

**Regional Connector Transit Corridor  
Draft Environmental Impact Statement/  
Draft Environmental Impact Report**

APPENDIX Z

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CULTURAL RESOURCES -  
PALEONTOLOGY (UPDATED)



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# LOCALLY PREFERRED ALTERNATIVE IMPACTS TO ARCHEOLOGICAL AND PALEONTOLOGICAL RESOURCES

The Draft Technical Memoranda for Archaeological Resources and Paleontological Resources were included with the Draft Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR) that was released for public comment on September 3, 2010. This addendum serves to finalize the draft report. Two variations of the Fully Underground LRT Alternative (Little Tokyo Variation 1 and Little Tokyo Variation 2) were analyzed in this report. Little Tokyo Variation 2 was subsequently dropped from consideration, and Little Tokyo Variation 1 became the sole alignment for the Fully Underground LRT Alternative.

On October 28<sup>th</sup>, 2010, Metro's Board of Directors approved staff's recommendation to designate the Fully Underground LRT Alternative described in the publicly reviewed Draft EIS/EIR for the Regional Connector Transit Corridor as the Locally Preferred Alternative (LPA). After the close of the Draft EIS/EIR comment period, refinements were made to the LPA to reduce impacts and address comments received. This addendum incorporates those refinements. The LPA would provide a direct connection from 7<sup>th</sup> Street/Metro Center Station to the Metro Gold Line near 1<sup>st</sup> and Alameda Streets. The Metro Gold, Blue and Expo light rail lines would be connected allowing trains to operate between Claremont and Long Beach, and from Santa Monica to the Eastside. In the action for approval, the Board also directed staff to remove the property located on the southeast corner of 2<sup>nd</sup> and Spring Streets from the list of potential acquisitions as well as eliminate the station at 5<sup>th</sup> and Flower Streets. This was due to its close proximity to the existing 7<sup>th</sup> Street/Metro Center Station and a need to reduce costs. The designated LPA thus includes three new stations instead of the original four described in the Draft EIS/EIR. On January 4<sup>th</sup>, 2011, the Federal Transit Administration (FTA) authorized Metro to initiate Preliminary Engineering as part of FTA New Starts funding program. In its authorization, FTA requested that Metro among other items pursue the identification of appropriate mitigations and realize potential cost savings. Consistent with FTA's authorization, refinements to the Locally Preferred Alternative have been identified and are to be analyzed as part of the development of the Final EIS/EIR.

This addendum to the Technical Memoranda was developed to describe the project refinements to the LPA. The effects on archeological and paleontological resources are the same as what was described in the Draft Technical Memoranda.

## 1.0 UPDATED PROJECT DESCRIPTION

On October 28<sup>th</sup>, 2010, the Metro Board of Directors concurred with staff's recommendation to designate the Fully Underground LRT Alternative as the LPA. The LPA alignment is

essentially the same as the Fully Underground LRT Alternative, except it does not include the Flower/5th/4th Street station and has a modified route through Little Tokyo. However, it still travels under the intersection of 1st and Alameda Streets rather than crossing at-grade, and connects to the Metro Gold Line within 1st Street and north of Temple Street.

LPA refinements made since the Draft EIS/EIR to reduce impacts include:

- Relocation of the proposed tunnel boring machine (TBM) insertion site to the Mangrove property northeast of 1<sup>st</sup> and Alameda Streets in order to reduce community disruption due to construction activities
- Elimination of cut and cover construction on 2<sup>nd</sup> Street in Little Tokyo
- Extension of TBM machine operation from 2<sup>nd</sup>/Hope Street station to 4<sup>th</sup> and Flower Streets, allowing an additional block of cut and cover construction to be eliminated
- Slight modifications to tunnel depths
- Rerouting of the tunnels beneath Japanese Village Plaza in order to reduce acquisitions on the block bounded by 1<sup>st</sup> Street, Central Avenue, 2<sup>nd</sup> Street, and Alameda Street

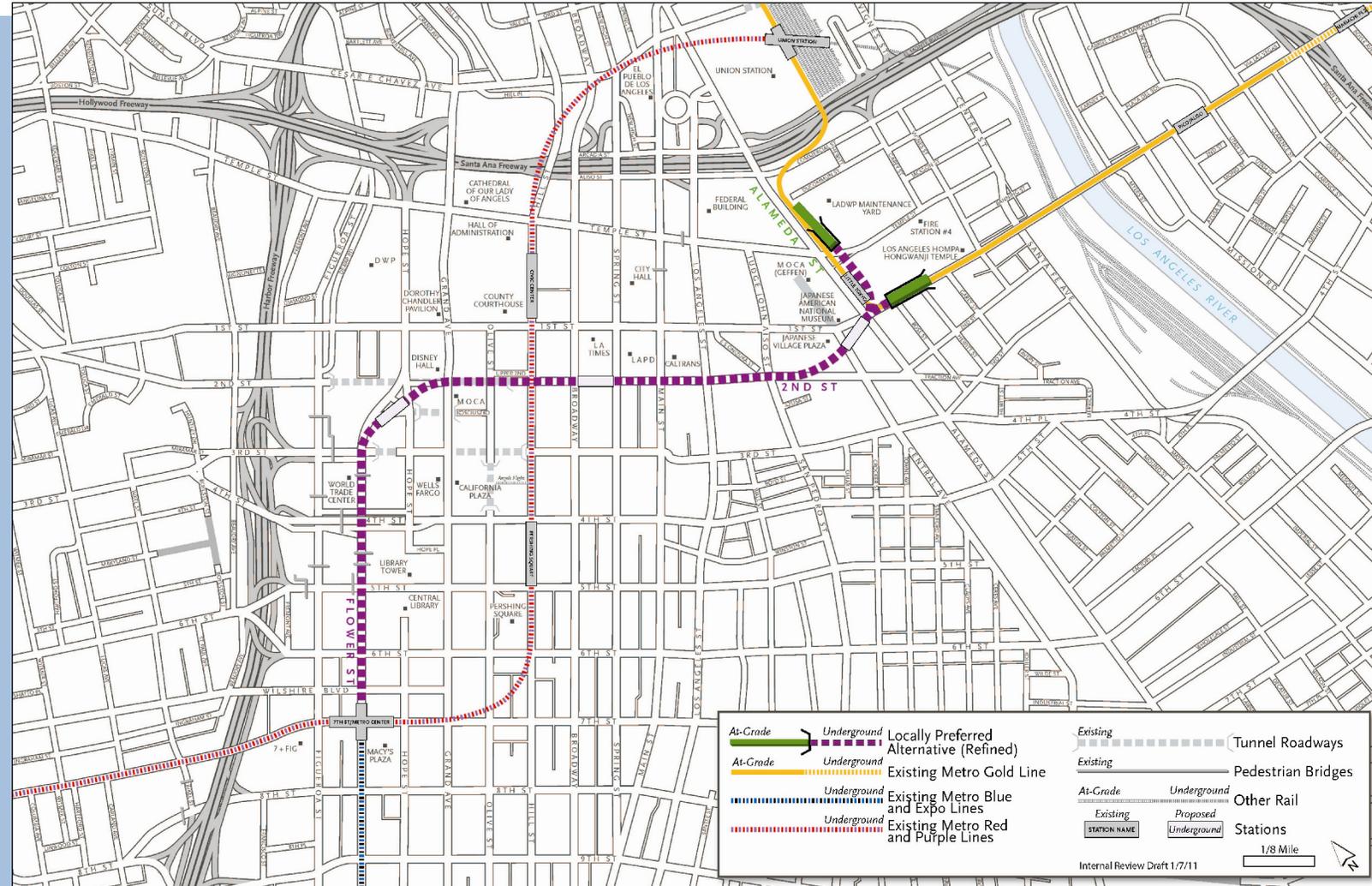


Figure 1 –Locally Preferred Alternative

## 1.1 Route Overview

The LPA alignment would extend north from the existing LRT platform at 7th Street/Metro Center Station and would run underneath Flower Street. An enhanced pedestrian walkway would be provided along Flower Street from the 4th Street and Flower Street area to the existing 7th Street/Metro Center Station entrance at 7th and Flower Streets, which would improve the pedestrian connection between the Financial District and the 7th Street/Metro Center Station. The tracks would then continue north underneath Flower Street and veer northeast near the intersection of 3rd and Flower Streets. A new underground station would be located just southwest of the intersection of 2nd and Hope Streets.

At 2nd and Hope Streets, a new pedestrian connection would be made to Upper Grand Avenue. A pedestrian plaza connecting to Upper Grand Avenue is currently planned above General Thaddeus Kosciuszko Way as part of the Broad Museum. Metro would construct an elevator from the station entrance to the plaza if one is not already provided. If the plaza is not built, Metro would build a pedestrian bridge to connect the elevator to Upper Grand Avenue.

Tracks would then head east underneath 2nd Street to the next proposed underground station between Broadway and Spring Street (2nd Street/Broadway station). The tracks would continue east underneath 2nd Street to just west of Central Avenue at approximately the pedestrian signal to the JVP, where the alignment would then veer northeast under privately held property and Central Avenue to a newly proposed Little Tokyo/Arts District underground station (1st/Central Avenue station). The proposed underground station would be partially located within Central Avenue and the northern half of the block bounded by 1st Street, Central Avenue, 2nd Street, and Alameda Street. The Señor Fish, Weiland Brewery, the former Café Cuba (The Spice Table), and associated parking would need to be acquired for construction of this station. However, the remaining businesses on that block would remain, including the Office Depot and associated parking. This station may include a small building at ground level on the southwest corner of 1st and Alameda Streets to house ventilation fans. This shallow station may potentially be built without a roof or mezzanine, leaving the below-grade platform level exposed.

An underground junction would be constructed beneath the intersection of 1st Street and Alameda Street. Two new portals would be located to the north and east of the junction, where trains would rise to the surface to connect to the Metro Gold Line heading north to Claremont and east to I-605.

One portal would be located north of Temple Street, northeast of the existing at-grade Little Tokyo/Arts District Station and Metro Gold Line tracks. This portal would rise to the north within the maintenance yard of the City of Los Angeles Department of Water and Power (LADWP) and connect to the existing LRT bridge over US 101, allowing a connection to the Metro Gold Line to Claremont. Tracks would run from the junction under 1st and Alameda Streets through a new tunnel crossing beneath Temple Street and the Mangrove property (the parcel on the northeast corner of 1st and Alameda Streets) to the new portal. This new tunnel

would run immediately east of the existing Little Tokyo/Arts District Station and Metro Gold Line tracks.

The second portal would be located within 1st Street between Alameda and Garey Streets. Tracks would rise to the east within this second portal and connect at-grade to the existing Metro Gold Line tracks toward I-605. 1st Street would be widened to the north to accommodate this second portal and maintain the existing number of through lanes. The widening would start at Alameda Street and continue east, significantly tapering down as it crosses Hewitt Street, returning to the existing condition prior to the Los Angeles Homba Hongwanji Buddhist Temple, to join the existing 1st Street LRT tracks, just west of the 1st Street Bridge.

Access to property northeast of 1st and Alameda Streets, the Mangrove property, would need to be acquired for insertion of the TBM, to stage construction of both portals, to connect to the Metro Gold Line LRT bridge, and to construct the tunnels beneath Temple Street and the Mangrove property. During construction, tracks would be installed in this area at-grade to allow service to proceed on the Metro Gold Line while construction activities occur within the project area. Figure 2-10 provides a map of this alternative.

The existing Metro Gold Line Eastside Extension and the Little Tokyo/Arts District Station surface tracks and station would be maintained for continued service during construction with intermittent disruptions related to construction activities. Once construction is complete, operation of the current Metro Gold Line between Pasadena and East Los Angeles and the existing, at-grade Little Tokyo/Arts District Station would terminate. In its place, Metro would initiate operations on two routes:

- Between Claremont and Long Beach
- Between East Los Angeles and Santa Monica

Crossovers could be located just east of the proposed station at 2nd and Broadway Streets, underground beneath 1st Street just east of the intersection of 1st and Alameda Streets, and underground beneath the Mangrove property, north of the rail junction. In addition, a pocket track, which could also serve as a crossover, would be located beneath Flower Street between 5th and 6th Streets. The crossovers and pocket track may not be needed at these locations and may ultimately be placed in other locations. Tunnel boring machines cannot be used for construction of crossovers since underground crossover locations require cut and cover construction. More information on these construction methods is provided in the Description of Construction, Appendix K.

## 1.2 Operating Characteristics

The Fully Underground LRT Alternative (LPA) consolidates the Metro Gold Line, Metro Expo Line, and Metro Blue Line into the two following routes:

East-West Route (Santa Monica to I-605 via the Metro Expo Line, Regional Connector, and Metro Gold Line Eastside Extension tracks): Metro Expo Line trains from Santa Monica would travel on existing Flower Street tracks north of the junction at Washington and Flower Streets. After stopping at the existing 7th Street/Metro Center Station, the trains would continue north along the new Regional Connector tracks to a new junction beneath the intersection of 1st and Alameda Streets. Trains would then travel to a new portal on 1st Street, and continue along the Metro Gold Line Eastside Extension tracks to I-605.

North-South Route (Claremont to Long Beach via the Metro Gold Line, Regional Connector, and Metro Blue Line tracks): After stopping at 7th Street/Metro Center Station, Metro Blue Line trains from Long Beach would continue north along the new Regional Connector tracks to a new junction beneath 1st and Alameda Streets. Trains would then travel to a new portal on the LADWP maintenance yard site, and continue along the Pasadena Metro Gold Line and the Foothill Extension to Claremont.

The east-west and north-south routes would each operate with five minute headways during peak hours, combining to yield trains every 2 ½ minutes in each direction along the Regional Connector.

## 2.0 LPA EFFECTS, IMPACTS AND MITIGATION FOR ARCHAEOLOGICAL RESOURCES

Construction of the Fully Underground LRT Alternative (LPA) has the potential to directly affect archaeological resources within the APE, including previously unidentified archaeological resources, the Los Angeles Zanja System, and sites CA-LAN-3588, P-19-003338, and P-19-003339 (Details regarding these resources can be found in the body of the Technical Memorandum for Archaeology).

Archaeological features associated with these sites may extend into the project area and be subject to direct alteration. This would result in a significant effect. Implementation of mitigation measures described in Sections 1.2.2.1 and 1.2.2.2 would reduce potential direct impacts to identified and previously unidentified archaeological resources to a less than significant level. The LPA would not result in operational impacts to both identified and previously unidentified archaeological resources.

Given that implementation of the mitigation measure described in Section 1.2.2.1 would reduce potential construction impacts to previously unidentified archaeological resources to a less than significant level, the LPA would not contribute to a cumulative impact on unidentified archaeological resources.

Potential destruction of portions of the Los Angeles Zanja System could contribute to a cumulative impact to this resource. Implementation of the mitigation measure described in Section 1.2.2.1.2 would reduce both direct and cumulative impacts to known archaeological resources, including the Zanja System, to a less than significant level.

## 2.1 NEPA Finding and CEQA Determination

Construction of the LPA has the potential to affect previously unknown resources. With implementation of mitigation measures, potential construction and cumulative impacts would not be adverse or significant under NEPA or CEQA. The LPA would not result in adverse or significant operational impacts to archaeological resources.

