Request for Proposals (RFP) Addendum #1

City of Torrance | 3031 Torrance Blvd, Torrance CA 90503 | www.TorranceCA.Gov

RFP No. B2016-38	**RFP for Engineering Design Services for Anza Ave Rehabilitation (190th St to Sepulveda Blvd), I-144**

There are no changes to the RFP submittal Due Date, Time or Location:

RFP SUBMITTAL INFORMATION

Proposals may be mailed or hand delivered. No faxed Proposals will be accepted.
Late bids will not be accepted.

Location:	Office of the City Clerk 3031 Torrance Blvd. Torrance, CA 90503
Date:	Monday, September 19, 2016
Time Deadline:	**3:00 P.M. Local (Pacific) Time**

The following changes are hereby incorporated into the subject RFP:

Original Specification	Changed Specification
SECTION 1 – INSTRUCTIONS AND INFORMATION, Prevailing Wage, page 4: **Prevailing Wage:** The State of California Senate Bill 7 (SB7) applies to construction contracts over $25,000 and contracts for alteration, demolition, repair and maintenance over $15,000. There are no exemptions. The contract issued as a result of this RFP is subject to prevailing wages for any classification included in the State's prevailing wage determination. Current prevailing wage determination rates may be found at the State of California Dept. of Industrial Relations website http://www.dir.ca.gov/oprl/DPreWageDetermination.htm	**SECTION 1 – INSTRUCTIONS AND INFORMATION, Prevailing Wage, page 4:** **Prevailing Wage:** The State of California Senate Bill 7 (SB7) applies to construction contracts over $25,000 and contracts for alteration, demolition, repair and maintenance over $15,000. There are no exemptions. The contract issued as a result of this RFP is subject to prevailing wages for any classification included in the State's prevailing wage determination, including but not limited to, surveyors, field soils and materials technicians, and nondestructive testing field technicians. Current prevailing wage determination rates may be found at the State of California Dept. of Industrial Relations website http://www.dir.ca.gov/oprl/DPreWageDetermination.htm
ATTACHMENT 3 SCOPE OF WORK, TASK II – PRELIMINARY DESIGN, Design Topographic Survey, 4th bullet point, page 16: • Provide 0.5 ft contours.	**ATTACHMENT 3 SCOPE OF WORK, TASK II – PRELIMINARY DESIGN, Design Topographic Survey, 4th bullet point, page 16:** • Provide 1.0 ft contours.

ATTACHMENT 3 SCOPE OF WORK, TASK II – PRELIMINARY DESIGN, Pavement Evaluation Review/Design, page 17:

Pavement Evaluation Review/Design

The Consultant must provide a pavement evaluation/analysis report. The first step must be to determine, as accurately as possible, the existing structural section(s) from as-built drawings and other available resources and verifying that information using ground-penetrating radar testing. Then, based on data gathered during utility investigations, ground-penetrating radar testing, visual inspections, and discussions with the City, the Consultant must, when directed by the City, obtain pavement corings at locations determined by the City. The coring data will help corroborate the Consultant's research and also determine the composition and properties of the underlying structural section and soil. For estimating purposes, the Consultant must assume a total of 20 corings.

Based on Traffic Indexes and existing conditions, the final report must provide recommendations for pavement rehabilitation alternatives that should include: localized repair with full-width or edge grind/overlay, pavement reconstruction, slurry seal, and/or other reasonable methods. Consultant must review the report and discuss the recommended pavement rehabilitation alternatives with the City prior to developing the 90% plans. Tasks, in addition to the research and testing described above, must include the following:

- Assess data and evaluate methods of pavement rehabilitation.
- Prepare value engineering estimates with cost estimates for up to three (3) alternatives, including comparisons based on projected life of AC pavement.
- Present and discuss recommendations with City. After concurrence of pavement rehabilitation method by the City, the final limits of removal must be shown on the plans.

ATTACHMENT 3 SCOPE OF WORK, TASK II – PRELIMINARY DESIGN, Pavement Evaluation Review/Design, page 17:

Pavement Evaluation Review/Design

The Consultant must provide a pavement evaluation/analysis report. The first step must be to determine, as accurately as possible, the existing structural section(s) from as-built drawings and other available resources ~~and verifying that information using ground-penetrating radar testing~~. Then, based on data gathered during utility investigations, ~~ground-penetrating radar testing,~~ visual inspections, and discussions with the City, the Consultant must, when directed by the City, obtain pavement corings at locations determined by the City. The coring data will help corroborate the Consultant's research and also determine the composition and properties of the underlying structural section and soil. For estimating purposes, the Consultant must assume a total of 10 corings. As an optional task, the City may request ground penetrating radar testing to supplement the corings to further substantiate the existing pavement sections (description for this optional task is described under Task V on page 22).

Next, the consultant must conduct flexible pavement deflection testing in accordance with California Test 356 to measure the structural adequacy of the existing pavement.

Based on Traffic Indexes, existing conditions, and deflection studies, the final report must provide recommendations for pavement rehabilitation alternatives that should include: localized repair with full-width or edge grind/overlay, pavement reconstruction, slurry seal, and/or other reasonable methods. Recommendations shall be provided for both 10-year and 20-year service life expectancies. Consultant must review the report and discuss the recommended pavement rehabilitation alternatives with the City prior to developing the 90% plans. Tasks, in addition to the research and testing described above, must include the following:

- Assess data and evaluate methods of pavement rehabilitation.

	• Prepare value engineering estimates with cost estimates for up to three (3) alternatives, including comparisons based on projected life of AC pavement (10-year and 20-year service life expectancies). • Present and discuss recommendations with City. After concurrence of pavement rehabilitation method by the City, the final limits of removal must be shown on the plans.
ATTACHMENT 3 SCOPE OF WORK, TASK IV, PROJECT COORDINATION, page 21: **Record Drawings [OPTIONAL TASK]** The Consultant must prepare record drawings following the completion of construction. A red-line set of record drawings will be provided to the Consultant. Consultant must utilize the red-line markups to create record drawings using AutoCAD, and must submit one complete set of mylar plans. Consultant must also provide all electronic files of the record drawings, with associated external reference files, blocks, and plot configurations. Consultant should assume 3 hours of drafting work per design sheet (excluding traffic control sheets) for purposes of the proposal.	**ATTACHMENT 3 SCOPE OF WORK, TASK IV, PROJECT COORDINATION, page 21:** Delete this paragraph in its entirety, as this task is also included under Task V – OPTIONAL TASKS. ~~**Record Drawings [OPTIONAL TASK]**~~ ~~The Consultant must prepare record drawings following the completion of construction. A red-line set of record drawings will be provided to the Consultant. Consultant must utilize the red-line markups to create record drawings using AutoCAD, and must submit one complete set of mylar plans. Consultant must also provide all electronic files of the record drawings, with associated external reference files, blocks, and plot configurations. Consultant should assume 3 hours of drafting work per design sheet (excluding traffic control sheets) for purposes of the proposal.~~
ATTACHMENT 3 SCOPE OF WORK, TASK V – OPTIONAL TASKS, page 22:	**ATTACHMENT 3 SCOPE OF WORK, TASK V – OPTIONAL TASKS, page 22:** Add the following paragraph in its entirety: **Ground Penetrating Radar Testing** To supplement information available from as-built drawings and pavement corings, the City may request the use of ground penetrating radar testing to verify existing pavement structural sections. Ground penetrating radar testing shall be performed continuously along each travel lane within the project limits. [ALSO ADD AN ADDITIONAL LINE ITEM FOR THIS TASK ON THE PROPOSED SCHEDULE OF FEES – ATTACHMENT 4 OF RFP].

Addendum Issued By Order Of,

/s/ Shin Furukawa

Shin Furukawa, P.E.
Engineering Manager
September 12, 2016

The following are responses to questions received by the City:

Question	City's Response
Q1. Is there a proposal page limit?	A1. No.
Q2. If there will be multiple subconsultants utilized, can the proposer submit multiple sheets of page 9?	A2. Yes. Use separate pages for each subconsultant.
Q3. What is the difference between firm references and candidate references as listed on page 10 of the RPF?	A3. Candidate references may apply if references are to be listed for particular individuals within the firm who have done similar work previously while employed with another firm.
Q4. Can we have a list of traffic engineering consultants the City has recently hired on recently completed successful projects?	A4. There is no list.
Q5. What are the limits of work at each end? How much of the 190th and Sepulveda intersections are expected to be surveyed and mapped and is monument preservation required for these two intersections?	A5. The north limit is on Anza Ave at the BCR to 190th St. The south limit is on Anza Ave at the BCR to Sepulveda Blvd. Topographic survey and monument preservation in the intersections will be as needed to facilitate the design of the adjacent roadway and/or as will be affected by nearby construction work.
Q6. Is work on the frontage roads included in the project scope?	A6. No. Where frontage roads exist, work will not extend beyond the landscaped islands.
Q7. Any anticipated right-of-way takes for widening?	A7. The project includes no roadway widening.
Q8. Is environmental clearance work included in the scope of work?	A8. No.
Q9. Has there been a soils investigation previously performed, and if so, can a copy be provided?	A9. Yes, see attached.
Q10. Will traffic control plans be required for taking core samples? We anticipate single lane closures.	A10. Traffic control plans will not be required for the taking of core samples. However, a contractor must use the City of Torrance standards for traffic control for the appropriate lane closure. The City of Torrance Standards can be found at http://www.torranceca.gov/13023.htm

Q11. Will Traffic Control for the Ground Survey of this Project be required at the intersections only or for the entire length of the Project?	A11. Traffic control plans will not be required for the topographic survey. Traffic control, as required, shall be set up in accordance with the City of Torrance Standards and per the CAMUTCD.
Q12. Can we backfill the cores with onsite excavated soils and sand? Can we use rapid-set concrete for pavement repair at the core locations?	A12. Yes to both.
Q13. Is a detailed topographic survey necessary for this project? A detailed survey at 50' cross-sections within the limits of the project will be a high cost and is not a typical task in a pavement rehabilitation project.	A13. Please propose based on the scope described in the RFP. If this task is later deemed excessive or unnecessary, the City will reserve the right to modify the scope and renegotiate the fee for any associated work.
Q14. Will the City be interested in obtaining an Aerial Topo to generate the Base for this Project?	A14. An aerial topo is not required.
Q15. The RFP lists ground penetrating radar and coring for the existing pavement section investigation. We want to confirm that the City wants both procedures performed.	A15. Yes, based on the revised scope of work discussed on pages 2 and 3 of the addendum.
Q16. The scope of work on page 19 "Roadway Rehabilitation Plan and Profile" seems extremely detailed for a pavement rehabilitation project. Given the project budget, we do not anticipate removing and replacing a lot of curb and gutter. Can you confirm the City wants the consultant to prepare profiles for the top of curb?	A16. Please propose based on the scope described in the RFP. If this task is later deemed excessive or unnecessary, the City will reserve the right to modify the scope and renegotiate the fee for any associated work.
Q17. Any known specific areas that would be ADA challenges?	A17. No. This will be determined during the design phase.
Q18. Any drainage problem areas that need attention or remediation?	A18. Consultant to determine based on topographic survey.
Q19. Will there be any phasing or will the entire route be improved at once?	A19. Phasing will be required to allow portions of the roadway to remain open during construction.
Q20. Any businesses, hospitals, etc. along the route that will require 24/7 access?	A20. None known at this time.

Q21. Assuming City staff will keep local business and residents informed and perform outreach education, workshops, mailers, advertising, etc.?	A21. Outreach efforts are not part of the consultant's scope of work.
Q22. What are the funding sources for the project and will the consultant be responsible for assisting the City with submitting reports to the funding agencies?	A22. Gas Tax funds. No assistance is required.
Q23. Who will be performing and reviewing certified payrolls, payment to contractors, etc.	A23. Not part of this RFP.
Q24. Who will be performing construction staking and providing survey control?	A24. Not part of this RFP.
Q25. Who will be performing project construction inspections, oversight?	A25. Not part of this RFP.
Q26. Is temporarily losing parking going to be a game changer for certain businesses along the route?	A26. The City is not aware of any issues.
Q27. Who are businesses/tenants/residences most against this project or is there a lot or public support for the project?	A27. Unknown.
Q28. Any undergrounding of overhead utilities being required?	A28. No.
Q29. Any replacement of underground utilities i.e. storm drain, sewer line replacements or upsizing, for future stubbing?	A29. Only related to traffic signal conduits.
Q30. For the preparation of the base sheets, can the exiting utility (storm drain, sewer, water) depths/inverts be based on City-provided as-builts, or will the depths need to be verified via survey?	A30. Yes. If certain information is missing, then that information may need to be obtained via field survey.
Q31. If there is no underground utility work being performed, what is the reason for the $10,000 utility potholing task?	A31. Utility potholing may be needed, based on the City's preference. The consultant would only charge for actual work performed.

Q32. In the "Utility Potholing" section of the RFP, does the City expect that the marking of utilities is to be completed via Dig Alert? Please confirm that the coordination of Dig Alert of similar service will be within the Consultant's scope of work.	A32. Yes to both.
Q33. Are new street lights being proposed for the entire project or just pockets?	A33. No new street lights are being proposed. Lighting improvements will be installed at existing traffic signals.
Q34. What is the extent of traffic signal pole replacements included in the project?	A34. Traffic signal pole replacements will be two existing Type 15 poles each at the intersections of Halison St, Spencer St, Emerald St and Lenore St (8 poles total). Poles will be replaced with Type 17-2-100 poles.
Q35. Does the City desire full actuation for the existing traffic signals that are currently semi-actuated?	A35. Yes.
Q36. The RFP states that existing loop detection will be converted to video. Will that also include existing advanced loops?	A36. Advanced detection exists at the Del Amo Blvd and Carson St intersections. Yes, proposed video detection zones at the intersections must include the area of the existing advanced loops.
Q37. What kind of landscape work is included in the project scope? Will the anticipated landscape upgrades require separate landscape plans or are they minor in nature and can be part of the street improvement plans?	A37. Landscape work will generally consist of removal of certain existing trees impacting curbs, gutters or sidewalks, planting of trees in vacant parkway locations, and installation of stamped concrete in certain locations within the islands separating the mainline from the service roads. No irrigation work is anticipated. The landscape work can be shown on the street improvement plans.
Q38. Do you anticipate adding any landscaped medians to the existing street sections?	A38. No.
Q39. Does all existing landscaping need to be shown, including tree size and species?	A39. Tree sizes (DBH) need to be shown, but identification of species is not necessary. General locations of shrubbery in the islands need to be shown, so that locations for installation of stamped concrete can be identified.

