

**DRAFT
EXECUTIVE SUMMARY**

**SOUTHERN CALIFORNIA ACCELERATED
RAIL ELECTRIFICATION PROGRAM**



PHOTO BY SPACESHOTS INC.

Prepared for

Southern California Regional Rail Authority

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February 10, 1992

Prepared By:

**Los Angeles County Transportation Commission
South Coast Air Quality Management District
Southern California Regional Rail Authority**

DeLeuw Cather & Company

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LTK Engineering Services

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Southern California Edison Inc.

Southern California Gas Company

Southwest Research Institute

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San Diego Gas and Electric/
San Diego Air Pollution Control District**

South Coast Air Coast Quality Management District

Southern California Edison

Southern California Gas Company

Southern California Regional Rail Authority

Southern Pacific Transportation Company

Union Pacific Railroad

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The Southern California Accelerated Rail Electrification Program report has been prepared in response to direction from the California Transportation Commission (CTC) to the Southern California Regional Rail Authority (SCRRA) and the Los Angeles County Transportation Commission (LACTC) to respond to concerns regarding plans for implementation of diesel-powered commuter rail service and the need to comply with Measure 14 of the 1991 Air Quality Management Plan which targets a 90% reduction in rail-related emissions by the year 2010.

The report documents the analyses performed and the conclusions reached by the Regional Rail Electrification Task Force, organized by SCRRA and LACTC with the invited participation of the South Coast Air Quality Management District, Southern California Association of Governments, California Air Resources Board, Southern California Edison, Southern California Gas Company, Los Angeles Department of Water and Power, Southern Pacific Transportation Co., Topeka & Santa Fe Railway, Union Pacific Railroad, California Transportation Commission, California Public Utilities Commission, Federal Railroad Administration, Amtrak, affected municipal utility districts, and other interested parties. The Task Force was organized into six committees, working with the SCRRA commuter rail consultant team, to simultaneously reach preliminary policy consensus and perform conceptual-level engineering for the Electrification Program. The Task Force Committees were: Planning, Engineering, Analysis, Operations & Maintenance; Environmental Analysis; Legal/Legislative; Funding; Alternative Fuels; and, Regulatory Applications. These committees were chaired by representatives of various Task Force member organizations. An organization chart which illustrates the structure of the Task Force is provided as Exhibit ES-1.

The report responds directly to the following concerns identified by CTC, SCAQMD and other relevant agencies:

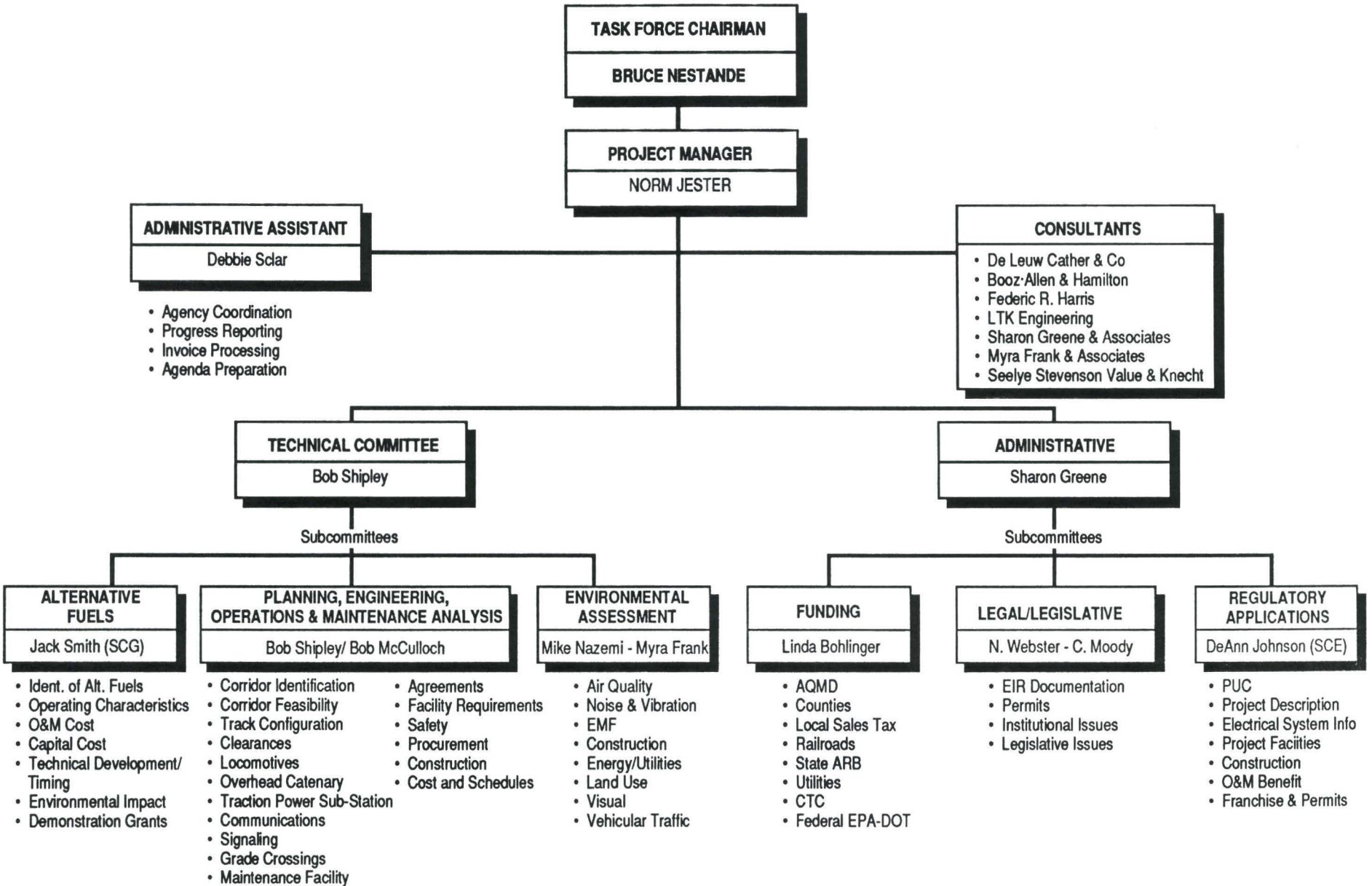
- How much would a regional rail electrification program cost?
- How quickly could railroad electrification be implemented?
- Which lines are the best candidates for electrification in terms of potential for reduced emissions and other relevant factors?
- What is the most viable approach to funding the electrification program?
- What are the air quality impacts associated with the planned diesel-powered commuter trains?
- What legal/legislative/regulatory actions must be undertaken to implement a regional electrification program?
- Does the candidate electrification network achieve the AQMP target of 90% reduction in emissions by the year 2010?
- What will be the role of alternative fuels in achieving the 90% reduction in emissions targeted by the AQMP?

A tremendous volume of information has been assembled to provide the answers to these questions. In addition, an attempt was made to address every technical aspect of implementing a major electrification program and to identify virtually every issue which could be anticipated to arise as part of such implementation. Although the contents of this report will almost certainly be the subject of vigorous debate, such contents, particularly in the area of estimated cost, represent the consensus of the overwhelming majority of professional opinion. Accordingly, the report is viable as an objective baseline for decision-making regarding electrification of the railroad network in and around the South Coast Air Basin.

**EXHIBIT ES-1
Regional Rail Electrification Task Force**

DRAFT VERSION 1
2/10/92

ES-2



KEY FINDINGS

The major findings of the Electrification Study are presented below in the form of answers to questions identified previously.

COST – The electrification of the 418 route miles of commuter rail only is estimated to cost \$1.45 billion in current dollars; the cost to electrify the entire 806 route miles of candidate lines is estimated to cost \$3.26 billion in current dollars. The escalated cost of electrifying the nine commuter rail routes only is estimated to be \$1.85 billion; the escalated cost for the entire candidate network is estimated to be \$4.6 billion.

SCHEDULE – The time required to electrify the nine individual candidate commuter rail routes is estimated to range between four and seven years. These durations include preliminary engineering, environmental approval process, final design, contract bid process, construction and testing. The freight railroad main lines and the UP/SP/ATSF Consolidated Corridor are estimated to require between approximately nine and ten years to electrify.

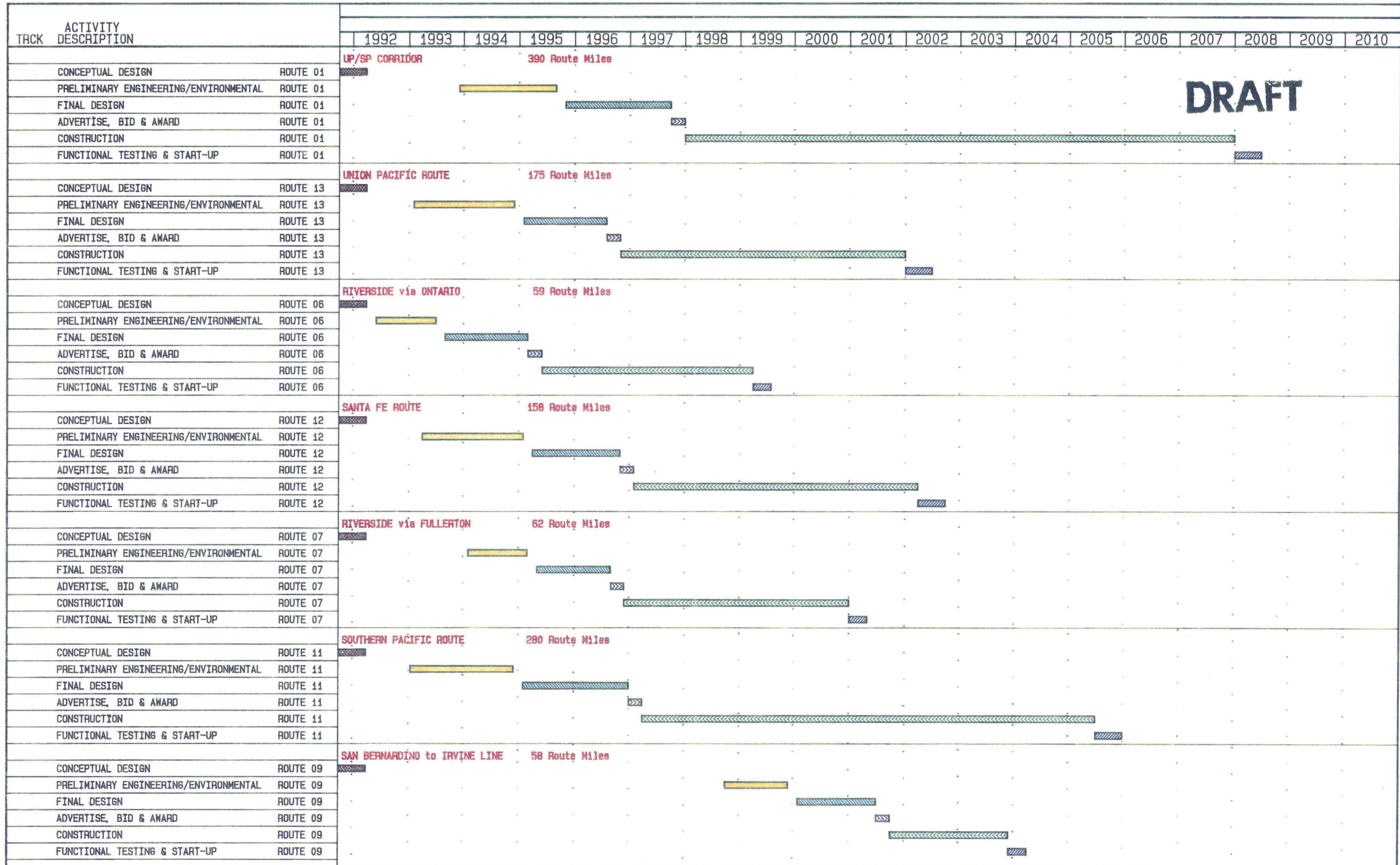
Application of assumed funding constraint of \$300 million annually to the schedule results in an estimated project duration of eighteen years. A preliminary design and construction schedule is provided in Exhibit ES-2. A graphic illustration of the year-by-year funding requirements, which reflects the assumed \$300 million annual funding cap and which drives the overall project duration of eighteen years, is provided in Exhibit ES-3.

