PLANNING & MODAL PROGRAMS

Aeronautics · Data & Digital Services · Local Assistance
Program Management · Rail & Mass Transportation
Research, Innovation & System Information · Transportation Planning

CSIS Metrics

Quantitative Metrics Update

Hunter Owens, Data and Digital Services

Constraints & Metric Design

- Focused on SB1 Cycle – projects in earlier phases may not have this level of data, a different methodology will be developed
    - Pre-PID projects for example, are the focus of the prior update
- **No such thing as a perfect project**
    - CAPTI has nuances, trade-offs
    - Projects that score well on one metric might score poorly on others
    - Focused on alignment
- Program fit remains the first criteria
- 8 total quantitative metrics aligned to the various CAPTI Principles
- Opportunity to advance projects that are CAPTI-aligned
- Methodology Doc will be sent out for comments
- Scoring Rubric allows all projects to be scored based on objective criteria, no stack ranking

CALTRANS | PLANNING & MODAL PROGRAMS

CSIS Metrics

- Safety

- Vehicle Miles Traveled

- Accessibility

- Disadvantaged Communities - Access to Destinations & Jobs

- Disadvantaged Communities – Traffic Impacts

- Passenger Mode Shift

- Land Use & Natural Resources

- Multimodal Freight and Freight Efficiency

Sample Projects

- In order to understand how the CSIS Metrics will be used, we tested the previous SB1 cycle nominations to Caltrans HQ

- Since the data collection was not aligned to the metrics, we could not score every project on every metric

- Total of 53 Projects

- Exercise allows us to refine the scoring process, but not correct scores for projects that will be resubmitted

Sample Project: SCCP SMART Train extension to Windsor

Safety Metric

- Draft metric:
  - Evaluates the following
    - Proven safety countermeasures' crash reduction factors
    - Counts of relevant crashes in a 5-year lookback period in project area from SWITRS/TIMS/TASAS
- Data required
  - Project location for each mode/intervention
  - Safety countermeasures
  - Crash reduction factors (CRFs) with references
  - Count of relevant crashes in a 5-year lookback period in project area (optional)

Safety Metric

- Scoring
  - 0: Project area has crashes and no safety countermeasures identified
  - 1: Project area has no crashes, no safety countermeasures identified
  - 2: Project area has no fatal or serious injury crashes, low (less than 10%) crash reduction factor
  - 3: Has either fatal or serious injury crashes, low crash reduction factor
  - 4: No fatal or serious injury crashes, high (greater than or equal to 10%) crash reduction factor
  - 5: Has either fatal or serious injury crashes, high crash reduction factor

Safety Metric

- Project Info
  - Projects score well by providing the following
    - Proven Need (history of crashes)
    - Proven Countermeasures
- Key Notes:
  - Metric requires District / Local Engineer to review and provide countermeasures, crash reduction factors, crash counts
  - Source safety data covers on and off system

Pedestrian/Bicyclist

Bicycle Lanes

Crosswalk Visibility Enhancements

Leading Pedestrian Interval

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

Pedestrian Hybrid Beacons

Rectangular Rapid Flashing Beacons (RRFB)

Road Diets (Roadway Configuration)

Walkways

Roadway Departure

Enhanced Delineation for Horizontal Curves

Longitudinal Rumble Strips and Stripes on Two-Lane Roads

Median Barriers

Roadside Design Improvements at Curves

SafetyEdge℠

Wider Edge Lines

Safety Metric

Sample Scores:

- A total of **49** Cycle 3 projects were evaluated:
  - **25** scored 5
  - **3** scored 4
  - **6** scored 1
  - **15** scored 0
- However, these scores are extremely unrepresentative due to limited info from project documents.
  - Most projects had at least 1 safety countermeasure

Vehicle Miles Traveled

INDUCING OR REDUCING TRAFFIC

- Draft metric:
  - Evaluate increase or reduced annual VMT
  - Score from –5 to 5 based on categories of increase
- Data required
  - VMT estimate from project proposal
  - Project description and location

- Project Detail
  - Projects score well by reducing VMT, poorly by increasing VMT
  - Rural Projects that increase VMT will perform better than urban projects, since the absolutely value will be lower
- Key Notes:
  - Projects must be at phase where they developed precise VMT estimate
  - Otherwise, a VMT range can be submitted, but we will use the worst number in range

VMT Scoring Guide

Score	VMT Range (Annual Change)	Example Projects
-5	Increase > 5 million	New Urban Freeway Lane
-3	Increase between 1 million and 5 million	Urban / Suburban Road Widenings,
-1	Increase between 1 and 1 million	Widening of a short arterial or overpass
0	No change in VMT	EV Charging
1	Decrease between 1 and 1 million	Active Transportation Improvements, smaller Transit projects, road diets
3	Decrease between 1 million and 5 million	Mid-sized Transit Projects
5	Decrease > 5 million	Large Urban Mass transit, Interregional Rail

VMT Guidance

- The assumption is that your environmental documents will contain a VMT number
  - If project environmental pre-dates SB743 or project hasn't gotten past environmental, use NCST Calculator
    - Caveat: Rural Counties (non-MSA counties) widening is presumed no impact
    - If project is transit / active transportation, use ridership model (FTA STOPS or similar) contact CSIS@dot.ca.gov
- If a range is provided, the lowest possible score will be assumed

VMT Guidance

- In the Cycle 3 Test Scoring, **53** projects were scored based on project documents or the NCST calculator

Score	Count of Score
-5	1
-3	5
-1	14
0	13
1	10
3	9
5	1

Accessibility

- Accessibility, in the CSIS context, represents how many destination a person can reach within a 2 hour time thresholds
    - Destinations farther away are awarded less weight using a decay function
- Utilize Conveyal Platform + hundreds millions of trip level calculations to determine the net gain
- Gains in auto-accessibility are harder to realize because the auto-network is more built out than the multimodal network in most cases

Isochrone (baseline)

