

COOPERATIVE AGREEMENT #2
BETWEEN
THE SANTA CLARA VALLEY TRANSPORTATION AUTHORITY
AND
THE CITY OF SAN JOSE
RELATING TO VTA'S BART SILICON VALLEY PHASE II EXTENSION PROJECT

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This Cooperative Agreement #2 (hereinafter “**Agreement #2**”) is entered into between the Santa Clara Valley Transportation Authority, a public agency organized as a special district under California law (hereinafter “**VTA**”) and the City of San José, a municipal corporation of the State of California, (hereinafter “**CITY**”). This Agreement #2 is entered into this 24th day of February, 2023 (the “**Effective Date**”). VTA and CITY are sometimes hereinafter referred to individually as a “**Party**” and collectively as the “**Parties**.”

RECITALS

- A. WHEREAS, VTA intends to construct an extension of the Bay Area Rapid Transit (“**BART**”) system rail line within Santa Clara County, under the project entitled VTA’s BART Silicon Valley Phase II Extension Project (“**PROJECT**”).
- B. WHEREAS, VTA has undertaken a program of activities leading to the aforementioned extension of BART service, to be constructed by VTA and operated by BART.
- C. WHEREAS, VTA and CITY entered into a Master Agreement on October 16, 2020 (“**Master Agreement**”) that generally describes the cooperative efforts of the Parties with respect to the preliminary engineering, final design, and construction of the PROJECT.
- D. WHEREAS, this Cooperative Agreement is made pursuant to the Master Agreement, and the terms, conditions, and obligations of the Master Agreement shall apply to this Agreement #2, unless explicitly stated otherwise herein.
- E. WHEREAS, VTA and CITY entered into the “**COOPERATIVE AGREEMENT #1 BETWEEN THE SANTA CLARA VALLEY TRANSPORTATION AUTHORITY AND THE CITY OF SAN JOSE RELATING TO VTA’S BART SILICON VALLEY PHASE II EXTENSION PROJECT**” on June 8, 2021 (“**Agreement #1**”) that further refines the cooperative efforts between the parties related to the PROJECT development prior to the advertisement for procurement of construction contracts.

- F. WHEREAS, the Parties desire to enter into this Cooperative Agreement #2 under the Master Agreement and Agreement #1 to further refine terms and conditions of their cooperative efforts related to the PROJECT and to address the reimbursement from VTA to CITY for costs related to the PROJECT after the award of the construction contracts.

NOW THEREFORE, VTA and CITY, in consideration of the foregoing, hereby agree as follows:

AGREEMENT

SECTION 1. DEFINITIONS

- A. Capitalized terms defined in the Master Agreement and Agreement #1 will have the same meaning in this Agreement #2 and any exhibits hereto, unless otherwise specified herein.
- B. In addition, the following definitions apply to this Agreement #2, including any Exhibits hereto:
- **“Agreement #1”** has the definition set forth in **Recital E**, above.
 - **“Construction Management Team”** is composed of CITY staff or consultants with a designated team leader to support internal CITY review of, and coordinate Inspection and Testing results for, the modifications, relocations, and/or removals of CITY Facilities within the CITY’s right-of-way as further described in Exhibit A, Section II.C, below.
 - **“Phase 1” is the first phase of the cost reimbursement that will cover the period from July 1, 2022 through June 30, 2023.**
 - **“Phase 2” is the second phase of cost reimbursement that will cover the period from July 1, 2023 through June 30, 2025.**
 - **PCI:** Pavement Condition Index (PCI) provides a snapshot of the pavement health of a road. It is measured on a scale of 0 to 100, where 100 means a newly paved road.
 - **Project Management Team:** a two-person team composed of one Senior Manager and one Project Engineer from CITY staff to be the main point of contact for coordination and communication of CITY input into the development of the PROJECT as further described in Exhibit A, Section II.A, below.

- **“Qualified Professional(s)”** is/are a person or persons qualified to review the agreed-upon PROJECT designs and design changes along with providing construction management and inspection related to the PROJECT as further described in Exhibit A.
- **“Technical Team”** has the definition set forth in Article II.B of Exhibit A.

SECTION 2. CITY FACILITIES

A. Construction Inspection and Testing:

In furtherance of the provisions set forth in **Section 7.H** of the Master Agreement and as further described in **Section 3.K** of Agreement #1, upon receipt of the test results and construction documentation submittals, CITY review times will be no more than fifteen (15) working days after the date of receipt of the initial submittals. CITY review times will be no more than ten (10) working days after the date of receipt for any subsequent reviews of a resubmittal package.

B. Construction Standards:

Notwithstanding the provisions set forth in **Section 7.B** of the Master Agreement and in **Section 3.A** of Agreement #1, VTA and its contractors will utilize the latest editions of the CITY’s design standards and ordinances in effect as of:

- For Contract Package (CP-2), Tunnel and Trackwork –thirty (30) calendar days prior to issuance of 60% design package submittal.
- For Contract Package (CP-3), Newhall Yard and Santa Clara Station –thirty (30) calendar days prior to issuance of Request for Proposals (RFP) Final Addenda.
- Contract Package (CP-4), Stations and Support Facilities –thirty (30) calendar days prior to issuance of Request for Proposals (RFP) Final Addenda.

VTA and its contractors will utilize the latest editions of the City’s standards in effect three hundred sixty (360) calendar days prior to design of the permanent traffic signals. To the extent reasonably practicable, VTA will make good faith efforts to accept and incorporate modifications and/or changes to the applicable standards and regulations no later than thirty (30) calendar days prior to: (i) issuance of the 60% design package submittal for CP-2, Tunnel and Trackwork; (ii) issuance of RFP Final Addenda for CP-3; (iii) Newhall Yard and Santa Clara Station; and (iv) issuance of RFP Final Addenda for CP-4 Stations and

Support Facilities RFP Final Addendum, provided that such subsequent revisions or additions do not: (a) require design product changes necessitating resubmittal of the design product to CITY or (b) increase the cost of construction as initially estimated and/or delay the beginning of construction as scheduled.

C. Construction Impacts to CITY Streets established as Truck Haul Routes for the Project:

Both before commencement, and after completion, of PROJECT construction, VTA, in consultation and cooperation with CITY, will perform a pavement condition survey and video recording of the CITY streets established as Truck Haul Routes for the Project that may be affected by construction activities. Pavement condition surveys shall be performed per MTC guidelines/methodology by a Consultant who uses pavement survey technicians certified in MTC StreetSaver Rater Certification Program. The Consultant shall determine the final PCI.

VTA will pay CITY the dollar amount reflecting the decline in the pavement condition (“Decline Amount”), to the extent such decline is directly attributable to construction of the PROJECT. VTA and CITY will establish the Decline Amount for which the PROJECT is responsible (VTA\$) by comparing the impact on the CITY streets attributable to the construction hauling traffic to the public traffic, using the following formulae and the methodology used in SVBX Project, Pavement Restoration Study, as attached in Appendix 1:

$$S_i = (N_{project} \times ESAL_{project}) / (Y \times 365 \times ADT \times t\% \times ESAL_{public} + N_{project} \times ESAL_{project}) \quad (\text{Equation 1})$$

$$VTA\$ = cost_i \times S_i \quad (\text{Equation 2})$$

- S_i : percentage of damage to the pavement contributed by the PROJECT on individual road segment
- $N_{project}$ (vehicles): number of PROJECT hauling trucks on street- i .
- $ESAL_{project}$ (no unit): AASHTO Equivalent Single Axial Load (ESAL) factor of PROJECT hauling trucks.
- $ESAL_{public}$ (no unit): AASHTO Equivalent Single Axial Load (ESAL) factor of public trucks.
- ADT (vehicles per day): Average Daily Traffic on street- i .
- $t\%$ (percentage): public truck percentage. (PROJECT traffic is not included).
- Y (years): maintenance period for street- i .
- $cost_i$ (dollars): maintenance cost for a maintenance period (Y) for street- i .

The total VTA\$ must not to exceed \$12,000,000.

City will collect traffic counts (public and PROJECT traffic) and calculate the Si (defined in the equation above) for each roadway type in each haul route and present the findings to VTA for the purpose of ensuring that data collected and calculations are reasonable. City will work with VTA on establishing the methodology for the traffic counts that will be applied to the formula in this section.

- D. In furtherance of the provisions set forth in **Section 8.E** of the Master Agreement, at least ninety-six (96) hours prior to the temporary closure to traffic of all or part of any street, sidewalk, or other public access, VTA will initiate electronic public notification to all residents, schools, and businesses for temporary closure of all or part of any street, sidewalk, or other public access to traffic within 1,000-foot radius of any such closures.

SECTION 3. REIMBURSEMENT OF CITY COSTS

- A. VTA will reimburse CITY for all services including the work of the Project Management Team, Technical Team, and Construction Management Team, including Qualified Professional(s) as well as any payments made to Union Pacific Rail Road (UPRR) for services directly related to review and coordination of an at-grade crossing located at N. Montgomery Street, which crossing will be impacted by the Project. Reimbursement will be paid for the work of technical-level CITY staff only; senior CITY management (department and division heads) will continue to consult on the PROJECT at no cost to VTA. Reimbursement will be strictly limited to services related to the PROJECT. VTA will not advance funds to City for any purpose.
- B. Notwithstanding Item A, the reimbursement of City staff costs associated with any CITY activities related to the permit applications submitted by VTA contractors and their subcontractors on behalf of VTA, including all related signed and sealed construction documents reviews and inspection and testing services will be covered by the permit fees paid by Contractors directly to City. VTA reimbursement of CITY services beyond the requirements of any associated permit fee(s), such as CITY review of Plans and Specifications of the 65% and 95% milestones, will be on the basis of the schedule of fully-burdened hourly rates for each phase. The schedule of fully-burdened hourly rates for Phase 1 is attached as Exhibit B to this Agreement #2. Notwithstanding

any of the foregoing, VTA contractors shall pay applicable City fees concurrently with any permit applications submitted to the City and VTA shall be fully responsible in the event VTA contractors' fails to make any timely payments to the City.

- C. Due to the long duration of the PROJECT, VTA reimbursement of City services will be separated into different phases. The first phase of the cost reimbursement ("Phase 1") will cover the period from July 1, 2022 through June 30, 2023.
- D. The cost reimbursement amount and the schedule of fully-burdened hourly rates for subsequent phases will be established through amendments to this Agreement #2 ("**Cost Reimbursement Amendments**"). No fewer than nine months prior to the commencement of the fiscal year in which a Cost Reimbursement Amendment becomes effective, VTA will provide CITY with a schedule of design submittals and inspections for the purpose of allowing CITY to identify the required resources and establish costs for its design reviews and inspections. The parties will negotiate in good faith to complete Cost Reimbursement Amendments bi-annually.
- E. CITY will maintain a separate accounting of staff time directly attributable to the PROJECT.