PRIORITY CANDIDATES – The two step evaluation process was applied to the nine planned commuter rail routes only, and repeated for all candidate routes, commuter and freight.

The evaluation process resulted in the following prioritization of the candidate routes:

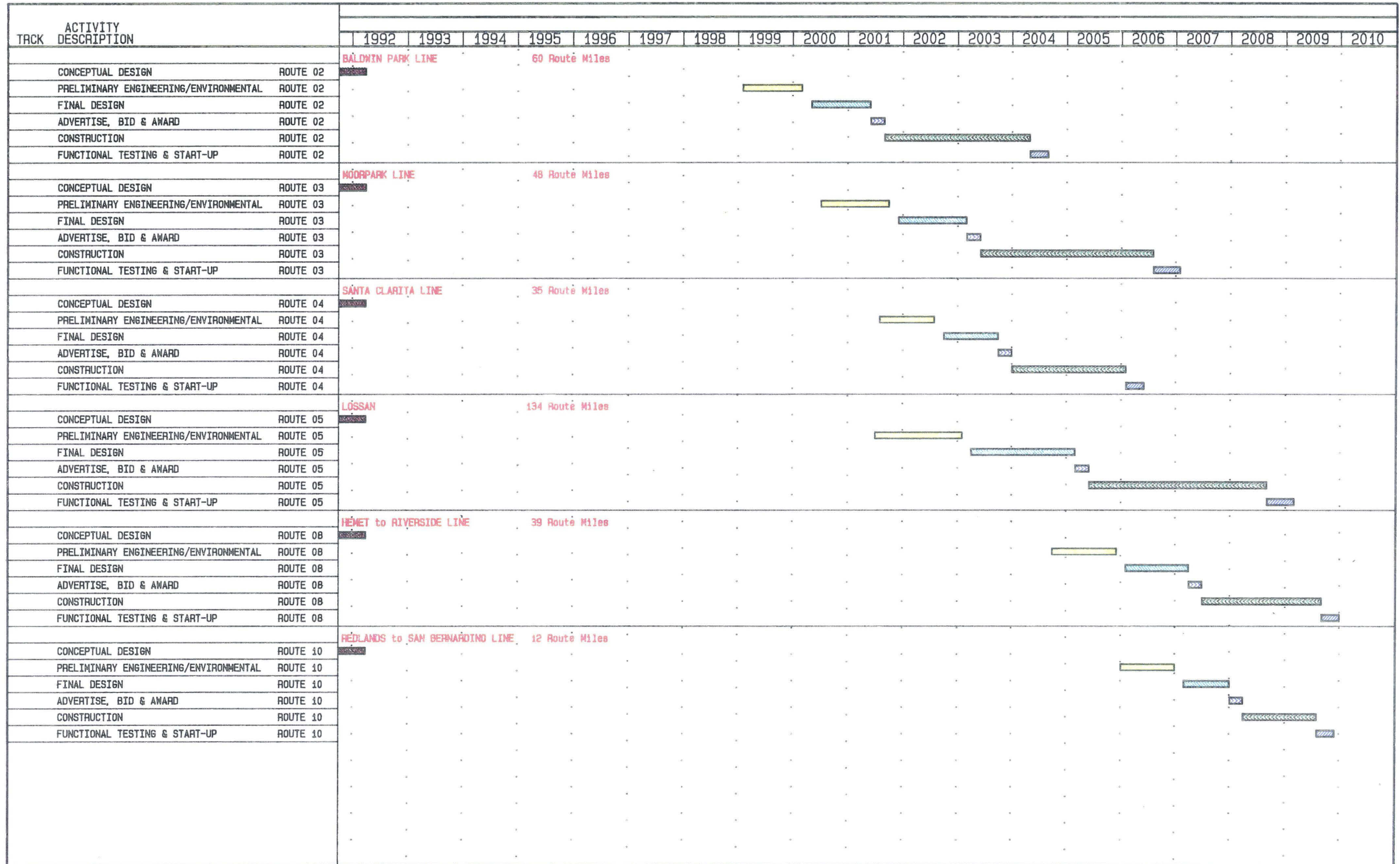
1. Route 1 UP-SP Consolidated Freight Corridor
2. Route 13 UP Ports to Yermo Freight
3. Route 6 Riverside to Los Angeles (UP) Commuter
4. Route 12 ATSF Ports to Barstow Freight
5. Route 7 Riverside-LAUPT via Fullerton (ATSF) Commuter
6. Route 11 SP Ports to Yuma Freight
7. Route 9 San Bernardino to Irvine (ATSF) Commuter
8. Route 2 Baldwin Park Commuter
9. Route 3 Moorpark Commuter
10. Route 4 Santa Clarita Commuter
11. Route 5 LOSSAN Corridor (ATSF) Commuter/Intercity
12. Route 8 Hemet to Riverside Commuter
13. Route 10 Redlands Commuter.




The highest scoring commuter rail line, candidate route 6, Riverside-Los Angeles via the Union Pacific, has been suggested as an initial project for preliminary engineering.









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<p>Primavera Systems, Inc. 1984-1991</p> <p>Activity Bar/Early Dates Critical Activity Progress Bar</p>	<p>WBS LEVEL 5</p> <p>CONCEPTUAL DESIGN PRELIMINARY ENGINEERING / ENVIRONMENTAL FINAL DESIGN ADVERTISE, BID & AWARD CONSTRUCTION FUNCTIONAL TESTING / START-UP</p>	<p>SOUTHERN CALIFORNIA REGIONAL RAIL ELECTRIFICATION PROGRAM DESIGN & CONSTRUCTION SCHEDULE Commuter & Freight</p> <p>Sheet 1 of 2</p>	<p>Project Start : 1JAN91 Project Finish: 31DEC10*</p> <p>Data Date: 10CT91 Plot Date: 7FEB92</p>	<p>Parsons DeLeuw, Inc.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Date</th> <th>Revision</th> <th>Checked</th> <th>Approved</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Revision	Checked	Approved																
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 Activity Bar/Early Dates
 Critical Activity
 Progress Bar

WBS LEVEL 5
 CONCEPTUAL DESIGN
 PRELIMINARY ENGINEERING / ENVIRONMENTAL
 FINAL DESIGN
 ADVERTISE, BID & AWARD
 CONSTRUCTION
 FUNCTIONAL TESTING / START-UP

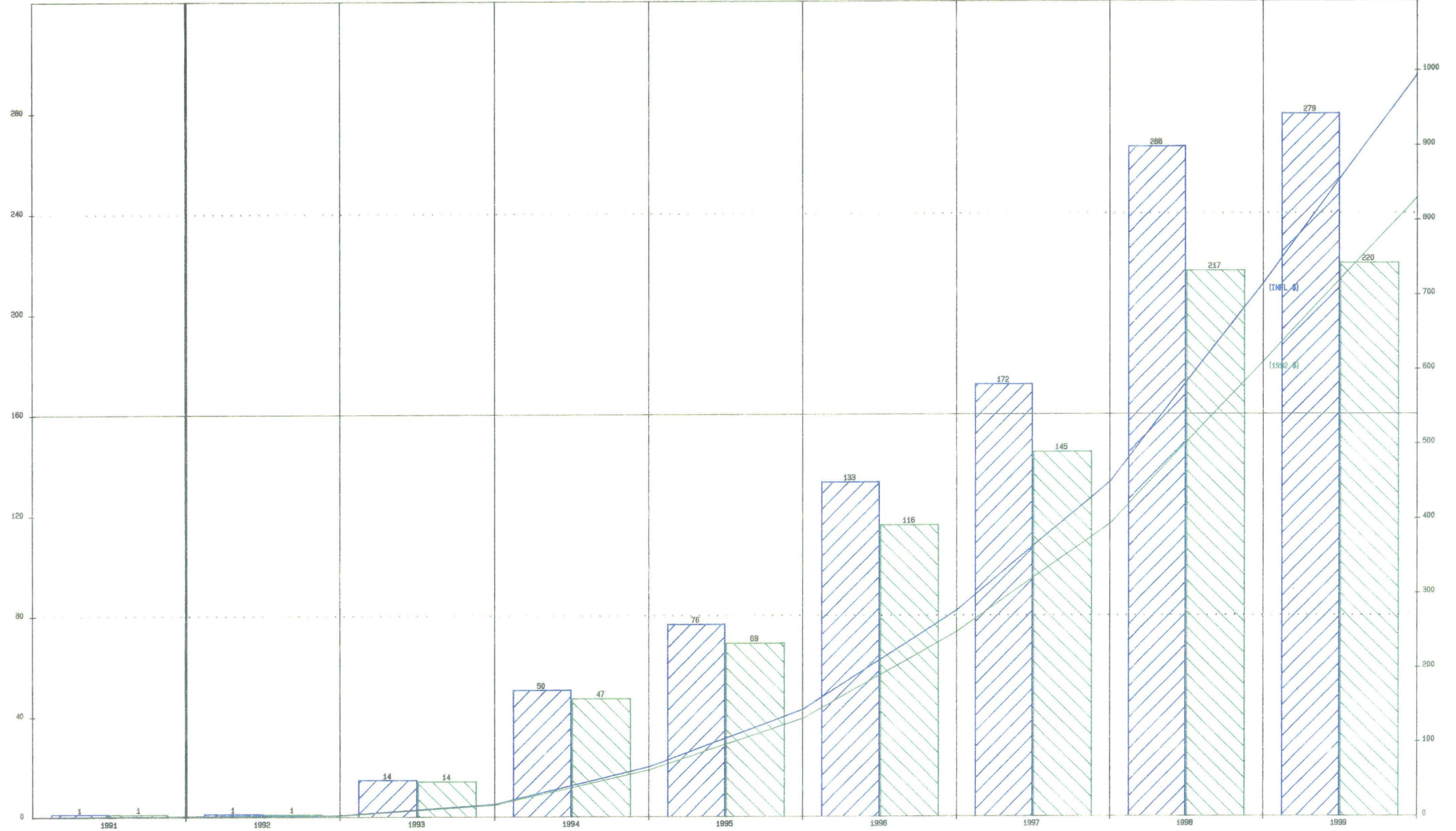
SOUTHERN CALIFORNIA REGIONAL RAIL
 ELECTRIFICATION PROGRAM
 DESIGN & CONSTRUCTION SCHEDULE
 Commuter & Freight



