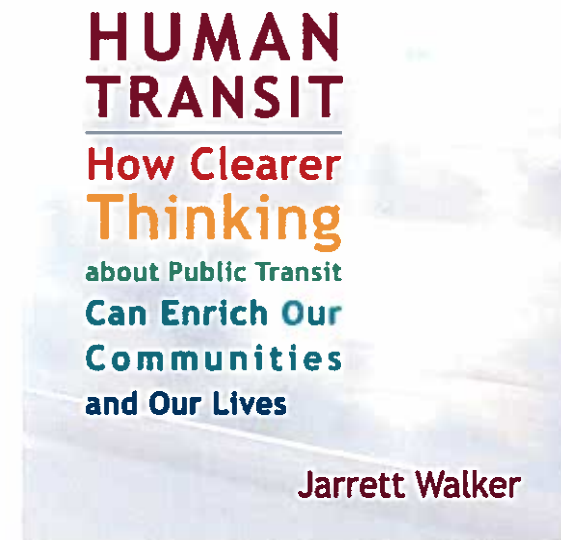


Jarrett Walker, PhD
JarrettWalker.com
HumanTransit.org
Twitter: @humantransit



Executive Workshop: TriMet Board of Directors



JARRETT WALKER + ASSOCIATES

About Jarrett Walker

- Author *Human Transit* and Humantransit.org.
- 25 years experience in transit network design and policy.
- Projects in >50 metro areas in 9 countries.
- Many successful implementations.
- PhD Humanities.



HUMAN TRANSIT

**How Clearer
Thinking**

about Public Transit
Can Enrich Our
Communities
and Our Lives

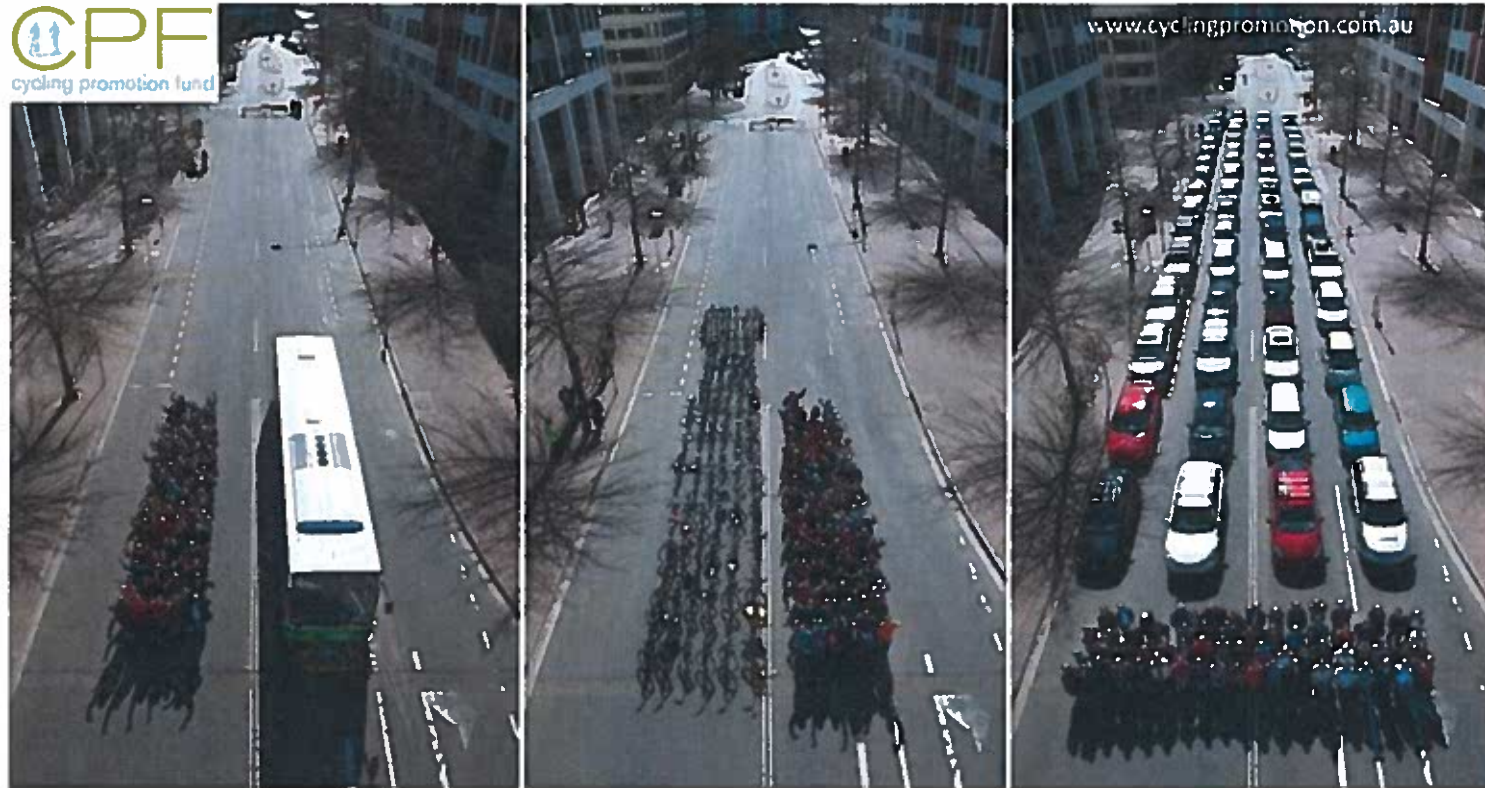
Jarrett Walker

Why fixed transit?



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Ultimately, it's about Space



Fixed transit is existential for cities

- In dense cities, are those wanting to be dense, transit is existential. *The city is impossible without it.*
- So be careful when anyone tells you that new ideas or technologies are “disrupting” fixed route transit.

No technology will change geometry.

- Energy and Emissions are technology problems.
- But space is a geometry problem.
- Technology never changes geometry.



Bus



Private Car



Uber/Lyft Car

Flexible routing = Inefficiency

Sample service	Passenger trips/vehicle hour
Subways in major cities	>200
MAX Blue	139
14-Hawthorne	40
Infrequent outer suburban/rural circulator	10
General Public Dial-a-Ride	0-3
Paratransit (senior-disabled)	0-2
Uber/Lyft/Taxi	1-3

Supremely effective demand-response can't get near half the productivity of a very ineffective fixed route!

Flexible routing = Inefficiency

Sample service	Passenger trips/vehicle hour	
Subways in major cities	>200	<p>How can demand-response service bridge this big gap?</p> <ol style="list-style-type: none">1. Pay driver (much) less.2. Higher fares.
MAX Blue	139	
14-Hawthorne	40	
Infrequent outer suburban/rural circulator	10	
General Public Dial-a-Ride	0-3	
Paratransit (senior-disabled)	0-2	<p>So replacing fixed route with demand response means:</p> <ul style="list-style-type: none">→ Deepening class divides.→ Higher congestion, emissions, need for road space.
Uber/Lyft/Taxi	1-3	

Roles for demand response

- Service for higher-paying travelers.
 - Logical private sector role.
- *Maybe* transit roles for semi-fixed services doing suburban feeders, but case for subsidy is weak.
 - Still not nearly as productive as a fixed route.

BUT

- Policy needs to capture impacts of these services.
- Probably no reason for TriMet to get into such an inefficient business.

Driverless Cars → Driverless Buses

- Driverless rapid transit already exists.
- Driverless buses are happening (China, Mercedes)
- Labor cost is the biggest limit on transit quantity.
- The driverless bus could make bus service much more abundant.



Source: PoYang, under CC license.



Source: Daimler AG

Will it be different when we have driverless cars?

- The geometry hasn't changed. The efficient use of urban space will still require an attractive, fixed route, big-vehicle system.



Cars with Drivers



Driverless Cars
(partial uptake)



High-Ridership Bus
(Driverless?)

Driverless Cars → Driverless Buses

- Driverless rapid transit already exists.
- Driverless buses are happening (China, Mercedes)
- Labor cost is the biggest limit on transit quantity.
- The driverless bus could make bus service much more abundant.



Source: PoYang, under CC license.



Source: Daimler AG

What is High-Ridership Transit?

To expand ridership, expand freedom (access).

The Wall Around Your Life

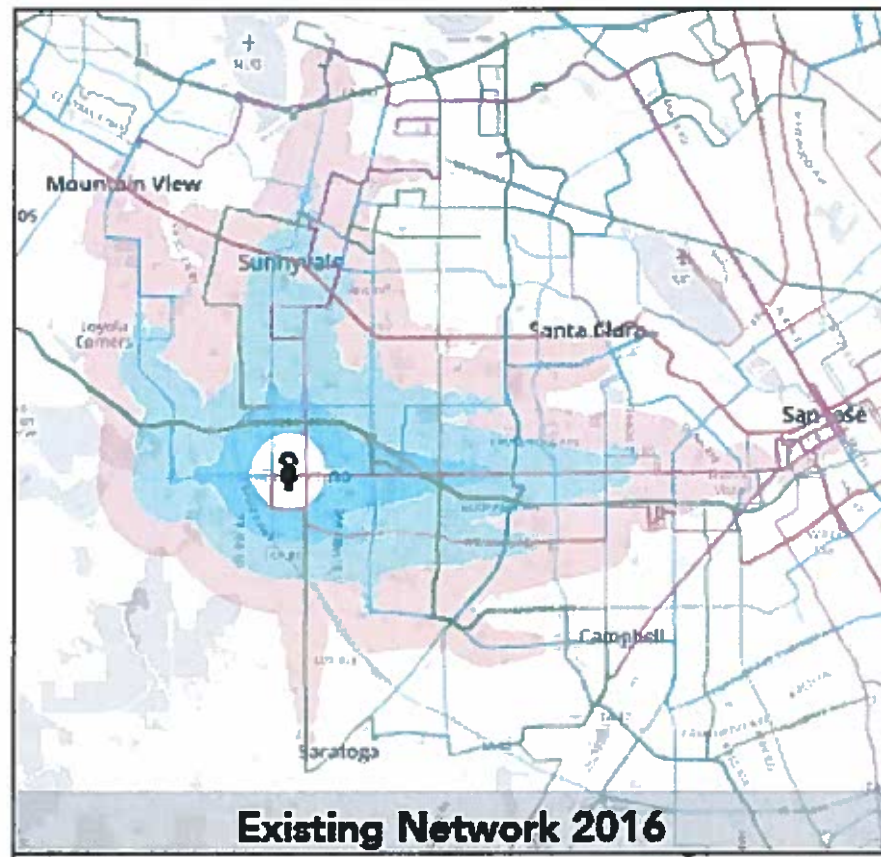


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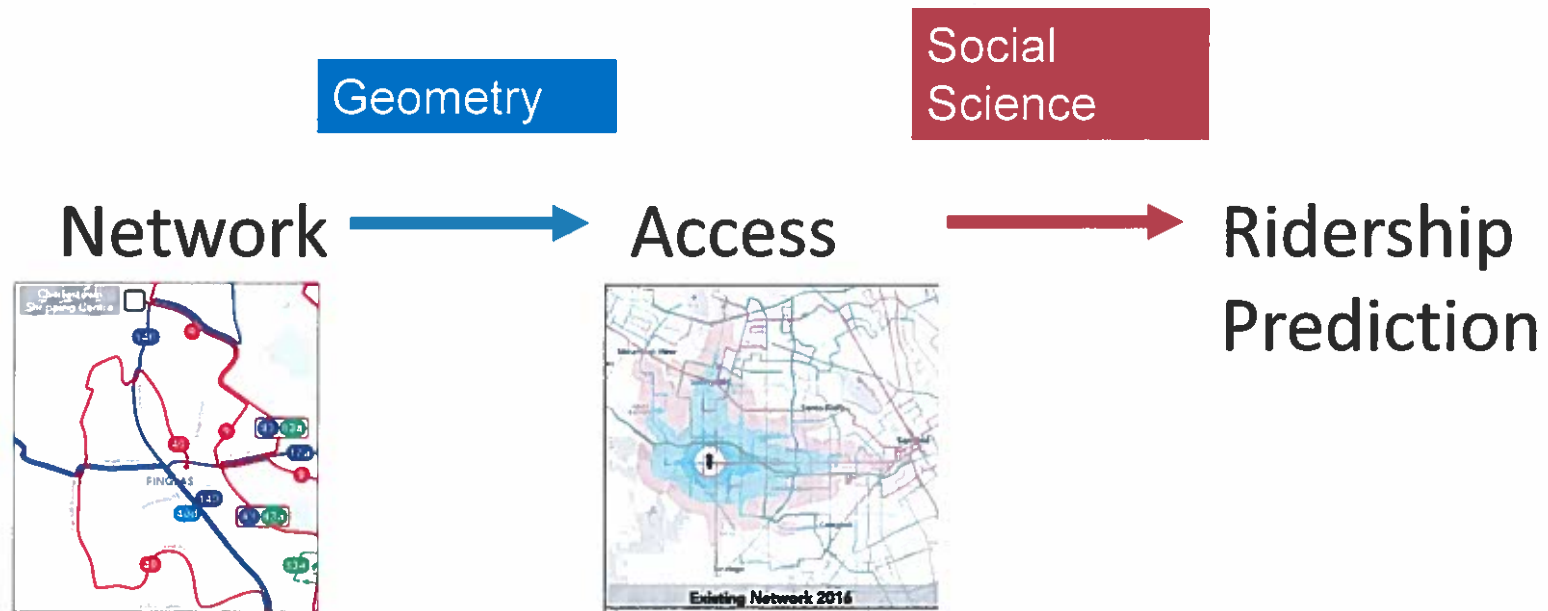
Isochrones as maps of your freedom.

How far can Jane travel in or minutes?

Where
can I be,
now?