PAVEMENT INVESTIGATION

Of

ANZA AVENUE

(Sepulveda Boulevard to 190th Street)

Within The

City of Torrance, California

Prepared by: ____________________

STEVEN R. MARVIN
RCE 30659

Client: **City of Torrance**
April 2003

Project No. 29492

TABLE OF CONTENTS

Introduction

Improvement of Anza Avenue from 190th Street to Artesia Boulevard within the City of Torrance is in the final planning stages. Improvement of the roadway will include a combination of reconstruction and resurfacing, combined with possible construction of new median or frontage improvements as required.

The purpose of this investigation is to provide data and independent analysis of the present structural conditions and define or explore various means of possible rehabilitation using in place strength testing, combined with pavement core sampling and laboratory testing.

Based on the present structural integrity of the existing travel lanes, and on projected future traffic use, improvement requirements to meet long term City performance requirements may b e d eveloped. A significant challenge for rehabilitation of the roadway will be effective control or limiting of premature reflective cracking combined with the geometric limitations imposed by existing crown and cross slope.

Scope of Work

Investigation of Anza Avenue included:

- Site Inspection

- In-Place Strength Testing

- Core sampling of the existing pavement including measurement of the
  - Asphalt Concrete Layer Thickness
  - Aggregate Base Layer Thickness (if any)

- Bulk Sampling and Identification of Subgrade Soils
  - Subgrade Moisture Determination
  - Subgrade R-Value Strength Determination

- Engineering Analysis Combining
  - Component Analysis
  - In-place Strength Analysis
  - Site Condition Assessment

- Report Preparation.

Discussion

The investigation performed utilizes pavement core sampling to define the existing section thicknesses, in place strength testing to determine the combined effects of subgrade strength variations, historical traffic use, prior maintenance and resurfacing, laboratory testing to develop predicted subgrade strengths, and subgrade moisture testing to aid in characterizing subsurface conditions. The specific 'hard' data is combined with visual examination of the roadway to develop recommendations for maintenance, rehabilitation or reconstruction.

During the course of combining the many variables associated with pavement performance and pavement rehabilitation, certain design challenges have to be addressed including current grades, crown heights and cross slopes, the impacts on surface grades and elevations for each of the rehabilitation or maintenance alternatives, projected short and long term performance and of course initial and projected long term costs. Balancing the costs and benefits then requires consideration of numerous alternative methods of construction, which along with the costs and benefits include certain risks.

The risks of pavement reconstruction are many, and include the potential for encountering as yet undefined subsurface conditions, utility conflicts, weather delays, and of course the increased costs which may actually prevent the project from moving forward, regardless of need or desire. Reconstruction also includes obvious disruption to residential and business life, and may be fraught with delays where subsurface conditions require design or construction changes. The specter of maintaining emergency access to businesses and residents impacted by the construction project are always most severe during roadway reconstruction projects.

Resurfacing of the existing roadway also includes risks, which are balanced with construction and personal cost savings, constructability, and a cost benefit ratio, projecting the necessary reoccurrence of maintenance with time, and the impact on future maintenance choices with the type of resurfacing procedure chosen. Pavement resurfacing must also address the reality of street variability, changes in past and future traffic patterns, such as the advent of street side recycling of green waste, bottles and cans, and collection of normal household and business refuse. The increase in trash collection alone has tripled the weekly destruction of residential roadways in the community, with lesser but proportional damage to the arterials and collectors. The least cost alternative available may therefore not always be the most cost effective alternative over time.

Evaluation of the roadway system, and ultimately selection of an appropriate course of corrective action must consider each of these objective issues, and combine these impacts with subjective values of the community such as appearance, curing periods, actual apparent work performed versus the total area within the City improved, i.e., the perceived value of work performed. Inherent in each of the construction procedures, including reconstruction, is the potential for unknown conditions, change orders, quality control and quality assurance procedures, the risks and implications of material variability, and in the case of resurfacing, grade impacts, grade restrictions along the roadway edges due to the presence or absence of curb or curb and gutter, prior construction history, the potential for reflection of existing cracking through the new wearing surface, etc.

Rehabilitation Procedures

The majority of resurfacing systems are designed to address these variables, simply and effectively utilizing cold milling along pavement edges, aggressive crack filling, and where cracking is extensive, use of materials or layers resistant to premature reflective cracking. A key element in each of the resurfacing procedures is a comparison of both structural and aesthetic need, combined with the foreseeable risk, long and short performance benefits of the procedure and a comparison of resurfacing costs with the large expense of complete reconstruction.

Reconstruction

Reconstruction almost always provides the least risk at the highest cost of construction. Typical reconstruction costs range from 3 to 10 times more than each of the resurfacing alternatives and is therefore selected only when all other alternatives are exhausted. Reconstruction involves complete removal of the existing asphalt concrete pavement and any underlying aggregate base layers, typically along with a defined amount of underlying subgrade soils. Where utility conflicts exist, such as shallow telecommunications lines or utilities which were previously installed within the upper few feet of the pavement surface due to other depth restrictions or prior regulations, such utilities are then either relocated or somehow protected in place.

Subgrade conditions may also dictate changes in construction scheduling, such as where subgrade is wet and will not support conventional construction equipment, areas where high ground water tables prevent ready drying of materials, of where adjacent conditions such as lakes, landscape slopes, etc. provide continual infiltration of water into the excavation. Prevailing weather conditions, such as persistent fog, unforeseen rainfall, etc. will also adversely impact reconstruction activities. Reconstruction does however present certain advantages such as future uniformity of construction, greater opportunities for quality control, correction of past problematic conditions, etc.

Specific replacement section alternatives are provided within this report, utilizing both conventional asphalt concrete over aggregate base sections and full depth asphalt concrete sections constructed directly over the prepared subgrade soils. The replacement sections are location and street specific, based on variations in subgrade strengths determined during laboratory testing, and projected future traffic use.

Replacement section alternatives are designed using methods outlined in the Flexible Pavement Structural Section Design Guide for California Cities and Counties, Third Edition, and the Caltrans Highway Design Manual Fourth and Fifth Editions. Metric alternative sections, designed in accordance with the Caltrans Highway Design Manual, Fifth Edition, are presented should the project require use of metric units.

Asphalt Concrete Overlay

Asphalt concrete overlay provides improvement of the roadway, utilizing the existing layers of asphalt concrete and aggregate base as support for a new wearing surface. Addition of a defined thickness of asphalt concrete provides structural reinforcement of the roadway, permitting the designer to address changes in traffic use, increases in traffic volumes and weights, correct riding qualities, and effectively extends the structural performance of the roadway for ten or even twenty years.

Placement of asphalt concrete overlays results in an increase in crown height and of course roadway cross slope. As such, repeated placement of asphalt concrete overlays ultimately becomes unacceptable, resulting in either full street cold milling or possibly reconstruction. Pavement grinding is used for most overlays to provide a transition along the edges of the roadway, adjoining curb or gutter, at cross streets, at the termination point of overlays and at transitions to other fixed elevations such as railroad crossings, large utility vaults, etc. Remaining fixed elevation improvements such as manhole covers, valve covers, etc. are typically adjusted to the new finished elevation through use of risers or reconstruction of the item.

A significant consideration during design and ultimately construction of overlays is the potential for existing pavement cracking of differing severity to reflect through the new wearing surface, with obvious aesthetic impacts. The reflected cracks also eventually become future maintenance issues, and in severe cases, provide an avenue of water damage from the surface, through to the underlying base and subgrade layers. Asphalt Concrete overlays must weight the risks of limited crack reflection versus the obvious cost and construction benefits of roadway reuse and extension of the useful life through cost effective overlay.

Asphalt concrete overlays are seldom placed over roadways that are completely free of cracks of some type or description. Reflection crack control systems have therefore been developed and include use of simple or involved crack filling, use of pavement reinforcing fabric and pavement grids, use of asphalt rubber aggregate membranes, etc. Each of these methods results in controlling a percentage of the reflective cracks, at varying costs. None of the systems are intended to address every type of crack, with the most aggressive systems achieving an 80% or greater reduction in premature reflective cracking. Since even new pavements following construction or reconstruction are subject to cracking over time, reasonable control of reflective cracking for a 10-year period is considered acceptable.

Placement of asphalt concrete overlays are limited by surrounding elevations such as existing curb and gutter, existing medians, the crown height or roadway elevation, and the cross slope resulting from placement of overlays. The overlay limit will vary, depending upon the specific roadway width and previous overlay history, etc. In general, a 4" thick maximum overlay thickness is considered for preparation of the materials report. Where the required overlay exceeds the limits imposed, reconstruction becomes necessary. Design elements during design such as widening, construction of new curbs and gutter, etc., will impact the potential for overlay placement.

Asphalt Rubber Hot Mix Overlay

Asphalt rubber hot mix overlay should be considered a hybrid of the asphalt concrete overlay pavement restoration procedure. Asphalt rubber binders, and more recently polymer-modified binders; have been developed to provide additional flexibility of the pavement layer, thereby providing further resistance to reflective cracking. The increased flexibility provides a greater tolerance for excessive deflection, and as such, although not providing inch per inch similar structural reinforcement of the existing pavement structure, provides comparable long-term performance characteristics.

Similar to asphalt concrete overlays addition of a defined thickness of asphalt rubber hot mix provides structural reinforcement of the roadway, permitting the designer to address changes in traffic use, increases in traffic volumes and weights, correct riding qualities, and effectively extend the structural performance of the roadway for 10 or more years.

Placement of asphalt rubber hot mix overlays also results in an increase in crown height and of course roadway cross slope. As such, repeated placement of asphalt concrete or asphalt rubber hot mix overlays ultimately becomes unacceptable, resulting in either full street cold milling or possibly reconstruction. Pavement grinding is used for most overlays to provide a transition along the edges of the roadway, adjoining curb or gutter, at cross streets, at the termination point of overlays and at transitions to other fixed elevations such as railroad crossings, large utility vaults, etc. Remaining fixed elevation improvements such as manhole covers, valve covers, etc. are typically adjusted to the new finished elevation through use of risers or reconstruction of the item.

Asphalt rubber hot mix overlays are seldom placed over roadways that are completely free of cracks of some type or description and are not used for new construction. Since even new pavements following construction or reconstruction are subject to cracking over time, reasonable control of reflective cracking for a 10-year period is considered acceptable.

Field Conditions

Anza Avenue is a four lane roadway, with a striped median and consistent curb and gutter frontage improvements. Inclusion of dedicated left turn lanes at major intersections places the right wheel path of the outer lanes adjacent to existing curbs.

The roadway serves as a major north/south arterial/collector street within the City of Torrance transportation network with a mixture of automobiles, trucks and regular transit bus service.

Distress along the majority of the roadway includes extensive alligator cracking, pavement failure, severe raveling, spalling and formation of extensive and numerous potholes. Delamination of the different pavement layers, was also noted, and will impact rehabilitation through overlay.

Field Core Sampling and Laboratory Data

Pavement core sampling was performed at twenty (20) locations, distributed along the length of the project. Prior to field core sampling all locations were marked on the pavement surface and Underground Services Alert notified to avoid conflict with buried utilities.

Access through the pavement was provided through 6" diameter core holes, cut through the pavement surface utilizing portable coring equipment. The aggregate base layer was then removed using a combination of hand excavation and power augers. The thickness of the asphalt concrete layer and aggregate base layer, where present, was determined during field sampling activities.

Borings were advanced below the pavement surface using a combination of hand and power augers to a maximum depth of four feet. Bulk samples of the subgrade soils were placed and sealed in plastic bags for transport to the laboratory. All test holes were backfilled and patched prior to leaving the site.

The extensive patching, obvious construction joints, and differing histories along the roadway disguise the likely original pavement section along the roadway. Based on core data, a large percentage of the roadway is constructed with relatively thin full depth asphalt concrete sections. The roadway north of Del Amo Boulevard generally includes 4" to 4 ½" asphalt concrete constructed directly on the prevailing subgrade soils. The roadway between Del Amo Boulevard and Torrance Boulevard is constructed with a conventional asphalt concrete over aggregate base section and typically includes 4 3/8" to 5" asphalt concrete over 5" to 8" aggregate base. The asphalt concrete section in this reach also includes three layers of pavement, likely reflecting previous resurfacing efforts not performed north Del Amo Boulevard or south of Torrance Boulevard. Certain locations in the northbound lanes in this section included thicker aggregate base sections of 1' +/-.

The roadway south of Torrance Boulevard again is constructed with 4" to 4 ½" asphalt concrete over the prevailing subgrade soils, with two locations in the northbound lanes constructed with 4 3/8" to 5 ¼" asphalt concrete over 6" to 10 5/8" aggregate base. These areas with conventional asphalt concrete over aggregate base likely reflect previous reconstruction activities.

Subgrade soils were identified as brown sand and brown fine sand which provides good to excellent support for the pavement section. All subgrade soils were visually identified and tested for existing in-situ moisture conditions. Moisture conditions were slightly elevated at only one location, within the northbound number one lane immediately north of Lenore Street. Representative subgrade samples were tested for R-Value strength. Individual core thickness information, test locations, subgrade soil identification and in-situ moisture conditions are provided within the Coring Results Table contained in Appendix C. Subgrade R-Value strength data is provided in Appendix E. A summary of test findings is provided herein for reference.

Existing Asphalt Concrete	4" to 9"
Existing Aggregate Base	0" to 13 ¼"
Subgrade Description	Brown Fine Sand; Brown Sand
Subgrade Moisture	4.8% to 13.5%
Equilibrium R-Value	71
Equilibrium Moisture	10 ½% to 12 ½%

In-Place Strength Testing

The net effect of as-built pavement thicknesses, variability of subgrade soil types and conditions, construction and maintenance history, weather and aging cycles, and of course, the impact of continued and ever increasing traffic weights and volumes is determined through specific measurement of the in place pavement strength. Pavement deflection testing, using the Model 400 Road Rater was performed in the right wheel path of each travel lane, at 200' intervals. Specific deflection test data are included in this report. Explanations of the test equipment, deflection testing performed, and the test data provided are included In Appendix F.

The pavement response to known loading criteria provides real time measurement of the present pavement strength. The pavement strength measurements are evaluated, using specific pavement performance models, combining all known information with projections of future traffic use as represented by the Traffic Index. The in-place strength testing permits development of rehabilitation alternatives which aid in reinforcing the roadway, address present physical defects and distress, and provide the user with a serviceable roadway for an extended time period.

Traffic Use Estimates

Traffic indices were provided by the City of Torrance. The estimates of future traffic use or Traffic Index were combined with in-place thickness information and measured section strengths to develop recommendations for rehabilitation.

Conclusions

Rehabilitation of the roadway through overlay will be challenging due to variability in conditions, the limited total section thicknesses, and the extensive and severe distress from Sepulveda Boulevard to Torrance Boulevard and from Del Amo Boulevard to Towers Street. The present roadway configuration includes dedicated bicycle lanes along the majority of the each side of the roadway. The existing crown is also relatively flat and may therefore permit placement of thick asphalt concrete overlays.

