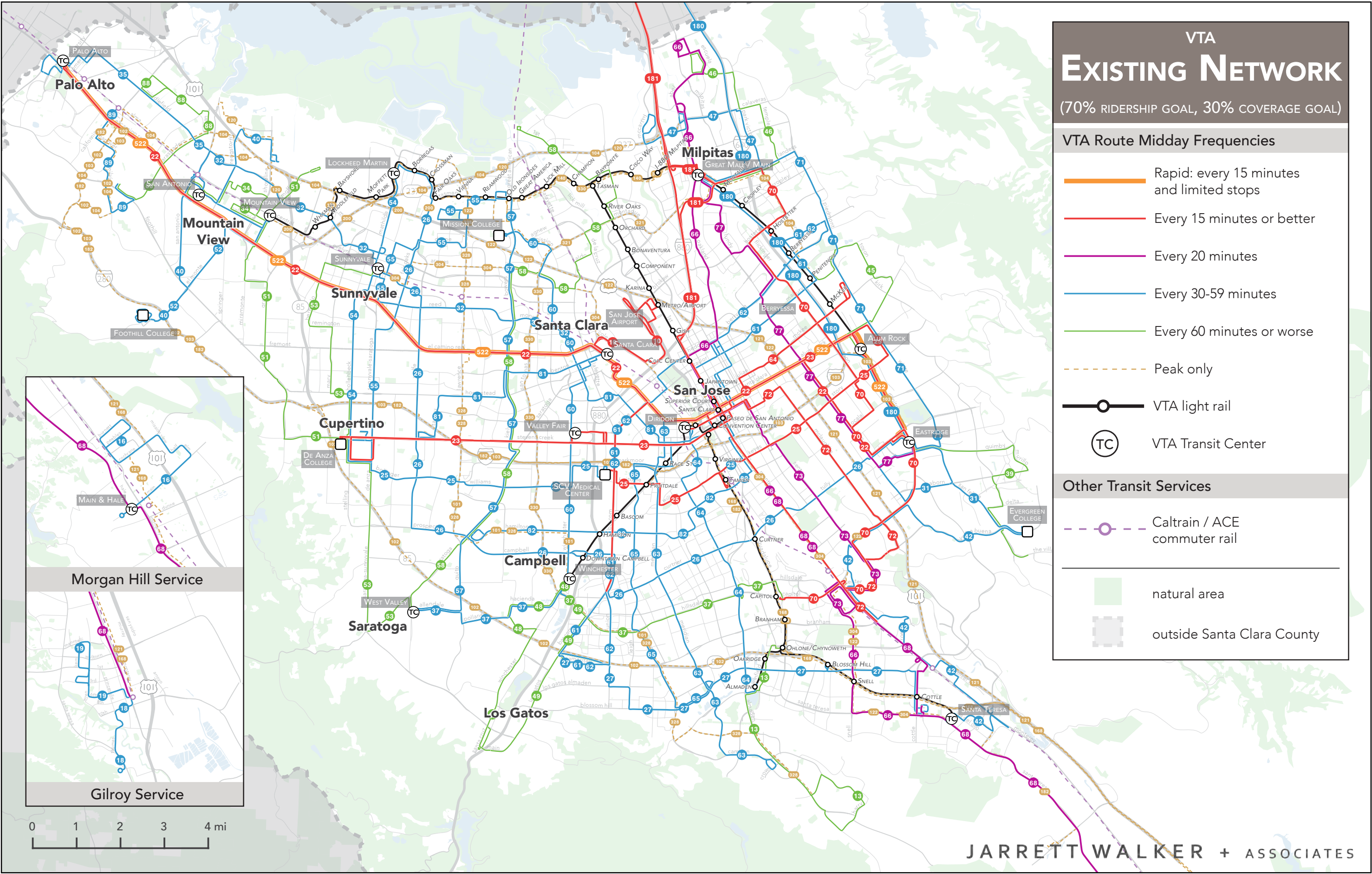
As a result of these cuts to low ridership service, dramatic expansions of high-frequency, high ridership service occur all over the county. Most resources go into an extensive Frequent Network covering as much of the

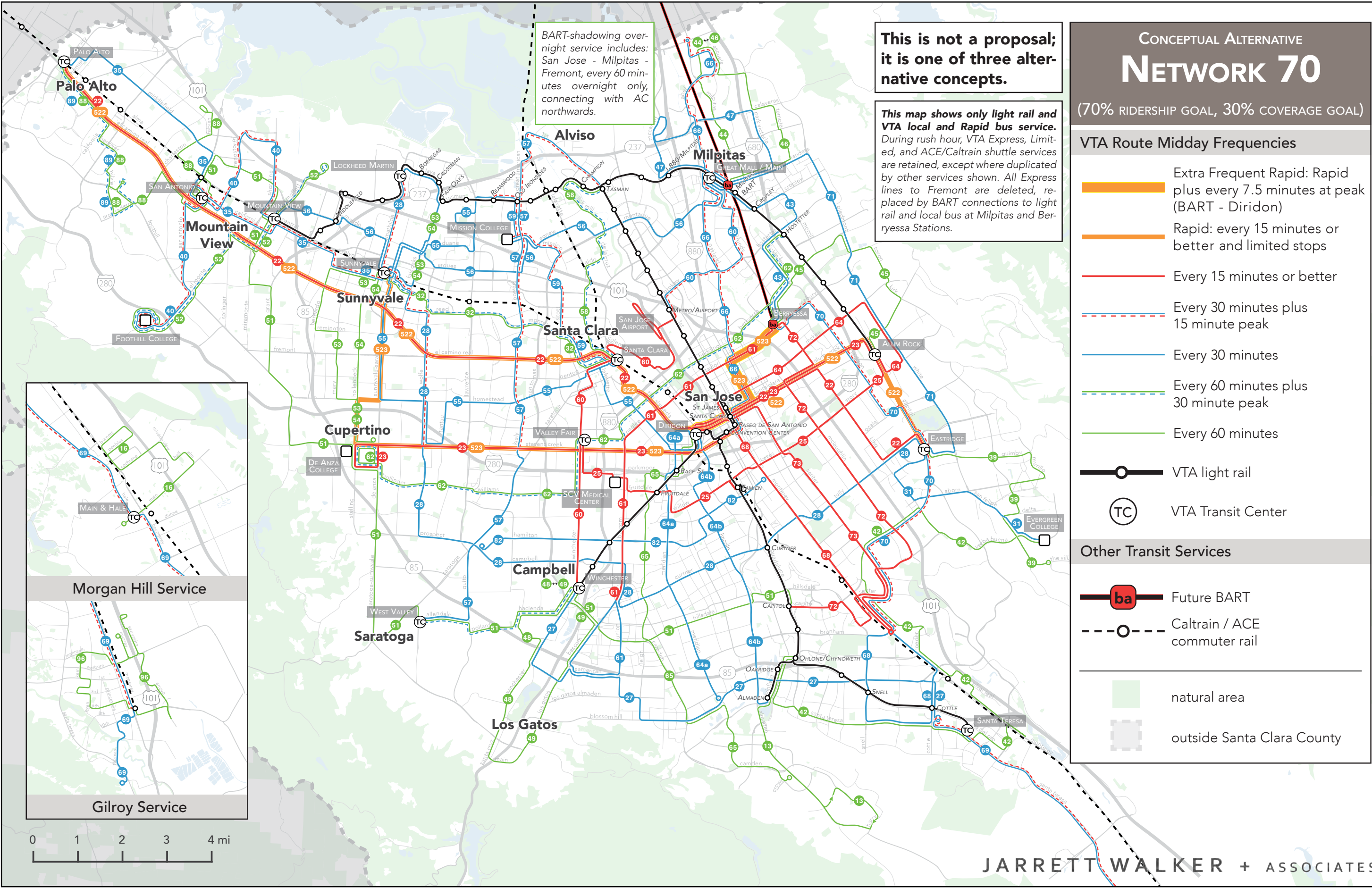
county’s dense areas as possible. Most remaining half-hourly routes are “Candidate Frequent,” ready to support frequent service when more resources become available.

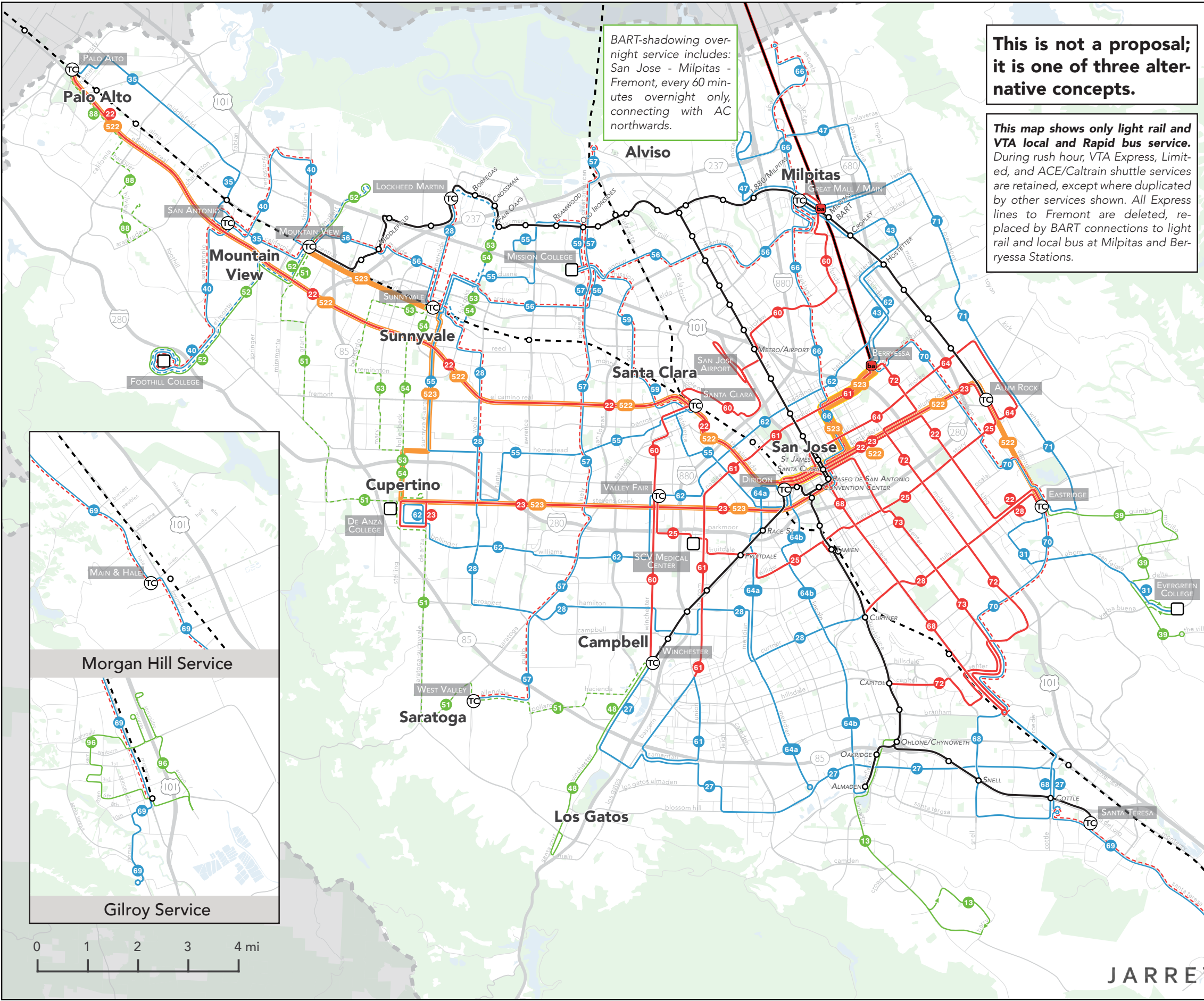
The particularly high number of grid intersections (places where frequent lines cross) is key to understanding how dramatically people’s ability to get places expands. At each point, it’s possible to make a fast connection, so that all the points on an intersecting route are readily reachable in a minimal amount of time. The effects of this are apparent in the analyses in the next chapter.

Introducing the Concept Maps

The maps on the next pages show first the existing system, and then the maps of each of the three concepts. In reading these maps, please look first at the legend, which will remind you of the colors and their meanings. These colors will have similar meanings in all maps produced throughout this project, so it is worthwhile to learn them. Without an understanding of these colors it is impossible to understand what each concept proposes.







CONCEPTUAL ALTERNATIVE

NETWORK 80

(80% RIDERSHIP GOAL, 20% COVERAGE GOAL)

VTA Route Midday Frequencies

Extra Frequent Rapid: Rapid plus every 5 minutes at peak (BART - Diridon)

Rapid: every 10 minutes or better and limited stops

Every 15 minutes or better

Every 30 minutes plus 15 minute peak

Every 30 minutes

Every 30 minutes peak only

Every 60 minutes plus 30 minute peak

Every 60 minutes

Every 60 minutes peak only

VTA light rail

VTA Transit Center

Other Transit Services

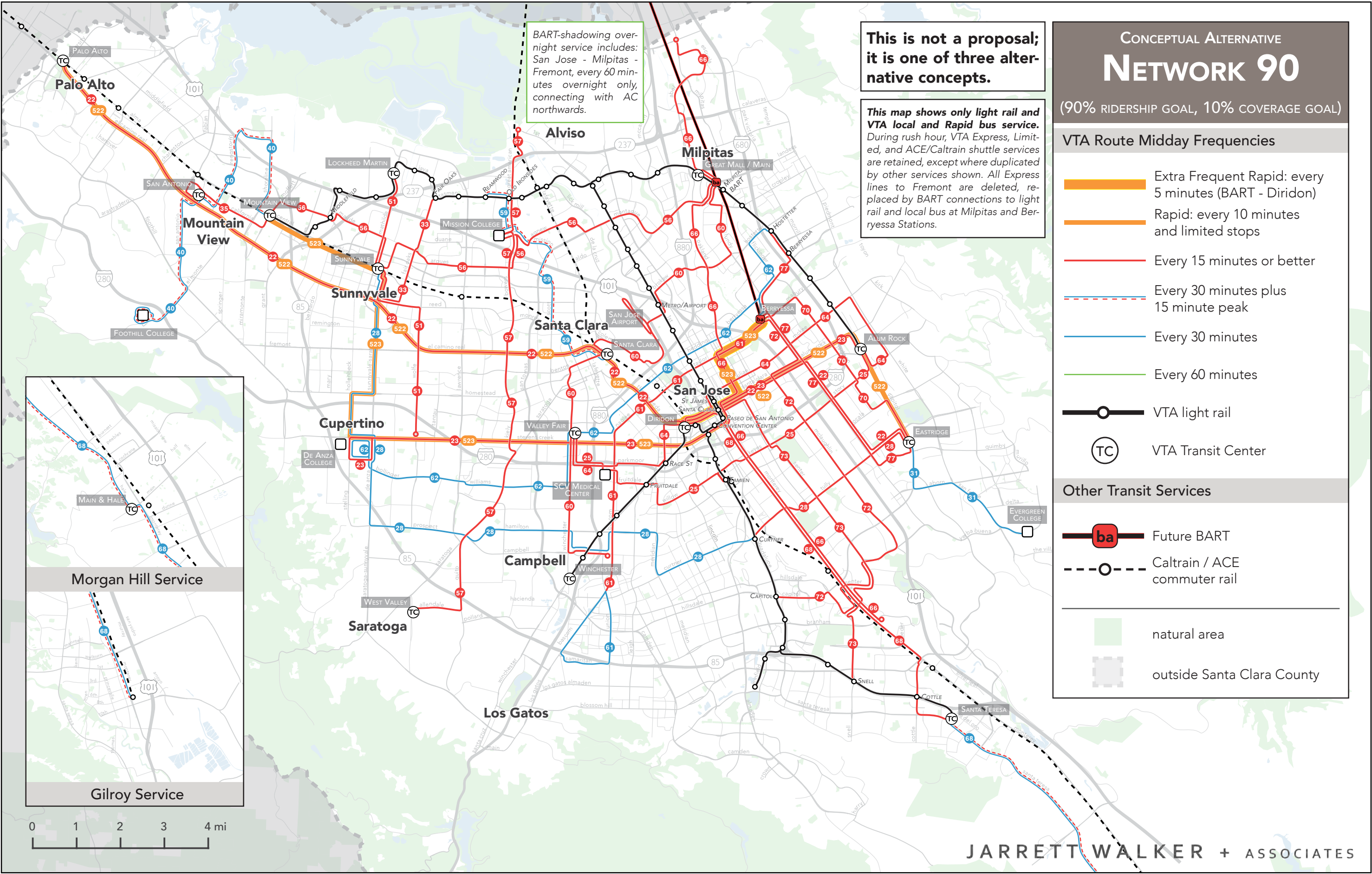
Future BART

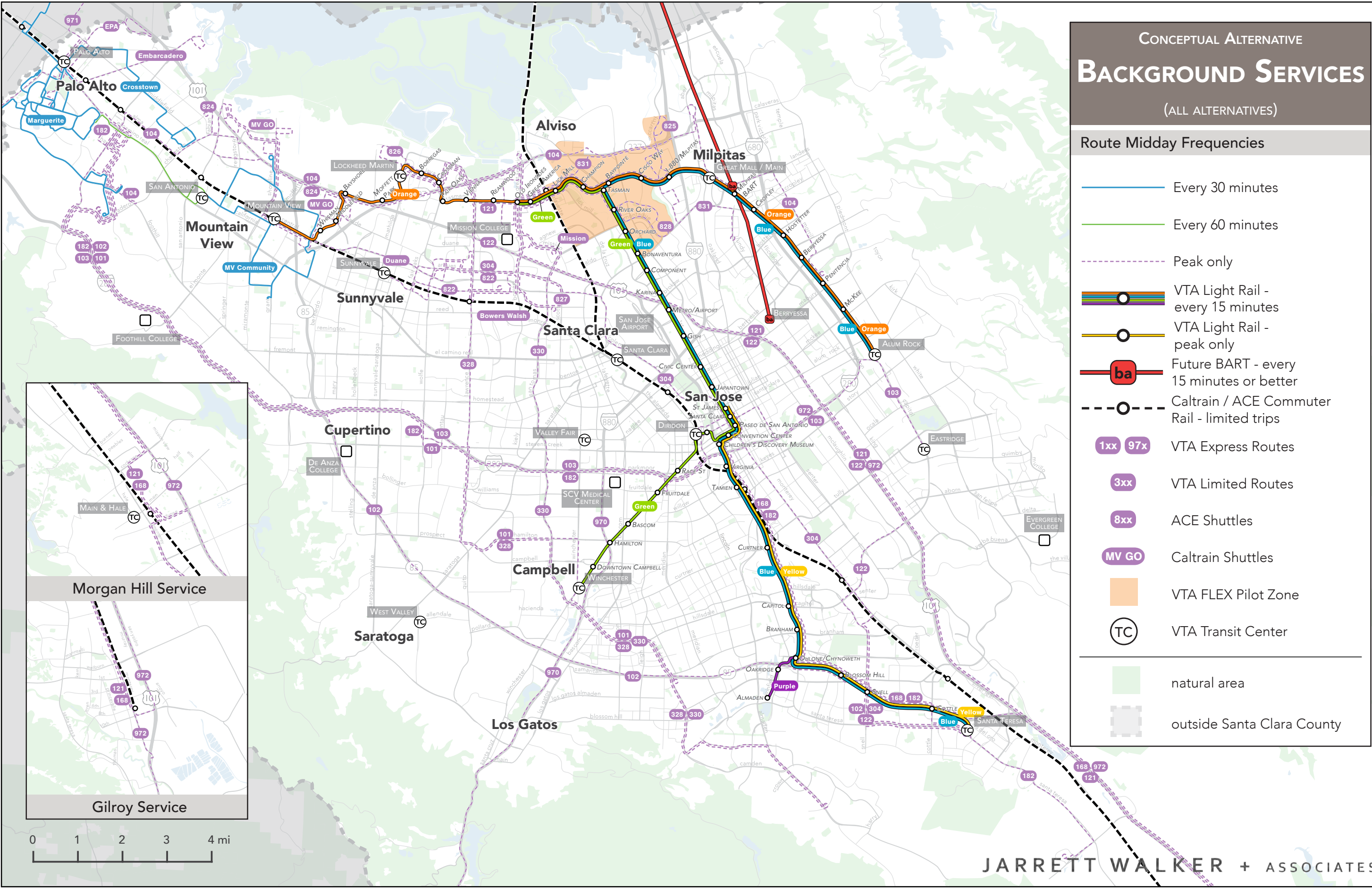
Caltrain / ACE commuter rail

natural area

outside Santa Clara County

JARRETT WALKER + ASSOCIATES





4

Outcomes: Liberty, Opportunity, and Ridership Potential

To understand why the high frequency networks in these concepts have such high ridership potential, it is helpful to consider what they do in geometric terms.

Quite simply, high frequency services, especially in a grid pattern where many connections are possible, *maximize the range of useful destinations that can be reached quickly, for the maximum possible number of people.*

While this point can be proven with data, it also becomes obvious if we think about how travel decisions are made. For a person to choose transit over other modes, transit must provide a reasonable travel time to reach their destination.¹ It stands to reason that when transit offers access to more destinations within a shorter travel time, to more people, it will attract higher ridership.

We can now visualize this change in travel times and access, and compare alternatives to one another using this measure. We have analyzed, for six locations around the county, what places can be reached in a fixed amount of time. Maps of this information are called “*isochrones*.”

In all of the isochrones in this chapter, you will see a human figure, named Jane, at the selected location. See Figure 12 for an example. Around Jane are blobs of color, which show where she could be, in a fixed amount of time, by walking and riding transit. The smallest blob, white, is where she could be in 15 minutes. The largest, light red, is where she could be in an hour.²

We sometimes refer to these as *maps of liberty and opportunity* because that’s what they are. If someone chooses to rely on transit, they will be constrained by where transit can readily take them, and will experience the blobs in these images as walls around where they can go and what they can do. For someone to choose to rely on transit, and especially for them to decide to not own a car or to share a car among, these blobs have to contain enough of the places that make people’s lives complete: jobs, education, shopping, services, social opportunities, and so on.

¹ Travel time is not the only reason to choose transit, but it tends to be a necessary condition for that choice. Subjective features such as comfort, amenity, and perceptions of safety also influence the choice, but none of these is a substitute for usefulness. Those other factors therefore have little influence unless the service is useful -- by which we mean taking people to desired destinations in an amount of time they find reasonable.

² To create the isochrones, we use a web app called Remix. Each of the networks re created in or imported into the web app, along with their frequencies, spans, and vehicle speeds. The frequencies, spans, and speeds are used to generate a schedule for stops along the route, which then allows the software to determine how far Jane can travel from a location chosen by the user.

From Remix (<http://getremix.com/guide>): “Jane’s travel includes a combination of walking (at a walk speed of approximately 3 miles per hour) and taking transit. Transit choices are based on the routes currently shown on the map, including potential transfers. If a transfer is taken, we assume that Jane must wait for half the headway of the next route.”

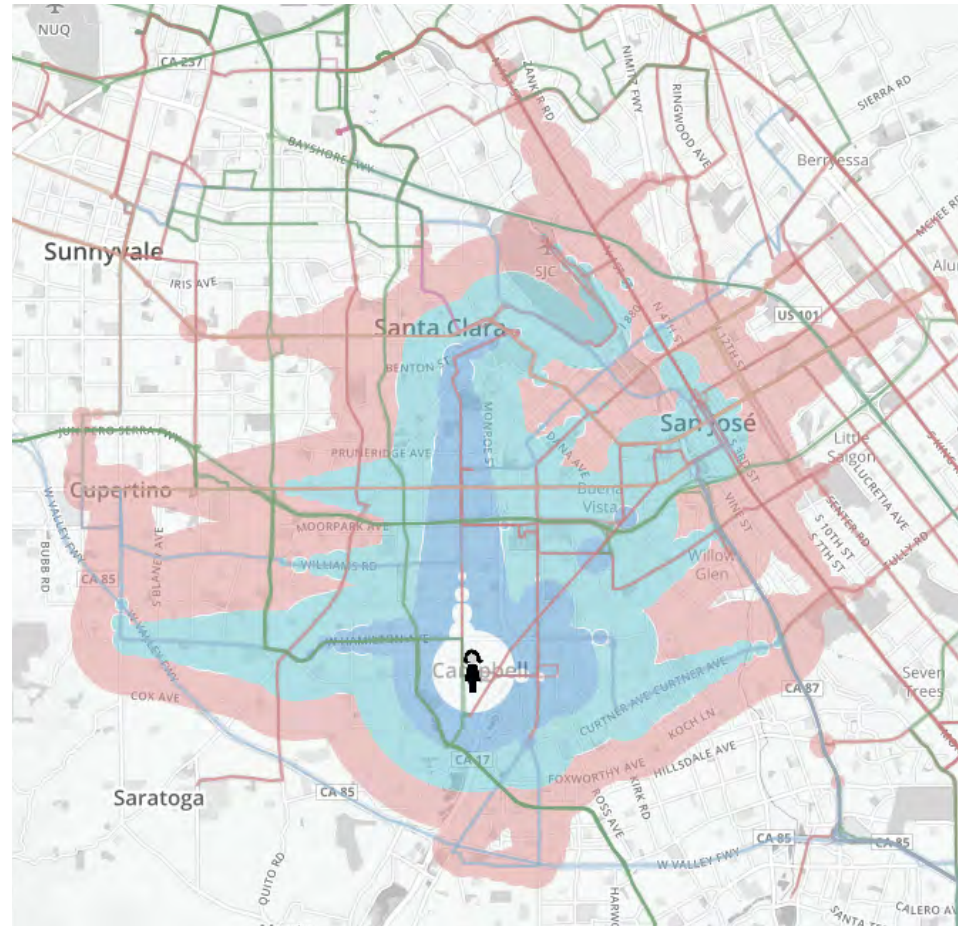


Figure 12: An isochrone shows a person’s liberty to access the county within 15, 30, 45, and 60 minutes, by transit and walking.

You use this tool to think about access in the reverse, as well. For a work-site or store at the selected point, the blobs show who could readily get there: the employees it can attract and the customers who might visit.

Of course, the real measure of usefulness is not just how much geographic area we can reach, but how many useful destinations we can access within that space. All geographically accurate maps tend to emphasize land area, when what really matters is population and activity. That’s why each page in this chapter shows not just isochrones, but also reports the numbers of jobs and residents within each isochrone, in accompanying tables.

Computer models that predict ridership have always been doing this analysis, behind the scenes. It has long been known that a good indicator of the ridership from a place is how many other useful places can be reached quickly from there, weighted by the number of people likely to be attracted to each of those destinations. *More ridership arises from service being useful, for more people, to get to more places.*

Thus larger isochrones – and dramatically larger numbers of jobs and residents within them – have always been a good indicator ridership potential. This helps to explain why Network 90 has the highest ridership potential and Network 70 the lowest. Network 90 offers the greatest expansion in where people can go, especially for those who live in the most transit-favorable development patterns. And of course, Network 90 does this by not trying to serve places where transit is not cost-effective, thus requiring people who live in those places to find other options for transportation.

Ridership is not the only payoff of large isochrones. Liberty and opportunity have their own value to the community served by VTA, aside from how they affect transit ridership. For lower income people, transportation is the biggest barrier to employment, and can also limit access to education. When low-income people are able to get to more places in less time, it means they have more choices in their lives, and in that sense, more freedom.

Campbell Ave - Winchester Blvd Travel Isochrones Weekdays 8 am

Residents Accessible by Transit			
Starting from Campbell Ave - Winchester Blvd and traveling for...			
	30 min	45 min	60 min
2016 Network	42,900	176,100	450,300
Increase from 2016 Network			
Network 70	37%	20%	8%
Network 80	78%	41%	19%
Network 90	73%	39%	13%

Jobs Accessible by Transit			
Starting from Campbell Ave - Winchester Blvd and traveling for...			
	30 min	45 min	60 min
2016 Network	28,500	118,000	257,400
Increase from 2016 Network			
Network 70	41%	23%	15%
Network 80	66%	32%	26%
Network 90	60%	36%	21%

How far can Jane travel in

15

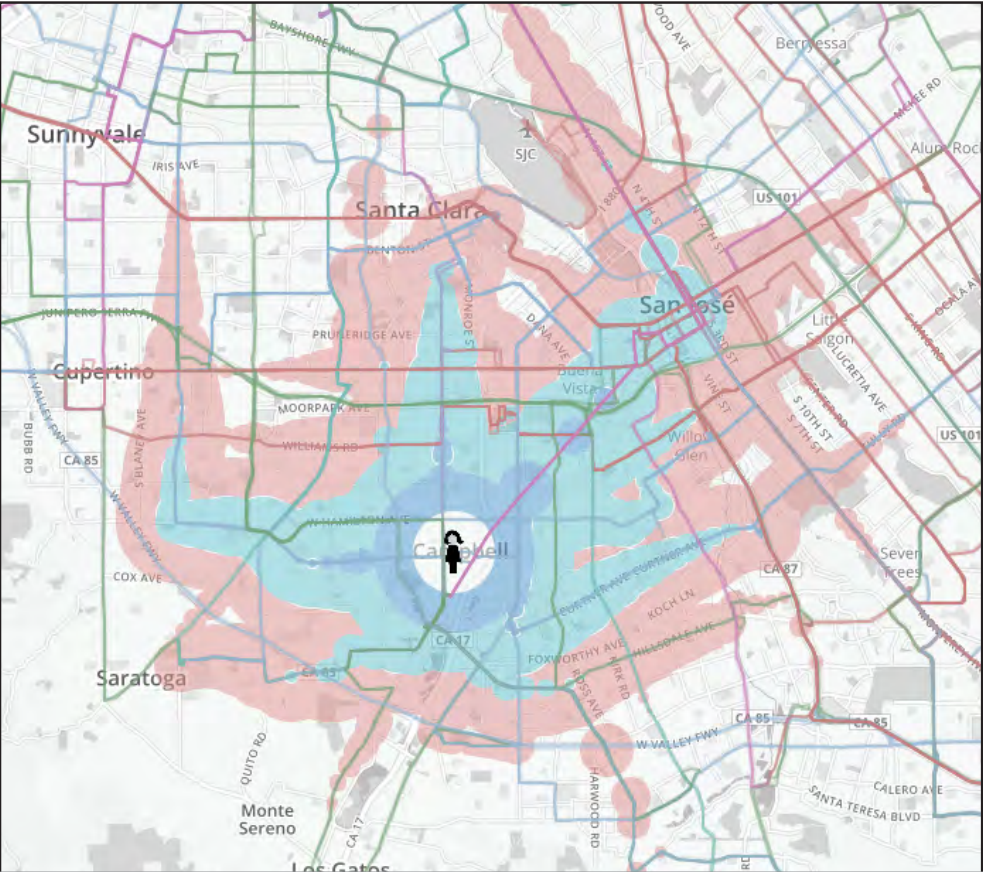
30

45

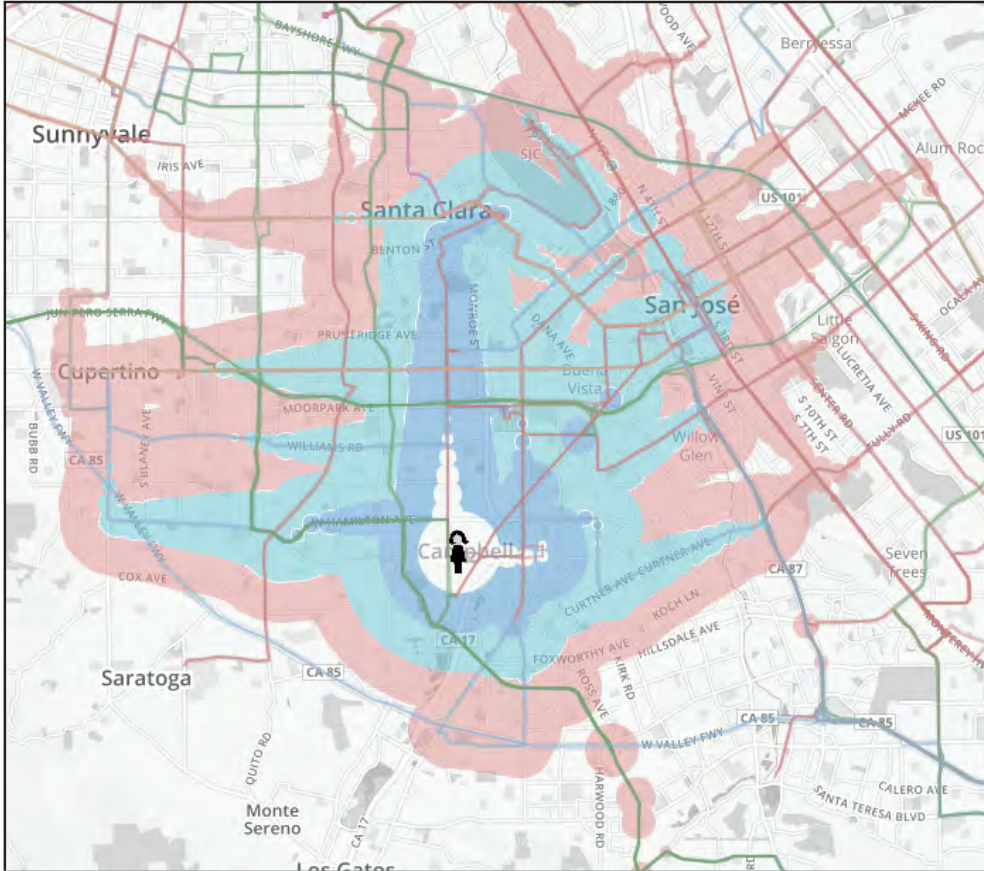
 or

60

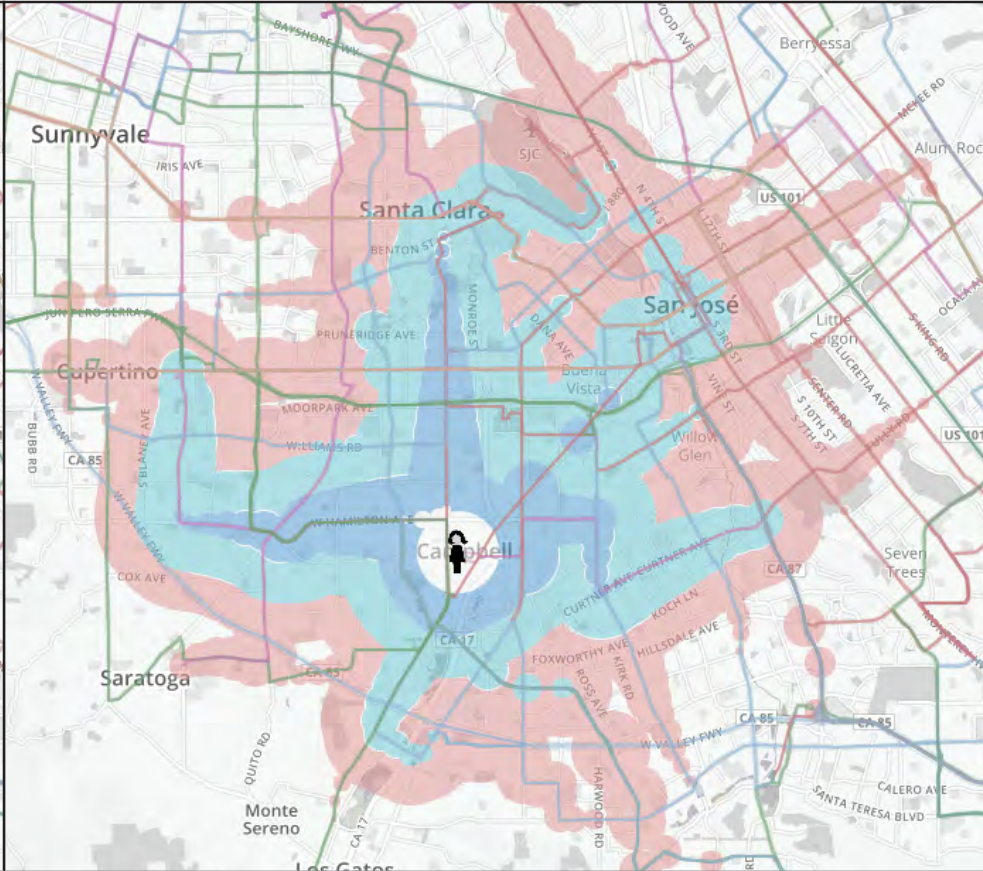
 minutes?