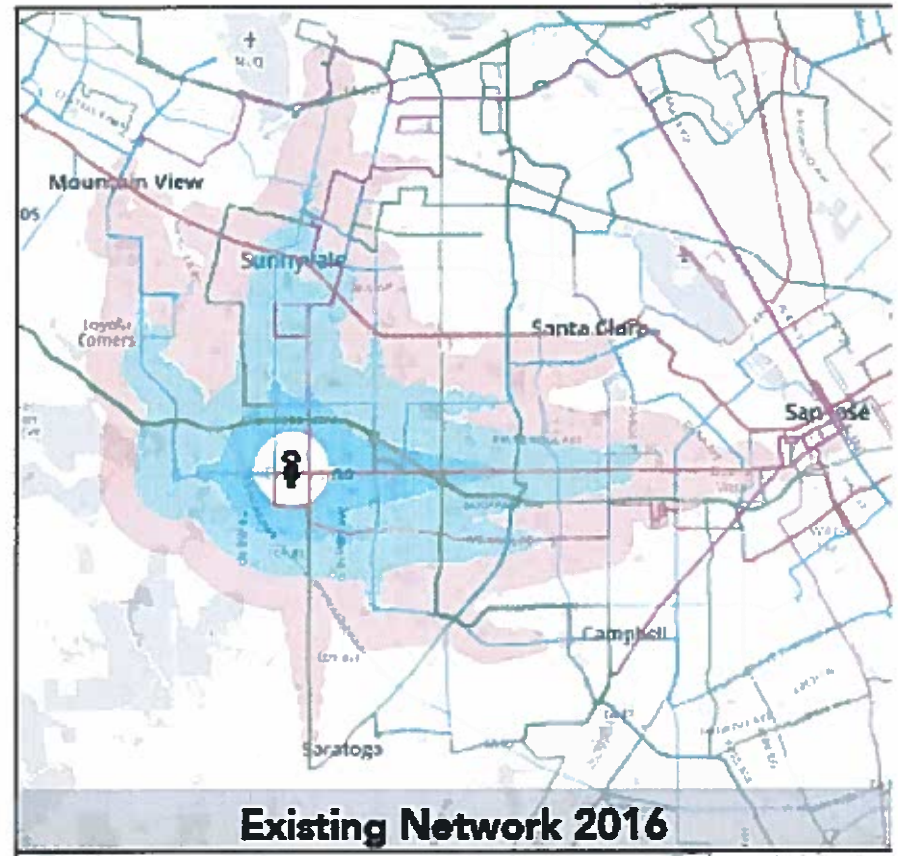


Freedom is a geometric fact.



What Maximizes Access?

- High Frequency Lines
- Forming a Connected Network
- Reasonably fast and reliable
- Focused on Transit Friendly Places
 - Dense
 - Walkable
 - Linear
 - Proximate



A “map” of the territory we’ll explore.

Abundant Access Handout



JARRETT WALKER + ASSOCIATES

Handout

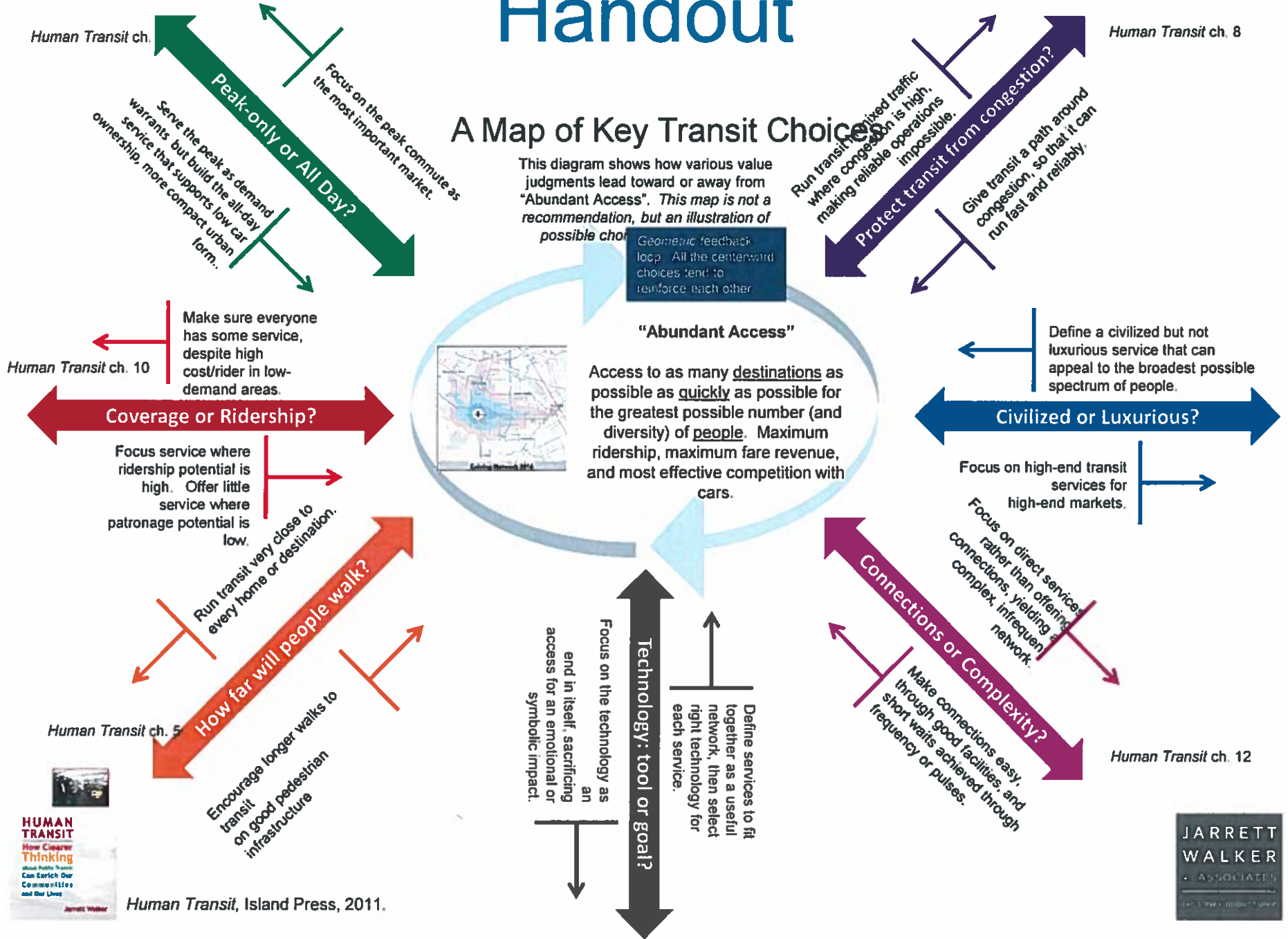
A Map of Key Transit Choices

This diagram shows how various value judgments lead toward or away from "Abundant Access". This map is not a recommendation, but an illustration of possible choices.

Geometric feedback loop: All the centerward choices tend to reinforce each other.

"Abundant Access"

Access to as many destinations as possible as quickly as possible for the greatest possible number (and diversity) of people. Maximum ridership, maximum fare revenue, and most effective competition with cars.



Human Transit, Island Press, 2011.



“Frequency is freedom!”

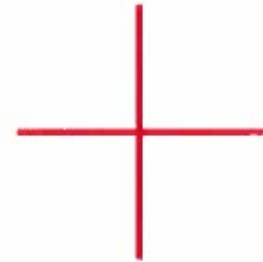
Frequency



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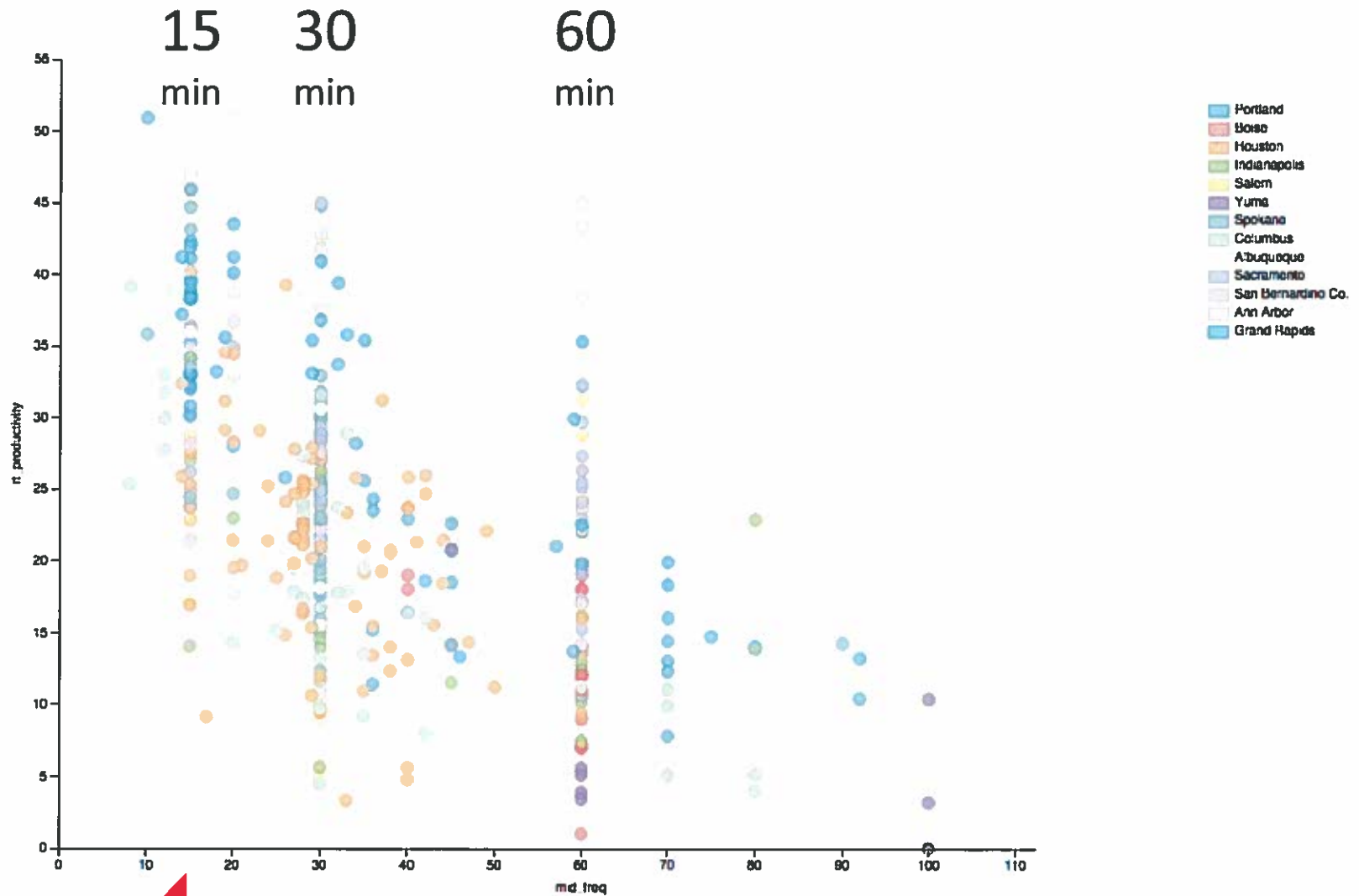
Frequency comes first

- High frequency means public transport is coming soon. This has three independent benefits:
 - **Reduced Waiting**
 - **Easier Connections**
 - **Reduced Impact of Disruptions**
- Lines with higher frequency tend to have not just higher patronage, but higher patronage per unit of service.



HIGH FREQUENCY → HIGH PRODUCTIVITY

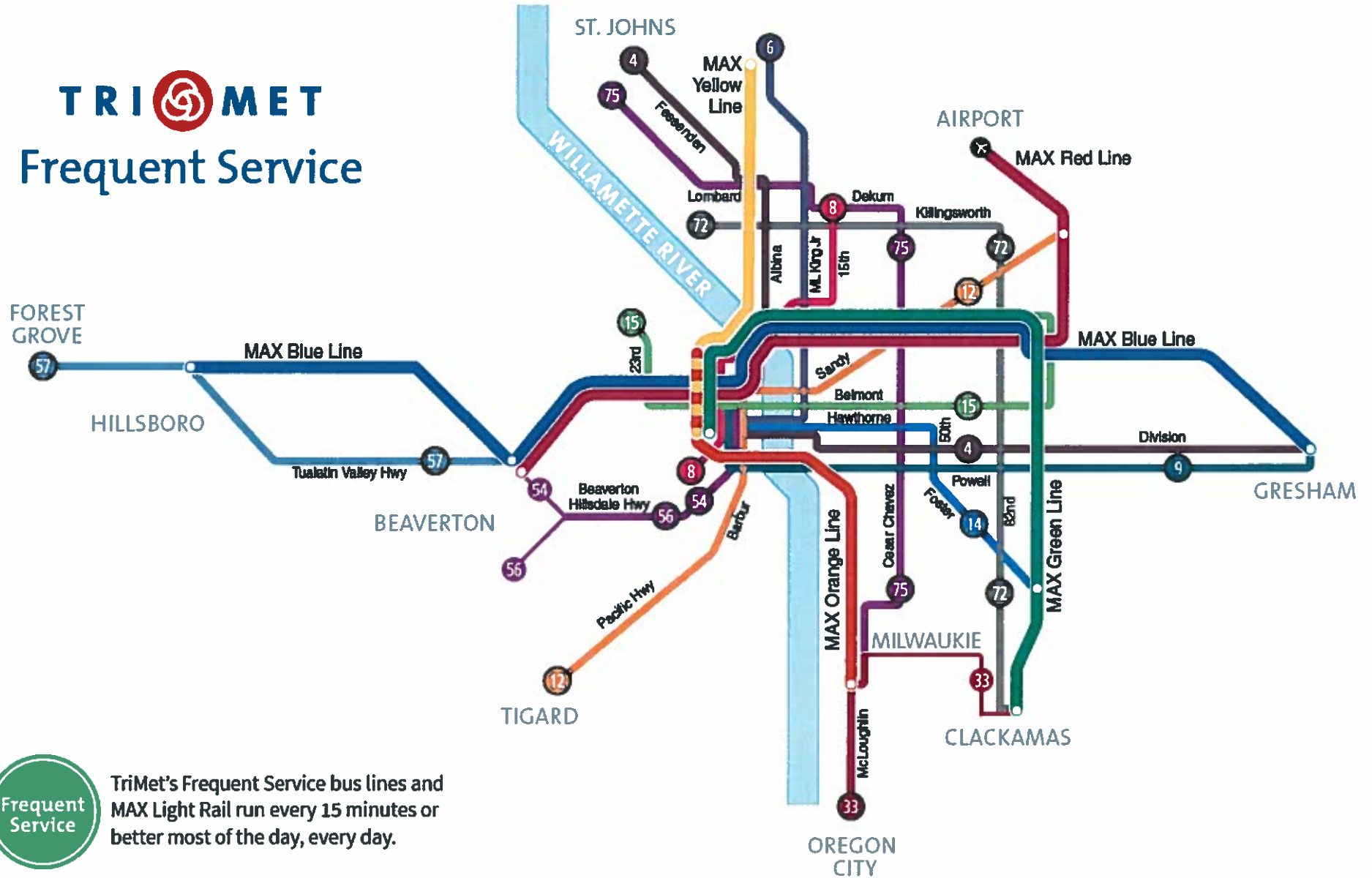
Higher Productivity (Boardings/Hour)



Higher Frequency

Frequent Network Brands

TRIMET
Frequent Service

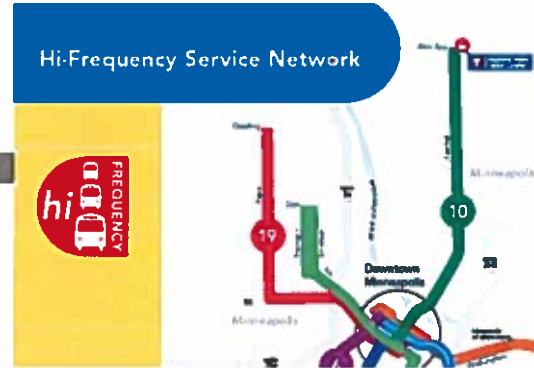


TriMet's Frequent Service bus lines and MAX Light Rail run every 15 minutes or better most of the day, every day.