Rehabilitation of Anza Avenue will require a combination of pavement milling, specific areas of reconstruction, combined with various options relative to resurfacing of the remaining areas. The specific limits of reconstruction will be a combined function of the required overlay thicknesses and any grade limitations imposed by crown height and cross slope. Improvements will also require addressing several measured conditions combined with the surface cracking. Alternative methods of rehabilitation have therefore been developed, each presenting differing impacts on surface elevations, which may then be explored during final design of overall roadway grades and fixed improvements.

Based on in place strength testing, significant structural improvement is required. Improvement must therefore include providing substantial reinforcement of the structural integrity of the roadway combined with providing resistance to reflection of the existing pavement cracking. Impacts on finish elevations will be significant.

Primary Recommendation

The roadway should be removed and reconstructed from Sepulveda Boulevard to Torrance Boulevard and from Del Amo Boulevard to Arvada Street. The remainder of the roadway from Torrance Boulevard to Del Amo Boulevard and from Arvada Street to 190th Street may be rehabilitated through a combination of edge grinding, crack treatment and placement of a new crack resistant wearing surface.

The outer edges of the roadway from Torrance Boulevard to Del Amo Boulevard and from Arvada Street to 190th Street should be cold milled 1 5/8" deep at the gutter lip, tapering to 0" deep, 5' from the edge of gutter. All cracking wider than 1/8" should be cleaned and filled. A minimum 2" thick asphalt rubber hot mix overlay should then be placed to complete resurfacing.

Reconstruction of the remainder of the roadway should utilize one of the replacement section alternatives provided within this report. Cross slope grades within the areas of reconstruction should be designed to provide for a minimum of 1.7% and preferable 2% cross slope.

Alternative Recommendation A – Asphalt Rubber Hot Mix Overlay

The outer edges of the roadway should be cold milled 1 5/8" deep at the gutter lip, tapering to 0" deep, 5' from the edge of gutter. Areas of dedicated right and left turn lanes, where the outer traffic lane is immediately adjacent to the edge of the roadway should be reconstructed. A minimum 2" thick asphalt concrete level course should be placed in the number one and two travel lanes from Sepulveda Blvd. to Torrance Blvd. and from Del Amo Blvd. and Arvada Street. The level course should extend though the striped median area for grade control. The level course may be tapered through the bicycle lane to 0" thick at or near the gutter lip. All cracking between Torrance Boulevard and Del Amo Blvd. And from Arvada St. to 190th St. wider than 1/8" should be cleaned and filled. A minimum 2" thick asphalt rubber hot mix overlay should then be placed from Sepulveda Blvd. To 190th St. to complete resurfacing.

Note: Due to the relatively thin existing pavement thicknesses along the roadway edges, reconstruction of the outer 5' to 6' along the sides of the roadway may be considered versus the cold milling alternative.

Alternative Recommendation B – Conventional Asphalt Concrete Overlay (Note: Substantial Grade Impacts may prevent implementation of this alternative, particularly within the number 2 travel lanes)

The outer edges of the roadway should be cold milled 1 5/8" deep at the gutter lip, tapering to 0" deep, 5' from the edge of gutter. Areas of dedicated right and left turn lanes, where the outer traffic lane is immediately adjacent to the edge of the roadway should be reconstructed.

A minimum 3" thick asphalt concrete level course should be placed in the number one and two travel lanes from Sepulveda Boulevard to Torrance Boulevard and from Del Amo Boulevard and Arvada Street. A minimum 1" asphalt concrete should be placed from Torrance Boulevard to Del Amo Boulevard. The level course should extend though the striped median area for grade control. The level course may be tapered through the bicycle lane to 0" thick at or near the gutter lip. All cracking between Arvada Street and 190th Street wider than 1/8" should be cleaned and filled.

Pavement reinforcing fabric should be installed after placement of the asphalt concrete leveling course and/or crack filling using 0.20 gallons per square yard AR4000 asphalt cement from Sepulveda Boulevard to Arvada Street and 0.25 gallons per square yard from Arvada Street to 190th Street. A minimum 2" thick conventional asphalt concrete overlay should then be placed to complete resurfacing.

Note: Due to the relatively thin existing pavement thicknesses along the roadway edges, reconstruction of the outer 5' to 6' along the sides of the roadway may be considered versus the cold milling alternative.

Replacement Section Alternatives

Reconstruction of portions of Anza Avenue will be required to address measured weakness and areas of distress that may develop between the time of investigation and final construction. Reconstruction may also be necessary to meet existing grade and elevation restrictions imposed by existing curb and gutter. The replacement section alternatives provided include the thickness of planned overlays.

Replacement section alternatives have been developed based on the subgrade R-Value strengths determined during laboratory testing. Based laboratory R-Value test results and in-situ moisture conditions, an R-Value of 50 has been selected for design purposes.

Design R-Value **50**

Design Traffic Index **8.5**

	Alt. 1	Alt. 2	Alt. 3
Asphalt Concrete	5 ½"	6"	8"
Aggregate Base	5 ½"	5"	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.

	Alt. 4	Alt. 5	Alt. 6
Asphalt Concrete	135mm	150mm	225mm
Aggregate Base	150mm	120mm	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.

Design Traffic Index 9.0

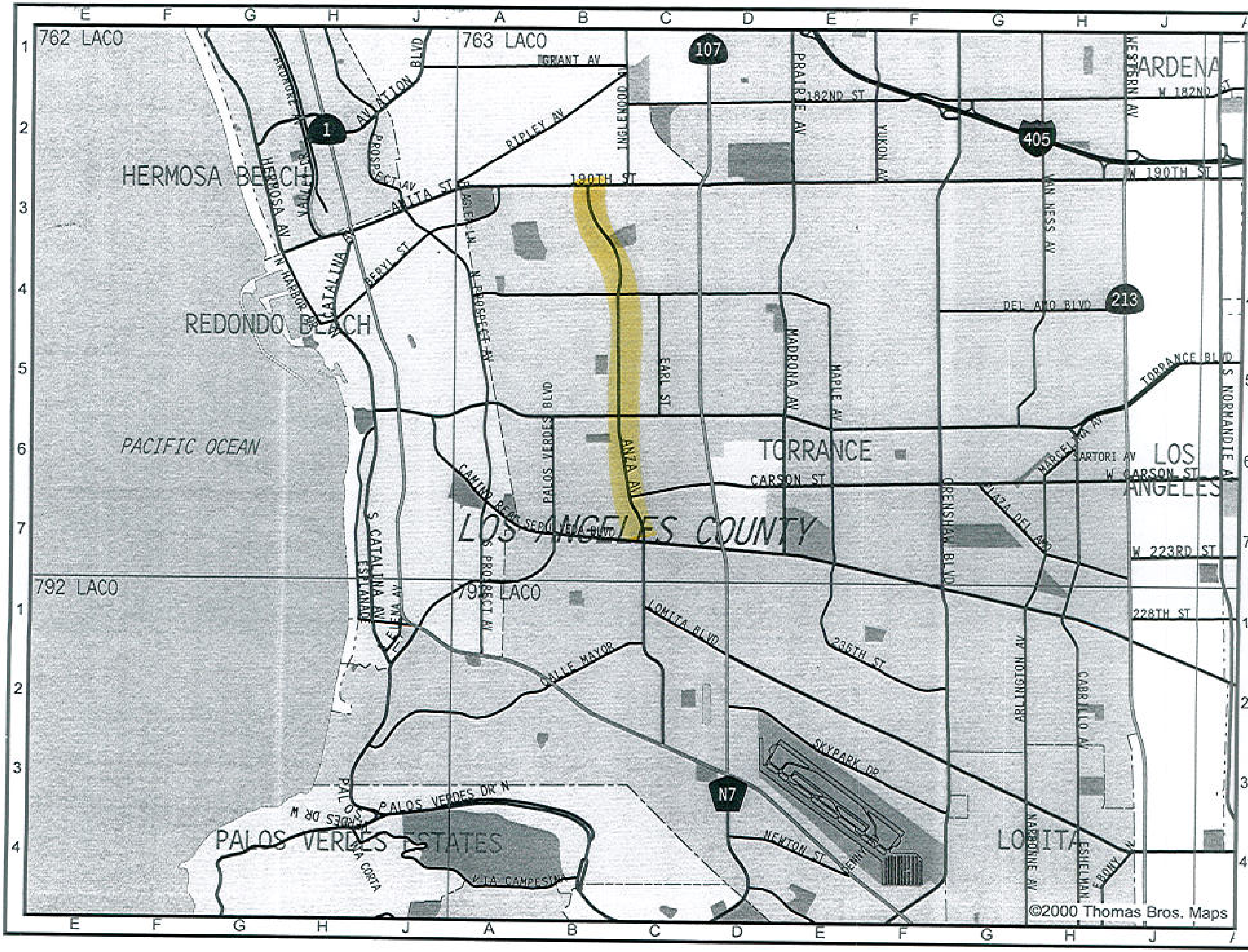
	Alt. 1	Alt. 2	Alt. 3
Asphalt Concrete	5 ½"	6"	8 ½"
Aggregate Base	6 ½"	6"	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.

	Alt. 4	Alt. 5	Alt. 6
Asphalt Concrete	135mm	150mm	225mm
Aggregate Base	180mm	150mm	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.

Design Traffic Index 9.5

	Alt. 1	Alt. 2	Alt. 3
Asphalt Concrete	6"	7"	9"
Aggregate Base	7"	5 ½"	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.

	Alt. 4	Alt. 5	Alt. 6
Asphalt Concrete	150mm	165mm	240mm
Aggregate Base	180mm	165mm	-
Subgrade Compaction (Upper 6")	90% Min.	90% Min.	95% Min.


762 LACO
763 LACO
792 LACO
HERMOSA BEACH
REDONDO BEACH
PACIFIC OCEAN
TORRANCE
LOS ANGELES COUNTY
LOS ANGELES
GARDENA
LOMITA
PALOS VERDES ESTATES
190TH ST
W 190TH ST
ANZA AV
EARL ST
MADRONA AV
MAPLE AV
PRAIRIE AV
YUKON AV
182ND ST
W 182ND ST
GRANT AV
INGLEWOOD AV
RIPLEY AV
AVIATION BLVD
PROSPECT AV
ANITA ST
BERYL ST
N PROSPECT AV
S PROSPECT AV
PALOS VERDES BLVD
CAMINO REAL
SEPULVEDA BLVD
CARSON ST
W CARSON ST
DEL AMO BLVD
TORRANCE BLVD
VAN NESS AV
WESTERN AV
S NORMANDIE AV
CRENSHAW BLVD
ARLINGTON AV
CABRILLO AV
NARBONNE AV
ESHELMAN
EBONY
SARTORI AV
MARCELINA AV
PLAZA DEL AMO
W 223RD ST
228TH ST
235TH ST
LOMITA BLVD
CALLE MAYOR
SKYPARK DR
NEWTON ST
S CATALINA AV
CATALINA
ELENA AV
ESPLANADE
N HARBOR DR
HERMOSA AV
PALOS VERDES DR N
PALOS VERDES DR W
VIA CORTA
VIA CAMPESINA
1
405
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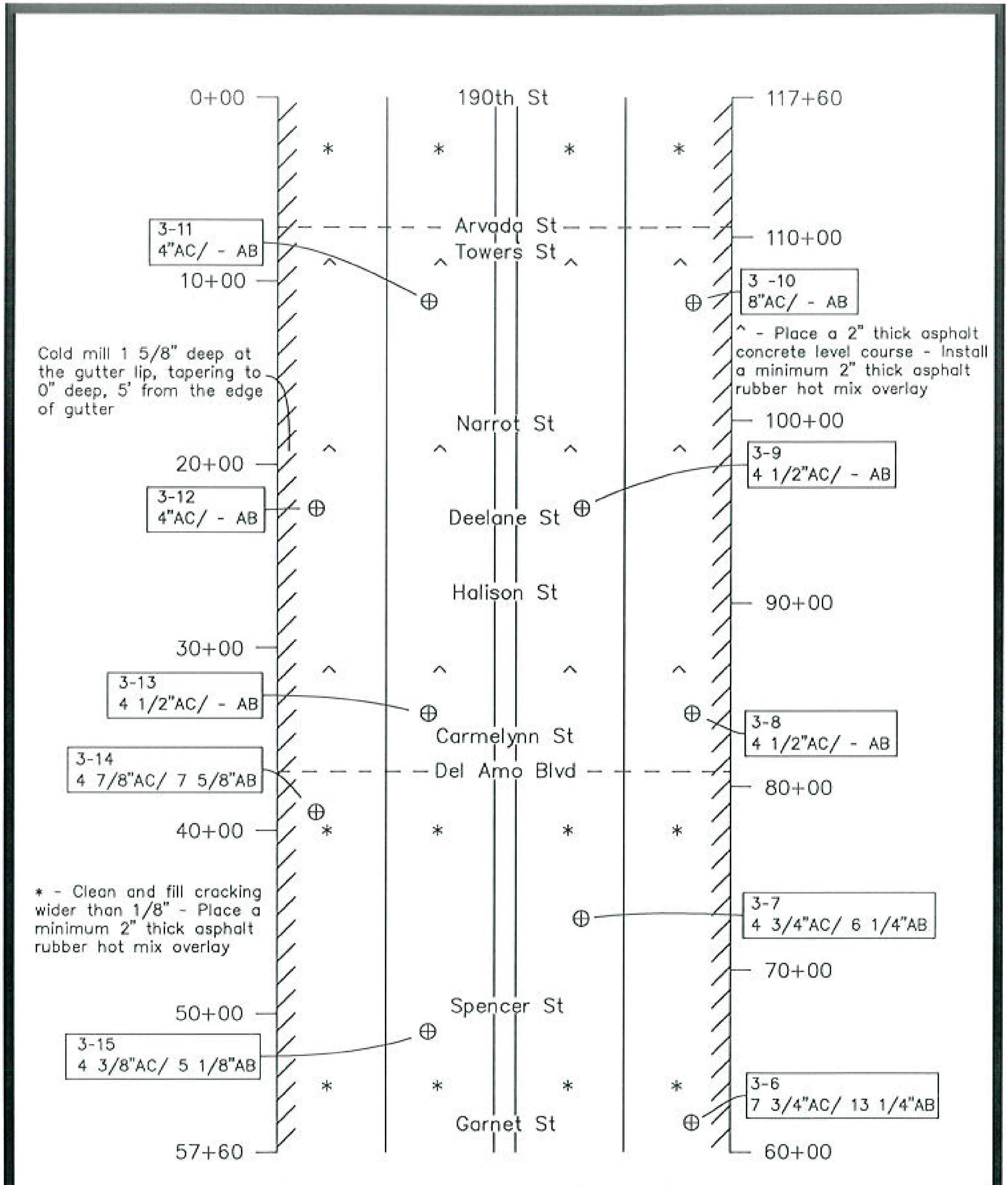
N7
©2000 Thomas Bros. Maps