SECTION 4. TIME OF PERFORMANCE

The Parties acknowledge that timely performance of services is essential to maintaining the overall PROJECT schedule and that Parties will work in a collaborative manner to minimize any delays. VTA will make every reasonable effort to ensure that contractor submittals are complete, ready for review, and submitted to CITY as scheduled, and CITY will make every reasonable effort to provide timely and complete review comments, as set forth in Exhibit A.

SECTION 5. MISCELLANEOUS

- A. Waiver: The failure of either Party to insist upon the strict performance of any of the terms, covenants and conditions of this Agreement #2 will not be deemed a waiver of any right or remedy that either Party may have, and will not be deemed a waiver of that Party's right to require strict performance of all of the terms, covenants, and conditions thereafter.

- B. Amendments: Future amendments to this Agreement #2 will be processed in writing by agreement of the Parties. Mutual consent shall be reached through negotiations. Notice of either Party's desire to amend this Agreement #2 must be provided at least ninety (90) calendar days before the desired effective date of such amendment.

- C. Term: Notwithstanding the provisions of the Master Agreement, the term of this Agreement #2 will commence retroactively on July 1, 2022 and will continue through December 31, 2030.

- D. Termination: Notwithstanding the provisions of the Master Agreement, either Party may terminate this Agreement #2 at any time, for any reason, upon giving sixty (60) calendar days written notice to the other party.

- E. Final Invoice: Within thirty (30) calendar days after termination of this Agreement #2, CITY must submit a final invoice for expenses it has incurred as of the effective date of the termination. VTA must pay such final invoice within thirty (30) calendar days after receipt.

Signatures of Parties on following page.

This Agreement #2 is made and entered into as of the Effective Date.

SANTA CLARA VALLEY
TRANSPORTATION AUTHORITY

carolyn.gonot@vta.org

Email: carolyn.gonot@vta.org
Date: 02/19/2023 GMT

Carolyn Gonot
General Manager/ CEO

APPROVED AS TO FORM:

Victor Pappalardo

Email: victor.pappalardo@vta.org
Date: 02/02/2023 GMT

Victor Pappalardo
Deputy General Counsel

CITY OF SAN JOSE

Sarah Zarate

Email: sarah.zarate@sanjoseca.gov
Date: 02/24/2023 GMT

Sarah Zarate
Director of Administration, Policy,
and Intergovernmental Affairs

APPROVED AS TO FORM:



Approved as to Form:

Attorney
Cameron Day

Cameron Day

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Date: 02/23/2023 GMT

Cameron Day
Deputy City Attorney

EXHIBIT A

SERVICES RELATED TO COORDINATION, DESIGN REVIEWS AND CONSTRUCTION INSPECTION AND TESTING PROJECT ACTIVITIES

I. GENERAL TASK DESCRIPTION:

CITY services under this Agreement consist of four distinct tasks:

- Task 1 – Project Management and Coordination,
- Task 2 – Design Review and Coordination,
- Task 3 – Construction Inspection and Testing Review, and
- Task 4 – Involvement of Qualified Professional.

Task 1 – Project Management and Coordination

For this task, designated CITY staff will provide overall coordination for all aspects of the PROJECT and maintain effective communication among the CITY, VTA and its contractors, consultants and other agencies.

Task 2 – Design Review and Coordination

For this task, designated CITY staff will participate in project coordination meetings to coordinate and perform design review of VTA contractors' deliverables submitted by VTA, including review of Plans and Specifications, showing work to be performed on, or directly affecting, CITY Facilities. VTA or its contractors will set up meetings with the CITY for design review submittals, discussion of details, schedules, and timeframes. As required, VTA or its contractors will schedule joint comment resolution meeting(s) with the CITY to discuss responses to comments within ten (10) working days of receipt of the comments and to determine the review comments to be incorporated into the PROJECT. Meeting notes of the design review comment resolution meetings will be transmitted to the CITY within fifteen (15) working days and will be included in any follow-on design submittal package affecting CITY Facilities.

Upon receipt of the submittals, the Project Management Team will distribute the deliverables to the different CITY reviewers, review the submittals, meet with the CITY reviewers as needed, and prepare a set of review comments as further set forth in **Section 3.B** of Agreement #1 and **Section 7.C** of the Master Agreement. CITY will return consolidated comments to VTA, in the time as set forth in **Section 3.B.3** and **Section 3.B.4** of Agreement #1.

VTA will provide the CITY with ten (10) working days' notice, barring reasonable unforeseen issues, prior to submission of Plans and Specifications pursuant to this Task in order to allow the CITY to mobilize review forces.

Task 3 – Construction Inspection and Testing Review and Coordination (Not Applicable to Phase 1)

Designated CITY staff will participate in coordination and review of Inspection and Testing results submitted by VTA for the modifications, relocations, and/or removals of CITY Facilities within the CITY's right-of-way. VTA will set up meetings with the CITY for inspection and testing result submittals that will occur during construction for each PROJECT contract package so the Parties can discuss details, schedules, and timeframes.

Upon receipt of the test results and construction documentation submittals, Project Management Team will distribute the deliverables to the different CITY reviewers, review the submittals, meet with the CITY reviewers as needed, and prepare a set of review comments. CITY will return consolidated comments to VTA within the timeframe as defined in **Section 2** of this Agreement #2. Designated CITY staff will coordinate any conflicting issues within CITY.

VTA will provide the CITY with ten (10) working days' notice, barring reasonable unforeseen issues, prior to scheduling an inspection and submission of test results pursuant to this Task in order to allow the CITY to mobilize its inspection and review forces.

Task 4 – Involvement of Qualified Professional(s)

For this task, designated CITY staff will engage Qualified Professional(s) to review the agreed-upon PROJECT designs and design changes along with providing construction management and

inspection related to the PROJECT, as set forth in **Task 2** and **Task 3** above, when expertise(s) is not currently available within CITY. For purposes of this task, CITY will use Fugro USA Land Inc. (**Fugro**) and Union Pacific Railroad (UPRR) as its Qualified Professionals on this Task (unless the Parties agree otherwise in writing). These Qualified Professionals have the required subject-matter expertise in geotechnical and railroad operation matters respectively, to provide the required services under this task. If CITY finds that additional subject-matter expertise is required, for this task, CITY will review its findings with VTA. If both parties agree, in writing, that retention of such additional Qualified Professional(s) is required, CITY will engage such Qualified Professionals(s) and VTA will reimburse CITY for costs thereof as further set forth in Section 3 of this Agreement #2.

Upon receipt of the submittals, Project Management Team will distribute the deliverables to the Qualified Professional(s), who will review the submittals, meet with the CITY reviewers as needed, and prepare a set of review comments. The Qualified Professional(s), in coordination with the CITY, will return consolidated comments to VTA, in the time as set forth in **Task 2** and **Task 3** above.

Participation in Fire Life Safety Committee (Task 2 and Task 3)

As part of Task 2 and Task 3, representatives from CITY's first responders will participate in the PROJECT Fire Life Safety and Security Committee established by VTA.

II. CITY RESPONSIBILITIES

In performing the above services, CITY must:

- A. Provide a two-person team composed of one Senior Manager and one Project Engineer from CITY staff ("**Project Management Team**") to be the main point of contact for coordination and communication of CITY input into the development of the PROJECT.
- B. Provide a Technical Team as needed, composed of CITY staff ("**Technical Team**") or consultants with a designated team leader to support internal CITY review of PROJECT deliverables by affected CITY departments. CITY will convene the Technical Team, *ad*

hoc, for the duration of Agreement #2 for the purposes of resolving specific but unforeseen issues associated with the scope described in this Exhibit A. VTA will reimburse hourly staff or consultant costs of persons participating on the Technical Team, as specified in Exhibit B.

- C. Provide a construction inspection and testing team (“**Construction Management Team**”), as needed, composed of CITY staff or consultants with a designated team leader to support internal CITY review of, and coordinate Inspection and Testing results for, the modifications, relocations, and/or removals of CITY Facilities within the CITY’s right-of-way. CITY will convene the Construction Management Team, *ad hoc*, for the duration of Agreement #2 for the purposes of resolving specific but unforeseen issues associated with the scope described in this Exhibit A. VTA will agree to reimburse hourly staff or consultant costs incurred in the work of the Construction Management Team, as specified in Exhibit B.
- D. Convene regular, but not less than quarterly, meetings of an Executive Committee composed of CITY staff from the CITY Manager’s Office and key department directors or deputies to provide timely and consolidated input to VTA on PROJECT issues that affect CITY interests.

III. ADDITIONAL VTA RESPONSIBILITIES

VTA must hold periodic meetings for assessing the progress of PROJECT issues that affect CITY interests as they arise, and provide pertinent PROJECT information to CITY in a timely fashion. VTA will be responsible for all advance notifications to the public for work associated with the PROJECT. The notification distribution area must be reviewed and approved by CITY. PROJECT information and Construction notifications may be provided in multiple formats including, electronic mail, PROJECT website, social media, and on-street portable changeable message boards. All signage not related to traffic controls or noise control must be approved by both CITY and VTA. VTA will design, procure, and install all wayfinding signage relating to the PROJECT based on the approved design. VTA will maintain all signage, including signage related to traffic and noise control, detours, and business promotion, in a neat, clean, presentable manner and free of dirt, graffiti, dents, or tears. If CITY identifies signage in which its appearance does not meet

such criteria, VTA must, to the extent reasonably practicable, replace any signage within twelve (12) hours after notification from CITY.