Project Start : 1JAN91
 Project Finish: 31DEC10*
 Data Date: 10CT91
 Plot Date: 7FEB92

Parsons DeLeuw, Inc.			
Date	Revision	Checked	Approved

X Million

X Million



 Inflated using annual rate of 3.46%.
 Constant 1992 dollars.

Primavera Systems, Inc. 1984-1991 CFRCONX

Project Start : 1JAN91
 Project Finish: 31DEC10

SOUTHERN CALIFORNIA REGIONAL RAIL
 ELECTRIFICATION PROGRAM
 COMMUTER & FREIGHT

Sheet 1 of 1

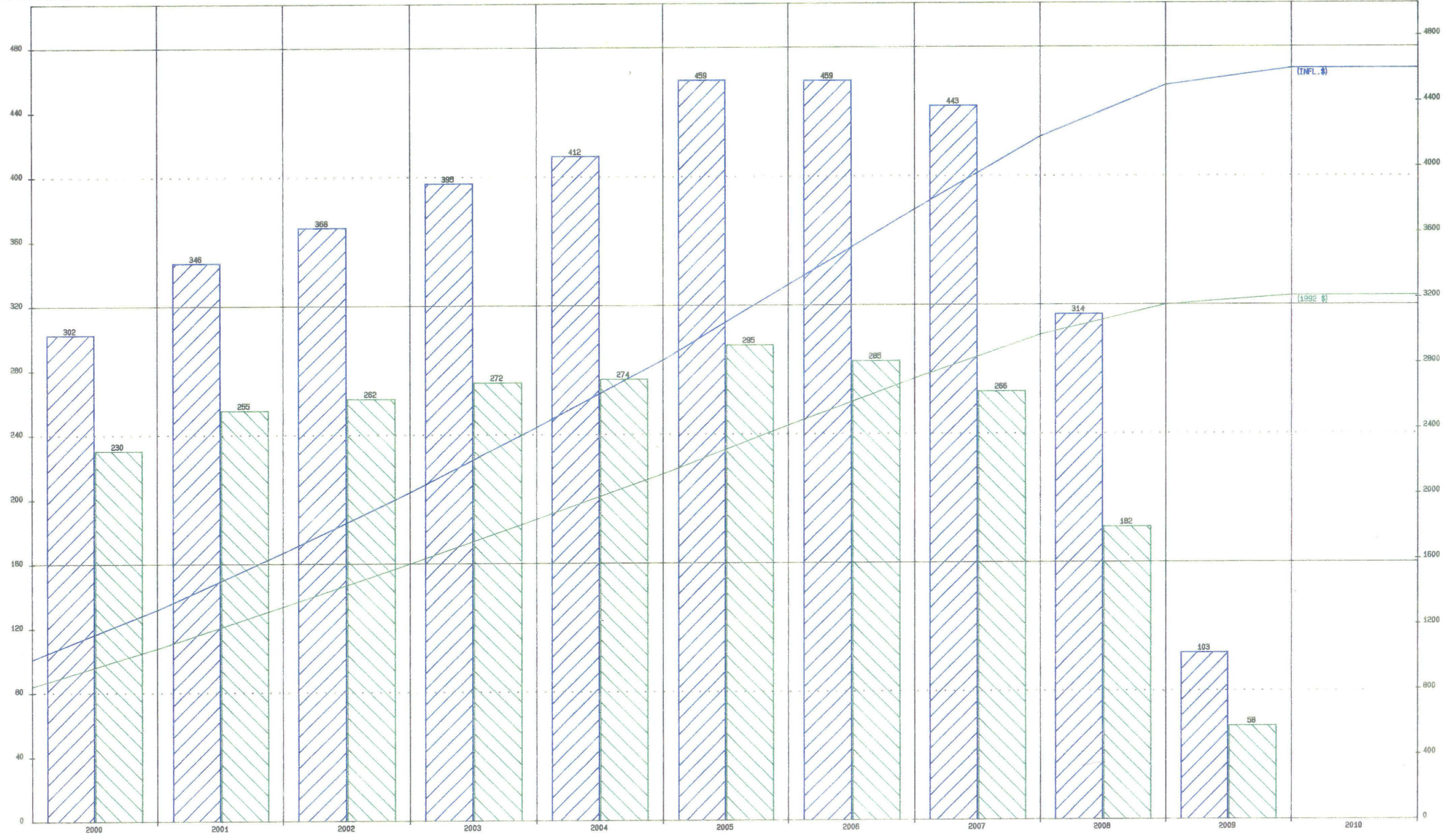
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Date	Revision	Checked	Approved

Data Date: 10CT91
 Plot Date: 7FEB92

X Million

X Million



 Inflated using 3.46% annual rate.
 Constant 1992 dollars.

Primavera Systems, Inc. 1984-1991 CFRCONY

Project Start : 1JAN91
Project Finish: 31DEC10

SOUTHERN CALIFORNIA REGIONAL RAIL
ELECTRIFICATION PROGRAM
COMMUTER & FREIGHT

Sheet 1 of 1

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Date	Revision	Checked	Approved

Data Date: 10OCT91
Plot Date: 7FEB92

FUNDING – To the extent that electrification costs are not offset by easily quantified economic benefits, decisions on funding participation levels among various public, private and commercial entities must attempt to spread the significant costs of rail electrification as widely and as equitably as possible. Rate based utility financing, if CPUC approval can be obtained, will spread the costs to SCE customers, and offer a base to which many other fund sources must be added. State, federal and local sources must be utilized as well as financial participation from the freight railroads in order to successfully accomplish rail electrification in Southern California.

AIR QUALITY – Current NO_x emissions from railroad operations constitute less than 2.6% of the total NO_x emissions in the South Coast Air Basin (see Exhibit ES-4). The SCAQMD projects that by the year 2010, mainline freight operations will constitute almost 72% of the railroad-related NO_x emissions in the South Coast Air Basin, with yard, switching, and other local operations contributing 21% of NO_x emissions. SCAQMD projects that commuter rail operations will constitute about 5.4% of the total NO_x emissions for rail operations in 2010 (See Exhibit ES-5).

Although diesel-powered commuter trains emit less of certain pollutants and less pollutants overall than an equivalent number of automobiles, the Air Quality Analysis conducted by SCAQMD indicates that NO_x emissions will increase by 2.04 tons/day and SO_x emissions will increase by 0.1 tons/day over the emissions from an equivalent number of automobiles displaced. (This analysis assumes 70% electrification of the automobile fleet and no improvement in diesel locomotive technology by 2010.) South Coast Air Quality Management District estimates of the potential NO_x reductions which might be achieved by electrification are summarized by candidate route on Exhibit ES-6. The costs per ton of potential NO_x reductions are summarized in Exhibit ES-7.

LEGAL/LEGISLATIVE – Electrification of commuter and freight lines may require compliance with environmental requirements under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Only commuter rail facilities electrified within existing railroad rights-of-way are exempt from such requirements.

While commuter rail lines acquired through fee or easement could be electrified, additional access rights would be required to electrify those lines operated under trackage rights agreements.

Delaying implementation of the planned commuter rail network until electrification takes place could subject the region to federal sanctions for failure to expeditiously implement Transportation Control Measure 2G. Further, these sanctions may include disapproval of the RTIP and withholding of Federal transportation funds for the region and/or the state.

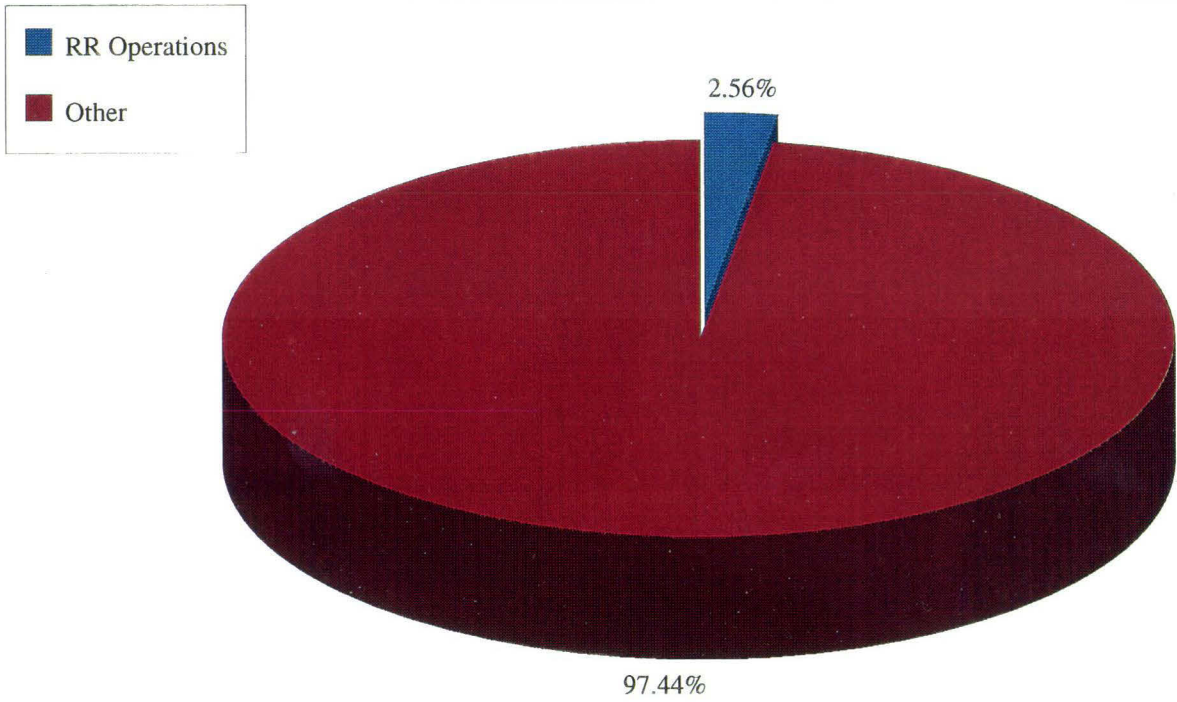
REGULATORY – There are 12 separate utilities in the electrification study area. The investor-owned utilities such as Southern California Edison could consider application to the California Public Utilities Commission for rate treatment financing of defined components of the electrification system. The municipally-owned utilities would apply to their respective City Councils.