New Class 1 Bike/Ped Path

Isochrone (post project implementation)
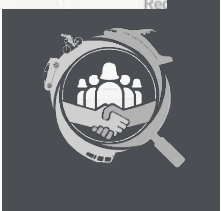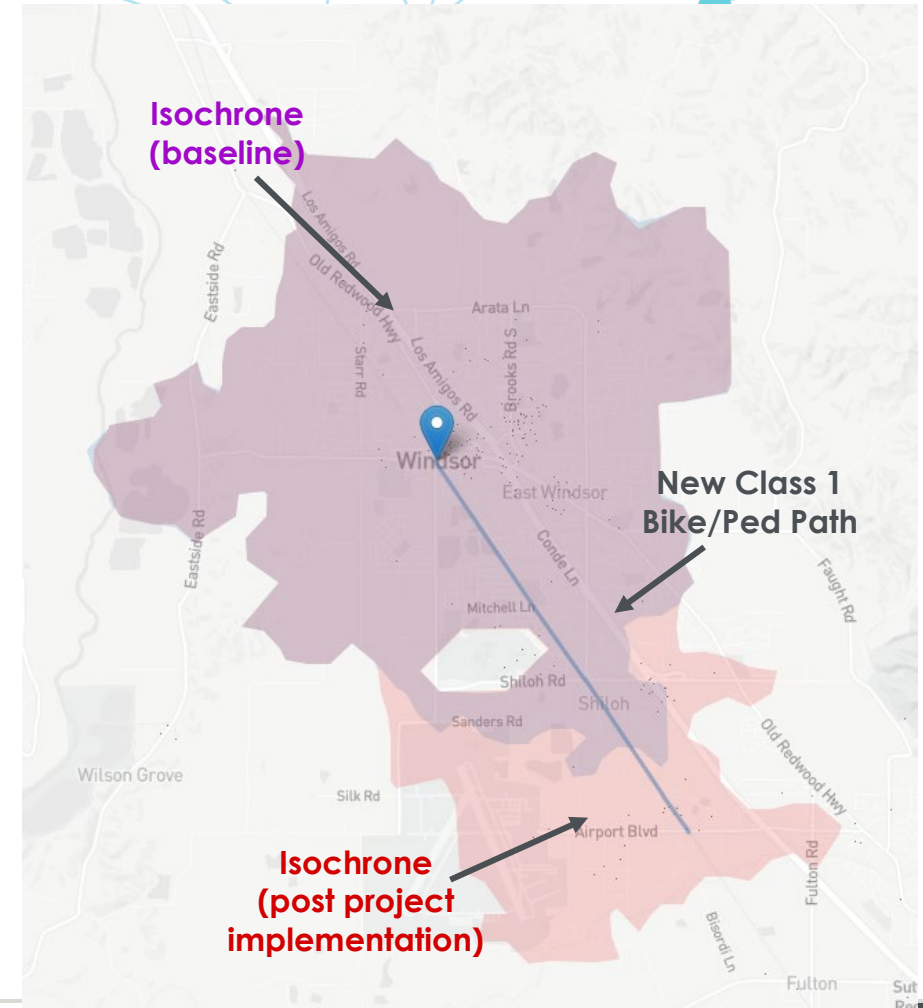
Accessibility

ACCESS TO DESTINATIONS – JOBS & OTHER

- Draft metric:
  - Estimate the percentage increase of jobs + destinations that residents can access post project implementation
  - Score from –5 to 5 based on categories of increase or decrease
- Data required
  - Project location for each mode/intervention
  - Project description (mode, type of project component)

- Project Detail
  - Projects score well by increasing the relative number of destinations somebody can get to within a time threshold
  - Population Weights account for where accessibility benefits are occurring relative to where people live
- Key Notes:
  - Increasing automotive speeds results in relatively small access gains compared to prior process
  - Teams can request reviews by emailing CSIS@dot.ca.gov

Accessibility

ACCESS TO DESTINATIONS

- Scoring:
  - 0: 0% change in population-weighted access
  - 1: > 0% - .25% increase in population-weighted access
  - 2: > .25% - .5% increase in population-weighted access
  - 3: > .5% - .75% increase in population-weighted access
  - 4: > .75% - 1% increase in population-weighted access
  - 5: > 1% increase in population-weighted access
- Negatives scores will be given for inverse access change with the same ranges.

Example Scoring

SIMPLIFIED 10 ZONE EXAMPLE

- A hypothetical project would increase the total number of jobs accessible from 3,080 to 3,598 (a net gain of 518 jobs)

- All 10 **travel analysis zones** (TAZs) gain access to new jobs due to the project, but this gain is not evenly distributed, ranging all the way from a 1% to 552% increase

- The number of workers in each TAZ also varies but is the same in both the baseline and build scenarios

- The worker-weighted percent change in access is 10.91%, and the average change in worker-weighted jobs accessible is 33.6

| TAZ	Baseline Accessible Destinations	People	BUILD Accessible Destinations	People	% Change
1	435	54	440	54	1%
2	654	35	660	35	1%
3	345	65	380	65	10%
4	456	123	470	123	3%
5	345	234	350	234	1%
6	342	123	348	123	2%
7	123	243	200	243	63%
8	234	34	300	34	28%
9	123	21	300	21	144%
10	23	3	150	3	552%
Total	3,080	935	3,598	935	17%

Metric	Value
% Change (across TAZs)	16.82%
Weighted % Change (across TAZs)	10.91%
Average Change (across TAZs)	51.8
Weighted Average Change (across TAZs)	33.6
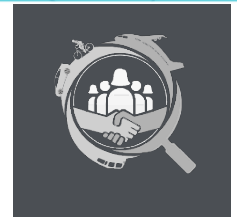
Example Scoring

WATSONVILLE-SANTA CRUZ MULTIMODAL PROJECT DEMO ACCESSIBILITY SCORE:

- Project has multiple components along the 101 corridor, including a Bus Only Lane, New Bike and Ped infrastructure and Auxiliary lanes