## 2.2. Mitigation Measures

Construction of the Regional Connector Transit Corridor project may impact one or more NRHP- or CRHR-eligible archaeological sites along with an unknown number of previously unidentified archaeological resources.

Since operational impacts to archaeological resources, including both previously recorded and undiscovered resources, are not expected for any of the project alternatives, mitigation for operation would not be required for this project.

In the event that resource avoidance is not possible, and to mitigate impacts to previously unidentified archaeological resources, the following mitigation measures related to construction activities are recommended.

Mitigation measures are also documented in the Mitigation Monitoring and Reporting Program (MMRP), which is part of the Final EIS/EIR.

### 2.2.1 Treatment of Undiscovered Archaeological Resources

A detailed Cultural Resources Monitoring and Mitigation Plan (CRMMP) would be prepared prior to implementing this project, similar in scope to the CRMMP that was prepared for Metro's Eastside Gold Line Transit Corridor (Glenn and Gust 2004). Implementing a CRMMP during ground disturbance in highly sensitive archaeological areas would ensure that cultural resources are identified and adequately protected.

If cultural resources are discovered or if previously identified resources are affected in an unexpected manner, the CRMMP would ensure that such resources receive mitigation to reduce the impact to a less than significant level. This plan would include, but not be limited to, the following elements:

- Worker training
- Archaeological monitoring
- The scientific evaluation and mitigation of archaeological discoveries
- Native American participation, as needed
- Appropriate treatment of human remains

- Reporting of monitoring and mitigation results

### **Worker Training**

Prior to initiating ground-disturbing activities, a qualified archaeologist would conduct a short awareness training session for all construction workers and supervisory personnel. The session would explain the importance of and legal basis for protecting significant archaeological resources.

Each worker would also learn the proper procedures to follow in the event cultural resources or human remains are uncovered during ground-disturbing activities. These procedures include work curtailment or redirection and the immediate contact of the supervisor and the archaeological monitor.

This worker education session could include visual representations of artifacts (prehistoric and historic) that might be found in the project vicinity, and it could take place on-site immediately prior to the start of ground disturbance.

Supervisory personnel may benefit from longer training sessions, while a brief training would suffice for non-supervisory workers. The brief (approximate 30- to 45-minute) training session may be conducted on-site by video, PowerPoint presentation, or similar media.

### **Archaeological Monitoring, Evaluation, and Mitigation**

Due to poor surface visibility and high archaeological sensitivity of the direct APE, an archaeological monitor would be present during ground-disturbing activities in archaeologically sensitive areas. This would reduce the potential level of impact to buried archaeological resources to a less than significant level. This work would be completed under the direction of an archaeologist who meets the Secretary of the Interior's Standards for archaeologists. An adequate number of monitors would be present to ensure that all earth-moving activities are observed and would be on-site during all grading activities for areas to be monitored.

During the original excavation of previously undisturbed soils, the archaeological monitor(s) would be on-site at a frequency determined by the lead archaeologist. Inspection frequency may vary based on the rate of excavation, the materials excavated, and the presence and abundance of artifacts and features. Full-time monitoring is warranted within one-half block of potentially significant archaeological resources that are known or suspected to be present within the direct APE.

If potentially significant archaeological resources are exposed during ground-disturbing activities, the project manager would be notified immediately. Archaeological monitor(s) would have the authority to divert or temporarily halt ground-disturbing operations in the area of discovery to allow the resources to be evaluated. Excavation work would halt until the archaeological monitor makes a determination of the significance of the archaeological resource. Construction activities may continue in other areas.

Evaluation of such resources is typically accomplished by a test-level excavation designed to determine the horizontal and vertical extent of the resource, and to characterize its contents. If the discovery proves to be potentially eligible for listing on the NRHP or the CRHR and project plans cannot be altered to avoid affecting the site, then an adverse effect would result within the project area. This adverse effect may be resolved by implementing a Memorandum of Agreement (MOA) between Metro and the SHPO.

Before construction activities are allowed to resume in an affected area, artifacts would be recovered and features recorded using professional archaeological methods. The lead archaeologist operating under the direction of the MOA would determine the amount of material to be recovered for an adequate artifact sample for analysis.

All cultural material collected during the construction monitoring program would be processed using professional archaeological methods. An appropriate sample of recovered materials, selected by the lead archaeologist, would be curated at a curation facility that meets federal standards per 36 CFR Part 79 and made available to other archaeologists and researchers for further study.

### **Native American Participation**

If Native American cultural resources (i.e., prehistoric or ethnohistoric-period artifacts, food remains, or features associated with Native Americans) are exposed during project-related ground disturbance, Metro would contact the Gabrielino/Tongva San Gabriel Band of Mission Indians and the Tongva Ancestral Territorial Tribal Nation. Both groups have expressed interest in the project. One or both of these groups would be asked to provide the services of a trained Native American consultant to monitor ground-disturbing work in the area containing the Native American cultural resources. This monitoring would occur on an as-needed basis, and would be intended to ensure that Native American concerns are taken into account during the construction process.

### **Human Remains**

The discovery of human remains is always a possibility during ground disturbance. For example, an unmarked early Spanish period Native American cemetery was recently discovered near the APE (Applied Earthworks 1999).

The State of California Health and Safety Code Section 7050.5 addresses what should be done when human remains are found during construction. This code section states that when human remains are encountered, no further disturbance would occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code (PRC) Section 5097.98. The County Coroner would be immediately notified of the find.

If the human remains are determined to be prehistoric, the Coroner would notify the Native American Heritage Commission, which would determine and notify a Most Likely Descendant (MLD). The MLD shall complete inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials. Impacts to human remains may remain significant even after mitigation.

### **Reporting**

If cultural resources are not discovered in the course of construction monitoring, a brief letter to that effect would be prepared by the consulting archaeologist, indicating that the monitoring activities have been satisfied. If previously unidentified cultural resources are discovered in the course of construction monitoring, a report would be prepared following Archaeological Resource Management Report (OHP 1990) guidelines that documents field and analysis results and interprets the data within an appropriate research context.

## 2.2.2 Treatment of Known Archaeological Resources

Destruction of a resource that is eligible for listing in the NRFP or CRHR would be a significant adverse effect. This effect may be resolved through by implementing an MOA between FTA, Metro, and the SHPO, as well as other interested parties.

Four archaeological sites that are either within or immediately adjacent to the direct APE are presumed eligible for listing on both the NRHP and the CRHR. These include the Los Angeles Zanja System (the Zanja Madre, CA-LAN-887H, and numerous unrecorded numbered zanjas) and sites CA-LAN-3588, P-19-003338, and P-19-003339.

Effects to the data potential of archaeological sites can be mitigated to a less than significant level by preparing and implementing a data recovery plan under Section 106 and CEQA. The actual mitigation measures agreed upon in the MOA may vary in substance and degree, but the MOA would include a process to resolve any adverse effects upon archaeological resources within the direct APE that are eligible for listing in the NRHP or CRHR. The treatment of sites CA-LAN-3588, P-19-003338, and P-19-003339 may include systematic and scientific exposure, evaluation, and if necessary, archaeological data recovery.

### Los Angeles Zanja System

The Los Angeles Zanja system was an extensive and integrated water conveyance network that served large areas of the City for multiple generations. Generally speaking, previous construction projects in downtown Los Angeles have unexpectedly encountered and documented limited exposures of a single zanja segment, often after the segment has been damaged by construction equipment. This incomplete approach does not permit the overall Zanja system to be evaluated, given the requirements that the OHP clarified in its recent letter (Toffelmier 2009).

It is likely that other projects (such as emergency utility repair) have damaged segments of the Zanja system without documentation. This repeated damage (both monitored and unmonitored construction impacts) constitutes a cumulative effect that should be mitigated. Construction monitoring alone is insufficient mitigation to address this effect, particularly given the likelihood of damaging the zanjas prior to discovery during project construction process.

Inadvertent project-related damage to the zanjas may constitute an adverse effect under the Criteria of Adverse Effect, “physical destruction or damage” (36 CFR Part 800.5(a) (2) and material impairment as defined in CEQA. This action would contribute to, rather than mitigate, these cumulative effects.

Both Section 106 of the NHPA (as amended) and CEQA require identification, documentation, and evaluation of historic properties/historic resources in a project area (or direct APE). For a poorly mapped and buried linear resource like the Zanja system, identification alone is challenging.

Rather than a costly archaeological excavation program or a remote sensing (ground-penetrating radar, etc.) survey that is unlikely to produce clear-cut results, a proactive identification and documentation program that would facilitate preservation or mitigation in a cost-effective manner is recommended.

This would include using additional documentary research to identify, as accurately as possible, the precise alignments of the zanjas within the APE. Where these alignments are expected to be affected by the proposed project, particularly where cut-and-cover or other near-surface construction techniques (as opposed to tunneling 20 or more feet below the ground surface) are planned in the vicinity of mapped zanja segments, full-time archaeological monitoring would be instituted to ensure documentation.

The archaeological monitors would work closely with equipment operators to ensure that every effort is made to avoid damaging zanja segments prior to their adequate documentation.

Documenting and evaluating the Los Angeles Zanja system would be best accomplished with a system-wide approach that incorporates historical, archaeological, and engineering research and documentation. This systemic approach to documentation and evaluation is a particularly appropriate mitigation measure for the Regional Connector Transit Corridor project, which has the potential to impact multiple zanja segments. Documentation of the zanja segments' alignments and slopes would have the added benefit of enabling future projects to more accurately predict the location of zanja segments outside of the project area.

To mitigate potential impacts to the Los Angeles Zanja system, the project MOA would provide that the system be adequately documented under the direction of an experienced archaeologist and an experienced historical architect, architectural historian, or historian, both meeting the Secretary of the Interior's qualification standards. This documentation would include a combination of historical research, archaeological testing, and architectural documentation, and would be followed by a formal evaluation of NRFP and CRHR eligibility.

It should be noted that substantial documentation already exists for the Zanja system in the form of maps and engineering records, published books and articles, unpublished technical reports, and site records. The collation of available data for the system as a whole would accomplish much of the documentation effort that is proposed here, while intensive, original research would be restricted to the zanja segments that cross the direct APE.

Research and documentation may include such specific measures as:

- Historical research using historical maps, photographs, and other written sources to document creation, maintenance, modification, and abandonment of the system.
- Archaeological research to establish the physical condition, presence of associated features and artifacts, and precise location of each zanja segment within the project's direct APE by using physical exposure through controlled excavation following its discovery during construction monitoring. Resources would be documented using DPR series 523 primary and detail forms, maps, and photographs. The results would be presented in a detailed technical report following Archaeological Resource Management Report (OHP 1990) guidelines. The report would address research questions and assess the NRHP and CRHR eligibility of the system.

- Architectural documentation of exposed zanja segments by producing narrative records, measured drawings, and photographs in conformance with Historic American Engineering Record (HAER) standards prior to any alteration or demolition activity.
- Preserving the results of the historical, archaeological, and historic architectural studies in repositories (e.g., the local main library branch, the lead agency headquarters library, and with identified non-profit historic groups interested in the subject matter).
- Interpretation of the Los Angeles Zanja system for the public through signage along the project alignment, visual representations of zanja alignments using colored pavement, or other appropriate means such as a dedicated internet website.

## 3.0 LPA EFFECTS, IMPACTS AND MITIGATION PALEONTOLOGICAL RESOURCES

The LPA involves ground disturbance associated with excavations to construct three new stations and an entirely underground tunnel located from the 7<sup>th</sup> Street/Metro Center Station to east of the intersection of 1<sup>st</sup> and Alameda Streets. Any ground disturbances in areas of high sensitivity will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or more below the ground surface. In areas where mitigation measures can be implemented, potential impacts can be reduced to a less than significant level. In areas where new underground TBM segments would be constructed, mitigation for paleontological resources would not be feasible resulting in significant and unavoidable impacts.

The LPA would not result in operational impacts to paleontological resources.

In areas where mitigation measures can be implemented, potential impacts can be reduced to a less than significant level thus reducing any cumulative impact on paleontological resources to less than significant. In areas where mitigation measures cannot be implemented, such as in areas where new underground TBM segments would be constructed, cumulative impacts may be unavoidable.

### 3.1 NEPA Finding and CEQA Determination

The LPA could have adverse effects on paleontological resources. With implementation of mitigation, potential construction and cumulative impacts would not be adverse under NEPA. The LPA would not have significant effects on paleontological resources with implementation of proposed mitigation measures with the exception of areas where tunneling operations cannot be mitigated. In areas where new underground TBM segments would be constructed, mitigation for paleontological resources would not be feasible and thus construction and cumulative impacts would be significant and unavoidable.

The LPA would not result in adverse or significant operational impacts to paleontological resources.

## 3.2 Mitigation Measures

### 3.2.1 Construction Mitigation Measures

The following mitigation measures have been developed in accordance with the SVP (1995) standards and guidelines and meet the paleontological requirements of CEQA. Mitigation measures are also documented in the Mitigation Monitoring and Reporting Program (MMRP), which is part of the Final EIS/EIR.

- A qualified paleontologist would produce a Paleontological Monitoring and Mitigation Plan for the proposed project and supervise monitoring of construction excavations. Paleontological resource monitoring would include inspection of exposed rock units during active excavations within sensitive geologic sediments. The monitor would have authority to temporarily divert grading away from exposed fossils to professionally and efficiently recover the fossil specimens and collect associated data.
- All project-related ground disturbances that could potentially affect the Puente Formation, Fernando Formation, and Quaternary older alluvium and terrace deposits would be monitored by a qualified paleontological monitor on a full-time basis (where feasible) because these geologic sediments are determined to have a high paleontological sensitivity (Figure 4.12.3-3). Very shallow surficial excavations (less than 5 feet) within Quaternary younger alluvium would be monitored on a part-time basis to ensure that underlying sensitive units are not adversely affected (Figure 4.12.3-3). Construction monitoring during any tunneling activity is not warranted as any potential fossil specimens present within sensitive geologic units would be crushed and destroyed by the nature of tunneling methodology.
- At each fossil locality, field data forms would be used to record pertinent geologic data, stratigraphic sections would be measured, and appropriate sediment samples would be collected and submitted for analysis.
- Due to the likelihood of the presence of microfossils, matrix samples would be collected and tested within the Puente Formation and Fernando Formation. Testing for microfossils would consist of screen-washing samples (approximately 30 pounds) to determine if significant fossils are present. Productive tests would result in screen-washing of additional bulk matrix up to a maximum of 2,000 pounds per locality to ensure recovery of a scientifically significant sample.
- Recovered fossils would be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and repositied in a designated paleontological curation facility (such as the Natural History Museum of Los Angeles County).

- The paleontologist would prepare a final monitoring and mitigation report to be filed, at a minimum with Metro and the repository.

### **3.2.2 Operational Mitigation Measures**

No mitigation is required because operational impacts to paleontological resources are not expected for any of the project alternatives.