EXHIBIT B

SCHEDULE OF HOURLY RATES AND BUDGET

- A. CITY's fully-burdened hourly billing rates for the period of July 1, 2022 through June 30, 2023 that will be used in calculating the budget for Phase 1 are specified below:

Task 1 – Project Management and Coordination

<u>Job Category</u>	<u>Hourly Billing Rate (\$/hour) in FY22-23</u>
Associate Engineer	\$219.64
Senior Engineer	\$272.22
Parking Manager	\$178.29
Public Information Rep I/II	\$109.05
Public Information Manager	\$177.31
Principal Engineer	\$273.48
Analyst I/II	\$144.36
Senior Transportation Specialist	\$244.56
Engineer I/II	\$204.33
Principal Planner	\$130.28
Deputy Fire Chief	\$268.45
Police Captain	\$183.50

Task 2 – Design Review and Coordination

<u>Job Category</u>	<u>Hourly Billing Rate (\$/hour) in FY22-23</u>
Engineer I/II	\$204.33
Associate Engineer	\$219.64
Senior Engineer	\$272.22
Public Information Rep I/II	\$109.05
Public Information Manager	\$177.31
Senior Transportation Specialist	\$244.56
Associate Transportation Specialist	\$139.85
Transportation Specialist	\$119.11
Parking Manager	\$178.29

Program Manager	\$161.48
Principal Engineer	\$273.48
Structure/Landscape Design I/II	\$127.90
Construction Manager	\$232.76
Principal Construction Inspector	\$188.00
Senior Construction Inspector	\$171.39
Principal Planner	\$130.28
Planner IV	\$130.22
Planner III	\$110.31
Deputy Fire Chief	\$268.45
Police Captain	\$183.50
Parks Manager	\$133.94

Task 3 – Construction Inspection and Testing Review and Coordination (Not Applicable for Phase 1)

Task 4 – Qualified Professional(s)

Geotechnical Services

<u>Firm</u>	<u>Budget (\$) in FY22-23</u>
<u>Fugro USA Land Inc.</u>	\$250,000

Union Pacific Railroad Related Services

<u>Firm</u>	<u>Budget (\$) in FY22-23</u>
Union Pacific Railroad	\$200,000

- B. Based on the CITY’s estimate for part-time salary and benefits for nineteen (19) positions and the Qualified Professionals for fiscal year 22-23, the total reimbursable expenses to be paid by VTA to CITY for Phase 1 under this Agreement #2 must not exceed One Million Three Hundred Thousand Dollars (\$1,300,000), subject to the provisions set forth in **Section 3.A** of this Agreement #2.

APPENDIX 1

**SVBX PROJECT, PAVEMENT RESTORATION STUDY
FEBRUARY 26,2020**



SVBX PROJECT

Pavement Restoration Study

February 26, 2020
FINAL

1. Background

The Silicon Valley Berryessa Extension (SVBX) project by VTA is a 10.2-mile extension of the existing BART rail transit system from Warm Springs station in Fremont through the City of Milpitas to Berryessa station in the City of San Jose. The project will be constructed by VTA and operated by BART. The design-build contractor prepared traffic management plans showing truck haul routes and obtained permits from the City. These construction hauling permits⁽¹⁾ were obtained from the City of San Jose (CSJ) in 2014/2015. The hauling route map (from CSJ) is shown in Figure.1.

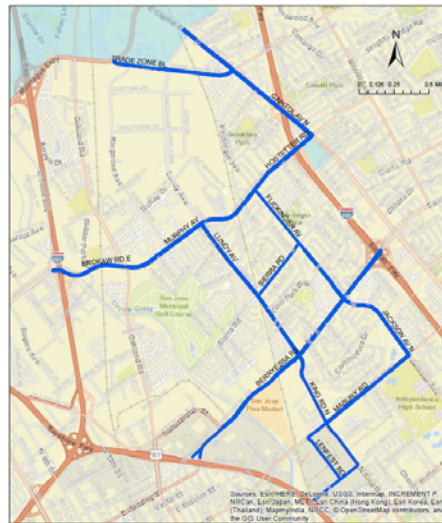


Figure.1 Hauling route map (from CSJ)

In the master agreement between VTA and CSJ (2010)⁽²⁾, section 8.G. stated that “.....VTA and CITY agree that, in accordance with the MTC PCI Index, VTA will pay CITY the Dollar Amount reflecting the decline in the PCI directly attributable to construction of the PROJECT.....”

In November, 2019, CSJ sent VTA the costs of completed pavement restoration projects and estimated costs of remaining paving work (referred to CSJ Spreadsheet in this report) as a starting point to discuss the amount directly attributable to the SVBX project and the dollar amount VTA is responsible for. In this study, Equivalent Single Axial Load factor (ESAL) is used to calculate the amount contributable to SVBX project.

2. Equivalent Single Axial Load factor

In order to assess the impact on the CSJ haul routes directly attributable to construction of the project, a method of comparison between total public traffic and SVBX construction traffic was required. The AASHTO Equivalent Single Axial Load (ESAL) was selected as the baseline unit for comparing relative pavement impacts of various traffic types with varying load and axle configurations. ESALs were selected for characterizing traffic loading over methods using axle load spectra based on the general nature of our comparison and the data available

ESAL is a numerical factor that expresses the relationship of a given axle load (typically 18,000 lbs) to another axle load in terms of the relative damage to the pavement structure (asphalt and concrete pavements). Project ESAL factors were developed based on Appendix D of AASHTO Guide for Design of Pavement Structures (1993)⁽³⁾, documented project data, and the assumptions detailed below:

Parameters used in development of project specific ESAL factors:

- Traffic count data – Traffic count data was based on Average Daily Traffic (ADT) data provided by the City of San Jose ArcGIS Map Server Layer DOT_AverageDailyTraffic⁽⁴⁾
- Estimated number of heavy vehicles – The percentage of ADT associated with heavy vehicles was estimated based on the FHWA functional classification of the roadway.
- Project Load Equivalency Factor – A Load Equivalency Factors (LEF) for the SVBX project specific vehicle type listed below was based on the values available in Appendix D of AASHTO Guide for Design of Pavement Structures (1993):

End-dump, semi-trailer (Figure.2) is the main type of SVBX hauling truck:

- Gross Vehicle Weight (GVW) – 80,000 lbs (20 tons vehicle weight, 20 tons capacity)
- Number of Axles – 5 axles
- Axle Loads (see Table.2)
 - 12 kips – single axle load (front axle) LEF=0.26
 - 34 kips – tandem axle load (trailer axles, 2 sets of 2 axles) LEF=1.11
 - Calculated ESAL value, $ESAL_{SVBX}=2.48$ ($=0.26+1.11 \times 2$)



Figure.2: SVBX Major Hauling Trucks

Axle Type (lbs)	Axle Load		Load Equivalency Factor (from AASHTO, 1993)	
	(kN)	(lbs)	Flexible	Rigid
Single axle	8.9	2,000	0.0003	0.0002
	44.5	10,000	0.118	0.082
	62.3	14,000	0.399	0.341
	80.0	18,000	1.000	1.000
	89.0	20,000	1.4	1.57
	133.4	30,000	7.9	8.28
Tandem axle	8.9	2,000	0.0001	0.0001
	44.5	10,000	0.011	0.013
	62.3	14,000	0.042	0.048
	80.0	18,000	0.109	0.133
	89.0	20,000	0.162	0.206
	133.4	30,000	0.703	1.14
	151.2	34,000	1.11	1.92
	177.9	40,000	2.06	3.74
222.4	50,000	5.03	9.07	

Assumptions

- Terminal serviceability index (p_t) = 2.5
- Pavement structural number (SN) = 3.0 for flexible pavements
- Slab depth (D) = 9.0 inches for rigid pavements

Table.1: AASHTO 1993 Load Equivalency Factor (LEF)

- ESAL factors for public, non-SVBX traffic were based on the values in Table.2.

Class	Type	Description	Typical ESALs per Vehicle
1	Motorcycles	All two- or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handle bars rather than wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles. This vehicle type may be reported at the option of the State.	negligible
2	Passenger Cars	All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.	negligible
3	Other Two-Axle,	All two-axle, four tire, vehicles, other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, and carryalls. Other two-axle, four-tire single unit vehicles pulling recreational or other light trailers are included in this classification.	negligible
4	Buses	All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. All two-axle, four-tire single unit vehicles. Modified buses should be considered to be a truck and be appropriately classified.	0.57
5	Two-Axle, Six-Tire, Single Unit Trucks	All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., having two axles and dual rear wheels.	0.26
6	Three-Axle Single Unit Trucks	All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., having three axles.	0.42
7	Four or More Axle Single Unit Trucks	All trucks on a single frame with four or more axles.	0.42
8	Four or Less Axle Single Trailer Trucks	All vehicles with four or less axles consisting of two units, one of which is a tractor or straight truck power unit.	0.3
9	Five-Axle Single Trailer Trucks	All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.	1.2
10	Six or More Axle Single Trailer Trucks	All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.	0.93
11	Five or Less Axle Multi-Trailer Trucks	All vehicles with five or less axles consisting of three or more units, one of which is a tractor or straight truck power unit.	0.82
12	Six-Axle Multi-Trailer Trucks	All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.	1.06
13	Seven or More Axle Multi-Trailer Trucks	All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.	1.39

Table 2. FHWA Vehicle Classification (from FHWA, 2001[2])

3. Percentage of damage to the pavement by SVBX Project

Using ESAL factors, percentage of damage to the pavement contributed by SVBX hauling trucks is calculated on individual road segment using Equation.1. Top of the equation represents the relative damage to the pavement contributed by SVBX trucks; bottom of the equation represents the relative damage to the pavement by the total traffic of trucks (sum of non-SVBX trucks and SVBX trucks). The impact of non-heavy vehicles is ignored.

$$S_i \% = \frac{N_{SVBX} \times ESAL_{SVBX}}{(Y \times 365 \times ADT \times t \% \times ESAL_{non-SVBX}) + (N_{SVBX} \times ESAL_{SVBX})} \quad \text{(Equation.1)}$$

- $S_i\%$: percentage of damage to the pavement contributed by SVBX on individual road segment.
- N_{SVBX} : number of SVBX hauling trucks on individual road segment calculated based on the permits obtained from City of San Jose. If the road segment is two-way (i.e. no “SB” or “NB” noted in the CSJ Spreadsheet), hauling trips in both directions are included.
- $ESAL_{SVBX}$: ESAL factor of SVBX hauling truck as determined in Section-2.1.
- $ESAL_{non-SVBX}$: ESAL factor of non-SVBX truck (**0.7**). Calculated as the average of class4 to class13 in Table.2.
- $t\%$: percentage of trucks. **2%** is used as suggested for “Truck Percentage of Local Commercial and Minor Collector” in Street Design Standards (Sacramento)⁽⁵⁾.
- Y : number of years between last treatment (“TREATMENT&YEAR” column in CSJ spreadsheet) and next treatment (“Treatment Needed” column in CSJ spreadsheet). Conservatively assumed to be done in 2020). The reason to include Y in the calculation is that all vehicles on the road after last treatment are attributable to the road damage and the cost of next treatment.