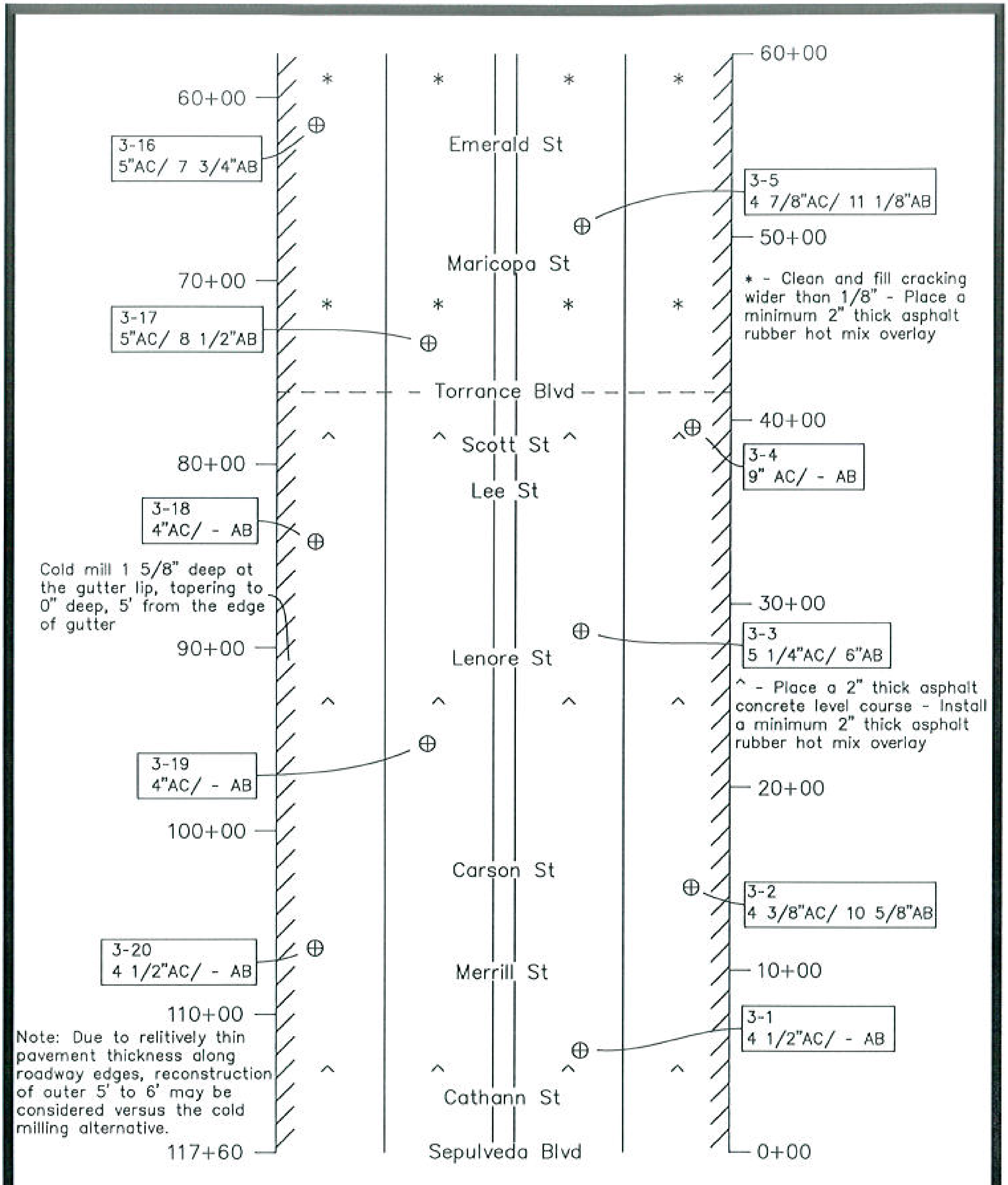
Alternative Recommendation A



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

LaBelle • Marvin

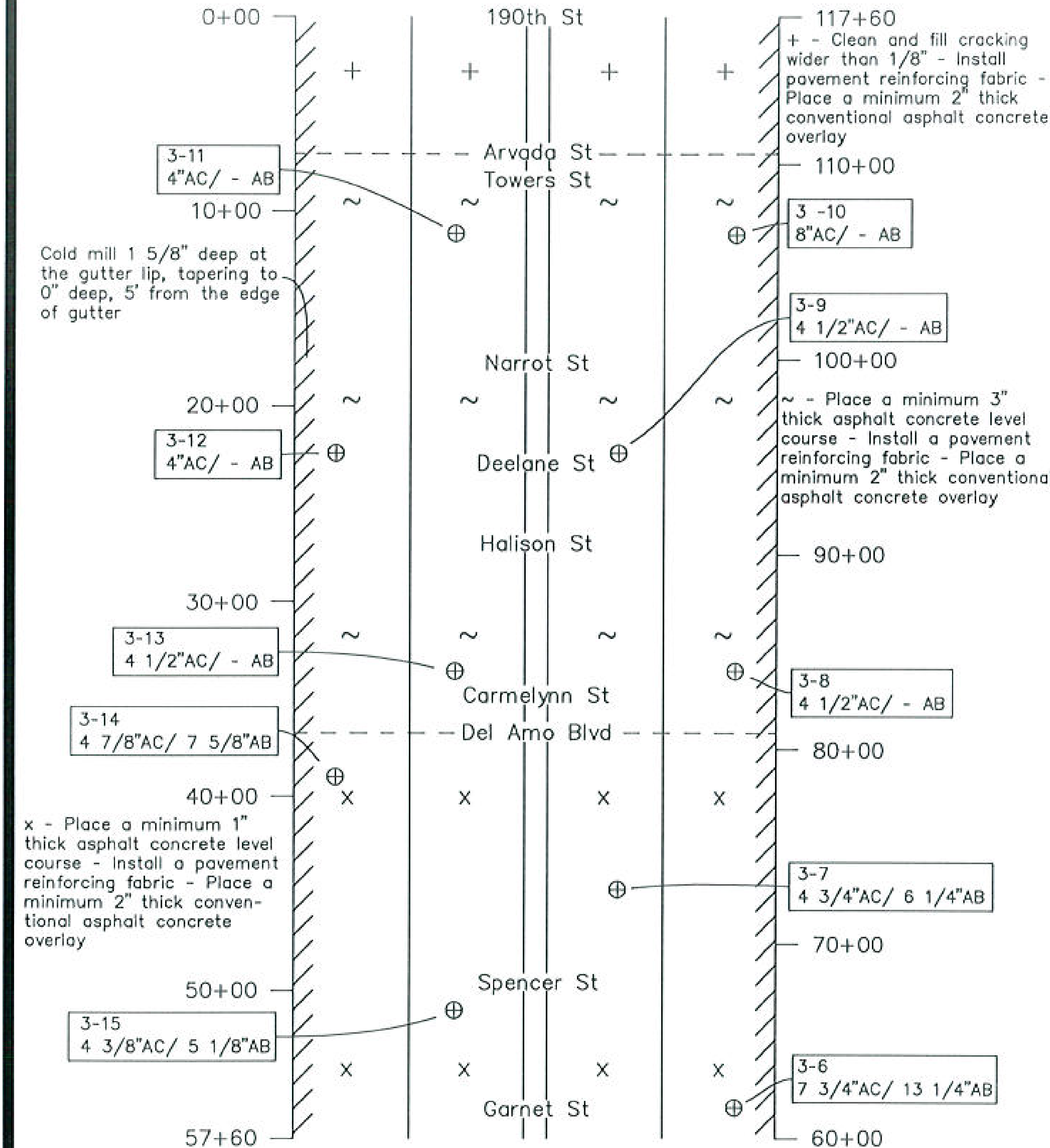
Alternative Recommendation A



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

LaBelle • Marvin

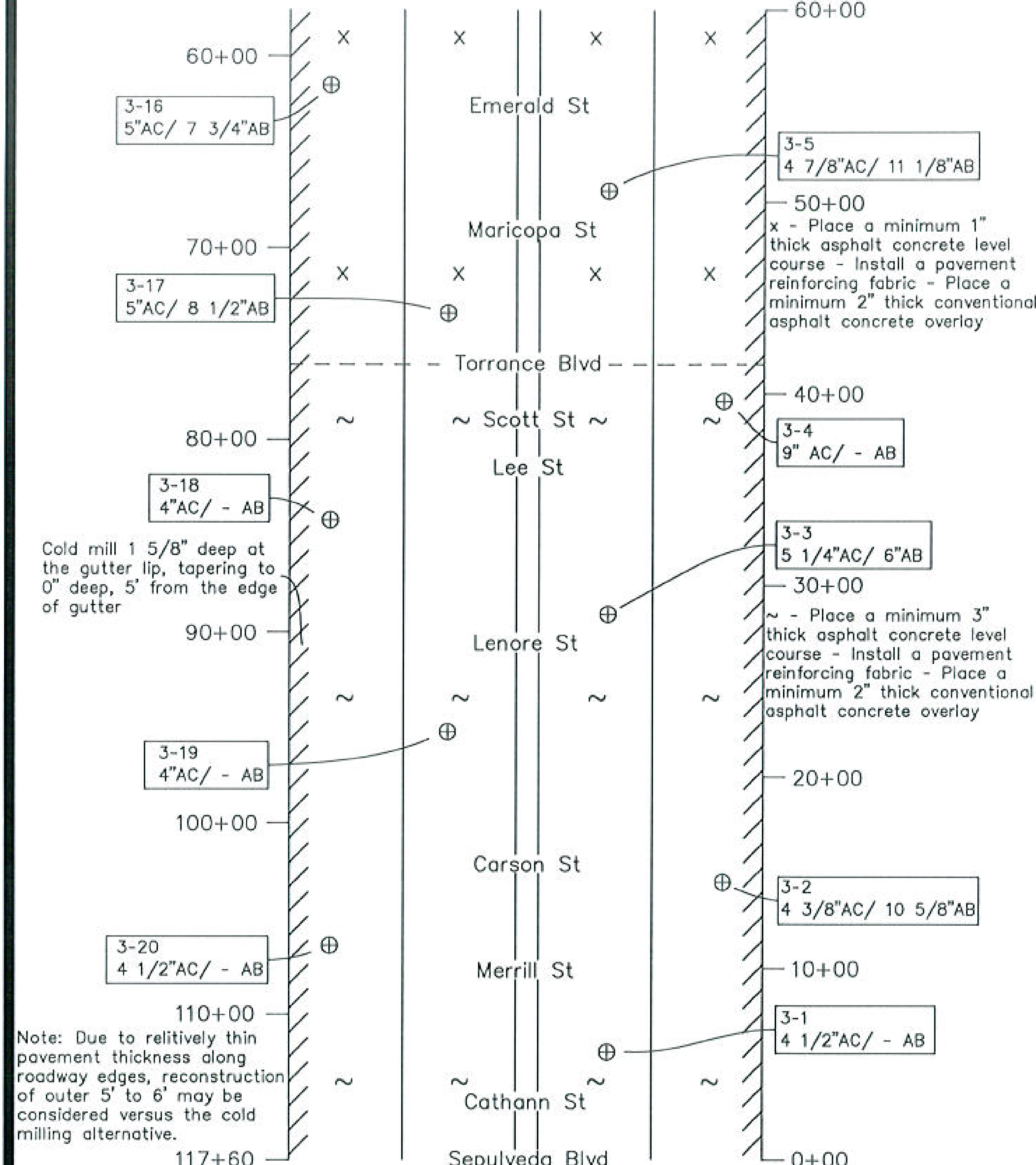
Alternative Recommendation B



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

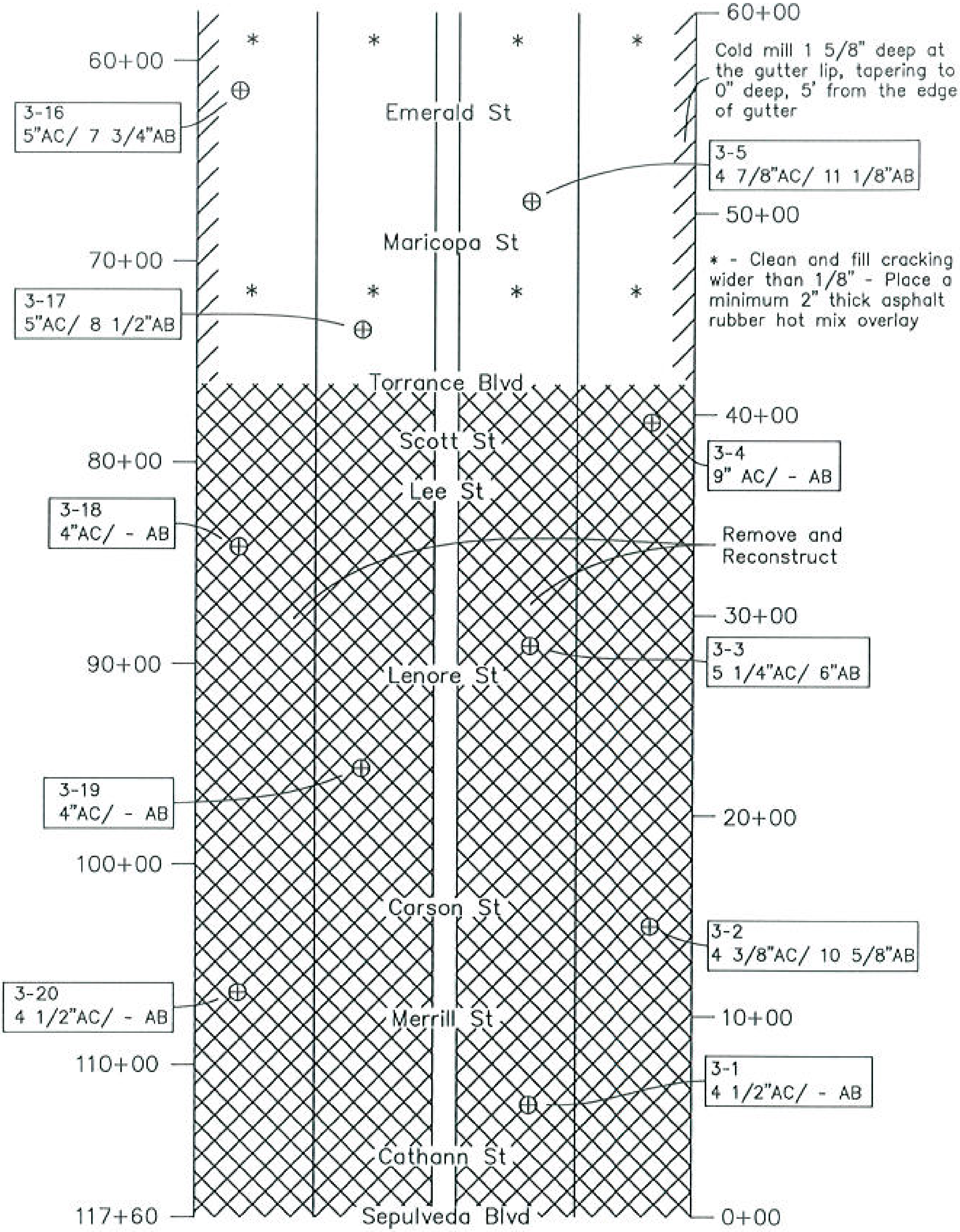
LaBelle • Marvin

Alternative Recommendation B



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

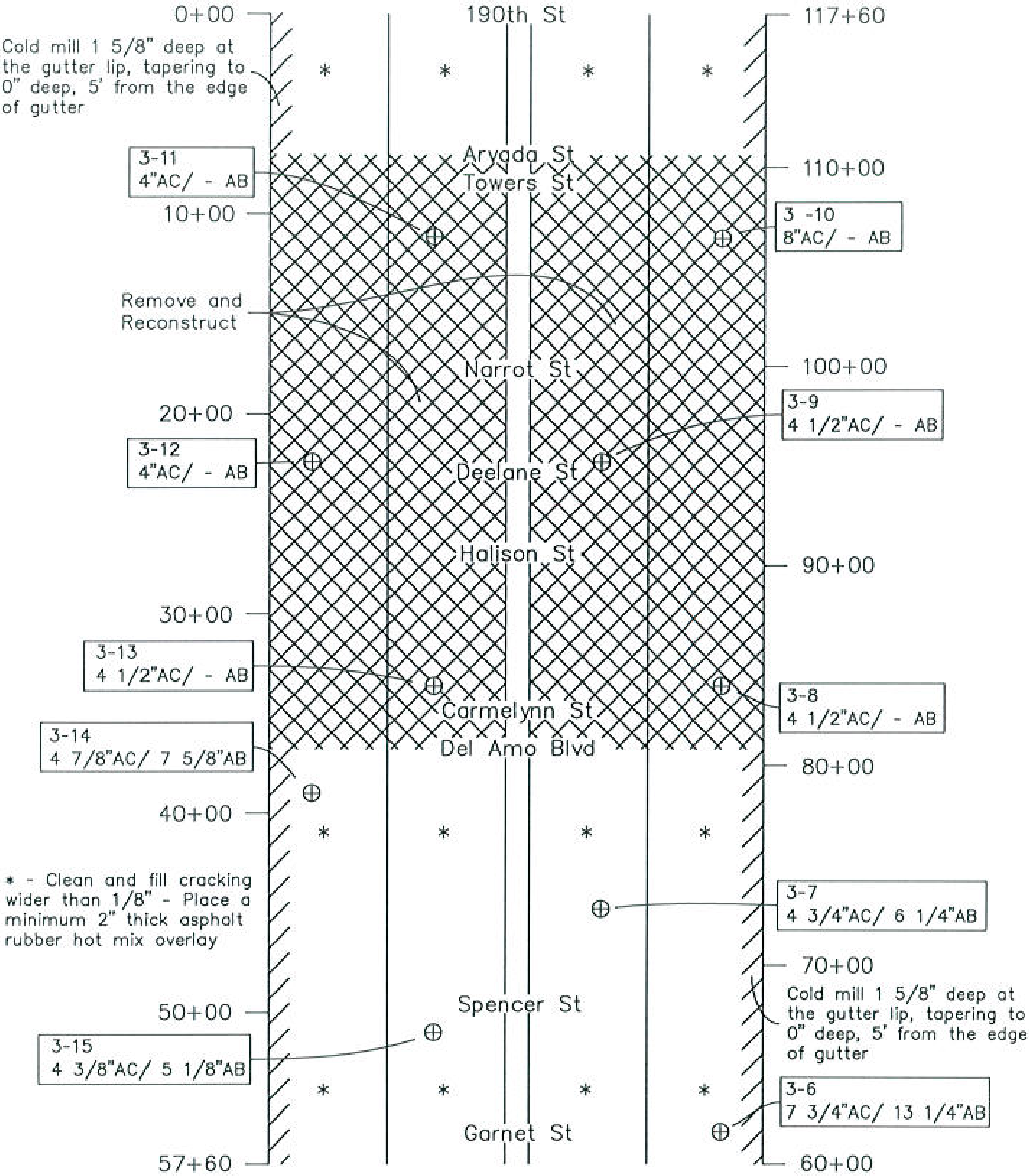
Primary Recommendation



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

LaBelle • Marvin

Primary Recommendation



Street: Anza Avenue	Date: March 2003
From: Sepulveda Blvd. to 190th St.	Project No: 29492

LaBelle • Marvin

TABLE ONE

Street and Limits	Measured Deflection R.R.	Measured Deflection T.D.	T.I.	'T' (ft.)	Allowable Deflection R.R.	Allowable Deflection T.D.	Reduction Required (%)	G.E. Required (ft.)	A.C. Required (ft.)	NSL (yrs)
ANZA AVENUE : SEPULVEDA BOULEVARD TO 190TH STREET										
NORTHBOUND - 1										
1+00 to 39+00	173	38.0	8.0	0.4	90	18.0	53	.71	.37	0
			9.0	0.4	79	15.3	60	.86	.45	0
			9.5	0.4	74	14.1	63	.92	.48	0
43+00 to 61+00	66	12.2	8.0	0.4	90	18.0	0	.00	.00	10+
			9.0	0.4	79	15.3	0	.00	.00	10+
			9.5	0.4	74	14.1	0	.00	.00	10+
63+00 to 79+00	98	19.9	8.0	0.4	90	18.0	10	.03	.02	5
			9.0	0.4	79	15.3	23	.14	.07	2
			9.5	0.4	74	14.1	29	.21	.11	1
83+00 to 87+00	96	19.4	8.0	0.4	90	18.0	8	.02	.01	6
			9.0	0.4	79	15.3	22	.13	.07	2
			9.5	0.4	74	14.1	27	.18	.09	1
89+00 to 109+0	199	44.3	8.0	0.4	90	18.0	59	.84	.44	0
			9.0	0.4	79	15.3	66	.99	.52	0
			9.5	0.4	74	14.1	68	1.03	.54	0
111+00 to 117+	86	17.0	8.0	0.4	90	18.0	0	.00	.00	10+
			9.0	0.4	79	15.3	10	.03	.02	5
			9.5	0.4	74	14.1	17	.08	.04	3
ANZA AVENUE : SEPULVEDA BOULEVARD TO 190TH STREET										
NORTHBOUND - 2										
2+00 to 40+00	148	32.0	8.0	0.4	90	18.0	44	.51	.27	0
			9.0	0.4	79	15.3	52	.69	.36	0
			9.5	0.4	74	14.1	56	.77	.41	0
44+00 to 60+00	138	29.6	8.0	0.5	84	16.6	44	.51	.27	0
			9.0	0.5	74	14.1	52	.69	.36	0
			9.5	0.5	70	13.1	56	.77	.41	0
62+00 to 80+00	61	11.0	8.0	0.5	84	16.6	0	.00	.00	10+
			9.0	0.5	74	14.1	0	.00	.00	10+
			9.5	0.5	70	13.1	0	.00	.00	10+
82+00 to 108+0	147	31.7	8.0	0.4	90	18.0	43	.49	.26	0
			9.0	0.4	79	15.3	52	.69	.36	0
			9.5	0.4	74	14.1	55	.75	.39	0
110+00 to 116+	84	16.5	8.0	0.4	90	18.0	0	.00	.00	10+
			9.0	0.4	79	15.3	8	.02	.01	6
			9.5	0.4	74	14.1	15	.04	.02	4
ANZA AVENUE : 190TH STREET TO SEPULVEDA BOULEVARD										
SOUTHBOUND - 1										
2+00 to 8+00	106	21.9	8.0	0.37	96	19.4	11	.03	.02	5
			9.0	0.37	83	16.4	25	.17	.09	2

No Growth Factor

Project No.29492

Street and Limits	Measured Deflection R.R.	Measured Deflection T.D.	T.I.	'T' (ft.)	Allowable Deflection R.R.	Allowable Deflection T.D.	Reduction Required (%)	G.E. Required (ft.)	A.C. Required (ft.)	NSL (yrs)
ANZA AVENUE : 190TH STREET TO SEPULVEDA BOULEVARD										
SOUTHBOUND - 1										
			9.5	0.37	79	15.2	30	.22	.12	1
10+00 to 36+00	162	35.3	8.0	0.37	96	19.4	45	.54	.28	0
			9.0	0.37	83	16.4	54	.73	.38	0
			9.5	0.37	79	15.2	57	.79	.42	0
38+00 to 74+00	123	25.9	8.0	0.37	96	19.4	25	.17	.09	2
			9.0	0.37	83	16.4	37	.35	.18	1
			9.5	0.37	79	15.2	41	.44	.23	0
78+00 to 114+0	179	39.4	8.0	0.37	96	19.4	51	.67	.35	0
			9.0	0.37	83	16.4	58	.82	.43	0
			9.5	0.37	79	15.2	61	.88	.46	0
ANZA AVENUE : 190TH STREET TO SEPULVEDA BOULEVARD										
