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DESIGN SUMMARY REPORT  
PHASE II, PART A  
JUNE 30, 1989

METRO RAIL PHASE II WORK PROGRAM  
PART A

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DESIGN SUMMARY REPORT  
PHASE II, PART A

1.1 Introduction

The Phase II Work Program contains two distinct parts. Part A includes General Engineering tasks related to the conceptual planning and general engineering of the Metro Rail subway alignment and station definition in the Vermont Avenue and Hollywood Boulevard corridors. In addition, Part A includes preliminary design development of the Wilshire/Alvarado station to Wilshire/Vermont Station Line Tunnel Segment and Wilshire/Vermont Station.

Part B, on the other hand, includes the start of Final Design tasks of the above two segments as well as the completion of Final Design tasks for the Wilshire Corridor Segments to Western Avenue, which have been on hold since 1985, as well as associated systems, engineering support, facilities design support and special studies to complete the Final Design packages. Part B, also continues the Vermont/Hollywood-Six Station and Line General Engineering to the Preliminary Engineering level.

Part B tasks are not to commence before completion of the NEPA process of the Environmental Impact Statement and its supplement(s) for the realignment of the Metro Rail corridor described as the Locally Preferred Alternative (LPA). The LPA was adopted by the Board of Directors of SCRTD on July 14, 1988.

Notice to Proceed (NTP) on Part A was issued by SCRTD on January 3, 1989 and recruitment of MRTC technical staff and expansion of office space began. Space and personnel planning considered continuation of Part "B" work program immediately following the completion of Part A work.

At this stage follow-on work on Part B still awaits the NEPA approval process and SCRTD authorization to proceed.

1.1.1 Background

The original Metro Rail starter line adopted for construction in 1983 consisted of an 18.6 mile all subway alignment. This original alignment extended west along Wilshire Boulevard then north on Fairfax

Avenue, turning east on Sunset Boulevard to Hollywood and Cahuenga Boulevards and then continuing north through the Cahuenga Pass to North Hollywood.

On March 24, 1985, a methane gas fire and explosion occurred at the Ross-Dress-For-Less store in the Fairfax District. Following that event, Congress passed legislation that prohibited the District from tunneling in that portion of the Metro Rail alignment described as the "potential risk and potential high risk methane gas zone." Congress also mandated the Congressionally Ordered Re-engineering (CORE) Study to adopt an alignment that would bypass the methane gas zones.

Six candidate alignments were examined in the CORE Study. Upon completion of this Engineering and Environmental Impact Statement/Subsequent Environmental Impact Report (SEIS/SEIR) was published in May 1988, and Public Hearings were held by the SCRTD Board on June 21, 1988. The District has submitted the Final SEIS/SEIR to the Urban Mass Transportation Administration (UMTA) for final approval in November 1988.

In March 1988, UMTA authorized, through a Letter of No Prejudice (LONP), Limited Preliminary Engineering (LPE) on the CORE Study Candidate Alignments. This work has advanced the Project by enabling development of refined preliminary designs, refined order-of-magnitude cost estimates, and development of a project schedule, and tasks that are essential for negotiation of the Full Funding Contract for the Phase II Metro Rail Project.

#### 1.1.2 Description of Phase II Project

On July 14, 1988, the District Board of Directors adopted the all-subway Candidate Alignment No. 1 Modified (CALM) as the new Locally Preferred alternative (LPA). The adopted alignment consists of approximately 17.33 miles of tunnel and eleven stations which are in addition to the five-station MOS-1 Metro Rail segment now under construction. The Phase II project shown in Figure 1, extends the MOS-1 segment from its current interim terminal at the Wilshire/Alvarado Station west along Wilshire Boulevard to Western Avenue and north along Vermont Avenue and west on Hollywood Boulevard and then through the Santa Monica Mountains and Universal City to a terminal in North Hollywood. The eleven Phase II stations are located at Wilshire/Vermont, Wilshire/Normandie, Wilshire/Western, Vermont/Beverly, Vermont/Santa Monica, Vermont/Sunset, Hollywood/Western, Hollywood/Vine, Hollywood/Highland, Universal City, and North Hollywood.

# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

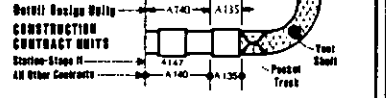


JULY 14, 1988  
as adopted by  
the SCRTD Board

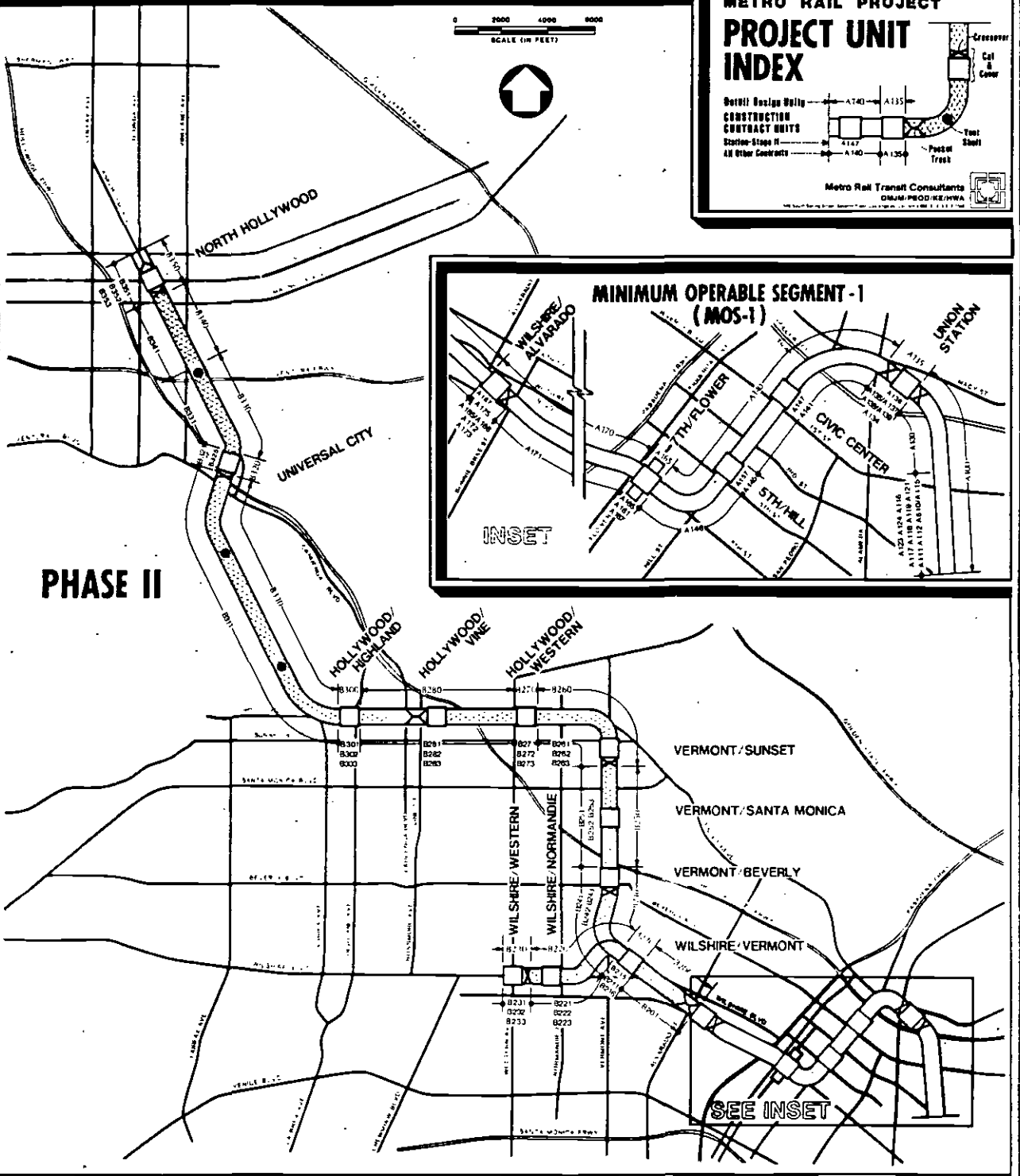
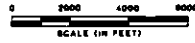
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**METRO RAIL PROJECT**

## PROJECT UNIT INDEX



Metro Rail Transit Consultants  
DRA: MCD/KR/HWA



**PHASE II**

### MINIMUM OPERABLE SEGMENT - 1 (MOS-1)

INSET

SEE INSET

1.1.3 Purpose of General Engineering and Final Design

The purpose of the General Engineering task contained in Part A of the Work Program was to provide additional information required to support the application for federal, state, and local funds. The objective of the first year work program was to transition the design and construction begun on MOS-1 in an orderly and timely progression to Phase II and to enable achievement of the objective of early completion of Metro Rail construction to the Wilshire/Vermont station. This will enable the shifting of the interim terminal at the Wilshire/Alvarado station to the Wilshire/Vermont station, thereby minimizing the environmental impacts in the surrounding MacArthur Park and Westlake communities. This work program represents the first year of activities necessary to complete design on several elements of Phase II. However, other construction related tasks and land acquisition tasks are required to complete construction of Phase II by December 1997.

## Design Summary Report

### 1.2 Summary Scope of Work Status

Part A of the Work Program was rescheduled in early February 1989 to complete on June 30, 1989. This was agreed to by SCRTD following MRTC's assessment of the work load generated by construction activities in MOS-1 and the balance of staffing to complete Part A and Construction Unit B-331 design package (SB 1995).