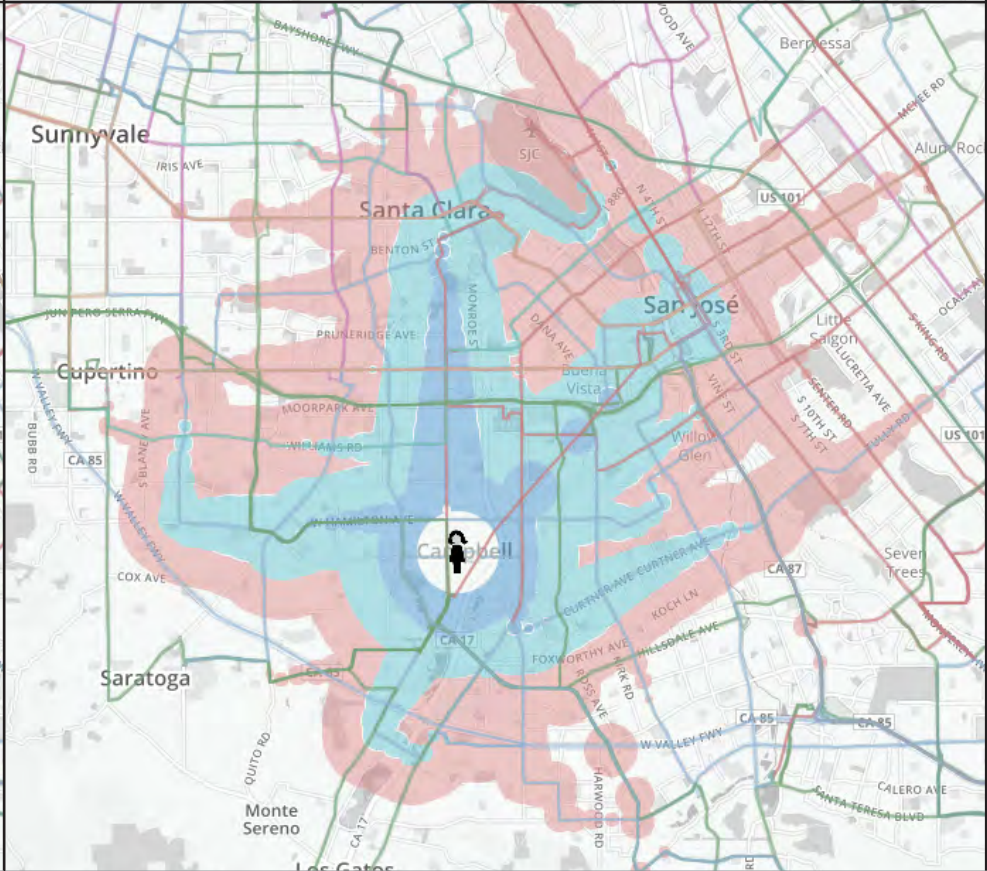
Existing Network 2016



Conceptual Network 90



Conceptual Network 80



Conceptual Network 70

Campbell Ave - Winchester Blvd Travel Isochrones Weekdays 12 pm

Residents Accessible by Transit			
Starting from Campbell Ave - Winchester Blvd and traveling for...			
	30 min	45 min	60 min
2016 Network	36,700	140,700	352,000
Increase from 2016 Network			
Network 70	60%	45%	28%
Network 80	63%	48%	29%
Network 90	83%	61%	33%

Jobs Accessible by Transit			
Starting from Campbell Ave - Winchester Blvd and traveling for...			
	30 min	45 min	60 min
2016 Network	22,400	72,100	195,900
Increase from 2016 Network			
Network 70	79%	97%	43%
Network 80	80%	103%	42%
Network 90	91%	108%	46%

How far can Jane travel in

15

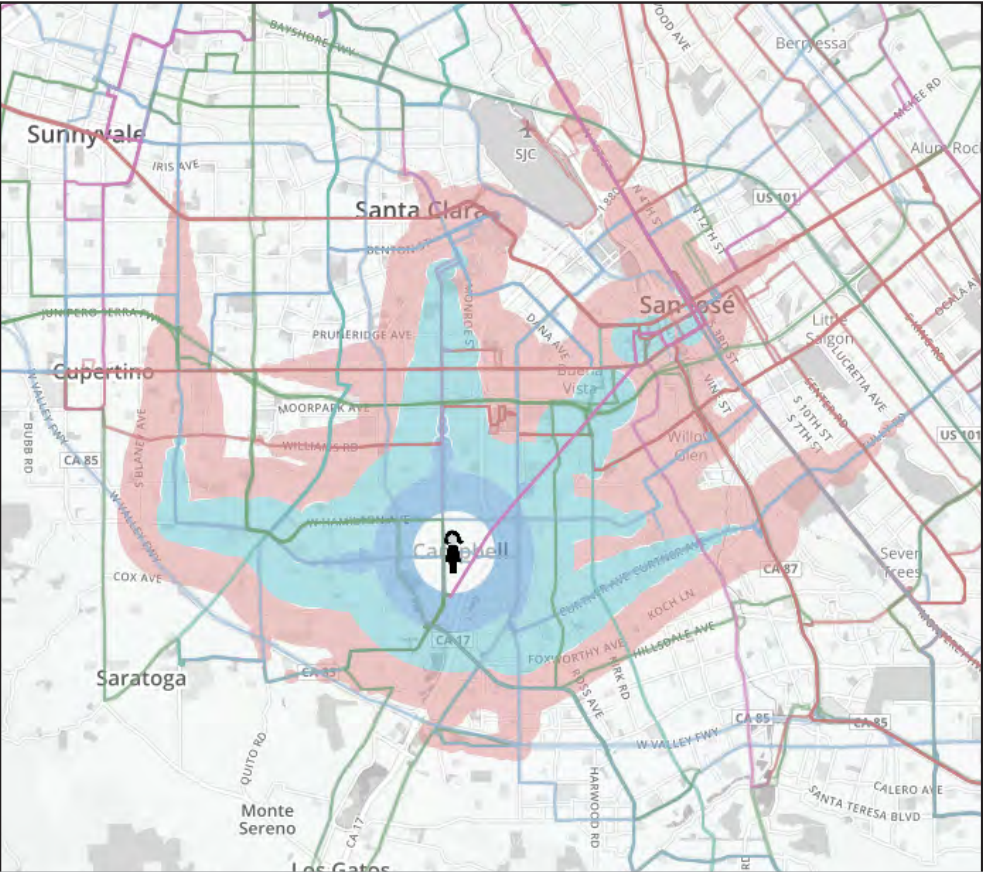
30

45

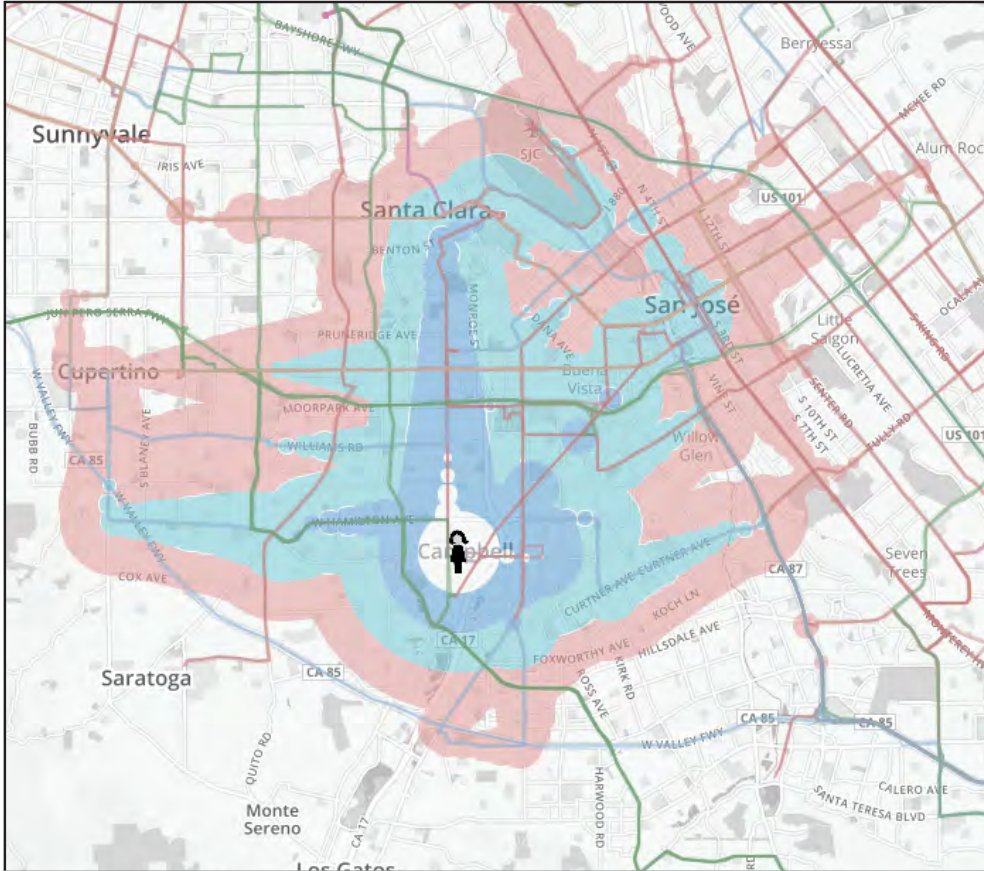
 or

60

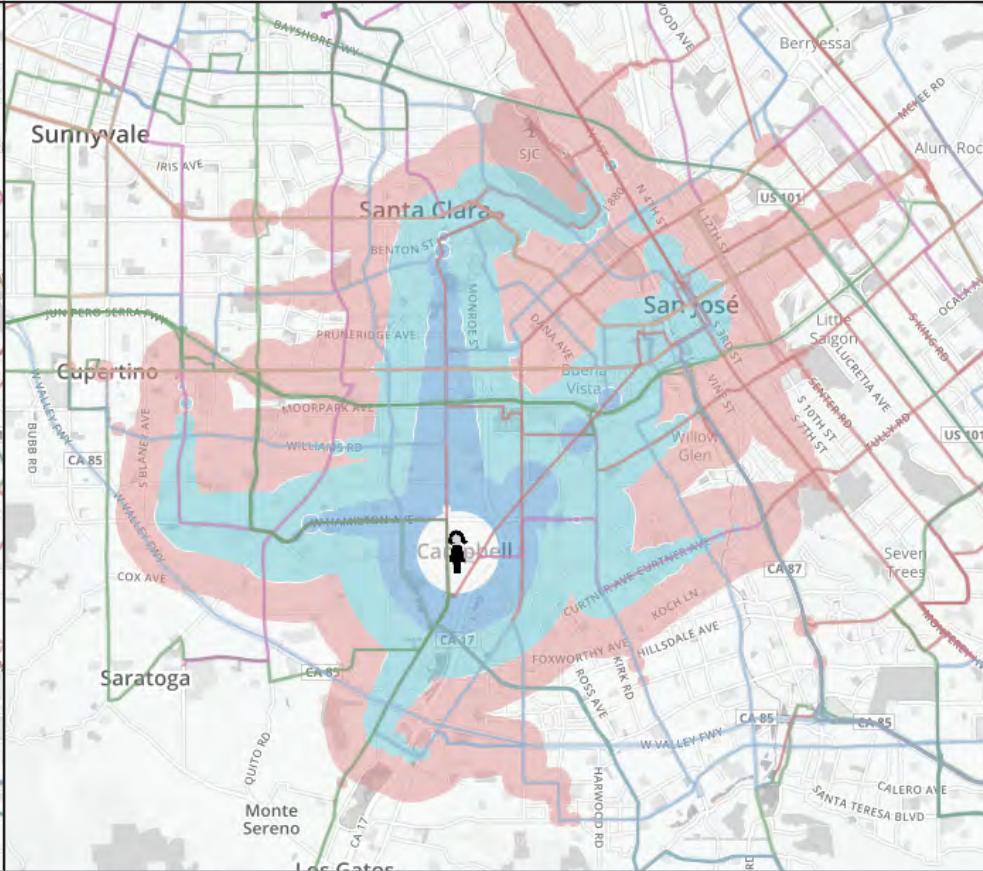
 minutes?



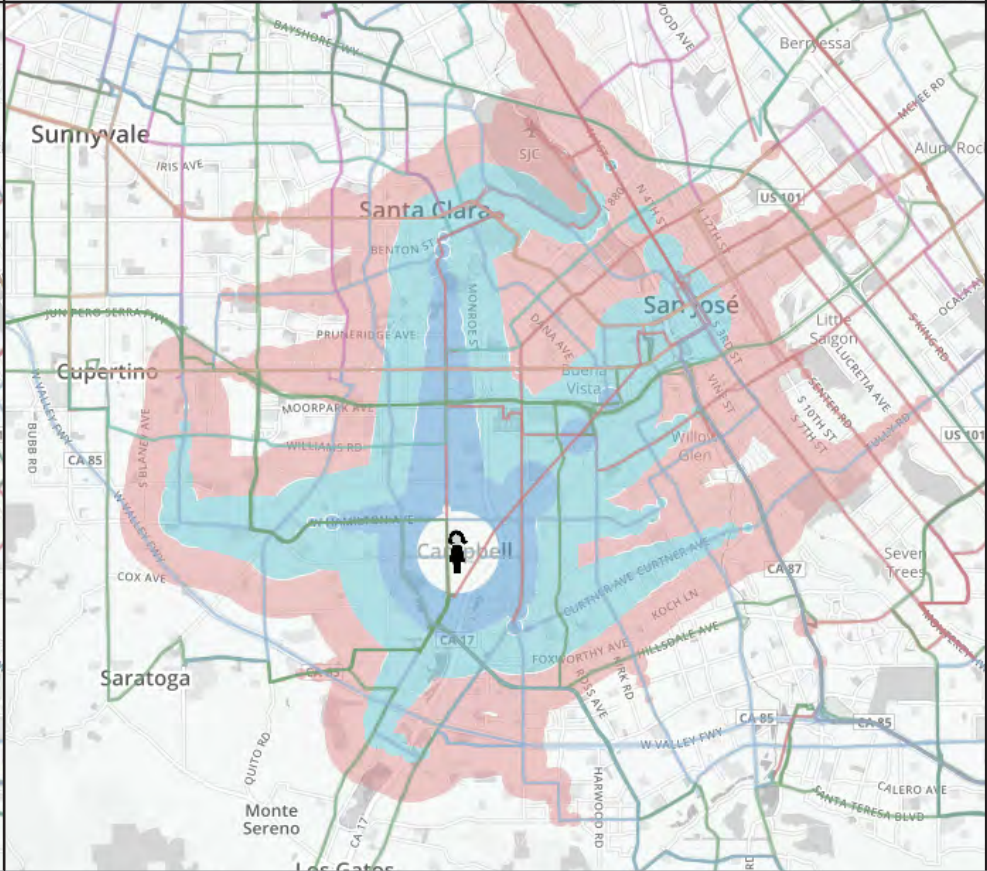
Existing Network 2016



Conceptual Network 90



Conceptual Network 80



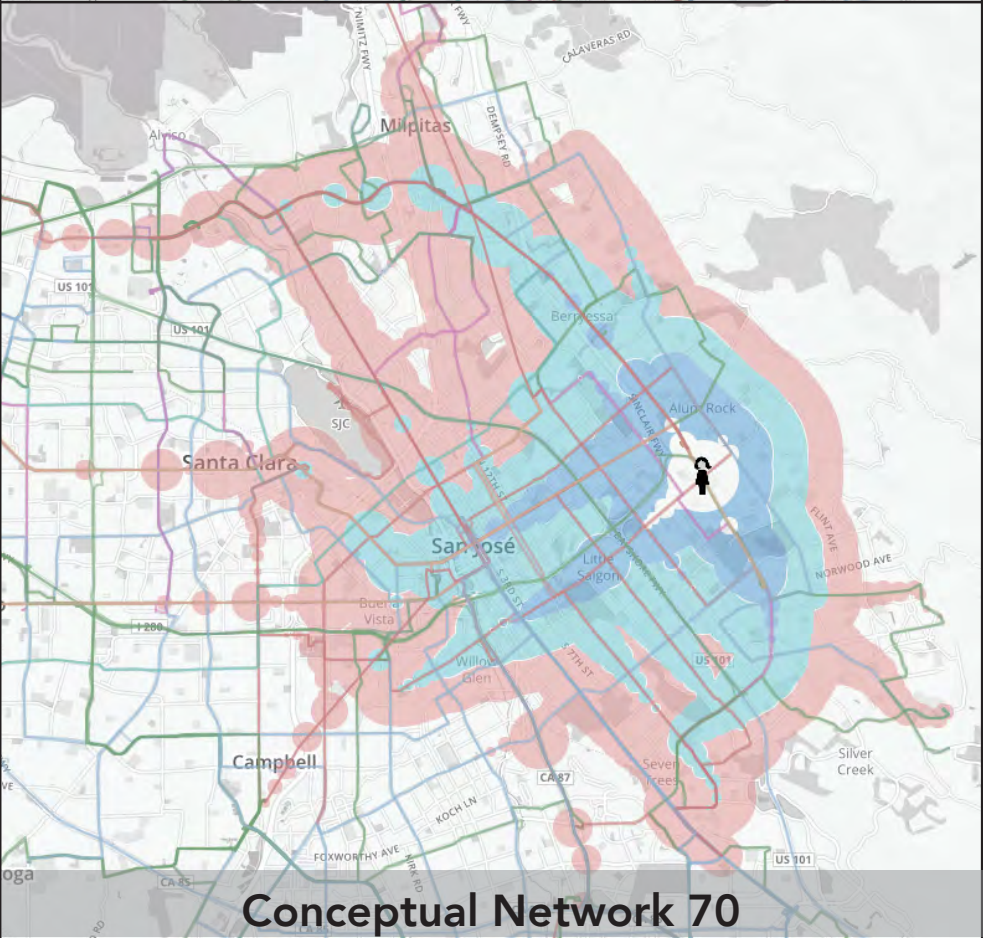
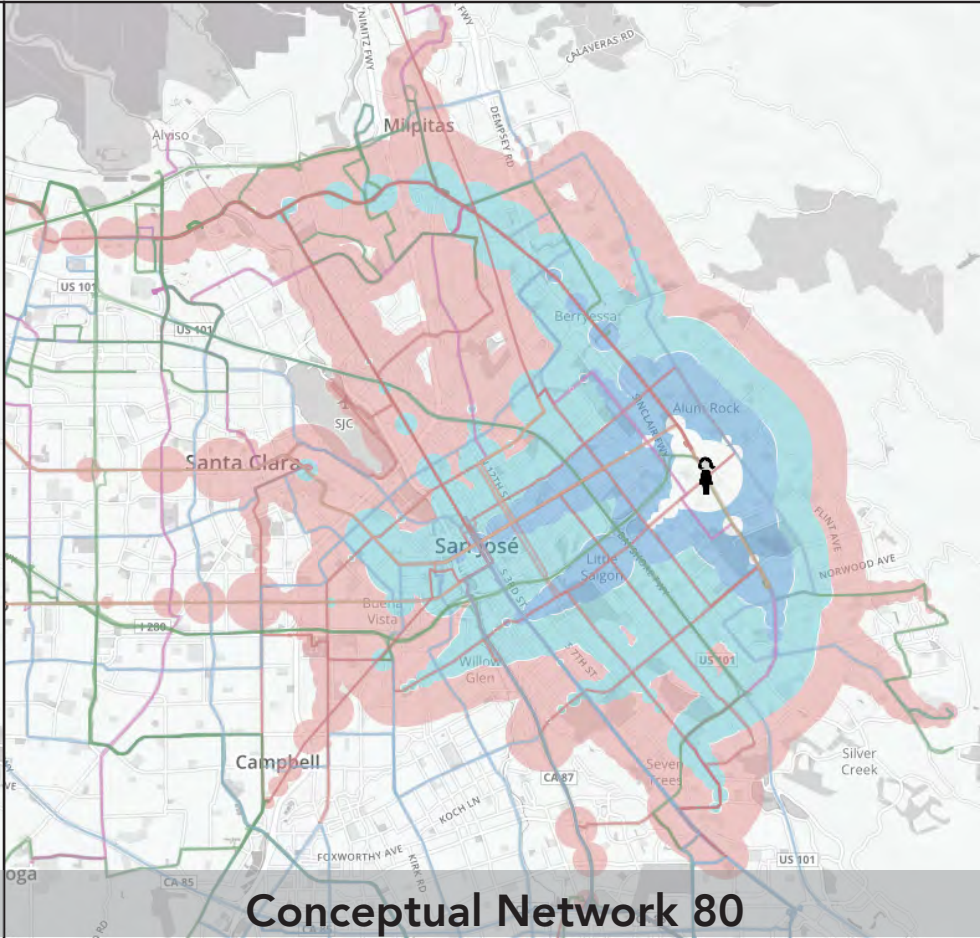
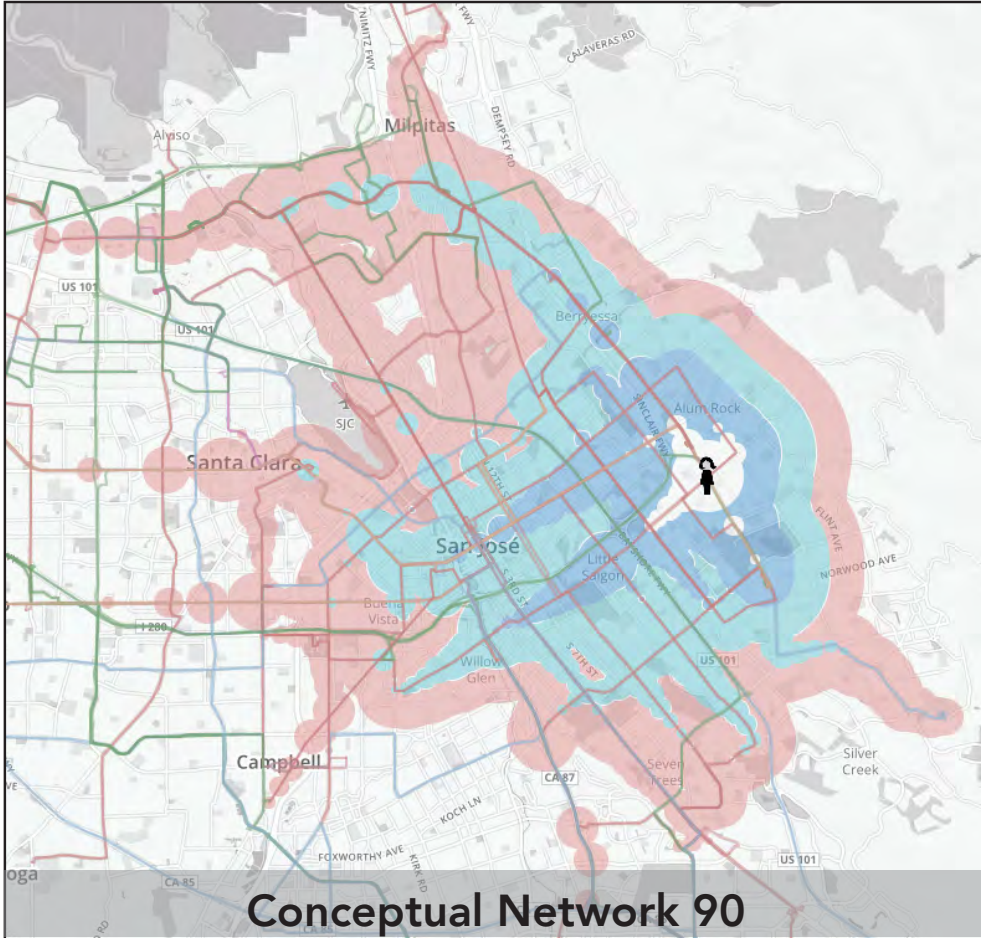
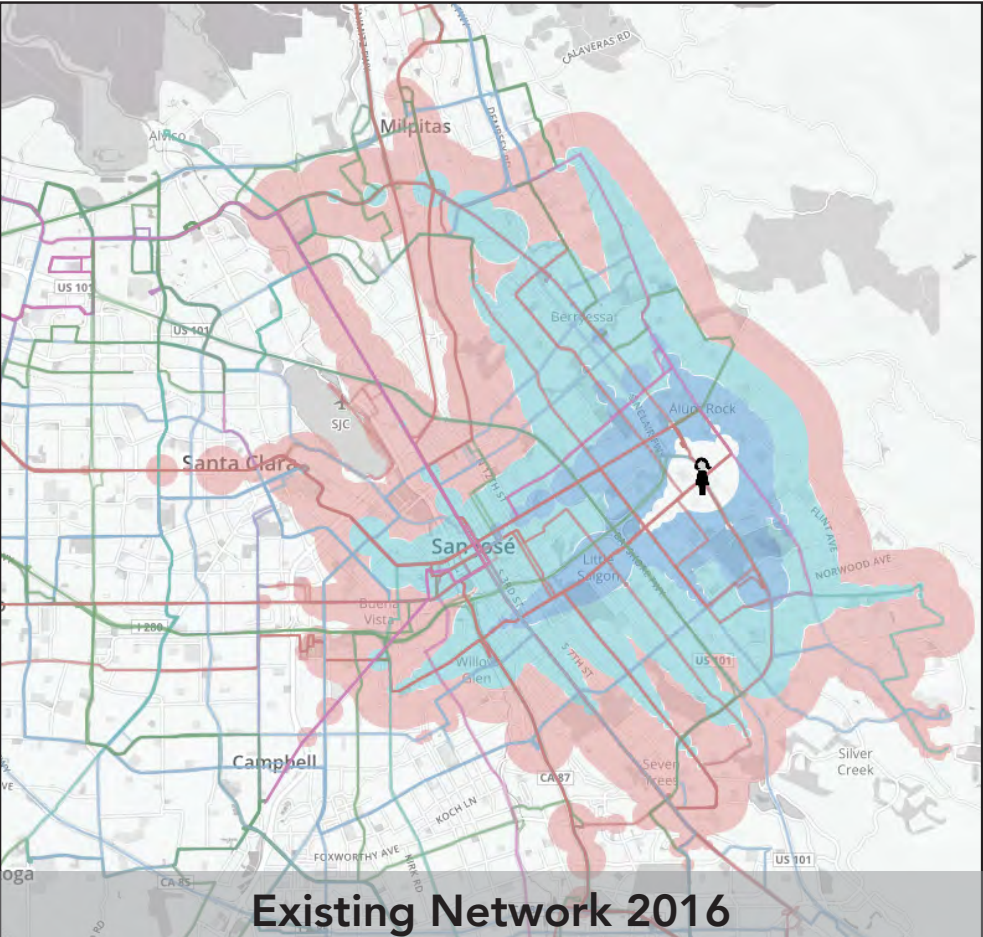
Conceptual Network 70

Capitol Expwy - Story Rd Travel Isochrones Weekdays 8 am

Residents Accessible by Transit			
Starting from Capitol Expwy - Story Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	136,200	494,700	1,112,700
Increase from 2016 Network			
Network 70	2%	-1%	0%
Network 80	7%	4%	4%
Network 90	16%	3%	3%

Jobs Accessible by Transit			
Starting from Capitol Expwy - Story Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	29,800	153,200	447,800
Increase from 2016 Network			
Network 70	26%	8%	11%
Network 80	43%	16%	19%
Network 90	49%	18%	20%

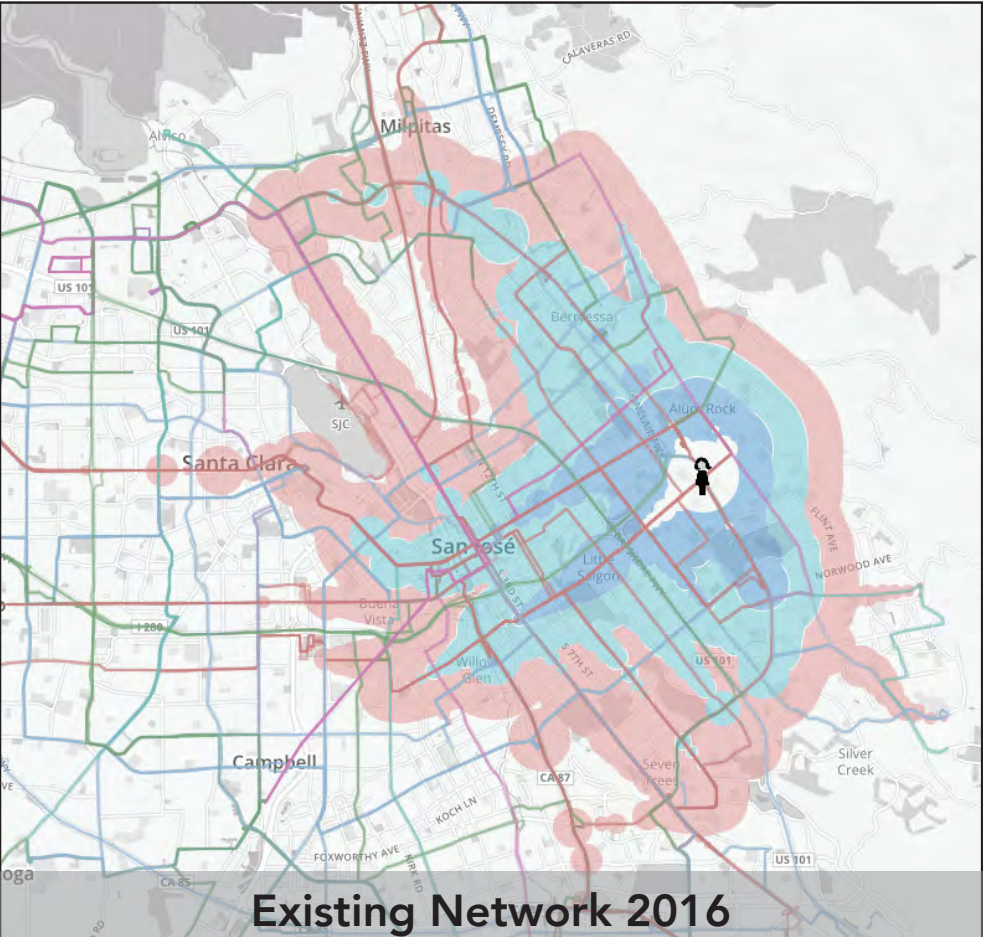
How far can Jane travel in 15 30 45 or 60 minutes?



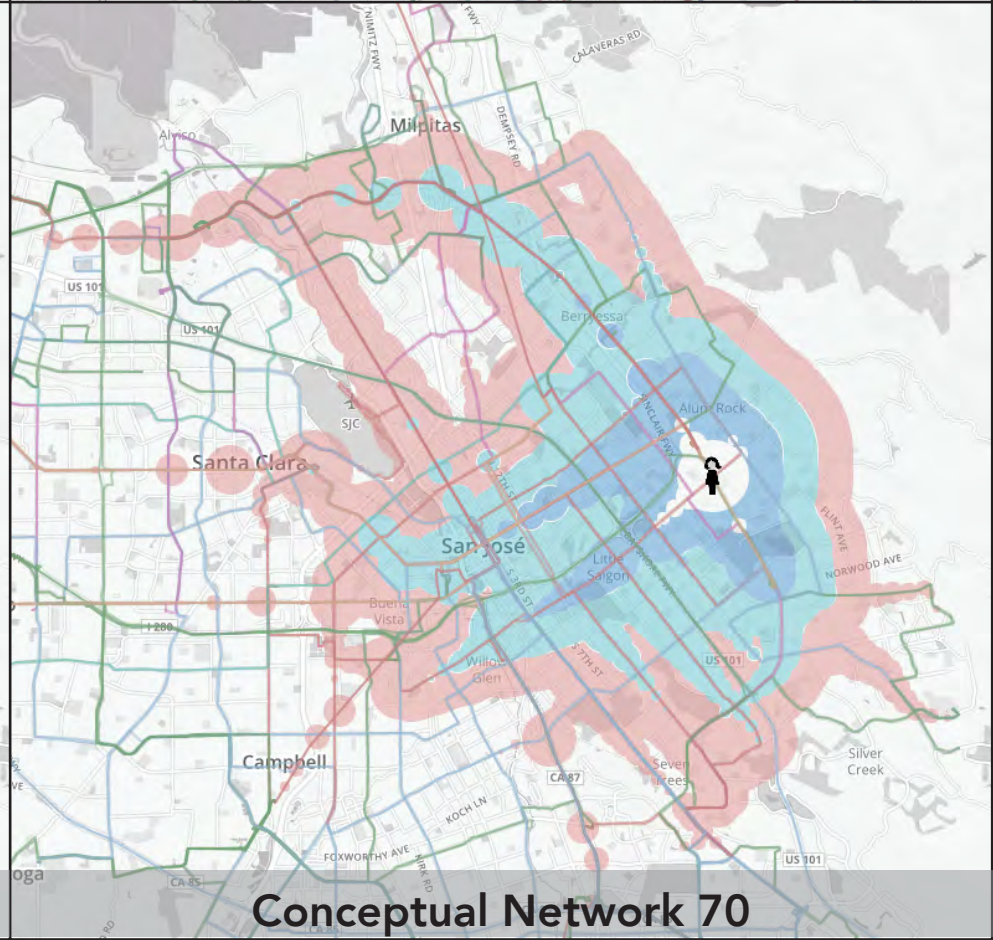
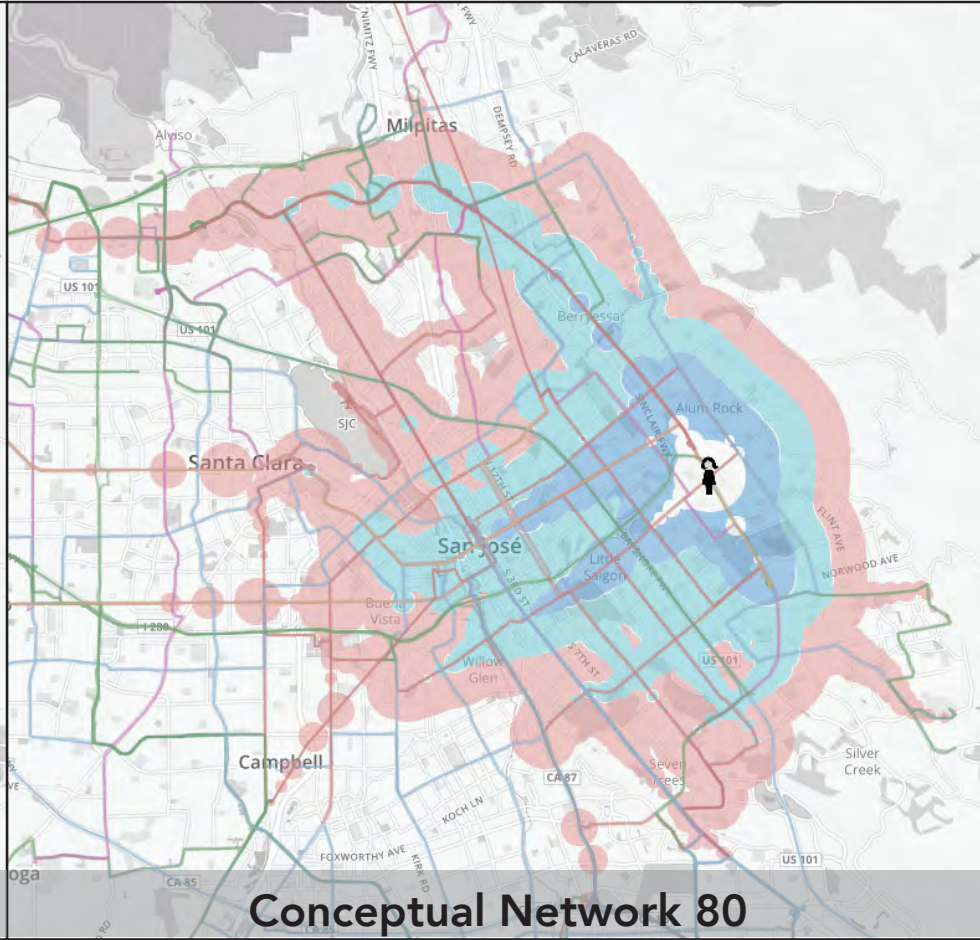
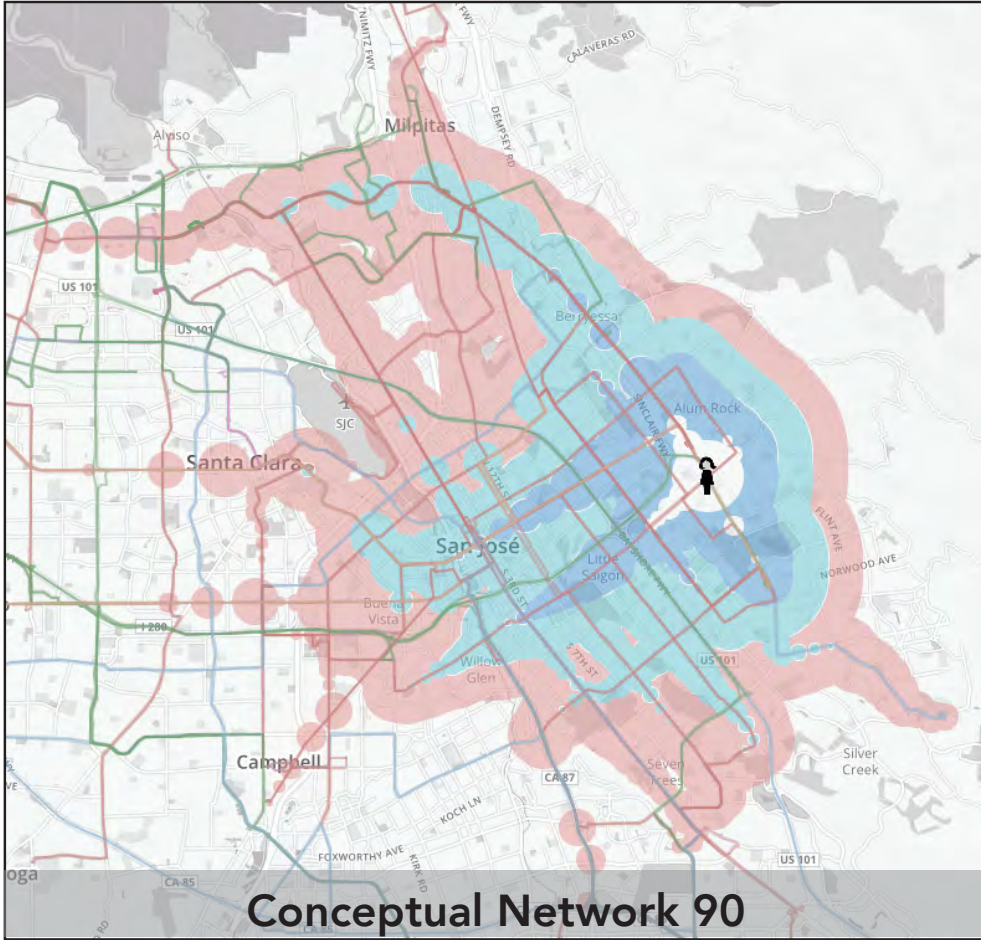
Capitol Expwy - Story Rd Travel Isochrones Weekdays 12 pm

Residents Accessible by Transit			
Starting from Capitol Expwy - Story Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	128,300	454,100	1,029,300
Increase from 2016 Network			
Network 70	2%	0%	-1%
Network 80	7%	4%	4%
Network 90	12%	6%	5%

Jobs Accessible by Transit			
Starting from Capitol Expwy - Story Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	28,300	141,900	416,700
Increase from 2016 Network			
Network 70	14%	8%	9%
Network 80	31%	17%	18%
Network 90	36%	18%	21%



How far can Jane travel in 15 30 45 or 60 minutes?