SOUTHBOUND - 2										
1+00 to 7+00	99	20.2	8.0	0.35	101	20.7	0	.00	.00	10+
			9.0	0.35	88	17.6	13	.04	.02	4
			9.5	0.35	83	16.3	19	.09	.05	3
9+00 to 35+00	162	35.3	8.0	0.35	101	20.7	41	.44	.23	0
			9.0	0.35	88	17.6	50	.64	.34	0
			9.5	0.35	83	16.3	54	.73	.38	0
39+00 to 77+00	112	23.3	8.0	0.41	90	18.0	23	.14	.07	2
			9.0	0.41	79	15.3	35	.30	.16	1
			9.5	0.41	74	14.1	39	.39	.21	0
79+00 to 117+0	161	35.1	8.0	0.35	101	20.7	41	.44	.23	0
			9.0	0.35	88	17.6	50	.64	.34	0
			9.5	0.35	83	16.3	54	.73	.38	0

CORING RESULTS

Client: City of Torrance
Project Name: Anza Avenue
Cores Obtained: March 3, 2003
Technician: DL, GW, BM

CORE	PAVEMENT THICKNESS (INCH)	PAVEMENT TYPE	BASE THICKNESS (INCH)	BASE TYPE	LOCATION
3-1	4 1/2 1 1/2, 1/2, 2 1/2	AC	-	AB	**Anza Avenue Northbound Lane 1** 560' N. of Sepulveda Ave., 22' W. of CF **Comments:** *Long and alligator cracks RWT* **Soil:** *Brown fine sand* **Moisture:** *9.7%*
3-2	4 3/8 1 7/8, 2 1/2	AC	10 5/8	AB	**Anza Avenue Northbound Lane 2** 1450' N. of Sepulveda Ave., 11' W. of CF **Comments:** *Slight long cracks RWT* **Soil:** *Brown fine sand* **Moisture:** *10.2%*
3-3	5 1/4 1 5/8, 1 3/8, 2 1/4	AC	6	AB	**Anza Avenue Northbound Lane 1** 2850' N. of Sepulveda Ave., 23' W. of CF **Comments:** *Long, lateral alligator cracks RWT* **Soil:** *Brown fine sand* **Moisture:** *13.5%*
3-4	9 1 7/8, 3 5/8, 3 1/2	AC	-	AB	**Anza Avenue Northbound Lane 2** 3960' N. of Sepulveda Ave., 11' W. of CF **Comments:** *Severe alligator cracks* **Soil :** *Brown fine sand* **Moisture:** *4.8%*
3-5	4 7/8 1 1/8, 3 3/4	AC	11 1/8	AB	**Anza Avenue Northbound Lane 1** 5060' N. of Sepulveda Ave., 26' W. of CF **Comments:** **Soil:** *Brown fine sand* **Moisture:** *9.0%*
3-6	7 3/4 2 1/2, 3, 2 1/4	AC	13 1/4	AB	**Anza Avenue Northbound Lane 2** 6160' N. of Sepulveda Ave., 16' W. of CF **Comments:** **Soil:** *Brown slgt. Silty sand* **Moisture:** *8.2%*

CF = Curb Face

CORING RESULTS

Client: City of Torrance
Project Name: Anza Avenue
Cores Obtained: March 3, 2003
Technician: DL, GW, BM

CORE	PAVEMENT		BASE		LOCATION
	THICKNESS (INCH)	TYPE	THICKNESS (INCH)	TYPE	
3-7	4 3/4 1 3/8, 1 1/2, 1 5/8	AC	6 1/4	AB	**Anza Avenue Northbound Lane 1** 7280' N. of Sepulveda Ave., 26' W. of CF ***Comments:*** *Slight longitudinal cracks RWT* ***Soil:*** *Brown fine sand* ***Moisture:*** *10.9%*
3-8	4 1/2 2 1/2, 2	AC	-	AB	**Anza Avenue Northbound Lane 2** 8400' N. of Sepulveda Ave., 10' W. of CF ***Comments:*** *Alligator cracks with patches* ***Soil:*** *Brown fine sand* ***Moisture:*** *7.7%*
3-9	4 1/2 1 7/8, 2 5/8	AC	-	AB	**Anza Avenue Northbound Lane 1** 9520' N. of Sepulveda Ave., 23' W. of CF ***Comments:*** ***Soil:*** *Brown fine sand* ***Moisture:*** *7.4%*
3-10	8 2 1/8, 2 7/8, 3	AC	-	AB	**Anza Avenue Northbound Lane 2** 10640' N. of Sepulveda Ave., 11' W. of CF ***Comments:*** *Alligator cracks LWT, long. cracks RWT* ***Soil :*** *Brown fine sand* ***Moisture:*** *12.3%*
3-11	4 1 7/8, 2 1/8	AC	-	AB	**Anza Avenue Southbound Lane 1** 1112' S. of 190th St., 21' E. of CF ***Comments:*** ***Soil:*** *Brown sand* ***Moisture:*** *7.8%*
3-12	4 2 1/2, 1 1/2	AC	-	AB	**Anza Avenue Southbound Lane 2** 2240' S. of 190th St., 12' E. of CF ***Comments:*** *Severe alligator RWT and LWT* ***Soil:*** *Brown sand* ***Moisture:*** *8.3%*

CF = Curb Face

CORING RESULTS

Client: City of Torrance
Project Name: Anza Avenue
Cores Obtained: March 3, 2003
Technician: DL, GW, BM