MEASURE 14 TARGET – Electrification of the entire candidate network is estimated to reduce rail-related emissions by 76% by the year 2010. Further study is required to ascertain how additional reductions might be achieved to meet the 90% emissions reduction target.

ALTERNATIVE FUELS – Several alternative fuels technologies appear to offer a means by which to reduce emissions from rail-operations not identified as candidates for electrification and could be used during transition from current diesel to electric operation.

EXHIBIT ES-4

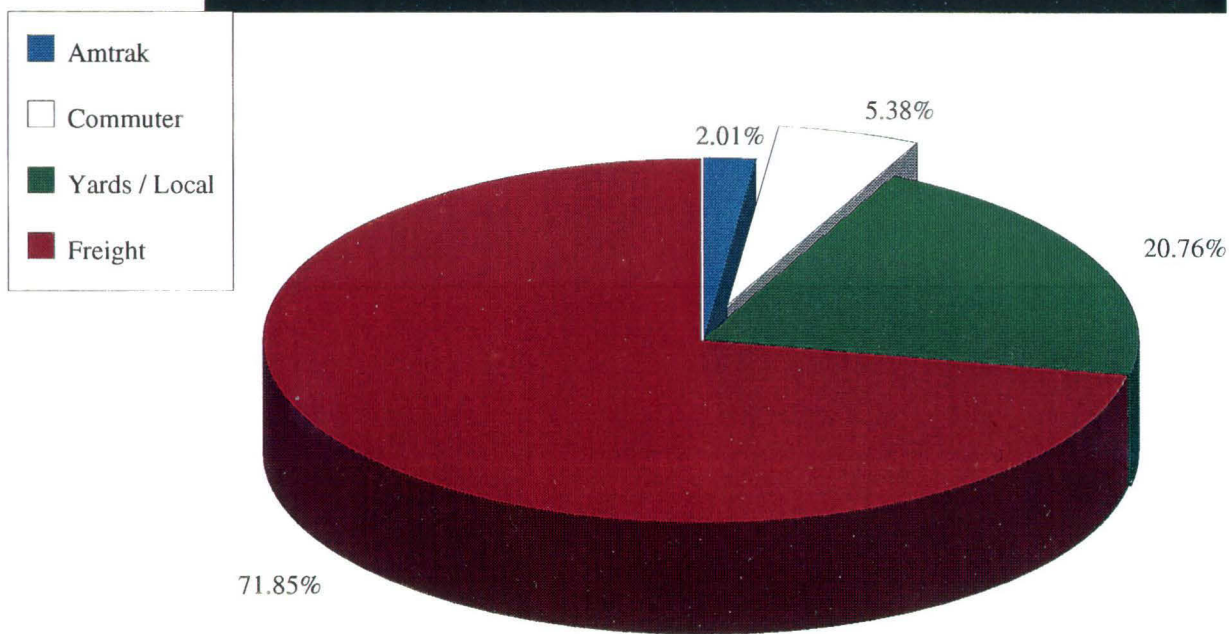
CURRENT NO_x EMISSIONS IN THE SOUTH COAST AIR BASIN



Source: Southern California Association of Governments, February 1992.

EXHIBIT ES-5

COMPONENTS OF RAILROAD RELATED NO_x EMISSIONS IN THE SOUTH COAST AIR BASIN IN 2010

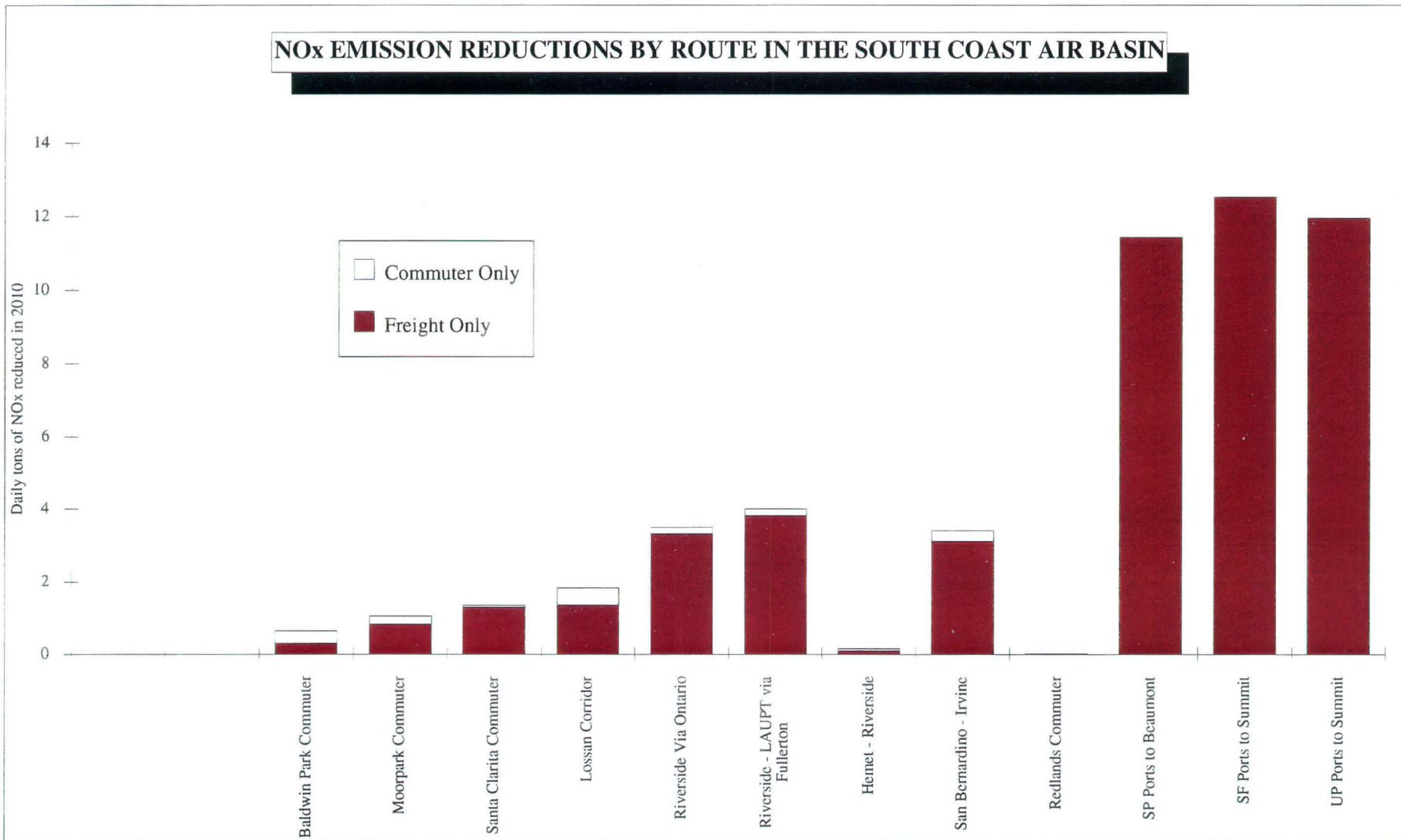


Source: South Coast Air Quality Management District, February 1992.

EXHIBIT ES-6

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ES-9

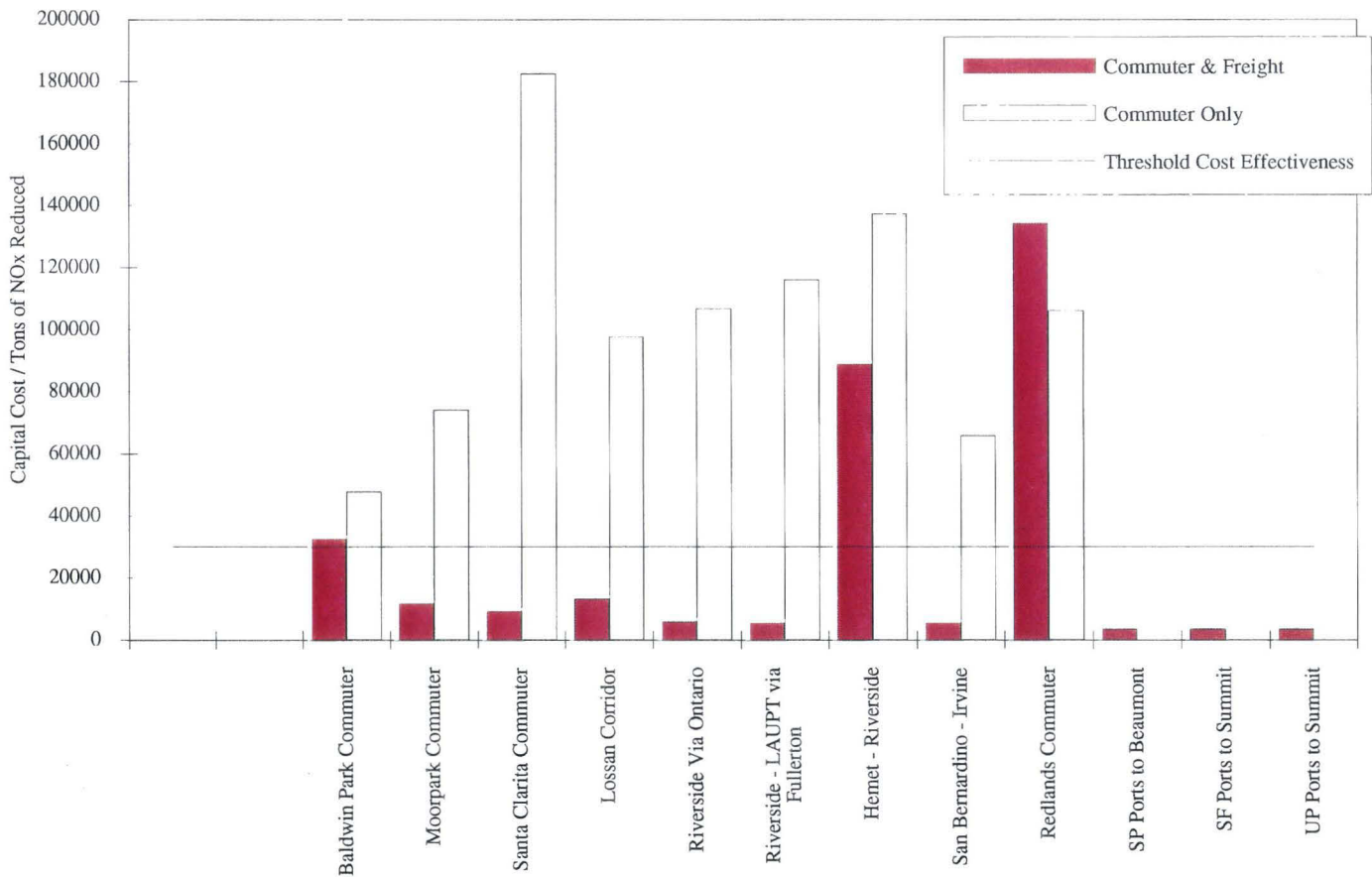


Note: Assumes all locomotives travelling in each corridor are converted to electric operation