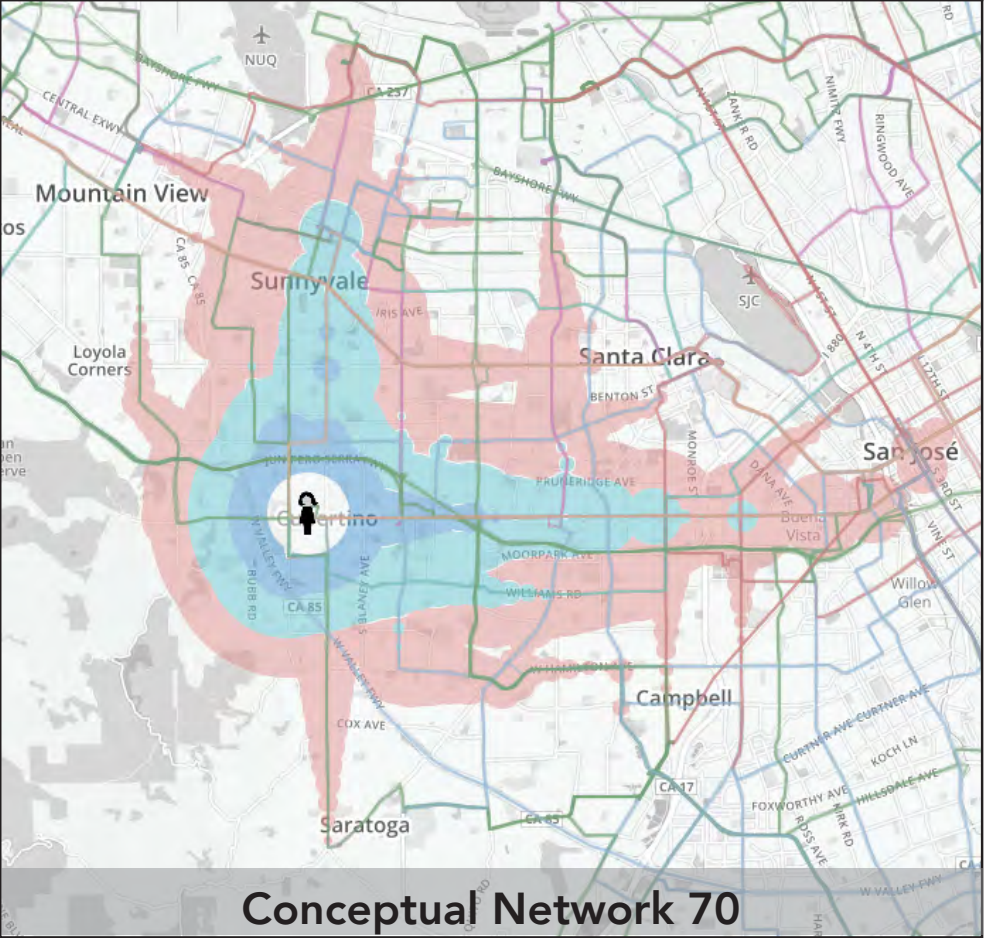
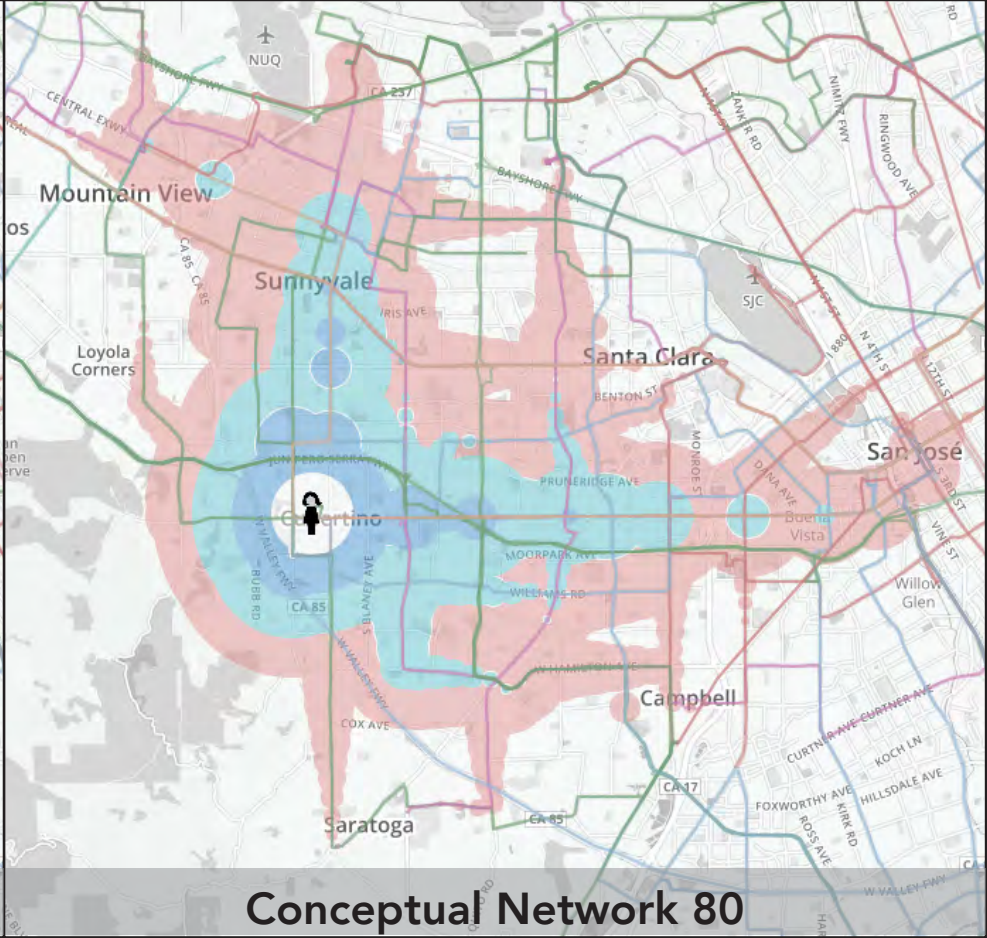
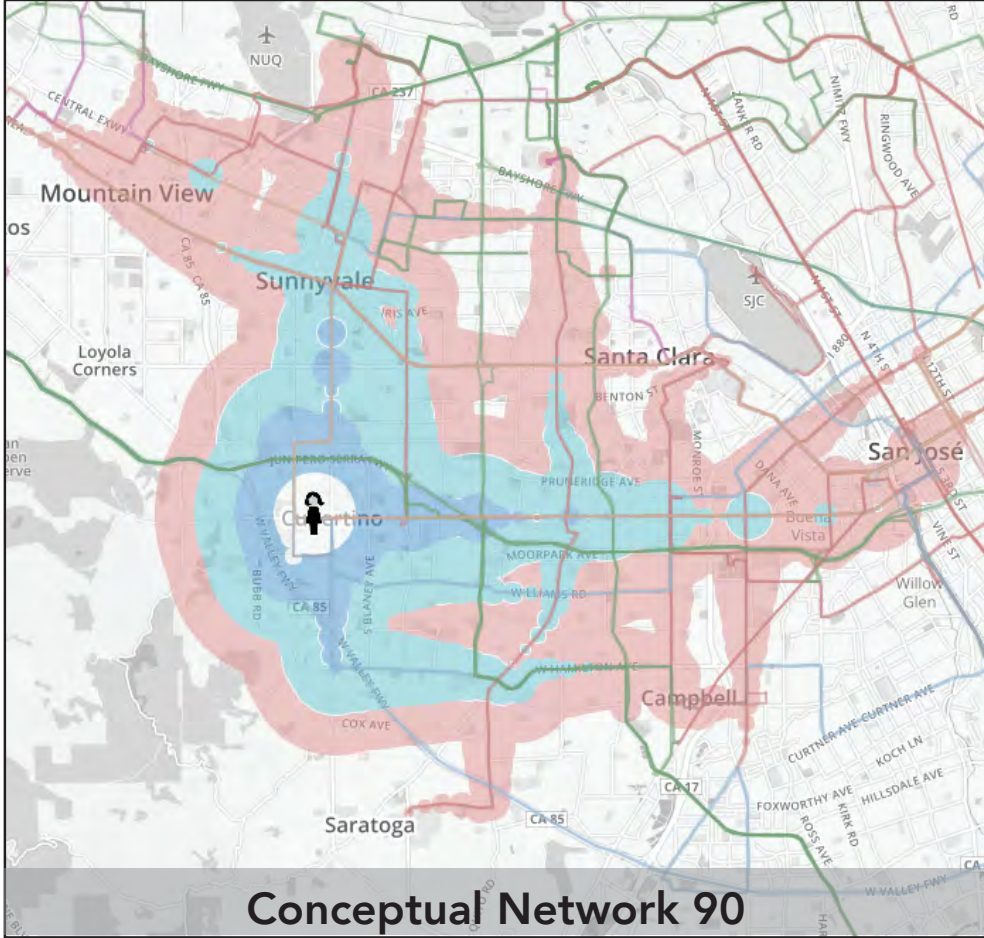
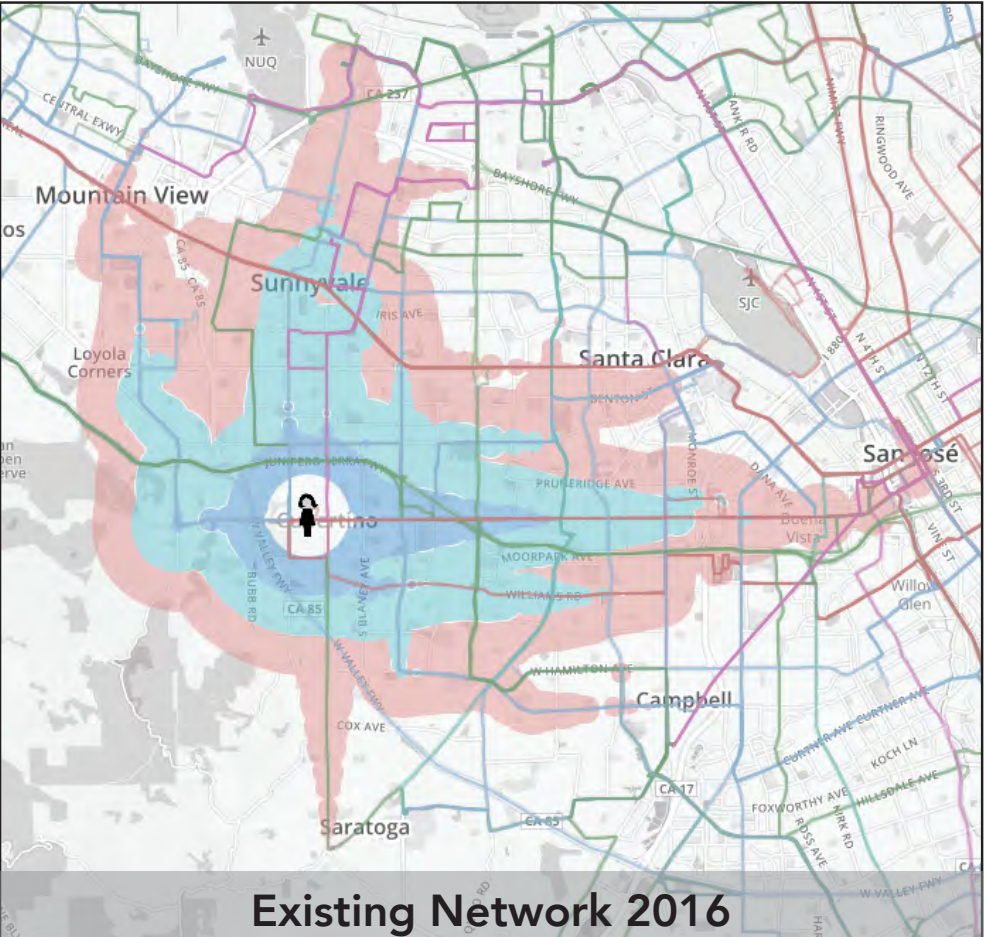
Cupertino Travel Isochrones

Weekdays 8 am

Residents Accessible by Transit			
Starting from Stevens Creek Blvd - Saich Way and traveling for...			
	30 min	45 min	60 min
2016 Network	43,100	165,800	375,500
Increase from 2016 Network			
Network 70	-7%	-17%	-2%
Network 80	9%	0%	17%
Network 90	13%	10%	22%

Jobs Accessible by Transit			
Starting from Stevens Creek Blvd - Saich Way and traveling for...			
	30 min	45 min	60 min
2016 Network	37,400	77,700	178,000
Increase from 2016 Network			
Network 70	-4%	-10%	11%
Network 80	3%	6%	41%
Network 90	4%	8%	49%

How far can Jane travel in 15 30 45 or 60 minutes?



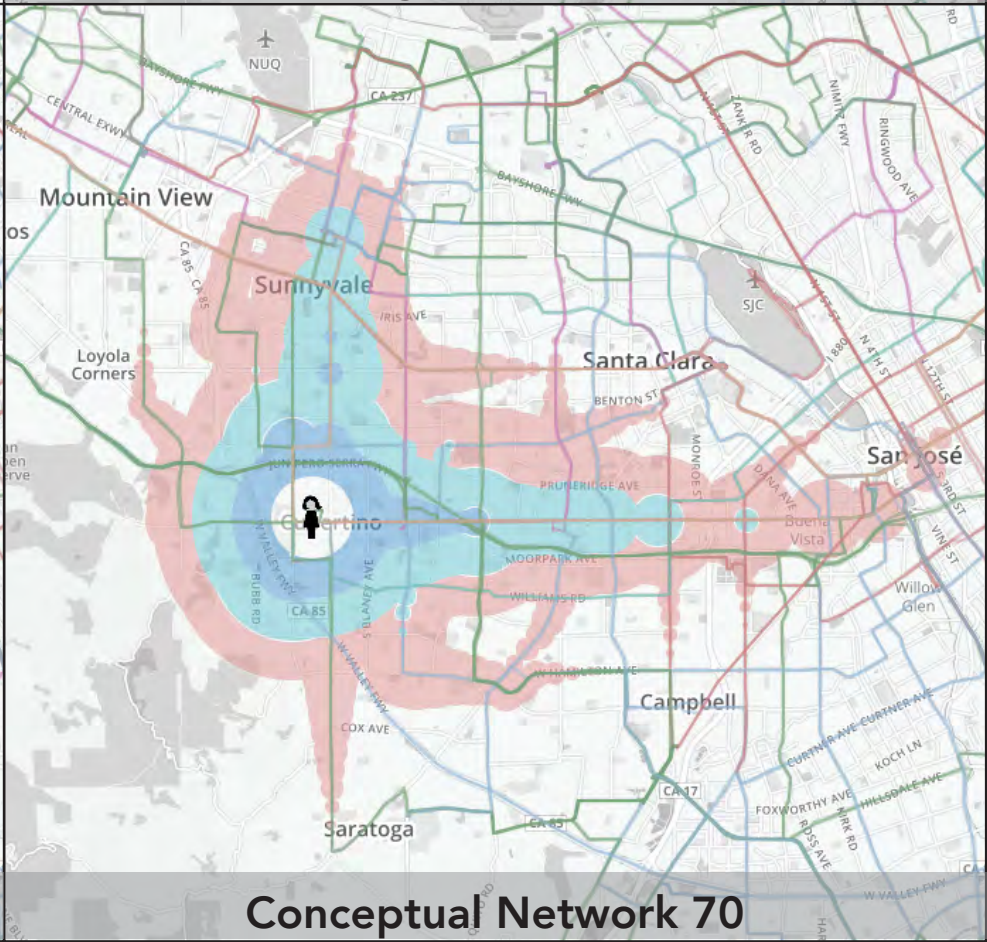
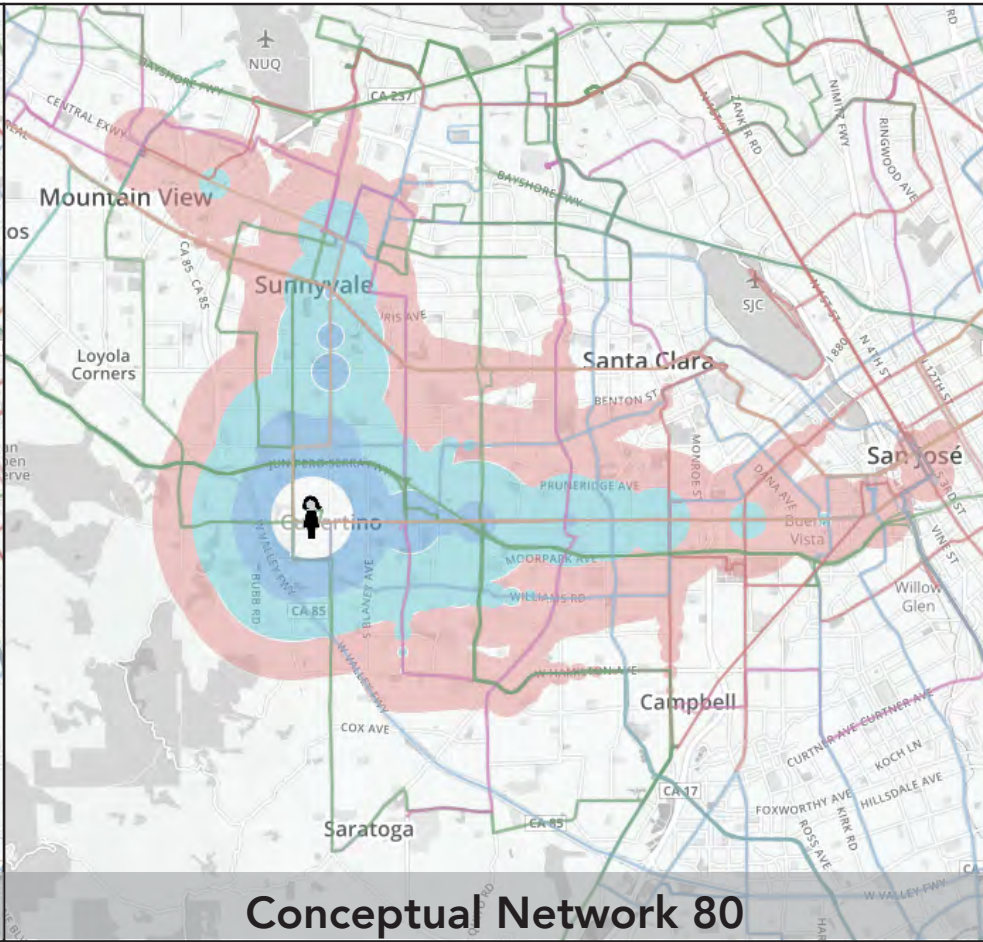
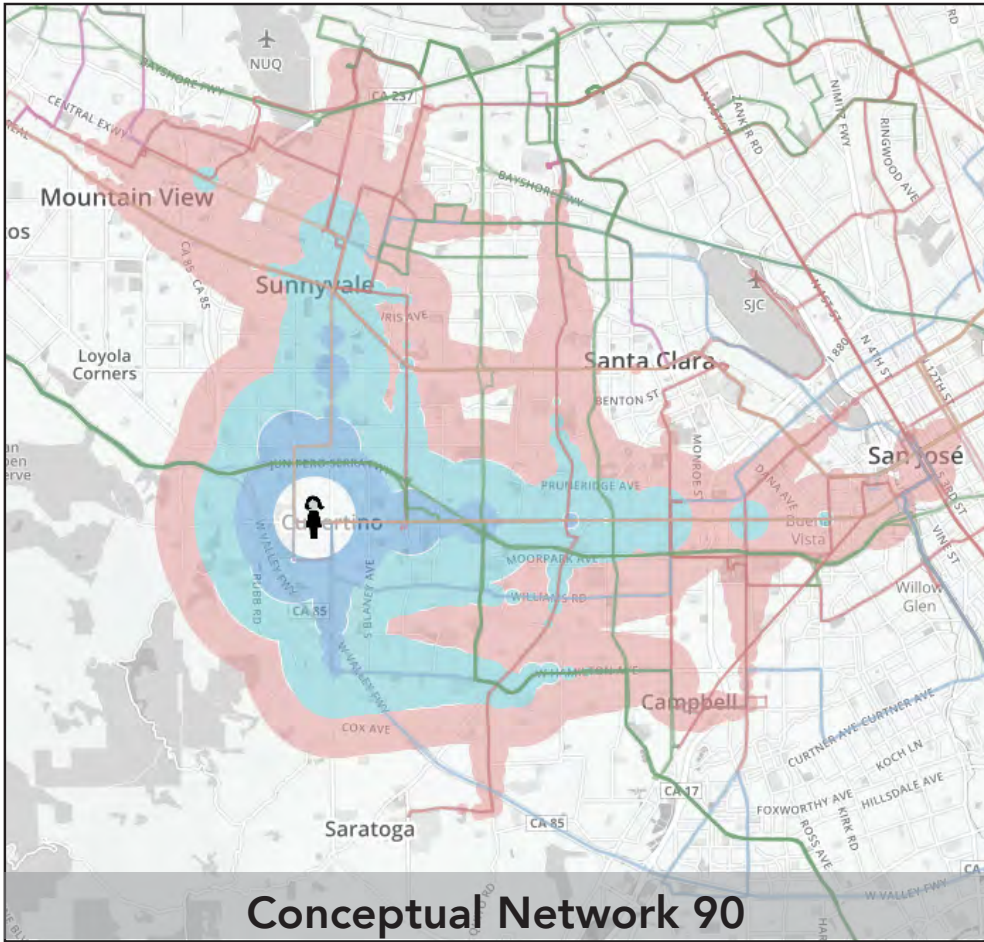
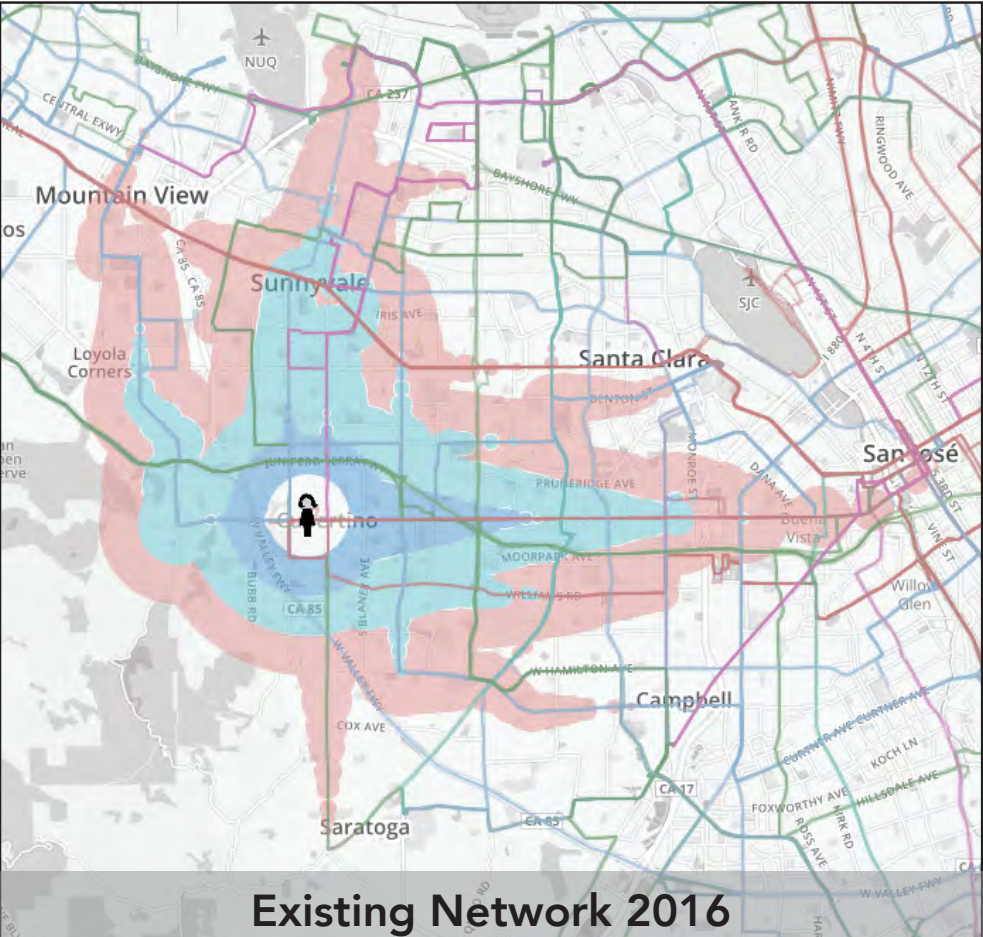
Cupertino Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from Stevens Creek Blvd - Saich Way and traveling for...			
	30 min	45 min	60 min
2016 Network	36,600	141,300	337,200
Increase from 2016 Network			
Network 70	-1%	-13%	-12%
Network 80	14%	0%	3%
Network 90	26%	17%	22%

Jobs Accessible by Transit			
Starting from Stevens Creek Blvd - Saich Way and traveling for...			
	30 min	45 min	60 min
2016 Network	35,800	69,800	158,900
Increase from 2016 Network			
Network 70	-3%	-10%	-7%
Network 80	2%	1%	13%
Network 90	6%	10%	48%

How far can Jane travel in 15 30 45 or 60 minutes?



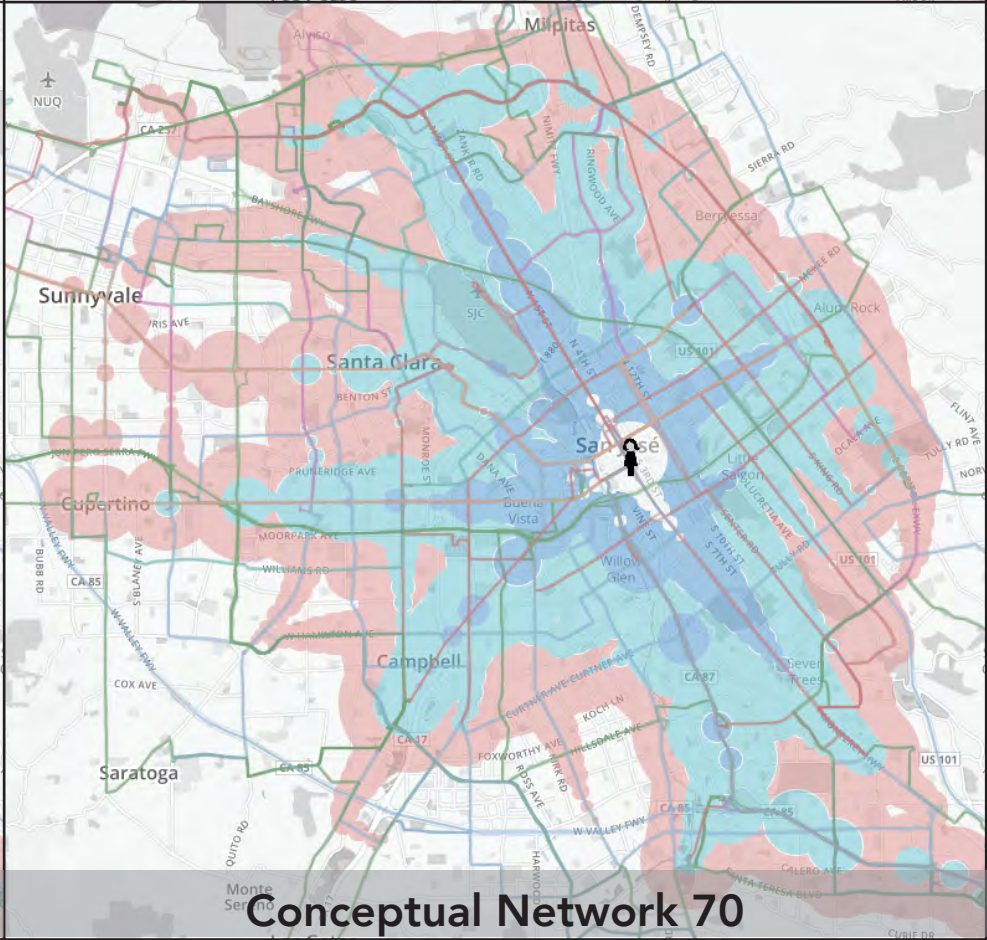
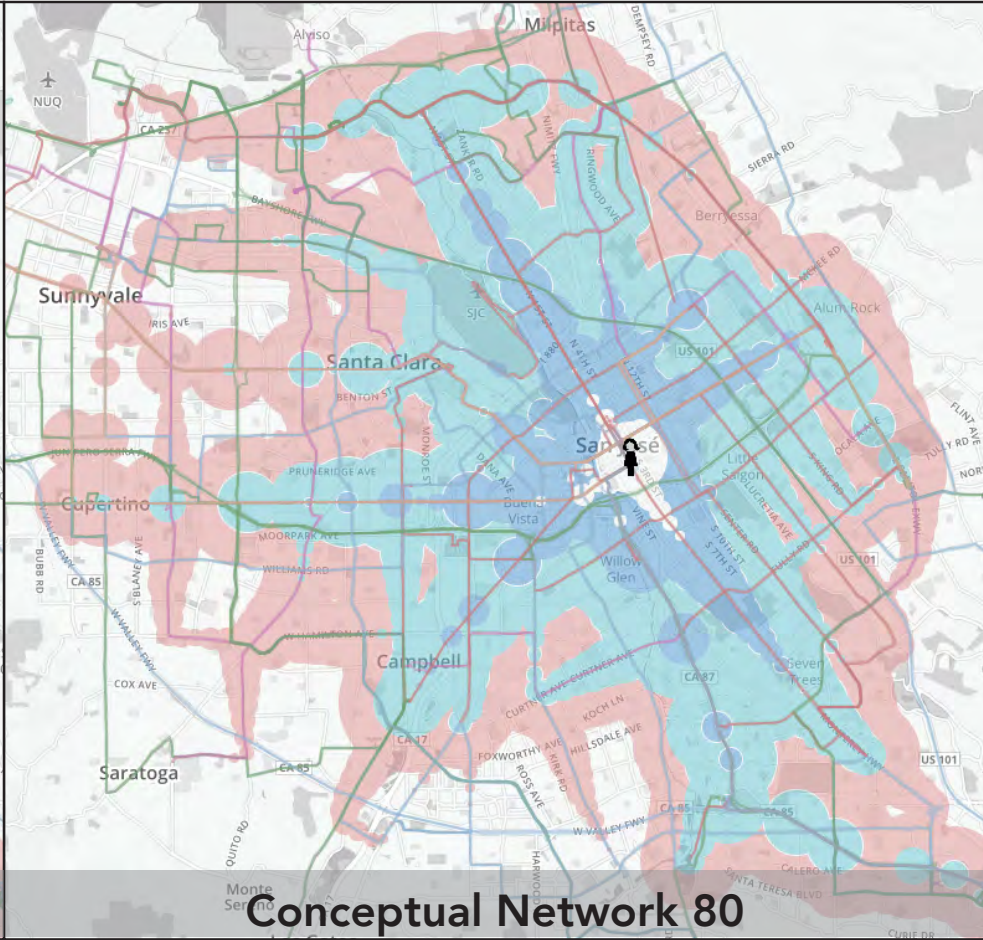
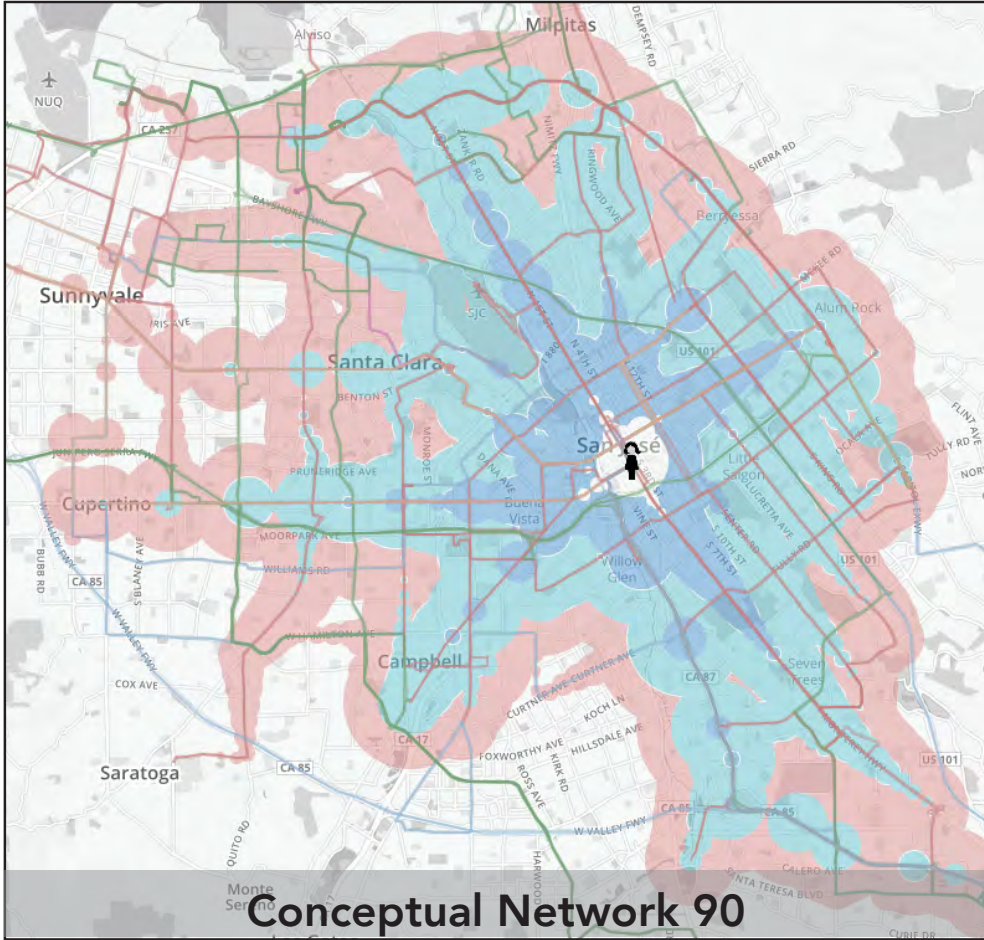
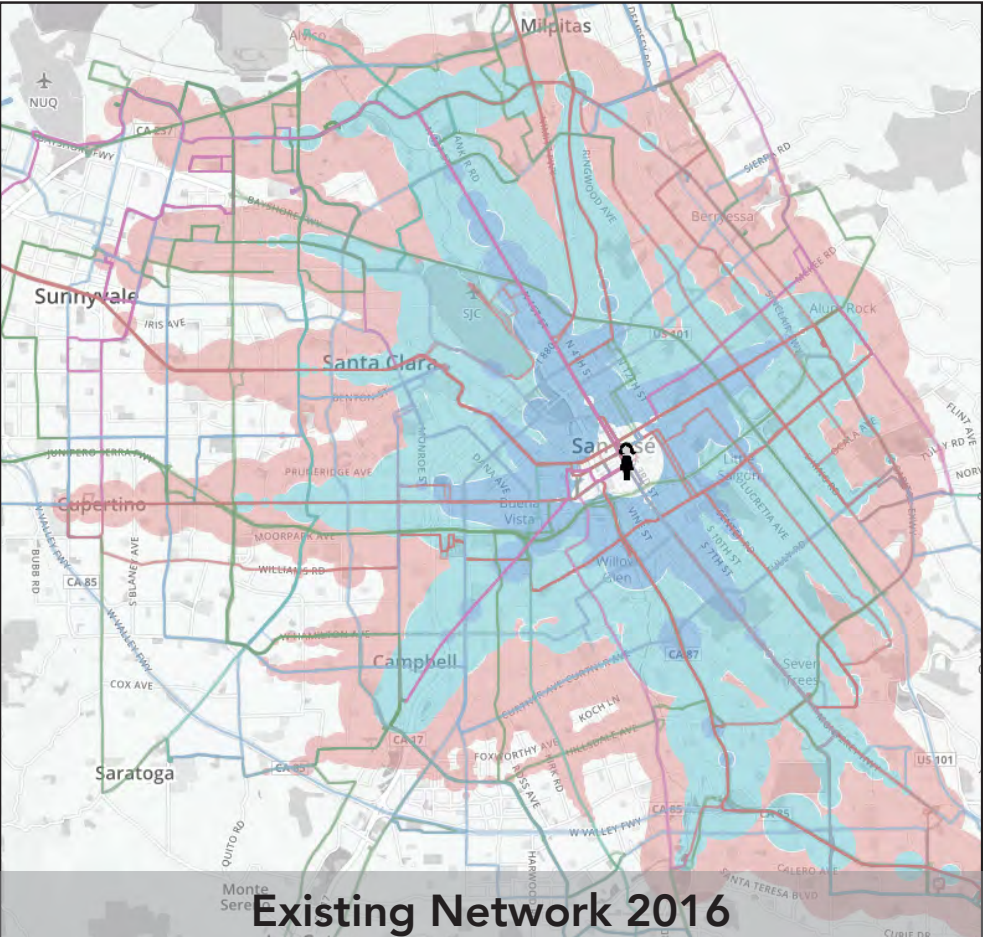
Downtown San Jose Travel Isochrones

Weekdays 8 am

Residents Accessible by Transit			
Starting from San Carlos St - S 1st St and traveling for...			
	30 min	45 min	60 min
2016 Network	133,700	464,400	896,600
Increase from 2016 Network			
Network 70	-3%	-2%	-1%
Network 80	4%	5%	6%
Network 90	5%	9%	4%

Jobs Accessible by Transit			
Starting from San Carlos St - S 1st St and traveling for...			
	30 min	45 min	60 min
2016 Network	131,100	334,900	548,000
Increase from 2016 Network			
Network 70	0%	3%	-1%
Network 80	3%	6%	2%
Network 90	2%	6%	0%

How far can Jane travel in 15 30 45 or 60 minutes?