CORE	PAVEMENT		BASE		LOCATION
	THICKNESS (INCH)	TYPE	THICKNESS (INCH)	TYPE	
3-13	4 1/2 2 1/2, 2	AC	-	AB	**Anza Avenue Southbound Lane 1** 3360' S. of 190th St., 25' E. of CF ***Comments*** *Severe alligator RWT , alligator LWT* ***Soil:*** *Brown sand* ***Moisture:*** *10.0%*
3-14	4 7/8 1 1/4, 1 3/8, 2 1/4	AC	7 5/8	AB	**Anza Avenue Southbound Lane 2** 3900' S. of 190th St., 12' E. of CF ***Comments:*** *Longitudinal RWT & LWT* ***Soil:*** *Brown fine sand* ***Moisture:*** *7.7%*
3-15	4 3/8 1 1/8, 1 1/2, 1 3/4	AC	5 1/8	AB	**Anza Avenue Southbound Lane 1** 5100' S. of 190th St., 24' E. of CF ***Comments:*** *Longitudinal LWT* ***Soil:*** *Brown fine sand* ***Moisture:*** *8.9%*
3-16	5 1 1/2, 1 1/4, 2 1/4	AC	7 3/4	AB	**Anza Avenue Southbound Lane 2** 6150' S. of 190th St., 14' E. of CF ***Comments:*** ***Soil :*** *Brown fine sand* ***Moisture:*** *6.7%*
3-17	5 1 1/4, 1 7/8, 1 7/8	AC	8 1/2	AB	**Anza Avenue Southbound Lane 1** 7390' S. of 190th St., 24' E. of CF ***Comments:*** *Slight longitudinal LWT* ***Soil:*** *Brown sand* ***Moisture:*** *9.1%*
3-18	4 2, 2	AC	-	AB	**Anza Avenue Southbound Lane 2** 8420' S. of 190th St., 11' E. of CF ***Comments:*** *Alligator cracks, 2nd lift fell apart* ***Soil:*** *Brown fine sand* ***Moisture:*** *6.8%*

CF = Curb Face

CORING RESULTS

Client: City of Torrance
Project Name: Anza Avenue
Cores Obtained: March 3, 2003
Technician: DL, GW, BM

CORE	PAVEMENT		BASE		LOCATION
	THICKNESS (INCH)	TYPE	THICKNESS (INCH)	TYPE	
3-19	4 1 1/2, 2 1/2	AC	-	AB	**Anza Avenue Southbound Lane 1** 9525' S. of 190th St., 23' E. of CF ***Comments:*** *Alligator cracks, 2nd lift fell apart* ***Soil:*** *Brown fine sand* ***Moisture:*** *7.8%*
3-20	4 1/2 2, 2 1/2	AC	-	AB	**Anza Avenue Southbound Lane 2** 10640' S. of 190th St., 12' E. of CF ***Comments:*** *Alligator cracks RWT* ***Soil:*** *Brown fine sand* ***Moisture:*** *9.5%*

CF = Curb Face

Street: ANZA AVENUE
Limits: 190TH STREET TO SEPULVEDA BOULEVARD
Direction: SOUTHBOUND
Lane: 1

Project No. 29492

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
●							BEGIN TEST LANE 1 SOUTHBOUND ANZA AVENUE
●0+00							190TH STREET TO SEPULVEDA BOULEVARD
●0+40							CENTERLINE STRIPE
2+00	58	34	17	0.59	68	10.28	
●3+80							Median PAINTED
4+00	74	40	23	0.54	70	14.13	
●5+65							BEGIN LTP
6+00	118	68	31	0.58	149	24.74	Longitudinal Cracks
●7+28							CL of ARVADA STREET
8+00	90	66	34	0.73	128	17.99	Alligator Cracks
●8+78							CL of TOWERS STREET
10+00	153	85	43	0.56	168	33.17	Alligator Cracks
12+00	148	68	34	0.46	136	31.97	Alligator Cracks
14+00	165	60	32	0.36	112	36.06	Alligator Cracks
16+00	139	78	38	0.56	160	29.8	Alligator Cracks
●16+88							BEGIN LTP
18+00	177	162	101	0.92	260	38.96	Alligator Cracks
●18+23							CL of NARROT STREET
20+00	171	87	42	0.51	180	37.51	Alligator Cracks
22+00	127	83	49	0.65	141	26.91	Alligator Cracks
●23+25							CL of DEELANE STREET
24+00	158	99	58	0.63	169	34.38	Alligator Cracks
26+00	98	56	30	0.57	105	19.92	Alligator Cracks
●26+37							BEGIN LTP
●27+33							CL of HALISON STREET
28+00	152	95	54	0.62	167	32.93	Alligator Cracks
30+00	107	73	44	0.68	121	22.09	Alligator Cracks
32+00	123	89	60	0.72	132	25.94	
34+00	79	54	31	0.68	94	15.34	Lateral Cracks
●34+72							Change in Pavement
●35+10							CL of CARMELYNN STREET
●35+90							BEGIN LTP
36+00	129	84	51	0.65	138	27.39	
●36+85							CL of DEL AMO BOULEVARD
38+00	115	88	57	0.77	136	24.02	Longitudinal Cracks
40+00	109	81	53	0.74	124	22.57	Lateral Cracks Longitudinal Cracks
42+00	90	64	40	0.71	102	17.99	Longitudinal Cracks Lateral Cracks
44+00	110	73	45	0.66	118	22.81	Longitudinal Cracks
46+00	117	72	41	0.62	126	24.5	Slight Alligator Cracks
48+00	93	70	42	0.75	117	18.71	Lateral Cracks Longitudinal Cracks
●48+50							BEGIN LTP
●49+80							CL of SPENCER STREET
52+00	107	65	36	0.61	117	22.09	Longitudinal Cracks
54+00	129	86	49	0.67	151	27.39	Longitudinal Cracks
56+00	103	76	49	0.74	118	21.12	Longitudinal Cracks
●56+50							CL of GARNET STREET
58+00	111	74	47	0.67	117	23.05	Longitudinal Cracks
60+00	162	103	59	0.64	180	35.34	Longitudinal Cracks
●61+40							BEGIN LTP
62+00	100	67	40	0.67	112	20.4	
●62+75							CL of EMERALD STREET
64+00	103	72	46	0.7	113	21.12	Longitudinal Cracks

● Not Included in Summary

DATA SHEET

Street: ANZA AVENUE

Project No. 29492

Limits: 190TH STREET TO SEPULVEDA BOULEVARD

Direction: SOUTHBOUND

Lane: 1

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
66+00	118	82	54	0.69	125	24.74	Longitudinal Cracks
68+00	104	67	43	0.64	104	21.36	Longitudinal Cracks
●69+30							CL of MARICOPA STREET
70+00	106	76	48	0.72	120	21.85	Longitudinal Cracks
72+00	87	44	24	0.51	81	17.27	
●73+60							BEGIN LTP
74+00	83	57	34	0.69	96	16.3	Longitudinal Cracks
●76+10							CL of TORRANCE BOULEVARD
78+00	165	113	64	0.68	200	36.06	Alligator Cracks
●79+13							CL of SCOTT STREET
80+00	147	70	44	0.48	111	31.73	Alligator Cracks
●81+14							Change in Pavement
●81+68							LEE STREET
82+00	211	112	65	0.53	193	47.15	Alligator Cracks
84+00	82	63	39	0.77	102	16.06	Alligator Cracks
86+00	143	89	48	0.62	165	30.76	Alligator Cracks
88+00	123	71	41	0.58	123	25.94	Alligator Cracks
●88+50							BEGIN LTP
90+00	162	123	68	0.76	222	35.34	
●90+85							CL of LENORE STREET
92+00	150	76	43	0.51	134	32.45	Alligator Cracks
94+00	204	95	58	0.47	156	45.46	Alligator Cracks
●95+58							BEGIN LTP
96+00	154	103	56	0.67	189	33.41	Alligator Cracks
98+00	145	87	49	0.6	154	31.25	Alligator Cracks
●99+85							BEGIN LTP
100+00	194	99	59	0.51	166	43.05	Slight Alligator Cracks
●102+30							CL of CARSON STREET
104+00	144	78	36	0.54	169	31	
106+00	164	105	52	0.64	212	35.82	Slight Alligator Cracks
●106+82							BEGIN LTP
108+00	146	77	43	0.53	138	31.49	Alligator Cracks
●108+10							CL of MERRILL STREET
110+00	139	78	43	0.56	141	29.8	Lateral Cracks Longitudinal Cracks
112+00	69	58	41	0.84	82	12.93	
114+00	140	84	51	0.6	138	30.04	Alligator Cracks
●114+80							CL of CATHANN STREET
●116+00	40	37	30	0.92	46	5.94	
●116+20							BEGIN LTP
●117+60							CL of SEPULVEDA BOULEVARD

● Not Included in Summary

DATA SHEET

Street: ANZA AVENUE

Project No. 29492

Limits: 190TH STREET TO SEPULVEDA BOULEVARD

Direction: SOUTHBOUND

Lane: 2

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
•							BEGIN TEST LANE 2 SOUTHBOUND ANZA AVENUE
•0+00							190TH STREET TO SEPULVEDA BOULEVARD
•0+60							Curb and Gutter
1+00	43	32	19	0.74	54	6.66	
3+00	70	37	20	0.53	68	13.17	Alligator Cracks
5+00	89	40	19	0.45	84	17.75	Severe Alligator Cracks
7+00	104	64	30	0.62	137	21.36	Severe Alligator Cracks
•7+32							CL of ARVADA STREET
•8+78							CL of TOWERS STREET
9+00	115	56	27	0.49	116	24.02	Severe Alligator Cracks
11+00	107	52	31	0.49	87	22.09	Severe Alligator Cracks
13+00	100	59	33	0.59	105	20.4	Severe Alligator Cracks
15+00	110	58	32	0.53	105	22.81	Severe Alligator Cracks
17+00	218	134	60	0.61	299	48.84	Severe Alligator Cracks
•17+20							Begin Longitudinal Trench LWT
•18+30							CL of NARROT STREET
19+00	214	125	56	0.58	279	47.87	Severe Alligator Cracks
•19+73							End Longitudinal Trench
•20+72							Begin Patch
21+00	83	60	33	0.72	109	16.3	On Patch
•22+72							End Patch
23+00	132	76	42	0.58	138	28.11	Severe Alligator Cracks
•23+35							CL of DEELANE STREET
25+00	100	66	37	0.66	118	20.4	Severe Alligator Cracks
•27+25							CL of HALISON STREET
29+00	150	74	44	0.49	124	32.45	Severe Alligator Cracks
31+00	116	78	50	0.67	122	24.26	Alligator Cracks
33+00	83	54	31	0.65	94	16.3	Alligator Cracks
•34+70							Change in Pavement
35+00	73	42	25	0.58	71	13.89	Alligator Cracks
•35+12							CL of CARMELYNN STREET
•36+95							CL of DEL AMO BOULEVARD
•38+20							BEGIN PARKING LANE ON RIGHT
39+00	103	79	50	0.77	125	21.12	
41+00	58	49	32	0.84	75	10.28	Lateral Cracks Longitudinal Cracks
43+00	91	65	39	0.71	108	18.23	
45+00	91	64	38	0.7	108	18.23	Longitudinal Cracks
47+00	90	60	33	0.67	109	17.99	
49+00	99	69	39	0.7	122	20.16	Alligator Cracks
•49+82							CL of SPENCER STREET
51+00	63	49	31	0.78	77	11.48	
53+00	110	81	50	0.74	131	22.81	
•53+94							Lateral Trench
55+00	110	88	54	0.8	143	22.81	
•56+30							CL of GARNET STREET
57+00	94	63	37	0.67	107	18.95	
59+00	145	91	54	0.63	153	31.25	Near Manhole Lateral Cracks Longitudinal Cracks
61+00	56	29	13	0.52	65	9.8	Near Manhole
•62+75							CL of EMERALD STREET
65+00	92	64	39	0.7	105	18.47	Longitudinal Cracks
67+00	128	81	51	0.63	129	27.15	
•69+00	9	7	6	0.78	8	-1.53	Near Manhole

• Not Included in Summary

DATA SHEET

Street: ANZA AVENUE **Project No.** 29492
Limits: 190TH STREET TO SEPULVEDA BOULEVARD
Direction: SOUTHBOUND
Lane: 2

Feet X 100	RR1	RR2	RR3	Ratio	Proj RR1	TD on 1	Comments
● 69+30							CL of MARICOPA STREET
● 69+50							END PARKING LANE
71+00	98	65	41	0.66	103	19.92	
73+00	81	47	28	0.58	79	15.82	
● 74+90							Change in Pavement
75+00	93	66	39	0.71	112	18.71	
● 76+10							CL of TORRANCE BOULEVARD
77+00	86	50	27	0.58	93	17.03	Alligator Cracks
79+00	147	88	49	0.6	158	31.73	Alligator Cracks
● 79+18							CL of SCOTT STREET
81+00	104	65	36	0.62	117	21.36	Alligator Cracks
● 81+72							CL of LEE STREET
83+00	110	66	40	0.6	109	22.81	Severe Alligator Cracks
85+00	173	95	50	0.55	180	37.99	Severe Alligator Cracks
87+00	144	107	56	0.74	204	31	Severe Alligator Cracks
89+00	101	52	25	0.51	108	20.64	Alligator Cracks
● 90+85							LENORE STREET
93+00	150	76	44	0.51	131	32.45	Alligator Cracks
95+00	153	92	45	0.6	188	33.17	Alligator Cracks
97+00	174	105	54	0.6	204	38.23	Alligator Cracks
99+00	146	89	50	0.61	158	31.49	Alligator Cracks
101+00	132	83	43	0.63	160	28.11	Alligator Cracks
● 102+33							CL of CARSON STREET
103+00	111	73	40	0.66	133	23.05	Alligator Cracks
105+00	79	63	39	0.8	102	15.34	Lateral Cracks Longitudinal Cracks
107+00	174	127	69	0.73	234	38.23	Longitudinal Cracks
● 108+12							CL of MERRILL STREET
109+00	154	80	41	0.52	156	33.41	Alligator Cracks
111+00	147	93	57	0.63	152	31.73	Alligator Cracks
113+00	148	73	42	0.49	127	31.97	Alligator Cracks
● 114+82							CL of CATHANN STREET
115+00	157	83	40	0.53	172	34.14	Alligator Cracks
117+00	126	54	31	0.43	94	26.67	Alligator Cracks
● 117+60							CL of SEPULVEDA BOULEVARD

● Not Included in Summary

Project No. 29492

Street: ANZA AVENUE
Limits: SEPULVEDA BOULEVARD TO 190TH STREET
Direction: NORTHBOUND
Lane: 1