The status of the Part A tasks are as follows:

1.2.1A Initiate General Engineering Design of Line Tunnel Segments and Six Stations at Vermont/Beverly, Vermont/Santa Monica, Vermont/Sunset, Hollywood/Western, Hollywood/Vine and Hollywood/Highland

The report covers station locations originally conceived from the adoption of Locally Preferred alignment (LPA) in 1988 to the evolution of present station locations based on cost, access, impacts on historic structures, land use and zoning as well as patronage and traffic impacts.

The conceptual design incorporates code revisions, Fire/Life Safety Committee requirements and identifies ancillary room requirements. Drawings were submitted for review on May 1, 1989 and review comments discussed and resolved on May 31, 1989.

The submission of the drawings and report completes the final conceptual design requirements for the initial General Engineering Design.

1.2.2A Initiate General Engineering Design of the Line Segment from Wilshire/Alvarado Station to Wilshire/Vermont Station

Preliminary drawings (174) were issued for review on May 15, 1989. Review comments were received by June 14, 1989 and the review meeting took place June 20, 1989. MRTC provided responses to the review comments and returned these responses to the reviewers.

At the review meeting, these comments and responses were discussed and action items resulting from the discussions were incorporated or highlighted on the drawings.



## Design Summary Report

### Significant items:

In May MRTC began redesigning the emergency ventilation system in the pocket track. The revision eliminates the need for a vent structure and blast relief shaft structure penetrating the surface inside the MacArthur Park property as directed by the District. This modification will reduce the capital cost of the transit facility as well as the cost of permanent easements resulting from the surface penetrations.

The revised scheme utilizes booster fans to ventilate air. MRTC has requested the District for approval to proceed with the revised scheme. Fire, Life Safety Committee has approved the scheme in principle, but will study final computer simulation data before approval. The proposed scheme will save over 3 million dollars in construction and in use of permanent easement inside the park. However, about 60 (B-201) drawings will need to be revised/redone requiring 3,200 manhours at an approximate cost of \$160,000.

Because of the change requirements, it is also possible to reduce cut/cover length by 85 feet and subsequently increase tunnel length by the same amount, but will involve rearrangement of electrical/systems equipment facilities and revision of 10 additional drawings. Additional design cost for these changes are included in the above estimate.

#### 1.2.3A Initiate General Engineering of the Wilshire/ Vermont Station (CCU B-211)

The purpose of the deliverables is to provide the District with an opportunity to review the preliminary design and to present an indication of progress toward design solutions. To accomplish this, the submittal includes:

- ° Civil drawings showing the alignment and a profile with a cross section of the station.
- ° An existing composite utility plan.
- ° An architectural site plan showing the location of the station entrances and exits, air exhaust and intake shafts, bus and parking bays and the extent of the surrounding properties. Architectural plans include layout, location and sizing of public and ancillary areas and horizontal and vertical circulation. The submittal will also include

the conceptual design for the entrances and their interface with the platform areas. A perspective is also included.

- ° The structural plans and sections will show the structural intent and construction feasibility as shown in design.
- ° A conceptual layout of mechanical equipment in the ancillary areas at each end of the station and the design of major elements such as blast relief shafts and under platform exhaust shafts. A schematic diagram of the fire protection is included.
- ° The electrical submittal includes a conceptual lighting design for platform and ancillary areas, the layout of ductbanks and the major embedded conduits for emergency and communications systems.

#### 1.2.6A Determine Right-of-Way Requirements

During the period the determination of R.O.W. requirements advanced to levels consistent with the design development of the three main work tasks. (1.2.1A, 1.2.2A and 1.2.3A)

Specific subtask work status is noted below.

- ° Formulate property identification plans, identify locations and ownership

Property Identification Maps consisting of 14 sheets at a scale of 1" = 100' have been prepared. The Metro Rail alignment and station locations have been plotted on the maps to identify the real estate properties that need to be acquired for the construction and operation of the Metro Rail Project.

Parcel numbers have been assigned to the properties and they have been classified by type of acquisition required as Full Take, Partial Take, Subsurface Area, or Temporary Construction Areas.

Records have been researched to identify County Assessors Parcel Numbers and current owners of the required properties. This information has been noted on the maps.

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- Establish contracts for title and escrow services.

Since all of the design work in Part A was only advanced to the preliminary or conceptual level this work will commence in Part B.

- Establish new appraiser panels as well as a new attorney panel for condemnation and legal services

No work was done by SCRTD due to the preliminary stage of design. The panels will be developed at the appropriate time during Final Design.

- Preliminary Analysis of Joint Development Potential

The Property Identification Maps and database information has also been submitted to the MRTC and SCRTD planning groups as a basis for preliminary analysis of joint development possibilities. Meetings have been held with planning groups to discuss and clarify the information shown on the maps. The Property Information Maps and database files will continually be updated and submitted to assist with further joint development studies and potential problems.

- Update and revise real estate procedures

SCRTD has developed procedures for real estate requirements review and acquisition. Updating the procedures with modifications and improvements to the procedures is an on-going SCRTD task.