If the last treatment was in/after 2013 and no next treatment is needed, Y=the year of last treatment–2010, by assuming there was a treatment completed in 2010. This assumption is conservative since the road damage by the traffic before 2010 is ignored

For the case of “CAPITAL AV N” in which last treatments are not listed and next treatments are needed, Y=10 years is assumed, by assuming, similarly, last treatments were completed in 2010.

- *ADT*: approximate Average Daily Traffic (2005-Now) per ArcGIS. Note that *ADT* from ArcGIS is measured in two-ways, so if the road segment is one-way (i.e. “SB” or “NB” noted), *ADT* used in the calculation is halved.

4. Dollar Amount Attributable to VTA

The dollar amount attributable to VTA is calculated as:

$$VTA\$ = \sum S_i\% \times (cost1 + cost2) \quad \text{(Equation.2)}$$

S%: percentage as calculated in Section-3 for each road segment.

cost1: cost of last treatment (“*Actual Cost of Complete Project*” column in CSJ spreadsheet).

cost2: cost of next treatment (“*Estimated Cost*” column in CSJ spreadsheet).

5. Results

The calculation shows that the cost directly attributable to VTA is **\$233,752.00**. Calculation sheet is attached in Appendix A.

Appendix

Appendix A: Calculation Sheet

Appendix B: Email between VTA and the City

Appendix C: Parameters

References

1. CSJ SVBX Haul Route Permits
2. Master Agreement Between The Santa Clara Valley Transportation Authority And The City of San Jose Relating to The Silicon Valley Rapid Transit Program Berryessa Extension Project, June 2010. PDCC#: P0501-PW-10-0336.
3. American Association of State Highway and Transportation Official, Guide for Design of Pavement Structures.
4. (https://geo.sanjoseca.gov/server/rest/services/DOT/DOT_AverageDailyTraffic/MapServer)
5. Section 15 – Street Design Standards. Design and Procedures Manual – City of Sacramento

Gao, Tian

From: Nnam, Martin
Sent: Friday, February 21, 2020 2:40 PM
To: 'Banwait, Manjit'; Lee, Jeff
Cc: Davey, Krishna; Gao, Tian; Giri, Ritu
Subject: RE: DRAFT Pavement Restoration Study_CSJ_R2_20200203

Manjit,
Thanks, we will send the final report next week.

Martin

From: Banwait, Manjit [mailto:Manjit.Banwait@sanjoseca.gov]
Sent: Friday, February 21, 2020 2:13 PM
To: Nnam, Martin; Lee, Jeff
Cc: Davey, Krishna; Gao, Tian; Giri, Ritu
Subject: RE: DRAFT Pavement Restoration Study_CSJ_R2_20200203

Hi Martin,

DOT reviewed the attached and do not have any comments. We look forward to receiving the study.

Have a good weekend!



SEE APPENDIX C

Manjit K. Banwait
Associate Engineer
Development Services
Department of Public Works
City of San Jose

200 East Santa Clara Street, Tower 3rd Floor
San José, California 95113
T.408.793.5301

From: Nnam, Martin [mailto:Martin.Nnam@vta.org]
Sent: Thursday, February 13, 2020 3:01 PM
To: Lee, Jeff <Jeff.Lee@sanjoseca.gov>; Banwait, Manjit <Manjit.Banwait@sanjoseca.gov>
Cc: Davey, Krishna <Krishna.Davey@vta.org>; Gao, Tian <Tian.Gao@vta.org>; Giri, Ritu <Ritu.Giri@vta.org>
Subject: FW: DRAFT Pavement Restoration Study_CSJ_R2_20200203

[External Email]

Jeff,
Following the agreed methodology, attached for City's review are the parameters that will be used in the formula to determine the cost.

Parameters below use constant numbers at all streets:
ESAL_{SVBX}=2.48 (Project ESAL factor)

ESAL_{non-SVBX}=0.7 (Non-project ESAL factor)
t%=2% (Truck percentage)

Parameters below vary by the street:

N_{SVBX} (Number of SVBX trucks determined based on hauling permits)
ADT (Average Daily Traffic – two way)
Y (Number of years)

Please provide comments to this office by Wednesday, February 19, 2020. If you have questions regarding this matter, let me know.

Thanks,
Martin

From: Lee, Jeff <Jeff.Lee@sanjoseca.gov>
Sent: Friday, February 07, 2020 10:21 AM
To: Nnam, Martin <Martin.Nnam@vta.org>; Banwait, Manjit <Manjit.Banwait@sanjoseca.gov>
Cc: Gao, Tian <Tian.Gao@vta.org>; Field, Liz <Elizabeth.Field@vta.org>; Martinez, Jorge <Jorge.Martinez@vta.org>; Davey, Krishna <Krishna.Davey@vta.org>
Subject: RE: DRAFT Pavement Restoration Study_CSJ_R2_20200203

Martin,

DOT Paving have reviewed the methodology and deemed it reasonable and make sense in principle. Please let us know when you will be able to deliver the results to the City? Thank you.

Jeff S. Lee, P.E.

Principal Engineer
City of San Jose
Department of Public Works
Development Services Division
200 East Santa Clara Street, 3rd Floor
San Jose, CA 95113
tel (408) 535-6829

From: Nnam, Martin [<mailto:Martin.Nnam@vta.org>]
Sent: Tuesday, February 4, 2020 10:45 AM
To: Lee, Jeff <Jeff.Lee@sanjoseca.gov>; Banwait, Manjit <Manjit.Banwait@sanjoseca.gov>
Cc: Gao, Tian <Tian.Gao@vta.org>; Field, Liz <Elizabeth.Field@vta.org>; Martinez, Jorge <Jorge.Martinez@vta.org>; Davey, Krishna <Krishna.Davey@vta.org>
Subject: DRAFT Pavement Restoration Study_CSJ_R2_20200203

[External Email]

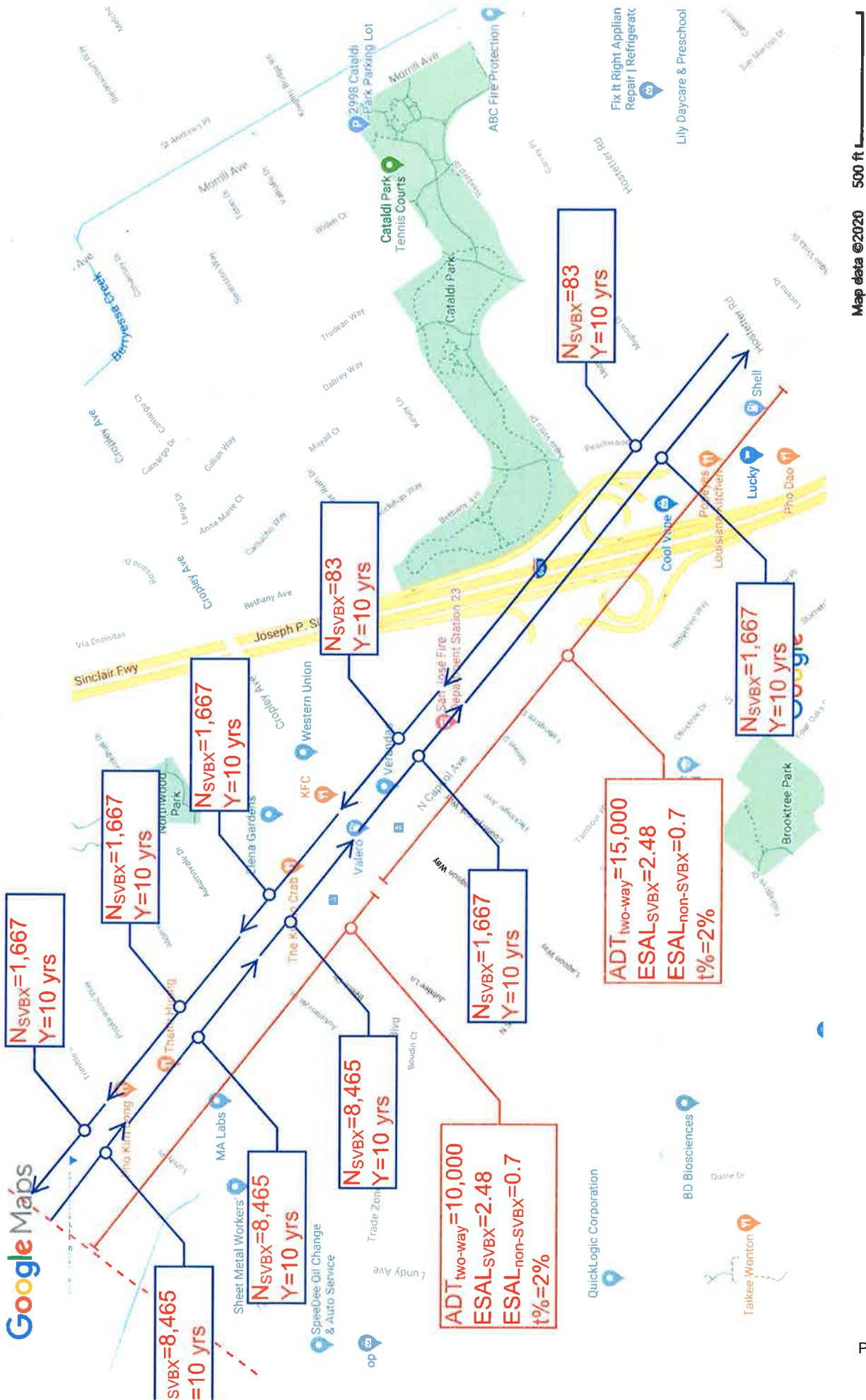
Jeff,
Attached for your review is the pavement restoration study. This exercise is to establish methodology to address the pavement restoration issue. Hence we agree on the methodology, then we can apply necessary data.
Please provide comments to this office by Thursday, February 6, 2020. If you have questions regarding this matter, let me know.
Thanks