**Regional Connector Transit Corridor  
Paleontological Resources  
Technical Memorandum**

**April 6, 2010**

**Prepared for**

**Los Angeles County Metropolitan Transportation Authority**

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State Clearinghouse Number: 2009031043





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## ACRONYMS

APE	Area of Potential Effects
CEQA	California Environmental Quality Act
FTA	Federal Transit Administration
LACM	Natural History Museum of Los Angeles County
LADWP	Los Angeles Department of Water and Power
LRT	Light Rail Transit
L RTP	Long Range Transportation Plan
mya	Million Years Ago
NEPA	National Environmental Policy Act
OPLA	Omnibus Public Lands Management Act
PRA	Paleontological Resources Preservation
PRPA	Paleontological Resources Preservation Act
PRMPP	Paleontological Resources Monitoring and Mitigation Plan
SVP	Society of Vertebrate Paleontology
TSM	Transportation Management System



## 1.0 SUMMARY

### 1.1 Background

This technical memorandum discusses the results of a Paleontological Resource analysis of the proposed Regional Connector Transit Corridor project. The study was performed to evaluate the paleontological sensitivity of the project area and vicinity, assess potential project-related impacts to paleontological resources, and provide recommendations. This analysis included a records search conducted at the Natural History Museum of Los Angeles County on February 5, 2008 and a literature review.

This study was conducted in accordance with the professional guidelines established by the Society of Vertebrate Paleontology (SVP) (1995). This technical memorandum will be filed with the Federal Transit Administration (FTA), Metro, CDM, and SWCA. All records related to the project will also remain on file at Metro and the South Pasadena office of SWCA.

### 1.2 Summary of Findings

According to geologic mapping published by Yerkes and Graham (1997a; 1997b) and records maintained by the Natural History Museum of Los Angeles County, the project area is underlain by the following geologic units, from oldest to youngest: (1) Miocene Puente Formation, (2) Pliocene Fernando Formation, (3) Quaternary terrace deposits, and (4) Quaternary alluvium. Museum records revealed that at least 12 previously recorded vertebrate fossil localities have been documented either along the proposed project alignment or within a 2-mile radius from the same sedimentary deposits underlying the project.

The combined results of the museum records search and literature review indicate that the geologic units underlying the project area have a paleontological sensitivity ranging from low to high. Therefore, construction of the project may potentially result in an adverse impact to nonrenewable fossil resources and will require implementation of paleontological resources mitigation measures, where feasible.

### 1.3 Mitigation and Monitoring

A qualified paleontologist would design and implement a Paleontological Resources Monitoring and Mitigation Plan (PRMPP) during any ground disturbances related to the proposed project, where feasible. All significant fossils recovered during construction monitoring would be prepared, stabilized, identified, and permanently curated in an approved repository or museum (such as the Natural History Museum of Los Angeles County).



## 2.0 INTRODUCTION

### 2.1 Project Description

The proposed project area extends 1.9 miles through downtown Los Angeles and would provide enhanced Metro service throughout four distinct travel corridors that span more than 50 miles across Los Angeles County (Figure 2-1). The proposed alternatives include from 1.6 to 1.9 miles of new dual tracks in downtown Los Angeles and would provide a direct link between the Metro Gold, Blue, and Expo Lines by bridging the gap in the regional light rail network between 7<sup>th</sup> Street/Metro Center Station and the Little Tokyo/Arts District Station. This would allow for direct trains from East Los Angeles to Culver City and from Long Beach to Pasadena.

The project also includes construction of several new stations downtown that would allow passengers on the Metro Gold, Blue, and Expo Lines to reach multiple destinations in the central business district without transferring. The following alternatives were evaluated:

- No Build Alternative
- Transportation System Management (TSM) Alternative
- At-Grade Emphasis Light Rail Transit (LRT) Alternative
- Underground Emphasis LRT Alternative
- Fully Underground LRT Alternative- Little Tokyo Variation 1
- Fully Underground LRT Alternative- Little Tokyo Variation 2

Each of these alternatives are described in the following sections.

#### 2.1.1 No Build Alternative

Transit service under the No Build Alternative is focused on preserving existing services and projects. The No Build Alternative does not include any major service improvements or new transportation infrastructure beyond what is listed in Metro's 2009 Long Range Transportation Plan (LRTP).

By the projection year of 2035, the Metro Expo Line to Santa Monica, the Metro Purple Line to Westwood, the Metro Crenshaw Line, and the Metro Gold Line extensions to Azusa and about I-605 will have opened, and a number of bus routes will have been reorganized and expanded to provide connections with these new rail lines. All bus and rail lines would operate using a fleet of vehicles similar to those currently in service or identified for purchase in the LRTP. The transit network within the project area would otherwise be largely the same as it is now.

## 2.1.2 Transportation System Management (TSM) Alternative

The TSM Alternative includes all the provisions of the No Build Alternative, plus two new express shuttle bus lines linking the 7<sup>th</sup> Street/Metro Center and Union Stations. These buses would run frequently, perhaps just a few minutes apart, especially during peak hours. Enhanced bus stops would be located every two to three blocks to maximize coverage of the area surrounding the routes. Rail service would remain the same as described for the No Build Alternative. The two new shuttle bus routes are illustrated on Figure 2-2.

## 2.1.3 At-Grade Emphasis Light Rail Transit (LRT) Alternative

### 2.1.3.1 Overview

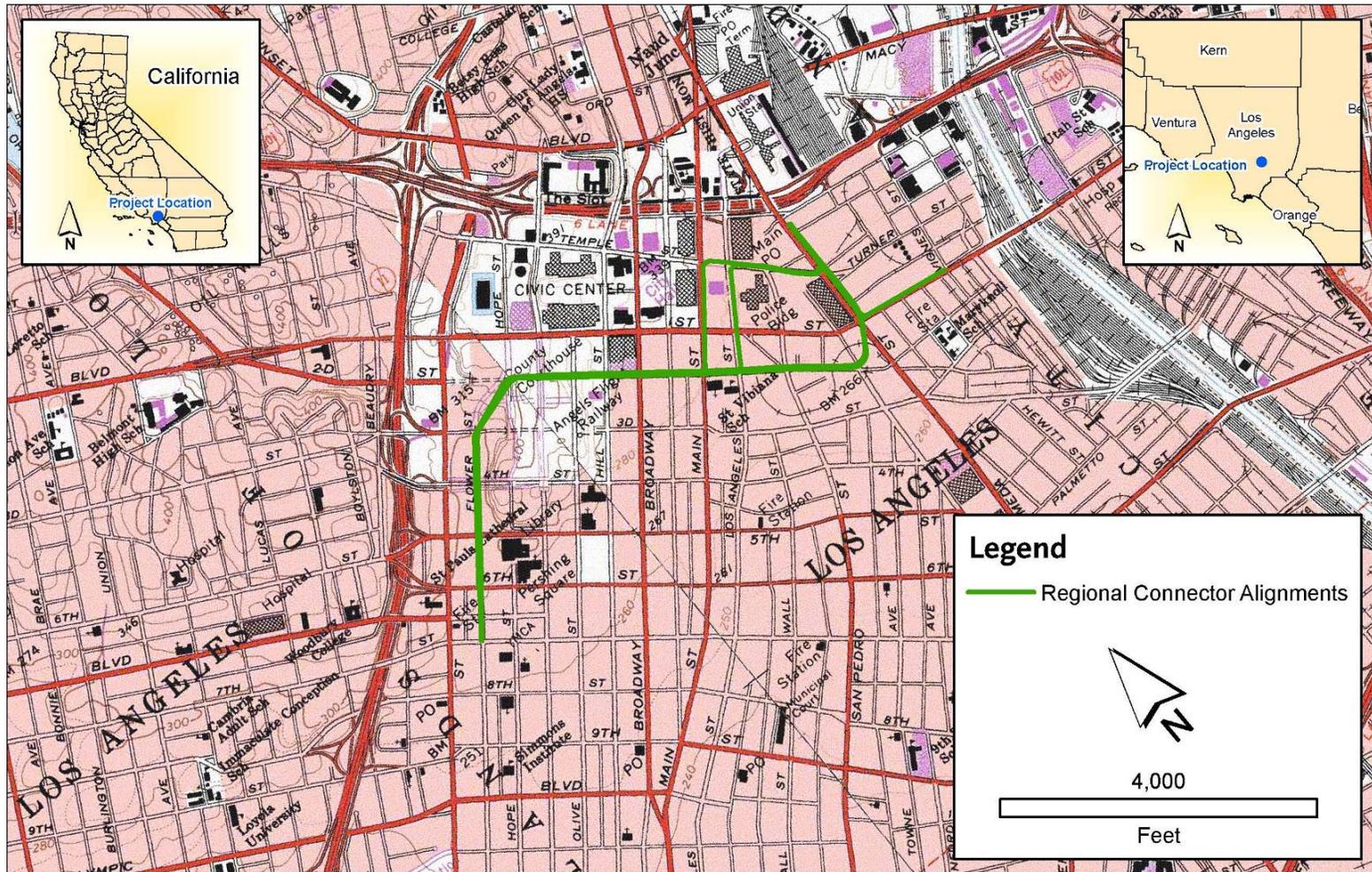
The At-Grade Emphasis LRT Alternative would provide a direct connection from the existing underground 7<sup>th</sup> Street/Metro Center Station to the Metro Gold Line at Temple and Alameda Streets with three new station locations proposed. This alignment includes a combination of underground and at-grade segments, with 46 percent of the route underground. New stations would serve the Civic Center, Grand Avenue, and Financial District.

Conversion of 2<sup>nd</sup> Street to a pedestrian-friendly transit mall is assumed. To implement this alternative, the number of traffic lanes and on-street parking spaces on 2<sup>nd</sup> Street would be reduced. As a result, traffic would be likely to divert to adjacent parallel streets such as 1<sup>st</sup> and 3<sup>rd</sup> Streets, but the roadway capacity along these streets would remain unchanged, as with the No Build Alternative. Traffic congestion along these streets would likely increase. Figure 2-3 illustrates the At-Grade Emphasis LRT Alternative.

### 2.1.3.2 Route Configuration

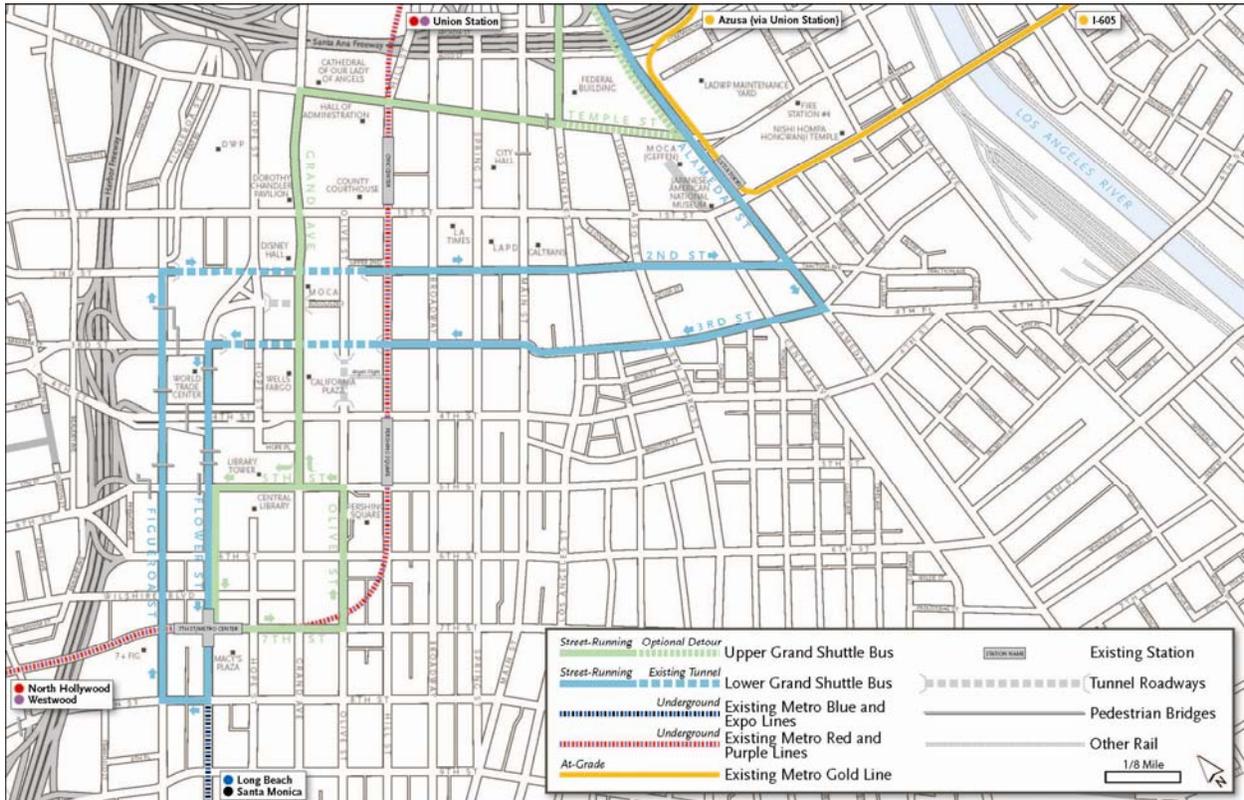
From the existing platform at the 7<sup>th</sup> Street/Metro Center Station, the tracks would extend north underneath Flower Street to a new underground station just south of 5<sup>th</sup> Street. The tracks would then continue north, surface just south of 3<sup>rd</sup> Street, cross 3<sup>rd</sup> Street at grade, and veer northeast through a portal in the hillside to an underground station at 2<sup>nd</sup> and Hope Streets. Tunnel construction would be constrained by existing buildings.

At 2<sup>nd</sup> and Hope Streets, a new pedestrian bridge would be constructed to connect the station to Upper Grand Avenue. The tracks would continue northeast, punch through the wall of the existing 2<sup>nd</sup> Street tunnel, and then travel east in the 2<sup>nd</sup> Street tunnel toward Hill Street.