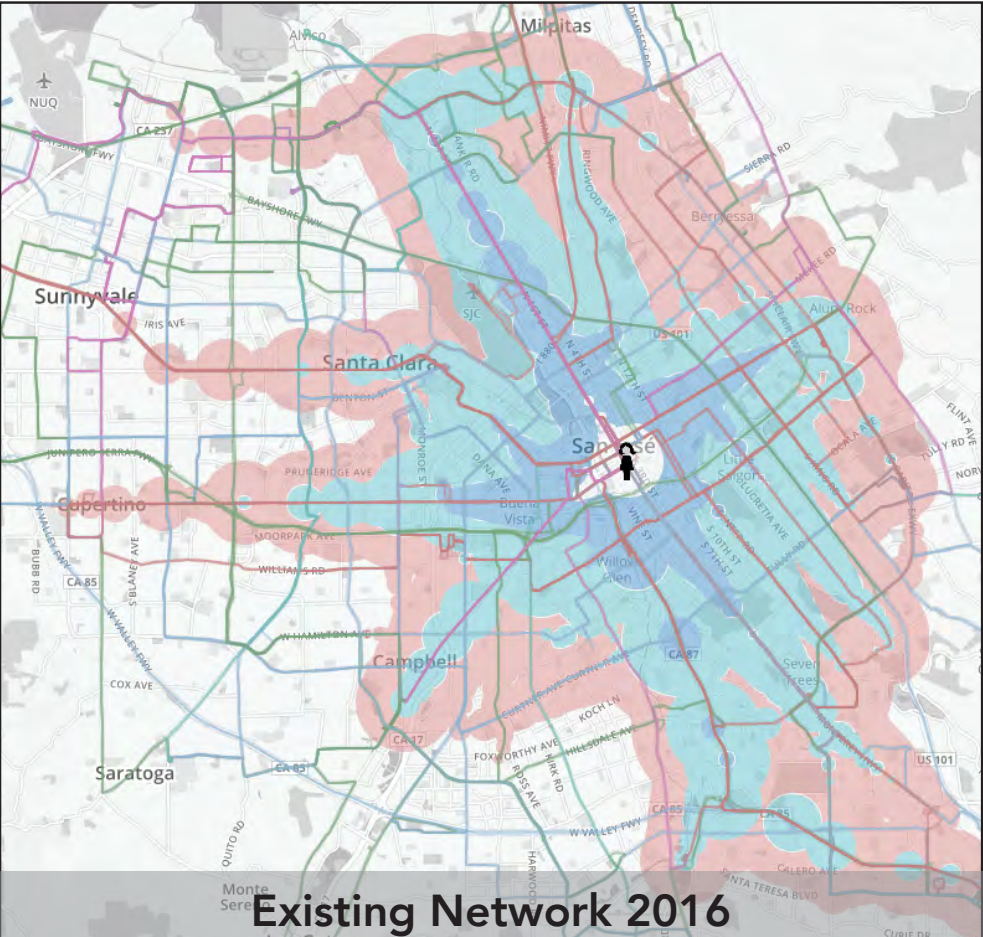


Downtown San Jose Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from San Carlos St - S 1st St and traveling for...			
	30 min	45 min	60 min
2016 Network	115,200	414,400	816,100
Increase from 2016 Network			
Network 70	4%	2%	3%
Network 80	14%	9%	7%
Network 90	13%	12%	8%

Jobs Accessible by Transit			
Starting from San Carlos St - S 1st St and traveling for...			
	30 min	45 min	60 min
2016 Network	118,400	296,300	444,700
Increase from 2016 Network			
Network 70	4%	5%	5%
Network 80	8%	11%	7%
Network 90	8%	11%	8%



How far can Jane travel in

15

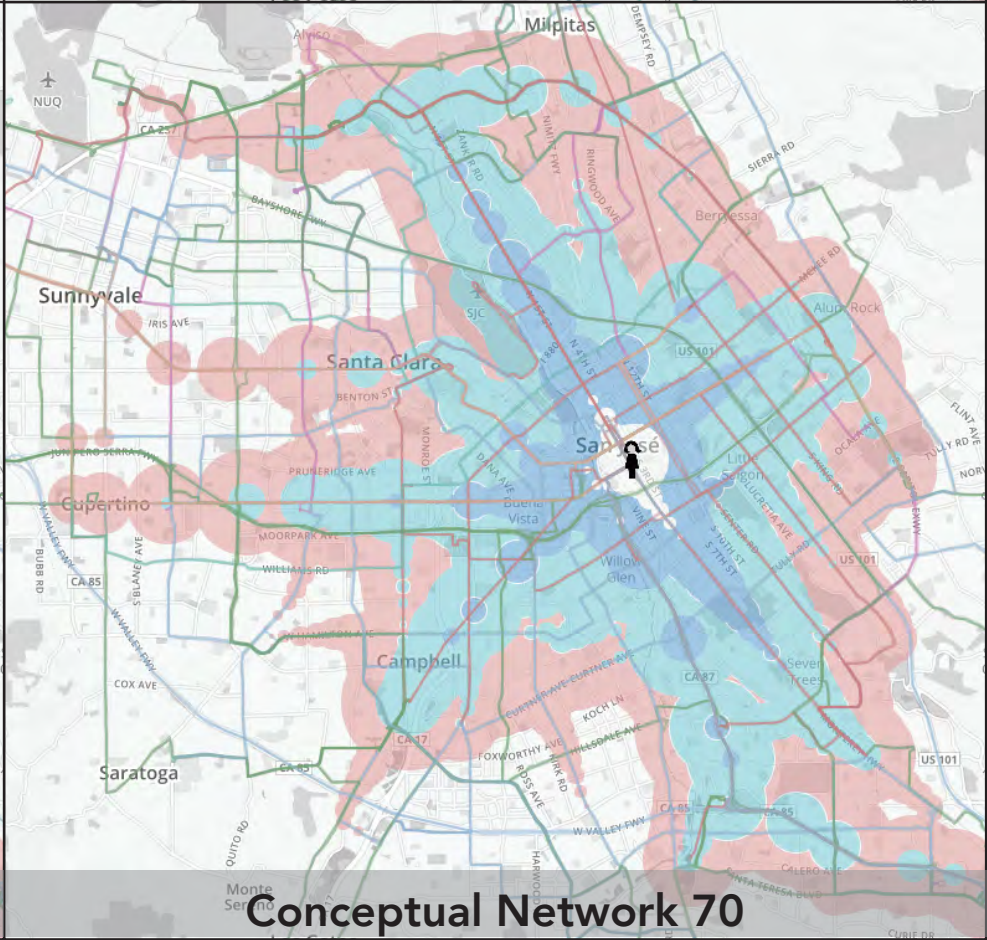
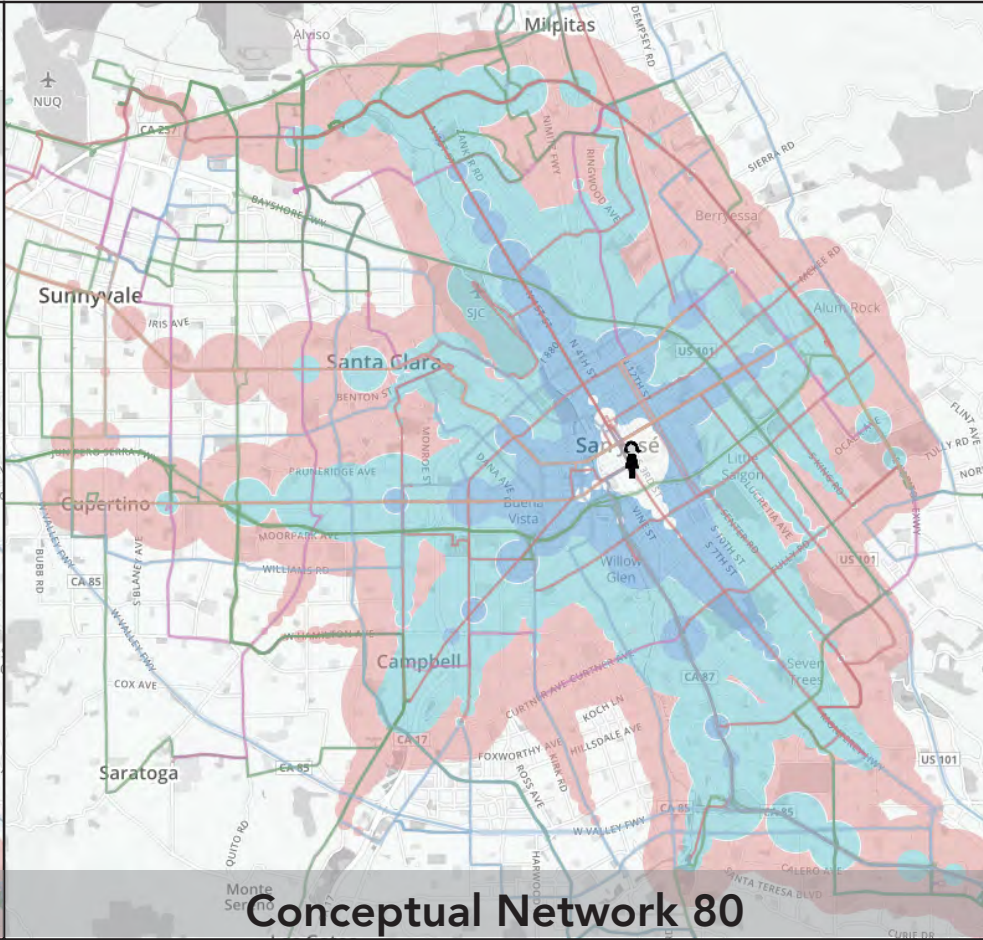
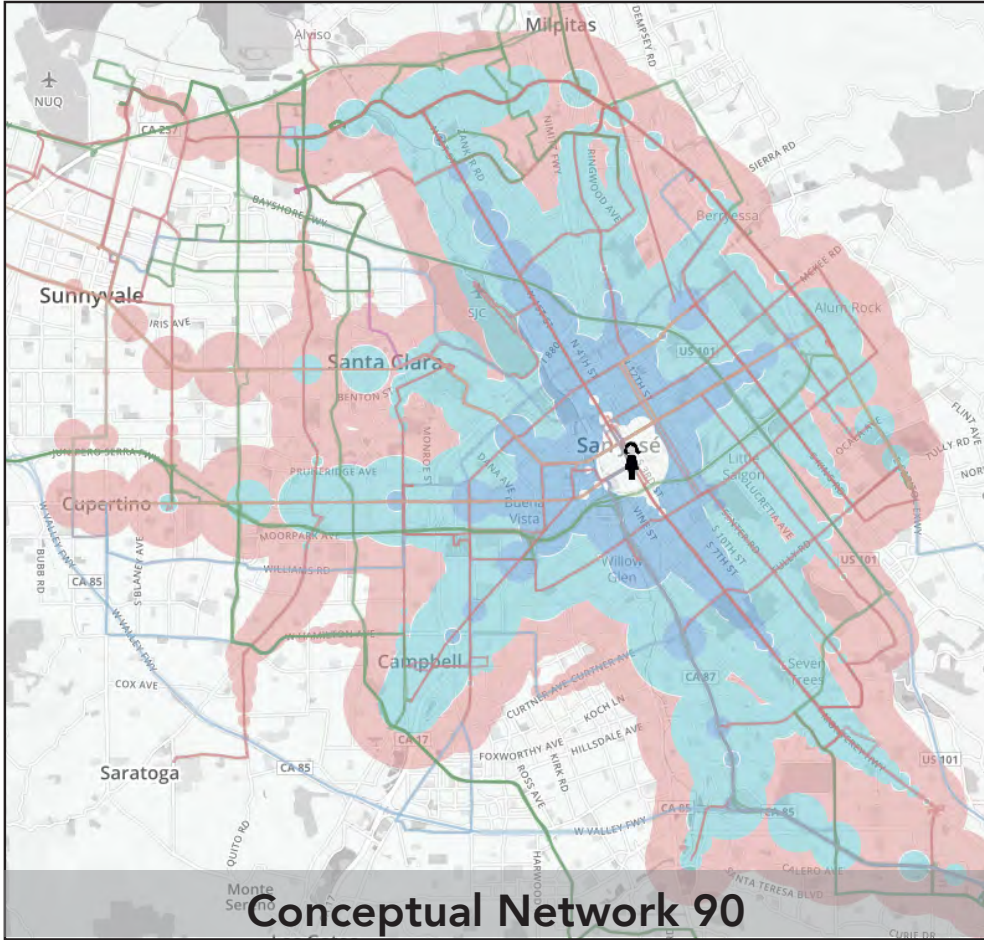
30

45

 or

60

 minutes?



Gilroy Travel Isochrones

Weekdays 8 am

Residents Accessible by Transit			
Starting from Monterey Rd - E 6th St and traveling for...			
	30 min	45 min	60 min
2016 Network	30,700	70,100	134,600
Increase from 2016 Network			
Network 70	11%	12%	10%
Network 80	11%	12%	10%
Network 90	9%	8%	7%

Jobs Accessible by Transit			
Starting from Monterey Rd - E 6th St and traveling for...			
	30 min	45 min	60 min
2016 Network	11,300	27,500	55,200
Increase from 2016 Network			
Network 70	7%	11%	8%
Network 80	7%	10%	8%
Network 90	4%	7%	5%

How far can Jane travel in 15 30 45 or 60 minutes?



Existing Network 2016



Conceptual Network 90



Conceptual Network 80



Conceptual Network 70

Gilroy Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from Monterey Rd - E 6th St and traveling for...			
	30 min	45 min	60 min
2016 Network	30,900	70,000	129,300
Increase from 2016 Network			
Network 70	-9%	-7%	-9%
Network 80	-8%	-7%	-9%
Network 90	-10%	-9%	-11%

Jobs Accessible by Transit			
Starting from Monterey Rd - E 6th St and traveling for...			
	30 min	45 min	60 min
2016 Network	11,400	26,300	50,000
Increase from 2016 Network			
Network 70	-4%	-3%	-6%
Network 80	-4%	-4%	-6%
Network 90	-5%	-4%	-7%

How far can Jane travel in

15

30

45

 or

60

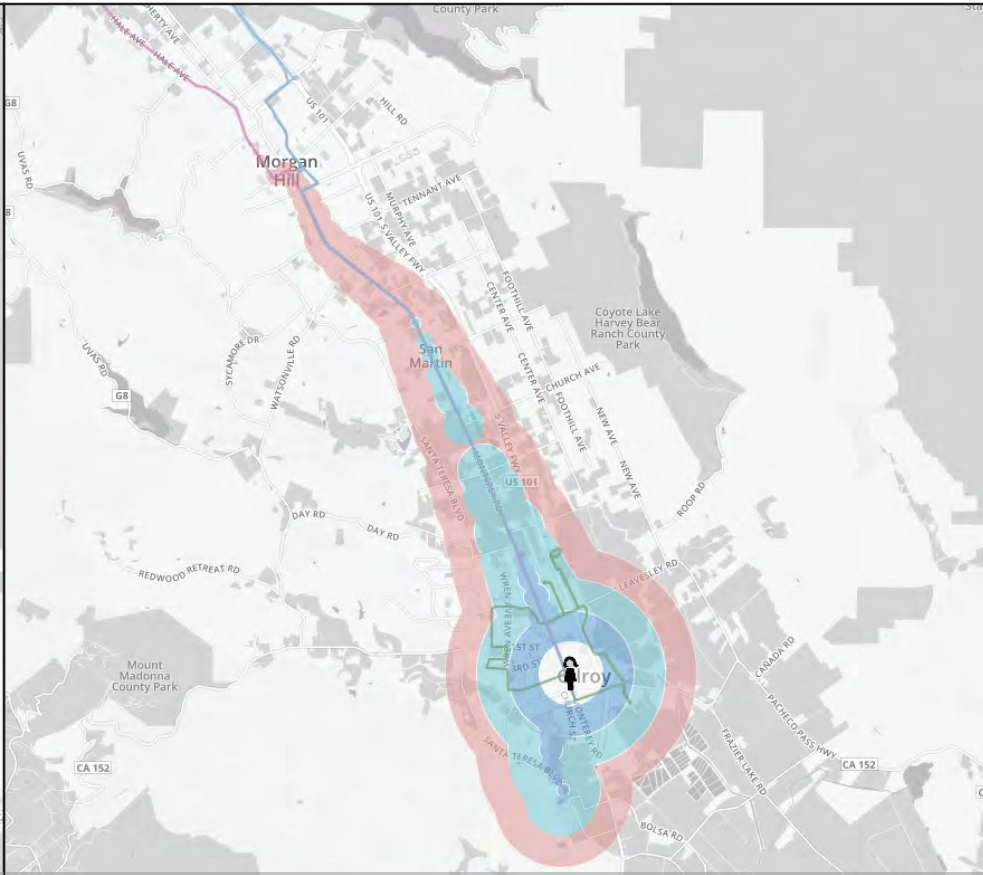
 minutes?



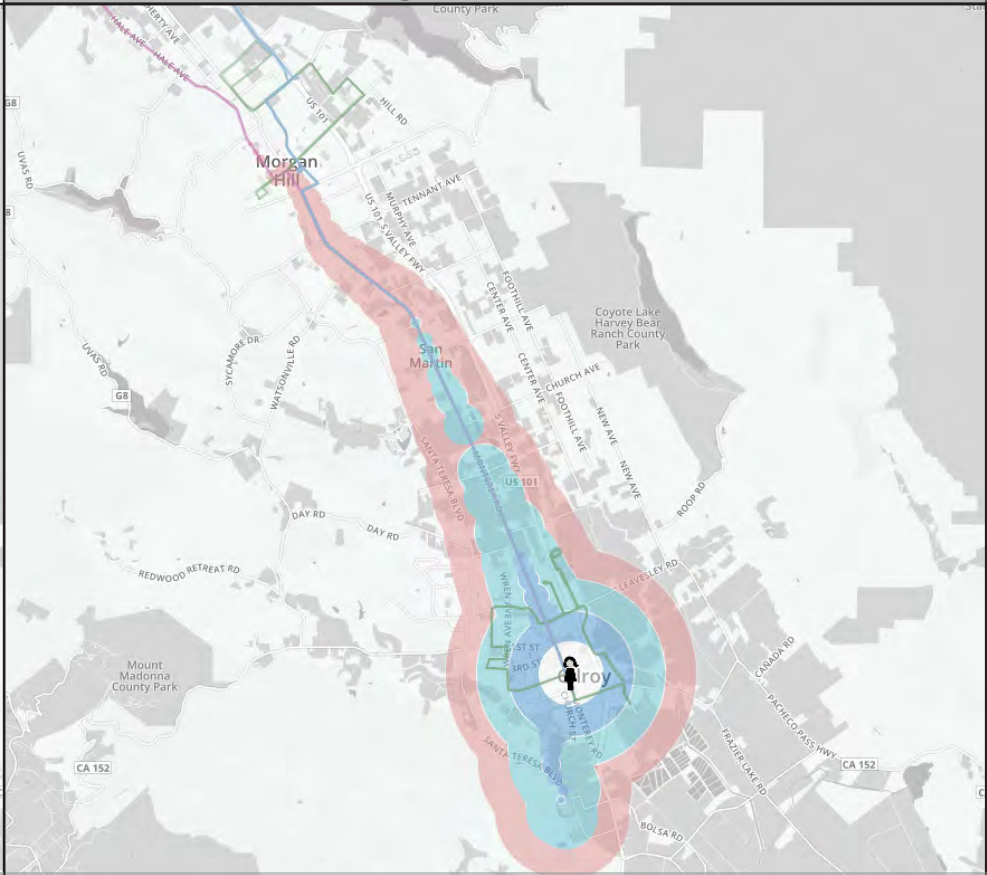
Existing Network 2016



Conceptual Network 90



Conceptual Network 80



Conceptual Network 70

OUTCOMES: LIBERTY, OPPORTUNITY, AND RIDERSHIP POTENTIAL

Milpitas BART

Travel Isochrones

Weekdays 8 am

Residents Accessible by Transit			
Starting from future Milpitas BART Station and traveling for...			
	30 min	45 min	60 min
2016 Network	69,200	236,200	466,200
Increase from 2016 Network			
Network 70	39%	25%	9%
Network 80	42%	27%	13%
Network 90	30%	19%	18%

Jobs Accessible by Transit			
Starting from future Milpitas BART Station and traveling for...			
	30 min	45 min	60 min
2016 Network	59,700	207,900	359,500
Increase from 2016 Network			
Network 70	61%	32%	14%
Network 80	80%	38%	21%
Network 90	87%	38%	26%

How far can Jane travel in

15

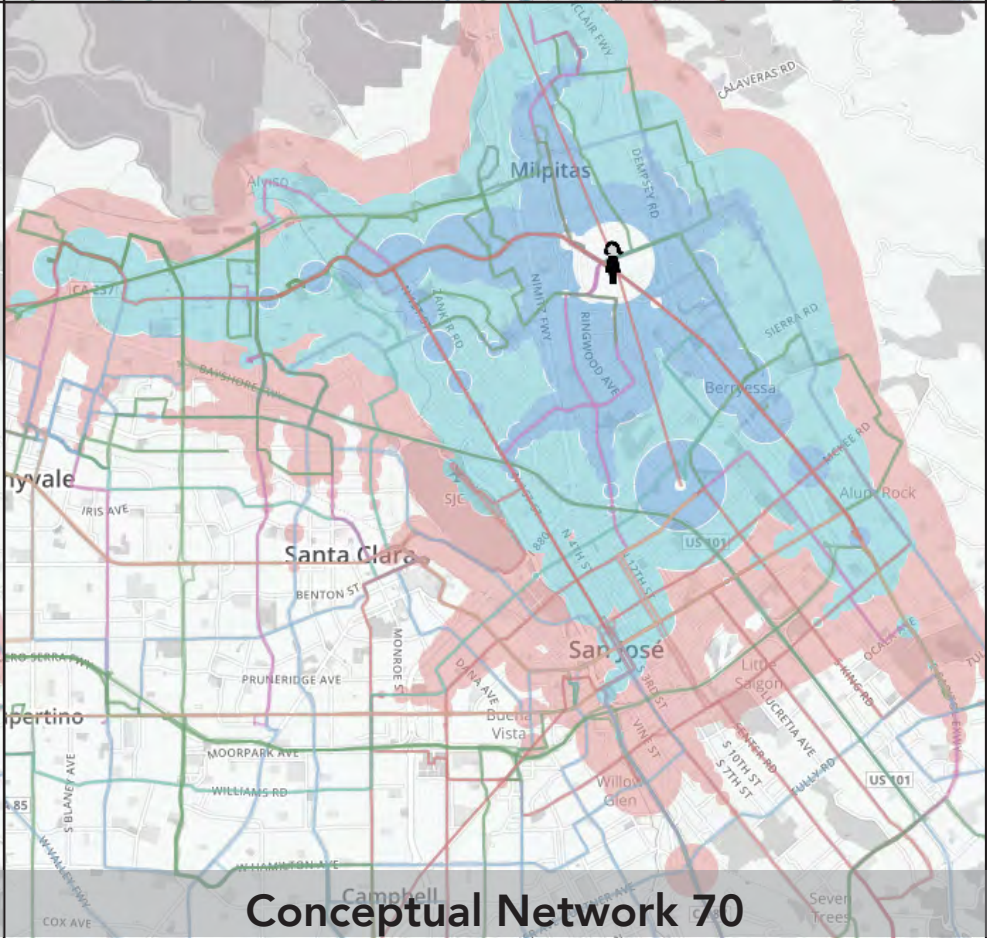
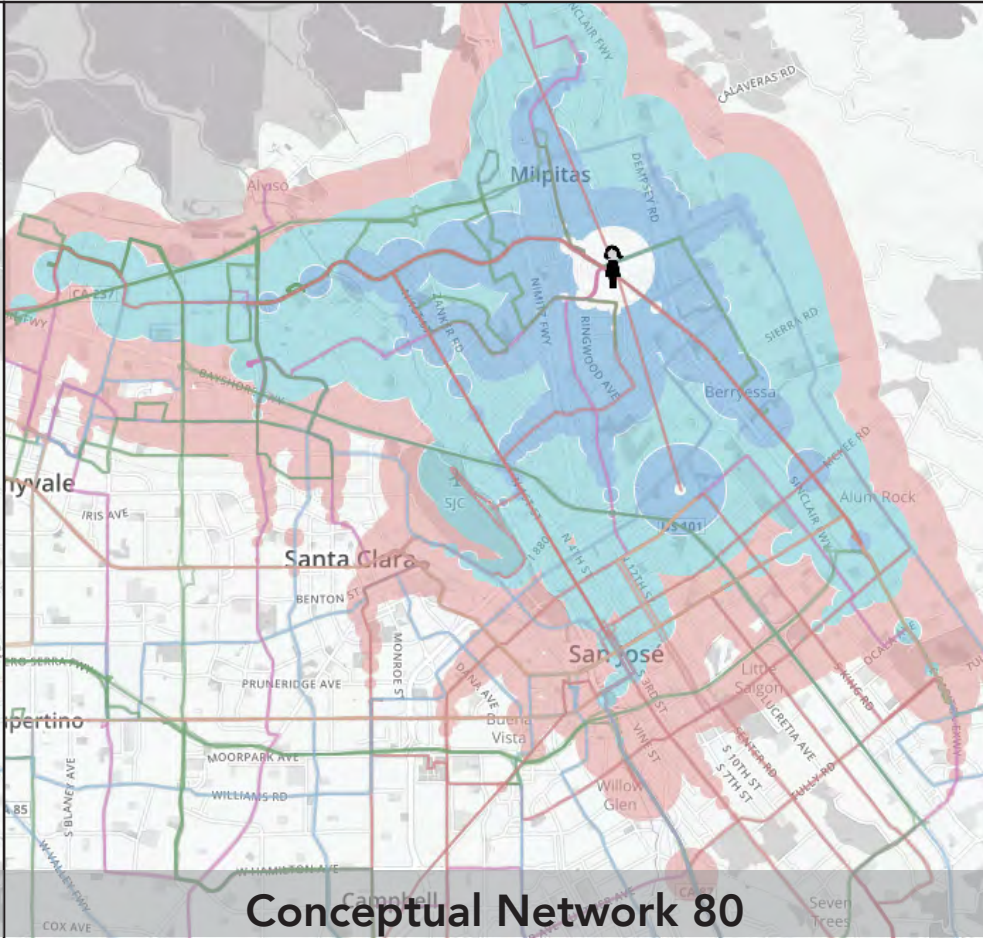
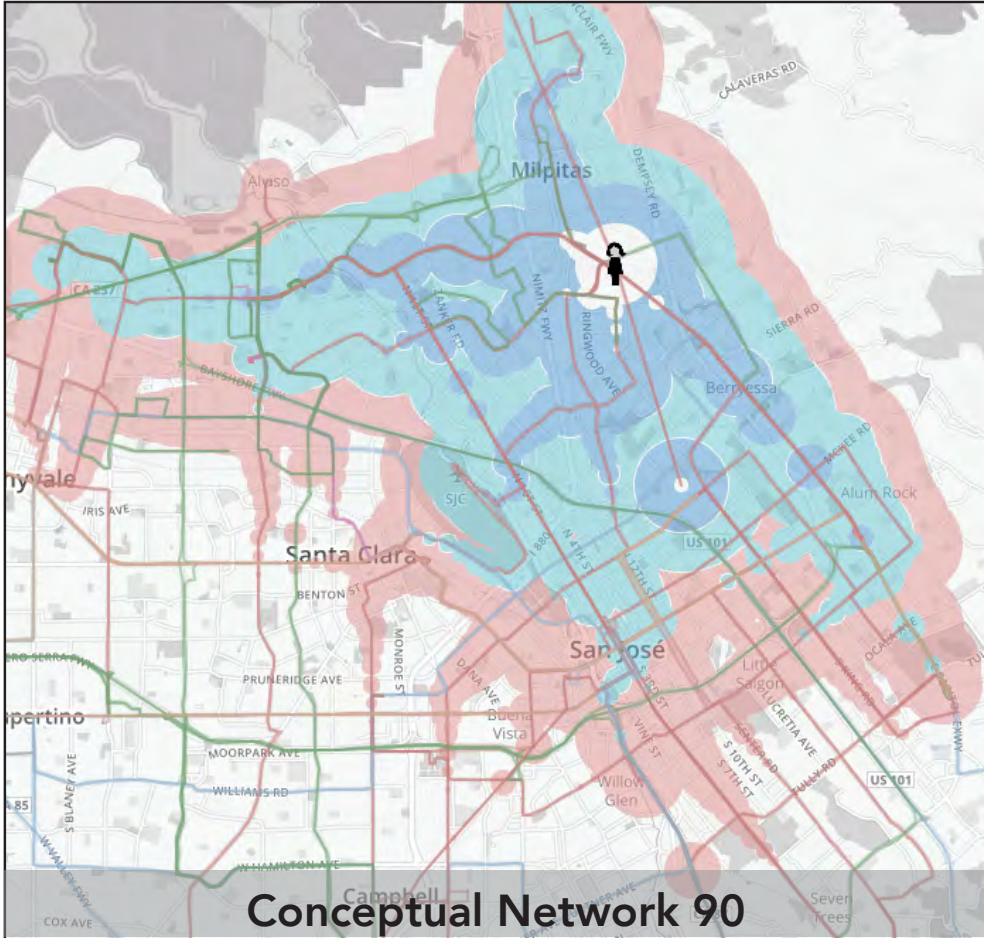
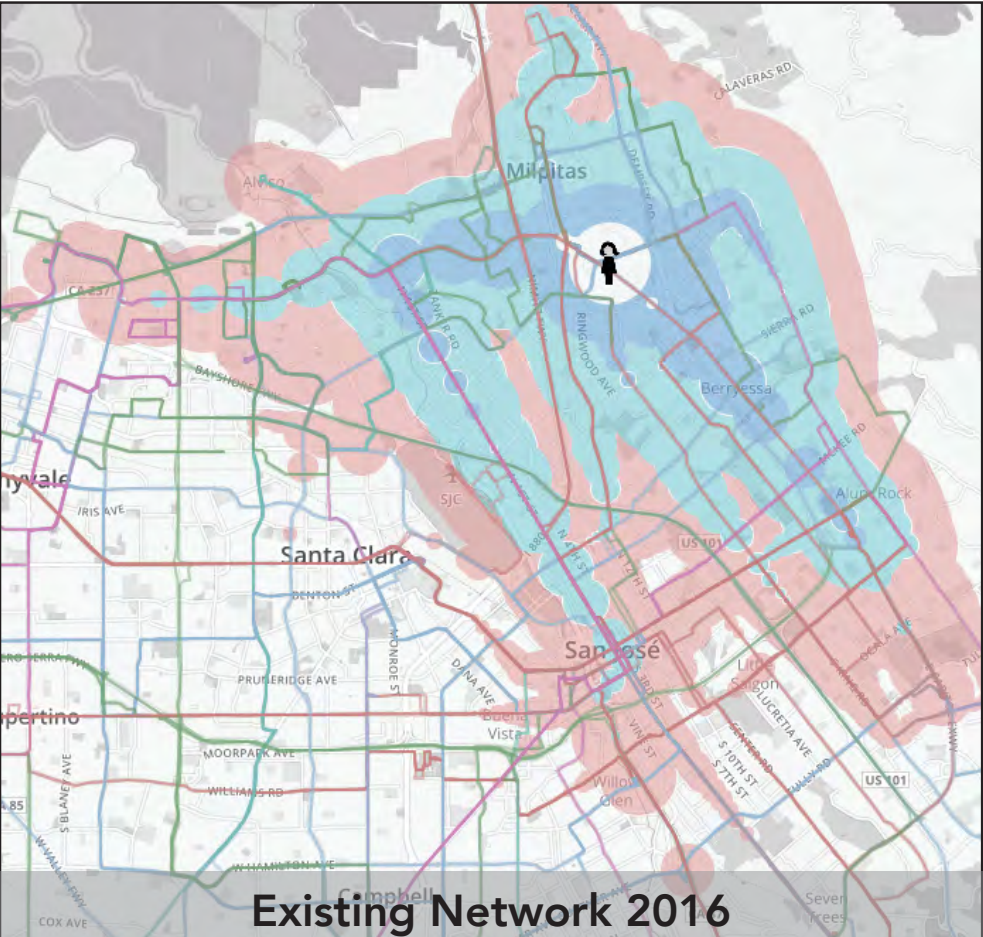
30

45

 or

60

 minutes?