Source: South Coast Air Quality Management District.

EXHIBIT ES-7

CAPITAL COST / TON OF NO_x REDUCED IN THE SOUTH COAST AIR BASIN



Notes: 1. Costs do not include incremental locomotives or O&M costs.
 2. Analysis does not include costs or emission reductions outside Basin.

Based on South Coast Air Quality Management District data, February 1992.

TASK FORCE WORK PROGRAM SUMMARY

The following sections provide highlights of the Report Findings, organized generally in accordance with elements of the work program.

Selection of Candidate Routes

Thirteen routes were selected for evaluation. Nine of these routes reflect the interest of the California Transportation Commission in evaluating the viability of electrifying the nine planned SCRRA commuter rail routes. Three of these routes are mainline, high-density freight corridors noted as candidates for electrification in the 1991 AQMP. A thirteenth route was developed to evaluate the effect of consolidating freight operations of the UP, SP, and ATSF on a consolidated electrified freight corridor.

The candidate routes evaluated in this report are shown in Table ES-1.

TABLE ES-1
Candidate Routes

Route No.	Route Name	Route Miles
1	SP/UP/ATSF Consolidated Corridor	393.5
2	Baldwin Park	57.0
3	Moorpark	47.5
4	Santa Clarita	34.9
5	LOSSAN Corridor	133.7
6	Riverside via Ontario (UP)	59.1
7	Riverside via Fullerton (ATSF)	61.8
8	Hemet to Riverside	39.1
9	San Bernardino to Irvine	52.8
10	Redlands to San Bernardino	12.2
11	Southern Pacific (Yuma to Ports)	281.7
12	Santa Fe (Barstow to Ports)	176.1
13	Union Pacific (Yermo to Ports)	186.8
Entire Network		805.7

Evaluation of Candidate Routes

To establish a framework for the prioritization of candidate routes, several criteria were defined and applied. The criteria and their respective weights are shown in Table ES-2:

TABLE ES-2
Route Selection Criteria

CRITERIA	MEASURE(*)	Weight
1. Emissions Reduction	1a. Tons/day	12
2. Air Quality Cost-Effectiveness	2a. \$/ton	12
3. Financial Cost-Effectiveness	3a. Capital cost/passenger	1
	3b. Capital cost/passenger-mile	1
	3c. Capital cost/ton of freight	1
	3d. Capital cost/ton-mile of freight	1
	3e. Annual O&M cost/passenger	1
	3f. Annual O&M cost/ton of freight	1
	3g. Annual O&M cost/ton-miles of freight	1
	3h. Annual O&M cost/ton-mile of freight	1
	3i. Life-cycle cost/passenger	1
	3j. Life-cycle cost/passenger-mile	1
	3k. Life-cycle cost/ton of freight	1
	3l. Life-cycle cost/ton-mile of freight	1
4. Environmental	4a. Potential for Significant Environmental Issues	12
5. Legal	5a. Potential for Significant Legal issues	12
6. Funding	6a. Eligibility for Rate-Basing	12
7. Service Quality	7a. Travel Time Change for Passenger	6
	7b. Travel Time Change for Freight	6
8. Shared Use Potential	8a. Shared Use Potential (Freight/Passenger)	6
	8b. Potential for Packaging with Other Lines	6
9. Schedule/Timing	9a. Potential for significant delay	12
	Total Unweighted Score	108
	Total Weighted Score	

These criteria were applied in a two step process. In the first step, all candidate routes were scored on a stand-alone basis. The second step was to re-evaluate the candidates on the basis of their incremental costs only. As an example, once the highest scoring candidate had been identified on a stand-alone basis, the remaining candidates were reconsidered, without the capital cost of those line segments assumed to have been paid for in the electrification of the first candidate route. This process was repeated eleven times with relative score of the remaining candidate routes shifting each time to reveal a revised leading candidate at a given point in the sequence.

The entire preceding process was applied to the nine planned commuter rail routes only, and repeated for all candidate routes, commuter and freight.

TABLE ES-3
TOTAL COSTS* RELATED TO ELECTRIFICATION
(NO SEGMENTS DUPLICATED)
25kV, Minimum Vertical Clearance
(Dollars in Millions)

Elements	Commuter Only		Commuter & Freight	
	Construction Cost	Total Cost	Construction Cost	Total Cost
Civil, Structural & Signal Costs	\$338.8	\$678.8	\$629.3	\$1,261.7
System-wide Traction Electrification Costs	371.3	758.9	889.0	1,831.8
Shops & Ancillary Facilities	0	0	40.0	80.1
Locomotive Change Facilities	0	0	34.0	68.1
Control Center	5.0	10.0	10.0	20.0
Total	\$715.1	\$1,447.7	\$1,602.2	\$3,260.9

* (Locomotives not included)

TABLE ES-4
SUMMARY OF COSTS BY ROUTE* COSTS RELATED TO ELECTRIFICATION
Commuter Only 25kV, Minimum Vertical Clearance
(Dollars in Millions)

Route	Description	Route Miles	Unduplicated ** Route Miles	Duplicated Construction Costs	Duplicated Total Cost
2.	Baldwin Park Commuter	57	57	\$ 93.5	\$ 189.5
3.	Moorpark Commuter	48	46	91.8	186.2
4.	Santa Clarita Commuter	35	57	68.3	137.9
5.	LOSSAN Corridor	134	133	248.5	502.4
6.	Riverside Via Ontario	59	24	108.9	220.5
7.	Riverside — LAUPT via Fullerton	62	35	126.8	256.3
8.	Hemet — Riverside	39	39	54.4	110.1
9.	San Bernardino — Irvine	53	13	106.0	214.8
10.	Redlands Commuter	12	12	18.9	39.1

* Locomotives, Shops & Ancillary Facilities, Locomotive Change Facilities and Control Center not included

** Unduplicated Route Miles Calculated Based on Order Shown.

Contract add-ons consist of contractor mobilization and demobilization, insurance, force account work, allowances for change orders, contingency, and other related costs expressed as a percentage of the construction cost. The consultant team developed estimates of add-ons based on the experience of the Rail Construction Corporation and the Southern California Regional Rail Authority with recent rail construction projects of comparable value. All of the parties which participated in the review of the unit cost estimates, similarly considered the estimated add-ons. All but one accepted the validity of the estimates; SCE held a dissenting opinion that the add-ons should be lower, based on their experience with construction of power generation and transmission facilities. Correspondence documenting SCE's comments regarding the Task Force's cost estimates, and SCRRA's response, are found in Appendix E-1.

In the third step in developing the estimated cost of electrification, the unit costs, including add-ons, were applied to the thirteen candidate routes, using year 2000 projected traffic volumes. The resultant costs expressed in constant 1992 dollars and by route are provided below. Note that the sum of the costs to electrify individual routes is not the same as the total cost to electrify the entire candidate network. This is because every route shares mileage with at least one other route, and the sum of the costs of individual routes would therefore include the cost of electrifying some line segments several times over.

The total cost of electrifying all of the candidate lines, divided by the total number of miles in the network, results in the average per mile costs as summarized in Table ES-6:

TABLE ES-6
Average Costs Related to Electrification
25kV Electrification System, Minimum Clearances
(Dollars in Thousands)

	Commuter Only	Commuter and Freight
Total Cost	\$1,448,000	\$3,261,000
Route Miles	417.8	805.5
Track Miles	671.3	1,452.5
Avg. Cost/Route Mile	\$3,466	\$4,048
Avg. Cost/Track Mile	\$2,157	\$2,245

There is a considerable difference between the clearances desired by the railroads and the clearances deemed adequate by the consulting team. In order to minimize the cost of electrification, the project teams' main effort was spent preparing estimates based upon minimum clearances and a 25kV electrification system. This combination results in the least impact to overhead bridges, minimizes track lowering requirements, and has the least impact on tunnels and through-truss bridges.

Estimates were also prepared for a 25kV electrification system using American Railroad Engineering Association (AREA) recommended clearances, and for a 50kV electrification system with minimum clearances.

A 25kV system was chosen for cost estimating purposes because it is widely accepted as the current international standard. 50kV, although also in use in some locations, was not selected for economic reasons, specifically, that potential savings from the reduced number of substations required would be more than offset by the cost of modifying and/or replacing overhead structures to provide the additional clearance necessary due to the higher voltage.

Alternative Fuels

Consistent with the 1991 Air Quality Management Plan, the consultant team prepared an analysis of alternative fuel technologies which would be applicable to those railroad operations which are not identified as candidates for electrification, namely local and yard switching operations and would also be viable for use in the transition from diesel to electric operation. Technologies addressed were:

- Clean Diesel
- Natural Gas
- Methanol/Avocet.

The alternative fuels analysis concluded that these fuels could be a viable and cost-effective alternative to current diesel or electric operation. Further demonstrations of these alternative fuel technologies are recommended.

Legal/Legislative Issues

The Legal and Legislative Issues analysis sought to identify all agencies and organizations which would be potential participants in the implementation of Accelerated Rail Electrification. Roles and responsibilities for each potential participant were categorized as planning, funding, regulatory review and/or implementation. The identified potential participants and their roles and responsibilities are summarized in Table ES-7.