Source: USGS

Figure 2-1. Project Location

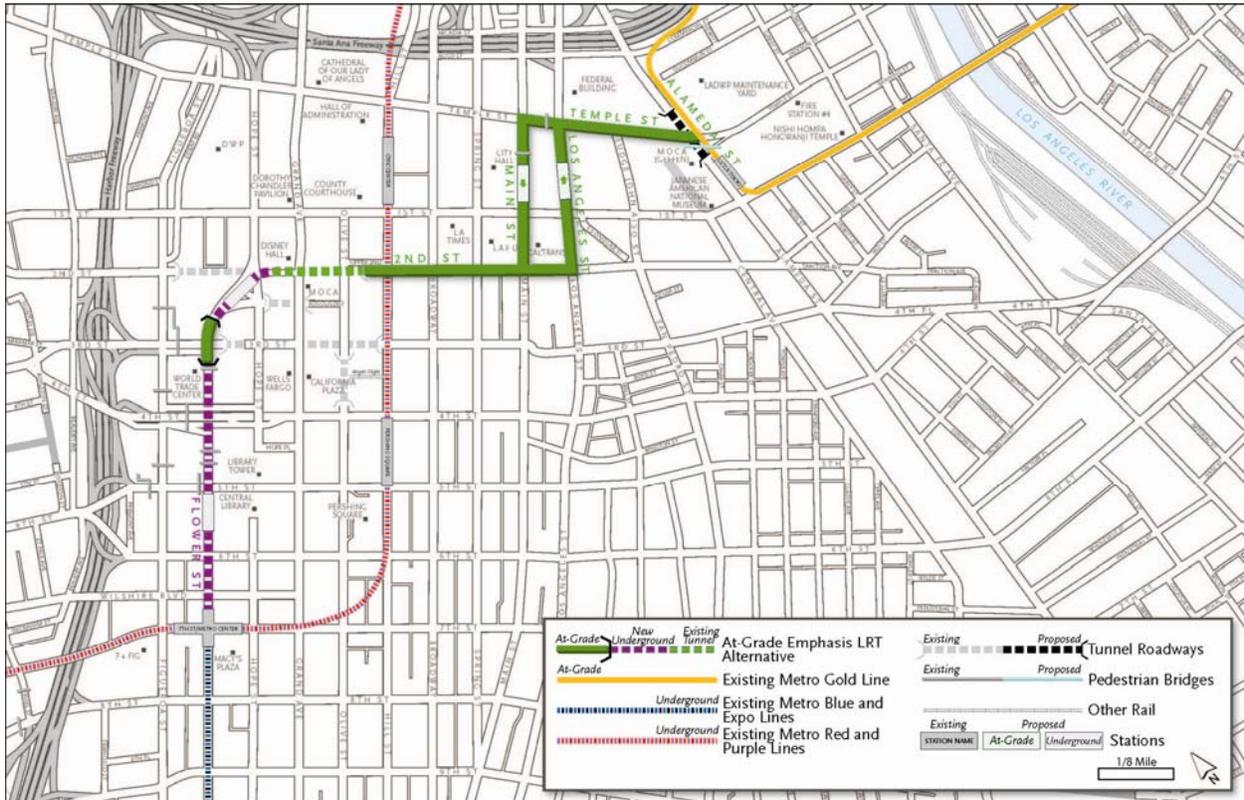


**Figure 2-2. TSM Alternative**

Trains would proceed east on 2<sup>nd</sup> Street to Main Street. At Main Street, the alignment would split into two single-track alignments. One track (for northbound trains) would continue east to Los Angeles Street and then north to Temple Street. The other track (for southbound trains) would travel north on Main Street and then west on Temple Street. Both tracks would have an at-grade station just north of 1<sup>st</sup> Street.

At Temple and Los Angeles Streets, the two tracks would rejoin and proceed west on Temple Street to Alameda Street, where the tracks would join the Metro Gold Line in a three-way junction.

A vehicular underpass and pedestrian overpass are proposed along Alameda Street to route through traffic beneath the rail tracks and Temple Street traffic. This would minimize potential conflicts between rail, vehicular, and pedestrian traffic, and reduce delays at the intersection of Temple and Alameda Streets. Temple Street and the rail tracks would remain at grade, and the existing at-grade segment of Alameda Street would be lowered to pass under Temple Street. The pedestrian bridge could potentially have endpoints located on each of the intersection's four corners.



**Figure 2-3. At-Grade Emphasis LRT Alternative Alignment and Configuration**

Locations of new light rail right-of-way and stations proposed for the At-Grade Emphasis LRT Alternative are identified in the following sections. It should be noted that this report analyzes maximum potential effects and impacts for each proposed project facility. Thus, ultimate effects and impacts may be smaller in magnitude than the impacts discussed herein.

### New light rail right-of-way

- Underground double track beneath Flower Street from the 7<sup>th</sup> Street/Metro Center Station to a new portal between 4<sup>th</sup> and 3<sup>rd</sup> Streets
- At-grade double track on Flower Street from the portal between 4<sup>th</sup> and 3<sup>rd</sup> Streets to 3<sup>rd</sup> Street, then across the intersection of 3<sup>rd</sup> and Flower Streets to a new portal into the hillside on the northeast corner
- Underground double track from the portal on the northeast corner of 3<sup>rd</sup> and Flower Streets to a new portal through the southern wall of the 2<sup>nd</sup> Street tunnel
- At-grade double track in the 2<sup>nd</sup> Street tunnel and on 2<sup>nd</sup> Street, from the new portal in the 2<sup>nd</sup> Street tunnel to Main Street

- At-grade single southbound-only track on Main Street between 2<sup>nd</sup> and Temple Streets, and on Temple Street between Main and Los Angeles Streets
- At-grade single northbound-only track on 2<sup>nd</sup> Street between Main and Los Angeles Streets, and on Los Angeles Street between 2<sup>nd</sup> and Temple Streets
- At-grade double track on Temple Street between Los Angeles and Alameda Streets

### **New stations**

- Underground station on Flower Street just south of 5<sup>th</sup> Street
- Underground station just southwest of 2<sup>nd</sup> and Hope Streets
- At-grade southbound-only station on Main Street just north of 1<sup>st</sup> Street
- At-grade northbound-only station on Los Angeles Street just north of 1<sup>st</sup> Street

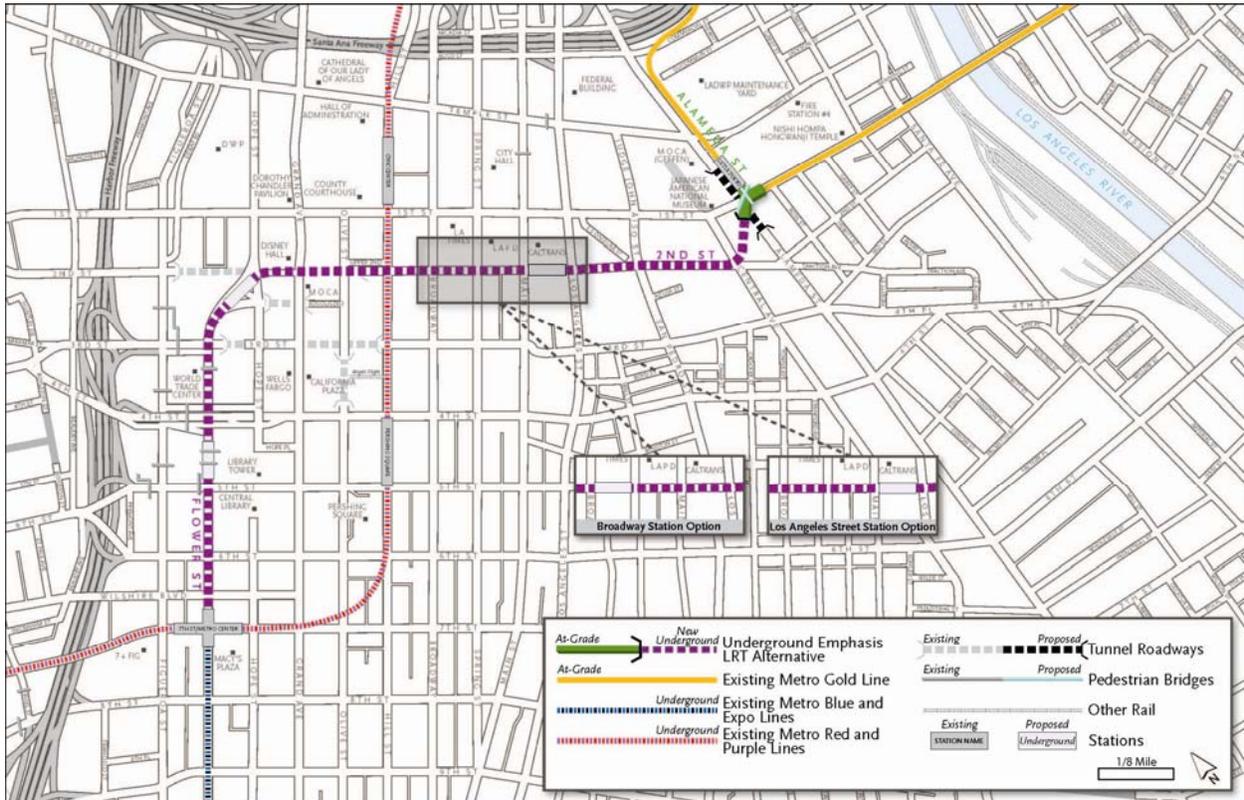
## **2.1.4 Underground Emphasis LRT Alternative**

### **2.1.4.1 Overview**

The Underground Emphasis LRT Alternative would provide a direct connection from 7<sup>th</sup> Street/Metro Center Station to the Gold Line tracks at the Little Tokyo/Arts District Station with three new station locations. The alignment would extend underground from the 7<sup>th</sup> Street/Metro Center Station under Flower Street to 2<sup>nd</sup> Street. The tracks would then proceed east underneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street to a new portal on the parcel bounded by 1<sup>st</sup> Street, Alameda Street, 2<sup>nd</sup> Street, and Central Avenue.

It is expected that property would need to be acquired to construct the portal and stage construction of the tunnels beneath 2<sup>nd</sup> Street. The tracks would then connect to the Gold Line tracks.

The Underground Emphasis LRT Alternative would be located primarily underground except for a single at-grade crossing at the intersection of 1<sup>st</sup> and Alameda Streets in the same type of three-way junction as proposed for the At-Grade Emphasis LRT Alternative. Tunnel construction would be constrained by existing buildings. Figure 2-4 illustrates this alternative.



**Figure 2-4. Underground Emphasis LRT Alternative Alignment and Configuration**

### 2.1.4.2 Route Configuration

The Underground Emphasis LRT Alternative alignment would extend north from the existing platform at the 7<sup>th</sup> Street/Metro Center Station. Tracks would run underneath Flower Street to the next proposed station, just north of 5<sup>th</sup> Street. The tracks would then continue north underneath Flower Street and veer northeast near the intersection of 3<sup>rd</sup> and Flower Streets.

A new underground station would be located just southwest of the intersection of 2<sup>nd</sup> and Hope Streets. At this location, a new pedestrian bridge may be constructed to connect the station to Upper Grand Avenue. The tracks would then head east underneath 2<sup>nd</sup> Street to the next proposed station.

There are two options for a station on 2<sup>nd</sup> Street. The Broadway Station option would place an underground station on 2<sup>nd</sup> Street between Broadway and Spring Street. The Los Angeles Street Station option would include an underground station between Main and Los Angeles Streets.

The tracks continue east under 2<sup>nd</sup> Street to Central Avenue, where they would veer northeast and surface in the lot bounded by 1<sup>st</sup>, Alameda, and 2<sup>nd</sup> Streets, and Central Avenue. The tracks would then come to the surface through a portal within this block and enter an at-grade three-way junction at the intersection of 1<sup>st</sup> and Alameda Streets.

A new underpass would carry car and truck traffic along Alameda Street beneath 1<sup>st</sup> Street and the rail junction, and a new overhead pedestrian bridge structure would eliminate most potential conflicts between pedestrians and trains. The proposed pedestrian overpass could potentially have endpoints at each of the four corners of the intersection.

Crossovers would possibly be located just north of the proposed station at 5<sup>th</sup> and Flower Streets and just east of the proposed station on 2<sup>nd</sup> Street (whether it is between Broadway and Spring Street or between Main and Los Angeles Streets). Crossovers may not be needed at both of these locations, and may ultimately be placed in locations that are not adjacent to stations. Underground crossover locations require cut-and-cover construction; tunnel-boring machines cannot be used to construct underground crossovers.

Locations of new light rail right-of-way, stations, and crossovers proposed for the Underground Emphasis LRT Alternative are identified in the following sections. It should be noted that this report analyzes maximum potential effects and impacts for each proposed project facility. Thus, ultimate effects and impacts may be smaller in magnitude than the impacts discussed herein.

### **New light rail right-of-way**

- Underground double track beneath Flower Street from the existing platform at the 7<sup>th</sup> Street/Metro Center Station to 3<sup>rd</sup> Street
- Underground double track curving northeast from the intersection of 3<sup>rd</sup> and Flower Streets toward 2<sup>nd</sup> and Hope Streets
- Underground double track beneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street from Hope Street to Central Avenue
- At-grade double track from the portal on parcel bounded by 1<sup>st</sup> Street, Alameda Street, 2<sup>nd</sup> Street, and Central Avenue to a three-way junction at the intersection of 1<sup>st</sup> and Alameda Streets

### **New stations**

- Underground station on Flower Street just north of 5<sup>th</sup> Street
- Underground station just southwest of the intersection of 2<sup>nd</sup> and Hope Streets

- Underground station on 2<sup>nd</sup> Street either between Broadway and Spring Street (Broadway Station option) or between Main and Los Angeles Streets (Los Angeles Street option)

### **New crossovers**

Locations are preliminary and crossovers may not be placed at both. The two locations proposed for new crossovers include:

- Underground just north of the station at 5<sup>th</sup> and Flower Street
- Underground just east of the station on 2<sup>nd</sup> Street, either between Broadway and Spring Street or between Main and Los Angeles Streets

## **2.1.5 Fully Underground LRT Alternative – Little Tokyo Variation 1**

### **2.1.5.1 Overview**

The Fully Underground LRT Alternative - Little Tokyo Variation 1 would provide four new stations and a direct connection from 7<sup>th</sup> Street/Metro Center Station to the existing Metro Gold Line tracks to the north and east of 1<sup>st</sup> and Alameda Streets. The alignment would extend underground from the 7<sup>th</sup> Street/Metro Center Station under Flower Street to 2<sup>nd</sup> Street. The tracks would then proceed east underneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street to Central Avenue. Tunnel construction would be constrained by existing buildings.

A new underground station would be located just southwest of the intersection of 2<sup>nd</sup> and Hope Streets. At this location, a new pedestrian bridge would possibly be constructed to connect the station to Upper Grand Avenue. The bridge would begin at street level near the station entrance and cross above the intersection and along Kosciuszko Way to reach Upper Grand Avenue.

The tracks would head east underneath 2<sup>nd</sup> Street to the next proposed station at Broadway. The proposed 2<sup>nd</sup> Street/Broadway station would be located under 2<sup>nd</sup> Street approximately between Broadway and Spring Street. From the new station, the tracks would continue east underneath 2<sup>nd</sup> Street to Central Avenue, where they would veer northeast to a new station, potentially located within the property currently occupied by Office Depot and other small commercial uses.

Crossovers would possibly be located just north of the proposed station at 5<sup>th</sup> and Flower Streets and just east of the proposed station at 2<sup>nd</sup> Street and Broadway.

At 2<sup>nd</sup> Street and Central Avenue, the tracks would continue underground heading northeast under 1<sup>st</sup> and Alameda Streets. A three-way junction would be constructed underground beneath the 1<sup>st</sup> and Alameda intersection. To the north and east of the junction, trains would

rise to the surface through two new portals to connect to the Metro Gold Line heading north to Azusa and east to I-605.

From the junction, one set of tracks would continue underground beneath the proposed Nikkei Center parcel (the parcel on the northeast corner of 1<sup>st</sup> and Alameda Streets), along the eastern side of the existing Little Tokyo/Arts District Station. These tracks would travel under Temple Street before surfacing through a portal in the LADWP yard and rising to connect to the existing Metro Gold Line LRT bridge over US 101.

