



1970 Broadway, Suite 740
Oakland, CA 94612
510.763.2061
www.dksassociates.com

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Rob Bartoli
Planner III
County of San Mateo
455 County Center 2nd Floor
Redwood City, CA 94063

**Subject: Scope of Work for an Intersection Control Evaluation (ICE) for the
Highway 1 & Cypress Avenue Intersection**

A#16x03-101

Dear Mr. Bartoli:

DKS Associates is pleased to submit this scope of work and budget to prepare an Intersection Control Evaluation (ICE) for the Highway 1 and Cypress Avenue intersection. Our approach to complete this project is outlined in the scope of work provided below.

SCOPE OF WORK

Task 1: Conduct Background Research and Collect Data

DKS will review prior study materials (namely the Connect the Coastside and Big Wave Development EIR¹) and gather available information about the study intersection. Base mapping (including right-of-way) for the intersection will be provided by the County. Items such as, crash history, existing and future traffic demand and conclusions from prior analysis will be obtained. DKS staff will review available recent traffic data and traffic study reports including traffic count data that is less than 24 months old. Collision data for the study intersection within the past five years will be obtained from the County and evaluated. This will be used as input for the traffic signal warrant analysis and as part of the ICE to determine the safety benefits of various alternatives.

DKS staff will conduct a field review of the study intersection to document design considerations including operating conditions during peak hours, queue lengths and other site constraints. An assessment of the physical layout including intersection geometrics, channelization, grades, sight distance restrictions, transit stops, parking conditions, pavement markings, roadway lighting, driveways, distance to the nearest traffic control signals, utility poles and fixtures, and adjacent land use will be made.

¹ Much of this initial screening was completed and documented in the April 9, 2015 "Connect the Coastside – Evaluation of Transportation Alternatives to Address Buildout Deficiencies" and in the Big Wave EIR. These analyses ruled out a four-way stop as a viable alternative and provided extensive analysis of a traffic signal at this intersection. Moreover, additional more formal evaluation of a traffic signal has been completed by the developers of the Big Wave project and therefore, this work program does not include any additional evaluation of a traffic signal for this intersection beyond summarizing prior work. In addition, much of the traffic data needed for completing Task 1 has been assembled by either Hexagon for Big Wave, or by DKS for Connect the Coastside and should be used for this task.



DKS will collect 14 hours (6:00 AM-8:00 PM) of weekday vehicle turning movement traffic counts (including vehicles, bicycle, and pedestrians) for use in the traffic signal warrant analysis and intersection capacity analysis. Collecting 14 hours of volume data will ensure we capture the highest eight hours of data for the California MUTCD signal warrant analysis. Historical data provided by the County will be obtained to determine any seasonal variation in traffic volumes at the intersection. Based on this data, a set of seasonally adjusted traffic volumes will be developed for the study intersection.

On SR 1, a bi-directional ten-day (Friday through the following Sunday) volume, speed and vehicle classification count will be conducted for use in determining the 85th percentile speed, a design vehicle and weekend versus weekday traffic volumes. The ten-day period will include Memorial Day weekend (starting the Friday before) in order to ensure peak recreational traffic volumes.

Task 1 Deliverables

- 14-hour intersection turn movement count data at study intersection
- Ten-day bi-directional volume, speed and vehicle classification count on SR 1
- Seasonally adjusted traffic volumes

Task 2: Traffic Signal Warrant Analysis

Using the intersection turn movement count data collected in Task 1 and seasonally adjusted traffic volumes developed in task 1, DKS will perform a traffic signal warrant analysis for the study intersection. Traffic Signal Warrant Analysis will be prepared using the methodology as described in the 2012 Edition of the California Department of Transportation Manual on Uniform Traffic Control Devices (CaMUTCD), Section 4C, Traffic Control Needs Study. It is assumed that warrants 1 through 9 will be analyzed, except for any warrants that are not applicable to this location. A complete list of warrants is shown below:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume
- Warrant 5: School Crossing
- Warrant 6: Coordinate Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection Near a Grade Crossing

Decreasing side street volumes to account for right turning vehicles will be considered as appropriate. Key elements we observed in the field such as vehicle queuing, sight distance constraints, right turning vehicles slipping passed left turning vehicles on the side streets and other observations will be carefully considered.