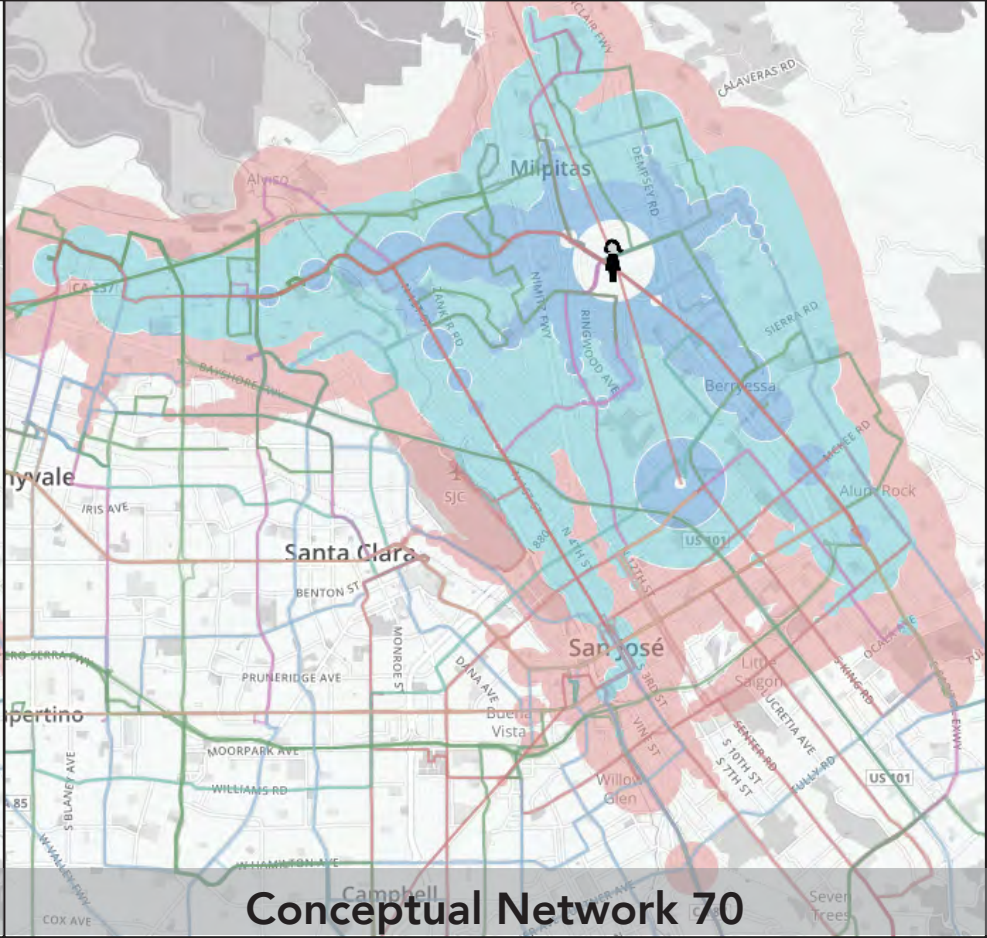
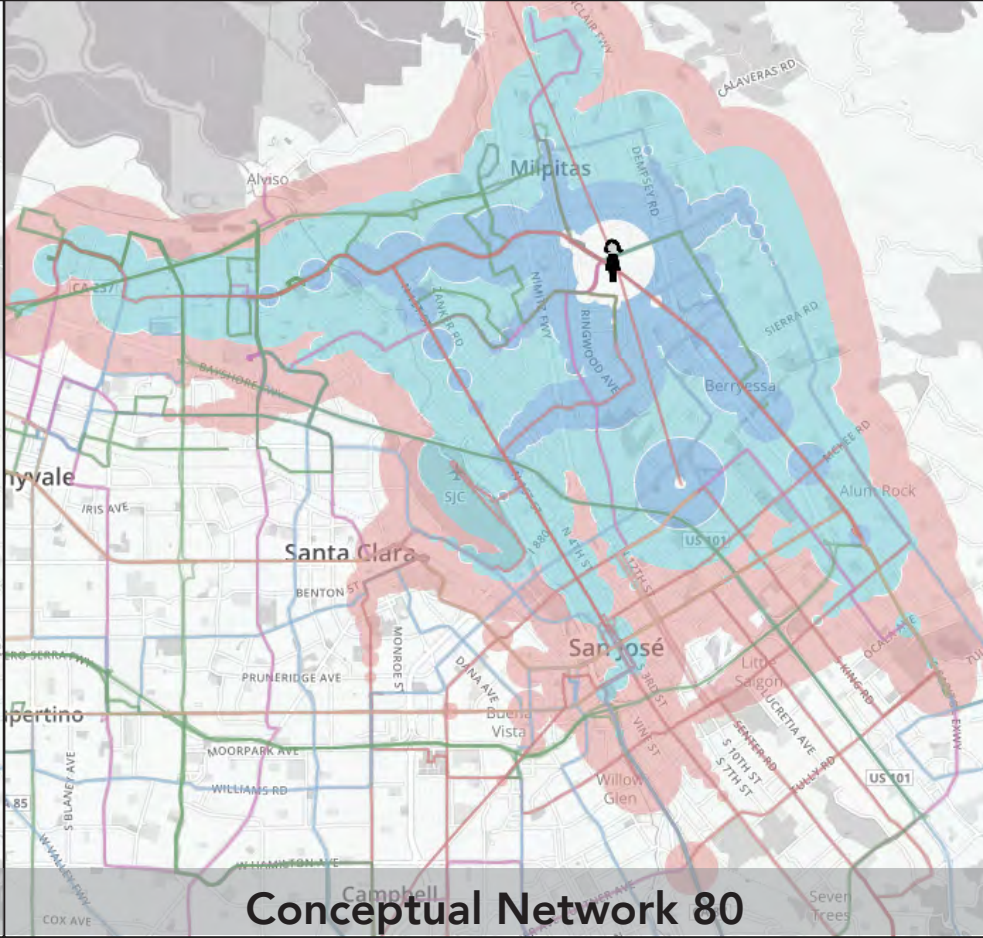
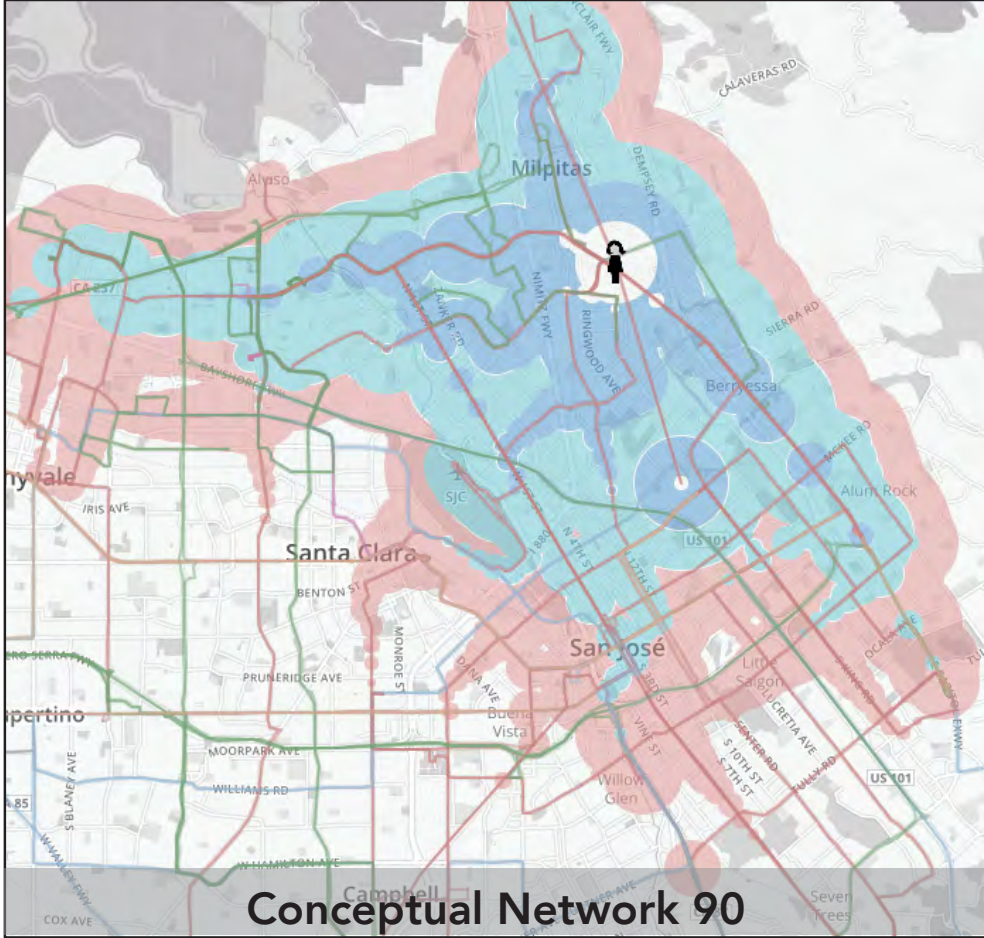
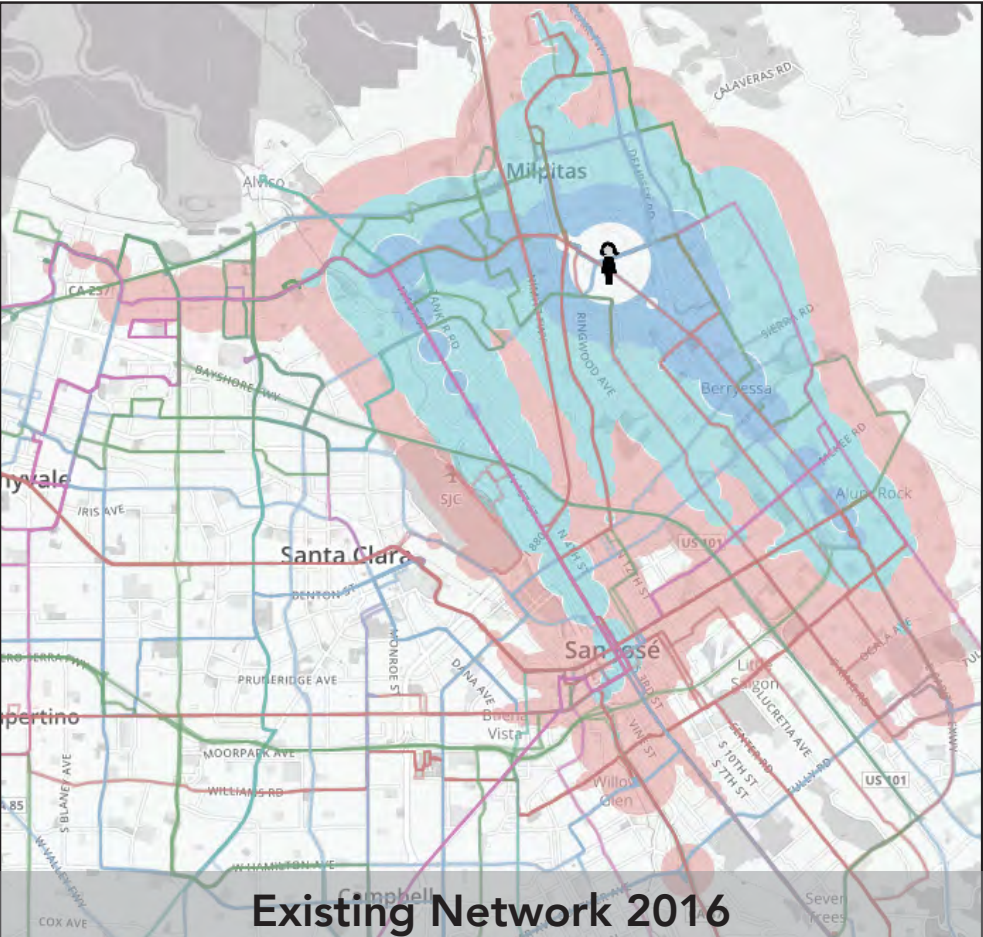
Milpitas BART Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from future Milpitas BART Station and traveling for...			
	30 min	45 min	60 min
2016 Network	62,600	213,200	434,900
Increase from 2016 Network			
Network 70	24%	28%	10%
Network 80	36%	29%	14%
Network 90	39%	30%	22%

Jobs Accessible by Transit			
Starting from future Milpitas BART Station and traveling for...			
	30 min	45 min	60 min
2016 Network	58,000	196,800	301,800
Increase from 2016 Network			
Network 70	34%	30%	25%
Network 80	59%	32%	29%
Network 90	83%	44%	43%

How far can Jane travel in 15 30 45 or 60 minutes?

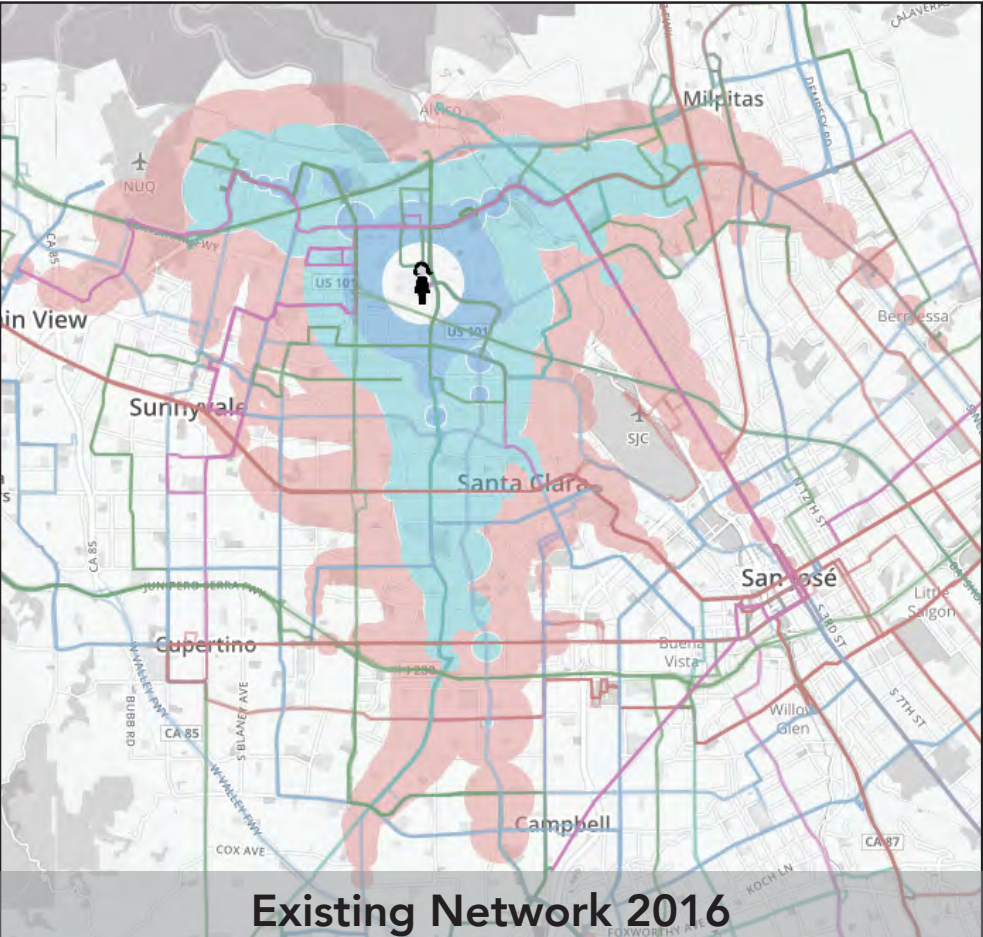


Mission College Travel Isochrones

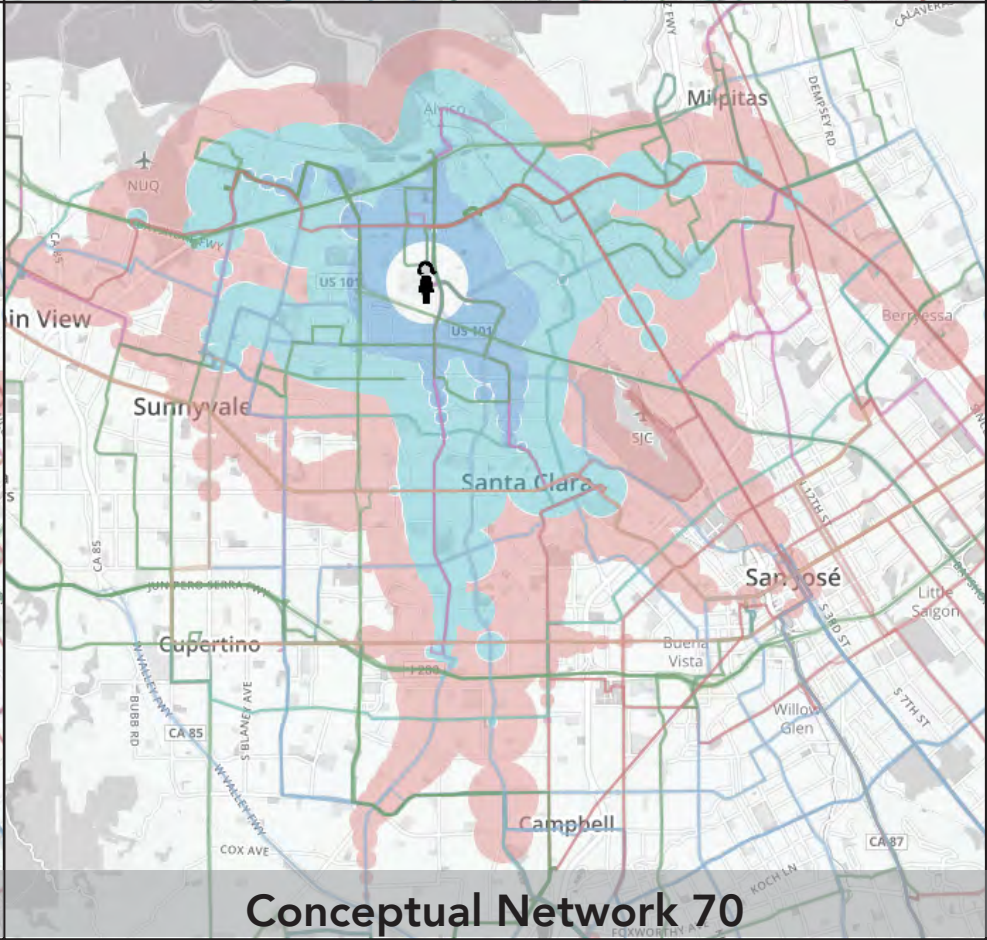
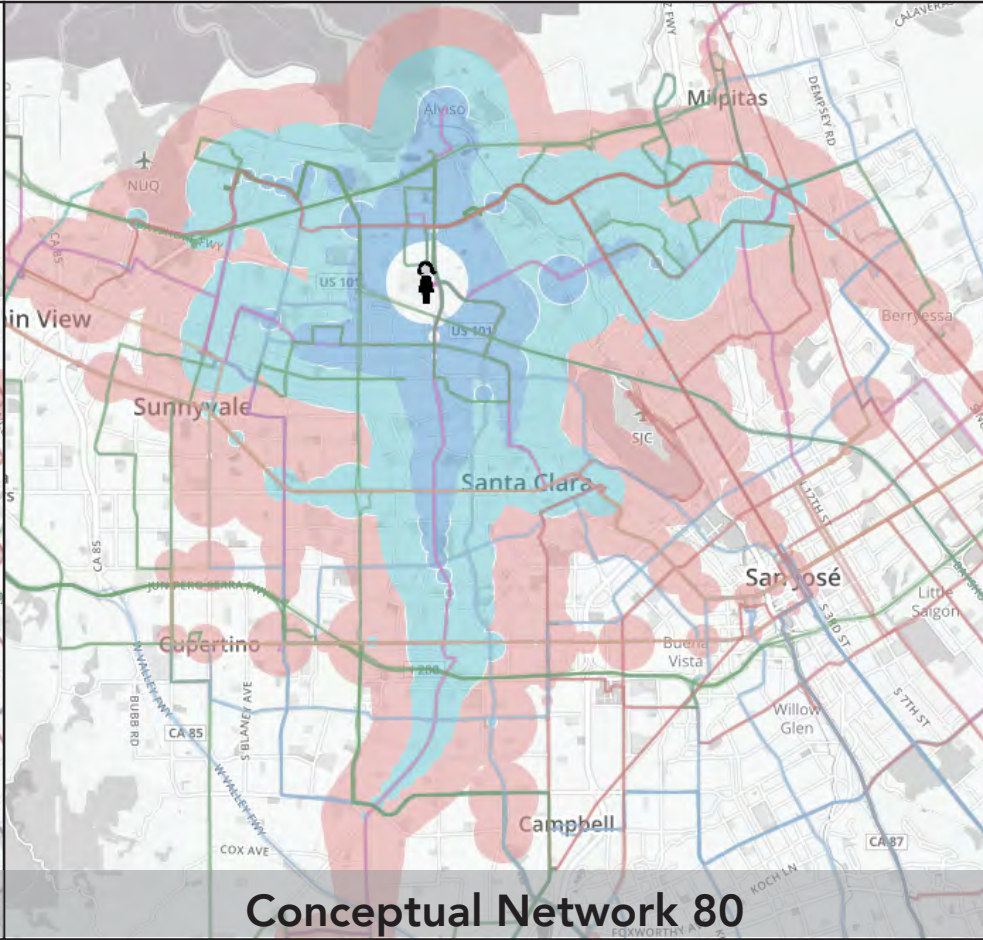
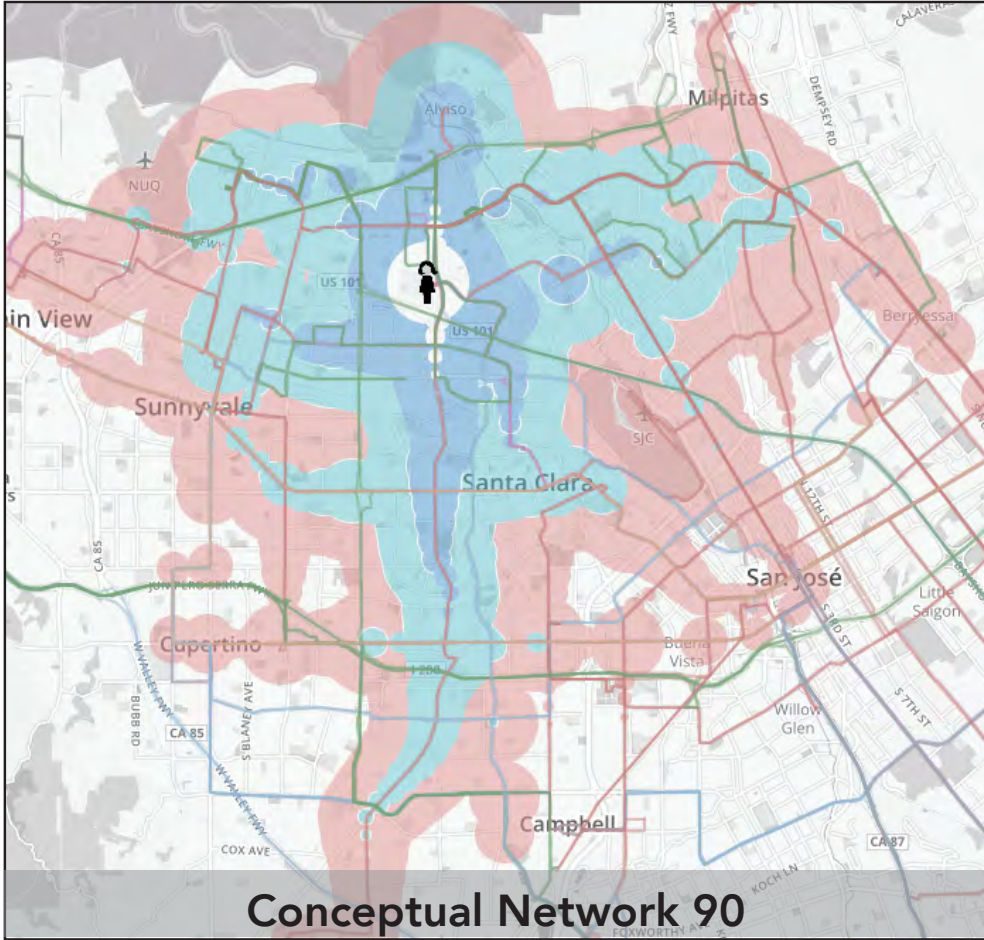
Weekdays 8 am

Residents Accessible by Transit			
Starting from Mission College and traveling for...			
	30 min	45 min	60 min
2016 Network	15,700	111,300	407,400
Increase from 2016 Network			
Network 70	11%	25%	22%
Network 80	122%	93%	63%
Network 90	145%	111%	76%

Jobs Accessible by Transit			
Starting from Mission College and traveling for...			
	30 min	45 min	60 min
2016 Network	56,400	200,600	531,600
Increase from 2016 Network			
Network 70	18%	30%	24%
Network 80	62%	57%	41%
Network 90	71%	67%	51%



How far can Jane travel in 15 30 45 or 60 minutes?



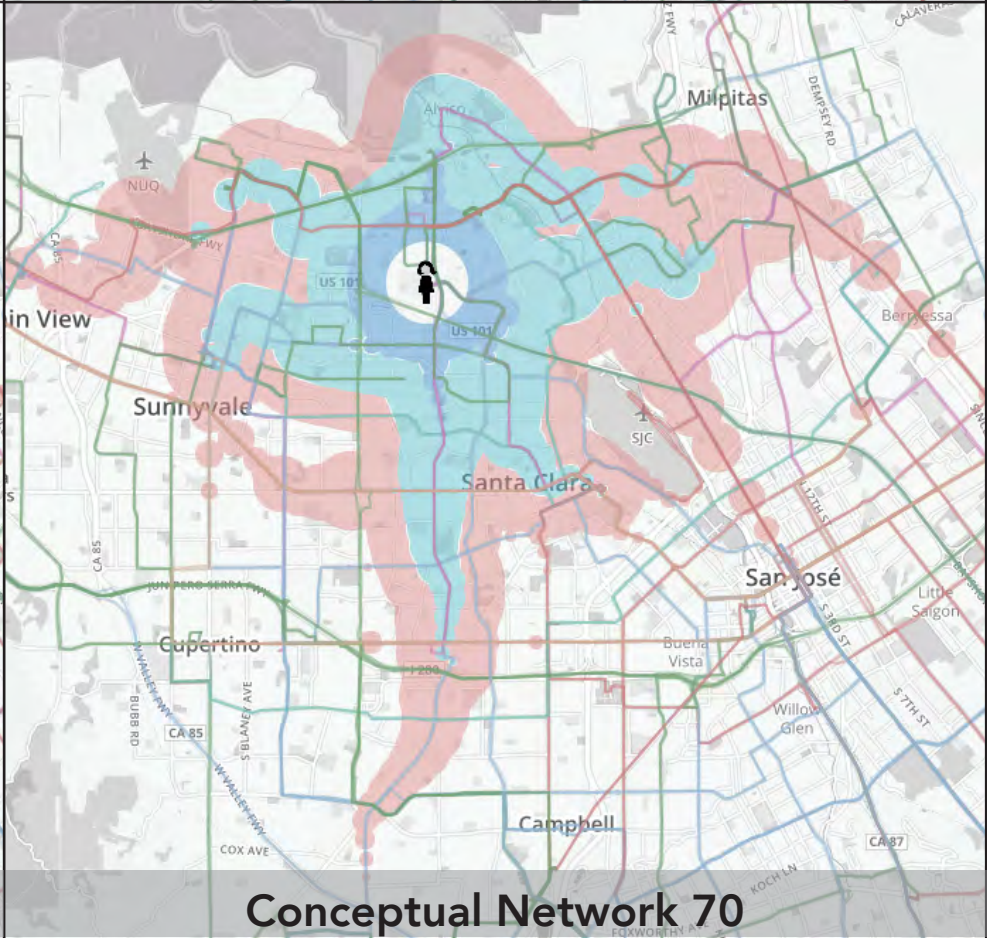
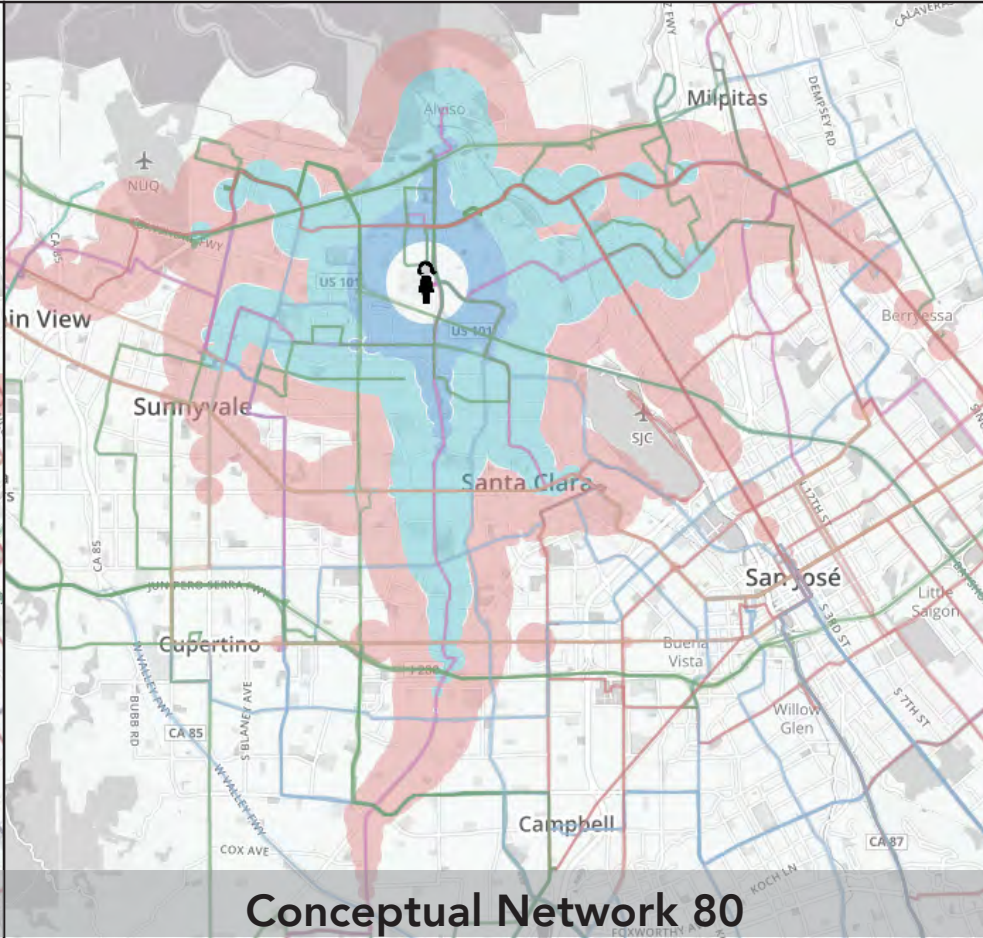
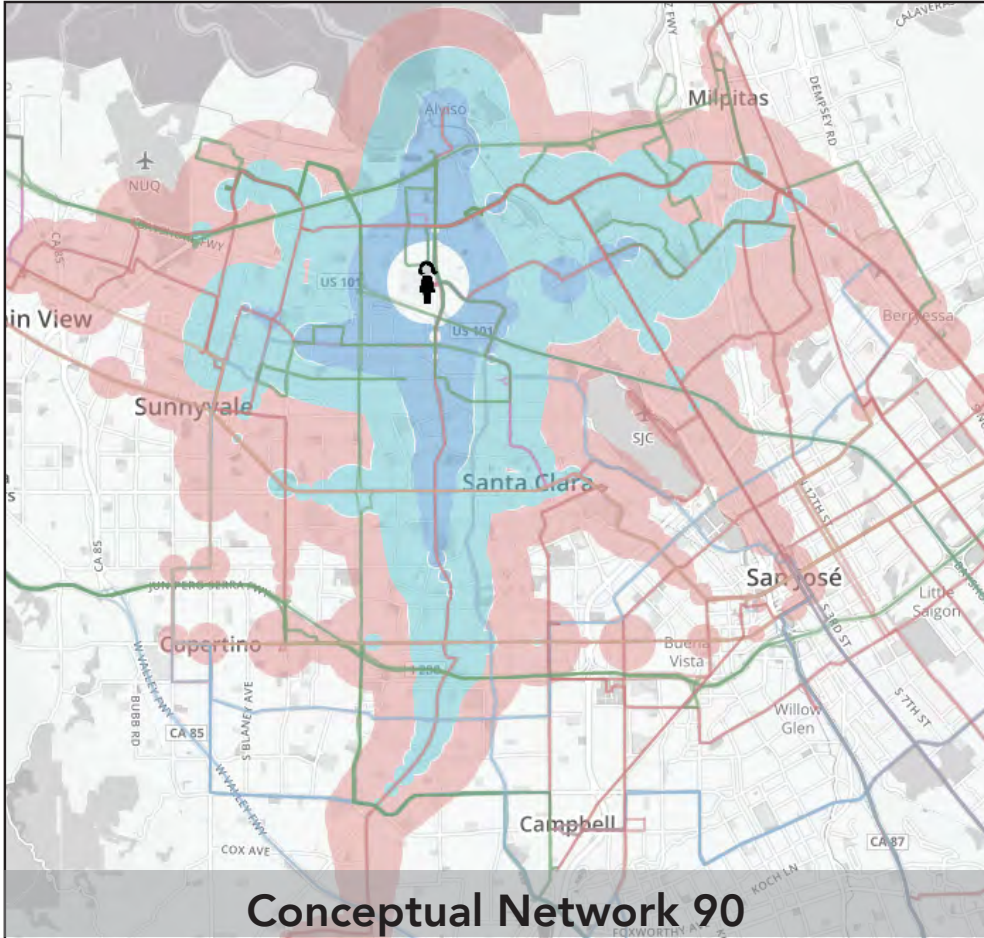
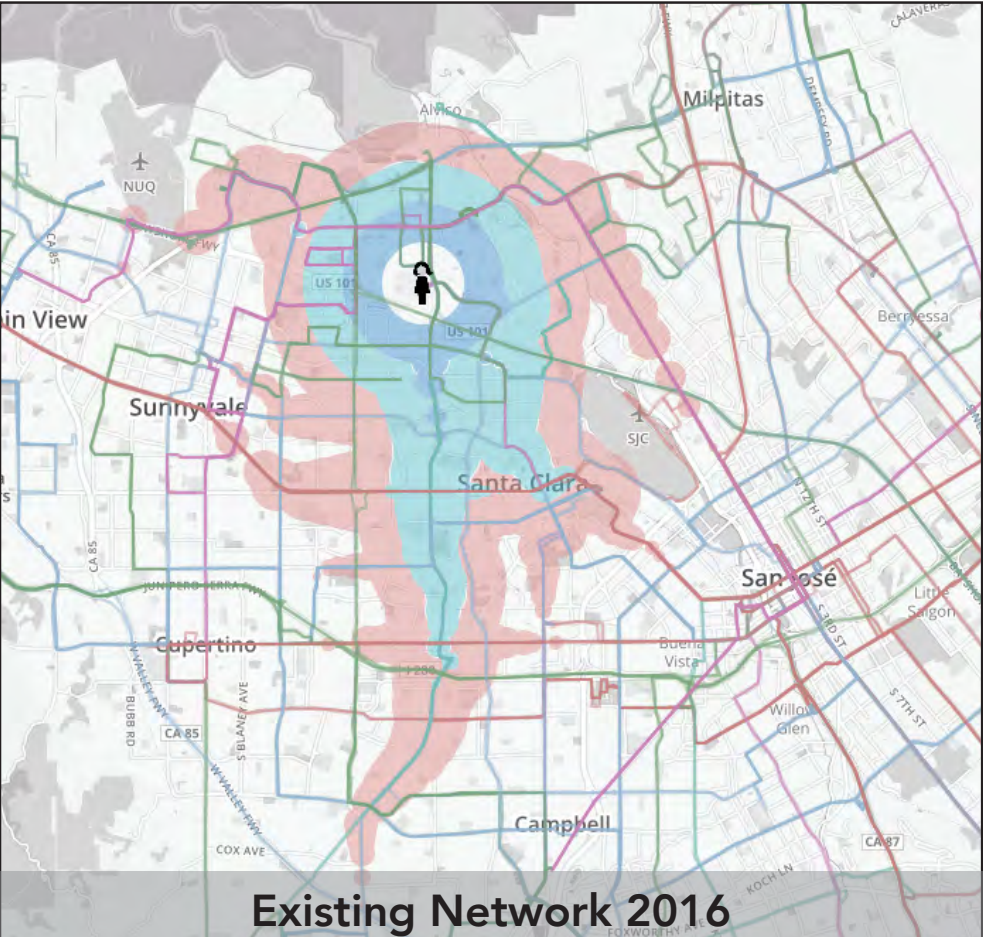
Mission College Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from Mission College and traveling for...			
	30 min	45 min	60 min
2016 Network	12,400	80,900	292,400
Increase from 2016 Network			
Network 70	1%	35%	29%
Network 80	13%	44%	38%
Network 90	142%	146%	109%

Jobs Accessible by Transit			
Starting from Mission College and traveling for...			
	30 min	45 min	60 min
2016 Network	45,400	131,500	351,600
Increase from 2016 Network			
Network 70	3%	49%	50%
Network 80	6%	49%	51%
Network 90	63%	113%	101%

How far can Jane travel in 15 30 45 or 60 minutes?

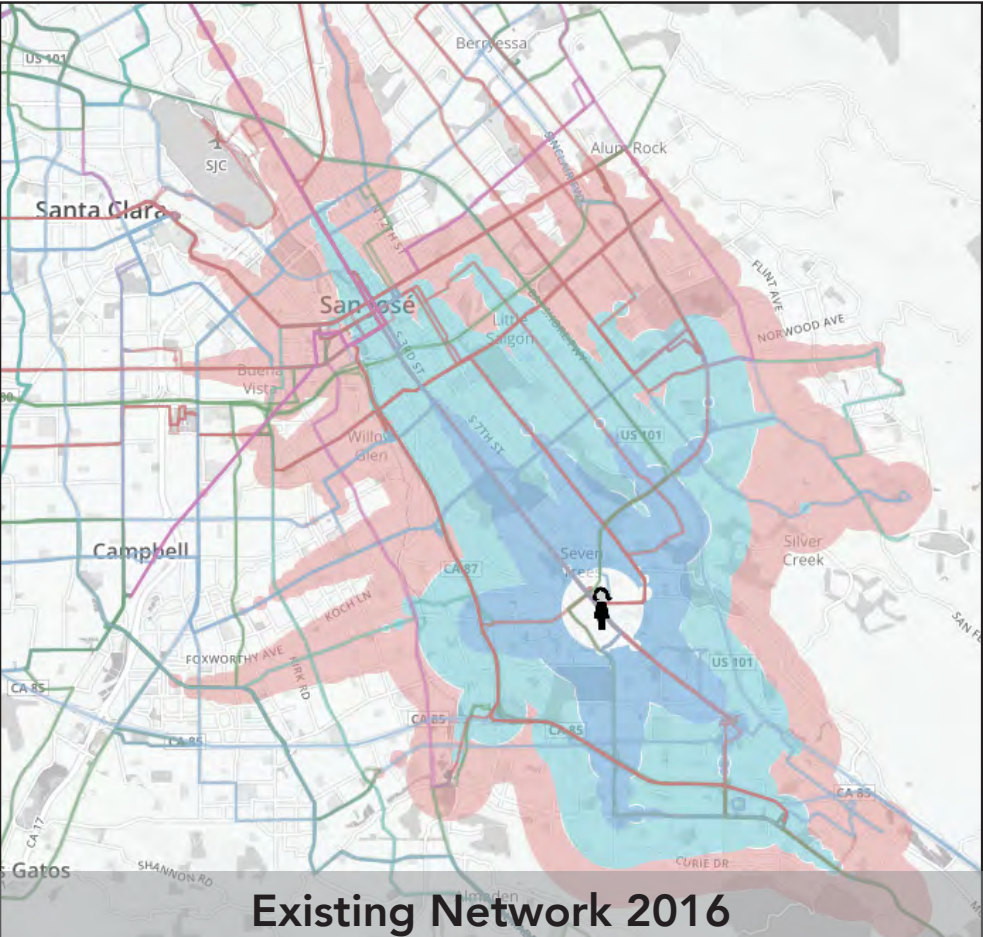


Monterey Rd - Senter Rd Travel Isochrones

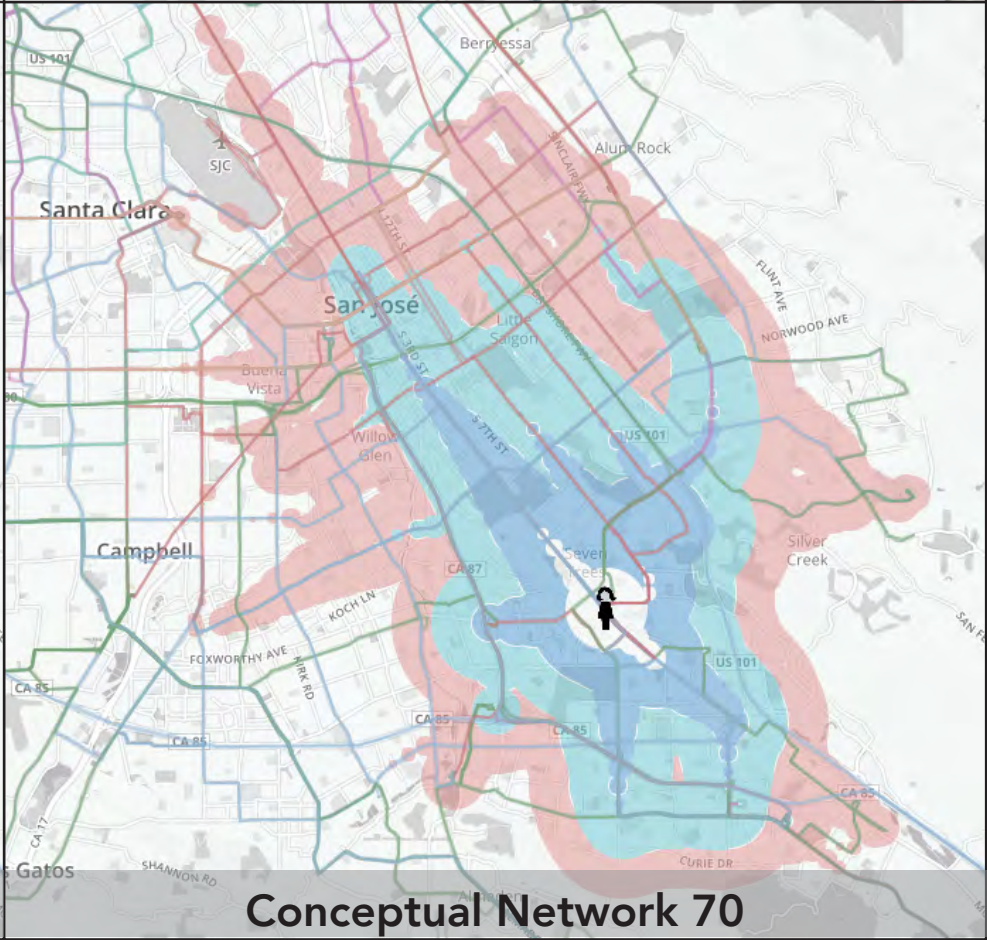
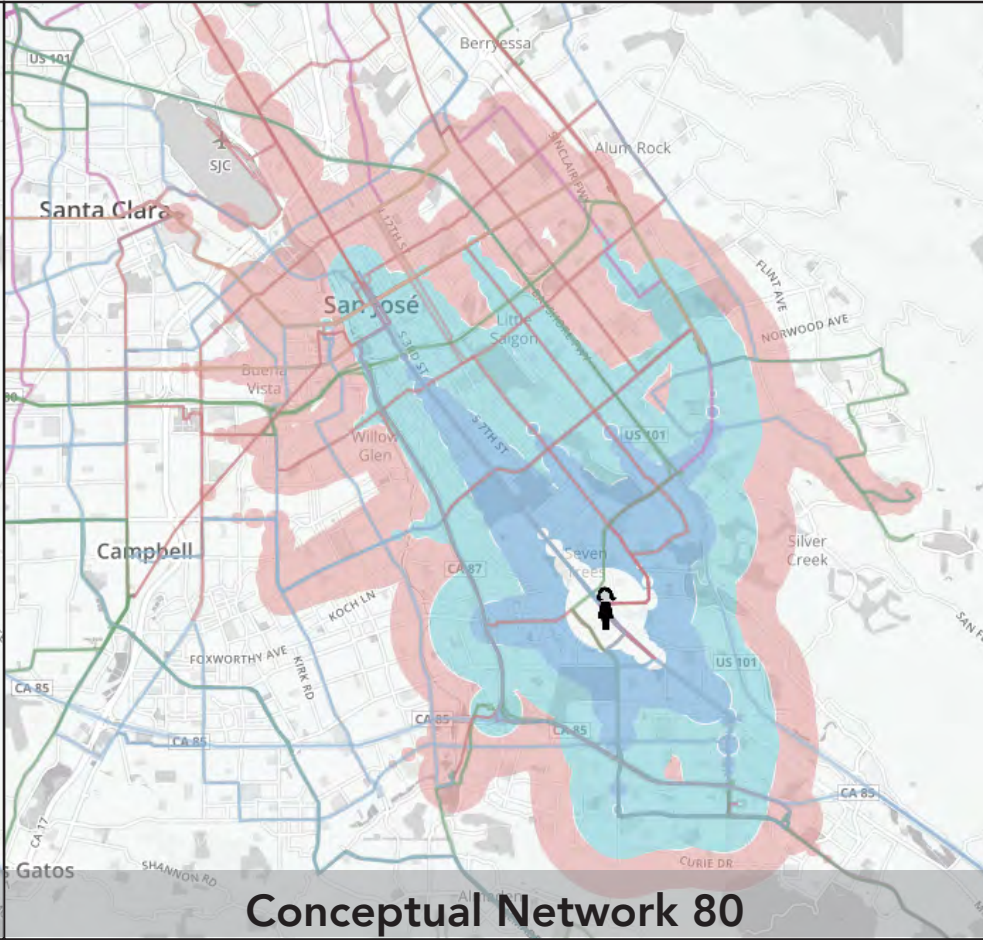
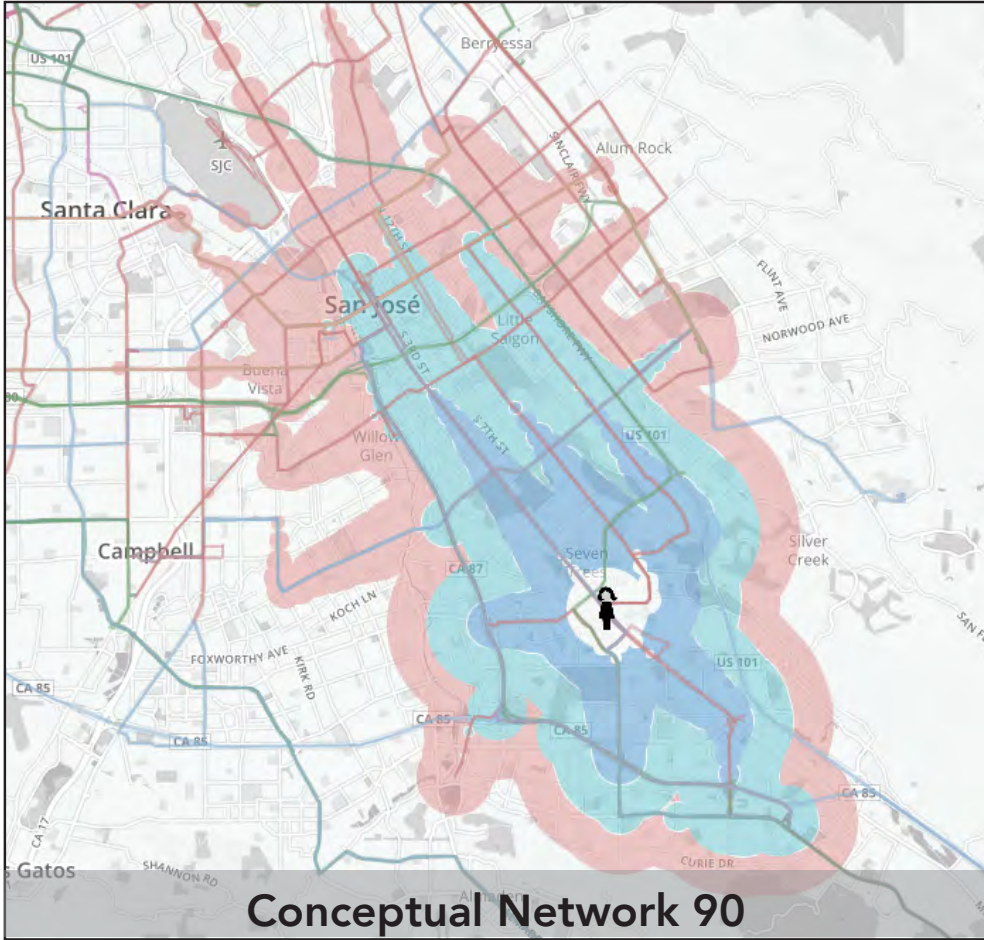
Weekdays 8 am