Frequent Network Brands

- “Turn up and go.”
- A network for people in a hurry.
- Frequency is Freedom

Minneapolis



Montreal



Bellingham



Los Angeles

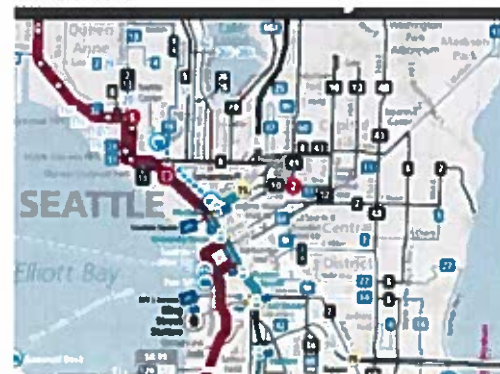
Every 15 Minutes (or Less)



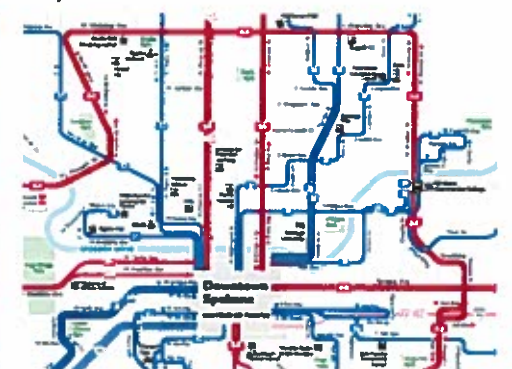
Vancouver BC



Seattle



Spokane



Brisbane



Frequency → Affordability

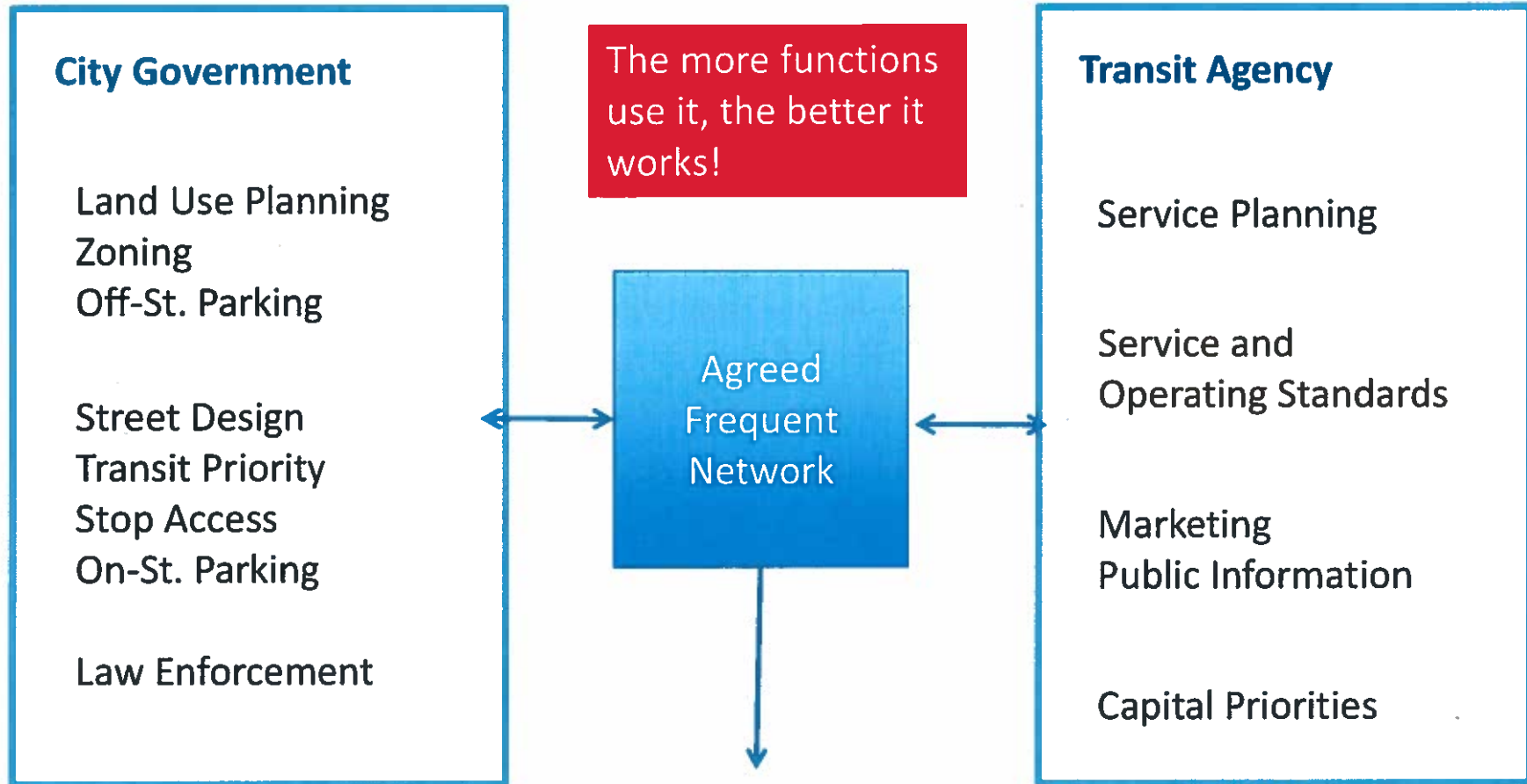
- *Useful enough to be liberating, and*
- *Abundant enough that it can't drive up housing prices everywhere.*
- *Helps build apartments with less parking → affordability*



Bus perceptions vs freq. network

Perceptions about “bus”	Frequent Networks
Confusing	Simple because of frequency.
“Easy to change”	Tends toward permanence.
Noisy, smelly, unpleasant.	Buses can be electric and can be as nice as we want them to be.
Irrelevant to Land use	Affects location choices and can drive land use modestly, <u>and</u> supports affordability.
“for disadvantaged people”	Discretionary ridership happens on useful service.
Unrelated to rail	Builds markets to the point where rail makes sense.

Frequent Network as Co-ordinator



Signals to Private Sector (e.g. Real Estate)

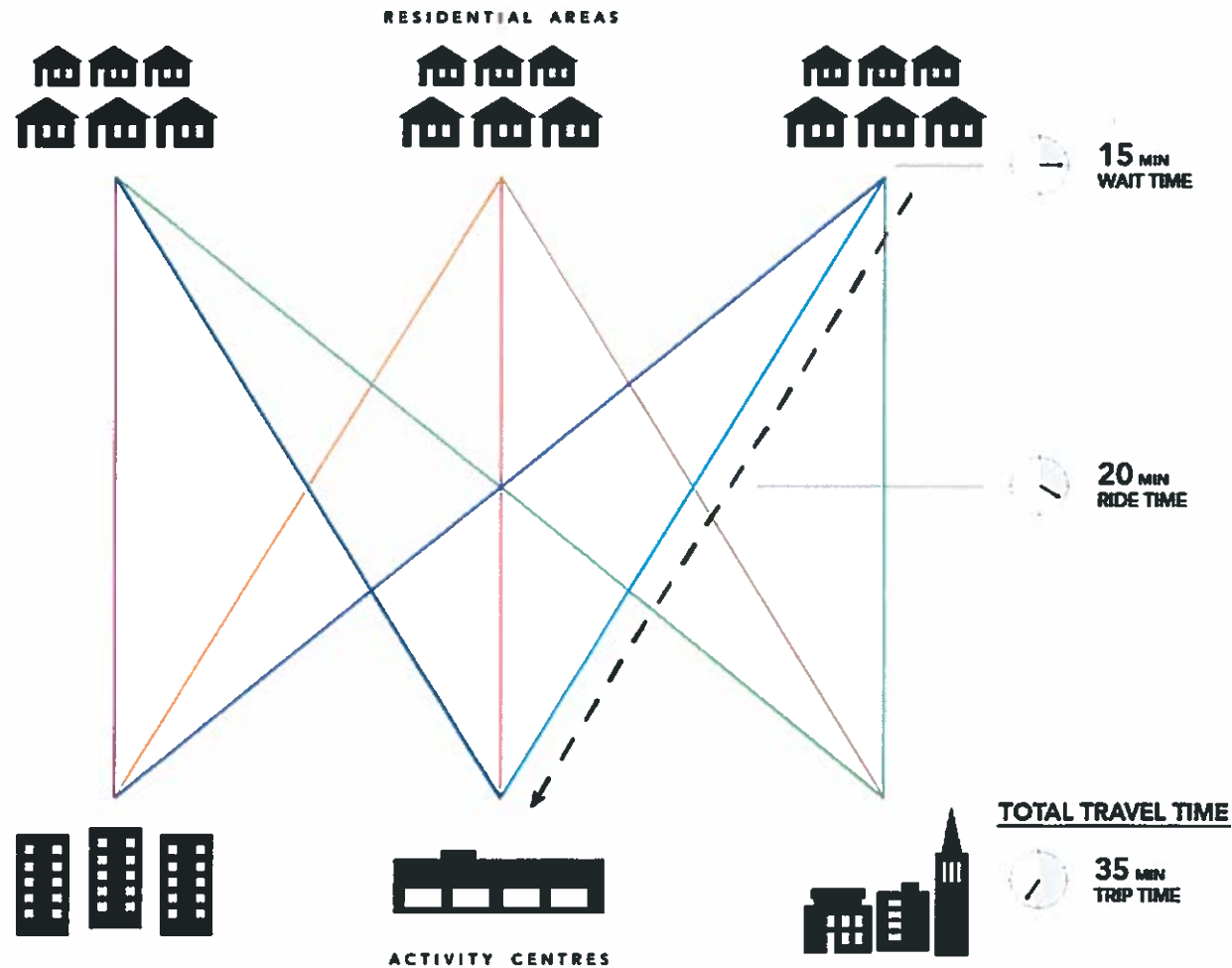
To grow freedom, make connections easy.