Task 2 Deliverables

- Draft traffic signal warrant analysis results memorandum



Task 3: Intersection Control Evaluation (ICE)

DKS will assess the suitability of installing a roundabout or a traffic signal at the study intersection through an ICE process. The process will consider numerous criteria when evaluating different intersection control alternatives and will be consistent with the Caltrans ICE Process Informational Guide, published in 2013. We will coordinate with the County to determine the appropriate criteria to be used; and the criteria could include some or all of the following:

- Intersection control delay
- Volume to capacity ratio
- Vehicle queuing
- Motor vehicle safety (conflict points, severity)
- Non-motorized vehicle safety (conflict points, severity)
- Anticipated users (appropriate heavy vehicle, buses, emergency vehicles, school children, elderly, visually impaired, ADA compliance)
- System effects (adjacent traffic control)
- Environmental impacts (land use context)
- Emergency response (response time/control delay)
- Intersection footprint (physical and operational)
- Intersection influence area (driveway closures or impacts)
- Cost (construction and maintenance /operations)
- Right-of-way
- Constructability (Estimated duration of construction, construction phasing, traffic control during construction, other)
- The viability to operate under anticipated horizon year conditions
- Would it “Fit visually into the coastal landscape and reflect community values”

The SIDRA analysis software will be used to evaluate how roundabout alternatives operate in terms of control delay, v/c ratio and vehicle queuing. DKS will use Synchro and Sim Traffic analysis software to perform analysis at the signalized study intersection to determine lane configuration needs and determine operational results in terms of control delay, v/c ratio, level of service and vehicle queuing.

DKS will develop a traffic model to evaluate the level-of-service, average vehicle delay and queuing for each alternative considered. Existing and horizon year AM, PM, and weekend mid-day peak hour intersection analysis will be evaluated using the latest versions of Synchro and SIDRA software. DKS will coordinate with County staff on the development of horizon year forecast volumes to be used in future scenario analysis, specifically regarding project volumes from the nearby planned Big Wave development project. The traffic analysis will include an evaluation and comparison of intersection level-of-service, average delay per vehicle and vehicle queuing for each alternative.



SIDRA, originally developed in Australia, is one of the preferred analysis tools for studying roundabouts accepted by Caltrans. Synchro is an industry standard analysis tool used for the study of signalized and unsignalized intersection control. Both Synchro and SIDRA are capable of analyzing signalized intersections, roundabouts, and stop- and yield-sign controlled intersections accounting for pedestrian crossings. These tools consider the effects of driver behavior and facility geometry to calculate vehicle capacity, vehicle delay and level-of-service. Synchro will be used for alternatives involving unsignalized and signalized intersections. SIDRA will be used to evaluate any roundabout alternatives.

DKS will request crash records (TASAS and TSAR) from Caltrans for a recent three-year period. Using the information provided by Caltrans, DKS will prepare a crash analysis of the existing condition to identify any potential trends and whether this location experiences a higher than the average crash rate along Highway 1 between the Devil's Slide Tunnel and the southern border of Half Moon Bay. A benefit cost analysis of the safety improvements for each alternative will be developed.

DKS will evaluate pedestrian and bicycle safety of the proposed roundabout using current industry practices and recommendations from the FHWA guidelines as published in the *Roundabout: An Informational Guide 2nd Edition*. Elements that will be reviewed will include the placement and orientation of pedestrian and bicycle access points, and vehicle stopping sight distances.

Roundabout and traffic signal alternatives will be compared using the above described ICE process and evaluation criteria that the County has agreed upon, using gap acceptance criteria for modeling to be chosen in consultation with the County and Caltrans. A recommended intersection control strategy (traffic signal, roundabout, or two-way stop) will be determined for the study intersection that is optimum based on the ICE process criteria.

DKS will revise the draft ICE technical memorandum for the three alternatives based on comments from the County and Caltrans.