- Hold community meetings to inform owners/occupants of acquisition procedures.

Meetings were held with the City's Department of Parks and Recreation regarding permanent and temporary easements through MacArthur Park.

Any other contacts with public agencies or the private sector was deferred until alignments and structural limits of rapid transit facilities were more definitive. This work will be advanced in Part B.

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- Prepare availability studies of housing and commercial resources, if needed.

No work was required in this area as design development was not advanced enough to finalize right-of-way requirement.

- Order title reports for properties under consideration.

Requests were made and data received for the B210 and B211 contract packages. Information was analyzed and incorporated in the development of R.O.W. plans.

- Identify property requirements based on General Engineering design accomplishments.

As noted above, property requirements were identified for the three major facilities design tasks. Identification of properties was advanced consistent with General Engineering Design Development.

- Refined Real Estate Budget

Site inspections were made of the properties identified as required for the project. Current use, existing building information, and other information deemed important was noted.

Research has been conducted to acquire plans of existing buildings along the alignment. A computerized database file has been established to store all available information on the properties that will be impacted. Listings of the information and copies of the Property Identification Maps have been submitted to SCRTD's Real Estate Department. The information has been used by the real estate appraisers to refine the Real Estate Budget.

### 1.2.7A Initiate Systems Requirements and General Interface Design

Interim Status Reports are included in this submittal to summarize the work accomplished in the preliminary design of Automatic Train Control, (ATC) Traction Power, Communications, Safety, Assurance and Security, and Operations and Maintenance. These interim status reports were submitted under separate cover. The ATC Interim

## Design Summary Report

Report documents work with civil engineers and operations planners to establish Phase II alignment and operating parameters, and development of preliminary equipment lists and space and power requirements.

The Traction Power Interim Report summarizes work accomplished and status of an Emergency Backup Power Analysis, and a Traction Power Substation Sizing Analysis. It also describes design support activities needed for equipment space sizing and conduit embedments.

The Communications Interim Report summarizes work assigned and work accomplished to establish equipment space, rack counts, power needs, redundancy requirements, and police radio requests.

The Safety, Assurance and Security Interim Report documents the work accomplished on the water supply analysis for station and tunnel fire suppression systems and on emergency exiting based on the preliminary station layouts. All Phase II station and line section submittals were reviewed for compliance with the Fire/Life Safety criteria.

The O&M Interim Status Report summarizes work accomplished toward developing operating scenarios for the Phase II alignment and considering the alternative locations for the Hollywood pocket track. The Hollywood pocket track report was completed and submitted prior to completion of Part A tasks.

### 1.2.8A Initiate Design Support Tasks

Design support of the first three tasks continued through the six month period and the various support functions assisted either directly or indirectly in the development of data, field information, special studies, cost estimates as well as managerial and administrative support.

#### 1.2.8.1 Design Reviews

##### ° Six Stations and Line Segments

Conceptual drawings of station plan and profile as well as preliminary plans and profiles of the line segments were transmitted for review and comments on May 01. A review meeting was held on May 31 to discuss and action all comments.

- Wilshire/Alvarado Station to Wilshire/Vermont Station Line Segment (CCU B201)

Preliminary drawings were issued on May 15, 1989; review comments were received on June 14 and a review meeting took place on June 20. All comments were responded to and actions from them returned to respective reviewers.

- Wilshire/Vermont Station (CCU B211)

Initial alignment drawings indicated a conflict with at least three existing and new building structures on either side of the station. Considerable design review between MRTC and SCRTD followed to select an alternative alignment to minimize the potential underpinning of existing structures. Conceptual design reviews of the entrance configurations were presented and discussed between MRTC and the District. A preferred general arrangement of the station entrance was selected and general design work continued based on that concept.

1.2.8.2 Prepare schedule and Develop procurement plan.

Design Control Registers were developed for each design package complete with manhour breakdowns. Bar chart schedules for the current and future design tasks were prepared and transmitted to the District for inclusion in the program network.

- Facilities

This work continued sporadically due to the lack of engineering information. Not until the planning and preliminary engineering had progressed sufficiently could we analyze the construction logistics of tunneling and cut and cover work. Input to the Construction Unit Description (CUD) updates continued as required.

In the final months of Part A work, MRTC began the analysis of tunnel shaft locations, muck handling sites, sequence of construc-

tion, and definition of property requirements for tunneling operations as well as cut and cover work. This analysis and recommendation for the Phase II work from MacArthur Park to Runyon Park on the Santa Monica Hills will be delivered under separate cover on or before July 17, 1989. Data from soil investigations is required to address some of the design issues and therefore geotechnical investigations and analysis will continue for few months beyond June 30, 1989.