Martin

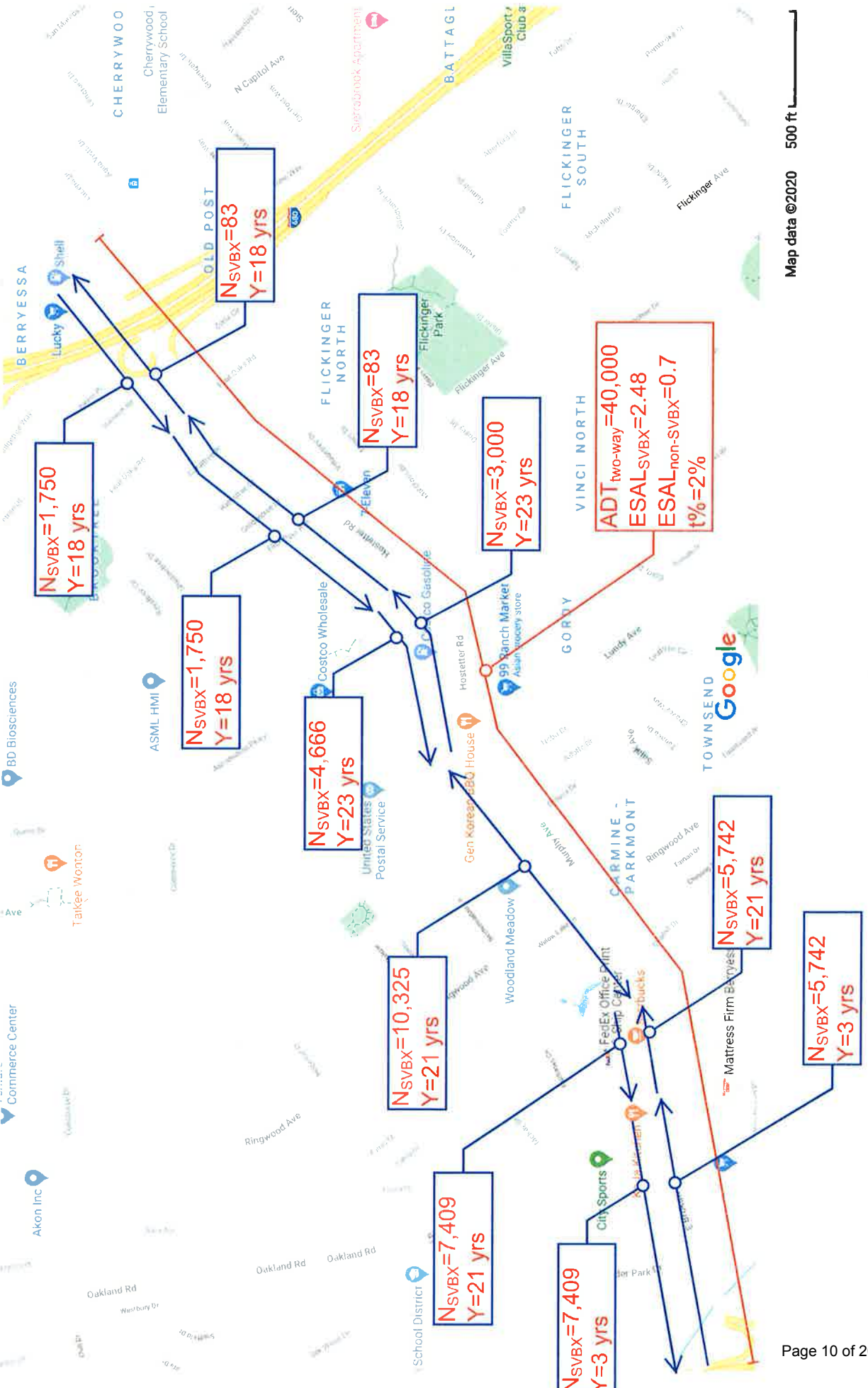
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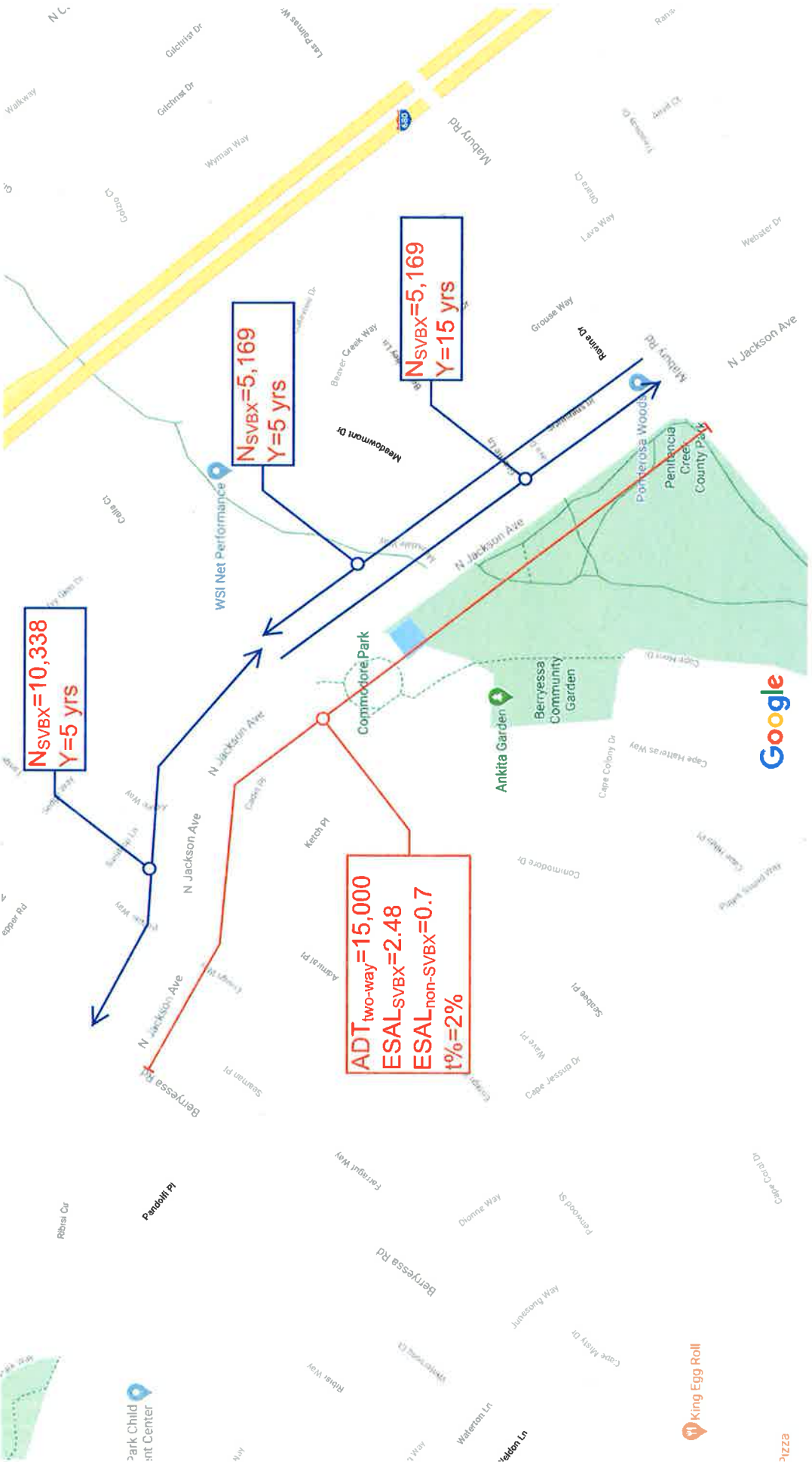
APPENDIX C: PARAMETERS