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
●							BEGIN TEST LANE 1 NORTHBOUND ANZA AVENUE
●0+00							SEPULVEDA BOULEVARD TO 190TH STREET
●0+55							Median PAINTED
1+00	84	73	54	0.87	99	16.54	Longitudinal Cracks
3+00	144	92	57	0.64	148	31	CL of CATHANN STREET Alligator Cracks
5+00	140	105	65	0.75	170	30.04	Longitudinal Cracks
7+00	145	105	68	0.72	162	31.25	
●8+75							BEGIN LTP
9+00	154	110	67	0.71	181	33.41	Alligator Cracks
●9+86							CL of MERRILL STREET
11+00	249	119	42	0.48	337	56.31	Alligator Cracks
13+00	153	82	37	0.54	182	33.17	BEGIN LTP
●15+42							CL of CARSON STREET
17+00	134	81	44	0.6	149	28.59	Alligator Cracks Near Manhole
19+00	127	88	48	0.69	161	26.91	Alligator Cracks
●19+80							BEGIN LTP
21+00	91	72	49	0.79	106	18.23	Longitudinal Cracks
23+00	190	108	58	0.57	201	42.09	Alligator Cracks
●24+67							BEGIN LTP
25+00	105	88	61	0.84	127	21.61	Longitudinal Cracks
●27+00							CL of LENORE STREET
29+00	144	121	82	0.84	179	31	Lateral Cracks Longitudinal Cracks
31+00	102	90	66	0.88	123	20.88	Lateral Cracks Longitudinal Cracks
33+00	177	78	51	0.44	119	38.96	Lateral Cracks Longitudinal Cracks
35+00	99	79	56	0.8	111	20.16	
●36+16							CL of LEE STREET
37+00	161	89	57	0.55	139	35.1	Lateral Cracks Longitudinal Cracks
●38+65							CL of SCOTT STREET
39+00	96	59	34	0.61	102	19.44	Lateral Cracks Longitudinal Cracks
●40+10							BEGIN LTP
●41+58							CL of TORRANCE BOULEVARD
43+00	41	38	30	0.93	48	6.18	Lateral Cracks
45+00	81	51	28	0.63	93	15.82	
47+00	49	41	29	0.84	58	8.11	
●48+55							CL of MARICOPA STREET Begin Patch
●48+75							End Patch
49+00	50	43	32	0.86	58	8.35	
51+00	59	46	31	0.78	68	10.52	
53+00	42	36	26	0.86	50	6.42	
●53+70							BEGIN LTP
●55+05							CL of EMERALD STREET
57+00	59	50	37	0.85	68	10.52	
59+00	66	60	47	0.91	77	12.21	
61+00	46	41	32	0.89	53	7.39	
●61+50							CL of GARNET STREET
63+00	105	68	41	0.65	113	21.61	
65+00	78	46	23	0.59	92	15.1	
●66+60							BEGIN LTP
67+00	34	27	18	0.79	41	4.49	
●68+00							CL of SPENCER STREET
69+00	81	65	44	0.8	96	15.82	
71+00	117	89	55	0.76	144	24.5	Longitudinal Cracks

● Not Included in Summary

DATA SHEET

Street: ANZA AVENUE

Project No. 29492

Limits: SEPULVEDA BOULEVARD TO 190TH STREET

Direction: NORTHBOUND

Lane: 1

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
73+00	66	44	25	0.67	77	12.21	
75+00	63	55	42	0.87	72	11.48	Longitudinal Cracks
77+00	60	40	23	0.67	70	10.76	
79+00	89	74	50	0.83	110	17.75	
●79+34							BEGIN LTP
●80+85							CL of DEL AMO BOULEVARD
●82+75							CL of CARMELYNN STREET
83+00	86	48	28	0.56	82	17.03	Slight Alligator Cracks
85+00	98	52	29	0.53	93	19.92	Lateral Cracks Longitudinal Cracks
87+00	78	51	28	0.65	93	15.1	
89+00	216	107	67	0.5	171	48.36	BEGIN LTP
●90+58							CL of HALISON STREET
91+00	77	44	23	0.57	84	14.86	
●92+20							BEGIN LTP
93+00	114	88	62	0.77	125	23.77	Alligator Cracks
●94+68							CL of DEELANE STREET
95+00	163	116	79	0.71	170	35.58	
97+00	233	154	66	0.66	359	52.45	
●98+10							BEGIN LTP
99+00	191	108	46	0.57	254	42.33	Alligator Cracks
●99+83							CL of NARROT STREET
101+00	224	114	56	0.51	232	50.28	Alligator Cracks
103+00	119	62	31	0.52	124	24.98	Alligator Cracks
105+00	115	62	33	0.54	116	24.02	Alligator Cracks
107+00	129	66	32	0.51	136	27.39	Alligator Cracks
●107+90							BEGIN LTP
109+00	116	58	28	0.5	120	24.26	Alligator Cracks
●109+20							CL of TOWERS STREET
●110+63							CL of ARVADA STREET
111+00	89	52	25	0.58	108	17.75	Alligator Cracks
113+00	78	42	21	0.54	84	15.1	
115+00	64	37	21	0.58	65	11.72	
117+00	77	45	25	0.58	81	14.86	
●117+60							CL of 190TH STREET

● Not Included in Summary

Street: **ANZA AVENUE** *Project No.* **29492**

Limits: **SEPULVEDA BOULEVARD TO 190TH STREET**

Direction: **NORTHBOUND**

Lane: **2**

Feet X 100	*RR1*	*RR2*	*RR3*	*Ratio*	*Proj RR1*	*TD on 1*	*Comments*
●							BEGIN TEST LANE 2 NORTHBOUND ANZA AVENUE
●0+00							SEPULVEDA BOULEVARD TO 190TH STREET
●0+60							Curb and Gutter
2+00	117	69	40	0.59	119	24.5	Alligator Cracks
●2+95							CL of CATHANN STREET
4+00	87	60	35	0.69	103	17.27	Alligator Cracks
6+00	90	58	32	0.64	105	17.99	Alligator Cracks
8+00	87	58	32	0.67	105	17.27	Alligator Cracks
●9+85							CL of MERRILL STREET
10+00	146	107	68	0.73	168	31.49	Alligator Cracks
12+00	93	81	58	0.87	113	18.71	Alligator Cracks
14+00	49	41	28	0.84	60	8.11	Alligator Cracks
●15+40							CL of CARSON STREET
18+00	140	88	49	0.63	158	30.04	Alligator Cracks
20+00	134	97	58	0.72	162	28.59	Alligator Cracks
22+00	111	75	43	0.68	131	23.05	Alligator Cracks
24+00	130	73	39	0.56	137	27.63	Alligator Cracks
26+00	156	112	66	0.72	190	33.9	Alligator Cracks
●26+97							CL of LENORE STREET
28+00	125	84	48	0.67	147	26.43	Alligator Cracks
30+00	126	65	25	0.52	169	26.67	Alligator Cracks
32+00	191	134	75	0.7	239	42.33	Alligator Cracks
34+00	134	87	52	0.65	146	28.59	Alligator Cracks
36+00	144	110	61	0.76	198	31	Alligator Cracks
●36+13							CL of LEE STREET
38+00	122	86	48	0.7	154	25.7	
●38+60							CL of SCOTT STREET
40+00	126	61	36	0.48	103	26.67	Alligator Cracks
●41+55							CL of TORRANCE BOULEVARD
44+00	48	32	18	0.67	57	7.87	Alligator Cracks
●45+30							BEGIN PARKING LANE ON RIGHT
46+00	76	48	30	0.63	77	14.62	
48+00	120	85	57	0.71	127	25.22	
●48+50							CL of MARICOPA STREET Begin Patch
●48+65							End Patch
50+00	53	32	19	0.6	54	9.07	Slight Alligator Cracks
52+00	124	92	64	0.74	132	26.18	Near Manhole
54+00	83	45	26	0.54	78	16.3	
●54+97							CL of EMERALD STREET
56+00	119	73	42	0.61	127	24.98	
●57+48							Change in Pavement
58+00	151	89	51	0.59	155	32.69	
60+00	161	105	64	0.65	172	35.1	
●61+40							CL of GARNET STREET
62+00	53	47	38	0.89	58	9.07	
64+00	55	47	34	0.85	65	9.55	
66+00	42	37	28	0.88	49	6.42	
●67+85							CL of SPENCER STREET
70+00	59	50	37	0.85	68	10.52	
72+00	35	26	17	0.74	40	4.74	
74+00	52	46	36	0.88	59	8.83	Near Manhole
76+00	71	57	40	0.8	81	13.41	

● Not Included in Summary

DATA SHEET

Street: ANZA AVENUE **Project No.** 29492
Limits: SEPULVEDA BOULEVARD TO 190TH STREET
Direction: NORTHBOUND
Lane: 2

Feet X 100	RR1	RR2	RR3	Ratio	Proj RR1	TD on 1	Comments
● 77+35							END PARKING LANE
78+00	49	43	33	0.88	56	8.11	
80+00	59	42	30	0.71	59	10.52	Near Traffic Sensors
● 80+75							CL of DEL AMO BOULEVARD
82+00	94	48	24	0.51	96	18.95	
● 82+05							Begin Longitudinal Trench
● 82+70							CL of CARMELYNN STREET
84+00	108	49	27	0.45	89	22.33	Alligator Cracks
● 84+50							Begin Patch
● 84+95							End Longitudinal Trench
86+00	145	86	51	0.59	145	31.25	Alligator Cracks On Patch
● 87+25							End Patch LWT
88+00	151	88	52	0.58	149	32.69	Alligator Cracks On Patch
90+00	110	74	40	0.67	137	22.81	Alligator Cracks On Patch
● 90+00							Begin Longitudinal Trench
● 90+35							CL of HALISON STREET
● 90+60							Begin Patch LWT
92+00	114	65	37	0.57	114	23.77	On Patch
● 92+82							End Longitudinal Trench
94+00	111	84	54	0.76	131	23.05	On Patch
● 94+05							End Patch RWT
● 94+65							CL of DEELANE STREET
96+00	175	121	71	0.69	206	38.48	Alligator Cracks Near Patch
98+00	180	135	80	0.75	228	39.68	Alligator Cracks Near Patch
● 99+80							CL of NARROT STREET
100+00	126	89	51	0.71	155	26.67	Alligator Cracks Near Patch
102+00	73	60	42	0.82	86	13.89	Alligator Cracks Near Patch
104+00	105	78	50	0.74	122	21.61	Alligator Cracks Near Patch
106+00	73	57	34	0.78	96	13.89	Alligator Cracks Near Patch
● 106+45							End Patch LWT
108+00	104	73	43	0.7	124	21.36	Alligator Cracks
● 109+20							CL of TOWERS STREET
110+00	85	66	41	0.78	106	16.79	Alligator Cracks
● 110+60							CL of ARVADA STREET
112+00	74	61	42	0.82	89	14.13	Alligator Cracks
114+00	83	44	22	0.53	88	16.3	Alligator Cracks
● 114+80							BEGIN RTP
116+00	77	51	29	0.66	90	14.86	
● 117+60							CL of 190TH STREET

● Not Included in Summary

DATA SHEET

R - VALUE DATA SHEET

City of Torrance
Anza Avenue

PROJECT NUMBER 29492 BORING NUMBER: Subgrade 3-3

SAMPLE DESCRIPTION: Brown Fine Sand

Item	SPECIMEN		
	a	b	c
Mold Number	1	2	3
Water added, grams	116	104	98
Initial Test Water, %	13.0	11.9	11.4
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	145	375	727
Height Sample, Inches	2.61	2.51	2.46
Gross Weight Mold, grams	3167	3169	3145
Tare Weight Mold, grams	2083	2116	2118
Sample Wet Weight, grams	1084	1053	1027
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	17 / 34	14 / 28	13 / 26
Turns Displacement	4.90	4.52	4.47
R-Value Uncorrected	65	72	74
R-Value Corrected	68	72	74
Dry Density, pcf	111.4	113.6	113.5
	DESIGN CALCULATION DATA		
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.33	0.29	0.27
G. E. by Expansion	0.00	0.00	0.00

Equilibrium R-Value	71 by EXUDATION	Examined & Checked: 3 /7/ 03

REMARKS:
Gf = 1.25
0.0% Retained on the 3/4" Sieve.

Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 29492 City of Torrance

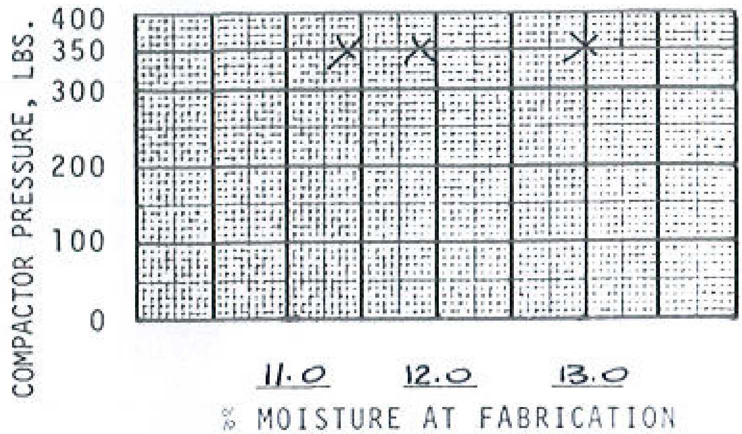
BORING NO. Subgrade 3-3 Anza Ave.