- Four modes: Bike, Ped, Car, Transit

- Percent Population-Weighted Accessibility Change: **0.286%**

- Sample Accessibility Score: **2**

- Map displays the relative change in accessibility for the bike project components within a 30km buffer
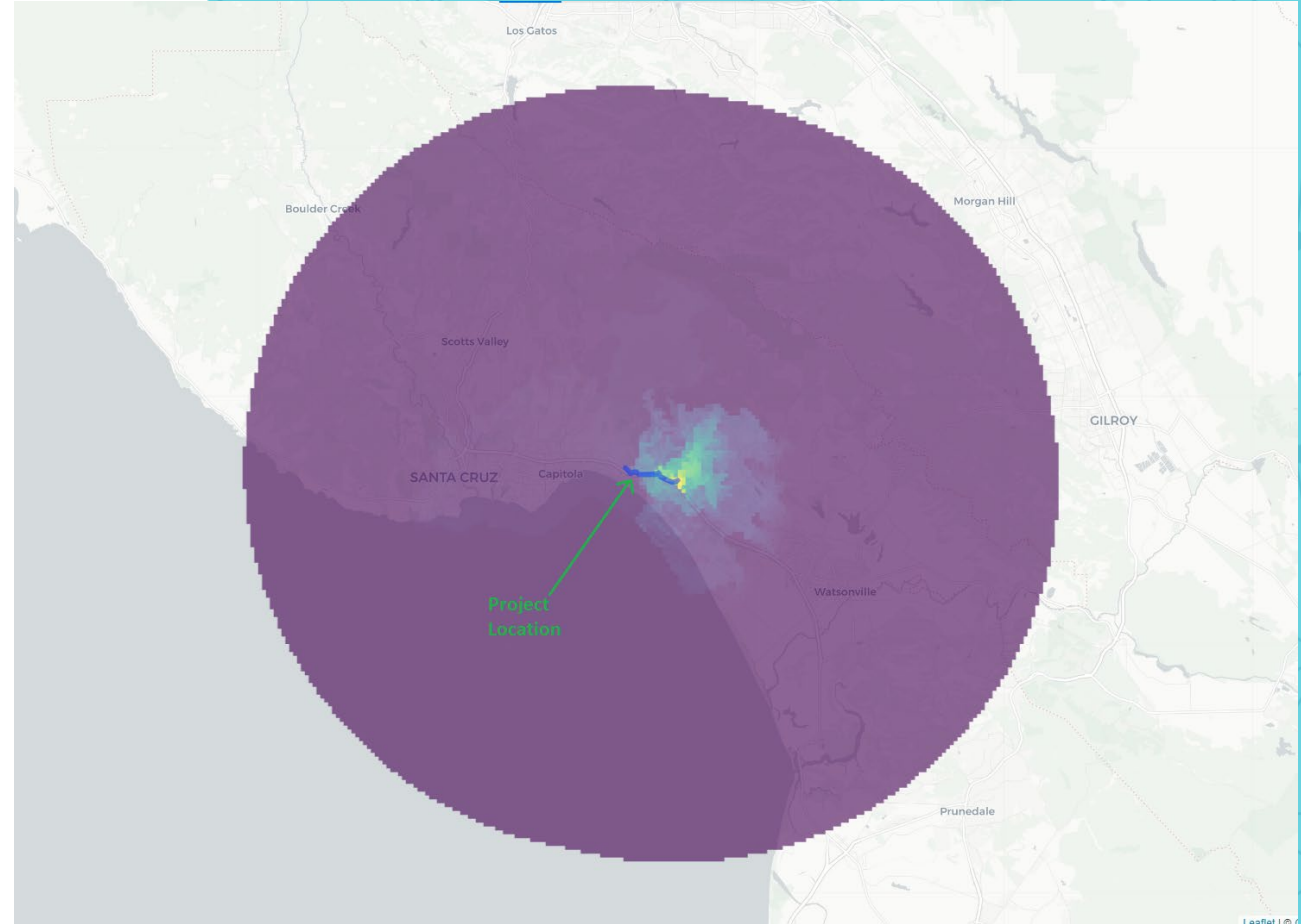
Example Scoring

- Overall, we were able to run accessibility analysis for 38 projects from Cycle 3

- The average score was .97, representing an average percent change in accessibility of .12% across work and non-work destinations per project.

- Multimodal projects generally scored the highest. This is due to auto accessibility baselines being relatively high, while transit / active transportation have larger access gaps

Disadvantaged Communities: Access to Jobs/Destinations

- Draft metric:
  - Evaluate DAC population-weighted percent change in accessibility with Conveyal
    - Weighted according to EQI demographic overlay definition (in an AB 1550 low-income household and/or non-white)
  - Work and non/work destinations

- Scoring
  - Same as accessibility, but DAC-weighted accessibility numbers

- Data required
  - Project location for each mode/intervention
  - Project description

# Disadvantaged Communities: Access to Jobs/Destinations

- Jobs and Destinations combined into a single metric to capture both points in CAPTI Principle, so metric averages two scores

- Access metrics will be similar, overall scoring encourages delivering benefits to disadvantaged communities (DAC).

- Rural Projects can score well due to relative access, high proportion of DAC

- Aligns to ½ CAPTI Principle:
    - *Strengthening our commitment to social and racial equity by reducing public health and economic harms and maximizing community benefits to disproportionately impacted disadvantaged communities, low-income communities, and Black, Indigenous, and People of Color (BIPOC) communities, in urbanized and rural regions, and involve these communities early in decision-making. Investments should also avoid placing new or exacerbating existing burdens on these communities, even if unintentional.*
    - *(Other half, DAC Traffic Impacts Metric)*

Example Scoring

WATSONVILLE-SANTA CRUZ MULTIMODAL PROJECT
DEMO DISADVANTAGED COMMUNITIES ACCESS TO
JOBS/DESTINATIONS SCORE:

- Project has multiple components along the 101 corridor, including a Bus Only Lane, New Bike and Ped infrastructure and Auxiliary lanes

- Four modes: Bike, Ped, Car, Transit

- Percent Disadvantaged Communities Population-Weighted Accessibility Change: **0.230%**