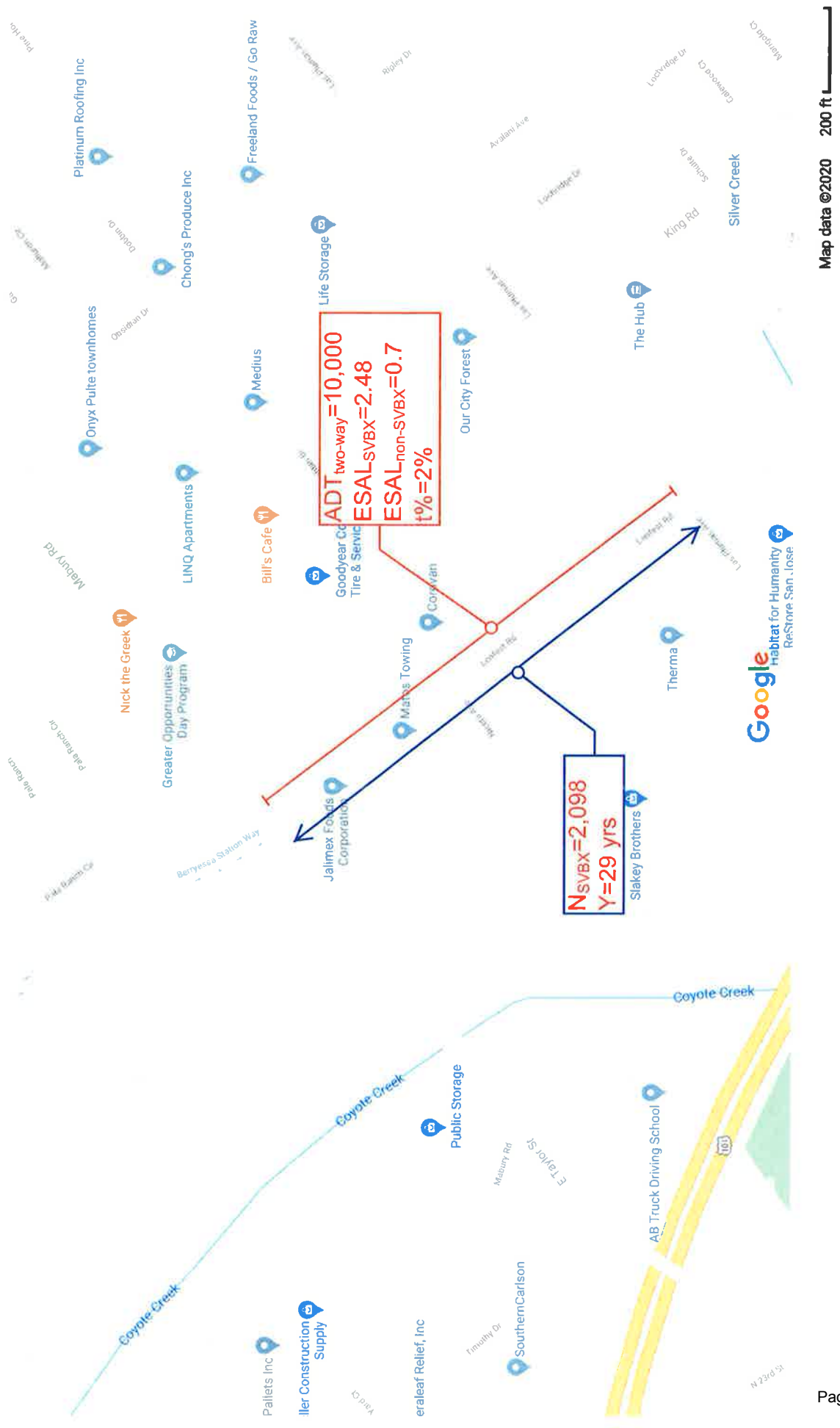


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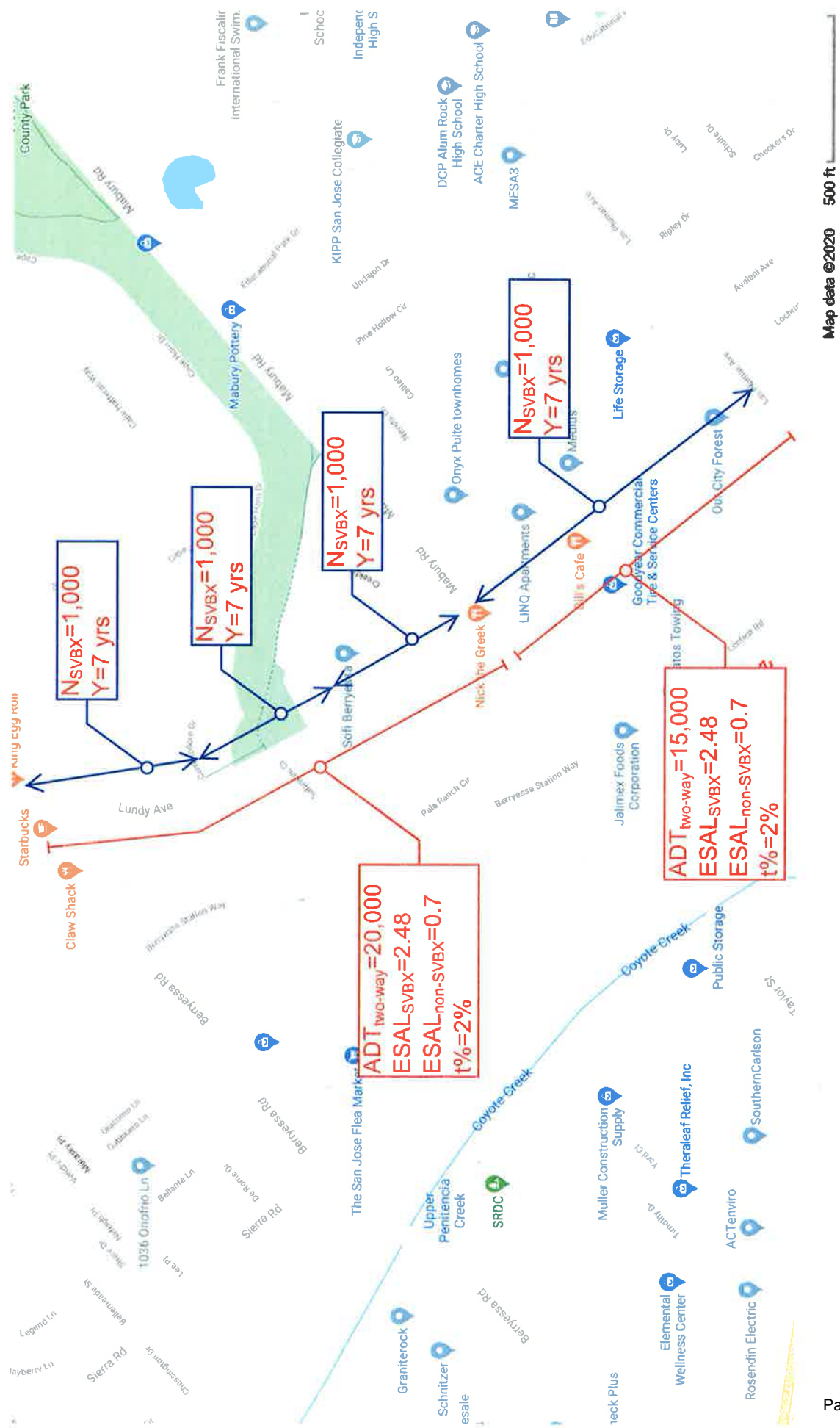