Residents Accessible by Transit			
Starting from Monterey Rd - Senter Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	112,900	397,900	938,400
Increase from 2016 Network			
Network 70	4%	-1%	-1%
Network 80	2%	0%	-1%
Network 90	6%	-4%	-8%

Jobs Accessible by Transit			
Starting from Monterey Rd - Senter Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	18,600	118,500	333,500
Increase from 2016 Network			
Network 70	10%	-8%	-4%
Network 80	9%	-6%	-3%
Network 90	10%	-8%	-7%



How far can Jane travel in 15 30 45 or 60 minutes?



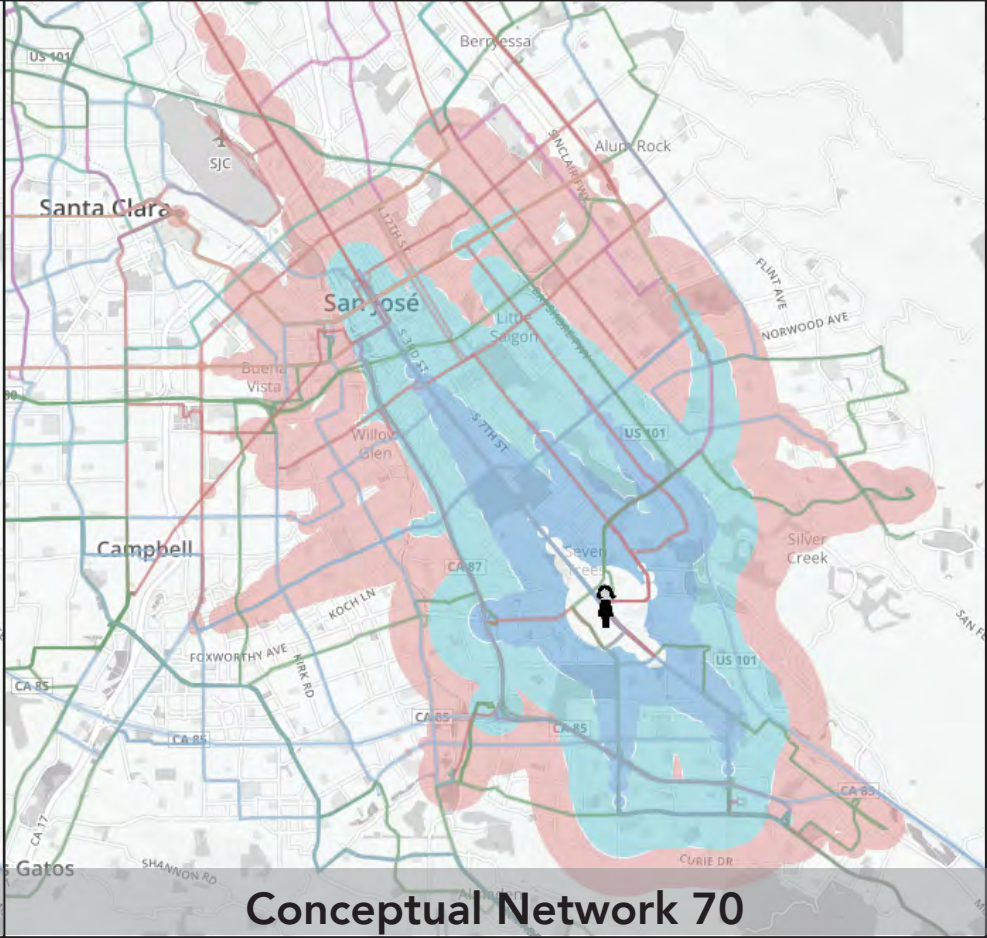
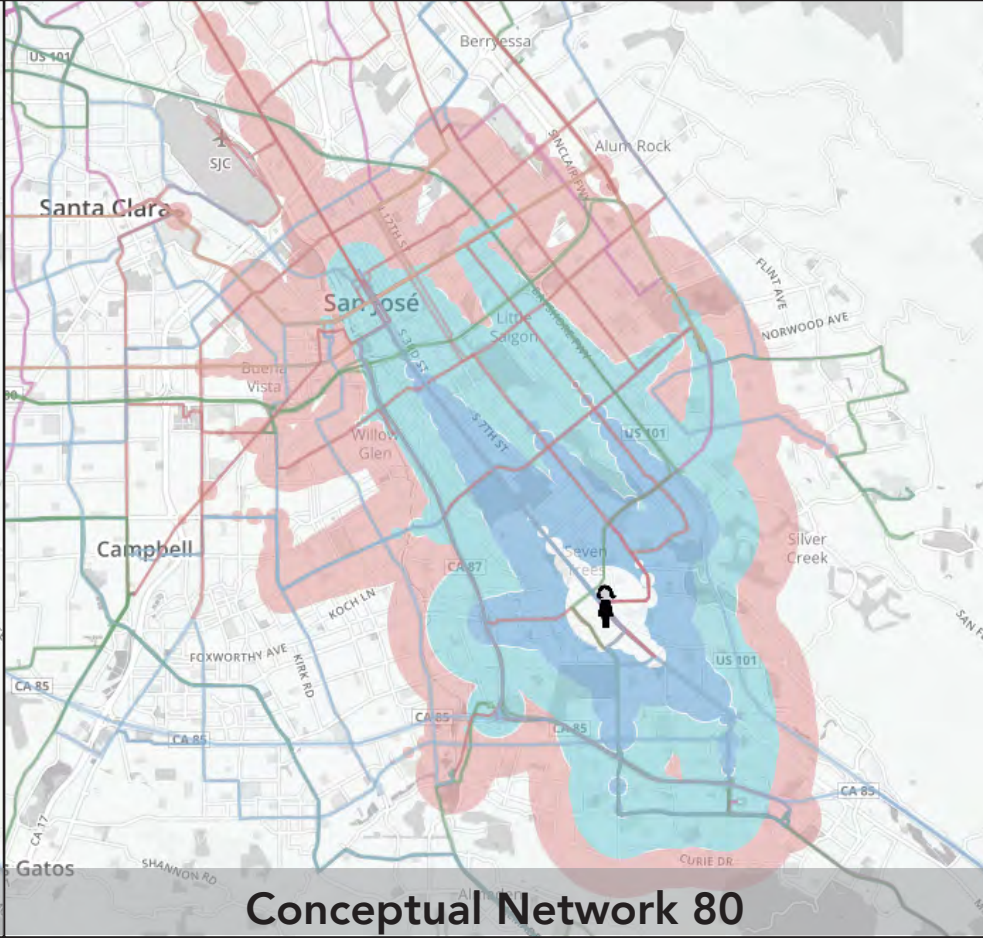
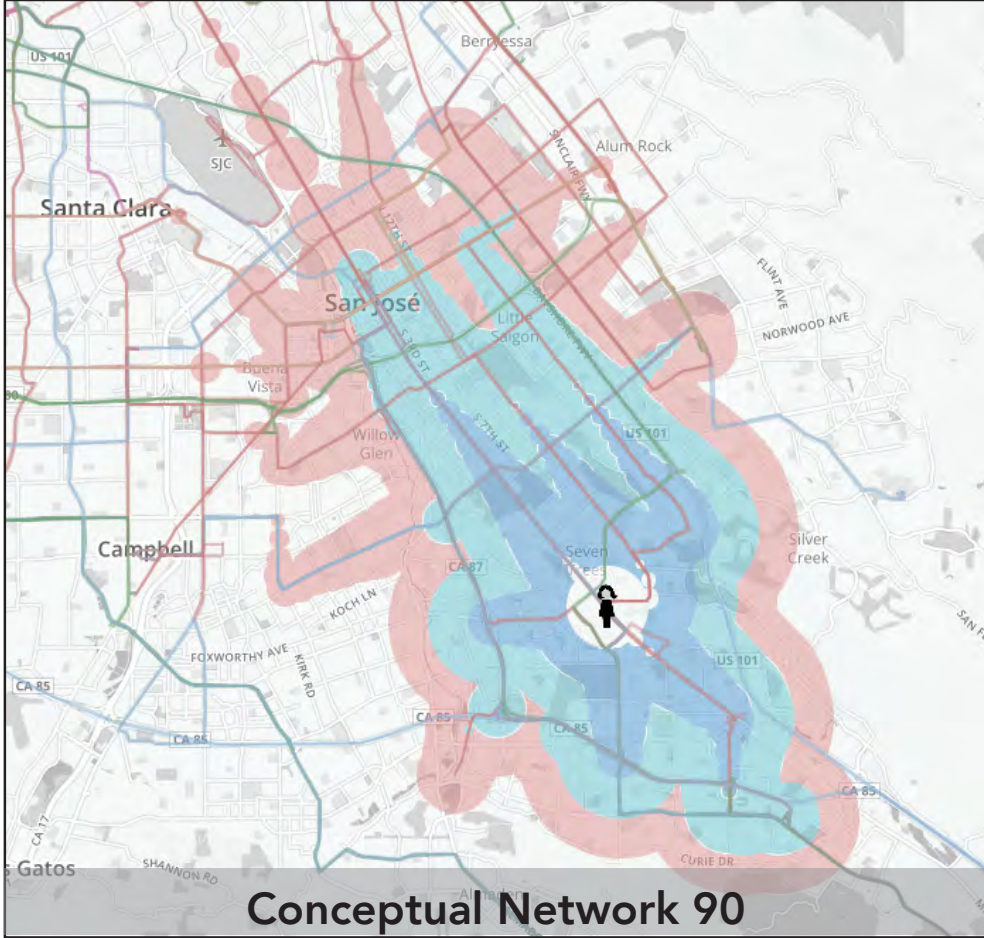
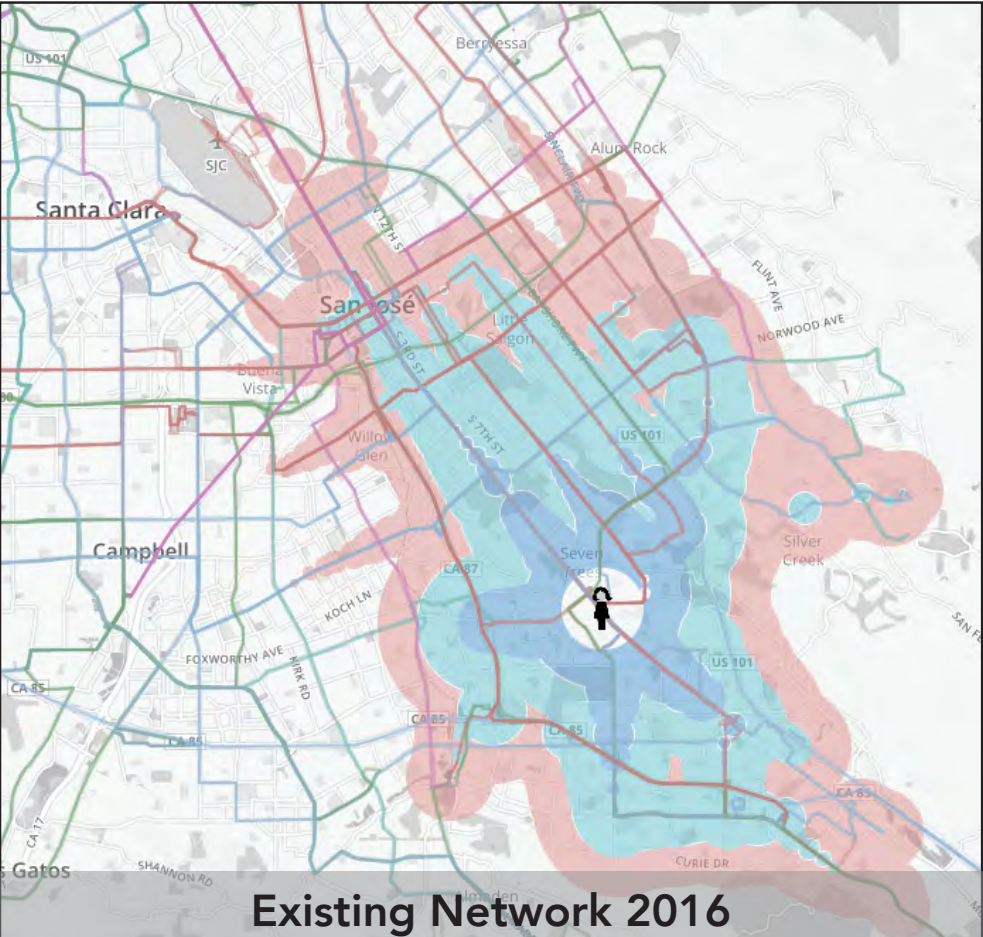
Monterey Rd - Senter Rd Travel Isochrones

Weekdays 12 pm

Residents Accessible by Transit			
Starting from Monterey Rd - Senter Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	97,500	361,600	840,900
Increase from 2016 Network			
Network 70	21%	7%	7%
Network 80	19%	9%	6%
Network 90	19%	4%	0%

Jobs Accessible by Transit			
Starting from Monterey Rd - Senter Rd and traveling for...			
	30 min	45 min	60 min
2016 Network	13,700	92,100	272,300
Increase from 2016 Network			
Network 70	47%	18%	17%
Network 80	46%	22%	17%
Network 90	41%	16%	11%

How far can Jane travel in 15 30 45 or 60 minutes?

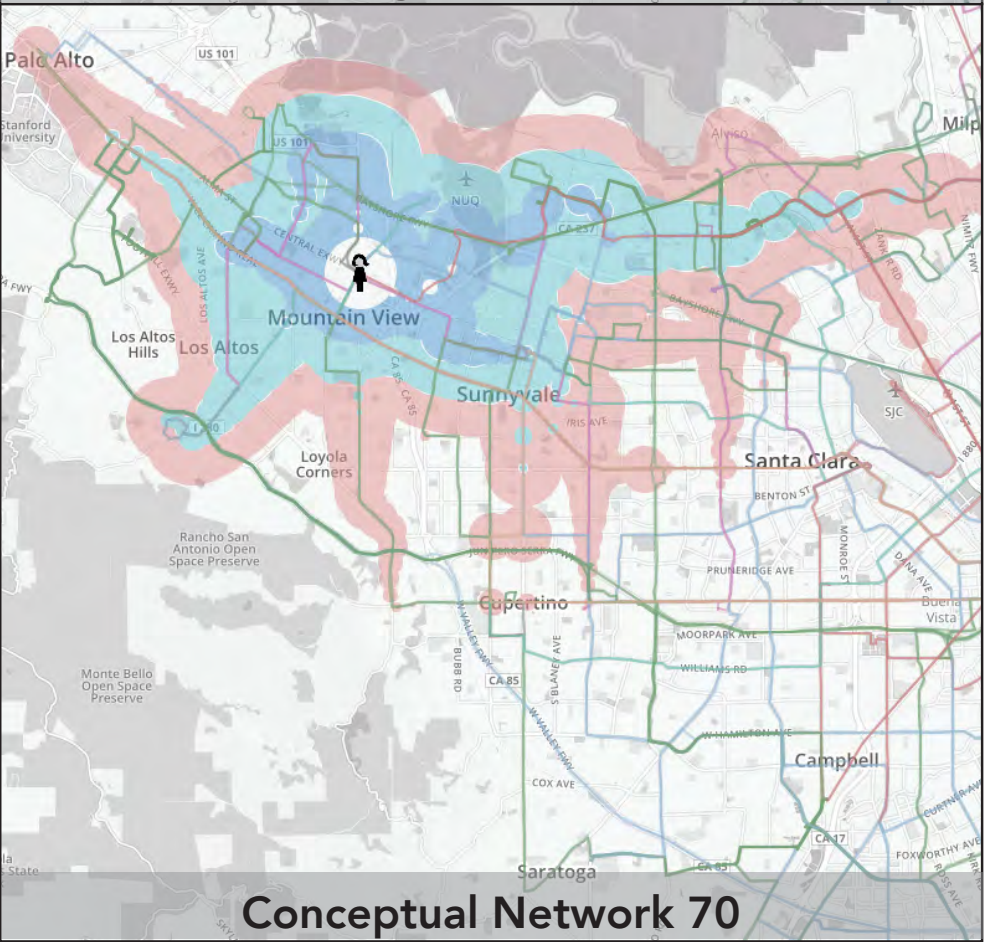
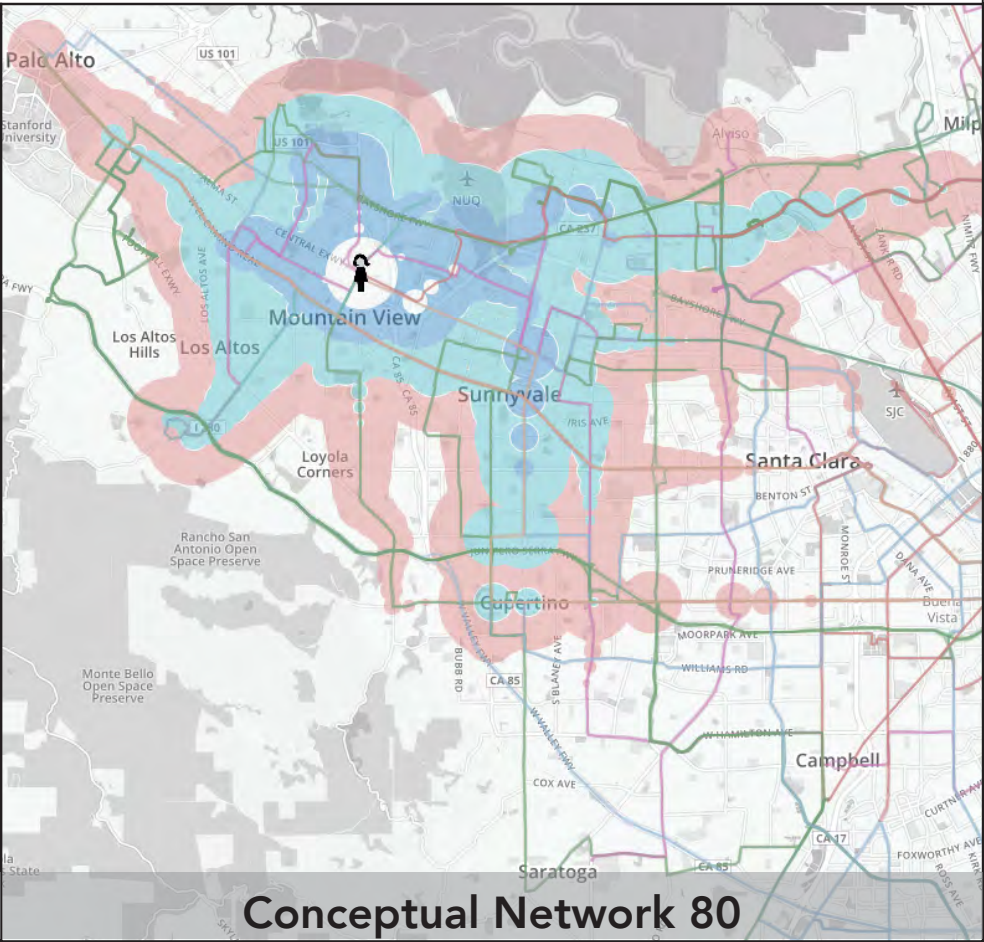
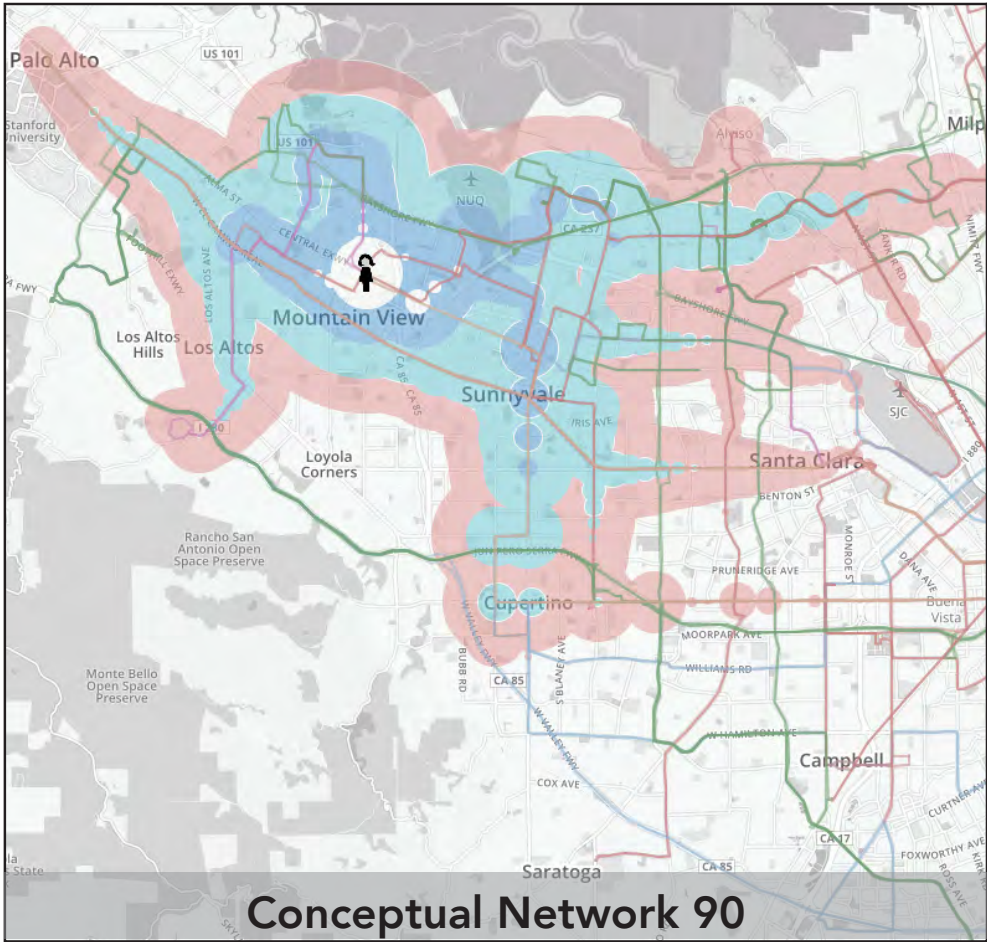
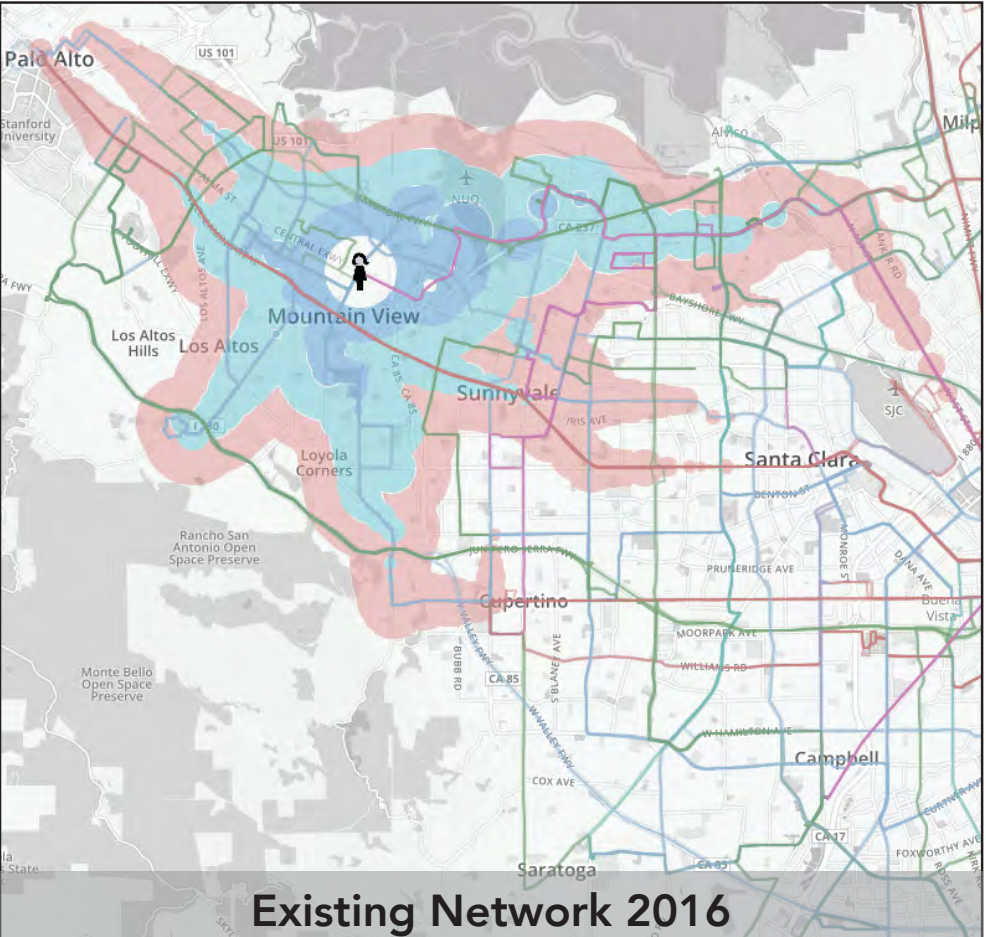


Mountain View Station Travel Isochrones Weekdays 8 am

Residents Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	47,200	141,200	311,100
Increase from 2016 Network			
Network 70	38%	13%	4%
Network 80	54%	51%	26%
Network 90	58%	56%	27%

Jobs Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	46,200	113,100	282,400
Increase from 2016 Network			
Network 70	107%	56%	23%
Network 80	130%	89%	44%
Network 90	127%	92%	45%

How far can Jane travel in 15 30 45 or 60 minutes?

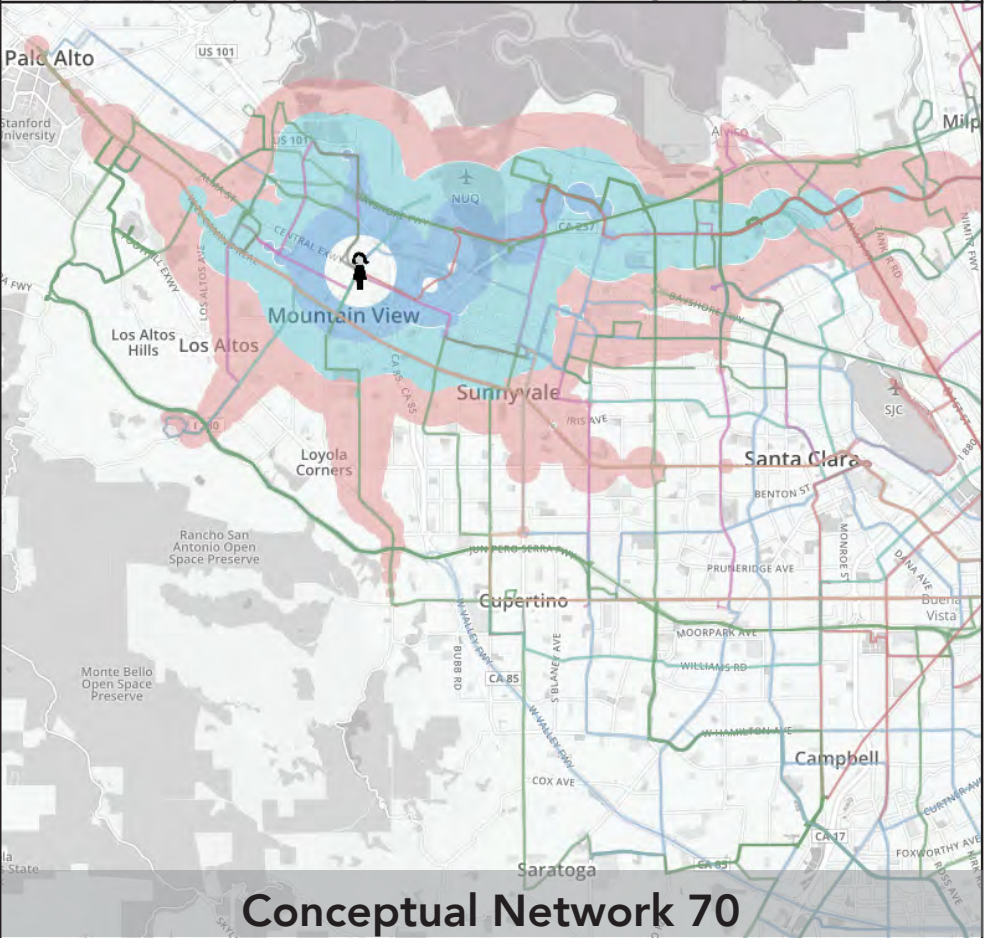
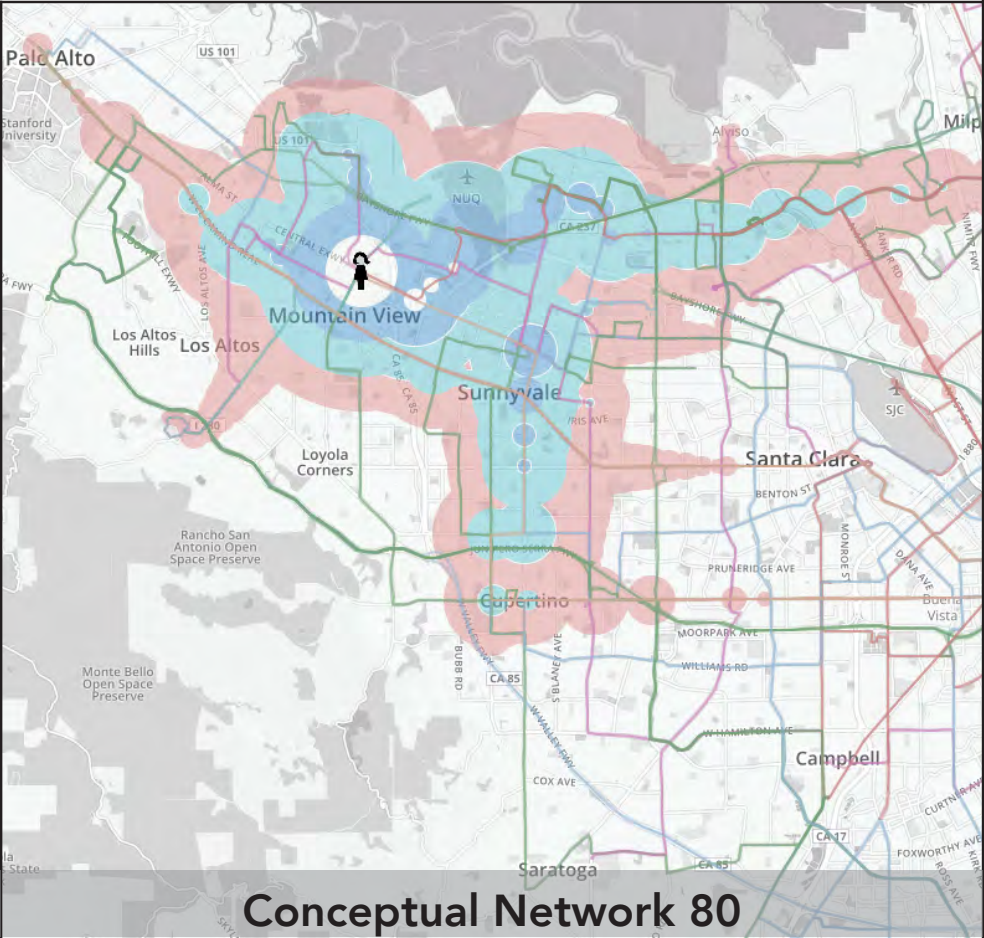
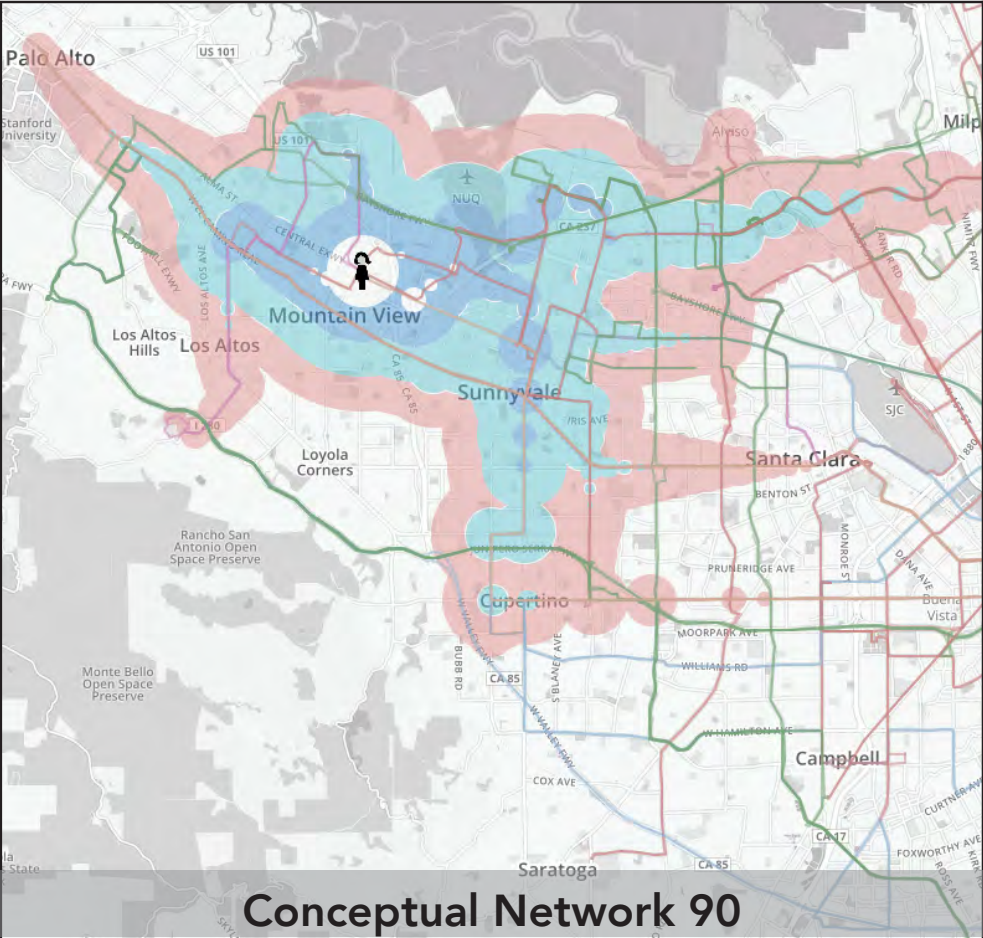
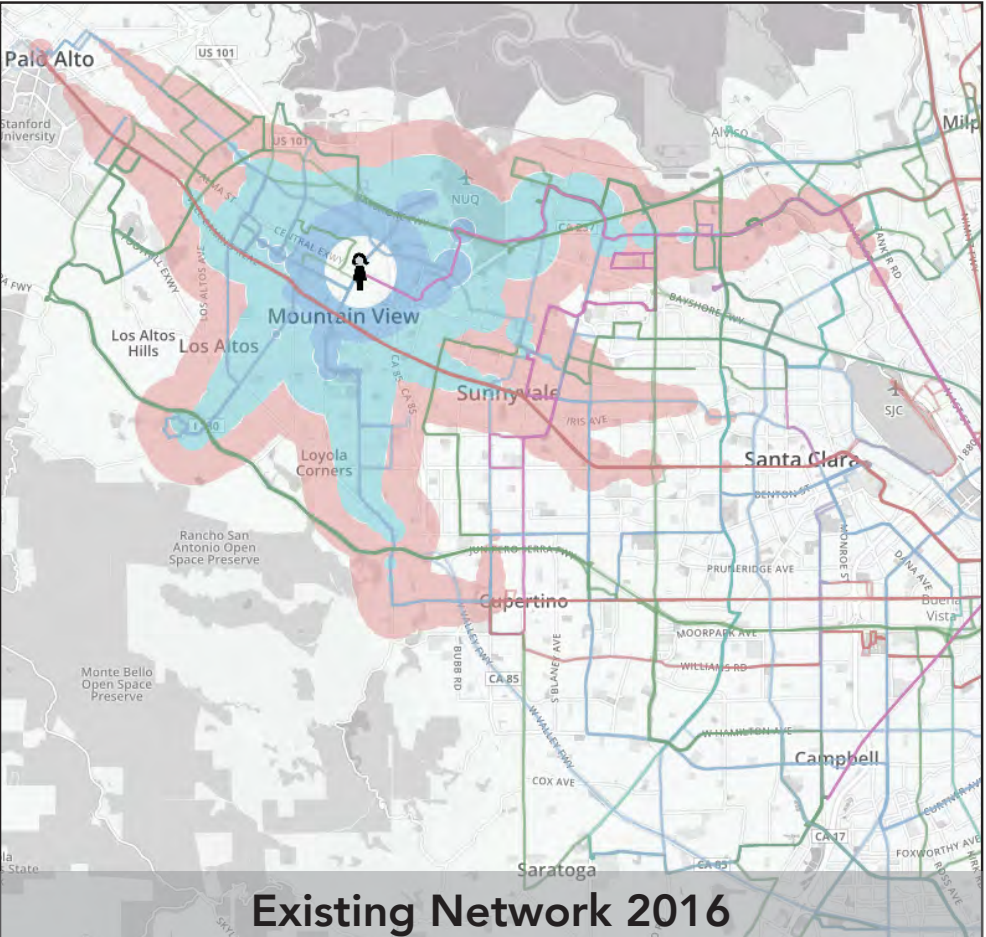