The key findings of the Legal and Legislative Analysis pertain to environmental documentation required, jurisdiction over regulation of locomotive emissions, and existing and future access rights necessary for electrification.

Regarding environmental requirements, the Legal/Legislative Committee found that:

- National Environment Policy Act (NEPA) Compliance is required only as a result of Federal Agency Action and/or use of Federal Funds.
- California Environmental Quality Act (CEQA) Compliance is not required for rail passenger service within existing rail rights-of-way but would be required for freight and/or commuter rail facilities outside existing rights-of-way.

Regarding jurisdiction over locomotive emissions, the Legal/Legislative Committee found that:

- U.S. Environmental Protection Agency (EPA) regulates emissions of new locomotives and authorizes states to regulate emissions from existing locomotives.
- California Air Resources Board (CARB) may regulate emissions from existing locomotives as authorized by U.S. EPA, and may have authority to require specific technologies (such as electrification) for emissions reduction.
- Southern California Air Quality Management District (SCAQMD) is prohibited from requiring specific technologies by which to reduce locomotive emissions. However Measure 14 of the 1991 AQMP requires reduction of rail emissions by 90%, using electrification, by the year 2010.

With regard to existing and future access rights for electrification, the Committee found that SCRRRA has sufficient rights to electrify only on commuter lines acquired through fee or easement. Additional access rights would be required on those lines acquired through trackage rights agreements.

Rights of third-party users within the rights-of-way would also have to be addressed.

TABLE ES-7

Agency Roles and Responsibilities in Rail Electrification

Agency	Planning	Funding	Regulatory			
			Safety	Operating Access	Financial (1)	Environmental
Southern California Regional Rail Authority	X	X				
Southern California Association of Governments	X				X	X
South Coast Air Quality Management District		X				X
California Transportation Commission					X	
California Air Resources Board						X
California Public Utilities Commission			X		X	X
California Department of Transportation	X	X			X	X
California Environmental Protection Agency						X
California Coastal Commission						X
U.S. Environmental Protection Agency						X
Interstate Commerce Commission				X	X	X
Federal Railroad Administration			X		X	
Federal Transit Administration		X			X	X
National Railroad Passenger Corporation (Amtrak)		X				
Private Railroads	X	X	X	X		
Investor-Owned Utilities	X	X				
Municipal Utility Districts	X	X				
Los Angeles-San Diego Rail Corridor Agency	X				X	
San Diego Association of Governments	X	X			X	X
Metropolitan Transit Development Board	X	X		X		
North San Diego County Transit Development Board	X	X				
Local Jurisdictions			X	X	X	X

1. Includes regulation of the issuance of securities by the private railroads, review and approval of applications for rate-based financing, and review and approval of applications for federal and state funds.

Regulatory Requirements

A thorough analysis was performed of the regulatory framework within which potentially involved electric utilities must operate. The regulatory analysis consisted of two main steps:

- Identification of the affected utilities and quantification of the proposed mileage of electrified railroad located within each utility's service area.
- Described in detail the formal processes by which investor-owned utilities, such as Southern California Edison, and municipally-owned utilities, such as the Los Angeles Department of Water and Power, would apply for authority to invest in the rail electrification infrastructure and recover their investment through rate treatment. Additionally, information requirements for such regulatory applications were identified in detail.

The analysis also addressed the anticipated duration of the regulatory review process which would govern the participation of electric utilities in the rail electrification program. The Task Force's expectation in this regard are summarized in Table ES-8.

TABLE ES-8
Regulatory Approval Process
Anticipated Task Durations

Investor-Owned Utilities	
• CEQA Compliance	9-12 months
• Obtain CPUC Certificate of Convenience and Necessity	1-3 months

	10-15 months
Municipal Utilities	
• CEQA Compliance	3-8 months
• Obtain CPUC Certificate of Convenience and Necessity	1-2 months

	4-10 months

Funding Alternatives

The Funding Committee found that the successful array of financing techniques and fund sources to accomplish rail electrification will necessarily include utility financing by both investor owned (SCE) and municipal utilities (LADWP), public sector participation at the state, federal and local levels, and financial participation by the freight railroads.

Utility Financing

Utility rate based financing in which the costs of constructing, owning, operating, and maintaining electrification facilities are recovered through customer rates offers the most promising method of financing a substantial portion (40% to 50%) of the costs of rail electrification.

Southern California Edison – SCE could apply to the CPUC for approval to invest in rail electrification, and seek recovery of its investment including a rate of return from its customers. While CPUC approval is uncertain, the CPUC in making its determination will closely examine the cost effectiveness of the investment, whether or not the facilities to be financed will be "used and useful" in the performance of the utility's duty to its customers, and whether or not rail electrification will provide a substantial benefit to SCE customers.

If the CPUC will not approve a customer-funded rate based utility financing approach, it may be possible to utilize the same approach but allocate the costs of the SCE investment to the local transportation agencies (e.g., the SCRRA). In this manner rate Basing then becomes a financing technique in which the local transportation agencies are able to spread the cost of rail electrification over a number of years.

Municipal Utilities – Participation in rail electrification by utilities such as the LADWP could occur through a rate based approach with the costs of the investment recovered from its customers, or through a facility charge in which the utility financed a portion of the costs of rail electrification, funding its investment with payments from the local transportation agencies. Although municipal utilities are not subject to CPUC regulation, their activities are subject to local government approval. While a customer-funded rate based approach would face the hurdle of obtaining local city council approval, a facility charge approach to utility financing may be more easily accomplished. The local municipal utilities could form a Joint Powers Authority for the purpose of coordinating their financial participation.

Public Agency Funding of Rail Electrification

Local Transportation Agencies – The regional transportation agencies have already programmed available funds to existing rail transit, highway, and congestion management projects. Any current sales tax or state grant funds which might be programmed into rail electrification will come at the expense of other local and regional transportation projects. In addition, sunset clauses on local sales tax authority, local ordinance constraints on the reprioritization of projects, and limitations on debt capacity constrain the ability of the local transportation agencies to issue long term debt to help finance their share of rail electrification.

State Sources – Proposition 108 and 116 funds including funds potentially available with voter approval of 1992 and 1994 rail bonds, are already programmed through the 1990 State Transportation Improvement Program (STIP). Funds for rail electrification from these funding sources would come at the expense of other rail projects. One source of currently unprogrammed State funds would be the 1994 STIP Flexible Congestion Relief Program (FCR) for FY's 1999/2000 and 2000/2001. Without the passage of a new gas tax, voter approval of a dedicated rail electrification bond issue, or cancellation/ deferral of programmed STIP projects, state allocation of 1994 STIP FCR Program would likely be the only available source of state funds for rail electrification.

Federal Sources – *The 1991 Intermodal Surface Transportation Efficiency Act* offers potential new sources of funding with the creation of two new programs: *The Surface Transportation Program*, and *The Congestion Mitigation and Air Quality Improvement Program*. These two programs currently offer the most viable source of unprogrammed federal funds available for rail electrification. It should be noted that rail electrification will compete with currently unprogrammed and unfunded transportation projects for access to these federal funds.

Freight Railroads

Although the railroads have stated that they remain open on the question of rail electrification, since the regulatory authority of the SCAQMD over their operations is uncertain, the railroads view investment in rail electrification not as a cost of operating in a regulated environment, but as a business investment decision. In order for the railroads to participate financially, they assert that the project would have to earn a sufficient return on investment relative to other potential projects competing for their limited capital funds.

Financing Scenarios for Rail Electrification

The Funding Committee has prepared three differing funding scenarios for analysis. The scenarios presented in no way reflect any agreements to participate in funding rail electrification, nor does the percentage allocated to individual agencies or industries represent any agreements by participants as to future levels of financial participation.

The three financing scenarios are applied to the electrification of commuter rail operations only, and to the electrification of commuter and freight rail operations. The scenarios are based on costs which assume construction according to a preferred sequence schedule which allows the costs to be presented unduplicated. They do include the costs of locomotives, and other system-wide facilities such as a control center. In addition, they are escalated using an inflation factor of 3.46%. They do not include the costs of electrifying the UP/SP/ATSF Consolidated Corridor.

The three scenarios are as follows:

SCENARIO ONE: 100% Rate Based: SCE Customer Paid

SCENARIO TWO: 40% Rate Based: SCE Customer Paid

SCENARIO THREE: 40% Rate Based: SCRRA PAID

Scenarios Two and Three allocate funding shares as follows:

- 40% SCE: Rate Based
- 30% State and Federal Funding
- 10% Local Transportation Agencies: Cash Contribution
- 10% Local Municipality/JPA Financed: SCRRA Funded
- 10 % Freight Railroad Participation.

Exhibit ES-8 presents a summary of total costs and total funding shares for each of the three scenarios for the electrification of commuter rail, and commuter and freight rail operations. In addition, it shows the actual costs to the local transportation agencies of the three scenarios.

TABLE ES-9

(MILLIONS \$'S)

SCENARIO ONE: 100% RATE BASED – SCE CUSTOMER PAID	TOTAL COSTS	REVENUES					
		SCE 100%	STATE & FEDERAL 50%	RAILROADS 16.7%	LOCAL CASH 16.6%	JPA BOND POOL 16.7%	SUBTOTAL LOCAL 33.4%
Commuter Rail Only (Line by line costs)	3,949	3,949					
Commuter Rail Only (Locomotives and the Control Center)	539		255	85	85	114	199
Commuter & Freight Rail (Line by line costs)	9,638	9,638					
Commuter & Freight Rail (Locomotives and the Control Center)	2,361		1,117	373	371	500	871
SCENARIO TWO: 40% RATE BASED – SCE CUSTOMER PAID	TOTAL COSTS	REVENUES					
		SCE 40%	STATE & FEDERAL 30%	RAILROADS 10%	LOCAL CASH 10%	JPA BOND POOL 10%	SUBTOTAL LOCAL 20%
Commuter Rail Only	2,988	816	804	268	268	833	1,100
Commuter & Freight Rail	8,270	1,812	2,456	819	817	2,366	3,183
SCENARIO THREE: 40% RATE BASED – SCCRA PAID	TOTAL COSTS	REVENUES					
		SCE/SCCRA 40%	STATE & FEDERAL 30%	RAILROADS 10%	LOCAL CASH 10%	JPA BOND POOL 10%	SUBTOTAL LOCAL 60%
Commuter Rail Only	2,988	816	804	268	268	833	1,916
Commuter & Freight Rail	8,270	1,812	2,456	819	817	2,366	4,994
NOTES:							
1. Total costs assume unduplicated sequencing of projects (see Ch. 3), escalated at 3.46% FY 1992 \$'s.							