- Sample Disadvantaged Communities Access to Destinations Score: **2**

% EQI DAC

- 0% - 10%
- 11% - 20%
- 21% - 30%
- 31% - 40%
- 41% - 50%
- 51% - 60%
- 61% - 70%
- 71% - 80%
- 81% - 90%
- 91% - 100%
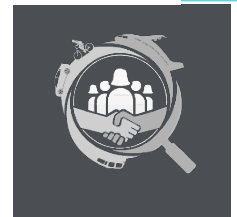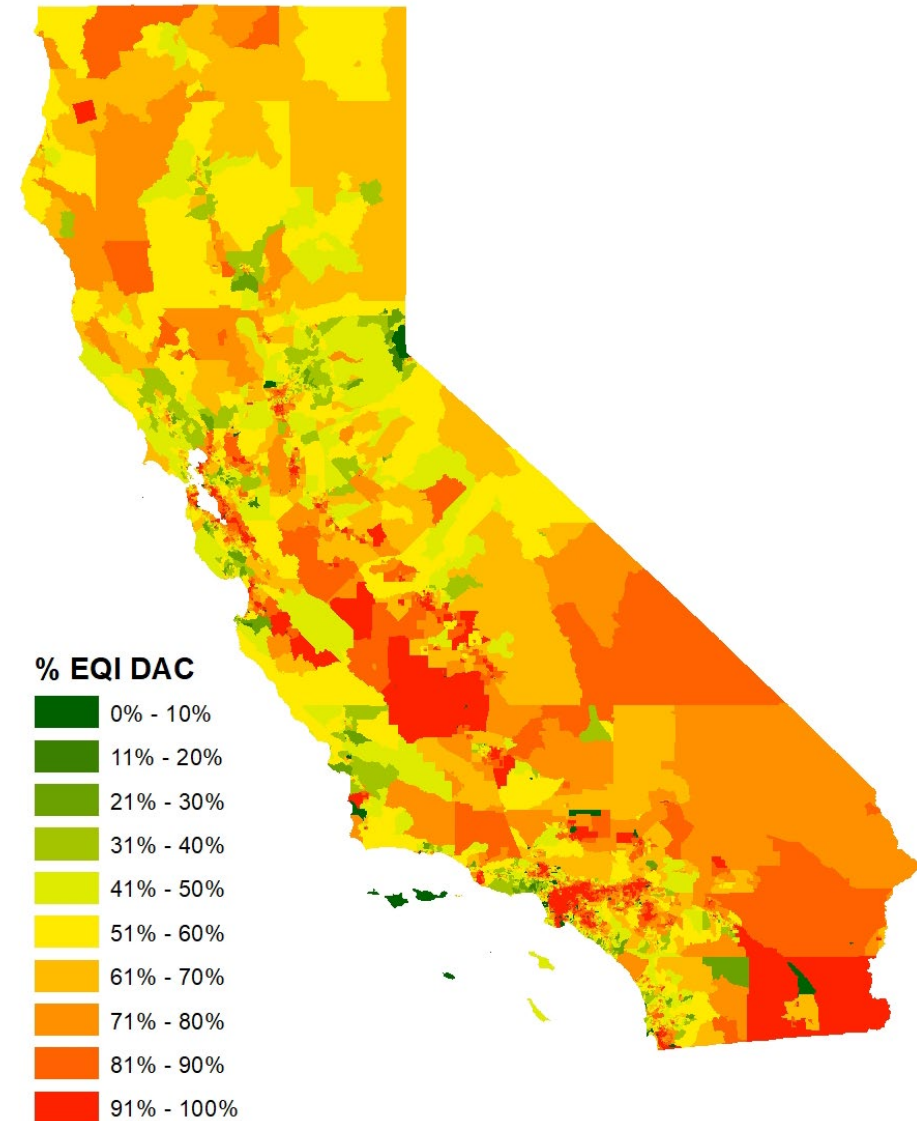
Example Scoring

- Overall, we were able to run accessibility analysis for 24 projects from Cycle 3

- The average score was 1.33, representing an average percent change in accessibility of .18% across work and non-work destinations per project

- Projects generally scored within the same range as the general accessibility metric, with a few exceptions

Disadvantaged Communities: Traffic Impact

- Draft metric:
  - Amount of additional projected truck-weighted AADT occurring impacting EQI traffic exposure screened communities.
    - Truck traffic is weighted at 6x car traffic
    - EQI Traffic Exposure Screen Definition: Census blocks that are:
      - low-income (per AB 1550)
      - >= 64.2% non-white (statewide %)
      - at or above the 80th percentile for truck-weighted traffic proximity and volume

Disadvantaged Communities: Traffic Impact

- Scoring
    - **-5**: Project increases truck-weighted AADT by >= 10%, is in an area screened by the EQI Traffic Exposure Screen
    - **-3**: Projects increases truck-weighted AADT by between 0% and 10%, is in an area screened by the EQI Traffic Exposure Screen
    - **0**: No change in AADT anticipated / no impact
    - **3**: Decline in truck-weighted AADT of between 0% and 10%, in an area screened by the EQI Traffic Exposure Screen
    - **5**: Decline in truck-weighted AADT by >= 10% in an area screened by the EQI Traffic Exposure Screen

Disadvantaged Communities: Traffic Impact

- Data required
  - Additional AADT in project footprint (500m buffer around project area)
- Project Detail
  - Projects score poorly by increasing truck weighted AADT inside particularly disadvantaged communities
  - Score well by reducing AADT inside particularly disadvantaged communities
  - Rural Context: unlikely to hit population threshold
- Key Notes:
  - Naturally in tension w/ Freight metrics.
  - CAPTI: "*Investments should also avoid placing new or exacerbating existing burdens on these communities, even if unintentional.* "

Disadvantaged Communities: Traffic Impact

- For Cycle 3 Projects, we used Cal B/C (where available) to calculate the assumed change in AADT

- **46** Projects were in a geographic area that would qualify for the Traffic Impact Score

- The total number of projects scored was **11**, with an average score of −1.67

Mode Shift

- Draft metric:
  - Evaluate change in ratio of transit/active transportation accessibility to auto accessibility.
  - [max population-weighted non-auto accessibility] / [population weighted auto accessibility]

- Data required
  - Project location for each mode/intervention
  - Project description

- Key Notes:
  - Projects score well by increasing the ratio of destinations that one can access via non-auto modes
  - Answers: "How many destination can I reach w/o a car vs with?"