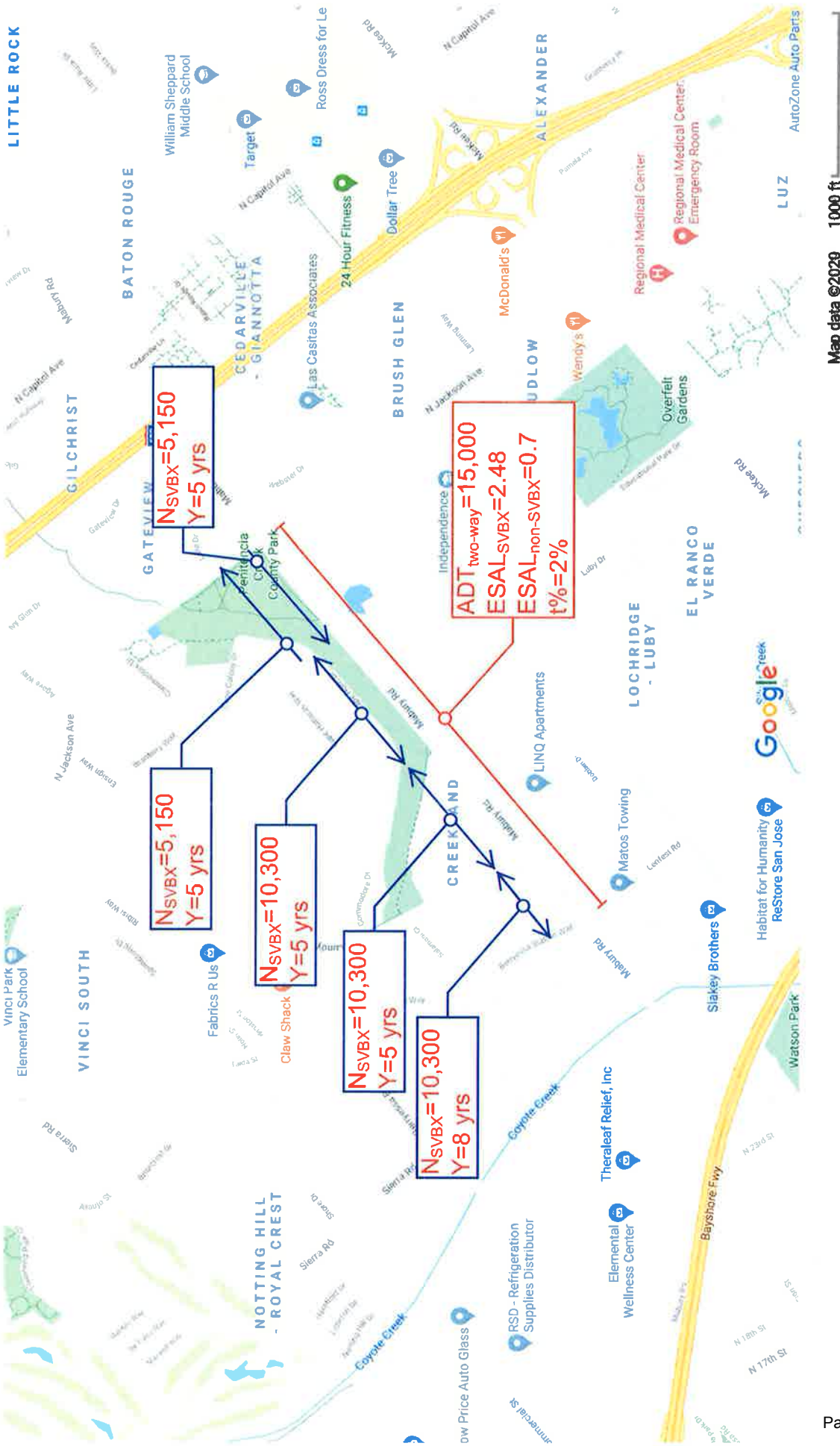


ADT two-way = 10,000
ESALsvbx = 2.48
ESALnon-svbx = 0.7
t% = 2%

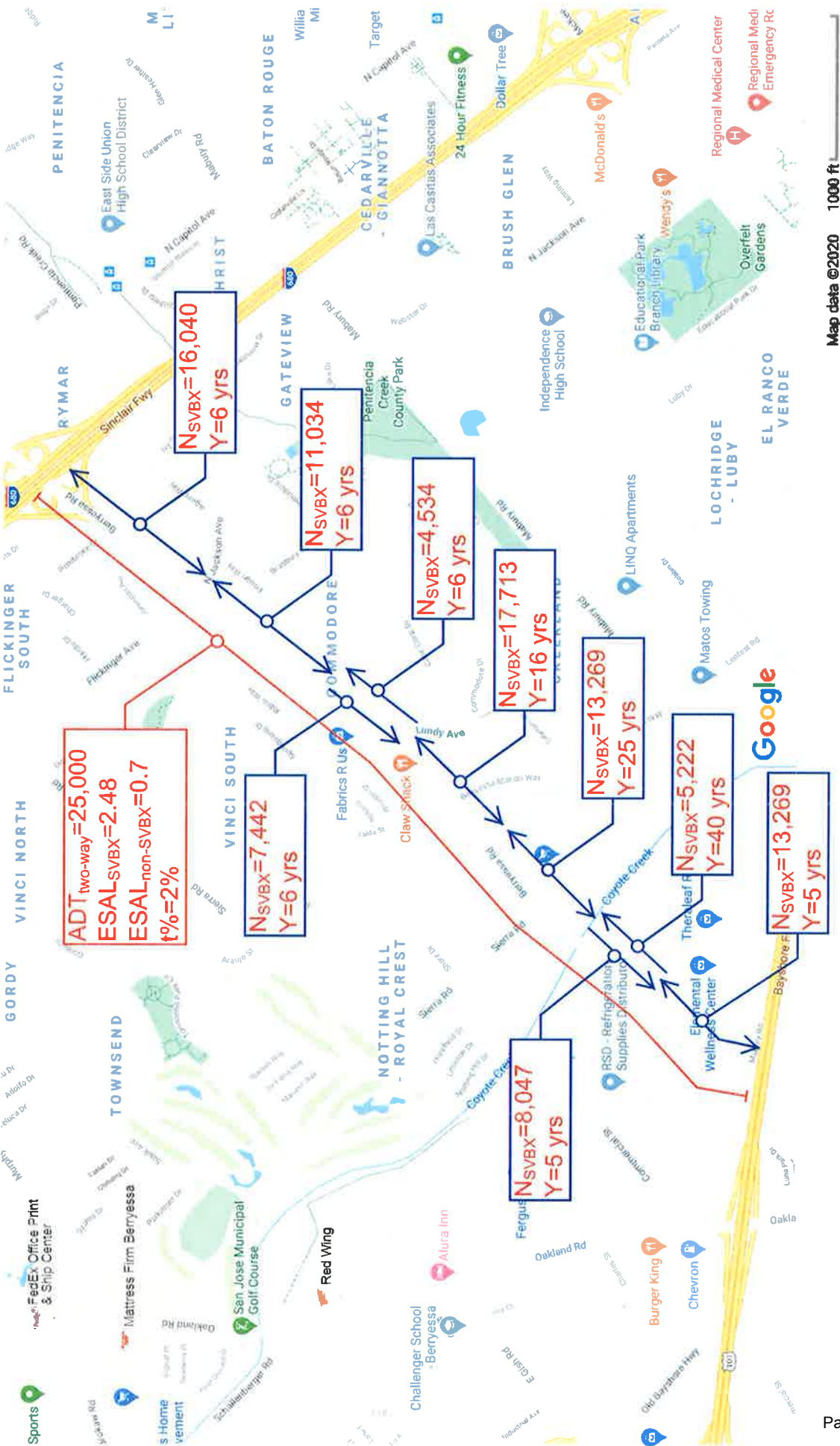
Nsvbx = 2,098
Y = 29 yrs

Map data ©2020 200 ft

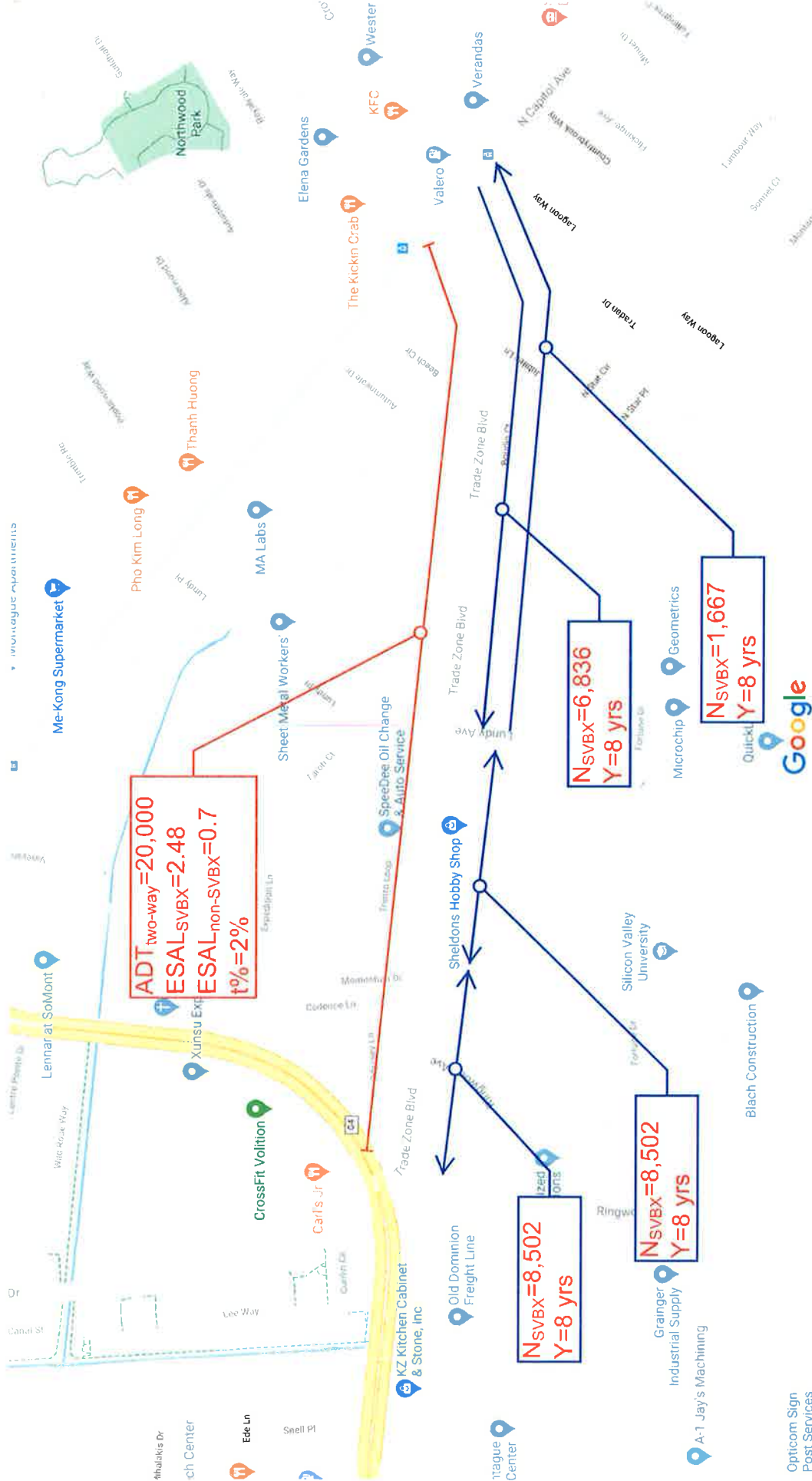




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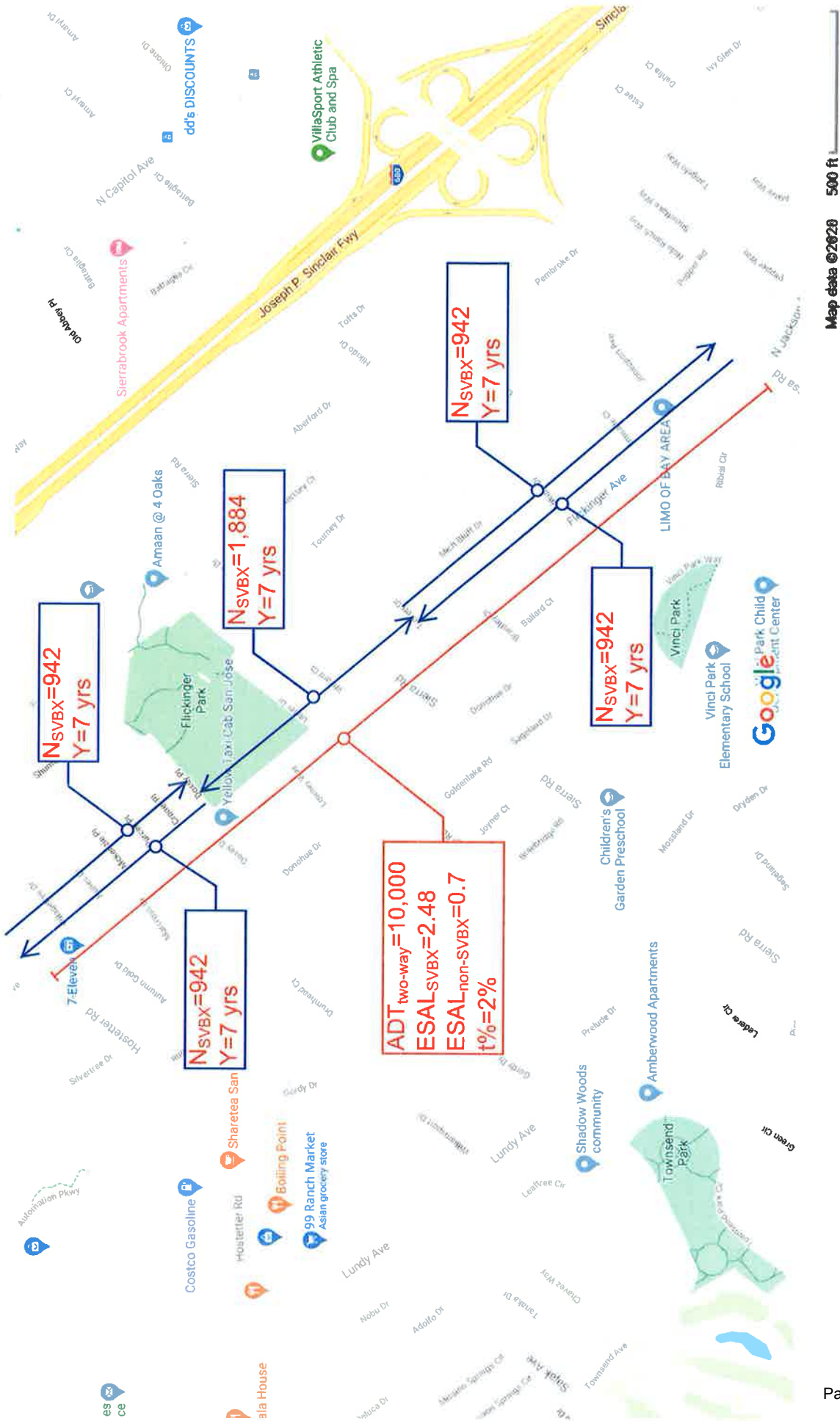