Connections

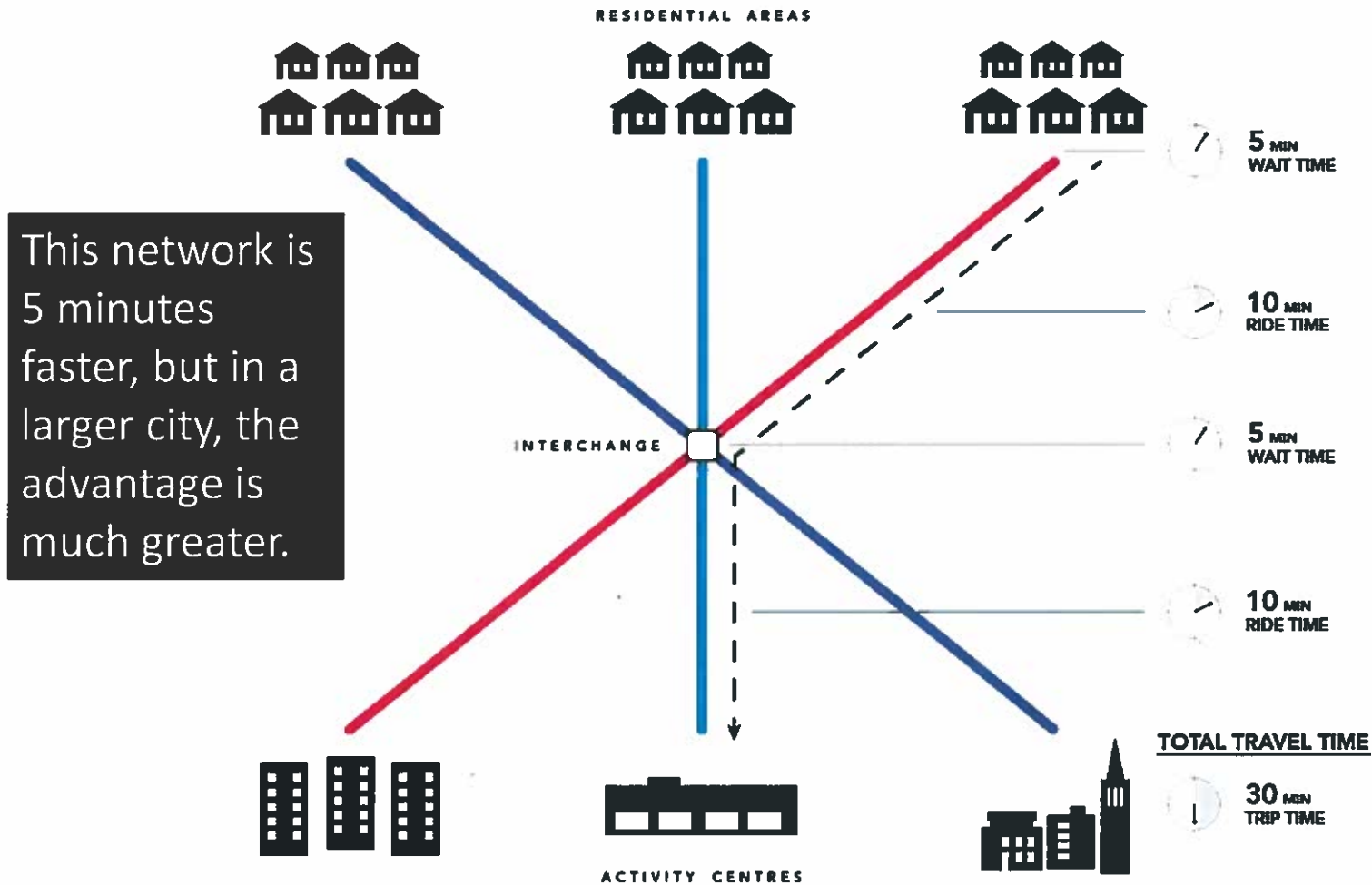


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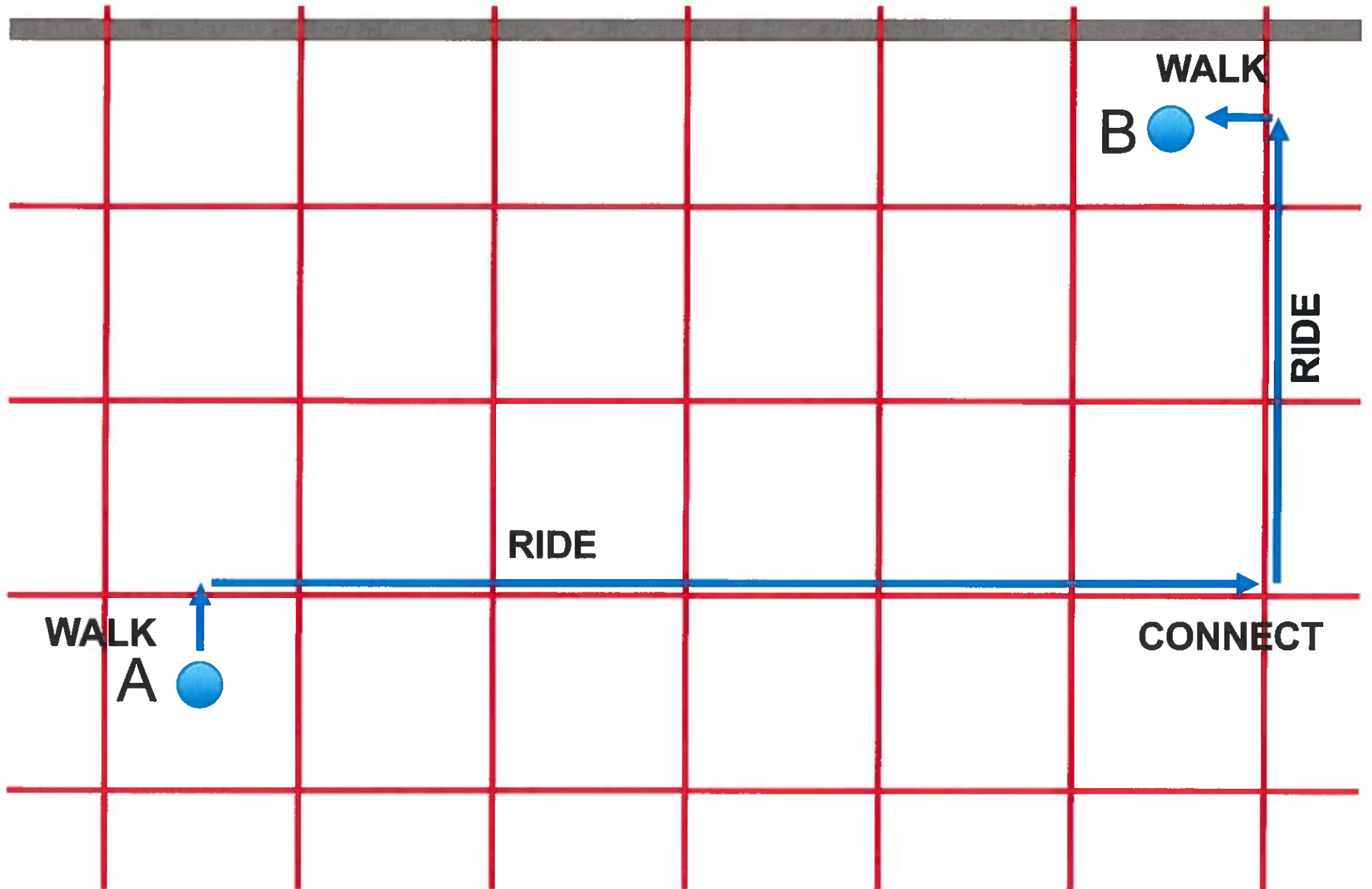
In a direct network, nobody needs to connect, but waits are long.



In a connected network, many passengers need to connect, but waits are short.



The Genius of the Frequent Grid



Put liberating service where it will liberate the most people.

Where can transit succeed?



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Density

How many people are near transit?

The more people are going to and from the area around each stop, the more people will ride transit.

High
Ridership



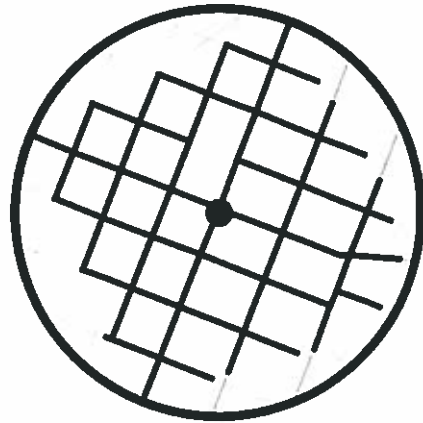
Lower
Ridership



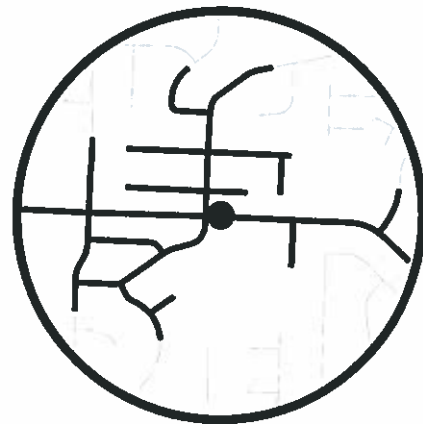
Walkability

Can the people around the stop walk to the stop?

High
Ridership



Lower
Ridership



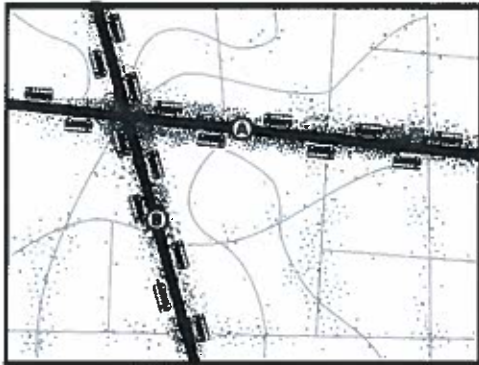
The Ridership-Coverage Tradeoff

But is Ridership What You Want?

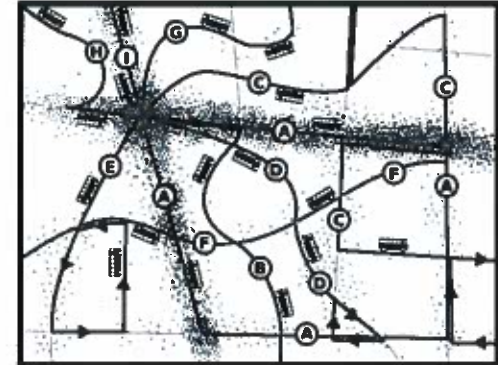


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So it helps to choose a point on the spectrum ...



Ridership Goal



Coverage Goal



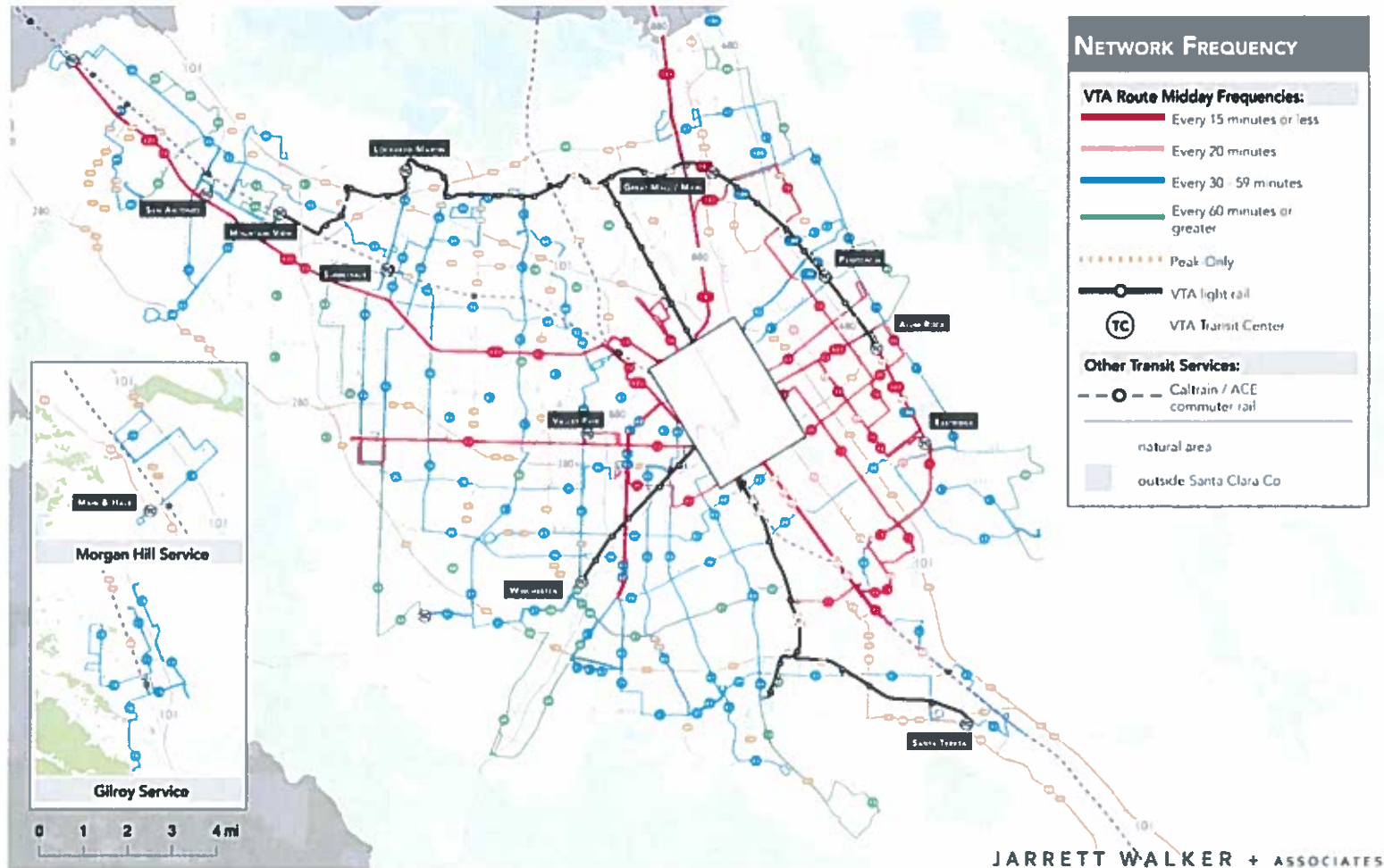
Linear Presentation ends here.
Remaining slides are used as
needed, but conversation explores
the abundant access diagram.

Case Study of a Ridership- Coverage Conversation: VTA

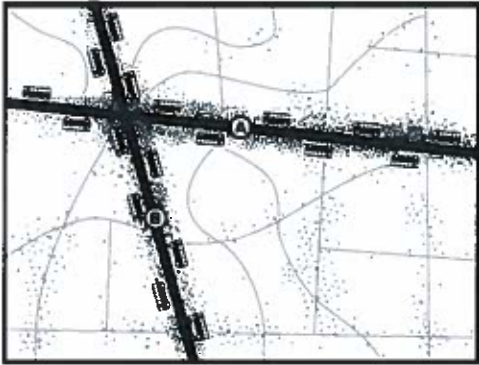


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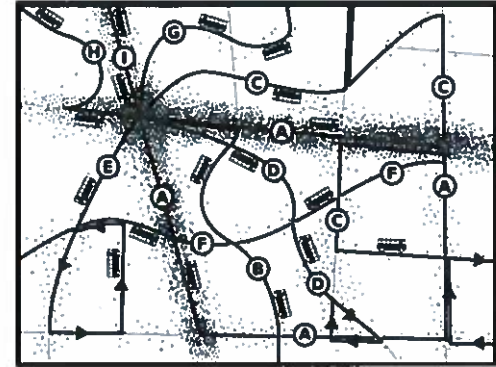
Current All-day Frequency



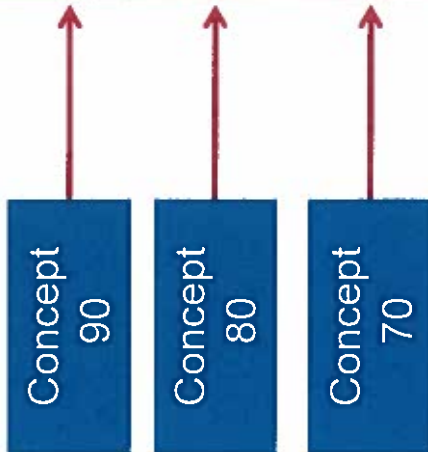
So it helps to choose a point on the spectrum ...