Mountain View Station Travel Isochrones Weekdays 12 pm

Residents Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	37,600	116,500	275,600
Increase from 2016 Network			
Network 70	11%	12%	-1%
Network 80	44%	50%	22%
Network 90	84%	72%	33%

Jobs Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	28,700	91,200	231,100
Increase from 2016 Network			
Network 70	73%	72%	28%
Network 80	95%	98%	47%
Network 90	134%	111%	62%

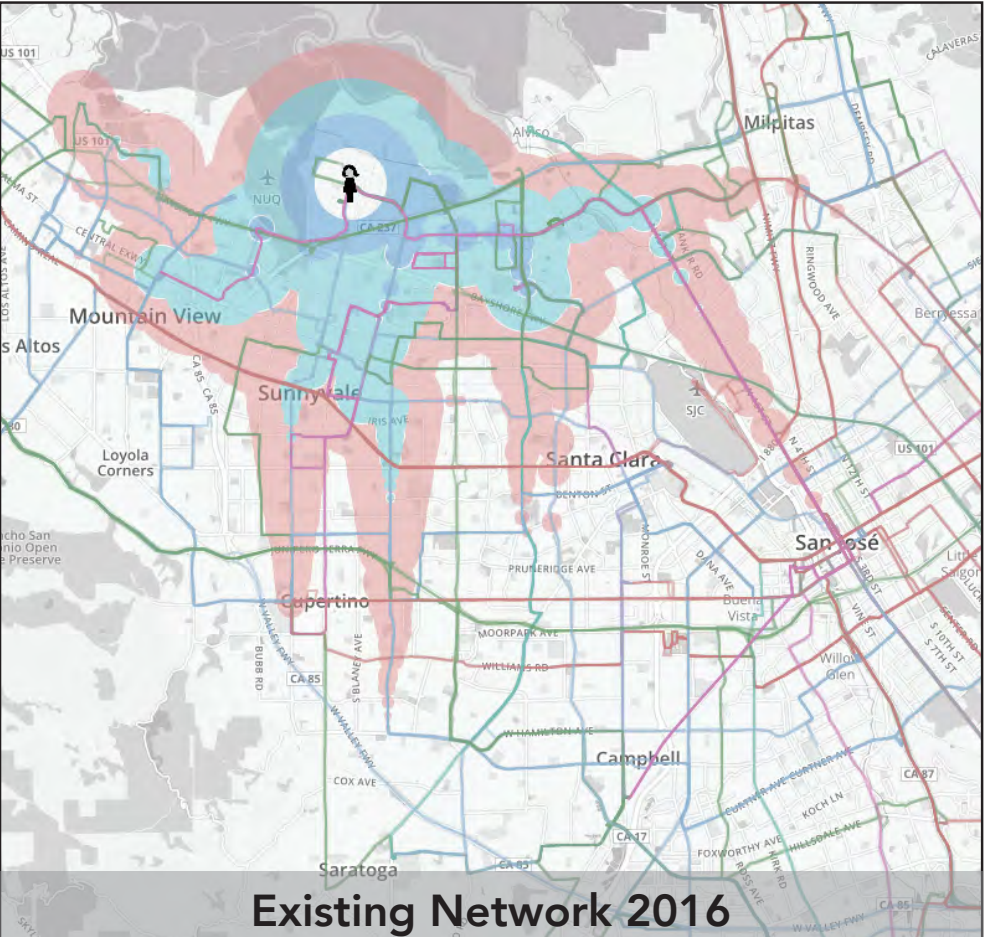
How far can Jane travel in 15 30 45 or 60 minutes?



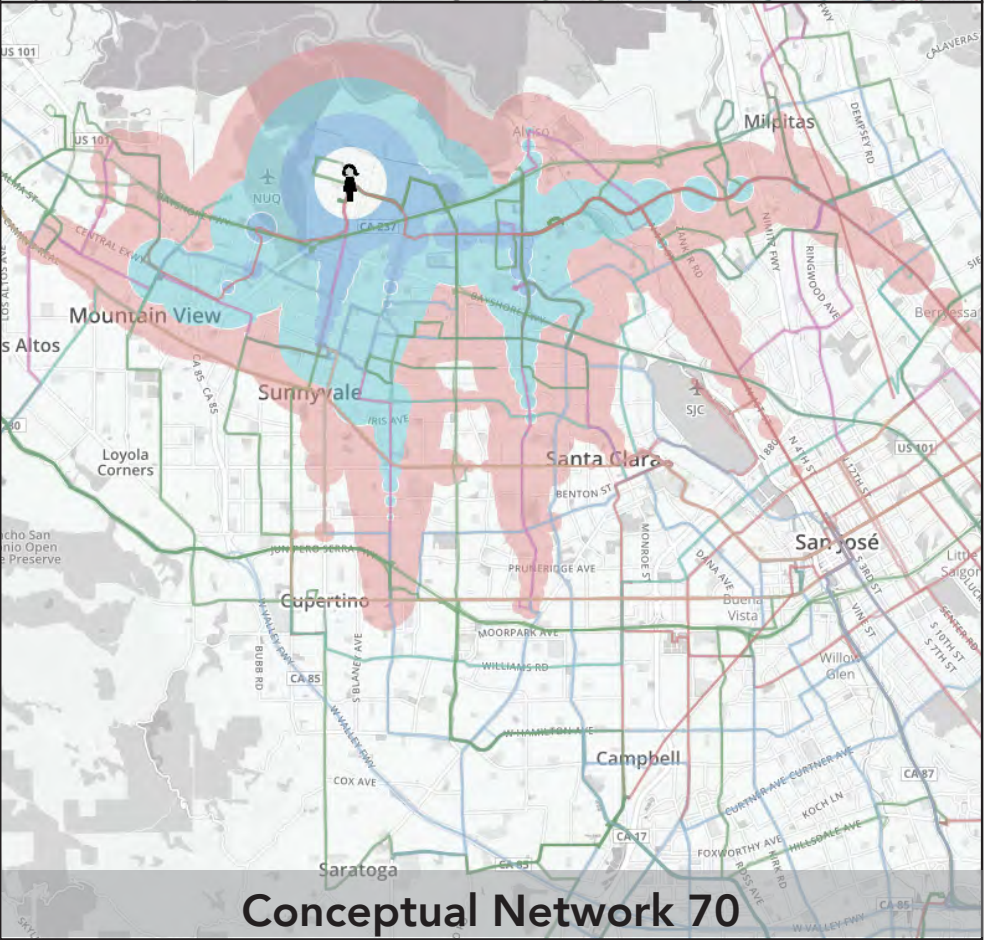
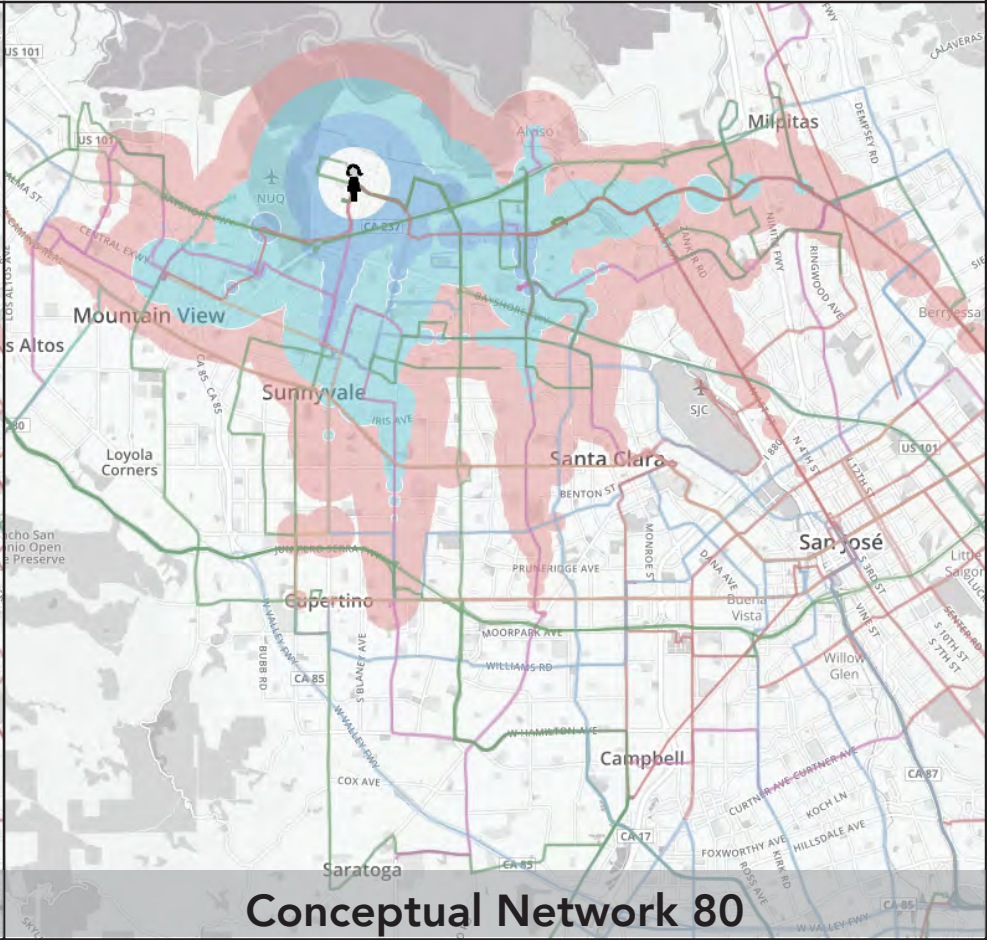
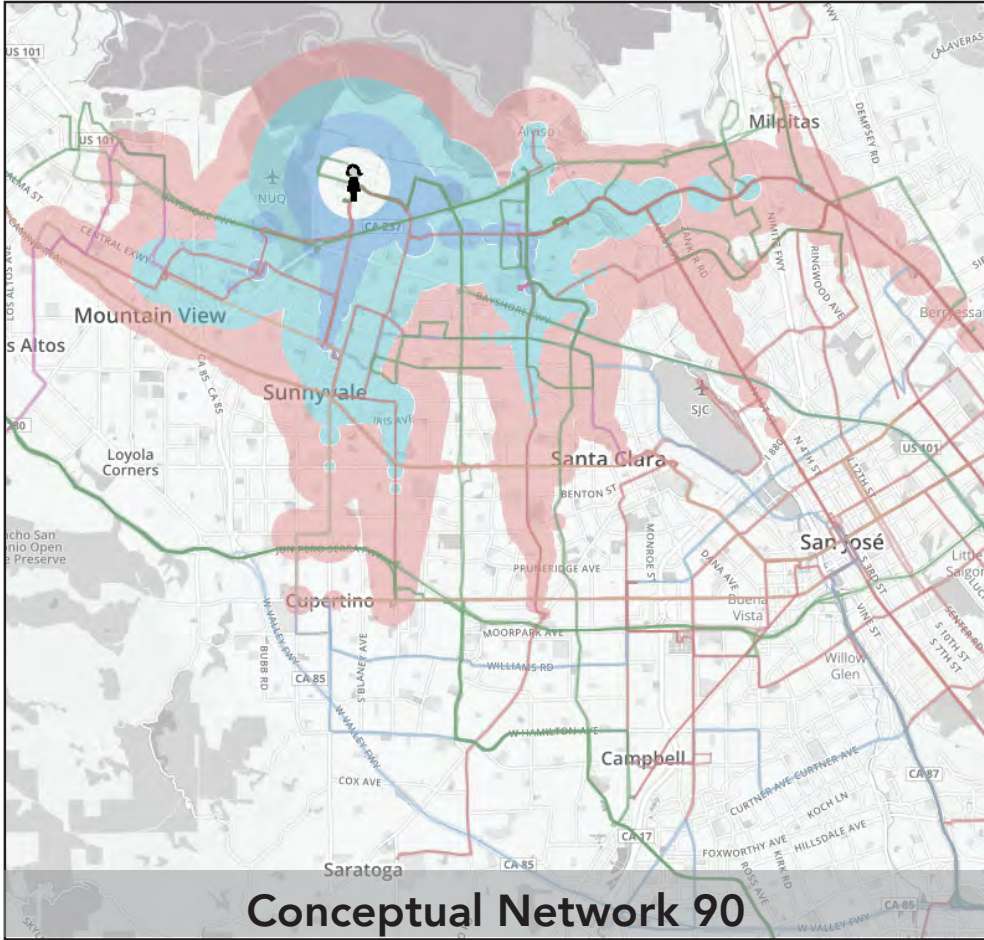
Sunnyvale Lockheed Martin Travel Isochrones Weekdays 8 am

Residents Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	10,800	88,700	237,600
Increase from 2016 Network			
Network 70	62%	14%	13%
Network 80	62%	17%	23%
Network 90	53%	16%	25%

Jobs Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	38,500	127,800	325,600
Increase from 2016 Network			
Network 70	16%	-2%	-2%
Network 80	16%	5%	5%
Network 90	17%	1%	7%



How far can Jane travel in 15 30 45 or 60 minutes?

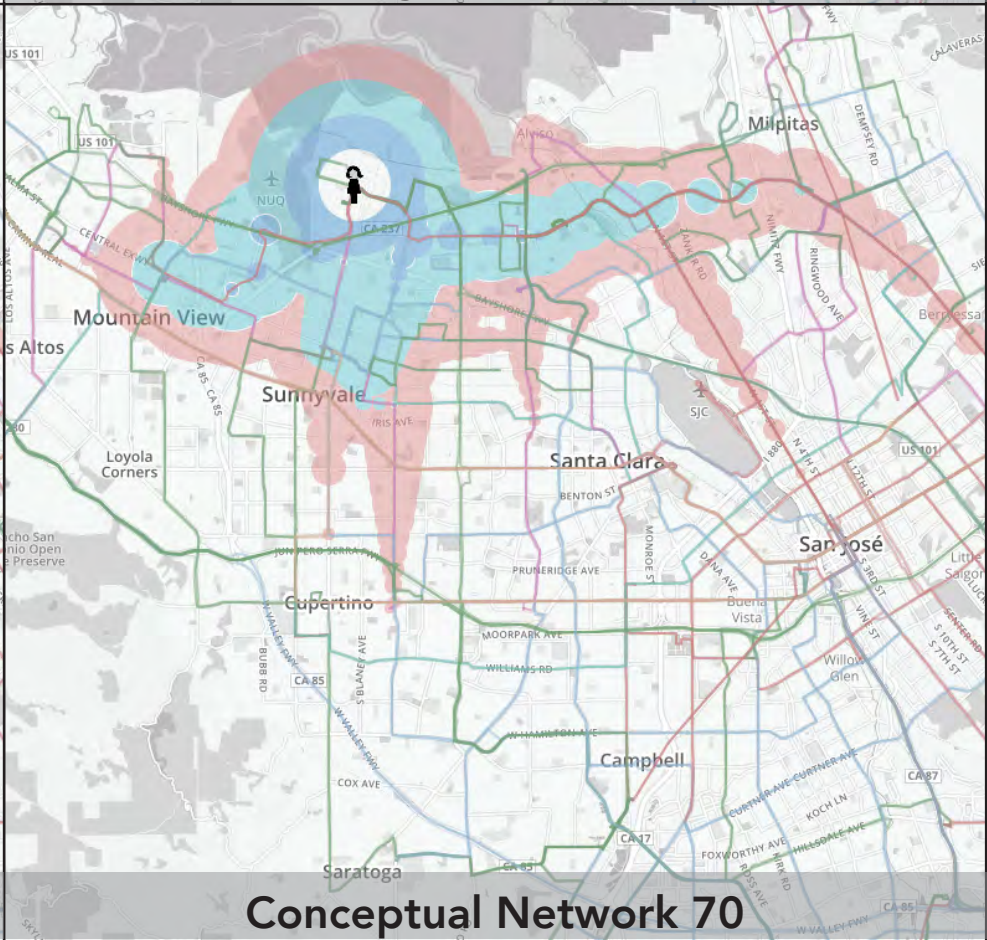
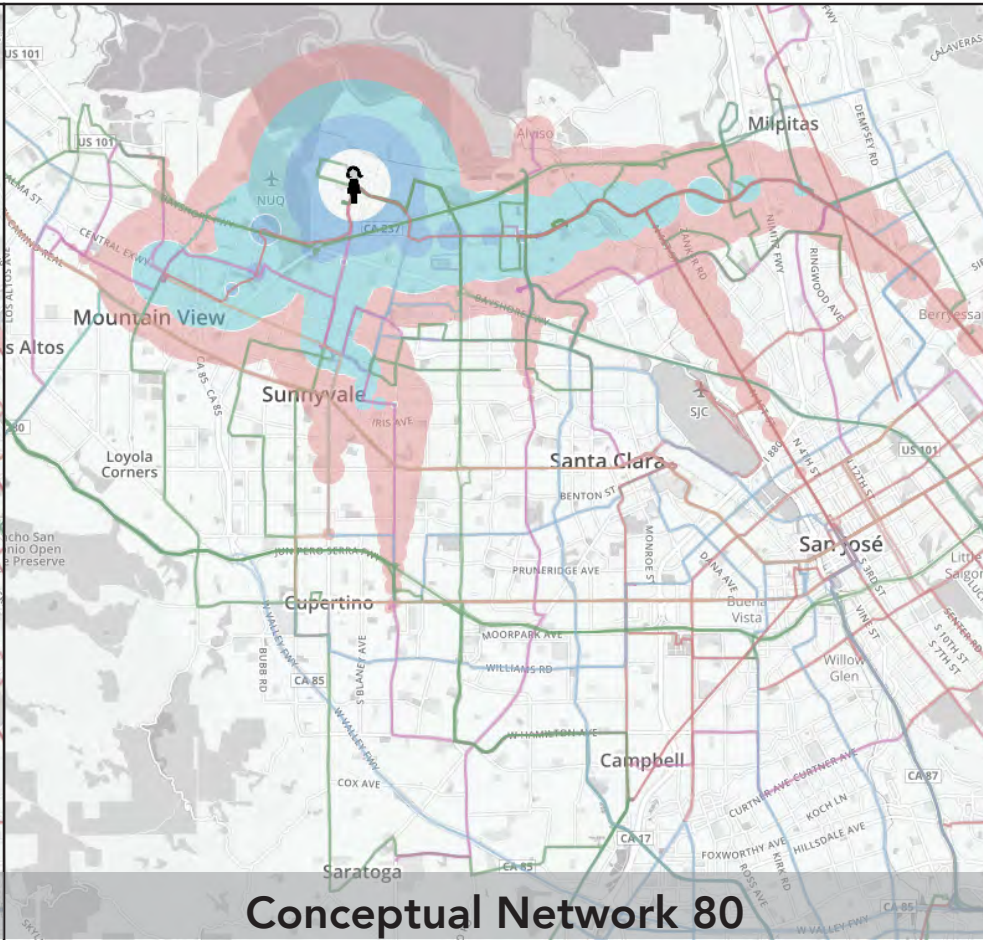
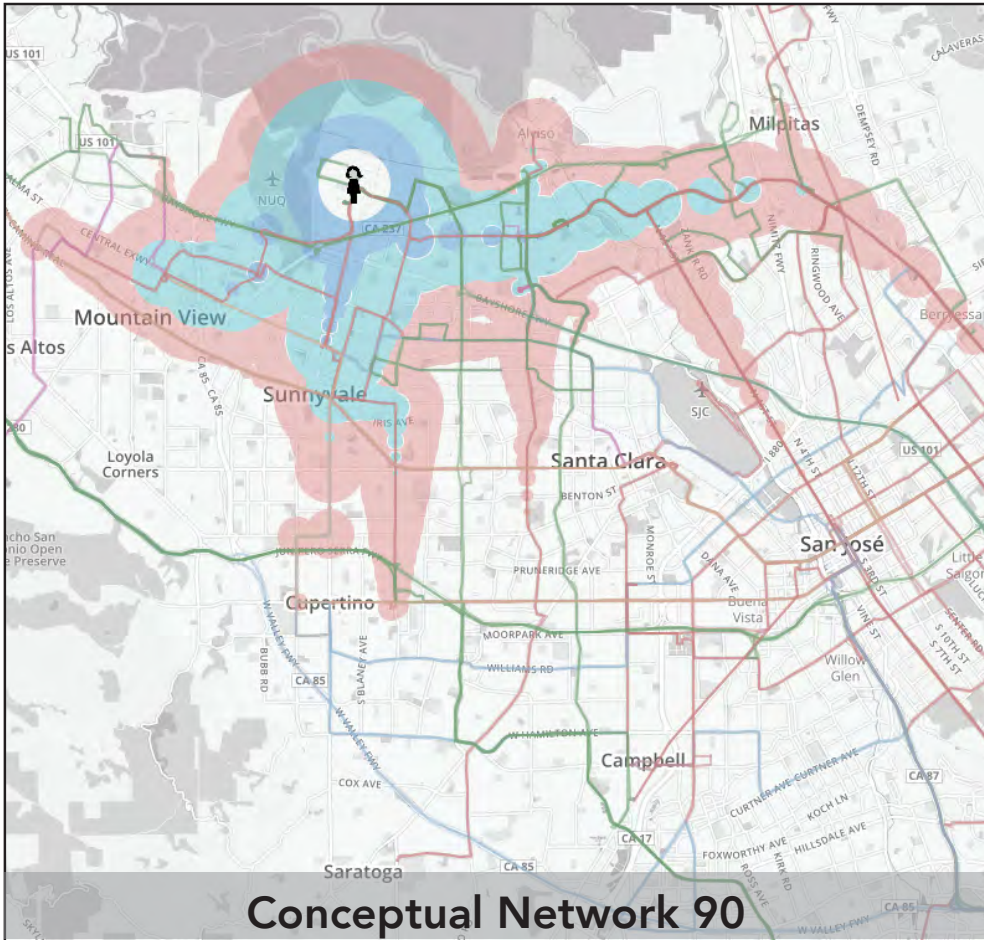
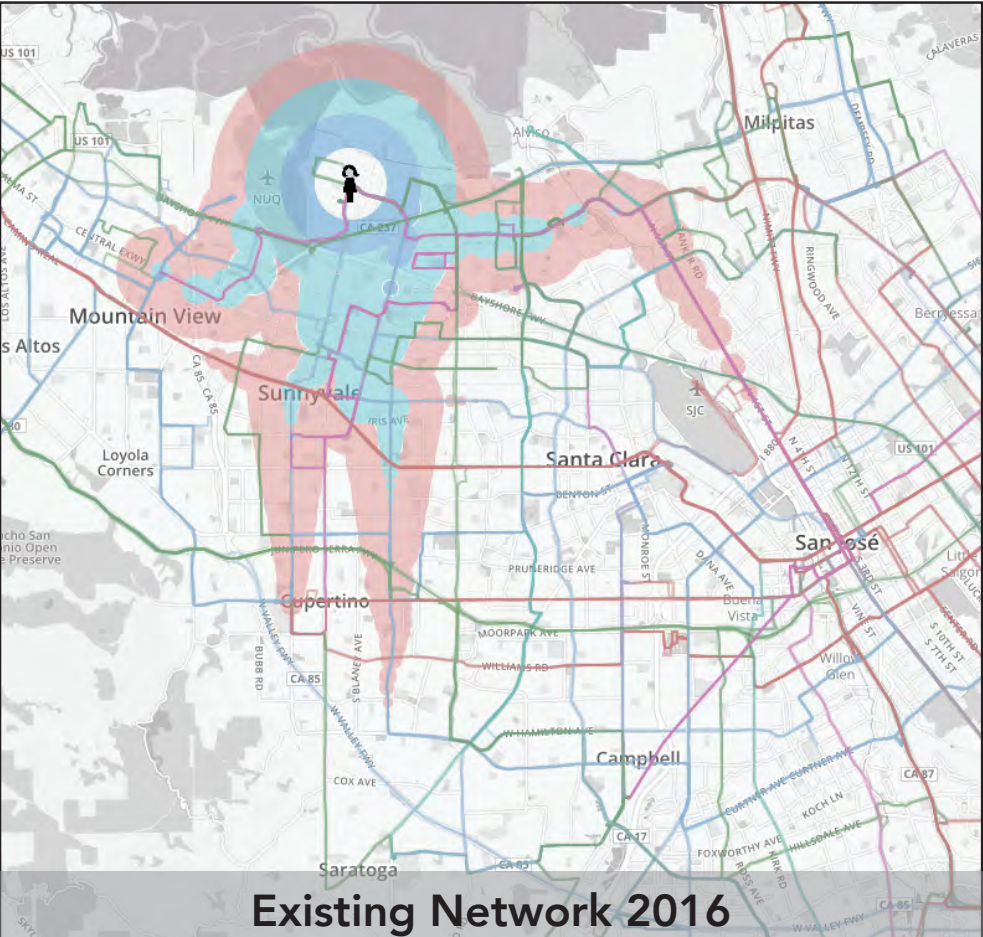


Sunnyvale Lockheed Martin Travel Isochrones Weekdays 12 pm

Residents Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	6,800	63,100	183,700
Increase from 2016 Network			
Network 70	56%	32%	12%
Network 80	30%	19%	12%
Network 90	92%	48%	36%

Jobs Accessible by Transit			
Starting from Mountain View LRT Station and traveling for...			
	30 min	45 min	60 min
2016 Network	26,600	75,200	172,900
Increase from 2016 Network			
Network 70	22%	41%	42%
Network 80	20%	32%	39%
Network 90	32%	42%	52%

How far can Jane travel in 15 30 45 or 60 minutes?



5 Outcomes: Coverage and Access to Frequency

About this Analysis

How many people lose access to service as we move from Network 70 toward Network 90? Graphs in this chapter answer this question.

They also show how many people gain access to high-frequency service, which tends to track with higher ridership. While access in a given travel time (shown in the last chapter) is the best indicator of ridership, access to frequent service has other benefits in terms of the ability to travel spontaneously. This is especially important when we consider the redevelopment value of frequent service. Since transit ridership is much higher near frequent transit stops, higher densities with less parking could logically be permitted. Portland, for example, dramatically lowers parking requirements along its Frequent Network, thus making higher density development pencil out at lower prices to the buyer or renter.

In each graph, the four bars, from top to bottom, show the existing system and then Networks 70, 80, and 90. The **red** part of each bar shows how many people have high-frequency service. The **blue** part shows how many have some all-day service at lower frequency. A small **orange** band shows people who have access to peak-only service, but finally there is a **grey** area, which is people with no service nearby.

Separate graphs are provided for the following groups:

- All residents
- All jobs
- All existing riders: This analysis is based on where existing riders board; obviously we have no data on exactly where they come from, though we know that most are walking and are therefore likely to be coming from nearby.
- All very low income persons: Low income people are of particular concern when it comes to access to opportunity.
- Minority racial or ethnic groups: This is relevant for civil rights analysis.

Separate graphs are also provided for two degrees of walking distance, $\frac{1}{2}$ mile and $\frac{1}{4}$ mile. Most people are used to having service within $\frac{1}{4}$ mile, so it may seem logical to use this measure. But many people can and do walk more than $\frac{1}{4}$ mile to service. In fact, people are consistently more likely to walk further to access service that is more useful. That makes sense: if the service takes you further and faster, then it's logical, as part of an optimal total trip time, to be willing to walk further to access it.

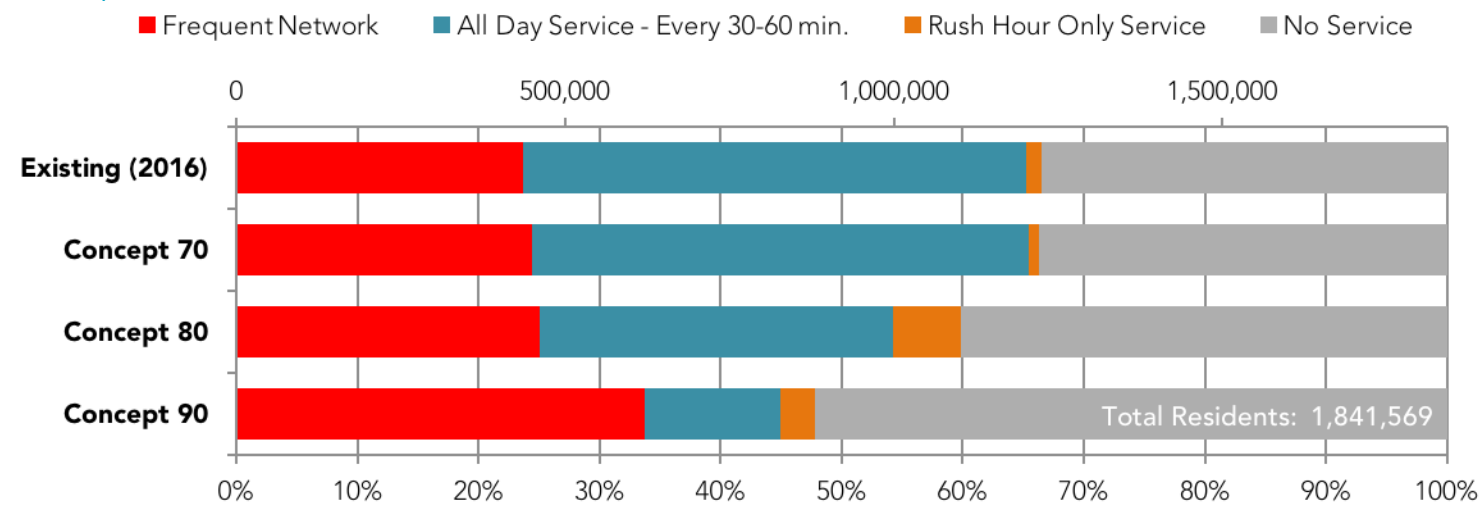
Of course, there are other forms of access, including Park-and-Ride and

cycling. However, the local bus services that are the main topic of this report tend to rely less on those modes, in part because they specialize in shorter distances at which cycling and driving (all the way to the destination) are often the more reasonable option for people who have started their trip in a car or on a bicycle.

At a basic level, all these graphs tell the same story. As you move from Network 70 toward Network 90, the number of people with frequent service goes up, but so does the number of people with no service. This is why the trade-off is so difficult, and why VTA needs the advice of residents in determining how to make it.

Residents with Access to Transit Services

within $\frac{1}{4}$ MILE of a VTA, Caltrain, BART, or ACE stop in Santa Clara County



within $\frac{1}{2}$ MILE of a VTA, Caltrain, BART, or ACE stop in Santa Clara County

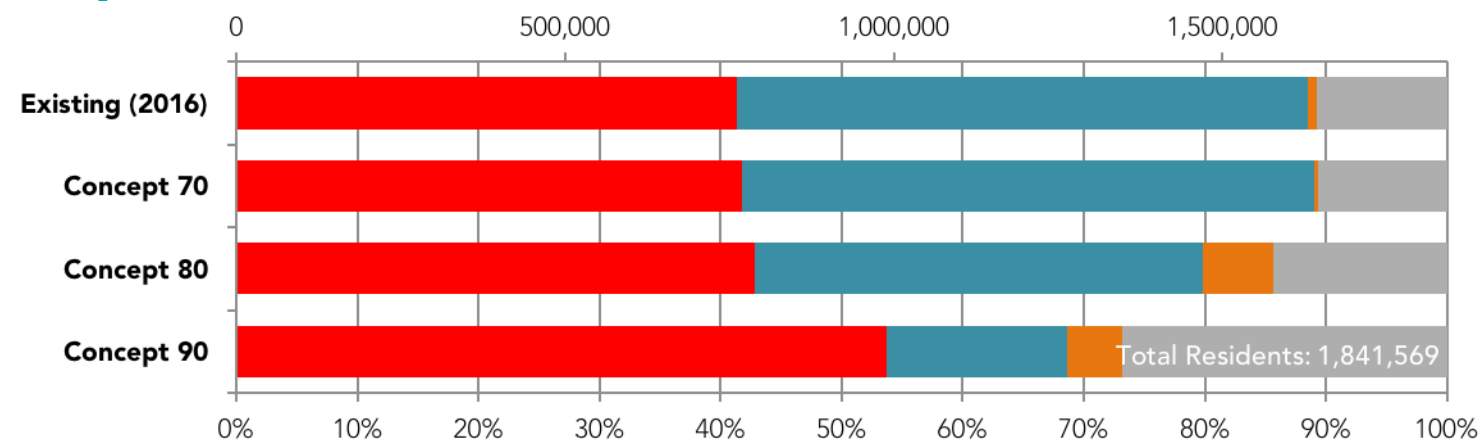


Figure 13: Residents with access to transit services

Coverage of Residents

On this measure, Network 70 is not much change from the existing system, either in terms of new access to frequent service or loss of access to service. This is logical; the proportion of service devoted to coverage has not changed, so virtually all areas that are served continue to be. In Network 70, too, there is not enough resource on the ridership side to expand the Frequent Network by much.

By the time we get to Network 90, the number of people with $\frac{1}{2}$ mile access to frequent service has both grown dramatically, from $\frac{1}{4}$ of the population to around $\frac{1}{3}$. A. Of course, the number of people with no service within $\frac{1}{2}$ mile has also grown, from about 10% to about 26%. Note, however, that most people who are losing access to service are not actually using it, so this should not be mistaken for an analysis of impact on current riders. That analysis appears in Figure 13.