The other set of tracks leaving the three-way junction would rise to the east within 1<sup>st</sup> Street through a new portal to join the existing at-grade Metro Gold Line tracks. This second portal would be located between Alameda and Vignes Streets. 1<sup>st</sup> Street would be widened to the north to accommodate the portal. Widening 1<sup>st</sup> Street would be initiated at Alameda and continue east, tapering down significantly as the alignment crosses Hewitt Street to join the existing 1<sup>st</sup> Street LRT tracks about one and half blocks west of the 1<sup>st</sup> Street Bridge. .

Additional property would need to be acquired in order to stage construction of both portals, connect to the Gold Line LRT Bridge, and construct the tunnels beneath 2<sup>nd</sup> Street and the Nikkei Center property. The Fully Underground Alternative – Little Tokyo Variation 1 would be located entirely underground from the 7<sup>th</sup> Street/Metro Center Station to east of the intersection of 1<sup>st</sup> and Alameda Streets. Figure 2-5 illustrates this alternative.

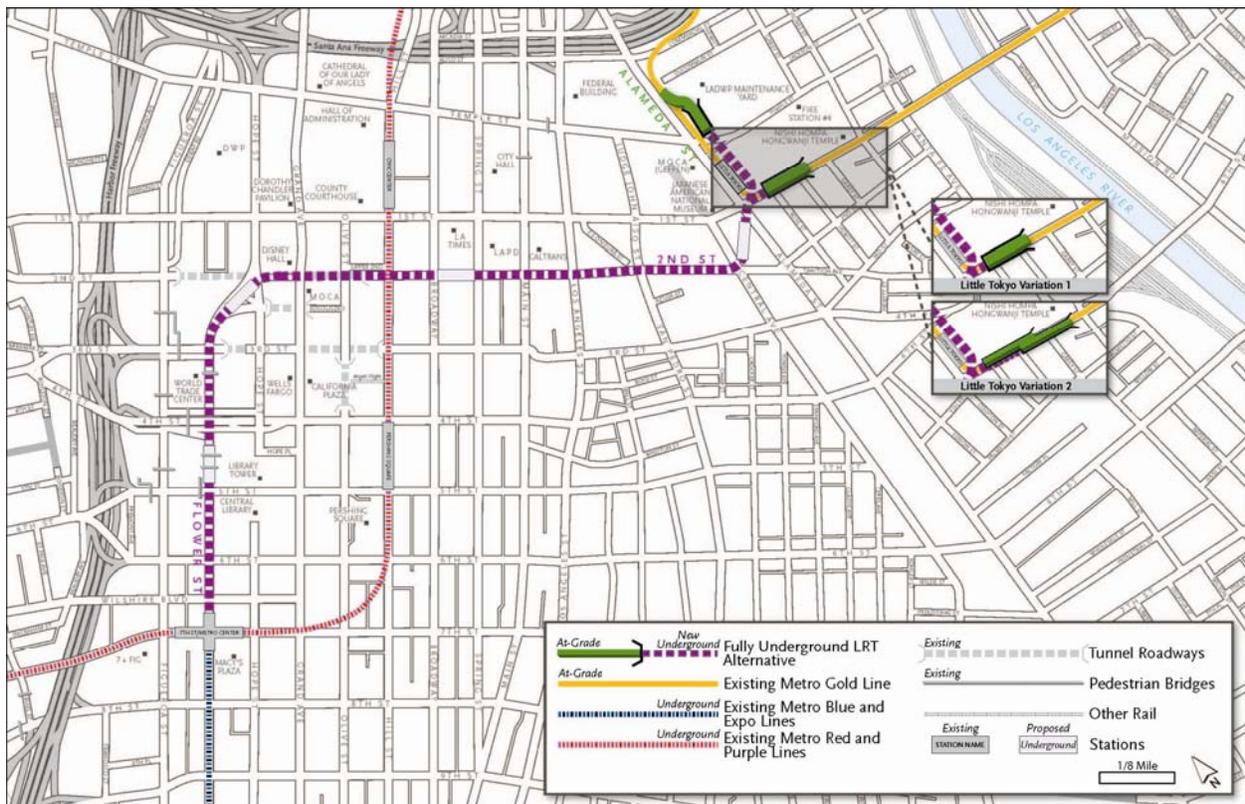
### 2.1.5.2 Route Configuration

Locations of new light rail right-of-way, stations, and crossovers proposed for Fully Underground LRT Alternative – Little Tokyo Variation 1 are identified in the following sections. It should be noted that this report analyzes maximum potential effects and impacts for each proposed project facility. Thus, ultimate effects and impacts may be smaller in magnitude than the impacts discussed herein.

#### New light rail right-of-way

- Underground double track beneath Flower Street from the existing platform at the 7<sup>th</sup> Street/Metro Center Station to 3<sup>rd</sup> Street
- Underground double track curving northeast from the intersection of 3<sup>rd</sup> and Flower Streets toward 2<sup>nd</sup> and Hope Streets
- Underground double track beneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street from Hope Street to Central Avenue, then to 1<sup>st</sup> and Alameda
- Underground three-way junction beneath the intersection of 1<sup>st</sup> and Alameda Streets

- Underground double track from the three-way junction to the portal located within a widened 1<sup>st</sup> Street between Vignes and Alameda Streets; then at-grade double track connecting to the existing Metro Gold Line Eastside Extension tracks toward I-605
- Underground double track from the three-way junction running north beneath the proposed Nikkei Center parcel and Temple Street, just east of the existing Little Tokyo/Arts District Station, to a new portal at the LADWP site; then at-grade double track rising from the portal on a new ramp structure to connect to the existing Metro Gold Line bridge over US 101



**Figure 2-5. Fully Underground LRT Alternatives – Little Tokyo Variation 1 and Little Tokyo Variation 2 Alignment and Configuration**

### New stations

- Flower/5<sup>th</sup>/4<sup>th</sup> Street Station: Underground station on Flower Street just north of 5<sup>th</sup> Street
- 2<sup>nd</sup>/Hope Street Station: Underground Station just southwest of the intersection of 2<sup>nd</sup> and Hope Streets

- 2<sup>nd</sup>/Broadway Station: Underground station on 2<sup>nd</sup> Street between Broadway and Spring Street
- 2<sup>nd</sup>/Central Avenue Station: Underground station just northeast of the intersection at 2<sup>nd</sup> and Central. This station may include a small building at ground level on the southwest corner of 1<sup>st</sup> and Alameda streets to house ventilation fans

### **New crossovers**

Underground crossover locations require cut-and-cover construction; tunnel boring machines cannot be used to construct underground crossovers. These construction methods are discussed in detail in the Description of Construction Technical Memorandum.

Locations are preliminary and crossovers may not be needed at both of these locations; and ultimately they may be placed in locations that are not adjacent to stations. The two locations for new crossovers include:

- Underground just north of the station at 5th and Flower Streets.
- Underground just east of the station on 2nd Street, between Broadway and Spring Street.

## **2.1.6 Fully Underground LRT Alternative – Little Tokyo Variation 2**

### **2.1.6.1 Overview**

The Fully Underground LRT Alternative - Little Tokyo Variation 2 would provide four new stations and a direct connection from 7<sup>th</sup> Street/Metro Center Station to the existing Metro Gold Line tracks to the north and east of 1<sup>st</sup> and Alameda Streets. The alignment would extend underground from the 7<sup>th</sup> Street/Metro Center Station under Flower Street to 2<sup>nd</sup> Street. The tracks would then proceed east underneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street to Central Avenue. Tunnel construction would be constrained by existing buildings.

A new underground station would be located just southwest of the intersection of 2<sup>nd</sup> and Hope Streets. At this location, a new pedestrian bridge would possibly be constructed to connect the station to Upper Grand Avenue. The bridge would begin at street level near the station entrance and cross above the intersection and along Kosciuszko Way to reach Upper Grand Avenue.

The tracks would head east underneath 2<sup>nd</sup> Street to the next proposed station at Broadway. The proposed 2<sup>nd</sup> Street/Broadway station would be located under 2<sup>nd</sup> Street approximately between Broadway and Spring Street. From the new station, the tracks would continue east underneath 2<sup>nd</sup> Street to Central Avenue, where they would veer northeast to a new station,

potentially located within the property currently occupied by Office Depot and other small commercial uses.

As the tunnels turn northeast from 2<sup>nd</sup> Street, the northbound tunnel would descend and the southbound tunnel would rise so that the southbound tunnel would be stacked on top of the northbound tunnel. A new proposed underground station near 2<sup>nd</sup> Street and Central Avenue would have two underground levels, each with a single-track platform. The northbound track with trains towards Azusa and I-605 would be on the lower level, and the southbound track with trains towards Long Beach and Santa Monica would be on the upper level.

The tracks would continue from the new station under the 1<sup>st</sup> and Alameda intersection into a new two-level underground junction. Separating from the junction, one track from the lower level (northbound) and one track from the upper level (southbound) would continue underground beneath the proposed Nikkei Center parcel (the parcel on the northeast corner of 1<sup>st</sup> and Alameda Streets), along the eastern side of the existing Little Tokyo/Arts District Station. These tracks would travel under Temple Street before surfacing in the LADWP yard and rising to connect to the Metro Gold Line LRT bridge over US 101. The portal would be connected to the 1<sup>st</sup> and Alameda junction by a new cut-and-cover tunnel crossing beneath Temple Street and the property proposed for the Nikkei Center (the parcel on the northeast corner of 1<sup>st</sup> and Alameda Streets). This would allow trains to continue along the Metro Gold Line.

A second track (westbound) leaving the upper level of the junction would rise to the east within 1<sup>st</sup> Street between Alameda and Hewitt Streets and link to the existing Metro Gold Line track. A second track (eastbound) leaving the lower level of the junction would rise to the east within 1<sup>st</sup> Street between Hewitt and Vignes Streets, adjacent to the westbound track, and link to the existing Metro Gold Line track.

Two portals, each containing one track, would rise to the east within the middle of a widened 1<sup>st</sup> Street to allow a connection to the Metro Gold Line towards I-605. The portal containing the westbound track would be located between Alameda and Garey Streets. The portal containing the eastbound track would be located adjacent to the westbound track between Hewitt and Vignes Streets.

1<sup>st</sup> Street would be widened to the north to accommodate the westbound portal. Widening 1<sup>st</sup> Street would be initiated at Alameda and continue east, tapering down significantly as it crosses Hewitt Street, where the new tracks would feed into the existing 1<sup>st</sup> Street LRT tracks, about half a block west of the 1<sup>st</sup> Street Bridge. 1<sup>st</sup> Street would also be widened to the south between Hewitt and Vignes Streets to accommodate the eastbound track portal. Widening this street would taper down as it approaches Vignes Street. No modification to the 1<sup>st</sup> Street Bridge would be necessary.

Additional property would need to be acquired to stage construction of both portals, connect to the Gold Line LRT Bridge, and construct the tunnels beneath 2<sup>nd</sup> Street and the Nikkei Center property. The Fully Underground Alternative – Little Tokyo Variation 2 would be located entirely underground from the 7<sup>th</sup> Street/Metro Center Station to east of the intersection of 1<sup>st</sup> and Alameda Streets. Figure 2-5 illustrates this alternative.

### 2.1.6.2 Route Configuration

Locations of new light rail right-of-way, stations, and crossovers proposed for Fully Underground LRT Alternative – Little Tokyo Variation 2 are identified in the following sections. It should be noted that this report analyzes maximum potential effects and impacts for each proposed project facility. Thus, ultimate effects and impacts may be smaller in magnitude than the impacts discussed herein.

#### New light rail right-of-way

- Underground double track beneath Flower Street from the existing platform at the 7<sup>th</sup> Street/Metro Center Station to 3<sup>rd</sup> Street
- Underground double track curving northeast from the intersection of 3<sup>rd</sup> and Flower Streets toward 2<sup>nd</sup> and Hope Streets
- Underground double track beneath the 2<sup>nd</sup> Street tunnel and 2<sup>nd</sup> Street from Hope Street to Central Avenue
- Two-level underground structure with a northbound single track on the lower level and a southbound single track on the upper level from 2<sup>nd</sup> Street and Central Avenue to 1<sup>st</sup> and Alameda Streets
- Underground two-level junction beneath the intersection of 1<sup>st</sup> and Alameda Streets
- Two-level underground structure leading from the two-level junction to two single-track portals located within the median of a widened 1<sup>st</sup> Street (eastbound portal between Hewitt and Vignes Streets, westbound portal between Alameda and Hewitt Streets); then at-grade double track connecting to the existing Metro Gold Line Eastside Extension tracks toward I-605
- Two-level underground structure leading from the two-level junction, running north beneath the proposed Nikkei Center parcel and Temple Street, just east of the existing Little Tokyo/Arts District Station, to a new portal in the LADWP site (tracks would begin to transition to side-by-side tunnels on a single level as they pass beneath the Nikkei parcel); then at-grade double track rising from the portal on a new ramp structure to connect to the existing Metro Gold Line bridge over the U.S.-101 freeway

**New stations:**

- Flower/5<sup>th</sup> /4<sup>th</sup> Street Station: Underground station on Flower Street just north of 5<sup>th</sup> Street
- 2<sup>nd</sup>/Hope Street Station: Underground Station just southwest of the intersection of 2<sup>nd</sup> and Hope Streets
- 2<sup>nd</sup>/Broadway Station: Underground station on 2<sup>nd</sup> Street between Broadway and Spring Street
- 2<sup>nd</sup>/Central Avenue Station: Underground two-level station just northeast of the intersection at 2<sup>nd</sup> and Central. Each level would have a single-track platform. Northbound trains to Azusa and Eastbound trains to I-605 would use the lower level. Southbound trains to Long Beach and westbound trains to Santa Monica would use the upper level. This station may include a small building at ground level on the southwest corner of 1<sup>st</sup> and Alameda Streets to house ventilation fans.

**New Crossovers**

Underground crossover locations require cut-and-cover construction; tunnel boring machines (TBMs) cannot be used to construct underground crossovers. These construction methods are discussed in detail in the Description of Construction technical memorandum.

Both locations are preliminary and crossovers may not be placed at either one. The two locations for new crossovers include:

- Underground just north of the station at 5<sup>th</sup> and Flower Streets
- Underground just east of the station on 2<sup>nd</sup> Street, between Broadway and Spring Street



## 3.0 METHODOLOGY FOR IMPACT EVALUATION

Paleontological resource sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. Due to the nature of the fossil record, paleontologists cannot know either the quality or quantity of fossils present in a given geologic unit prior to natural erosion or human-caused exposure. No field surveys were conducted for the proposed project; therefore, it is necessary to assess the sensitivity of rock units based on their known potential to produce scientifically significant fossils elsewhere within the same geologic unit (both within and outside of the project area) or a unit representative of the same depositional environment.

### 3.1 Regulatory Framework

Fossils are classified as nonrenewable scientific resources and are protected by various laws, ordinances, regulations, and standards across the country. The Society of Vertebrate Paleontology (SVP) (1995) has established professional standards for assessment and mitigation of adverse impacts to paleontological resources. This paleontological assessment was conducted in accordance with the regulations and standards that are applicable to paleontological resources within the project area. These regulations and standards are summarized in the following sections.