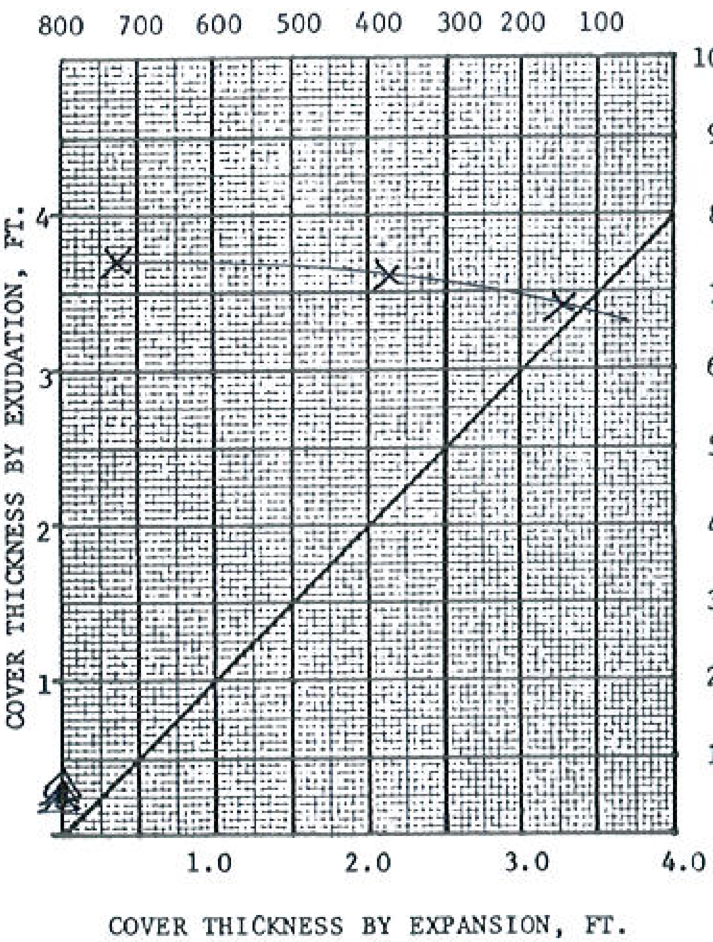
DATE 3-7-03

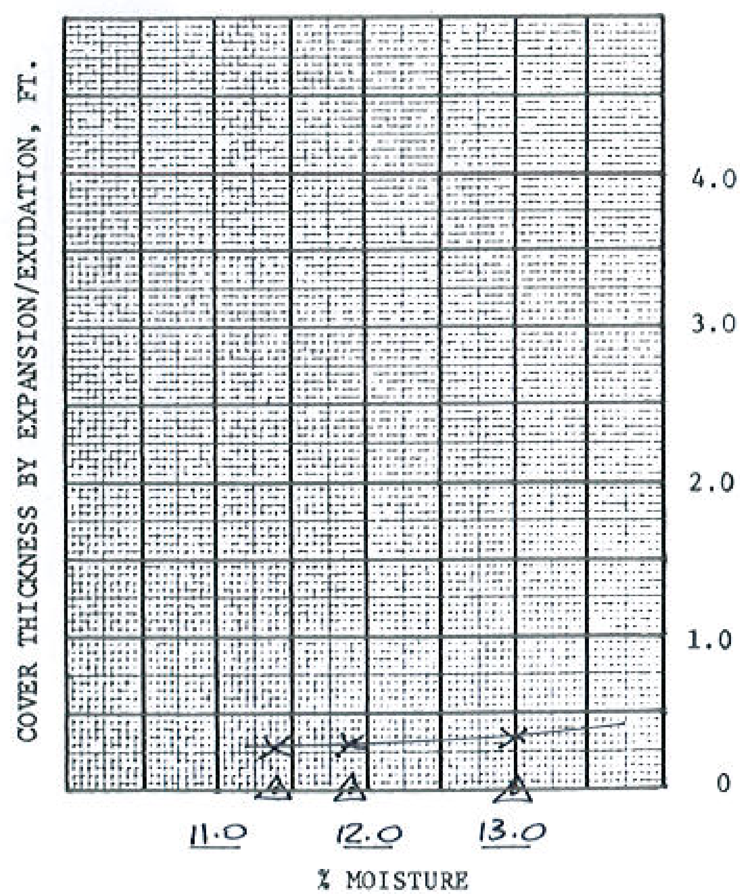
TRAFFIC INDEX Assume 4.0

R-VALUE BY EXUDATION 71

R-VALUE BY EXPANSION —







R-VALUE vs. EXUD. PRES. — T by EXUDATION

EXUD. T vs. EXPAN. T — T by EXPANSION

REMARKS

GF=1.25

R - VALUE DATA SHEET

City of Torrance
Anza Avenue

PROJECT NUMBER 29492 BORING NUMBER: Subgrade 3-13&14

SAMPLE DESCRIPTION: Brown Fine Sand

Item	SPECIMEN		
	a	b	c
Mold Number	4	5	6
Water added, grams	90	105	96
Initial Test Water, %	9.8	11.1	10.3
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	650	113	355
Height Sample, Inches	2.50	2.57	2.50
Gross Weight Mold, grams	3145	3190	3165
Tare Weight Mold, grams	2120	2117	2122
Sample Wet Weight, grams	1025	1073	1043
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	12 / 26	15 / 30	13 / 27
Turns Displacement	4.92	4.97	4.94
R-Value Uncorrected	72	69	71
R-Value Corrected	72	70	71
Dry Density, pcf	113.2	113.9	114.6
	DESIGN CALCULATION DATA		
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.29	0.31	0.30
G. E. by Expansion	0.00	0.00	0.00

Equilibrium R-Value	**71** by EXUDATION	Examined & Checked: 3 /7/ 03

REMARKS:

Gf = 1.25
0.0% Retained on the 3/4" Sieve.
Partial Free Drainage.

REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN 30659 Exp 12/31/04 CIVIL STATE OF CALIFORNIA

Steven R. Marvin, RGE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 29492 City of Torrance

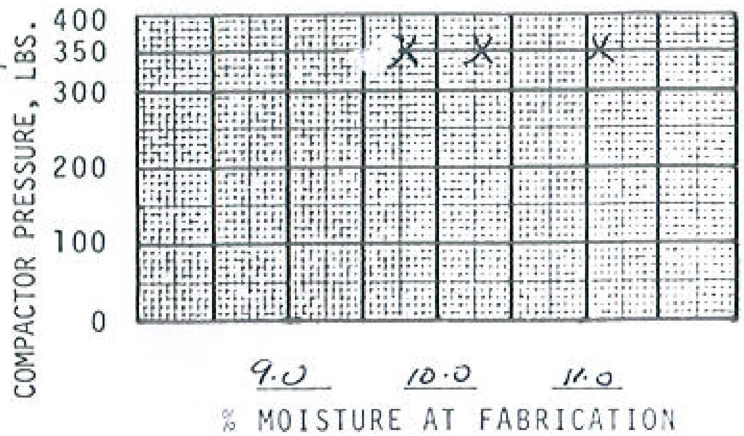
BORING NO. Sub. 3-13&14 comb. Anza Ave.

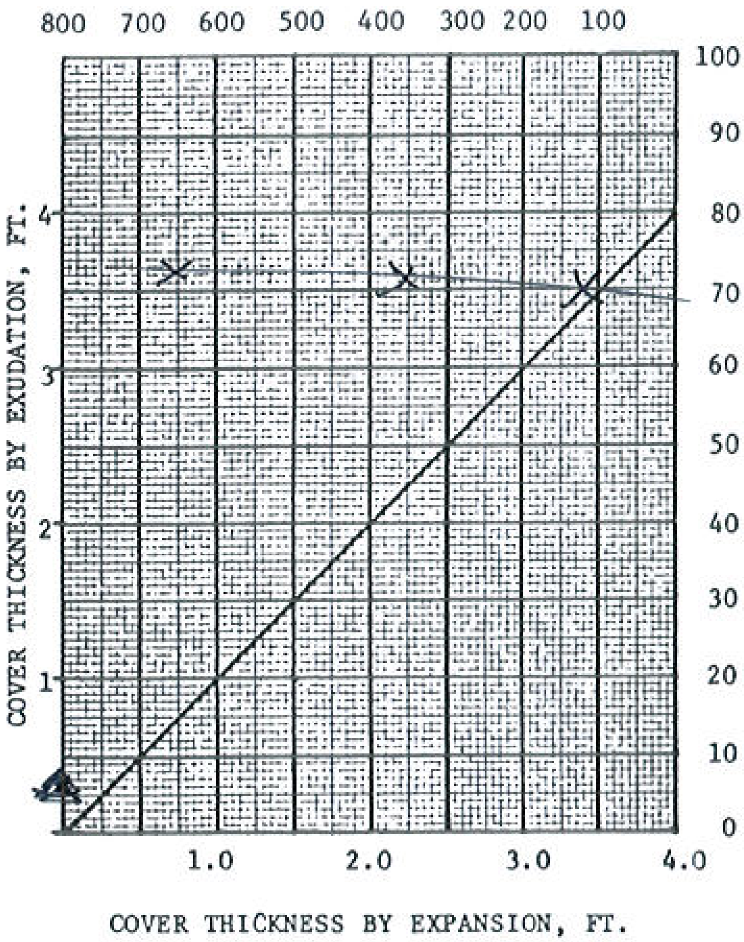
DATE 3-7-03

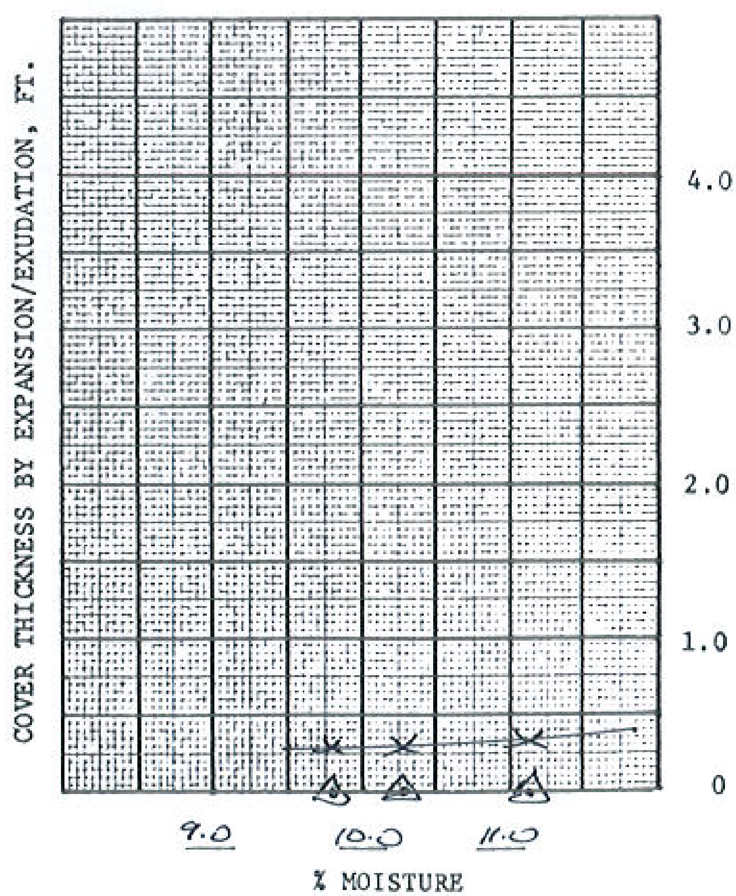
TRAFFIC INDEX Assume 4.0

R-VALUE BY EXUDATION 71

R-VALUE BY EXPANSION —







R-VALUE vs. EXUD. PRES. — T by EXUDATION

EXUD. T vs. EXPAN. T — T by EXPANSION

REMARKS

GF=1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING

EXPLANATION OF LISTINGS ON ROAD RATER DATA SHEETS

The Road Rater Data Sheets provide a tabulation of all field test data, field observations and pertinent landmarks such as cross streets, patches, utility trenches, etc. The following is an explanation of the various information contained on the data sheets:

FEET X I00 - The stationing of test locations as measured in the direction of travel.

RR1, RR2, RR3 - The Road Rater deflection reading in 10^{-5} inches. RR1 represents the deflection directly beneath the load input with RR2 representing deflection one foot and RR3 representing deflection two feet from the load input point.

RATIO - The ratio of RR2 / RR1 or the inter-relationship of the deflection one-foot from the stress input to the deflection at the load center. This value indicates the extent of support provided directly beneath the pavement layer.

PROJ. RR1 - Evaluation of the pavement deflection basin is based upon deflected pavement shape. The pavement response one and two feet from the loading center is compared to an ideal flexible pavement model and the Projected Road Rater value calculated. Comparison of the Projected RR1 and the Measured RRI provides information relative to subgrade response and asphalt concrete stiffness.

TD ON 1 - The measured Road Rater sensor number one under load converted to an equivalent Traveling Deflectometer unit. The basis of conversion is:
T.D. = (R.R. x 0.01 x 24.I) - 3.7

EXPLANATION OF LISTINGS ON TABLE ONE

Table One is a statistical accumulation of measured deflection values obtained during field-testing. Individual deflection test data was reviewed and grouped according to data trends and engineering judgment. Contained within the Table One are the limits of evaluation, the 80th percentile measured deflection, the allowable deflection, overlay requirements and the Nominal Service Life. The following is a more detailed explanation of the various information contained in Table One:

STREET AND LIMITS - The roadway studied is separated by lane, direction of travel and stationing. The station limits selected represent areas of like deflection determined during the engineering review of data and field conditions.

MEASURED DEFLECTION

R.R. The 80th percentile deflection value, representing the strength under loading of the section being evaluated, reported in inches times 10^{-5}.

T.D. The 80th percentile deflection value in Traveling Deflectometer units, 10^{-3} inches.

T.I. The Traffic Index used for evaluation of the specific test loading. The Traffic Index represents the anticipated accumulation of equivalent axle loads within the design period.

'T' The thickness of existing surfacing material provided.

ALLOWABLE DEFLECTION - The maximum permissible deflection value where no reinforcement is necessary. The calculated maximum value is based upon asphalt concrete thickness and traffic index as determined per Caltrans Test Method 356. The allowable deflection is reported in both Road Rater (R.R.) and Traveling Deflectometer (T.D.) units.

RED. REQ'D (%) The percent reduction in measured deflection to match tolerable or allowable deflection levels, based upon Traveling Deflectometer conversions.

G.E. REQ'D (FT.) The equivalent thickness, in feet, of rock base required to effect the specified deflection reduction.

A.C. REQ'D (FT.) The equivalent asphalt concrete thickness required to effect the specified deflection reduction.

NSL (YRS.) The nominal service life is a computation of the time it would take to generate the number of equivalent axle loads permissible based upon measured strengths. The NSL should be considered as an ordering tool due to variations in growth rates and actual axle loading within specific times of the design period.

TECHNICAL DETAILS ON ROAD RATER & DEFLECTION ANALYSIS

TEST EQUIPMENT - The Road Rater is a non-destructive hydraulic test apparatus that measures the stiffness of a pavement by applying a dynamic load. It is equipped with electronic instrumentation that measures and displays the deflection at the point where the force is applied and one or more other nearby points. Additional details will be provided if desired. Following are specific operation data for this study:

TEST FREQUENCY =	25 Hertz
AIR PRESSURE-Transfer Pods =	35 psig
AIR PRESSURE-Support Pods =	47 psig
STATIC LOADING =	5333 Newtons
OSCILLATING LOADING =	5340 Newtons

DEFLECTION ANALYSIS BIBLIOGRAPHY

1. The State of California, Department of Public Works, Division of Highways, Materials Manual-Volume I, Test Method CAL 356

2. The Asphalt Institute Publication, "Asphalt Overlays and Pavement Rehabilitation" MS-17

3. Flexible Pavement, Structural Section Design Guide for California Cities and Counties

4. International Conference on the Structural Design of Asphalt, Proceedings 1962, 1967, 1972 and 1982 - Various Papers

5. A Guide to the Structural Design of Flexible and Rigid Pavements in Canada; Canadian Good Roads Association, September 1975 and Australia Method, 1982

6. Various Technical Memorandums and Reports presented by:

   a) American Society of Civil Engineers, Soils Mechanics Division and Transportation Division

   b) Highway Research Board Records and Special Reports on Pavement Performance

   c) FHWA, FAA and miscellaneous Federal and State Reports relative to Deflection Analysis