Ridership Goal



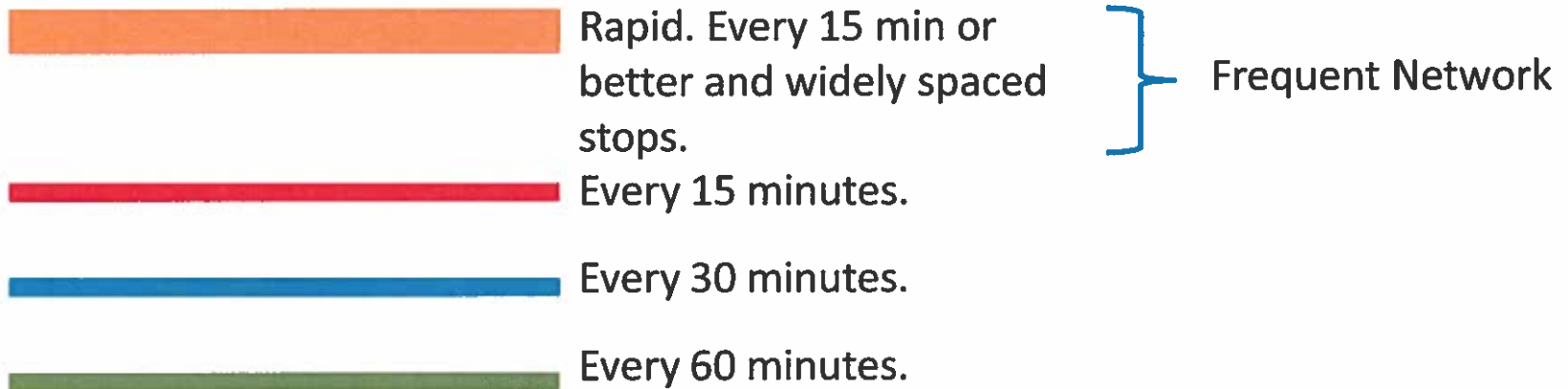
Coverage Goal



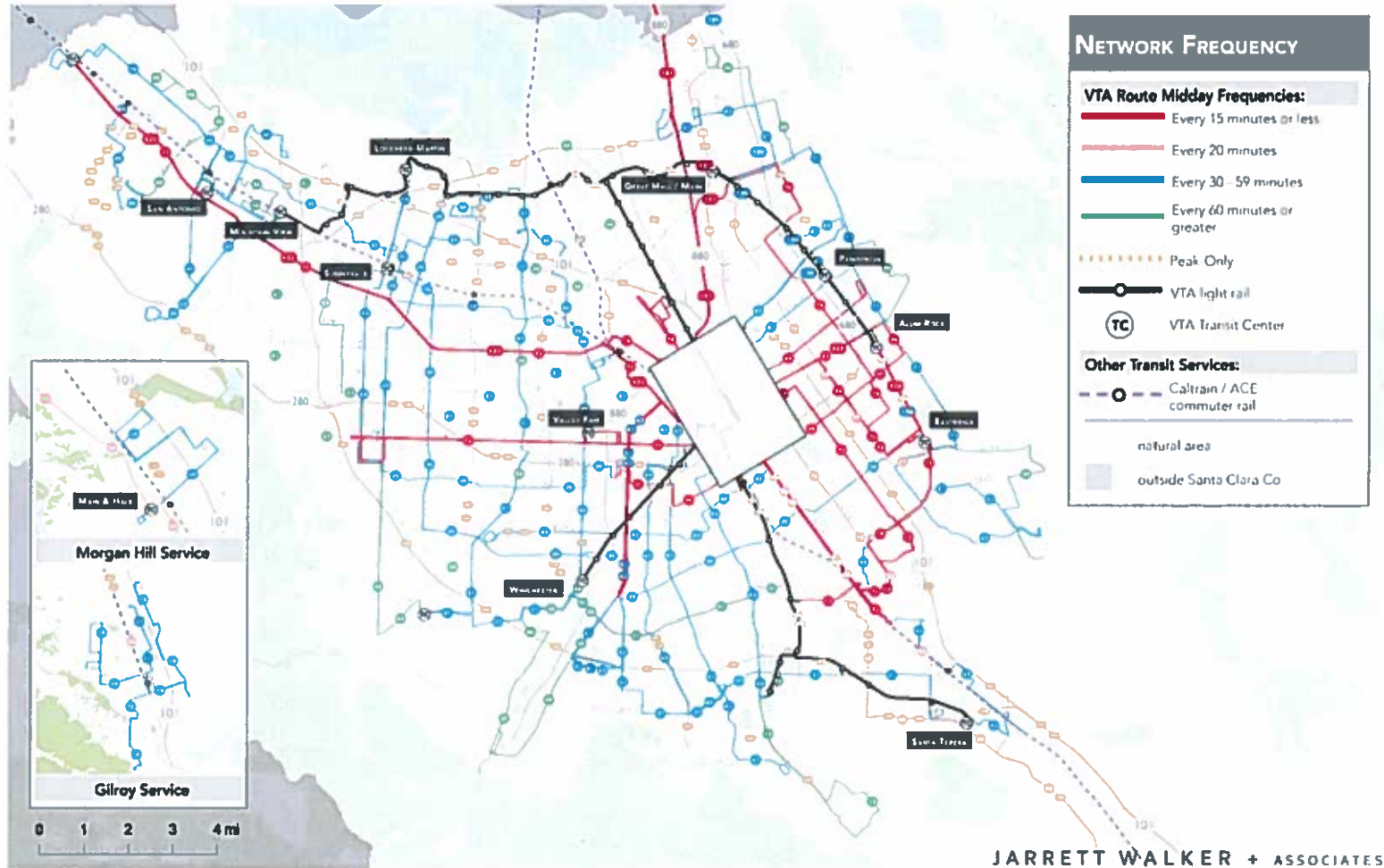
How much should VTA focus on ridership? 70%? 80% 90%?

Please Learn 4 Colors

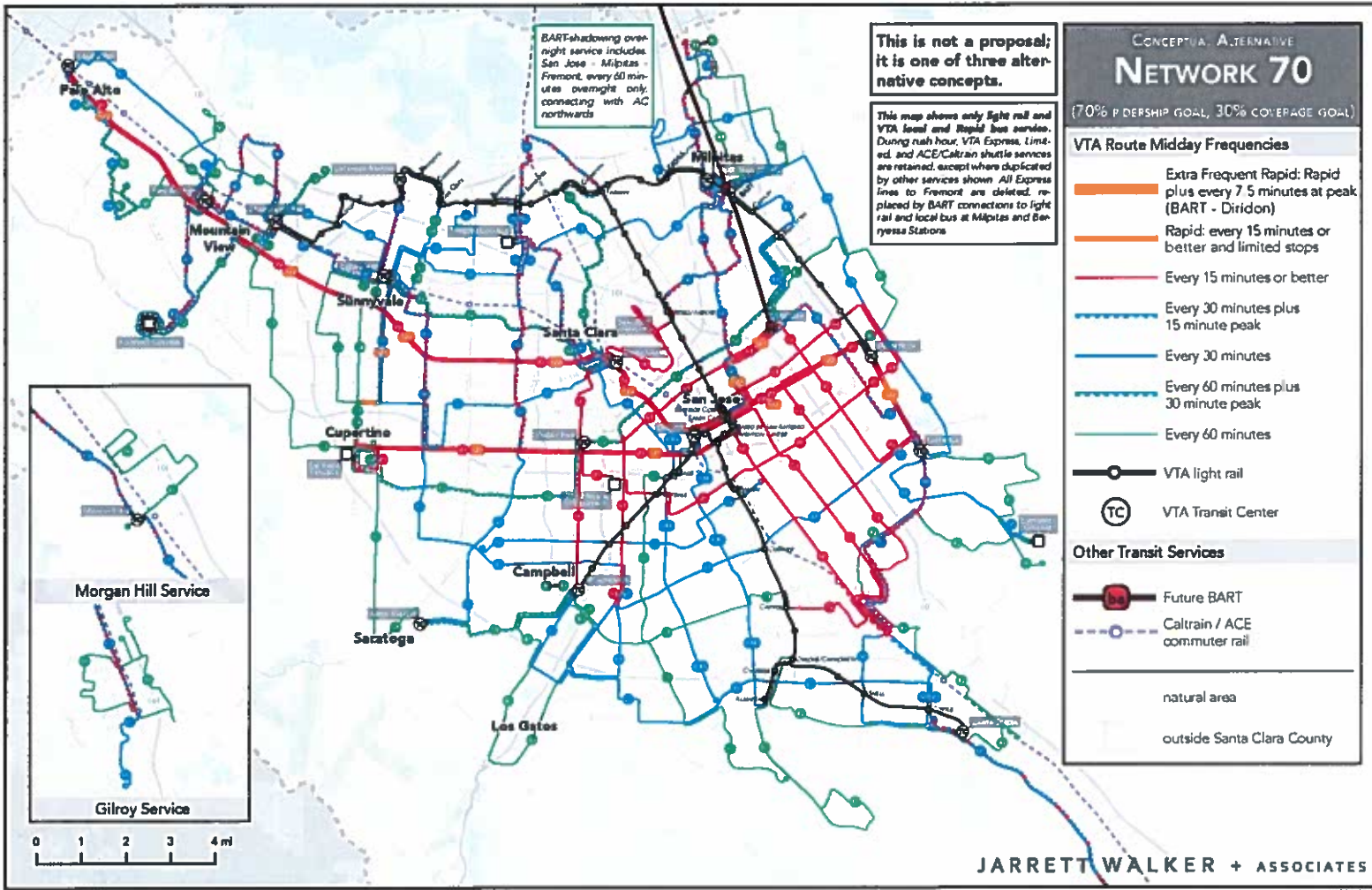
These will be used consistently throughout the project.