### Systems

A Systemwide Equipment Procurement Study was initiated to investigate alternative systems procurement strategies that will better stimulate competition and minimize the costs of systems implementation. The initial scope and duration of the study were enlarged and extended to include lessons learned during installation of MOS-1 equipment and to survey selected peer transit properties. Work element lists and candidate packages of elements were formulated and submitted for MRTC staff and District review. Lists of contractor firms and peer properties were prepared, as were survey questionnaires, solicitation letters, evaluation criteria, and a study report outline. Copies of the procurement study report, with all related correspondence were submitted under separate cover.

When the study activity resumes, the remaining study work to be completed will include conducting the industry and peer surveys, evaluating the results, drawing conclusions and recommendations therefrom, refining the study report outline, and preparing the final report.

#### 1.2.8.3 Utilities Relocation

- ° B-201 - Only minor utility rearrangements will be required for this contract at the following cut and cover locations:

Alvarado Street - Utilities in Alvarado Street align with the temporary deck beams. Therefore, existing utilities can be supported in place

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without lowering. The following major utilities will require support within the excavation limits.

- 36" Storm Drain - Temporary line required
- 12" Water Line - To be replaced in steel
- 4" Water Line - To be replaced in steel
- 16" Water Line - To be replaced in steel
- 16" X 22" Electrical Duct Bank
- 15" Sanitary Sewer - Temporary line required
- 12" Storm Drain - Temporary line required
- 26" X 15" Telephone Duct Bank

Mac Arthur Park - Park utilities that cross the pocket track excavation include a 4" water main, a 6" sanitary sewer lateral serving the boat house, lighting conduits, and elements of the lake aeration system, which will require reconstruction after backfilling of the pocket track structure. Depending on the scope of park renovation, additional utility work could be required.

- Wilshire Boulevard at Rampart Street

Vertical cross passage and emergency exit. This structure will require a cut and cover excavation, but the utility impact has not yet been determined because the location for this facility was only recently established.

- Wilshire Boulevard at Rampart Street

Vertical cross passage and emergency exit. This structure will also require a cut and cover excavation that will affect utilities in Wilshire Boulevard, but the utility impact has also not been determined for the reason cited above.

° B-211 - Utility rearrangement for this station is limited due to station being sited predominately in an off-street location. However the following locations will require utility rearrangement.

South of the Vermont Avenue, 6th Street Intersection - The cut and cover excavation for the station extends into the east half of 6th Street. The following utilities will be affected:

- 30" CIP Water Line - This facility will require replacement with 30" steel line on a



## Design Summary Report

parallel alignment so that it can be supported within the excavation.

- 6 MTD Telephone Duct Bank - The existing cables will be fitted with split plastic duct and lowered to clear deck beams as required.
- Electrical Duct Bank and Electrical Vault - The vault will be relocated outside of the excavation, and the duct bank will be reconstructed on a parallel alignment.
- 6", 12" Gas Lines - These facilities will be reconstructed to clear deck beams within the excavation limits as required.
- 8" Sanitary Sewer - This line will be replaced with a temporary PVC line within the excavation and reconstructed in VCP during street restoration.

### Shatto Street North of Wilshire Boulevard

- The following utilities will be affected by the cut and cover excavation which crosses Shatto Street on a skewed alignment:
- 12" Gas Line - This line will be replaced on a lower parallel alignment within the excavation limits.
- 8" CI Water Line - This line will be replaced in steel on a lower parallel alignment.
- 8" VCP Sanitary Sewer - Within the excavation, a temporary plastic line will be installed and supported during street restoration a permanent V.C.P. line will be installed.

Electrical Duct Bank - A lowered duct bank will be constructed within the excavation and supported from temporary deck beams.

Telephone Duct Bank - The existing cables will be enclosed in split plastic ducts, lowered in place to clear deck beams and supported in place.

- ° Phase II - The utility impact on Phase II construction is discussed in detail in the Phase II design report, and preliminary rearrangement plans for each of the six stations are shown in the Phase II Conceptual Design Submittal package.

#### 1.2.8.4 Design Specifications

Work continued through the period on the updating of the baseline specifications from MOS-1 experience. No specifications were produced for the design packages since they were all at a preliminary or conceptual level.

#### 1.2.8.5 Geotechnical Investigations

The scope of work for the geotechnical task required taking soil borings for the sampling of soil, water and rock for the alignment from Wilshire/Vermont Station to Hollywood/Highland Station and beyond through Santa Monica Mountains to Universal City Station.

This task was undertaken to verify subsoil conditions for the final design and construction of tunnel segments and also the cut and cover sections for the proposed stations and special structures.

The field work for this task was started at Wilshire and Vermont in March, 1989 by The Earth Technology Corporation (TETC) of Long Beach, California. Before starting TETC met with all utility companies, City and County entities to obtain permits for drilling and verify locations to be clear of any underground utility. Boring locations (and alternate locations) were supplied to appropriate governmental agencies and utility companies for their oversight. A total of 100 borings were drilled and sampled by end of May 1989. Five additional borings remain to be drilled in the Barnsdall Park area as the permit from the City Recreation and Parks Department was made available to TETC in June, 1989. These will be completed by July 15, 1989. Thirteen additional soil and rock borings required to be drilled in the Santa Monica Mountains between Hollywood/Highland and Universal City Station. Drilling will be resumed when the alignment through the mountains is finalized.