#### 3.1.1 Federal

Federal protection for scientifically significant paleontological resources applies to projects if any construction or other related project impacts occur on federally owned or managed lands, involve the crossing of state lines, or are federally funded. The following federal protections may apply to paleontological resources within the project area:

- American Antiquities Act of 1906 (6 United States Code [USC] 431 433). Establishes a penalty for disturbing or excavating any historic or prehistoric ruin or monument or object of antiquity on federal lands as a maximum fine of \$500 or 90 days in jail.
- The National Environmental Policy Act of 1969, as amended (Public Law [PL] 91 190, 42 USC 4321 4347, January 1, 1970, as amended by PL 94 52, July 3, 1975, PL 94 83, August 9, 1975, and PL 97 258 Section 4(b), Sept. 13, 1982). Recognizes the continuing responsibility of the federal government to “preserve important historic, cultural, and natural aspects of our national heritage.” (Section 101 [42 USC Section 4321]) (No. 382).
- National Historic Preservation Act of 1966 (PL 89 665; 80 Stat. 915, 16 USC 470 et seq.). Provides for the survey, recovery, and preservation of significant paleontological

data when such data may be destroyed or lost due to a federal, federally licensed, or federally funded project.

- Federal Land Management and Policy Act of 1976 (43 USC 1712[c], 1732[b]); Section 2, Federal Land Management and Policy Act of 1962 [30 USC 611]; Subpart 3631.0 et seq.), Federal Register Vol. 47, No. 159, 1982. Defines significant fossils as: unique, rare, or particularly well preserved; an unusual assemblage of common fossils; being of high scientific interest; or providing important new data concerning (1) evolutionary trends, (2) development of biological communities, (3) interaction between or among organisms, (4) unusual or spectacular circumstances in the history of life, or (5) anatomical structure.
- Paleontological Resources Preservation Act (PRPA). Enacted as a result of the passage of the Omnibus Public Lands Management Act (OPLA) of 2009, PL 111-011. PL 111-011, Title VI, *Subtitle D. Paleontological Resources Preservation* (OPLA-PRA). The PRPA sets forth regulations and provisions pertaining to paleontological resources on all federally administered lands.

### 3.1.2 State

- California Environmental Quality Act. Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations: 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section XIV, Part a) including the following: “Will the proposed project directly or indirectly destroy a significant paleontological resource or unique geologic feature?”
- Public Resources Code (Chapter 1.7), Sections 5097.5 and 30244. These statutes prohibit removal of any paleontological site or feature on public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts to paleontological resources from developments on public (state) lands.

### 3.1.3 Local

The Conservation Element of the City of Los Angeles General Plan (adopted September 2001) specifically addresses paleontological resources in Section 3 of Chapter 2. The Plan’s paleontological objective is to “protect the city’s archaeological and paleontological resources for historical, cultural, research and/or educational purposes.” Moreover, its policy is to “continue to identify and protect significant archaeological and paleontological sites and/or

resources known to exist or that are identified during land development, demolition or property modification activities.”

### 3.1.4 Professional Standards

The SVP has established standard guidelines (SVP 1995) that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP’s assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. State regulatory agencies with paleontological regulations and standards typically accept and use the professional standards set forth by the SVP.

As defined by the SVP (1995:26), significant nonrenewable paleontological resources are defined as:

Fossils and fossiliferous deposits here restricted to vertebrate fossils and their taphonomic and associated environmental indicators. This definition excludes invertebrate or paleobotanical fossils except when present within a given vertebrate assemblage. Certain invertebrate and plant fossils may be defined as significant by a project paleontologist, local paleontologist, specialists, or special interest groups, or by lead agencies or local governments.

As defined by the SVP (1995:26), significant fossiliferous deposits are defined as:

A rock unit or formation which contains significant nonrenewable paleontologic resources, here defined as comprising one or more identifiable vertebrate fossils, large or small, and any associated invertebrate and plant fossils, traces and other data that provide taphonomic, taxonomic, phylogenetic, ecologic, and stratigraphic information (ichnites and trace fossils generated by vertebrate animals, e.g., trackways, or nests and middens, which provide datable material and climatic information). Paleontologic resources are considered to be older than recorded history and/or older than 5,000 years, BP [before present].

Based on the significance definitions of the SVP (1995), all identifiable vertebrate fossils are considered to have significant scientific value. This position is adhered to because vertebrate fossils are relatively uncommon, and only rarely will a fossil locality yield a statistically significant number of specimens of the same genus. Therefore, every vertebrate fossil found has the potential to provide significant new information on the taxon it represents, its paleoenvironment, and/or its distribution. Furthermore, all geologic units in which vertebrate

fossils have previously been found are considered to have high sensitivity. Identifiable plant and invertebrate fossils are considered significant if found in association with vertebrate fossils or if defined as significant by project paleontologists, specialists, or local government agencies.

A geologic unit known to contain significant fossils is considered to be “sensitive” to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from that for archaeological resources as follows:

It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontologic sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontologic potential in each case. [SVP, 1995]

Many archaeological sites contain features that are visually detectable on the surface. In contrast, fossils are contained within surficial sediments or bedrock and are therefore not observable or detectable unless exposed by erosion or human activity. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken to prevent adverse impacts to these resources.

### 3.2 Paleontological Sensitivity

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit.

Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its “Standard Guidelines for the Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources,” the SVP (1995:23) defines three categories of paleontological sensitivity (potential) for sedimentary rock units:

- **High Potential.** Rock units from which vertebrate or significant invertebrate fossils or suites of plant fossils have been recovered and are considered to have a high potential for containing significant nonrenewable fossiliferous resources. These units include, but are not limited to, sedimentary formations and some volcanic formations that

contain significant nonrenewable paleontologic resources anywhere within their geographical extent and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical; and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas that contain potentially datable organic remains older than Recent, including deposits associated with nests or middens, and areas that may contain new vertebrate deposits, traces, or trackways are also classified as significant.

- **Low Potential.** Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potentials for yielding significant fossils. Such units will be poorly represented by specimens in institutional collections.
- **Undetermined Potential.** Specific areas underlain by sedimentary rock units for which little information is available are considered to have undetermined fossiliferous potentials.

It should be noted that highly metamorphosed rocks and granitic rock units do not generally yield fossils and therefore have low potential to yield significant nonrenewable fossiliferous resources.

In general terms, for geologic units with high potential, full-time monitoring typically is recommended during any project-related ground disturbance. For geologic units with low potential, protection or salvage efforts typically are not required. For geologic units with undetermined potential, field surveys by a qualified paleontologist are usually recommended to specifically determine the paleontologic potential of the rock units present within the study area.



## 4.0 AFFECTED ENVIRONMENT

The project is located within the City of Los Angeles in Los Angeles County, California. Specifically, the Direct Area of Potential Effects (APE) extends in a northeasterly direction from the intersection of Flower and 7<sup>th</sup> Streets to the Gold Line Extension project at Alameda Street between 1<sup>st</sup> and Temple Streets within downtown Los Angeles (Figure 4-1). The project crosses several communities of downtown Los Angeles, including the Bunker Hill, Civic Center, and Little Tokyo communities.

This area is highly urbanized with commercial and public use development. Most of the native vegetation has been removed and replaced by non-native trees and grasses. Elevations range from 250 to 270 feet (76 to 82 meters) above mean sea level. The nearest natural water source includes the now-channelized course of the Los Angeles River, located approximately 0.72 mile (1.1 km) east of the project area.

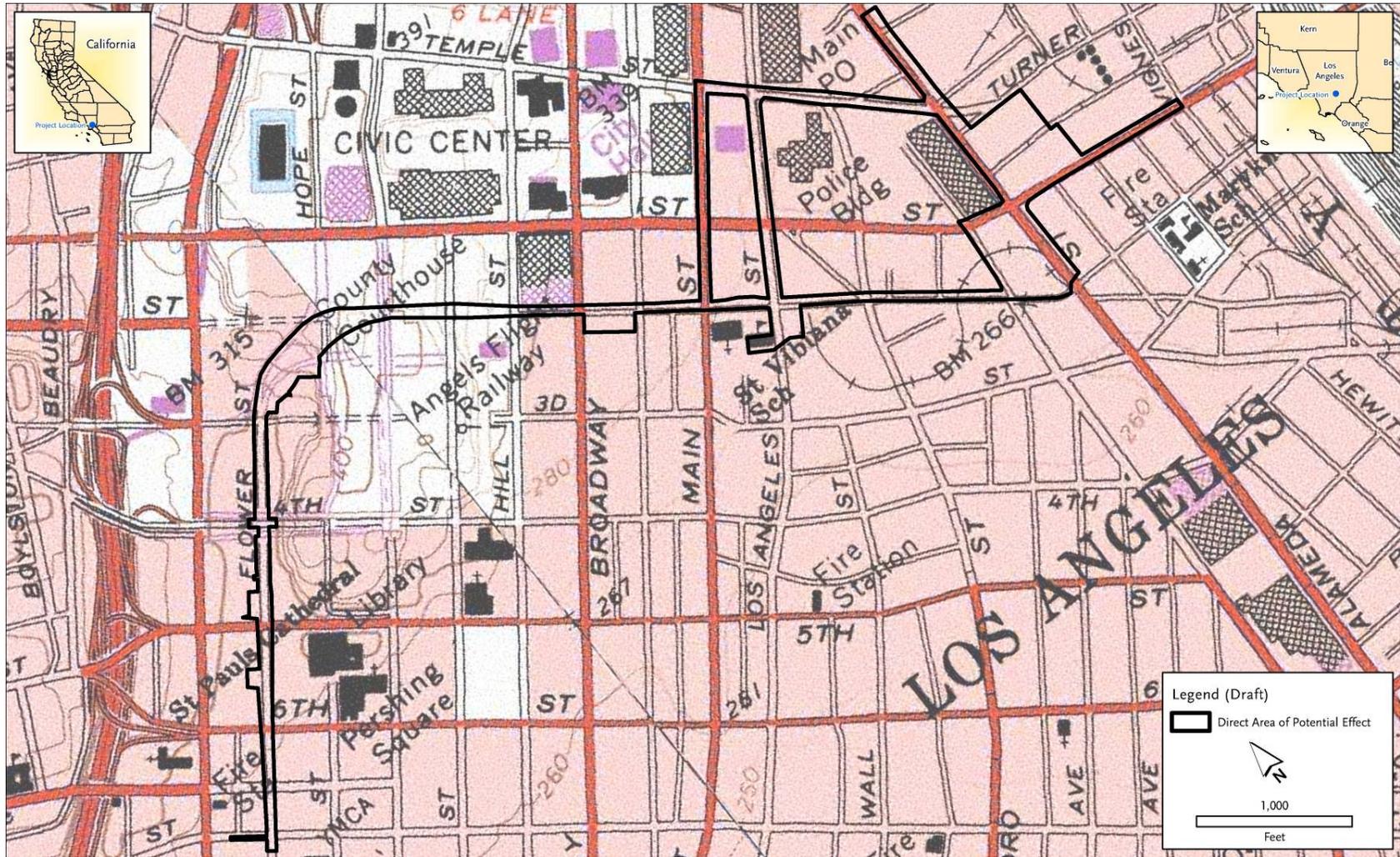
### 4.1 Resource Assessment Guidelines

For this project, a paleontological collections records search was conducted by the Vertebrate Paleontology Section of the Natural History Museum of Los Angeles County. A detailed review of museum collections records was performed to identify any known vertebrate fossil localities within at least 1 mile of the proposed project and to identify the geologic units within the project area and vicinity. In addition, the following published geologic maps were consulted:

- Preliminary geologic map of the Hollywood 7.5-minute quadrangle, southern California: a digital database: U.S. Geological Survey, Open-File Report OF-97-431, scale 1:24,000 (Yerkes and Graham 1997)
- Preliminary geologic map of the Los Angeles 7.5-minute quadrangle, southern California: a digital database: U.S. Geological Survey, Open-File Report OF-97-432, scale 1:24,000 (Yerkes and Graham 1997)

### 4.2 Geologic Setting

The project area is situated in the southwestern block of the Los Angeles basin. The Los Angeles basin is one of many basins making up the Neogene continental borderland of southern California. It extends from the Santa Ana Mountains in the north to the San Joaquin Hills to the south, and includes the southern foothills of the San Gabriel Mountains, the Puente Hills, and the Palos Verdes Hills. The southwestern block is mostly submerged by the Pacific Ocean, but is exposed in the low plain extending from Santa Monica southeast to Long Beach (Yerkes et al. 1965).



Source: USGS

**Figure 4-1. Project Area of Potential Effect**

The Los Angeles basin is a structural depression that has been the site of discontinuous deposition since the Late Cretaceous and of continuous subsidence and primarily marine deposition since the middle Miocene. This and other sedimentary basins formed during the Miocene and Pliocene as a result of an early San Andreas-type phase of transform motion along the western margin of North America.

At least three cycles of shallow marine transgression and regression created embayments and floodplains along the ancient coastline. During much of the middle Miocene, a northwest-trending marine embayment covered the site of the Los Angeles basin. Rivers that drained the highlands to the north and east transported and deposited huge volumes of coarse-grained sandstone and sandy cobble-boulder conglomerate into the embayment (Yerkes, et al. 1965).

Deposition continued until the end of the Pliocene, at which time the Palos Verdes Hills were an island, and large parts of the Santa Monica Mountains, the Puente Hills, the Santa Ana Mountains, and much of the southwest portions of the basin were exposed. In the early Pleistocene, the Palos Verdes Hills and southwestern areas again subsided and marine deposition resumed (Yerkes, et al. 1965).

### 4.3 Site-specific Geology

According to geologic mapping and museum collections records, the proposed project is immediately underlain by the following geologic units, from oldest to youngest: (1) Miocene Puente Formation, (2) Pliocene Fernando Formation, (3) Quaternary terrace deposits, and (4) Quaternary alluvium. These geologic units and their paleontological resource sensitivity are discussed in the following sections and depicted on Figure 4-2 and Figure 4-3 (respectively).

#### 4.3.1 Puente Formation

The Puente Formation is middle to late Miocene (14 to 5 million years ago [mya]) in age, and was named in 1907 for its exposures in the Puente Hills (Yerkes 1972). The Puente Formation is isochronous (deposited at the same time) with the Monterey and Modelo Formations but consists of more terrigenous sediments because of the basin's proximity to the continental borderlands. Critelli (1995) suggests that an intrabasinal bathymetric ridge probably separated these formations.

The Puente Formation was deposited during an accumulation of sedimentary strata between 14 and 10 mya (Bjorklund 2002). Around 7 mya, north-south contractions formed the Whittier fault and the Puente Hills anticline. Today, the half-dome shape is reflected in the distribution of four members of the Puente Formation (Yerkes 1972). The oldest member, the La Vida Member, outcrops just north of the Whittier fault zone and forms the core of the half dome. In decreasing age, the Soquel, Yorba, and Sycamore Canyon Members outline this core in concentric half circles. According to Dibblee (1989), the Yorba Member underlies the

project area in the vicinity of the intersection of Flower and 3<sup>rd</sup> Streets and Hope and 2<sup>nd</sup> Streets (Figure 4-2).