Jobs Accessible by Transit Services

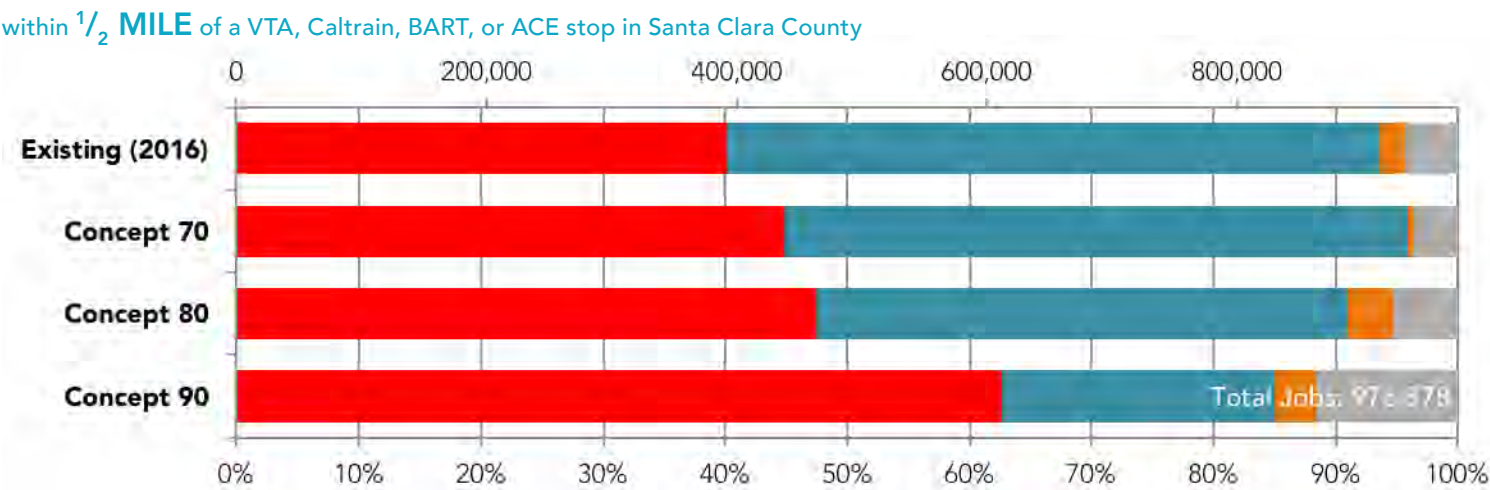
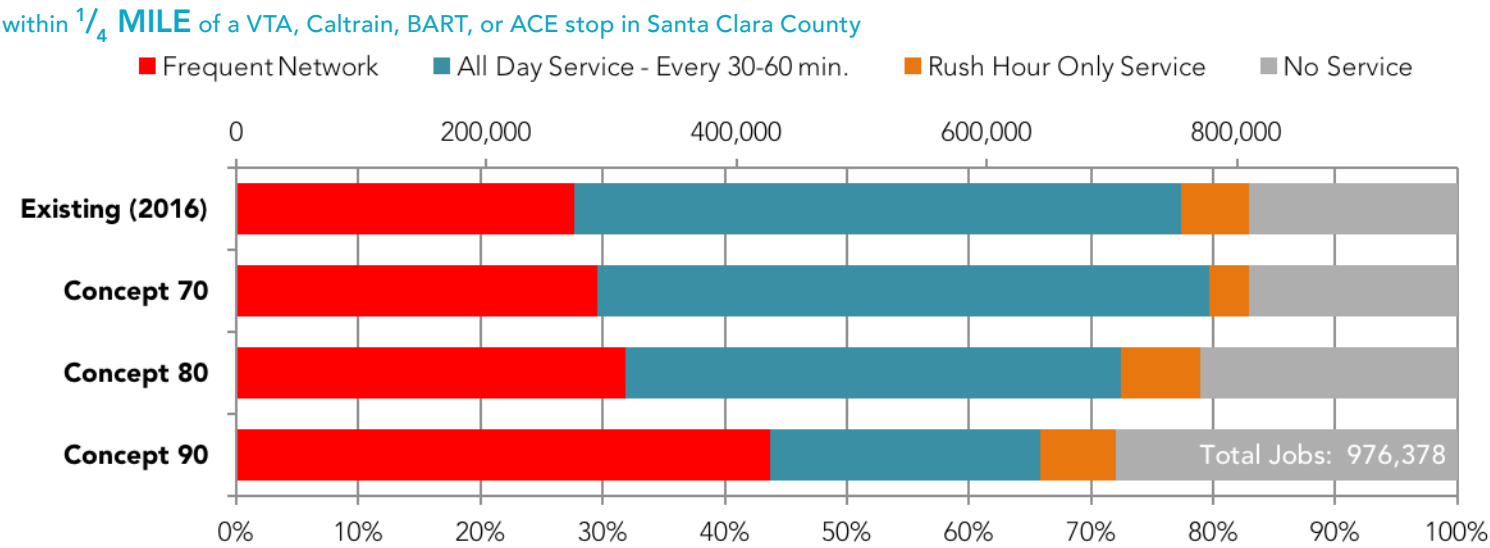


Figure 14: Jobs accessible by transit services

Coverage of Jobs

Moving from the existing system to Network 70, the number of jobs accessible to all-day transit and to frequent transit increases somewhat. This reflects the fact that the few frequent services that can be added in this concept tend to be job-rich (Great America Parkway, for example). The light growth in all-day, as opposed to peak-only, service is also important, as many of the employees who rely most on transit tend to be commuting at all times of day.

By the time we reach Network 90, the percentage of the county's jobs that are within 1/2 mile of the frequent network has surged from 40% to 63%.

As always, this means that jobs with no service have also grown, but not by much. About 5% of jobs have no service in the existing system, and this rises to 13%. Again, jobs in this category are likely to already be poor transit markets with low or zero expectations of transit service.

Coverage of Current VTA Boardings

The effect of the network on current riders is an important measure for two reasons:

- It offers a useful counterpoint to the previous analysis of population and jobs covered, by showing how dramatically existing ridership already correlates with frequency, and how the higher-ridership options provide even better service to places where existing ridership already signals high potential.
- It tends to anticipate the responses of people who already rely on the system. The more existing riders loses service, the more negative feedback should be expected. (Of course, negative feedback will also come from people who still have some service but who find it less convenient. Some will also come from people who dislike any change to the routine, even though the impacts on them, viewed objectively, are not severe.)

Measuring impact on existing riders is difficult. We do not know where their trips begin, but only where they boarded, so we must begin by treating all existing riders as though their trips began at their boarding location. However, this problem is constant across all the alternative concepts, including the analysis of the existing system, so while it gives us reason to suspect that the exact numbers may be lower, the comparison between alternative concepts, and between these concepts and the existing system, can still be viewed with a high level of confidence.

Note also that this is technically a count of boardings rather than riders. As a result, transfers may be double counted and round trips certainly are. Again, however, this is the best data available, and while this casts doubt on the whole numbers it should not cast doubt on the comparison.

Obviously, all existing boardings, by definition, are on the existing network. Using a 1/2 mile walking distance, almost 100% of them are on Network 70's network while 99% are on Network 80's. More existing riders lose service if we move toward Network 90, but even there, over 95% are still on the network.

While Concepts 70 and 80 have very little impact on the coverage of existing riders, they do achieve a significant boost in existing riders who have access to frequent services; this number is up by about 1/5 in either case. This should not be surprising, since the top priority for higher frequency tends to be in places where ridership is already high. As you would expect, Network 90 has the biggest benefits to existing riders, with 88% located on the new Frequent Network, or an increase of about 1/4.

Access to Transit Services: Existing Boardings

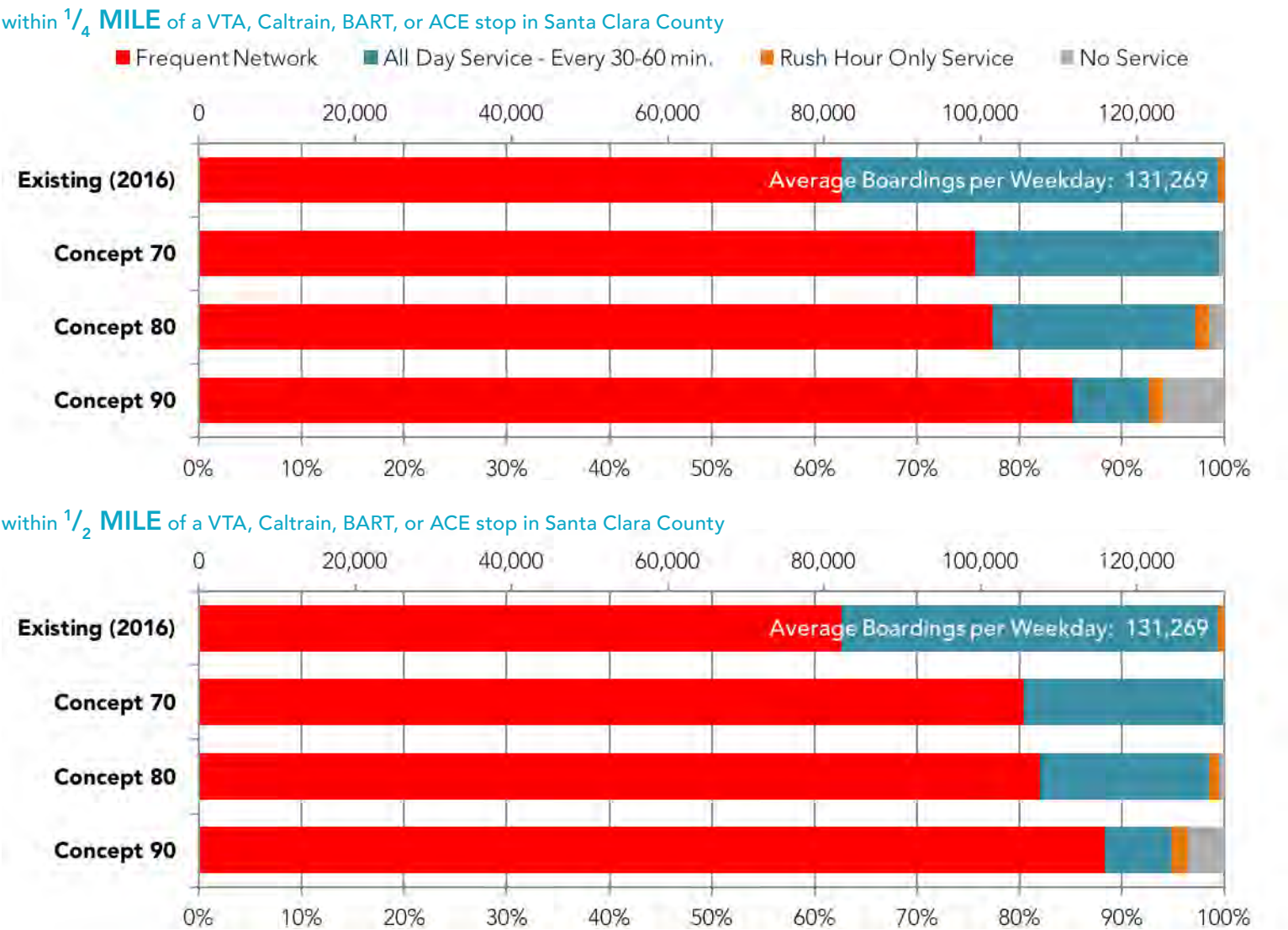


Figure 15: Existing boardings covered by transit services

Residents in Poverty with Access to Transit Services

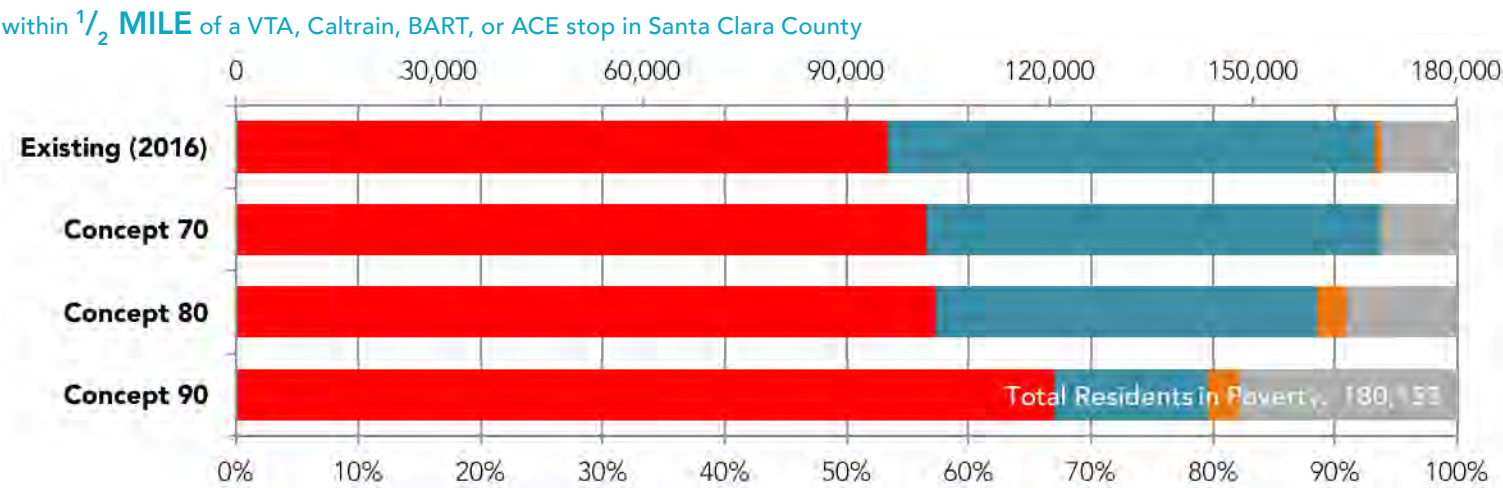
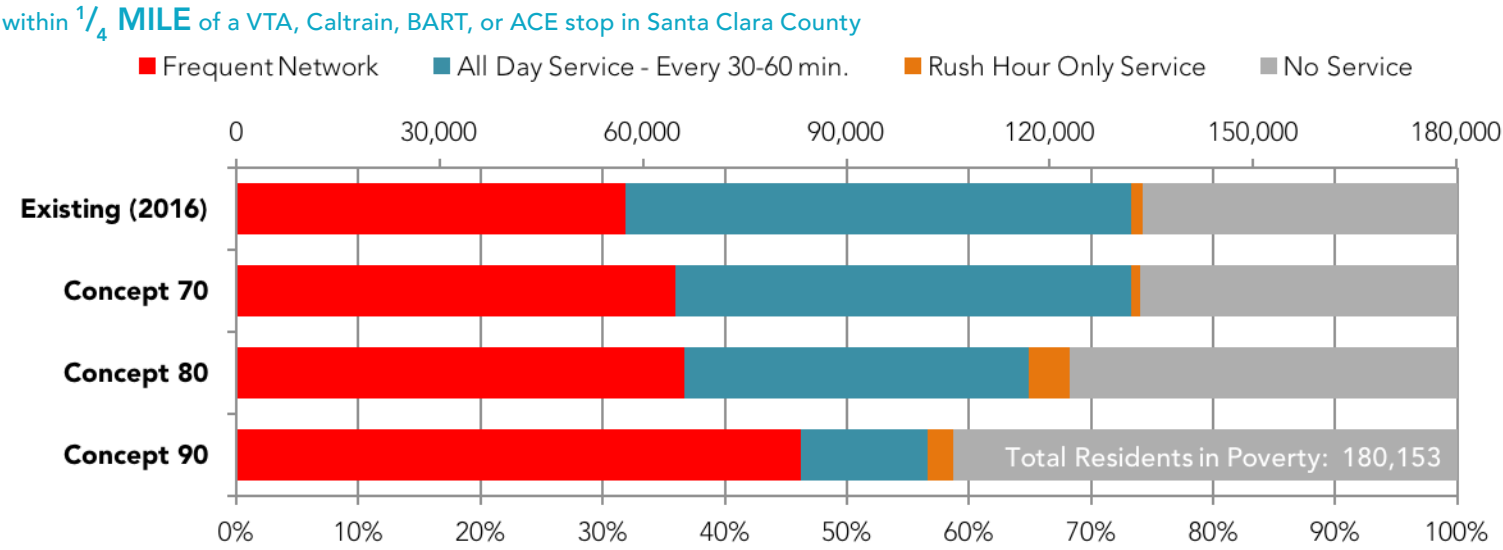


Figure 16: Residents in poverty with access to transit services

Coverage of Low-Income People

Low-income people tend to be strong sources of ridership, and also to depend on transit to a higher degree, so impacts on them are important to assess.

Here, we rely on the Federal census, which identifies low income in terms of the Federal poverty line. This is a national abstraction that is not ideal for understanding poverty in Santa Clara County. In terms of their actual buying power, living at the poverty line in Santa Clara County makes you much poorer than if you live in a lower-cost area such as the Central Valley. Nevertheless, this is the form in which the information is readily available.

So in Santa Clara County's terms, we cannot count all of the people whose lives are defined by extreme financial hardship, but only those who are in the worst situation in this regard. For this reason, again, the comparison between concepts is more meaningful than the whole numbers.

Already, about 7% of people in poverty are not within walking distance of transit service. This does not change in Network 70 and goes up slightly in Network 80, to about 9%. On the other hand, it more than doubles in Network 90, to about 18%. These numbers reflect the fact that while the vast majority of low income people are in concentrated locations where they are easy to serve, a small number of people are distributed all over the county, in places where high-ridership transit is impossible.

Coverage of Minority Residents

Racial minorities experience almost exactly the same impacts as low-income people. (Obviously these categories overlap to a degree but there are also plenty of low-income white people and medium- to high-income people in the racial minority categories.) About 8% of minority residents are not within 1/2 mile of service now. This is unchanged in Network 70, rises to 13% in Network 80, and reaches 23% in Network 90. This mirrors a big change in the number of minority residents on the Frequent Network, which goes from about 47% today (unchanged in Concepts 70 and 80) to 59% in Network 90.

Title VI Communities

Title VI is Federal civil rights legislation that requires service changes to have no disparate impact on low-income or minority persons. Expertise in Title VI has been engaged throughout the process of developing these alternatives.

While the details can be complex, the general spirit of Title VI is that if there is any negative impact on people in these categories, there should also be a corresponding negative impact on people outside these categories. This is necessary to establish that none of the negative impact is correlated with race or income. (Title VI does not care about the intentions in planning, only the outcomes.)

If you compare the coverage of minorities and people in poverty with that of all residents, it's clear that the impacts are generally comparable. The big impacts happen in Network 90 but even they are proportional, impacting low-income and minority residents no more severely than they impact everyone. If anything, majorities of these groups are likely to benefit from the changes, since they tend to live in places where ridership potential is high.

A full Title VI analysis will be done in the course of refining the final plan. Any final plan will be adjusted as needed to ensure Title VI compliance. However, this high-level review is a preliminary indication that it is probably possible to comply with Title VI at any chosen point on the ridership-coverage spectrum.

Minority Residents with Access to Transit Services

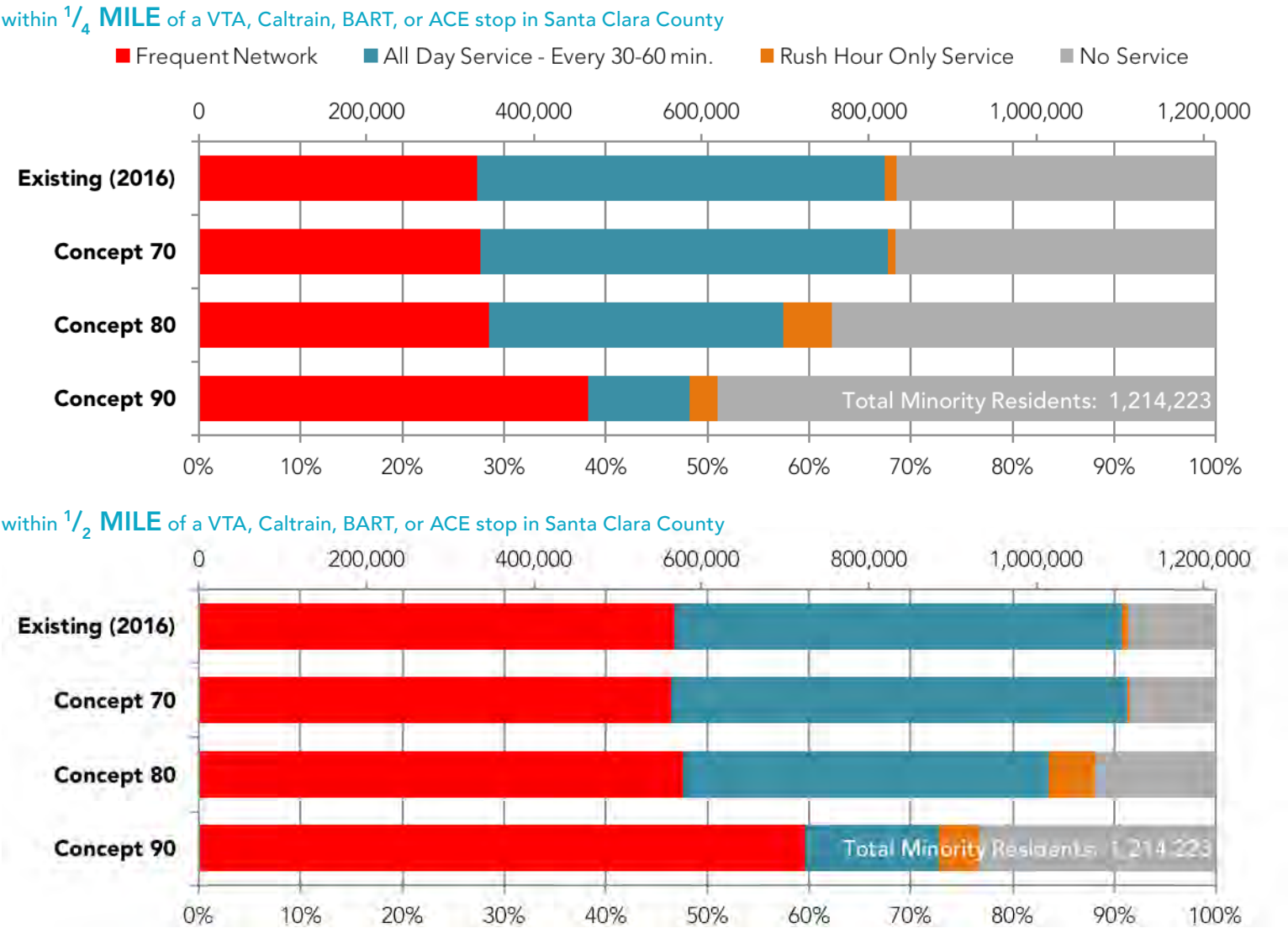


Figure 17: Minority residents with access to transit services

A

Appendix: Frequency Tables

Key	
Route Type	Frequency
Rapid	15 min or better all day, limited stops
Peak Rapid	15 min or better during peak only, limited stops
Frequent	15 min or better all day
Candidate Frequent	30 min or better all day
Peaked Candidate Frequent	15 min or better during peak, 30 min otherwise
Infrequent	60 min all day
Peaked Infrequent	30 min during peak, 60 min otherwise
Peak 30	30 min during peak only
Peak 60	60 min during peak only
Expresses	varied frequency during peak only, limited stops
Limited	varied frequency during peak only
Night	60 min during night only
Weekend	weekend trips only

Concept 70 Routes			Weekday										Saturday						Sunday					
#	Name	Description	Frequency					Span (hrs)					Frequency			Span (hrs)			Frequency			Span (hrs)		
			AM	Mid	PM	Eve	Night	AM	Mid	PM	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
13	Almaden	Ohlone / Chynoweth - Harry Rd	60	60	60			3.0	6.0	3.0														
16	Morgan Hill	Main & Hale - Burnett	60	60	60			3.0	6.0	3.0														
22	El Camino	Palo Alto - Eastridge	15	15	15	15	60	3.0	6.0	3.0	3.5	8.5	15	60	60	14.5	3.5	6.0	15	60	60	13.5	3.5	7.0
522	El Camino Rapid	Palo Alto - Eastridge	12	12	12	12		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
23	Stevens Creek	De Anza - Alum Rock	15	15	15	15		3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
23	Stevens Creek Night	De Anza - Downtown San Jose					60					5.0			60			6.0			60			7.0
523	Stevens Creek Rapid	Sunnyvale - Berryessa BART	15	15	15	15		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
523	Berryessa BART Rapid	Diridon - Berryessa BART	15		15			3.0		3.0														
25	Story	Valley Fair - Alum Rock	12	12	12	12	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
27	Blossom Hill	Winchester - Kaiser San Jose	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
28	Wolfe	Lockheed Martin - Stevens Creek	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
28	Tully	Stevens Creek - Eastridge	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
31	Evergreen	Eastridge - Evergreen College	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
32	Reed	Sunnyvale - Santa Clara	30	60	30			3.0	6.0	3.0														
35	California	Sunnyvale - San Antonio	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
35	Middlefield	San Antonio - Palo Alto	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
39	Quimby	Eastridge - The Villages	60	60	60			3.0	6.0	3.0														
40	San Antonio	Foothill College - Mountain View	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
42	Yerba Buena	Ohlone / Chynoweth - Evergreen College	60	60	60			3.0	6.0	3.0														
43	Hostetter	Milpitas - Berryessa BART	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
44	Milpitas	Milpitas - Park Victoria	60	60	60			3.0	6.0	3.0														
45	Toyon	Berryessa BART - Alum Rock	60	60	60			3.0	6.0	3.0														
46	Park Victoria	Park Victoria - Milpitas	60	60	60			3.0	6.0	3.0														
47	Milpitas	Milpitas loop	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
48	Winchester	Los Gatos - Winchester	60	60	60			3.0	6.0	3.0														
49	Los Gatos	Winchester - Los Gatos	60	60	60			3.0	6.0	3.0														
51	Grant	San Antonio - Capitol	60	60	60			3.0	6.0	3.0														
51	Pollard	West Valley - Winchester	60		60			3.0		3.0														
52	El Monte - Moffett	Foothill College - Carnegie Mellon Univ.	30	60	30			3.0	6.0	3.0														
53	Mary	Cupertino - Lockheed Martin	30	30	30			3.0	6.0	3.0	4.5					12.0	3.5					11.0	3.5	
54	Hollenbeck	Cupertino - Lockheed Martin	30	30	30			3.0	6.0	3.0	4.5					12.0	3.5					11.0	3.5	
53/54	Fair Oaks Weekend	Sunnyvale - Lockheed Martin						3.0	6.0	3.0	4.5		30			12.0	3.5		30			11.0	3.5	
55	Homestead	Reamwood - Diridon	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
56	Montague	Mountain View - Milpitas	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
57	Bowers	Stevens Creek - Tasman	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
57	Saratoga	West Valley - Stevens Creek	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
58	Lafayette	Santa Clara - Tasman	30	60	30			3.0	6.0	3.0														
59	Monroe	Reamwood - Santa Clara	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	

Concept 70 Routes (continued)			Weekday										Saturday						Sunday					
#	Name	Description	Frequency					Span (hrs)					Frequency			Span (hrs)			Frequency			Span (hrs)		
			AM	Mid	PM	Eve	Night	AM	Mid	PM	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
60	Winchester	Winchester - Airport	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
60L	Brokaw	Airport - Milpitas	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
61	Taylor	Campbell - Bascom - Berryessa BART	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
62	Hedding - Williams	Hostetter - Berryessa BART - De Anza	30	60	30			3.0	6.0	3.0														
64	McKee	Alum Rock - Diridon	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
64	Meridian	Diridon - Blossom Hill	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
64	Lincoln	Diridon - Almaden	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
65	Camden	Diridon - Almaden Expwy	60	60	60			3.0	6.0	3.0														
66	Oakland	Milpitas H.S. - Downtown San Jose	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
68	Monterey	Downtown San Jose - Branham	10	10	10	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
68	Snell	Branham - Snell - Cottle	20	20	20	30		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
69	Santa Teresa	Kaiser San Jose - Gilroy	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
69	Thomas	Gilroy - Gaviola	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
70	Jackson	Berryessa BART - Eastridge - Branham	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
71	Piedmont	Milpitas - Eastridge	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
72	McLaughlin	Berryessa BART - Capitol	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
73	Senter	Diridon - Branham	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
82	Hamilton		30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
88	Charleston	Palo Alto - Meadow Circle	60	60	60			3.0	6.0	3.0														
89	Palo Alto	Palo Alto - VA	60		60			3.0		3.0														
96	Gilroy	Gilroy Circulator	60	60	60			3.0	6.0	3.0														
100s	Expresses unchanged except those to/from Fremont, which are deleted																							
202	Warm Springs Night	Downtown San Jose - Warm Springs BART					60					3.0		60			5.0			60			7.0	
304	Monterey Limited	S San Jose - Sunnyvale TC	30		40			3.0		3.5														
328	Lawrence Expwy Limited	Almaden Valley - Lockheed Martin	80		70			3.0		2.5														
330	San Tomas Expwy Limited	Almaden Valley - Old Ironsides	25		50			3.0		3.0														
900	Light Rail	Almaden - Ohlone / Chynoweth	15	15	15			3.0	6.0	3.0														
901	Light Rail	Santa Teresa - Alum Rock	15	15	15			3.0	6.0	3.0														
902	Light Rail	Winchester - Old Ironsides	15	15	15			3.0	6.0	3.0														
903	Light Rail	Alum Rock - Mountain View	15	15	15			3.0	6.0	3.0														
904	Light Rail	Santa Teresa - St James	30		30			3.0		3.0														

Concept 80 Routes			Weekday										Saturday						Sunday					
#	Name	Description	Frequency					Span (hrs)					Frequency			Span (hrs)			Frequency			Span (hrs)		
			AM	Mid	PM	Eve	Night	AM	Mid	PM	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
13	Almaden	Ohlone / Chynoweth - Harry Rd	60		60			3.0		3.0														
22	El Camino	Palo Alto - Eastridge	15	15	15	15	60	3.0	6.0	3.0	3.5	8.5	15	60	60	14.5	3.5	6.0	15	60	60	13.5	3.5	7.0
522	El Camino Rapid	Palo Alto - Eastridge	10	10	10	10		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
23	Stevens Creek	De Anza - Alum Rock	15	15	15	15		3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
23	Stevens Creek Night	De Anza - Downtown San Jose					60					5.0			60			6.0			60			7.0
523	Stevens Creek Rapid	Mountain View - Berryessa BART	10	10	10	10		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
523	Berryessa BART Rapid	Diridon - Berryessa BART	10		10			3.0		3.0														
25	Story	Valley Fair - Alum Rock	12	12	12	12	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
27	Blossom Hill	Winchester - Kaiser San Jose	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
28	Wolfe	Lockheed Martin - Stevens Creek	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
28	Hamilton	Stevens Creek - Curtner	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
28	Tully	Curtner - Eastridge	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
31	Evergreen	Eastridge - Evergreen College	30	30	30	60		3.0	6.0	3.0	4.5					12.0	3.5					11.0	3.5	
35	California	Mountain View - San Antonio	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
35	Middlefield	San Antonio - Palo Alto	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
39	Quimby	Eastridge - The Villages	60	60	60			3.0	6.0	3.0														
40	San Antonio	Foothill College - Mountain View	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
43	Hostetter	Milpitas - Berryessa BART	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
47	Milpitas	Milpitas loop	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
48	Los Gatos	Los Gatos - Winchester	60	60	60			3.0	6.0	3.0														
51	Grant - Saratoga	Mountain View - Winchester	60		60			3.0		3.0														
52	El Monte - Moffett	Foothill College - Carnegie Mellon Univ.	30	60	30			3.0	6.0	3.0														
53	Mary	Cupertino - Lockheed Martin	60		60			3.0		3.0														
54	Hollenbeck	Cupertino - Lockheed Martin	60		60			3.0		3.0														
55	Homestead	Reamwood - Diridon	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
56	Montague	Mountain View - Milpitas	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
57	Bowers	West Valley - Alviso	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
59	Monroe	Reamwood - Santa Clara	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
60	Winchester	Campbell - Airport - Milpitas	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
61	Taylor	Campbell - Bascom - Berryessa BART	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
62	Hedding	Hostetter - Berryessa BART - De Anza	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
64	McKee	Alum Rock - Diridon	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
64	Meridian	Diridon - Blossom Hill	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
64	Lincoln	Diridon - Almaden	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
66	Oakland	Milpitas H.S. - Downtown San Jose	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
68	Monterey	Downtown San Jose - Branham	10	10	10	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
68	Snell	Branham - Snell - Cottle	20	20	20	30		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
69	Santa Teresa	Kaiser San Jose - Gilroy	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	

Concept 80 Routes (continued)			Weekday										Saturday						Sunday					
#	Name	Description	Frequency					Span (hrs)					Frequency			Span (hrs)			Frequency			Span (hrs)		
			AM	Mid	PM	Eve	Night	AM	Mid	PM	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
69	Thomas	Gilroy - Gaviion	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
70	Jackson	Berryessa BART - Eastridge - Branham	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
71	Piedmont	Milpitas - Eastridge	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
72	McLaughlin	Berryessa BART - Capitol	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
73	Senter	Diridon - Branham	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
88	Palo Alto	Palo Alto - VA	60		60			3.0		3.0														
96	Gilroy	Gilroy Circulator	60	60	60			3.0	6.0	3.0														
100s	Expresses unchanged except those to/from Fremont, which are deleted																							
202	Warm Springs Night	Downtown San Jose - Warm Springs BART					60					3.0		60			5.0			60			7.0	
304	Monterey Limited	S San Jose - Sunnyvale TC	30		40			3.0		3.5														
328	Lawrence Expwy Limited	Almaden Valley - Lockheed Martin	80		70			3.0		2.5														
330	San Tomas Expwy Limited	Almaden Valley - Old Ironsides	25		50			3.0		3.0														
900	Light Rail	Almaden - Ohlone / Chynoweth	15	15	15			3.0	6.0	3.0														
901	Light Rail	Santa Teresa - Alum Rock	15	15	15			3.0	6.0	3.0														
902	Light Rail	Winchester - Old Ironsides	15	15	15			3.0	6.0	3.0														
903	Light Rail	Alum Rock - Mountain View	15	15	15			3.0	6.0	3.0														
904	Light Rail	Santa Teresa - St James	30		30			3.0		3.0														

Concept 90 Routes			Weekday										Saturday						Sunday					
#	Name	Description	Frequency					Span (hrs)					Frequency			Span (hrs)			Frequency			Span (hrs)		
			AM	Mid	PM	Eve	Night	AM	Mid	PM	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
22	El Camino	Palo Alto - Eastridge	12	15	12	15	60	3.0	6.0	3.0	3.5	8.5	15	60	60	14.5	3.5	6.0	15	60	60	13.5	3.5	7.0
522	El Camino Rapid	Palo Alto - Eastridge	10	10	10	10		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
23	Stevens Creek	De Anza - Alum Rock	12	15	12	15		3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
23	Stevens Creek Night	De Anza - Downtown San Jose					60					5.0			60			6.0			60			7.0
523	Stevens Creek Rapid	Mountain View - Berryessa BART	10	10	10	10		3.0	6.0	3.0	3.5		15	15		12.0	2.5		15	15		12.0	1.5	
523	Berryessa BART Rapid	Diridon - Berryessa BART	10	10	10	10	30	3.0	6.0	3.0	3.5	6.0	20	30		15.0	4.5		20	30		13.0	4.5	
25	Story	Valley Fair - Alum Rock	10	10	10	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
28	Tully	Curtner - Eastridge	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
28	Hamilton	Sunnyvale - Curtner	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
31	Evergreen	Eastridge - Evergreen College	30	30	30	60		3.0	6.0	3.0	4.5					12.0	3.5					11.0	3.5	
33	Fair Oaks	Sunnyvale - Fair Oaks	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
35	California	San Antonio - Mountain View	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
40	San Antonio	Foothill College - Mountain View	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
51	Wolfe	Lockheed Martin - Stevens Creek	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
56	Montague	Mountain View - Milpitas	15	15	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
57	Bowers	Saratoga - Alviso	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
59	Monroe	Reamwood - Santa Clara	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
60	Winchester	Campbell - Airport - Milpitas	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
61	Taylor	Campbell - Bascom - Berryessa BART	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
62	Hedding	Hostetter - Berryessa BART - De Anza	30	30	30	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
64	McKee	Alum Rock - Valley Fair	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
66	Oakland	Milpitas H.S. - Branham	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
68	Monterey	Downtown San Jose - Santa Teresa	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
68	Santa Teresa	Santa Teresa - Gilroy	15	30	15	60		3.0	6.0	3.0	4.5		30	60		12.0	3.5		30	60		11.0	3.5	
70	Jackson	Berryessa BART - Eastridge	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
72	McLaughlin	Berryessa BART - Capitol	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
73	Senter	Diridon - Snell	12	15	12	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
77	King	Hostetter - Berryessa BART - Eastridge	15	15	15	15	60	3.0	6.0	3.0	3.5	3.5	15	60		14.5	3.5		15	60		13.5	3.5	
100s	Expresses unchanged except those to/from Fremont, which are deleted																							
202	Warm Springs Night	Downtown San Jose - Warm Springs BART					60					3.0			60			5.0			60			7.0
304	Monterey Limited	S San Jose - Sunnyvale TC	30		40			3.0		3.5														
328	Lawrence Expwy Limited	Almaden Valley - Lockheed Martin	80		70			3.0		2.5														
330	San Tomas Expwy Limited	Almaden Valley - Old Ironsides	25		50			3.0		3.0														
900	Light Rail	Almaden - Ohlone / Chynoweth	15	15	15			3.0	6.0	3.0														
901	Light Rail	Santa Teresa - Alum Rock	15	15	15			3.0	6.0	3.0														
902	Light Rail	Winchester - Old Ironsides	15	15	15			3.0	6.0	3.0														
903	Light Rail	Alum Rock - Mountain View	15	15	15			3.0	6.0	3.0														
904	Light Rail	Santa Teresa - St James	30		30			3.0		3.0														