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ES-23

NEXT STEPS

For the Southern California Accelerated Rail Electrification Program to progress to the implementation stage, eight major steps must be taken:

- Address policy issues
- Adopt contingent phasing plan for electrification and alternate technologies
- Proceed with concurrent initial electrification project and alternate technologies demonstrations
- Perform Preliminary Engineering
- Obtain environmental clearances
- Negotiate railroad/utility agreements
- Develop full funding plan
- Obtain regulatory approvals.

Resolution of Policy Issues

There are a number of policy issues to be addressed in conjunction with a decision to proceed with rail electrification. Key issues include the following:

- A shared commitment will be required from SCRRA and its member counties, the investor-owned and municipally-owned utilities, the railroads, California Transportation Commission (CTC), federal funding agencies, South Coast Air Quality Management District (AQMD), and Southern California Association of Governments (SCAG) to fund and implement electrification and alternate technologies.
- SCRRA should proceed with implementation of the Metrolink System under diesel operation initially, taking further steps to reduce emissions from the diesel locomotives. System design should continue to be compatible with future electrification.
- Based on the results of this report, 1991 AQMP Measure 14 which requires 90% emissions reduction from rail operations through electrification by 2010, should be re-evaluated with respect to the following:
 - NOx Emission Reduction Target
 - Proposed Technology to Achieve Required Emission Reductions
 - Phasing of Required Emission Reductions
- On March 6, 1992 when AQMD reconsiders its October 1991 resolution concerning the electrification of the Metrolink Commuter Rail Program, the District Board should revise the resolution to allow SCRRA to proceed with expeditious implementation of the Metrolink Program under reduced-emission diesel operation initially.

- Demonstrations of alternative fuels should be initiated to test the viability and cost-effectiveness of these strategies to reduce emissions. Alternative fuels offer the opportunity to reduce emissions on those portions of the rail network not planned for electrification, yard and terminal operations, some of which are technically infeasible for electrification, and local/light density freight lines. In addition, limitations on the availability of required capital and long lead times associated with rail electrification offer the opportunity to incorporate alternative fuels as an interim emission control strategy in the transition from diesel to electric operation.
- Through the shared commitment of involved agencies, identify funding sources for proceeding with the proposed next steps.
- Address concerns about cost and cost-effectiveness of an electrification program.
- Create a "Blue Ribbon" panel to establish a baseline for comparison of O&M costs;
- Negotiate roles and responsibilities of SCRRRA, the utilities and the railroads with respect to funding, design, construction, O&M, and ownership of electrification-related facilities.
- Negotiate among SCRRRA, the utilities, and the railroads to determine which elements of electrification would be proposed for rate treatment.

Selection of an Initial Route for Detailed Analysis

To expedite progress toward meeting the goals of the 1991 AQMP, an initial route should be selected for preliminary engineering for electrification. In parallel with engineering and environmental studies, demonstrations of alternative fuels should be undertaken to better understand the role these fuels may play in emission reduction. By proceeding on these two courses of action simultaneously, policy makers will be able to resolve issues concerning:

- Cost and cost-effectiveness
- Viability of rate treatment as a source of financing
- Railroad participation
- Other funding commitments.

Recommended agency actions to move forward with this process are outlined below. Table ES-10 summarizes the key actions required.

Recommended for SCRRRA Action

- Re-affirm dual commitment to mobility and air quality objectives.
- Continue with expeditious implementation of the Metrolink Regional Commuter Rail System under reduced emission diesel operation initially. System design will accommodate future electrification.
- Commit to achievement of air quality goals.

TABLE ES-10
Recommended Next Steps By Agency

Task	Agency					
	SCRRA	Utilities	Railroads	CTC	SCAQMD	SCAG
<u>POLICY RESOLUTION</u>						
Ascertain shared commitment to proceed with electrification	P	P	P	Ps	S	S
Re-evaluate Measure 14	S		S		P	P
Revise AQMD resolution of 10/91					P	
Implement Metrolink System with diesel initially	P			S	S	
Investigate alternate technologies	P		P	S	S	S
Identify funding in source for next steps	P	P	P	P	P	S
<u>PROJECT DEFINITION</u>						
Adopt a phased program for electrification contingent upon: utility rate treatment; state and federal funding; railroad participation; and local funding commitment and incorporating alternate technologies	P	P	P	S		
Select and approve an initial project for preliminary engineering and testing of alternate fuels	P	P	P	S		
Retain staffing/consultant support until consultant services secured	P					
Determine phasing of freight electrification	S		P		S	
<u>PRELIMINARY ENGINEERING</u>						
Prepare RFP for PE and environmental studies and select consultant support						
Refine Consolidated Corridor	P		P			
Negotiate acceptable clearances	P		P			
<u>ENVIRONMENTAL CLEARANCES</u>						
Determine type of environmental clearance required	P	P	S			
Determine lead/co-lead for environmental documentation	P	P	S			
<u>RAILROAD/UTILITY AGREEMENTS</u>						
Determine roles and responsibilities during design, construction, testing and operation	P	P	P			
Secure agreements on rights and responsibilities for property, installation, O&M of traction power system, and sales of electric service	P	P	P			
Secure agreements regarding O&M requirements	P	P	P			
<u>ACCESS RIGHTS</u>						
Obtain access rights and operating agreements	P	P	P			
Secure third party agreements	P	P	P			
<u>FULL FUNDING PLAN</u>						
Develop cost streams	P	S				
Negotiate relative funding shares	P	P	P	P		
Secure state & federal funding	P	S	S	P		
Secure funding commitments	P	P	P	P		S
<u>REGULATORY APPROVALS</u>						
Determine which elements of project eligible for rate treatment	S	P	S			
Prepare and submit application for rate treatment	S	P	S			

P = Primary Role; S = Secondary Role

- Adopt Phased Electrification Program contingent on:
 - Utility rate treatment
 - State and Federal funding commitments
 - Railroad participation
 - Local funding commitments
 - Resolution of concerns about cost and cost-effectiveness.
- Incorporate Alternate Technologies in Electrification Program.
- Select Initial Corridor.

California Transportation Commission

- Provide preliminary commitment of funding sources available at their discretion.
- Provide preliminary conceptual approval of the Phased Electrification Program and the initial projects.

South Coast Air Quality Management District in Conjunction with California Air Resources Board

- Revise resolution to permit expeditious implementation of Metrolink with diesel operations initially.
- AQMD, CARB, SCAG, SCRRA and its member agencies should re-evaluate Measure 14 of the AQMP with respect to:
 - NOx emissions reduction target
 - Proposed technology.

Southern California Association of Governments

- Based on the results of this report, SCAG in conjunction with AQMD, CARB, SCRRA and its member agencies, and the freight railroads should re-evaluate Measure 14 of the AQMP with respect to:
 - NOx emissions reduction target
 - Proposed technology
 - Phasing of required emissions reduction.

Investor- and Municipally-Owned Utilities

- In conjunction with SCRRA and the Railroads, select an initial project for Preliminary Engineering.
- Initiate negotiations with SCRRA and the railroads to determine elements eligible for rate treatment.
- Negotiate with SCRRA and the Railroads to defining roles and responsibilities during Design, Construction, Testing, and Operation.
- Negotiate agreements between the Railroads, Utilities, and others regarding rights and responsibilities for Property, Installation, O&M of Traction Power System, and Sales of Electric Service.
- Prepare and submit applications for rate-treatment.
- Secure ruling from appropriate regulatory bodies.

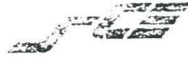
The Railroads (Santa Fe Railway Co., Southern Pacific Transportation Co., and Union Pacific Railroad)

- Select a Project for Preliminary Engineering.
- Assist in determining elements eligible for rate-treatment.
- Negotiate with SCRRRA with respect to:
 - Definition of the Consolidated Corridor
 - Access rights
 - Construction phasing
 - Financial participation
 - Phasing of freight electrification.
- Initiate discussions with SCRRRA and the utilities to define roles and responsibilities during Design, Construction, Testing and Operation.
- Negotiate with utilities and SCRRRA with respect to O&M requirements including:
 - Roles and responsibilities for maintenance
 - Funding responsibilities
 - Division of power costs
 - Basis for allocating O&M costs.

DISCLAIMER

All participants in the Electrification Task Force identified on the previous page have contributed in some measure to the preparation of this Southern California Accelerated Rail Electrification Program report. However, not every participant is in agreement with the analysis and findings contained herein. Accordingly, identification of a participant does not indicate acceptance of, or agreement with, the entirety of the information provided in the report.

APPENDIX ES-1



Southern California Edison Company

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DIANE O. WITTENBERG
MANAGER
ELECTRIC TRANSPORTATION

February 5, 1992

TELEPHONE
(818) 302-7965

Bruce Nestande
SCRRA
1818 W. 7th, Seventh Floor
Los Angeles, CA

SUBJECT: Edison's Analysis of the SCRRA Cost Estimate dated Jan 14, 1992

Thanks for the opportunity to review the SCRRA Draft Cost Estimates. I recognize what a difficult undertaking this study has been, given the short-time frame in which to collect and evaluate the cost data.

After reviewing the draft cost estimates, I would like to make the following observations:

COST

The estimated cost of approximately \$4 million per mile seems too high because some of the assumptions leading up to the \$4 million cost estimate are overly conservative. It is Edison's opinion that the cost per mile should be around \$2.5 million, depending on the extent of electrification of the second track and other variables such as clearance requirements, bridge modifications, and other similar costs factors (see following detailed analysis).

SCRRA Estimate Analysis

Following are some of the significant areas where Edison believes the assumptions should be reevaluated.

1. In the SCRRA cost estimate analysis, there are approximately 400 route miles and 670 single track miles in the proposed commuter system, which means that 60% of the system has double tracking. The estimate

assumes that 100% of the second track has to be electrified. Although this will provide the maximum operational flexibility, it increases the cost per mile substantially. A line-by-line operational analysis should be performed to estimate the extent of electrification requirements for the second track. We believe that electrification of 25% of the second track should be sufficient for the operational flexibility.

2. Project Add-ons:

The project add-ons are approximately 105% of the direct costs and are considered high because of:

- double accounting of some of the items such as contractor mobilization, insurance, contractor employee training, etc. These items are part of the direct unit costs.
- Project reserves cover the unforeseen changes in scope and errors in pricing etc., and is reasonable at 20% at this stage of the project. Therefore, we believe that allowances (14%) for change orders and mitigation in addition to the project reserve is unjustified.
- The project services estimate at + 25% of direct cost is high. On large projects, it runs in the order of 15%.