* Caltrans HQ
◻ Transit: 20 minutes
◻ Car: 20 minutes
Job Density
- Higher
- Lower
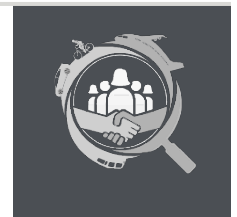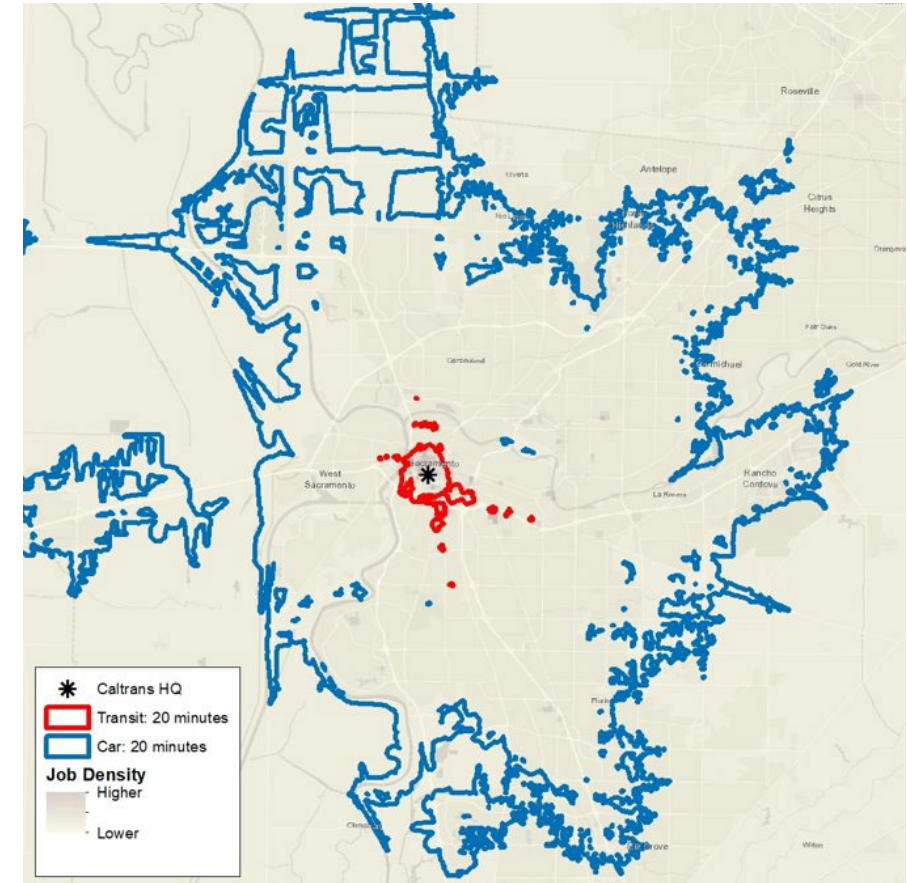
Mode Shift Scoring

- Scoring:
  - **0**: No average change in population-weighted mode shift ratio
  - **1**: > 0 - .001 average change in population-weighted mode shift ratio
  - **2**: > .001 - .002 average change in population-weighted mode shift ratio
  - **3**: > .002 - .003 average change in population-weighted mode shift ratio
  - **4**: > .003 - .004 average change in population-weighted mode shift ratio
  - **5**: > .004 average change in population-weighted mode shift ratio
  - Negatives scores will be given for inverse mode-shift changes with the same ranges.

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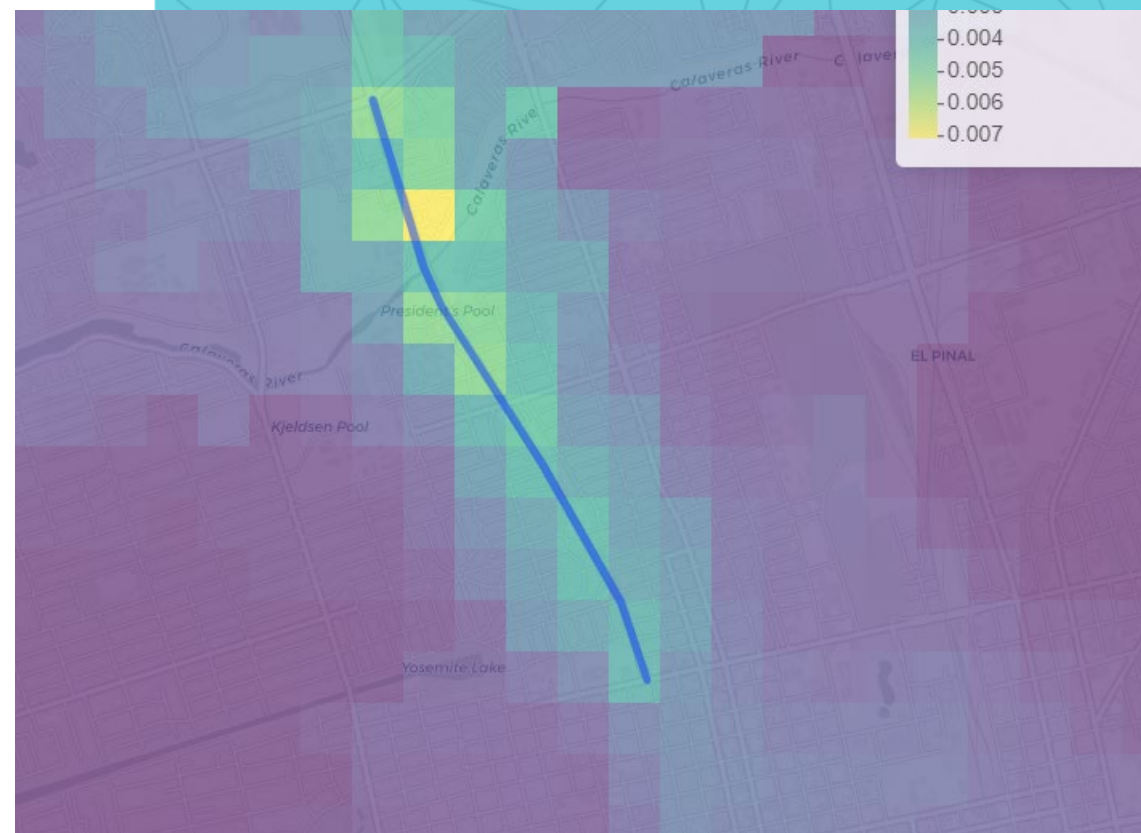
Example Project Score