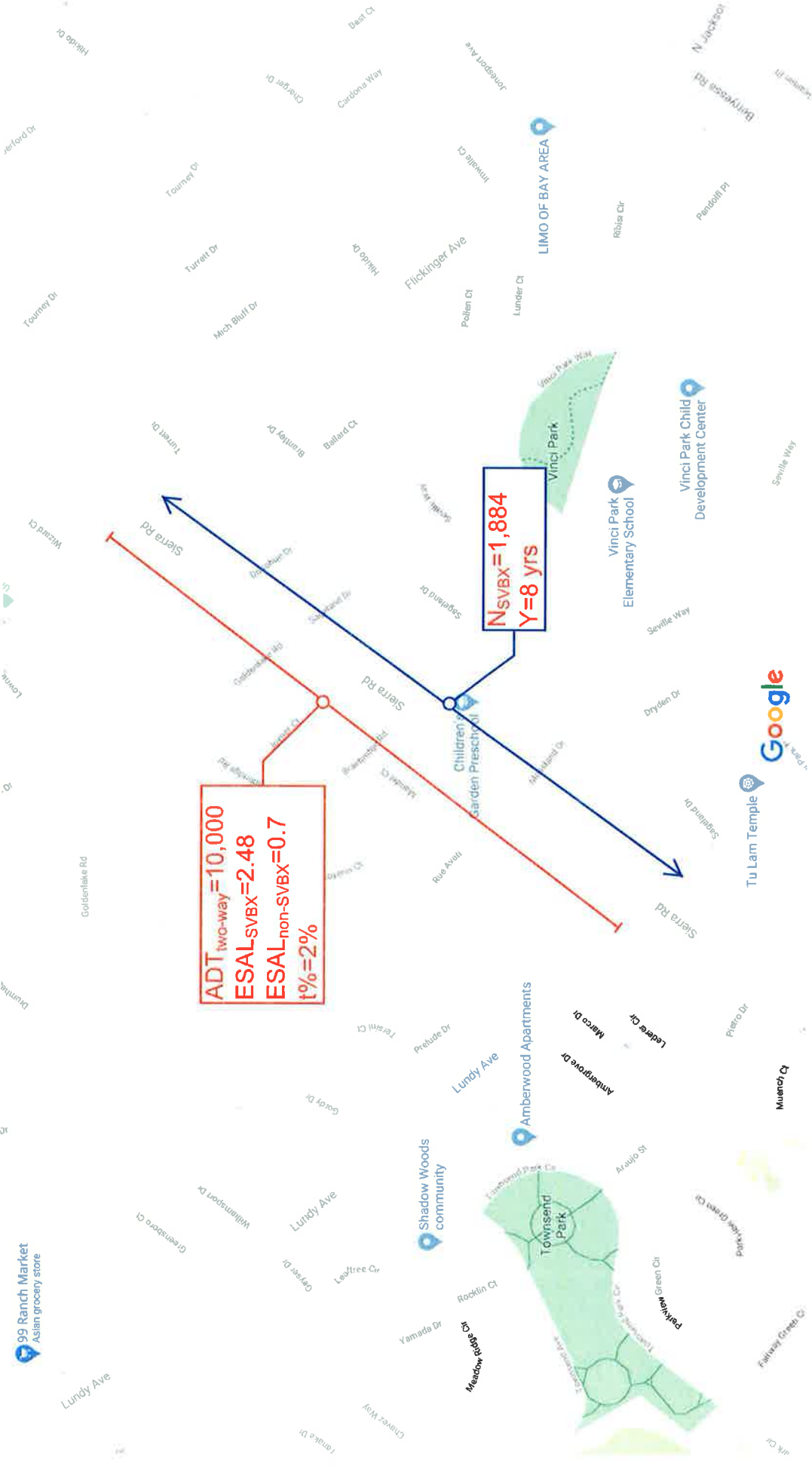
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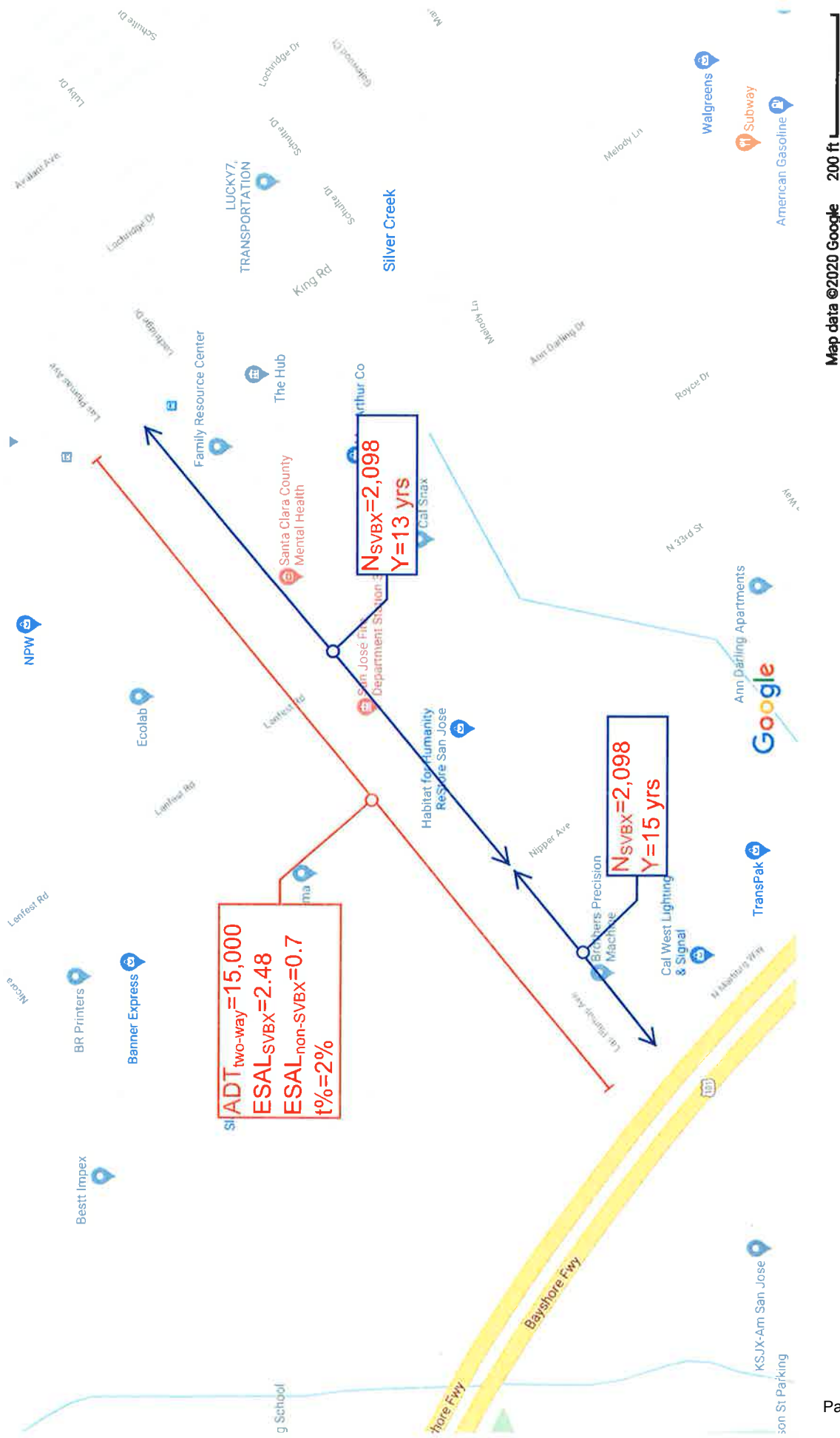


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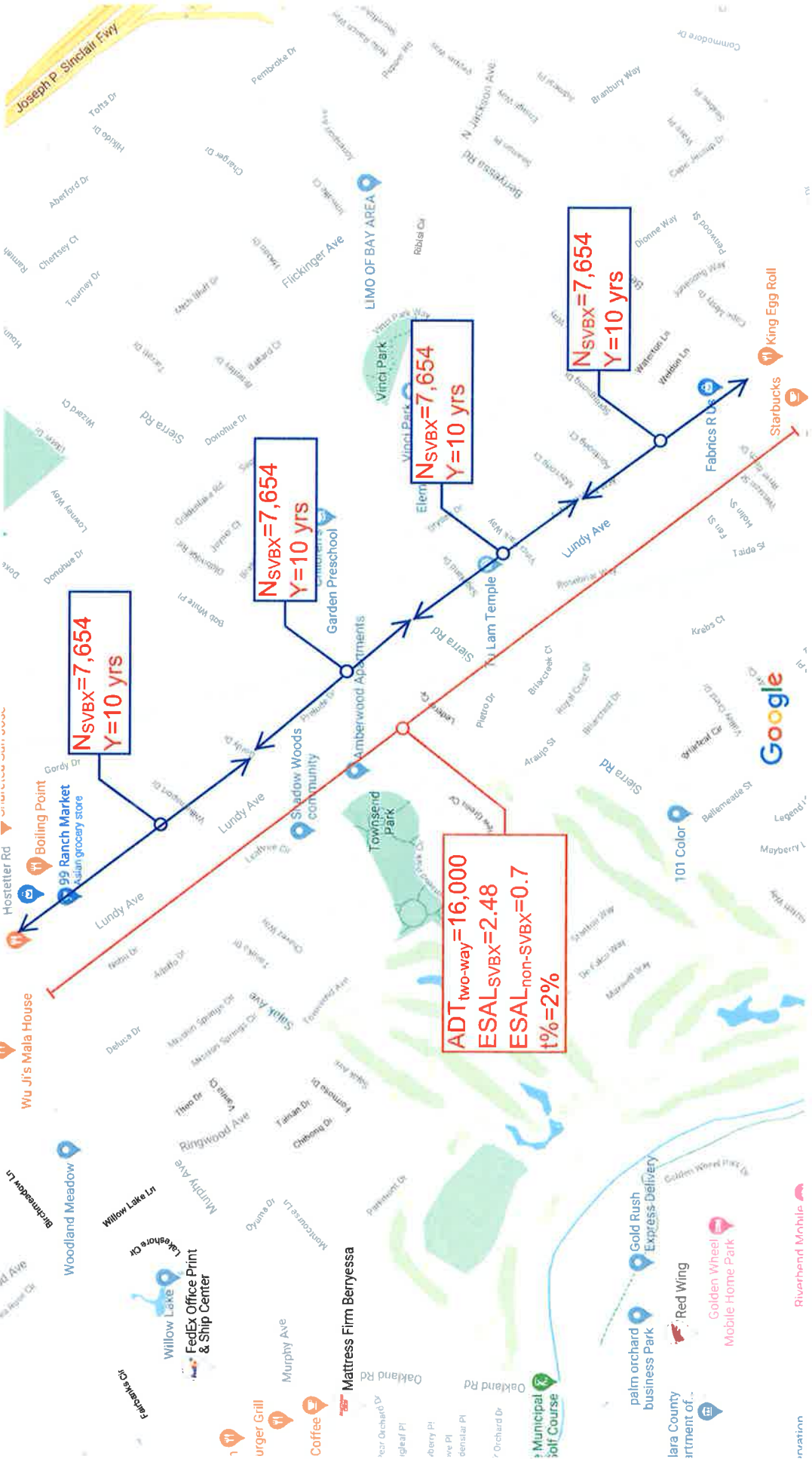








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500 ft

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