At present the geotechnical samples are being analyzed in the laboratory and their properties indentified. A draft geotechnical report for the Wilshire/Vermont Station is completed and is being reviewed.

The geotechnical task will be completed by the end of September, 1989 when the final geotechnical reports for all the seven stations and the tunnel alignments will be made available.

#### 1.2.8.6 Underpinning

The tunnel segment of the Phase II alignment passes under Vermont Avenue and Hollywood Boulevard and the segment to the west passes under Wilshire Boulevard. The alignment crosses at least two major structures where underpinning to support the structures is required. In addition there are a few other large structures adjacent to the Phase II alignment where some form of building protection measures may be required.

Those structures which are adjacent to the tunnel alignment are outlined on Phase II plans and available foundation data are plotted on sections.

The tunnel segment for B201 Contract passes under a belled-caisson foundation at the southwest corner of U.S. Borax Building at 3075 Wilshire Boulevard. This is at Station 308+00 where the crown of the upper tunnel (over/under configuration) comes to within four feet of caisson bottom. The crown of the tunnel at this location is 35 feet below the ground surface. It will be required to underpin at least one or probably two of thecaissons supporting the structure. Preliminary studies indicate that the underpinning can be done from inside the basement of the structure or from outside of the building. This may require a permanent easement under the sidewalk on City street right-of-way.

The alignment for Contract B241 passes under Fireman's Fund parking garage structure which is adjacent to the Fireman's Fund eleven story main structure. The garage is a three story high structure with one story basement. It will require underpinning approximately sixteen columns founded on belled caissons.

Our preliminary studies indicate that no underpinning will be required for other existing structures. Final design will have to confirm this current assumptions.

There are a number of mid-rise structures along Vermont Avenue and Hollywood Boulevard whose building plans are not yet available. It is emphasized that some building protection measures for few structures along Vermont Avenue and Hollywood Boulevard may be required. The confirmation of what type of protection will be addressed in the final design phase.

#### 1.2.8.7 Noise and Vibration

Due to the general and preliminary design efforts authorized by Part A of Phase II, the level of design for noise and vibration control was minimal. The Noise and Vibration Analysis for the Metro Rail Project CORE Study was submitted to MRTC in June of 1986, and contains data representing the expected noise and vibration levels for Metro Rail operations.

When design work resumes some re-study will be necessary to account for changes in alignment plan and profile. This data and recommendations will then be used in the specific contract documents to provide construction restrictions, special trackbed isolation, and acoustical treatment to reduce noise and vibration to meet allowable levels.

#### 1.2.8.8 Corrosion Control

The level of general design accomplished in Part A of Phase II required only a minimum of corrosion control design effort. When work resumes on these contracts, a detailed design of collector grids for stray current control, probes for stray current monitoring, coatings and monitoring devices for various utility piping will be developed for the line segment of B-201, Wilshire/Vermont Station, Wilshire/Western Station and Wilshire/Normandie Station and line segment.

The Corrosion Control Consultant will also participate in the analysis of soil borings collected along the alignment from Wilshire/Vermont Station to Universal City Station in order to determine if

any modifications to corrosion control methods need to be generated.

1.2.8.9 Surveying

Aerial photographic surveys were carried out for the entire Phase II corridor to Universal City Station. Scaled topographic details were developed and tied to the project coordinate system and elevation datums.

In addition, field work was completed to expand the primary survey control system in the areas of the design development, where required for geotechnical investigations and to verify aerial map scales.

Field "pothole" surveys were done to locate utilities at Lankershim Boulevard and Ventura Freeway. In addition, field surveys to locate buildings on revised alignment near Wilshire/Vermont were completed.

1.2.8.10 Supervisory Control and Data Acquisition (SCADA)

MRTC's contract with Macro requires that Macro provide the SCADA subsystem design and specifications for inclusion in the A640 Communications Contract. The basic contract was amended to initiate similar services for Phase II. Tasks accomplished by Macro as of the end of Part A work are summarized as follows:

The SCADA data base structure was examined and modified to accommodate the MOS-2 and full Phase II alignment which now defines the number of stations and branch lines. The Phase II alignment was used to estimate the expansion requirements for the central computer and memory devices. Remote Terminal Units (RTU) quantities for Phase II were estimated based on MOS-1 data point counts. A cost estimate for Phase II SCADA has been initiated and will be completed when Part B is authorized.

Work has progressed as planned and approximately \$10,000 dollars were expended by MACRO.

1.2.8.11 Fire/Life Safety

Meetings of the Fire/Life Safety Committee continued through the period. Most of the agenda items pertained to MOS-1 but the agreements and direction also relate to Phase II design.