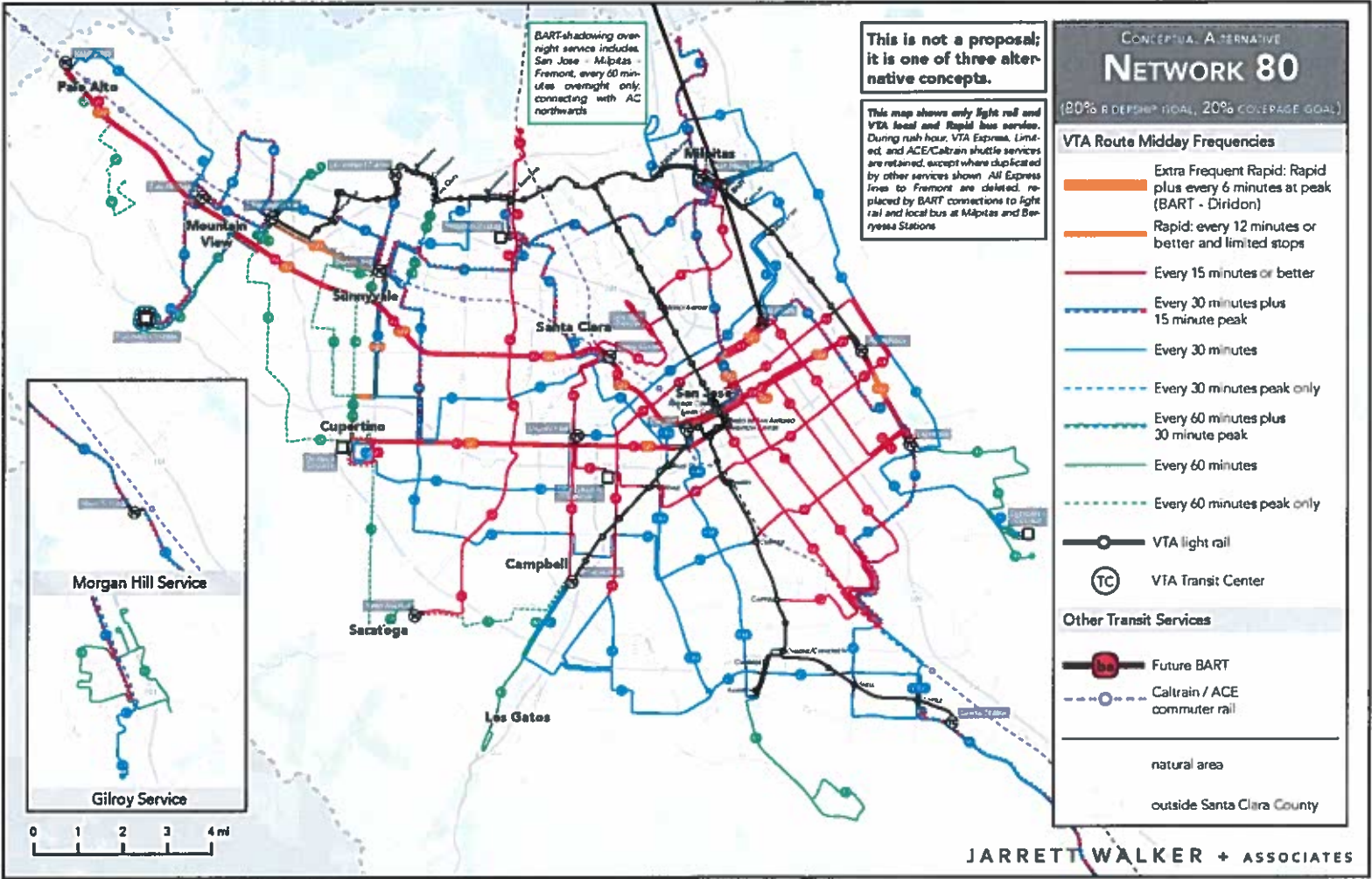
Current All-day Frequency



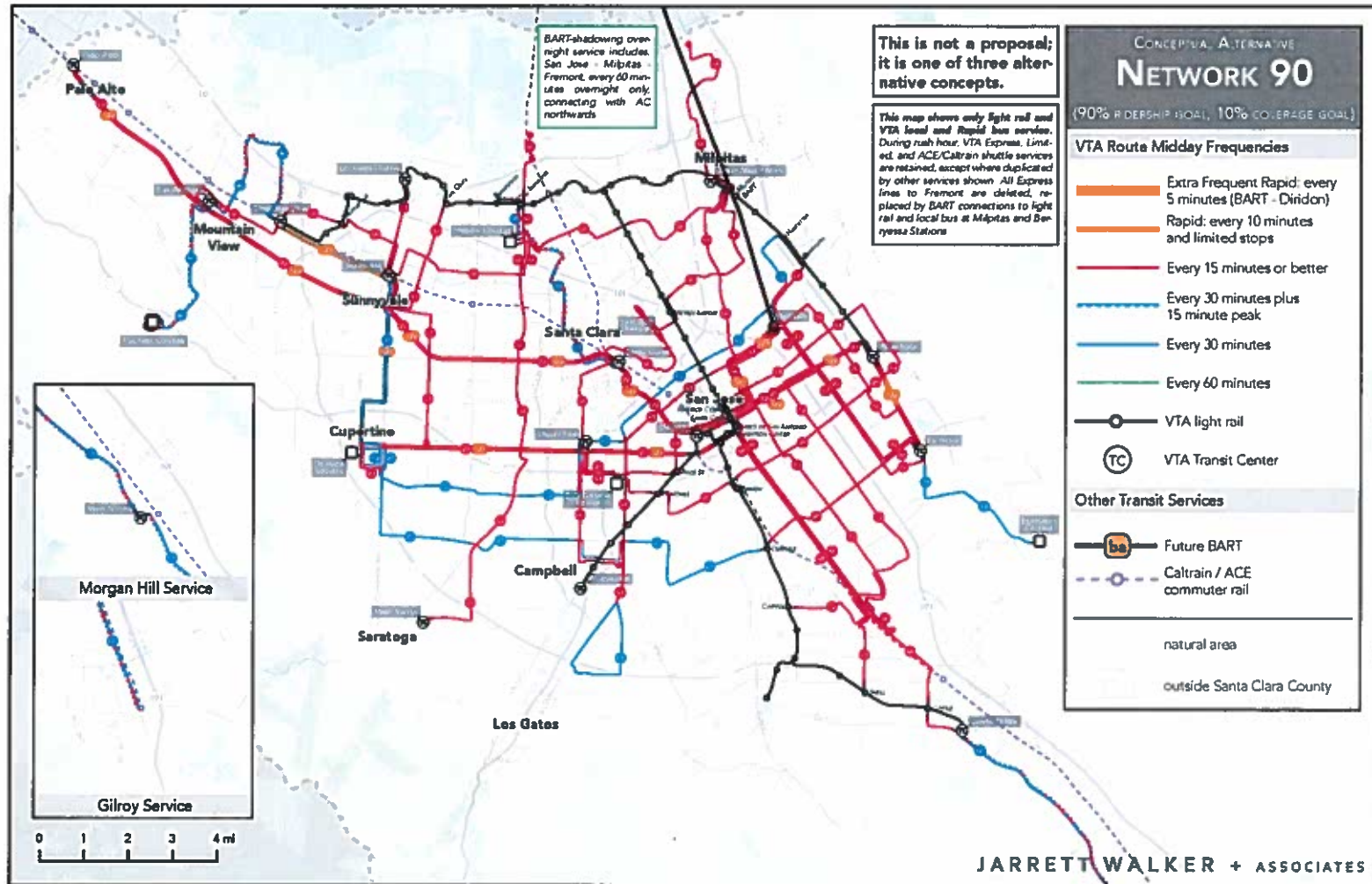
Concept 70 (70% Ridership, 30% Coverage)



Concept 80 (80% Ridership, 20% Coverage)



Concept 90 (90% Ridership, 10% Coverage)



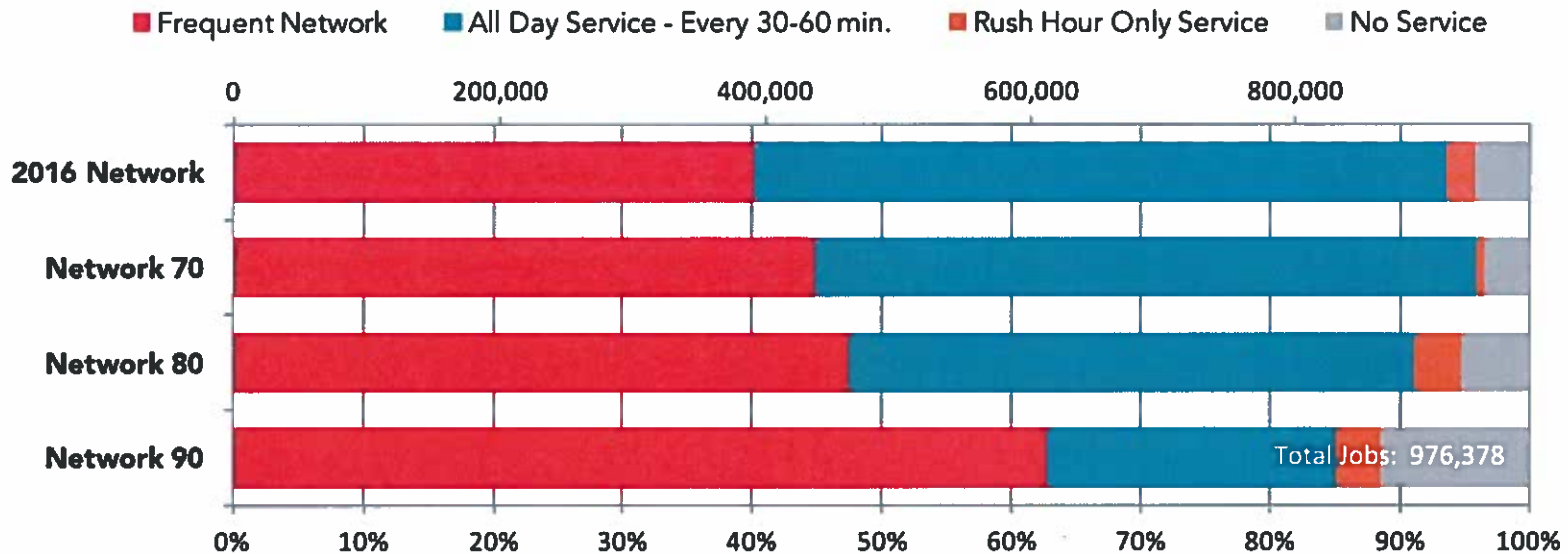
Access to jobs ...

As you move toward a higher ridership network ...

- People and jobs near frequent transit go up ...
- People and jobs near any transit go down.

Jobs Accessible by Transit Services

2016 Network vs. Conceptual Networks 70, 80, 90
(within 1/2 mile of a VTA, Caltrain, or ACE stop in Santa Clara County)



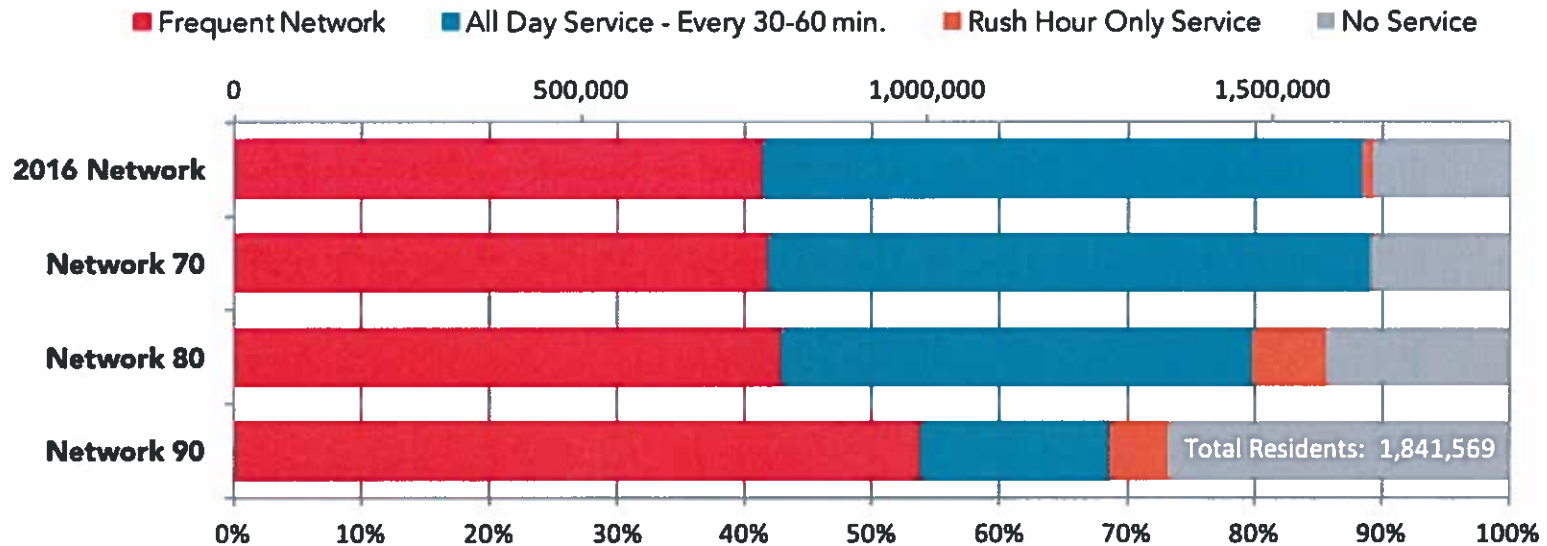
Access by residents ...

As you move toward a higher ridership network ...

- People and jobs near frequent transit go up ...
- People and jobs near any transit go down.