LOWER IMPACT PROJECT

- A new bike lane is planned on Alpine Blvd in Stockton, CA between W March Ln and E Harding W

- The bike lane will reduce the level of traffic stress from 4 (high) to 2 (low)

- This lower-stress route will create a more direct link resulting in shorter travel times in some cases

- Accessibility is calculated for both the baseline and build bike scenarios

- Baseline and build bike accessibility outputs are divided by auto accessibility to create baseline and build accessibility ratios

- The difference between the baseline and build ratios is calculated and a population-weighted average of the differences is calculated for changes within a 24 km buffer of the project alignment

Example Project Score

LOWER IMPACT PROJECT

- Overall, the project would increase the mode-shift ratio by 0.0006. In the highest impact areas, the ratio would increase by .007

- Project would receive a 1

- Note: This same project would score relatively well on accessibility, but generally larger-scale projects score higher on mode shift

Example Project Score

HIGHER IMPACT PROJECT

- The Capitol Corridor Intercity Rail Service currently operates between Auburn, CA and San Jose, CA

- Long-term planning documents identify a need for higher speed and higher-frequency rail service along the corridor

- This example assumes 30-minute frequencies and a 100% increase in speed along the route

- Accessibility is calculated for both the baseline and build rail scenarios

- Baseline and build rail accessibility outputs are divided by auto accessibility to create baseline and build accessibility ratios (assuming auto accessibility is unchanged)

- The difference between the baseline and build ratios is calculated and a population-weighted average of the differences is calculated for changes within a 50 km buffer of the project alignment

Example Project Score

HIGHER IMPACT PROJECT

- Overall, the project would increase the mode-shift ratio by 0.004. In the highest impact areas, the ratio would increase by .14

- Project would receive a 4

- Note: This same project would also score highly on accessibility
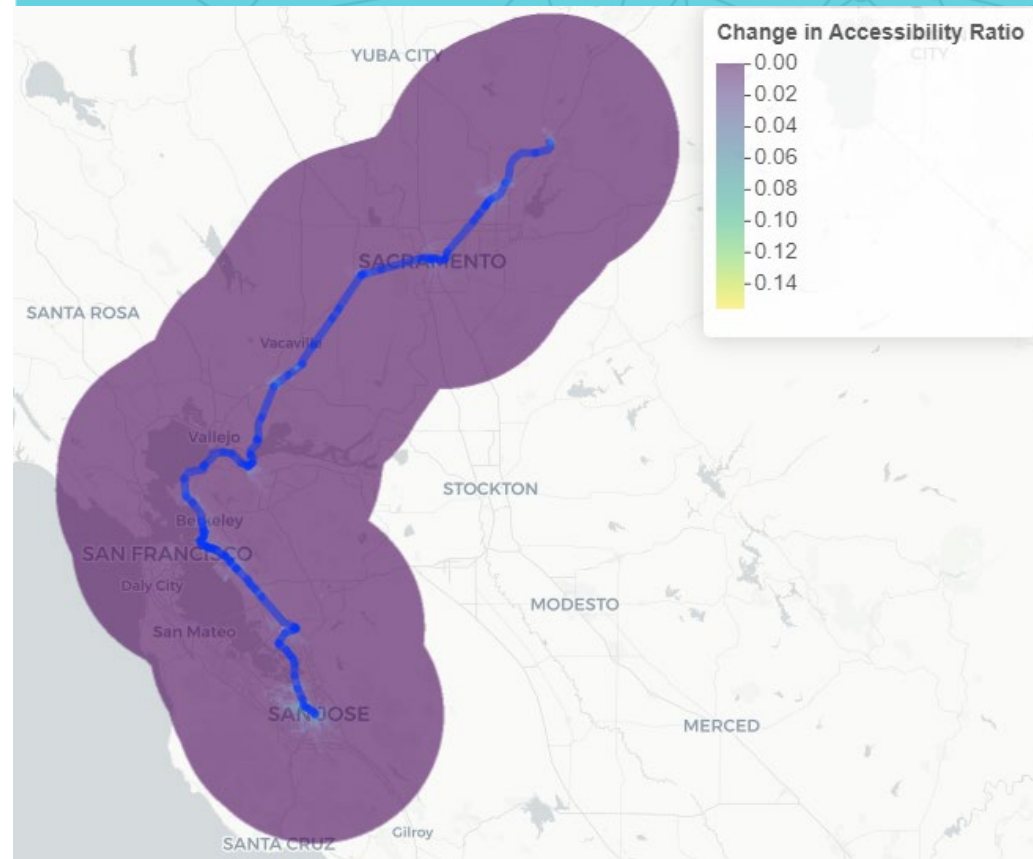
Overall Project Scores

- 35 Projects were scored for mode shift, with an average score of .2

- Projects that did well typically had strong Transit or Active Transportation Elements

- Projects that did poorly generally lacked multimodal elements altogether and/or significantly increased auto access

- Most scores were 1, 0, and -1

Freight Metric

- Draft metric:
  - Evaluate sustainability based on the percentage of the project budget dedicated to CA Sustainable Freight Action Plan typologies
  - Evaluate efficiency based on throughput, Truck Travel Time Reliability Index
- Data required
  - Project location for each freight mode/intervention
  - Project description

- Scoring: Sustainability Scores
  - 1: Less than 50% of the project budget is dedicated to sustainable freight action plan typologies.
  - 2: Between 50 and 90% of project budget is dedicated to sustainable freight action plan typologies.
  - 2.5: >90% of the project budget is dedicated to sustainable freight action plan typologies.
- Efficiency Scores:
  - 1: Truck Travel Time Reliability index <= 1.5
  - 2: Truck Travel Time Reliability index > 1.5
  - 2.5: Increase in Modal Freight OR Truck Travel Time Reliability Index >= 3.0