The Yorba Member of the Puente Formation is as much as 2,950 feet thick and is generally made up of thin-bedded diatomaceous siltstone and mudstone as well as interbedded sandstone (Critelli et al. 1995; Yerkes 1972). Within the study area, the Yorba Member is described as a gray to light-brown silty clayey shale with interbedded fine to coarse-grained sandstone and lenses of diatomaceous shale (Dibblee 1989; Yerkes and Graham 1997b). This deep basin deposit is well known for its abundant and diverse assemblage of fossil fish (Eisentraut and Cooper 2002).

The Puente Formation is known to produce significant paleontological resources, including fossilized remains of sharks, fish, and marine and terrestrial mammals, as well as some of the most complete collections of marine algae and terrestrial flora. It has been assigned a high paleontological resource sensitivity (Eisentraut and Cooper 2002; McLeod 2008) for its proven potential to yield scientifically significant fossil resources.

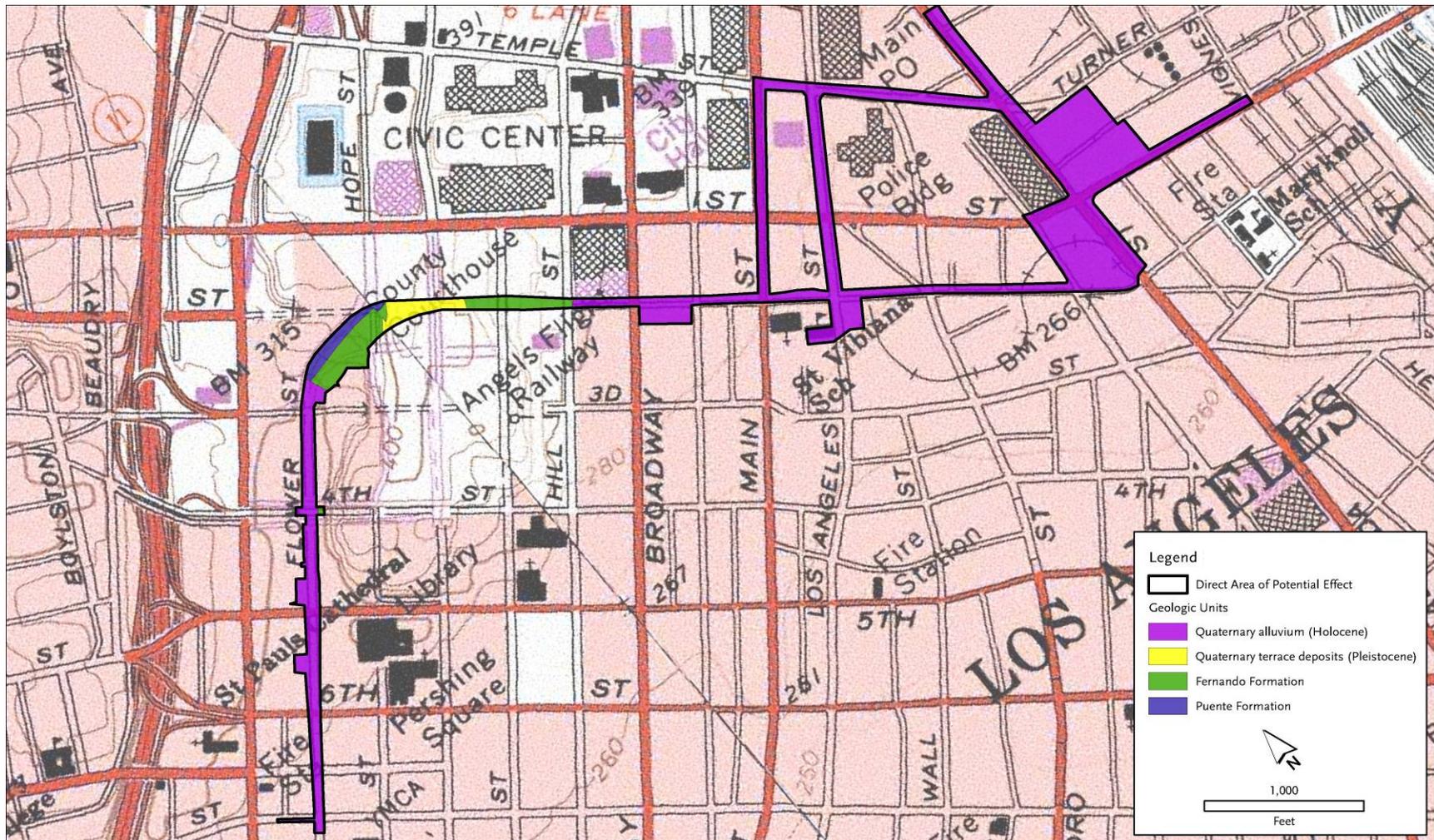
#### **4.3.2 Fernando Formation**

The Pliocene (5 to 1.8 mya) age Fernando Formation is present in the eastern Puente Hills and much of the northeastern Los Angeles basin. The formation has been divided into two members, the Pico and the Repetto Members, which are separated by an erosional unconformity.

The Repetto Member (lower member) generally consists of a light grayish-brown to olive-brown siltstone, massive to poorly bedded, and micaceous. Several thin lenticular pebble conglomerate beds are interbedded with the fine-grained strata and form prominent outcrops. The presence of this coarse-grained material within generally fine-grained strata suggests these coarse marginal basin deposits were carried to the deeper basin center by turbidity currents.

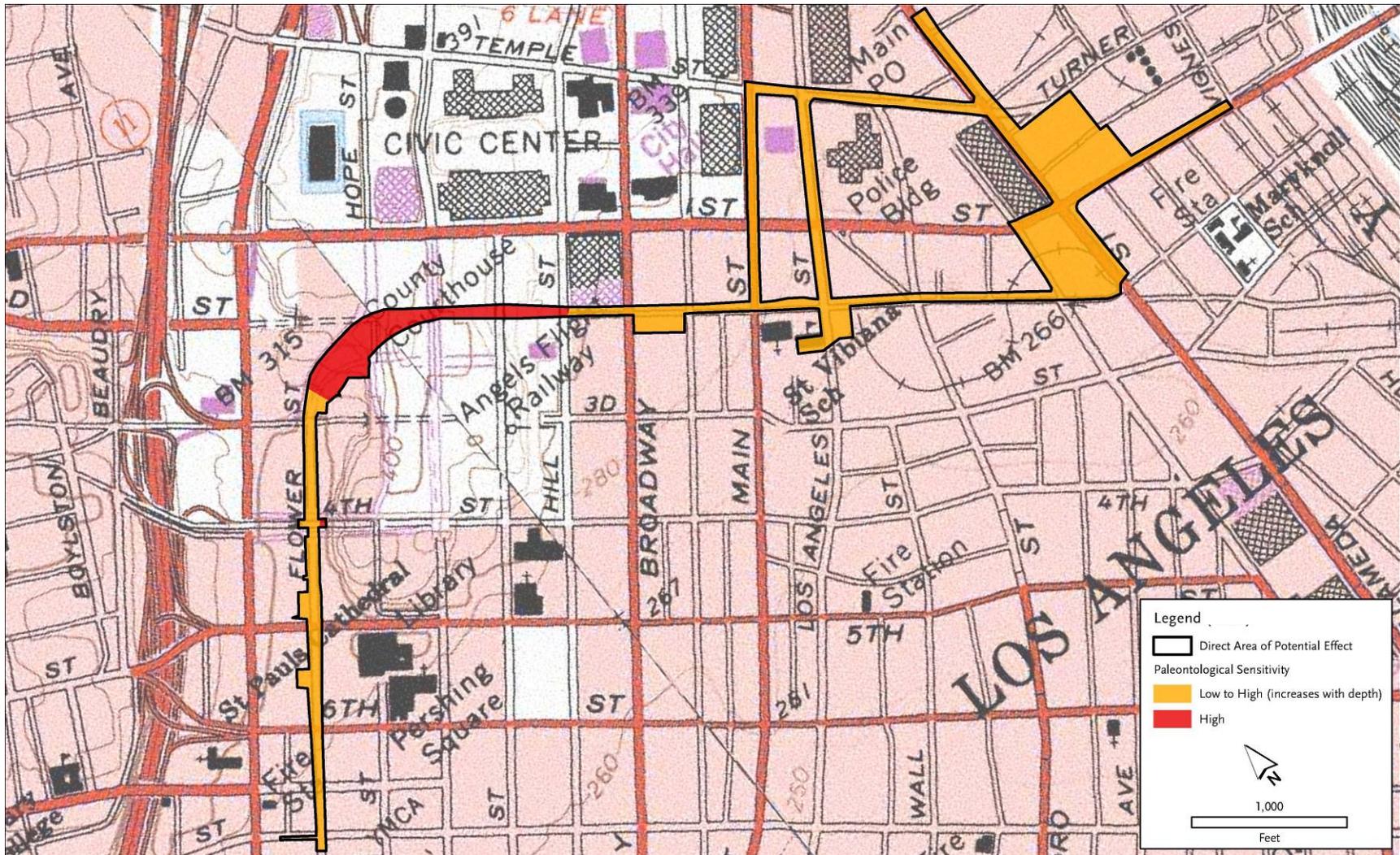
Within the project area, the Repetto Member is described as gray to greenish-gray, partly sandy, and vaguely bedded to massive marine claystone and siltstone (Dibblee 1989, 1991; Yerkes and Graham 1997). It outcrops within the project area in the vicinity of the intersection of Flower and 3<sup>rd</sup> Streets and Hope and 2<sup>nd</sup> Streets and, according to museum records, is present immediately beneath Quaternary alluvium along Flower Street (Figure 4-2).

In addition to numerous invertebrate fossils collected from the Fernando Formation, some marine vertebrate material has also been documented, including fossilized specimens of great white shark, dolphin, herring, hake, lanternfish, mackerel, swordfish, flounder, and whale (McLeod 2005). The presence of these fossils within this geologic unit, as well as its proven potential to yield vertebrate remains in the vicinity of the study area, has resulted in the designation of the Fernando Formation as having a high paleontological sensitivity.



Source: USGS

Figure 4-2. Geologic Map



Source: USGS

Figure 4-3. Paleontological Sensitivity Map

### 4.3.3 Quaternary Terrace Deposits

Older alluvium consists of stream channel or floodplain deposits of Pleistocene (1.8 mya to 10,000 years BP) or early Holocene (10,000 years BP to Recent) age that are no longer part of an active stream channel or its flood banks. Older alluvium in coastal southern California is usually found capping slopes and in areas of higher elevations along ridges and slopes, commonly above modern streambeds in a terrace sequence. These terrace deposits are formed by down-cutting of active stream channels and subsequent abandonment of the old channel/floodplain, resulting in a stair-step sequence of older terraces located above modern stream channels. Older alluvium generally consists of clayey sands and silts, with local concentrations of pebble to cobble conglomerate. Within the project area, Quaternary terrace deposits outcrop in the vicinity of Grand Avenue and 2<sup>nd</sup> Street (Figure 4-2).

Throughout southern California, older non-marine alluvium and terrace deposits have produced Pleistocene-age fossils from numerous localities. Sixty Pleistocene localities, exclusive of Rancho La Brea, were reviewed by Miller (1971), and many localities have been discovered since then.

Pleistocene taxa from alluvial and terrace deposits include amphibians (toad, frog, newt), reptiles (pond turtle, desert tortoise, fence lizard, alligator lizard, rattlesnake, gopher snake), birds (duck, hawk, burrowing owl, quail, coot, sparrow), and mammals (shrew, ground sloth, jack rabbit, cottontail rabbit, ground squirrel, pocket gopher, pocket mouse, kangaroo rat, deer mouse, mouse, wood rat, vole, muskrat, coyote, dire wolf, weasel, sabertooth cat, mammoth, mastodon, horse, camel, antelope, deer, bison) (Miller 1971). Older alluvium (sediments not part of an active stream channel) can provide important paleoecological data even if it does not contain the remains of extinct organisms. Older alluvium (non-marine terrace deposits) has been assigned a high paleontological resource sensitivity.

### 4.3.4 Quaternary Alluvium

Quaternary alluvium of Holocene age underlies the majority of the project area, from 7<sup>th</sup> and Flower Streets north to approximately 3<sup>rd</sup> and Flower Streets and from the intersection of Hill and 2<sup>nd</sup> Streets eastward (Figure 4-2). This unit consists of unconsolidated floodplain deposits of clay, silt, sand, and gravel (Dibblee 1989, 1991) that may overlie “older alluvium” of Pleistocene age at depths as shallow as 3 meters (Yerkes and Graham 1997b). Older alluvial sediments may be slightly to moderately consolidated, but are generally only distinguishable through relative dating and stratigraphic position. The Holocene-age alluvial deposits present in the western portion of the project area are estimated to be 1,000 to 10,000 years BP, and the alluvial deposits to the east are less than 1,000 years BP (Yerkes and Graham 1997b).

Holocene-age deposits contain the remains of modern organisms and are generally too young to contain fossils. Fossil localities in older Quaternary alluvium deposits throughout southern

California have yielded terrestrial vertebrates such as mammoths, mastodons, ground sloths, dire wolves, short-faced bears, saber-toothed cats, horses, camels, and bison. Fossilized invertebrates and plant remains have also been collected from this unit. Younger alluvium is determined to have a low potential for paleontological resources, but is often underlain by older alluvium, which is determined to have a high potential for paleontological resources.

#### 4.4 Museum Records Search Results

Museum collections records maintained by the Natural History Museum of Los Angeles County (LACM) were searched, and 12 previously recorded vertebrate fossil localities were discovered either along the proposed project area or within a 2-mile radius (Table 4-1). These significant vertebrate fossil localities were discovered within the same geologic units that are present within the proposed project area (Table 4-1). These localities yielded fossil specimens of mastodon, mammoth, shark, ray, and fish from Quaternary older alluvium, the Fernando Formation, and the Puente Formation. The depth at which these localities were discovered ranges from 5 to 60 feet below the surface (McLeod 2008).