Residents with Access to Transit Services

2016 Network vs. Conceptual Networks 70, 80, 90
(within 1/2 mile of a VTA, Caltrain, or ACE stop in Santa Clara County)

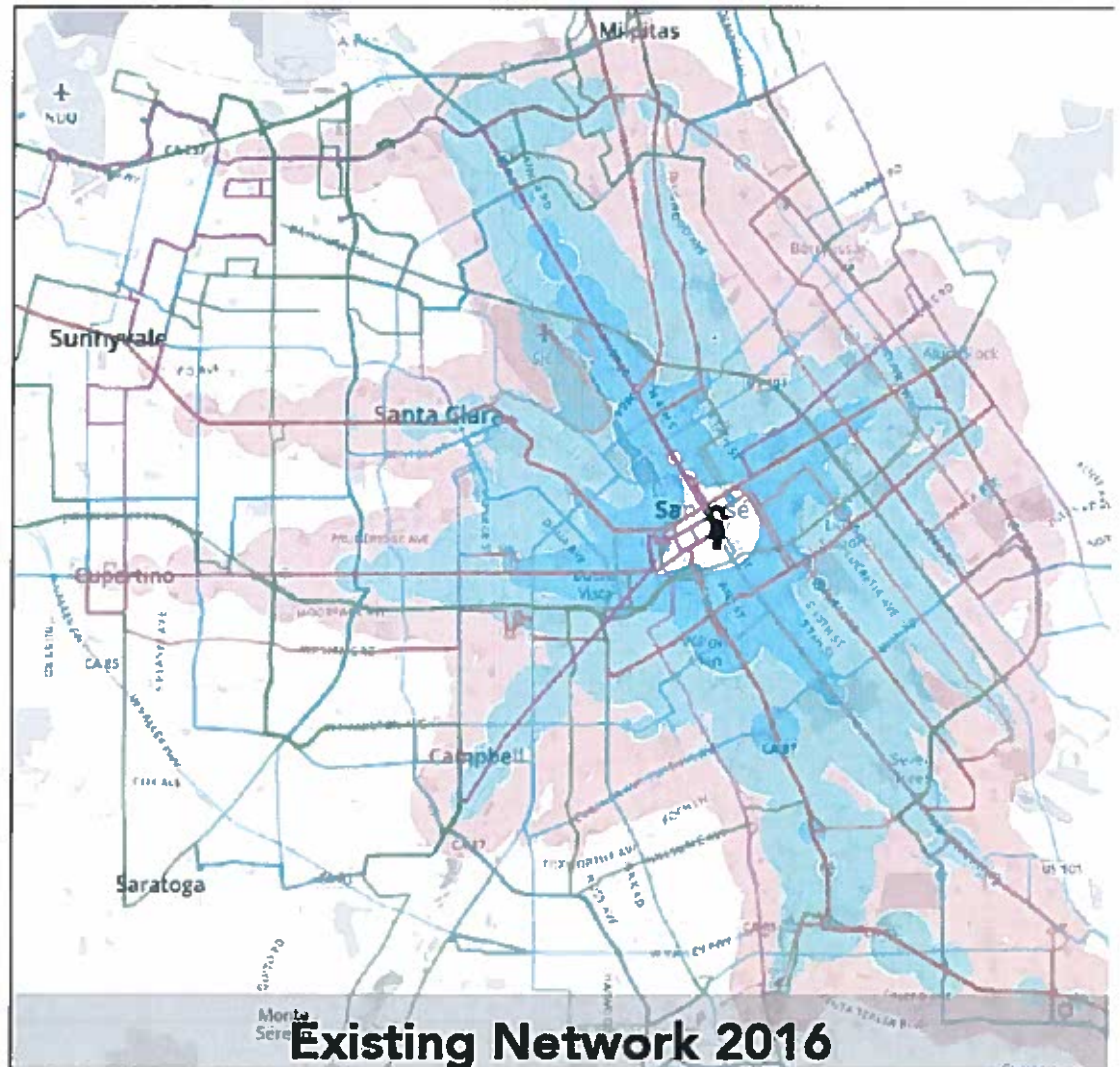


Visualizing Access

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

Downtown San
Jose
12 noon

**Existing
Network**



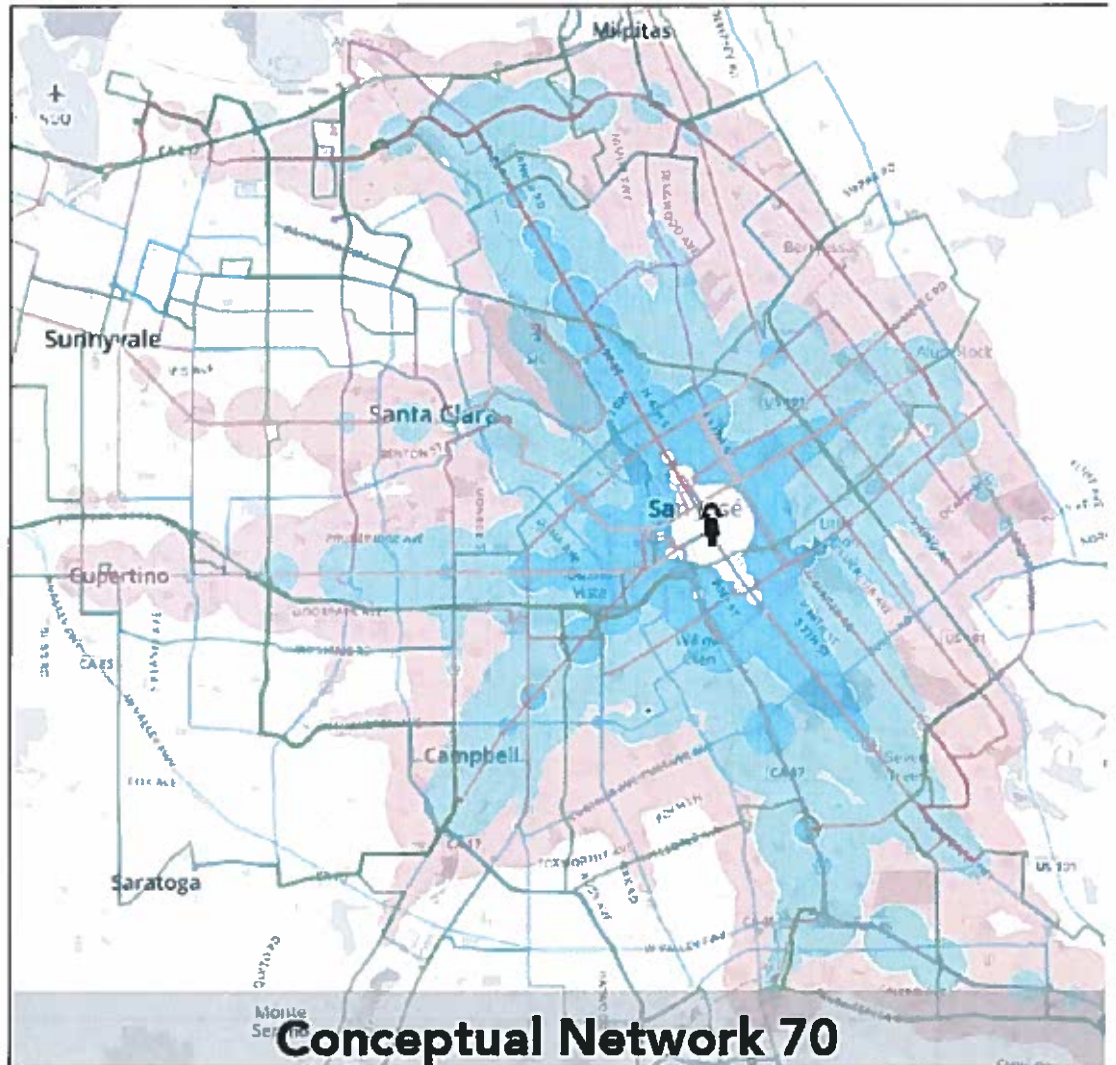
Visualizing Access

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

Downtown San
Jose
12 noon

Concept 70

(70% ridership)



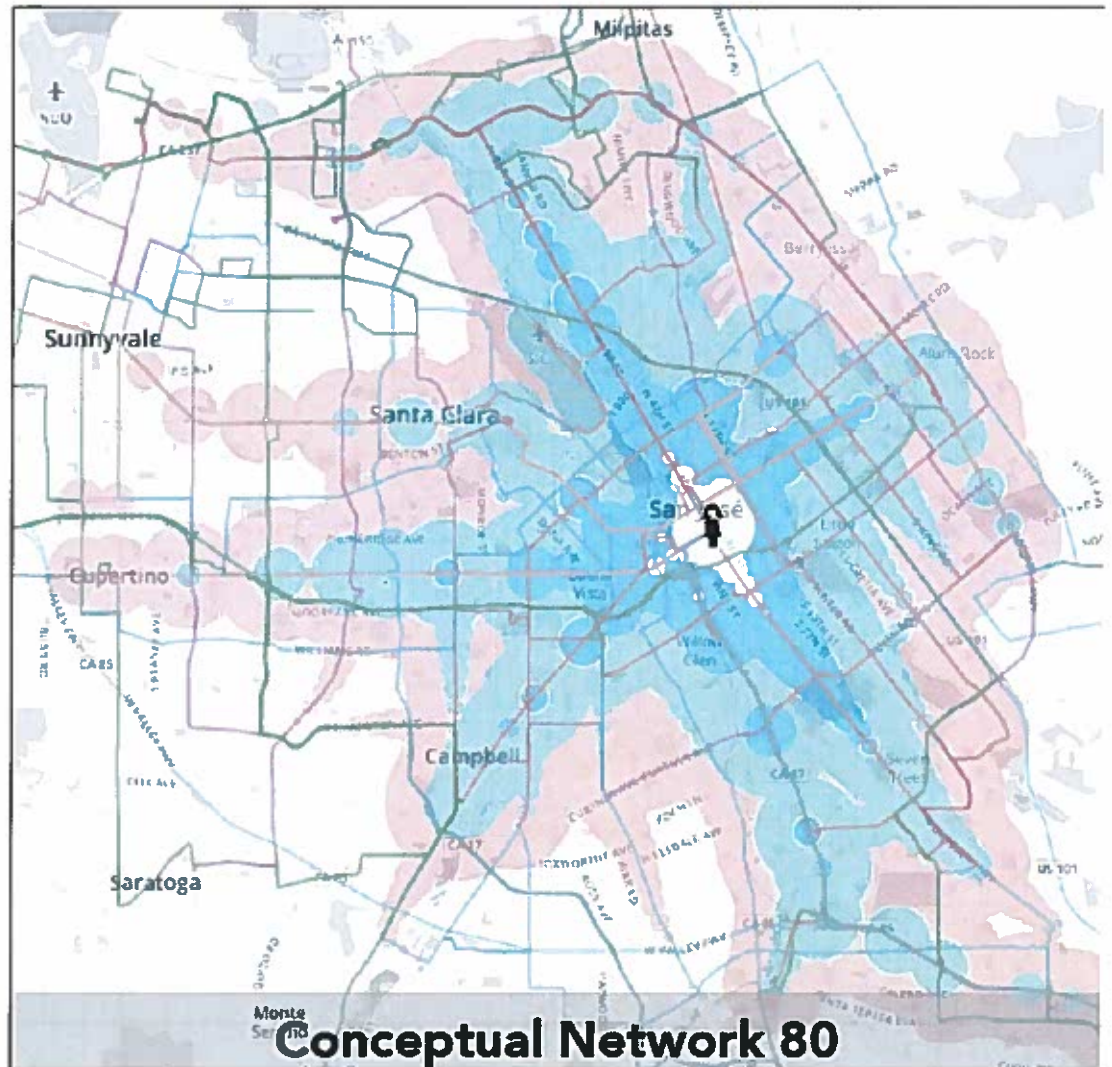
Visualizing Access

How far can Jane travel in or minutes?

Downtown San
Jose
12 noon

Concept 80

(80% ridership)



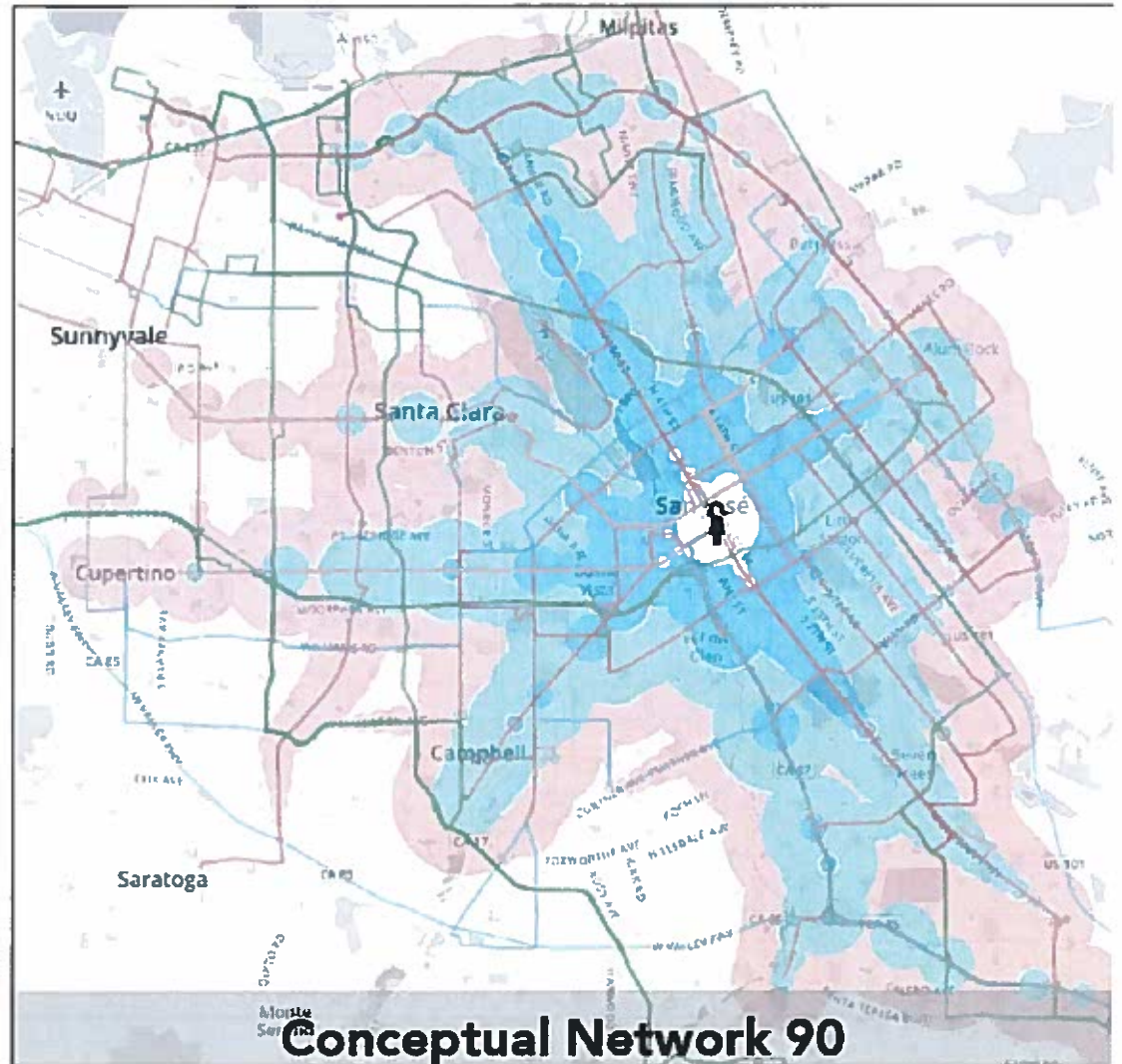
Visualizing Access

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

Downtown San
Jose
12 noon

Concept 90

(90% ridership)



So How Many People Is That?

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

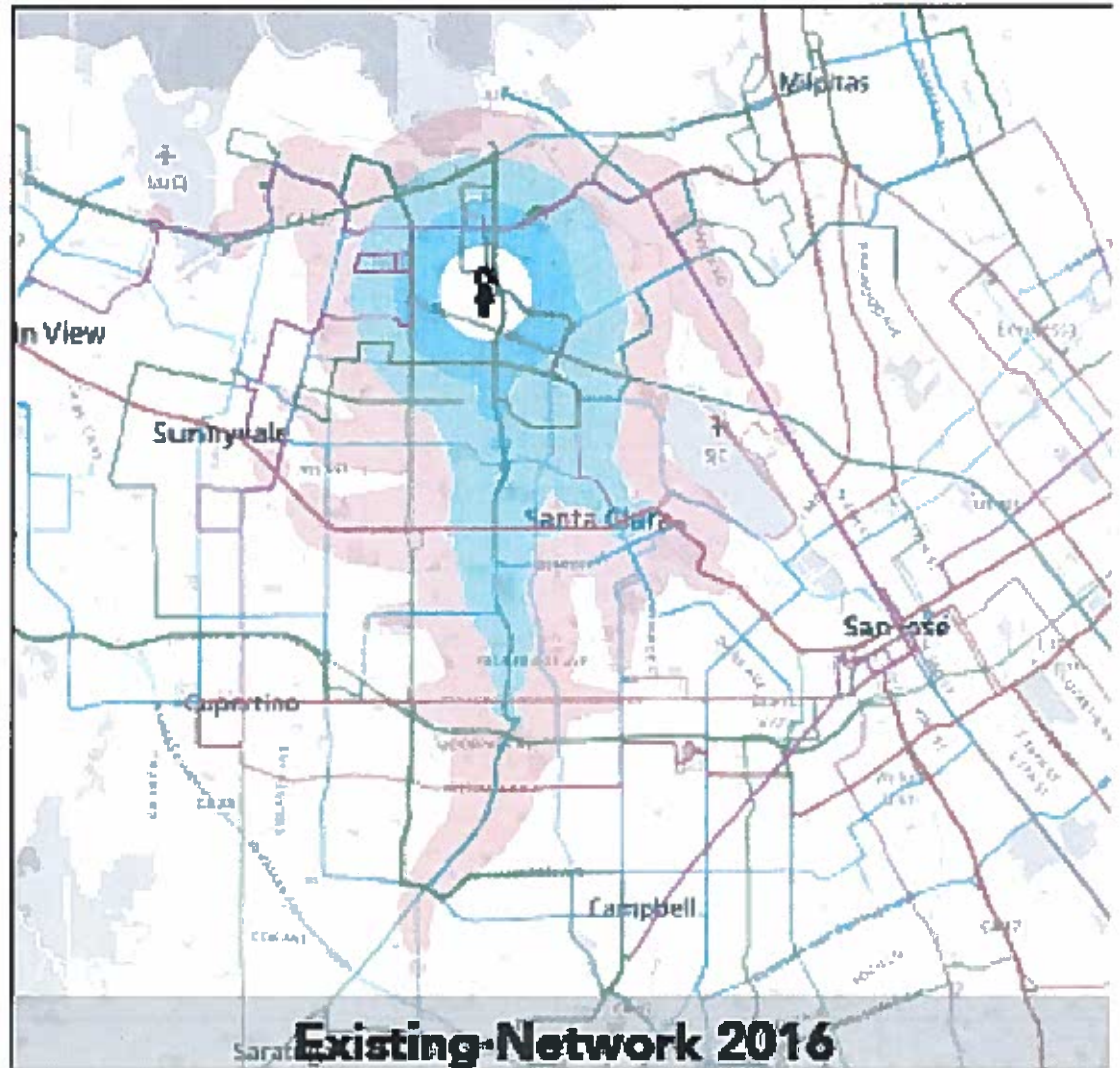
Jobs Accessible by Transit			
<i>Starting from San Carlos St - S 1st St and traveling for...</i>			
	30 min	45 min	60 min
2016 Network	118,400	296,300	444,700
<i>Increase from 2016 Network</i>			
Network 70	4%	5%	5%
Network 80	8%	11%	7%
Network 90	8%	11%	8%

Visualizing Access

How far can Jane travel in or minutes?