The Rolf Jensen and Associates (RJA) contract with MRTC requires that they perform analysis and review of station exiting capacities, fire protection provisions and hydraulic calculations. Tasks accomplished by RJA as of the conclusion of Part A work are as follows:

- Developed tunnel wet standpipe hydraulic calculations for contract B331, verifying compliance with F/LS criteria.
- Performed initial preliminary emergency exiting calculations for seven (7) stations, providing emergency stair and stair/escalator requirements for use by architectural staff.
- Reviewed station concept drawings and sketches for Wilshire/Vermont station and responded to questions from architectural staff with respect to emergency exiting requirements.

Work will be continue when Part B is authorized.

1.2.8.12 Electromagnetic Interference (EMI)

No EMI issues were raised during Part A design and the services of Comstock Engineering were not required.

Work will proceed as required when Part B commences.

1.2.8.13 Value Engineering

MRTC, in addition to cost effective analysis of the design, has always reviewed the design to identify potential cost savings without reducing reliability or performance of the Metro Rail system. In the past, the District had the benefit of MRTC's recommendations. Similarly, for the Phase II MRTC has analyzed and recommended elimination of the west a ventilation shaft in MacArthur Park, shortening of pocket track length, and revision to the structure resulting in substantial cost reduction. MRTC is also reviewing the

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construction access and sequencing for Phase II to establish, where possible, construction contract units that will derive the maximum usage of equipment, labor, materials and personnel for major items of work such as tunnelling and open cut and cover excavation. Results of the study will be finalized and submitted to District under separate cover. MRTC has also assisted the District in their effort to hire an independent value engineering consultant. Copies of requested material have been provided to the District for review and evaluation by the consultant. When the VE reports are made available, MRTC will review and participate in the discussions concerning the report recommendations.

### 1.2.8.14 Special Studies

MRTC assisted the District in the preparation of minor changes and clarifications to the Supplemental Draft Environmental Impact Statement.

A study was completed of ventilation requirements and recommendations made to reduce the shaft structure at the west end of the pocket track at MacArthur Lake.

### 1.2.9A Conduct Project Management Support Tasks

Project Management procedures developed for MOS-1 were reviewed, improved and implemented for the Phase II work. General improvements in budget control, reporting procedures and response times were initiated during the period.

#### 1.2.9.1 Program Control

##### ° Conceptual Estimates For Line Sections and Stations

Conceptual estimates were revised and updated for all segments of Phase II and a description of the output is listed chronologically below.

##### Construction Budget Estimates:

01/89      Revision No. 5 for Phase II Cases 1,2,3 and 4

## Design Summary Report

03/89 MOS-2 and MOS-3, Options I through V  
03/89 MOS-2 Modified (with pocket track east  
of  
Hollywood/Vine Station)

### Estimates:

05/89-06/89 In Progress Estimate for B201

### Cost Studies:

02/89 Reduce station width at Wilshire/Vermont  
04/89 Underpinning of Building on alignment  
from Wilshire/Vermont to Wilshire/  
Normandie  
and to Vermont/Beverly  
04/89 Separate cost of vent structure/BRS at  
MacArthur Lake pocket track  
05/89 Domestic water line alternatives at  
Vermont/Beverly  
06/89 Revised domestic water line alternatives  
at Vermont/Beverly  
06/89 Proposed Improvements at MacArthur Park

### Other:

02/89 Review of Contract Unit Descrip-  
tions  
02/89-06/89 Development of Estimating Data Base  
(Timberline)

### Phase II, Part A Cost Performance

This report provides a summary of the financial results of MRTC's operations on the Phase II Program during the 88/89 Annual Work Program (AWP) that ended on June 30, 1989.

#### Background:

On November 23, 1989, the District executed Amendment No. 13 to the General Consultant Contract with MRTC to incorporate Phase II design work into MRTC's current AWP (88/89). The amendment covers a program of work with an estimated cost of \$11,481,000 and a time of performance of nine months after Notice to Proceed (NTP). The District had planned to give NTP shortly after executing the Amendment. However, UMTA advised that the Final Design work covered by the Amendment could



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When all adjustments to schedule were taken into account, the following overall budget distribution between Part A and Part B resulted.

Amendment No. 13 Budget	Part A Budget	Part B Budget
\$11,481,000	\$6,276,000	\$5,205,000

Financial Results of Phase II Operations:

The summary breakdown of the Part A Budget is shown in Table 1 that follows. The table also shows the actual costs as of the end of June 1989 when all work was completed except for Specialty Subcontractors ongoing close-out work; i.e. data analysis, report preparation, etc.