Task 3 Deliverables

- Draft and final ICE technical memorandum
- Sidra, Synchro and Sim Traffic Analysis of study intersections

Task 4 – Develop Conceptual Layout Plan

DKS will prepare scaled conceptual layouts (approximately 10 percent design showing horizontal but not vertical layout) for each alternative (traffic signal, and up to two roundabout concepts) at the Highway 1 / Cypress Ave intersection. Basemaps will be provided by the County and could incorporate an overlay on both aerial photographs and as-built drawings if appropriate information is provided by the County. Concept layouts for roundabout alternatives will be developed using the TORUS software package and will specify the dimensions of all features of each roundabout, including center island, lane widths, approach lanes, pedestrian crossings, sidewalks, and bike lanes (if appropriate).



Some of the design elements to be considered in the roundabout layouts include:

- Alignments of approaches and entries
- Vehicle paths
- Design vehicles
- Speed consistency through roundabout
- Entry curve
- Right-of-way and utility impacts
- Geometry of center island
- Other items

If appropriate, DKS will use the results from the operational analysis to refine the concept plans. The number of lanes and arrangement (including by-pass lanes, if needed) will be determined based on the results of the existing year and horizon year operational analysis. The concept plans will be context sensitive with consideration to be consistent with other planned *Connect the Coastside* improvements.

For each alternative, DKS will conduct a truck turning template analysis using the Surface Transportation Assistance Act (STAA) design vehicle using the AutoTURN analysis software. The truck turning analysis will confirm that the conceptual plans will comply with the STAA to safely accommodate the largest commercial shipping trucks currently in use.

The conceptual roundabout layouts will be prepared with features consistent with the FHWA guidelines as published in the *Roundabout: An Informational Guide*. These features will consider balancing safety for all users while providing optimal operation performance. Features such as the inscribed circle or ellipse diameter(s), design vehicle swept path, stopping sight distances on both the circulating roadway and at each approach, pedestrian and bicycle amenities, fastest path speed curves, entry approach treatments and proposed signing and striping will comply with current FHWA and industry recommendations.

The conceptual plans will show right of way lines (if provided by the County) as well as the limits of each alternative to be used to approximate the extents of any potential land acquisitions or right of way impacts. DKS will strive to contain the layout within the existing right of way to minimize land acquisitions.

DKS will prepare an engineer's cost estimate of preliminary costs based on the conceptual layout drawings for the three alternatives. This cost estimate will include planning level cost estimates for construction, maintenance, and preliminary right of way acquisition costs of each alternative evaluated. For all alternatives, on-going maintenance costs, societal cost of crashes and right of way costs will be estimated.

DKS will revise the draft conceptual layouts and cost estimates for the three alternatives based on comments from the County and Caltrans.

Task 4 Deliverables:

- Draft and final scaled conceptual layouts (10 percent design) of up to three alternatives (one signalized and two roundabout alternatives) will be provided in Electronic AutoCAD format and PDF files.



- Draft and final preliminary cost estimates (10 percent design) of improvements for three alternatives

Task 5 – Meetings

DKS will facilitate one design charrette meeting with Caltrans and County staff. The design charrette is estimated to be three hours in length and shall occur after the data collection and traffic signal warrant analysis tasks are complete and before significant work has been undertaken on the ICE and conceptual layout tasks. DKS will provide an agenda, materials and meeting minutes for the design charrette.

DKS will facilitate one community meeting to present material regarding the alternatives (including roundabouts). DKS will provide an agenda, materials and meeting minutes for the design charrette. DKS will incorporate community feedback to refine all alternatives considered.

DKS will participate in up to eight conference call check in meetings and up to four in person meetings with County and/or Caltrans staff.

Task 5 Deliverables:

- One design charrette
- One community meeting
- Up to eight conference call check-in meetings
- Up to four in person meetings with County and/or Caltrans staff

Schedule

DKS staff is available to commence this work immediately. We expect delivery of the Draft ICE Technical Memorandum and Draft Scaled Conceptual Layouts (10 percent design) within three months of receiving Notice to Proceed.

BUDGET

The budget estimate for this proposed scope of work is \$54,220 (see Table 1) and is based on the work scope presented in this proposal. Any items not specifically noted in this proposal are excluded from this budget estimate, and would require a written contract modification prior to additional work commencing.

Thank you for the opportunity to prepare this work scope for you. We look forward to working closely with you on this project.

Sincerely,

DKS Associates

Peter L. Coffey

Principal

Cc: Josh Pilachowski, PE -- Project Manager