Mission College
12 noon

**Existing
Network**



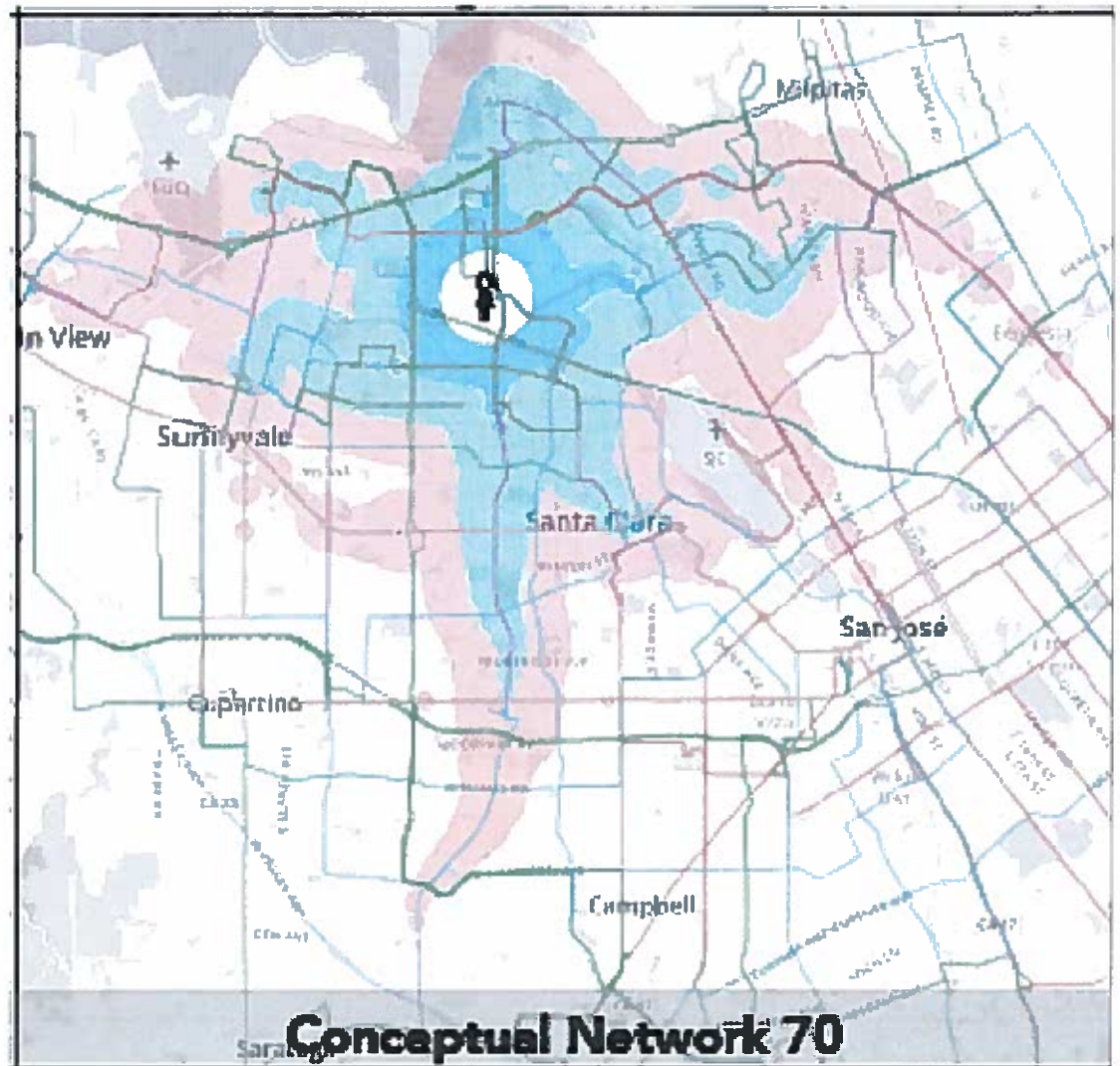
Visualizing Access

How far can Jane travel in or minutes?

Mission College
12 noon

Concept 70

(70% ridership)



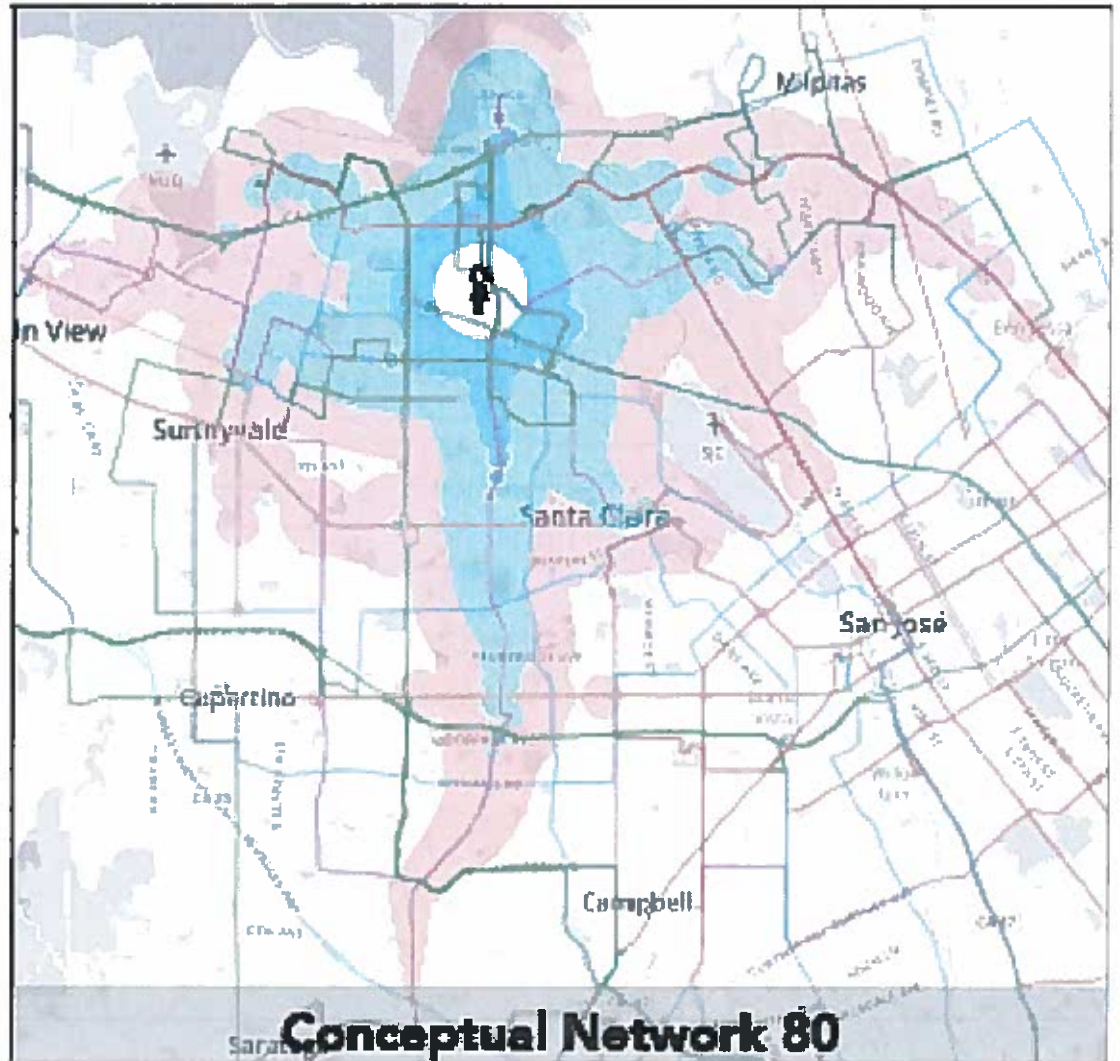
Visualizing Access

How far can Jane travel in or minutes?

Mission College
12 noon

Concept 80

(80% ridership)



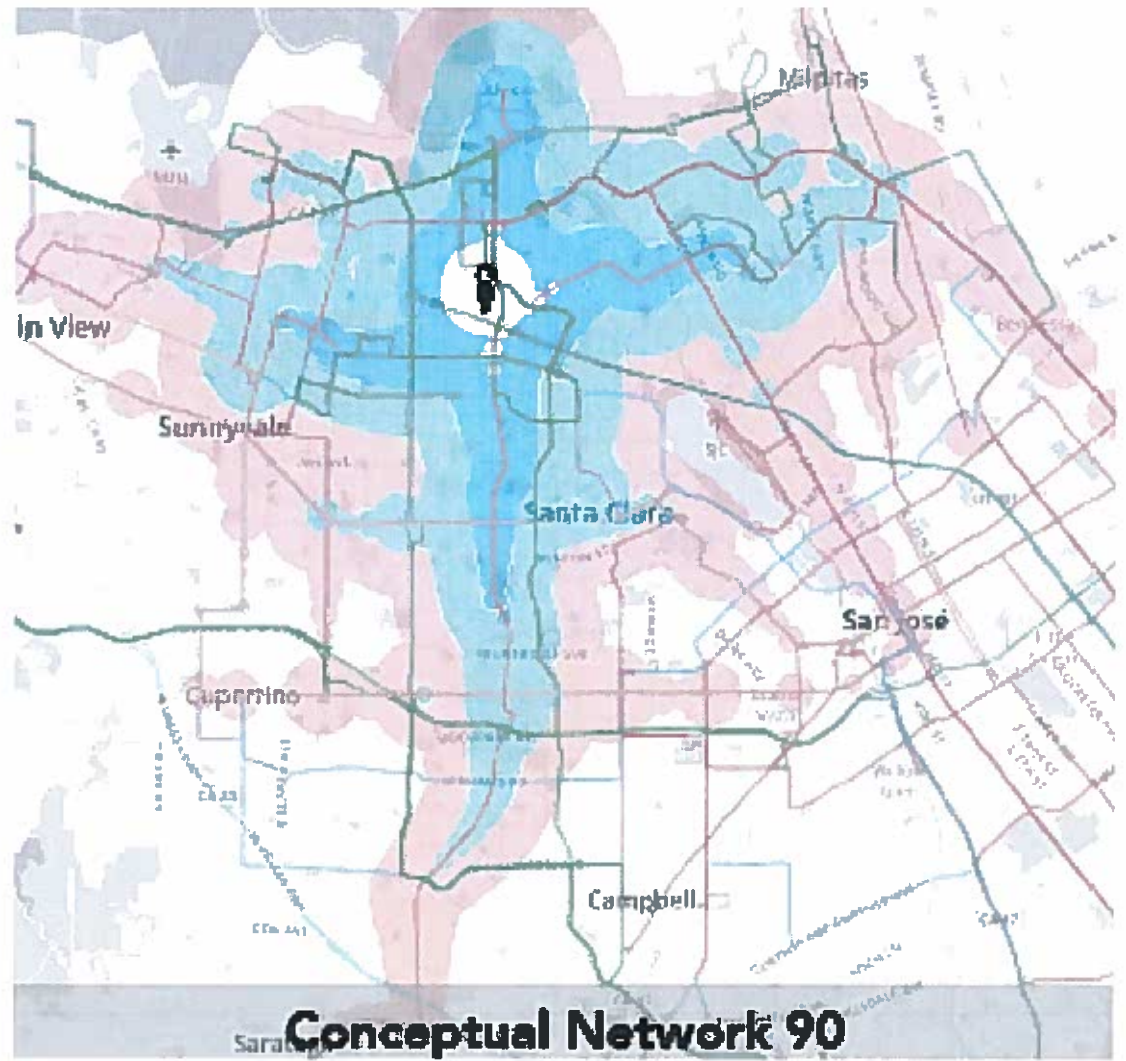
Visualizing Access

How far can Jane travel in or minutes?

Mission College
12 noon

Concept 90

(90% ridership)



So How Many People Is That?

Residents Accessible by Transit			
<i>Starting from Mission College and traveling for...</i>			
	30 min	45 min	60 min
2016 Network	13,400	94,300	295,200
Increase from 2016 Network			
Network 70	46%	29%	22%
Network 80	180%	96%	51%
Network 90	263%	118%	66%

Jobs Accessible by Transit			
<i>Starting from Mission College and traveling for...</i>			
	30 min	45 min	60 min
2016 Network	48,300	144,000	333,200
Increase from 2016 Network			
Network 70	29%	41%	22%
Network 80	72%	59%	31%
Network 90	100%	76%	43%

Peak Express?



JARRETT WALKER + ASSOCIATES

The challenge of peak express

Peak express service imposes three kinds of cost that all day local service does not:

- Inefficiency of short shifts.
- Deadheading against the peak direction.
- Owning, storing, and maintaining fleet that is used only briefly.

Conventional reporting doesn't highlight these factors, but they are a real reason to resist peak express growth.

Concluding Observations



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The Challenge: Plan for Everyone

- High-ridership services attract diverse ridership.
- So all impulses to specialize around certain riders (except paratransit) lead to less efficient design.
- The best network is not what any interest group would design.
- “Market segmentation” can lead us astray if it weighs demographics too heavily.
- Be careful of elite projection.
 - Elite projection = Using your own tastes as a guide to what would make a good service.

Jarrett Walker

Blog: HumanTransit.org

Twitter: [@humantransit](https://twitter.com/humantransit)



HUMAN TRANSIT

How Clearer
Thinking

about Public Transit
Can Enrich Our
Communities
and Our Lives

Jarrett Walker

Thank you!



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