Freight Metric

- Projects score well by:
  - Focusing on sustainable freight elements as a large proportion of project budget
  - Providing specific metrics on increased freight efficiency or promoting a shift to modal freight
- Key Notes:
  - CAPTI Principle: *Developing a zero-emission freight transportation system that avoids and mitigates environmental justice impacts, reduces criteria and toxic air pollutants, improves freight's economic competitiveness and efficiency, and integrates multimodal design and planning into infrastructure development on freight corridors.*
  - Additional details on freight efficiency measurement are in progress with SMEs

Freight Scores

CYCLE 3 TESTING SCORING

- The Freight Metric was unable to be scored for Cycle 3 Projects because we did not collect line-item budget level data, and the sustainability metric requires line-item budget data (% of budget dedicated to sustainable freight action plan typologies)

- Additionally, we did not have time to run the efficiency metric for all the proposed projects

- However, we identified a few projects that would have scored highly

Freight Projects Detail

- Harbor Drive Project
  - Multiple Sustainable Freight Action Plan typologies
    - The Project will include zero-emission commercial vehicle charging stations (up to three) with electrical conduit infrastructure
    to assist in the transition of truck fleets to models using sustainable fuels and achieve Portside Community emission reduction
    targets

- Fresno UPRR Double Track
  - Entirely Modal Freight
 - Shift from Road Freight to Rail

Land Use and Natural Resources

- Draft metric:
  - Evaluate whether project supports non-SOV travel in an urbanized area eligible for infill development according to the OPR Sitecheck tool.
  - Projects can have a positive by creating new high-quality transit areas (PRC – 21155, 21064.3). HQTAs trigger infill-friendly policies:
    - No parking minimums
    - CEQA streamlining
  - Projects in a rural context can score well by preserving Natural and Working Lands (Sitecheck tool)
- Data required
  - Project locations for non-SOV elements
  - Project description
  - Projected change in transit schedules

Land Use and Natural Resources

- Projects score well by:
  - Urban/suburban context: creating new HQTAs
  - Rural Context: enhancing natural and working lands

- Key Notes:
  - Definition of urban/suburban: project intersects an incorporated city
  - Definition of "supporting": existence non-SOV travel project element
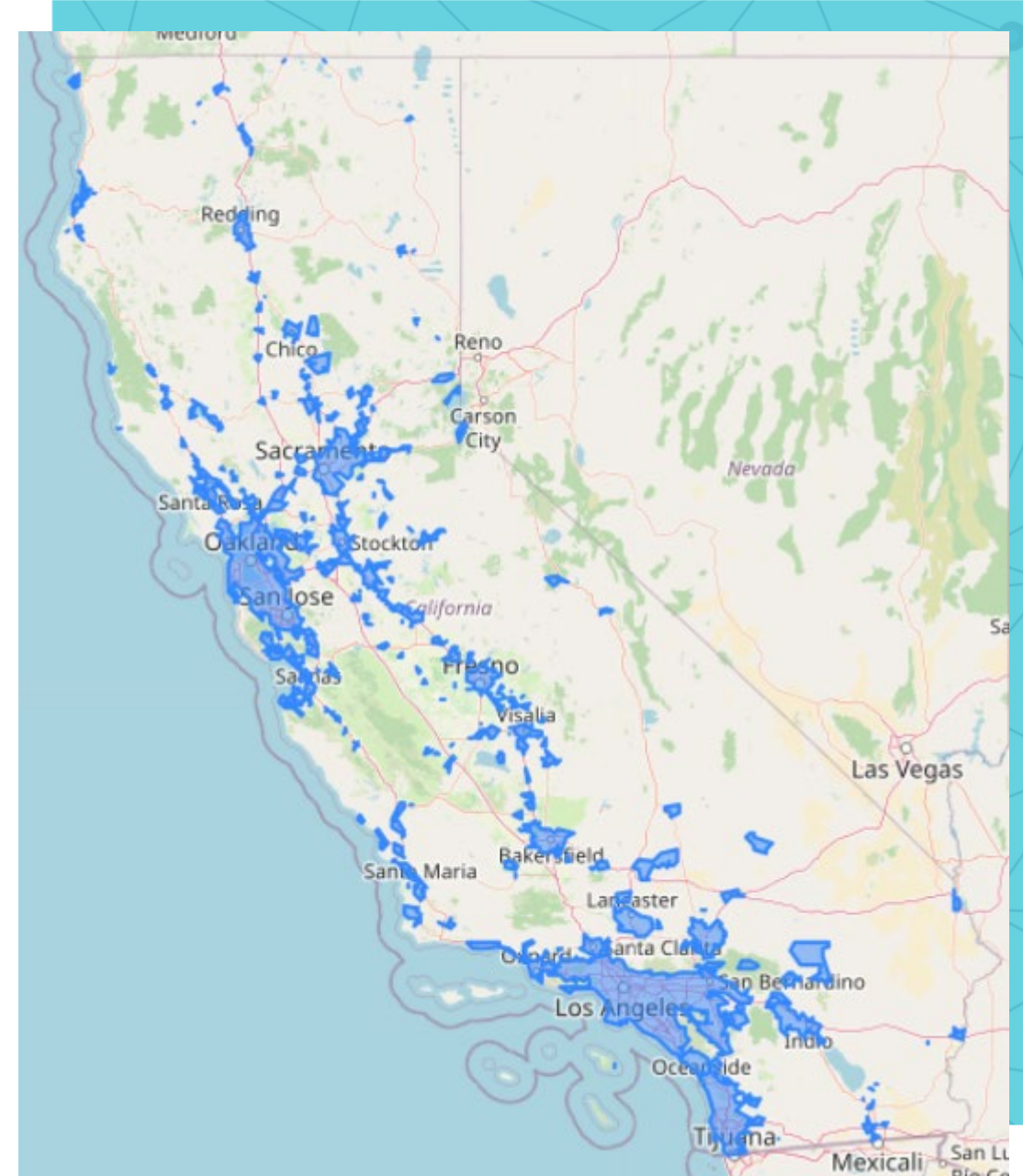
Land Use and Natural Resources