Table 1

Part A Cost Performance  
Budget vs. Cost

<u>Cost Category</u>	<u>Budget - \$</u>	<u>Cost - \$ Through June</u>
Labor	2,853,000	2,852,000
Specialty Subcontractors	2,573,000	1,003,000
Other Direct Costs (ODC)	<u>450,000</u>	<u>473,000</u>
Total Direct Cost	5,876,000	4,382,000
Fee	<u>400,000</u>	<u>400,000</u>
Total Cost	6,276,000	4,728,000

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### Comments on Variances:

The variance in Specialty Subcontractor cost results, primarily, from the length of time required to start-up geotechnical work (value of work approximately \$2,000,000). Most of the time is spent in establishing location for drilling and obtaining the necessary permits to drill.

The overrun in ODC is attributed to higher than planned cost for space, recruiting, facility furnishing, and similar costs associated with the personnel build-up. The total ODC budget (Parts A and B) will be adequate for completion of the total work in Amendment 13.

A detailed breakdown of budget and cost by tasks is included with this report as Enclosure A.

#### 1.2.9.2 Configuration Control

MRTC provided staff materials and facilities to maintain a sound configuration management system which included document control, "original" filing and protection, plan room services and change control.

#### 1.2.9.3 Project Administration

Staff prepared, assembled and distributed to copies of the monthly progress report to the participating agencies.

All other administrative activities such as purchasing, accounting and word processing were carried out to meet the demands of management.

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jeopardize the Supplemental Environmental Impact Statement (SEIS) review process. It was at this time that a decision was made to divide the program into Parts A and B.

Part A was structured to include those activities categorized as continued General Engineering that could proceed in advance of the SEIS approval. Part A scope also included work by Specialty Subcontractors to obtain additional engineering data along the preferred system alignment (geotechnical, survey, utilities, etc.). Part A was planned for completion in four months.

Part B included Final Design activities and continuation of work started by the Specialty Subcontractors in Part A. Part B was planned to start after completion of Part A and the federal SEIS approval and be completed in a five-month period.

### Budget Planning:

The total budget as provided in Amendment 13 was apportioned to Part A and Part B as required to match the redistribution of work. The following changes in the work schedule led to a significant redistribution of monthly budgets when compared to the monthly budgets in Amendment 13.

1. The start of final design of the three Wilshire Stations was deferred to Part B of the program.
2. A large part of the funding for Other Direct Costs (ODC) was budgeted for Part A to provide additional office space for the added personnel to work on Phase II.
3. It was decided to expedite the General Engineering effort for the six stations and tunnels on the Vermont Avenue and Hollywood Boulevard alignments.
4. Most of the budget for Specialty Subcontractors was included in Part A to permit that work to be advanced in conjunction with the General Engineering of the six stations.

AWP PHASE II - A  
BUDGET  
(\$x1,000)

AWP PHASE II - A  
COST TO 6/30/89  
(\$x1,000)

	DESIGN CONSULTANT COST	DISTRICT COST	TOTAL PART "A"	DESIGN CONSULTANT COST	CONSULTANT COST VARIANCE
1.0 DESIGN					
1.1 FACILITIES					
1.1.1 STATIONS (ITEMS 1.2.1 THRU 1.2.5)	\$811	\$159	\$970	\$808	\$3
1.1.2 TUNNELS (ITEMS 1.2.1 THRU 1.2.5)	\$758	\$79	\$837	\$774	(\$16)
1.2 SYSTEMS (ITEM 1.2.7)	\$309	\$119	\$428	\$249	\$60
1.3 OTHER DESIGN SUPPORT (ITEM 1.2.8)	\$347	\$40	\$387	\$319	\$28
1.4 PUBLIC AGENCY COSTS	\$0	\$340	\$340	\$0	\$0
2.0 RIGHT-OF WAY (ITEM 1.2.6)					\$0
2.1 IDENTIFY REQUIREMENTS	\$34	\$64	\$98	\$71	(\$37)
2.2 APPRAISALS	\$0	\$527	\$527	\$0	\$0
3.0 PROJECT MANAGEMENT (ITEM 1.2.9)					\$0
3.1 PROGRAM CONTROL	\$223	\$95	\$318	\$220	\$3
3.2 ADMINISTRATION	\$371	\$24	\$395	\$450	(\$79)
3.3 SAFETY	\$30	\$19	\$49	\$0	\$30
3.3 OTHER DEPARTMENTS	\$0	\$91	\$91	\$0	\$0
4.0 OTHER DIRECT COSTS	\$940	\$150	\$1,090	\$1,042	(\$102)
5.0 SUB-CONSULTANTS	\$2,572	\$393	\$2,965	\$1,072	\$1,500
TOTAL DIRECT COSTS	\$6,395	\$2,100	\$8,495	\$5,005	\$1,390
GENERAL & ADMINISTRATIVE	\$0	\$42	\$42	\$0	\$0
CONTINGENCY	\$0	\$1,100	\$1,100	\$0	\$0
TOTAL PROGRAM COSTS	\$6,395	\$3,242	\$9,637	\$5,005	\$1,390

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