Considering the above points, we believe that the estimate for the project add-ons should be in the range of 75% of direct costs.

3. Track Stabilization

The SCRRA estimate includes allowances for track upgrades for each of the lines due to the height of catenary wire. We question this assumption and recommend a pentograph simulation study be conducted to verify this need.

4. Communication/SCADA and Signal Systems

For both the systems, a cost of \$30 per route foot for installation of the conduits appears to be excessive. We believe a \$20 per route foot per installation is more realistic. In addition, consideration should be given to utilizing a single duct bank for the two systems, which could cut costs further.

It also appears that a brand new signal system is being proposed instead of modification of the system that will be installed for the diesel commuter service. Real savings can be achieved by designing the initial signal system for diesel to minimize the subsequent changes required for electrification.

5. Clearances and track availability

Although the freight carriers have called for higher than normal clearance requirements, it is reasonable to assume that more standard clearances will ultimately prevail. Also, the assumption of four hours a day of track availability to work on electrifying the lines is not realistic, and increases cost estimates unnecessarily.

6. Pole Spacing

An average distance of 165 feet between the poles has been assumed for the SCRRRA estimate. This spacing is reasonable at the curved sections of the track, while on the straight sections spacing should be approximately 200 feet. Since the catenary system is the single largest item of the estimate, increasing the pole spacing on straight sections should save a considerable amount of money.

7. Power Supply Substations

We have previously sent you some detailed comments for the substations. These include reduction in physical size of substation and grounding requirements, etc.

8. Spare Parts and Special Tools

An allowance (6%) for spare parts and special tools has been included in cost estimate for each line. Since this allowance is included at a direct cost level, after factoring in the project add-ons, this allowance doubles and becomes excessive. It is more reasonable to assume that a certain level of spare parts and tools should be carried for the whole rail system rather than for each line. This should provide significant reduction in overall cost.

Although I appreciate the desire to have a preliminary cost estimate err on the conservative side, it is equally bad policy to over-estimate cost to an extent that it jeopardizes a reasonable policy decision on the cost/ benefits of a project. The combination of the effect of the points raised above supports a \$2.5 million a mile electrification cost as a fairer estimate.

In light of the difference in our two costs estimates, I am recommending that the Task Force Report reflect electrification costs ranging between \$2.5 million per mile and \$4.0 million dollars per mile.

COST EFFECTIVENESS

Edison feels that it is important to include in the report a cost benefit analysis that compares the cost per ton of NOx control for commuter rail electrification against other electrified rail projects already in place such as the Blue, Green, and Red Lines.

I also believe that the cost-effectiveness estimates should be based on a "system-wide" approach rather than on a line-by-line segment approach. The system approach is now used by the South Coast Air Quality Management District (District) in all other cost-effectiveness estimates for rulemaking and should be used in this study.

Lastly, if the cost of electrifying track miles outside the basin are included in the District's cost-effectiveness estimates, then the District should also include all NOx emissions benefits resulting to other Air Pollution Districts.

Please feel free to call me if you have any questions.

Sincerely,



DIANE O. WITTENBERG

DOW/mlw

cc: C. B. McCarthy, Jr.
M. L. Merlo
N. Jester
M. Nazami

Southern California Regional Rail Authority

Los Angeles County
Transportation Commission

Orange County
Transportation Commission

Riverside County
Transportation Commission

San Bernardino
Associated Governments

Ventura County
Transportation Commission

February 10, 1992

Ms. Diane O. Wittenberg
Manager Electric Transportation
Southern California Edison Company
PO Box 800
2244 Walnut Grove Avenue
Rosemead, California 91770

Subject: Response to SCE's letter of February 5, 1992
re: SCRRRA Cost Estimate

Dear Ms. Wittenberg:

I am writing in response to your letter of February 5, 1992 concerning selected cost and cost-effectiveness assumptions used in the Draft Final Report. We are fully supportive of Southern California Edison's desire to reduce the capital costs of regional rail electrification and note that additional refinement of such estimates would best be accomplished during preliminary engineering for a recommended first corridor to be selected as a result of this report. However, we are not in agreement with your proposal to include a range of capital cost estimates in the Draft Final Report. In addition, we take issue with some of the specific comments that you raise about over-estimation of costs. We consider the cost estimates in the Draft Report to be reasonably optimistic, given the fact we are assuming that all affected underground utilities will be relocated at no cost to the Southern California Regional Rail Authority (SCRRRA). Further, we are providing the railroads with roughly two and a half feet (2'4") less vertical clearance than they had mandated. The cost growth that could result from these two items alone would offset by far any overly conservative judgements that we have made in other areas of the estimates.

The sections below respond to the specific comments raised in your letter concerning costs and cost-effectiveness.



COSTS

1. Commuter System Trackage

With regard to commuter rail system trackage, the commuter system contains 417.8 route miles and 671.3 track miles, the majority of which are owned by freight railroads. The track miles are comprised of main line tracks, yard tracks, and storage tracks located at the ends of lines. In most locations, the commuter trains run on the same tracks as freight trains. In locations where the freight lines utilize two main tracks, the commuter lines must also use two main tracks in order not to delay freight service, to maintain commuter service schedules, and to provide operating flexibility required by the railroads. Particularly at this stage of analysis, it is prudent to assume that the freight railroads would mandate that there be no reduction in their operating flexibility or on-time performance to accommodate electrified commuter service. You state in your letter that "electrification of 25% of the second track would be sufficient." We would appreciate receiving your analysis justifying the reduction in electrified trackage that you propose. The justification should include freight railroad operating impacts and be supported by the freight railroads.

2. Project Add-Ons

Your comments in this area focus on three issues: possible double accounting, project reserves, and project services.

a) Double Accounting - While there may be some minor double accounting with regard to contractor mobilization, other cost items dealing with insurance, employee training, etc. are not included in direct costs and are thus not double counted. Contractor mobilization is a standard separate bid item in SCRRA contracts. As such, this item is not included in the track related bid items.

Insurance has become a major problem in the construction industry. The percentages used reflect actual experience of the Rail Construction Corporation (RCC), the construction arm of the Los Angeles County Transportation Commission, within the Los Angeles Basin. The risks involved in electrifying an operating railroad where major track modifications are required are very high.

Ms. Diane O. Wittenberg
Southern California Edison Company
February 10, 1992
Page 3

With regard to employee training, this item pertains to training costs for railroad and commuter rail employees, and not to contractor employees as you state. None of these costs are included in direct costs.

b) Project Reserves - The 20% project reserve is required to compensate for the low level of design completion (less than 5%) at the conceptual design stage of the current electrification study. The 12% for change orders during construction reflects real experience in the rail transit industry related to change orders after construction has begun. Both allowances are necessary.

c) Project Services - RCC's experience is that project services range between 25% and 35% of construction costs. We have used the bottom of their range. The consultant team experience is that 30% of construction is typical for public works projects in rail transportation.

We believe RCC's real project add-ons experience is applicable to the electrification of the LA Basin railroads and commuter lines.

3. Track Stabilization

A railroad powered by diesel locomotives can operate over track with more alignment imperfections than a railroad utilizing electric locomotives. This is because of the interface required between the locomotive pantograph and the electrical contact wire. Surfacing and lining of track prior to implementation of electric operations is standard industry practice. A cost of \$6 per track foot has been provided in the cost estimates for lining and surfacing of existing track.

4. Communication/SCADA and Signal Systems

a) SCADA - The \$30 per route foot cost is a conceptual estimate. We would appreciate receiving detailed data from you supporting a \$20 per route foot cost in a railroad application and would consider revising our conceptual estimate to reflect this additional detail.

b) **Signals** - A brand new signal system is not being proposed. The \$55 per track foot for wayside signals and \$7 per track foot for cab signals are for the replacement of existing signal circuits that are not compatible with electrification. A new signal system would cost approximately \$160 per track foot. To the extent possible, any modifications to the existing signal system to accommodate diesel commuter rail service are being designed to minimize subsequent changes required for electrification.

5. Clearances and Track Availability

The project costs have been estimated assuming clearances that are less than those recommended by the Federal Railroad Administration and are 2'-4" less than those proposed by the three freight railroads. The additional cost for minimal track occupancy time has already been reduced in response to SCE's request and should not be further reduced.

6. Pole Spacing

The 165 foot average pole spacing reflects the mix of straight and curved track, interlockings and turnouts located throughout the Los Angeles Basin. This average spacing was developed in coordination with SCE's electrification consultant.

7. Power Supply Substations

We have reviewed the comments previously sent to us by SCE and have reduced the costs of the power supply substations appropriately.

8. Spare Parts and Special Tools

The project add-ons percentages reflect RCC's real experience with construction in the Los Angeles Basin and include any spare parts and special tools required to be furnished by contractors. There is no double counting of spare parts and special tools in the calculation of average cost per track mile as all redundancies have been eliminated.

COST EFFECTIVENESS

We concur with your view that a comparative cost benefit analysis that contrasts the cost per ton of NOx control for commuter rail electrification against other electrified rail projects such as the Blue, Green, and Red Lines would be of interest. This could be pursued in conjunction with LACTC and RCC staffs responsible for these projects, separate and apart from the report. It is important to note, however, that commuter rail and those forms of rapid transit you identify are quite different in terms of their passenger densities, service frequencies, patronage, average trip lengths, and capital and operating costs. In comparison to these forms of rapid transit, commuter rail is a low cost rail approach to accommodate a relatively lower density, primarily peak period market with infrequent train service using existing rights-of-way and existing facilities. The electrification component of rapid transit projects is generally less than 10% of the cost of the system, whereas electrification of commuter rail would roughly double the capital cost of providing the service.

We concur also with your comment that cost-effectiveness estimates should be based on a system-wide approach rather than line-by-line. Consistent with analysis prepared by the South Coast Air Quality Management District (AQMD), both such estimates will be used in the Draft Report. We further consider it essential for the draft to report the cost-effectiveness of commuter rail electrification as well as overall rail electrification. Both are important for policy makers in the region and for rulemaking by AQMD.

Your final comment concerning cost-effectiveness has already been addressed in the computations of the cost-effectiveness estimates by AQMD. Only those costs and NOx emission benefits associated with electrifying track miles within the basin are included.

In conclusion, we do not support your recommendation to use a range of capital costs of between \$2.5-4.0 million per mile in the Task Force Report. We do not consider the 2.5 million per mile you propose to be adequate, and we disagree as to the rationale used to arrive at this estimate. Further, if a range of costs were to be used, the high end of the cost spectrum would exceed the average of 3.47 million and 4.05 million per mile for commuter and freight respectively developed in the Draft Report. As noted earlier in