- Additional Key Notes:
  - Metric is a combination of 2 CAPTI Principles, to incorporate urban and natural land uses
    - *Promoting compact infill development while protecting residents and businesses from displacement by funding transportation projects that support housing for low-income residents near job centers, provide walkable communities, and address affordability to reduce the housing-transportation cost burden and auto trips.*
    - *Protecting natural and working lands from conversion to more intensified uses and enhance biodiversity by supporting local and regional conservation planning that focuses development where it already exists and align transportation investments with conservation priorities to reduce transportation's impact on the natural environment.*
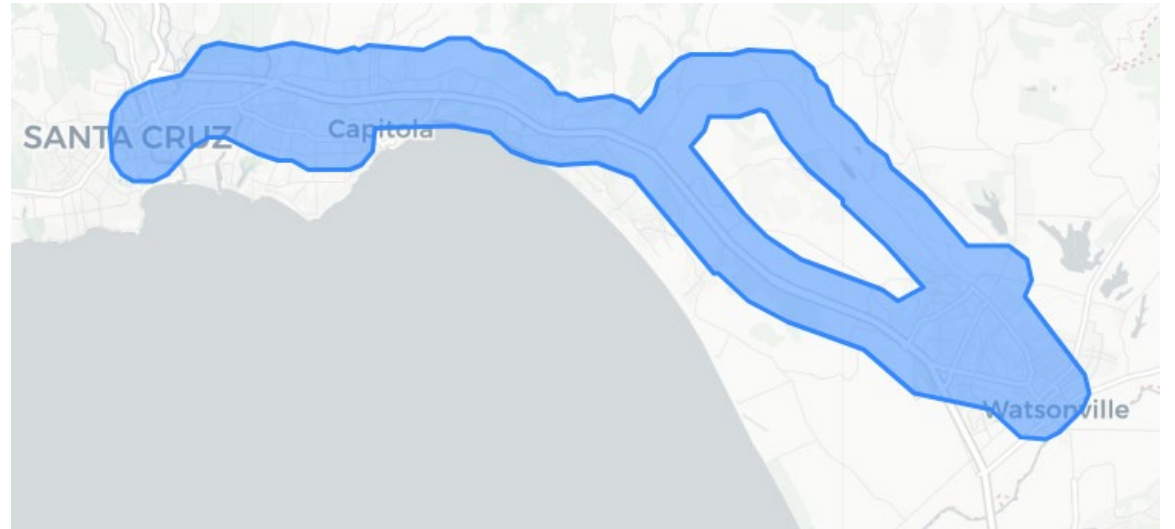
Land Use and Natural Resources

SCORING

- **-1**: Project is in infill development area but does not identify a non-SOV element that supports infill development
  - OR project is within 200 meters of natural / working lands and does not identify significant enhancement
- **0**: Project is not in infill area OR not within 200 meters of natural working lands
- **1**: Project is in infill area, has a supporting element, but project has a projected increase in VMT
- **2**: Project is in infill area, has a supporting element, and does not have a projected decrease in VMT
  - OR project is within 200m of natural/working lands and only describes mitigations
- **3**: Between 0 and .5 sq miles of new HQTA
- **4**: Between .5 and 1 sq miles of new HQTA
- **5**: Greater than 1 sq mile of new HQTA
  - OR project has a significant enhancement to natural and working lands while being located within 200 meters of Site Check Protected Areas

Land Use Example Projects

HYPOTHETICAL EXAMPLES

- Urban area – Creating HQTA
    - Watsonville-SC bus-on-shoulder allows Santa Cruz Metro to increase peak hour frequencies from every half-hour to every 15 minutes -> 31 sq mi of new HQTA around corridors for Routes 69A, 69W, 71, and 91X
    - Note that project still includes mitigation elements for sensitive coastal habitat
    - Must **commit** to new transit service, not just enable

Land Use Natural Resources Scoring

CYCLE 3 EXAMPLE SCORING

- Overall, **37** projects were evaluated:
  - **3** Urban projects created new HQTA
    - **2** scored a 5 (increased frequency or new light rail)
    - **1** scored a 4 (new train stop)
  - **30** Urban projects did not create new HQTA
    - **19** scored 2 or 1
    - **11** scored –1 (no clear non-SOV infrastructure)
  - **4** Rural projects (no proximity to incorporated areas)
    - **3** scored a 5 (had wildlife crossings)
    - **1** (Desert Rail Infrastructure) did not go through environmental review

Quantitative Score Table

SB 1 CYCLE 3 PROJECTS

Metric	
Safety	49 Projects Scored, 25 Scored 5
Vehicle Miles Traveled	53 Projects Scored, 37 between -1 & 1
Accessibility	38 Projects Scored, Average score of 0.97
Disadvantaged Communities – Access to Destinations & Jobs	38 Projects Scored, Average score of 1
Disadvantaged Communities – Traffic Impacts	11 Projects Scored, Average Score of -1.64
Passenger Mode Shift	35 Projects Scored, Average Score of 0.2
Freight	N/A
Land Use & Natural Resources	37 Projects Scored, Plurality scored 2 or below, but 3 out of 4 Rural Projects scored 5
Total Score	
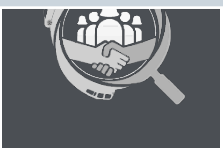
Thanks!

- CSIS Metric team is on hand to help you get preliminary scores for your project
  - Have your Caltrans District Partners email csis@dot.ca.gov to setup a time
  - Caltrans Districts can invite external stakeholders to review meeting at their discretion
- This presentation will be sent out for comments, as will the underlying methodology document.
  - Email comments to csis@dot.ca.gov
- During the SB1 Nomination process, there will data collection, scoring and validation phases
- Questions?

Sample Project

- Example Project: Sacramento 15-min bus network enhancement
- DAC-weighted

Show [10 ∨] entries   Search: [_____]

	project	pct_change_access	pct_change_access_weighted	avg_change_access	weighted_avg_change_access
1	Test	3.50%	3.08%	276.7449	1,595.2066

Showing 1 to 1 of 1 entries   Previous [1] Next

- Worker-Weighted

Show [10 ∨] entries   Search: [_____]

	project	pct_change_access	pct_change_access_weighted	avg_change_access	weighted_avg_change_access
1	Test	3.50%	3.64%	276.7449	1,658.9807

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