**Table 4-1. Previously Discovered Paleontological Resources  
In and Around the Direct APE**

LACM Locality Number(s) and Approximate Location	Geologic Formation	Age	Taxa
LACM 5845; Western Avenue and Beverly Boulevard	Quaternary alluvium	Pleistocene	<i>Mammutidae</i> (fossil mastodon)
LACM 3250; east of Vermont Avenue near Madison Avenue and Middlebury Street	Quaternary alluvium	Pleistocene	<i>Mammuthus</i> (fossil mammoth)
LACM 6971; 6 <sup>th</sup> and Flower Streets; LACM 4726; 4 <sup>th</sup> and Hill Streets	Fernando	Pliocene	<i>Myliobatis</i> (eagle ray), <i>Carcharodon carcharias</i> (white shark), <i>Isurus oxyrinchus</i> (bonito shark), <i>Carcharhinus</i> (requiem shark), <i>Semicossyphus</i> (sheepshead)
LACM 3868; Wilshire Boulevard and Lucas Avenue	Fernando Formation	Pliocene	<i>Carcharodon sulcidens</i> (white shark)

**Table 4-1. Previously Discovered Paleontological Resources  
In and Around the Direct APE**

<b>LACM Locality Number(s) and Approximate Location</b>	<b>Geologic Formation</b>	<b>Age</b>	<b>Taxa</b>
LACM 5961; 1 <sup>st</sup> and Hill Streets	Puente Formation	Late Miocene	<i>Cyclothone</i> (bristlemouth fish)
LACM 6198- 6203; Wilshire Boulevard from intersection of Alvarado Street west to past Vermont Avenue	Puente Formation	Late Miocene	<i>Osteichthyes</i> (bony fish), <i>Cetacea</i> (whale)



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## 5.0 IMPACTS

Surface fossils may be located, evaluated, and salvaged by paleontologists during a field survey prior to a surface-disturbing action. The project area surface is largely obscured by urbanization and a field survey was not warranted. However, subsurface fossils that are not visible cannot be located and evaluated prior to ground disturbance.

Any estimates of adverse impacts to subsurface fossils can be predicted only by determining the number and types of fossils that occur in the study area, based on projections derived from similar areas. The existence of subsurface fossils can be definitively determined only by monitoring excavations during surface-disturbing actions.

Direct adverse impacts on surface or subsurface paleontological resources are the result of destruction by breakage and crushing, typically in construction-related excavations. In areas containing paleontologically sensitive geologic units, surface disturbance has the potential to adversely impact an unknown quantity of surface and subsurface fossils. Without mitigation, these fossils, as well as the paleontological data they could provide if properly salvaged and documented, could be adversely impacted (destroyed), rendering them permanently unavailable.

Direct adverse impacts can typically be mitigated to below a level of significance by implementing paleontological mitigation. Mitigation also creates a beneficial effect because it results in the salvage of fossils that may never have been unearthed via natural processes. With mitigation, these newly salvaged fossils become available for scientific research, education, display, and preservation into perpetuity at a public museum.

Indirect adverse impacts typically include those effects that result from continued implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of constructing new access roads in areas that were previously less accessible. This increases public access and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. No indirect impacts are expected as the result of this project because the area of potential effect is highly urbanized.

Cumulative impacts on the environment can result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions on the cumulative effects area. They can result from individually minor, but collectively significant, actions taken over a period of time.

The incremental loss of paleontological resources over a period of time as a result of project-related ground disturbance has the potential to result in significant cumulative effects because it could result in destruction of nonrenewable paleontological resources and

irretrievable loss of scientific information. However, when paleontological monitoring and mitigation is implemented prior to and during project construction, fossils are protected and information is obtained. By implementing monitoring and mitigation where feasible, the cumulative effects to paleontological resources resulting from the project would be negligible. Further, any scientifically significant fossils discovered prior to or during ground disturbances related to the proposed project would benefit the scientific community by increasing knowledge associated with the fossils.

## **5.1 No Build Alternative**

### **5.1.1 Construction Impacts**

The No Build Alternative, in which the project area would remain in its existing condition, would not result in construction impacts to paleontological resources because no ground disturbance would occur.

### **5.1.2 Operational Impacts**

The No Build Alternative would not result in operational impacts to paleontological resources.

### **5.1.3 Cumulative and Indirect Impacts**

The No Build Alternative would not result in impacts to paleontological resources. Therefore, the No Build Alternative would not contribute to a cumulative impact on these resources.

## **5.2 Transportation System Management (TSM) Alternative**

### **5.2.1 Construction Impacts**

The TSM Alternative may have the potential to adversely affect paleontological resources within the project area during ground disturbance related to construction of bus stop facilities. These facilities will be constructed every two to three blocks, but their precise locations have not yet been established. Should the facilities be constructed in areas of high sensitivity (See Figure 4-3), any excavations at the surface or at depth will have the potential to impact paleontological resources. Should the facilities be constructed in areas of sensitivity ranging from low to high (See Figure 4-3), any excavations occurring to a depth of 5 feet or greater below the ground surface will have the potential to impact paleontological resources. Implementation of the proper mitigation measures (Section 6.1) would reduce potential adverse impacts to a less than significant level.

### **5.2.2 Operational Impacts**

The TSM Alternative would not result in operational impacts to paleontological resources.

### **5.2.3 Cumulative and Indirect Impacts**

Construction of the TSM Alternative has the potential to directly affect paleontological resources within the project area should excavations related to the construction of new bus stations occur in paleontologically sensitive geologic units. Implementing the proper mitigation measures (Section 6.1) would reduce potential adverse impacts to a less than significant level. Therefore, the TSM Alternative would not contribute to a cumulative impact on these resources.

## **5.3 At-Grade Emphasis LRT Alternative**

### **5.3.1 Construction Impacts**

The At-Grade Emphasis LRT Alternative has the potential to adversely impact paleontological resources at the surface and at depth within the project area as a result of ground disturbance related to construction of new underground tunnel segments between 7<sup>th</sup> and Hope Streets and at new proposed stations at Flower/6<sup>th</sup>/5<sup>th</sup> Street, 2<sup>nd</sup>/Hope Street, Main/1<sup>st</sup> Street, and Los Angeles/1<sup>st</sup> Street. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or greater below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level.

### **5.3.2 Operational Impacts**

The At-Grade Emphasis LRT Alternative would not result in operational impacts to paleontological resources.

### **5.3.3 Cumulative and Indirect Impacts**

The At-Grade Emphasis LRT Alternative has the potential to adversely impact paleontological resources within the project area as a result of ground disturbance related to constructing new underground TBM segments on Flower Street between 7<sup>th</sup> and Hope Streets and at new stations at Flower/6<sup>th</sup>/5<sup>th</sup> Street, 2<sup>nd</sup>/Hope Street, Main/1<sup>st</sup> Street, Los Angeles/1<sup>st</sup> Street. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level thus reducing any cumulative impact on paleontological resources.

## **5.4 Underground Emphasis LRT Alternative**

### **5.4.1 Construction Impacts**

The Underground Emphasis LRT Alternative involves ground disturbance and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations related to construction of a new underground

tunnel along most of the alignment; new underground stations at Flower/5<sup>th</sup>/4<sup>th</sup> Street, 2<sup>nd</sup>/Hope Street, 2<sup>nd</sup> Street station (either at Broadway or at Los Angeles Street); an automobile underpass on Alameda Street between 2<sup>nd</sup> Street and Temple Street; and a proposed pedestrian bridge at the intersection of Alameda and 1<sup>st</sup> Streets. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or more below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level. In areas where new underground TBM segments would be constructed, mitigation for paleontological resources will not be feasible and are thus unavoidable.

### 5.4.2 Operational Impacts

The Underground Emphasis LRT Alternative would not result in operational impacts to paleontological resources.

### 5.4.3 Cumulative and Indirect Impacts

The Underground Emphasis LRT Alternative involves ground disturbance, and therefore has the potential to adversely affect paleontological resources within the project area. This disturbance would result from excavations to construct a new underground tunnel along the alternative's alignment, three new underground stations, an automobile underpass, and a pedestrian bridge. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level thus reducing any cumulative impact on paleontological resources. In areas where proper mitigation measures cannot be implemented, such as in areas where new underground TBM segments would be constructed, cumulative impacts may not be avoidable as a result of the Underground Emphasis LRT Alternative.

## 5.5 Fully Underground LRT Alternative - Little Tokyo Variation 1

### 5.5.1 Construction Impacts

The Fully Underground LRT Alternative - Little Tokyo Variation 1 involves ground disturbance, and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations to construct four new stations and an entirely underground tunnel located from the 7<sup>th</sup> Street/Metro Center Station to east of the intersection of 1<sup>st</sup> and Alameda Streets. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or more below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level. In areas where

new underground TBM segments would be constructed, mitigation for paleontological resources will not be feasible and are thus unavoidable.

### **5.5.2 Operational Impacts**

The Fully Underground LRT Alternative - Little Tokyo Variation 1 would not result in operational impacts to paleontological resources.

### **5.5.3 Cumulative and Indirect Impacts**

The Fully Underground LRT Alternative - Little Tokyo Variation 1 involves ground disturbance, and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations to construct four new stations and an entirely underground tunnel. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level thus reducing any cumulative impact on paleontological resources. In areas where proper mitigation measures cannot be implemented, such as in areas where new underground TBM segments would be constructed, cumulative impacts may not be avoidable as a result of the Fully Underground LRT Alternative- Little Tokyo Variation 1.

## **5.6 Fully Underground LRT Alternative - Little Tokyo Variation 2**

### **5.6.1 Construction Impacts**

The Fully Underground LRT Alternative - Little Tokyo Variation 2 involves ground disturbance, and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations to construct four new stations, a two-level junction beneath the 1<sup>st</sup> and Alameda intersection, and an entirely underground tunnel located from east of the 7<sup>th</sup> Street/Metro Center Station to the intersection of 1<sup>st</sup> and Alameda Streets. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or greater below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level. In areas where the new underground tunnel will be constructed, mitigation for paleontological resources will not be feasible and are thus unavoidable.

### **5.6.2 Operational Impacts**

The Fully Underground LRT Alternative - Little Tokyo Variation 2 would not result in operational impacts to paleontological resources.

### 5.6.3 Cumulative and Indirect Impacts

The Fully Underground LRT Alternative - Little Tokyo Variation 2 involves ground disturbance and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations to construct new stations, tunnel, and a two-level junction. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level thus reducing any cumulative impact on paleontological resources. In areas where proper mitigation measures cannot be implemented, such as in areas where new underground TBM segments would be constructed, cumulative impacts may not be avoidable as a result of the Fully Underground LRT Alternative- Little Tokyo Variation 2.

## 6.0 POTENTIAL MITIGATION MEASURES

### 6.1 Construction Impact Mitigation Measures

The following mitigation measures have been developed in accordance with the SVP (1995) standards and guidelines and meet the paleontological requirements of CEQA. These mitigation measures have been used throughout California and have been demonstrated to be successful in protecting paleontological resources while allowing timely completion of construction.

- MM-P-1. A qualified paleontologist would produce a Paleontological Monitoring and Mitigation Plan for the proposed project and supervise monitoring of construction excavations. Paleontological resource monitoring would include inspection of exposed rock units during active excavations within sensitive geologic sediments. The monitor would have authority to temporarily divert grading away from exposed fossils to professionally and efficiently recover the fossil specimens and collect associated data.
- MM-P-2. All project-related ground disturbances that could potentially affect the Puente Formation, Fernando Formation, and Quaternary older alluvium and terrace deposits would be monitored by a qualified paleontological monitor on a full-time basis (where feasible) because these geologic sediments are determined to have a high paleontological sensitivity (Figure 4-3). Very shallow surficial excavations (less than 5 feet) within Quaternary younger alluvium would be monitored on a part-time basis to ensure that underlying sensitive units are not adversely affected (Figure 4-3). Construction monitoring during any tunneling activity is not warranted as any potential fossil specimens present within sensitive geologic units would be crushed and destroyed by the nature of tunneling methodology.
- MM-P-3. At each fossil locality, field data forms would be used to record pertinent geologic data, stratigraphic sections would be measured, and appropriate sediment samples would be collected and submitted for analysis.
- MM-P-4. Due to the likelihood of the presence of microfossils, matrix samples would be collected and tested within the Puente Formation and Fernando Formation. Testing for microfossils would consist of screen-washing samples (approximately 30 pounds) to determine if significant fossils are present. Productive tests would result in screen-washing of additional bulk matrix up to a maximum of 2,000 pounds per locality to ensure recovery of a scientifically significant sample.
- MM-P-5. Recovered fossils would be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and reposit in a designated paleontological curation facility (such as the Natural History Museum of Los Angeles County).

- MM-P-6. The paleontologist would prepare a final monitoring and mitigation report to be filed, at a minimum with Metro and the repository.

## 6.2 Operational Impacts Mitigation Measures

No mitigation is required because operational impacts to paleontological resources are not expected for any of the project alternatives.

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## 7.0 CONCLUSIONS

The potential for direct and indirect effects to paleontological resources is best estimated by the amount of ground disturbance within paleontologically sensitive units associated with a proposed action. Thus, the potential for project-related impacts to paleontological resources increases as the amount of surface disturbance within paleontologically sensitive geologic formations increases.

Construction of the project or alternatives could require substantial excavations in the paleontologically sensitive Puente Formation, Fernando Formation, and Quaternary older alluvium and terrace deposits. Implementing proper mitigation measures, including construction monitoring where feasible, would reduce potential impacts to paleontological resources to below the level of significance. However, tunneling operations cannot be mitigated for paleontological resources because construction monitoring is not feasible. The potential to impact unknown paleontological resources within sensitive geologic units as a result of tunneling would be unpredictable and in essence, unavoidable. Without mitigation, these fossils, as well as the paleontological data they could provide if properly salvaged and documented, could be adversely impacted (destroyed), rendering them permanently unavailable.

### 7.1 NEPA Findings

The results of this analysis indicate that the geologic units underlying the project area are paleontologically sensitive and that construction of each of the build alternatives has the potential to impact previously undiscovered (buried) paleontological resources. By implementing the mitigation measures identified in Section 6.0, the potential direct and cumulative effects to paleontological resources resulting from the TSM Alternative, the At-Grade Emphasis LRT Alternative, the Underground Emphasis LRT Alternative, the Fully Underground LRT Alternative – Little Tokyo Variation 1, or the Fully Underground LRT Alternative - Little Tokyo Variation 2 would be negligible.

Furthermore, scientifically significant fossils discovered prior to or during ground disturbances related to the project would benefit the scientific community by increasing knowledge associated with the fossils. No cumulative effects would result from the No Build Alternative because no ground disturbance would occur.

### 7.2 CEQA Determinations

The CEQA threshold of significance for a significant impact to paleontological resources is reached when a project is determined to “directly or indirectly destroy a significant paleontological resource or unique geologic feature.” In general, for project areas that are underlain by paleontologically sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for significant impacts to paleontological resources.

By implementing the mitigation measures identified in Section 6.0, potential construction impacts to paleontological resources resulting from the TSM Alternative, the At-Grade Emphasis LRT Alternative, the Underground Emphasis LRT Alternative, and the Fully Underground LRT Alternative – Little Tokyo Variation 1, the Fully Underground LRT Alternative – Little Tokyo Variation 2 could be reduced to below the level of significance with the exception of areas where tunneling operations cannot be mitigated for paleontological resources. Should construction monitoring not be feasible, as would be the case during any tunneling activities, then the potential to impact unknown paleontological resources within sensitive geologic units would be unavoidable. Considering the CEQA threshold of significance with regard to paleontological resources, unavoidable impacts could occur should potentially unknown fossil resources be destroyed as a result of tunneling activities. Accordingly, a CEQA statement of overriding considerations with respect to paleontological resources would be necessary should the Underground Emphasis LRT Alternative, Fully Underground LRT- Little Tokyo Variation 1, or Fully Underground LRT – Little Tokyo Variation 2 be selected. No significant impacts would result in the No Build Alternative because no ground disturbance would occur.

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