DRAFT ENVIRONMENTAL IMPACT REPORT
TECHNICAL APPENDICES VOLUME 1 OF 3

TIERRA LUNA EIR

Prepared for:
City of Downey

Prepared By:

CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

April 2009

TIERRA LUNA EIR

DRAFT ENVIRONMENTAL IMPACT REPORT
TECHNICAL APPENDICES

PREPARED FOR:
City of Downey
11111 Brookshire Avenue
Downey, California 90241

PREPARED BY:
Christopher A. Joseph & Associates
11849 West Olympic Boulevard, Suite 101
Los Angeles, California 90064

April 2009

APPENDIX I-1

Notice of Preparation

THE CITY OF DOWNEY

CALIFORNIA ENVIRONMENTAL QUALITY ACT
NOTICE OF PREPARATION AND SCOPING MEETING
(Article VI, Section 2 – CEQA Guidelines)

TO: All Interested Agencies, Parties, Organizations, and Persons

FROM: City of Downey, 11111 Brookshire Avenue, Downey, CA 90241

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report

PROJECT TITLE: Downey Studios Specific Plan

PROJECT APPLICANT: City of Downey

The City of Downey (City) will be the Lead Agency and will prepare an Environmental Impact Report (EIR) for the proposed Project identified above. We request the views of your agency as to the scope and content of the environmental information that is germane to your agency's statutory responsibilities in connection with the proposed Project. Your agency will need to use the EIR prepared by this Agency when considering your permit or other approval.

The Project description, location and the probable environmental impacts are contained in Attachment A.

____ A copy of the Initial Study is attached.

__X__ A copy of the Initial Study is not attached.

Due to the time limits mandated by state law, your response must be sent at the earliest possible date but not later than 30 days after receipt of this notice. In order to receive consideration in the Draft EIR, comments are due by **June 2**, **2008**.

Please send your response to Mark Sellheim, Principal Planner (telephone: 562/904-7158) at the address of the City as shown above. Please provide the name of a contact person in your agency.

An information open house and scoping meeting will be held to receive public comment regarding the appropriate scope and content of the environmental information to be included in the Draft Environmental Impact Report. The public scoping meeting will be held on Thursday, May 15, 2008, at 6:30 p.m. at the following location:

Apollo Park Gymnasium
Activity Room
12540 Rives Avenue
Downey, CA 90242

Your participation in the public scoping meeting is welcome and voluntary. The Project description, location and the areas of possible environmental impact are discussed in Attachment A.

DATE: _____

_____

Mr. Mark Sellheim
Principal Planner

ATTACHMENT A

Downey Studios Mixed Use Development Project

I. PURPOSE OF NOTICE OF PREPARATION

The purpose of the Notice of Preparation (NOP) is to inform Responsible Agencies (i.e., public agencies that may have discretionary approval power over the proposed Project that an Environmental Impact Report (EIR) will be prepared and to solicit their concerns regarding the potential environmental effects of the proposed project.

The California Environmental Quality Act (CEQA) also encourages early consultation with private persons and organizations that may be concerned with the potential environmental effects of the project. The NOP serves this purpose as well.

The State CEQA Guidelines state that, to be considered in the preparation of the Draft EIR, responses to this NOP must deal with the potentially significant environmental issues related to the specific project.

All written responses to this NOP will be included as Appendices in the Draft EIR and their contents considered in accordance with State and Agency environmental guidelines. Those who respond to the NOP (Respondents) do not receive individual responses. Instead, each Agency Respondent to the NOP receives a copy of the Draft EIR when it is distributed for public review and comment. Copies of the Draft EIR will be on file at the City of Downey for non-Agency Respondents.

II. PROJECT LOCATION, BOUNDARIES, AND EXISTING CHARACTERISTICS

The proposed Project is located at 12214 Lakewood Boulevard in the City of Downey (see Figure 1). The Project site is an approximately 79 acre site generally bounded to the north by the Downey Landing Retail Center, an outdoor shopping complex; to the east by Bellflower Boulevard, to the south by the city park learning center, and the Kaiser Permanente Hospital and Medical Center (currently under construction); and to the west by Lakewood Boulevard (see Figure 2). Regional access to the site is provided by the 5 Freeway located north of the Project site, the 605 Freeway located east of the Project site, the 105 Freeway located south of the Project site, and the 710 Freeway located west of the Project site. Arterial access to the Project site is provided from Lakewood and Bellflower Boulevards.

The Project site is located within the 168-acre Downey Landing Specific Plan area (Figure 1). The proposed Project would amend the Downey Landing Specific Plan at the Project site to provide for different uses and a revised urban design.

The Project site was an aircraft manufacturing and National Aeronautics and Space Administration (NASA) industrial facility with connections to the U.S. manned spaceflight program dating to the 1960s. A total of 25 buildings related to this industry exist on the Project site along with current improvements related to movie set usage. The certified EIR for the Downey Landing Specific Plan currently contemplates removal of most of those structures and concludes that such action does not constitute a

significant environmental impact. At present, the Project site is occupied by a television and movie studio production facility called Downey Studios, and includes studio, production and office uses, an outdoor suburban street movie set, 20 acres of back lot space, and parking lots.

The proposed Project site is listed on Hazardous Waste and Substances Sites List, commonly known as the "Cortese List." The Cortese List provides information about the location of hazardous materials release sites. The list is comprised of information from the Department of Toxic Substances Control (DTSC) and other governmental agencies. The Cortese List references the Project site, or portions thereof, under various names, including: Air Force Plant #16 (NASA); Vultee Aircraft Co., and Vultee Training Field. An environmental remediation program associated with these previous industrial uses on the Project site is underway.

III. PROJECT DESCRIPTION

The proposed Project is intended to promote development of a mixed-use, urban infill, comprehensively–designed and coordinated development that implements state-of-the-art planning concepts and principles on the presently underutilized proposed Project site. The Project will promote the creation and restoration of diverse, walkable, compact, vibrant, mixed-use communities composed of the same program components as conventional development, but assembled in a more integrated fashion, in the form of complete communities. These contain housing, work places, shops, entertainment, parks and civic facilities essential to the daily lives of residents, all within easy walking distance of each other. Principles embodied within the community that would be implemented through the proposed Downey Studios Specific Plan would include:

- Pedestrian Orientation
- Mix of Land Uses
- Infill Development
- Interconnected Street System
- Quality of Public Spaces
- Distinct Character
- Housing Choice; and
- Circulation and Parking.

Development of the proposed Project would involve demolition of on-site structures and the construction of up to 3,950,000 square feet of residential, commercial, and office uses, including up to 675,000 square feet of commercial/office use; 1,200,000 square feet of commercial/retail use; 375,000

square feet of hotel use; and 1,700,000 square feet (approximately 1,500 units) of residential use, including live-work units, for-sale units, and for-rent units. The proposed Project also includes approximately 125,000 square feet of open space. The Project would feature 850,000 square feet of parking within several multi-level parking structures, on-street parking and surface parking lots. Parking supply would be provided in these different configurations (structures, on-street spaces and lots) throughout the Project site, allowing parking to be shared by a variety of uses. Open space and streetscape improvements are reflected in the proposed Specific Plan, along with environmental management standards and amenities related to stormwater management, energy consumption and water conservation.

The proposed Project would also include construction of an internal street network and all infrastructure (sewer, water, storm drain) required to support development within the new community. Environmental remediation would continue for at least of portion of the period of implementation of the proposed Specific Plan.

The Proposed Specific Plan would also include mechanisms allowing for interchange of the type, location and character of uses and facilities within the Specific Plan area.

The proposed Project may require several permits and approvals, including but not limited to:

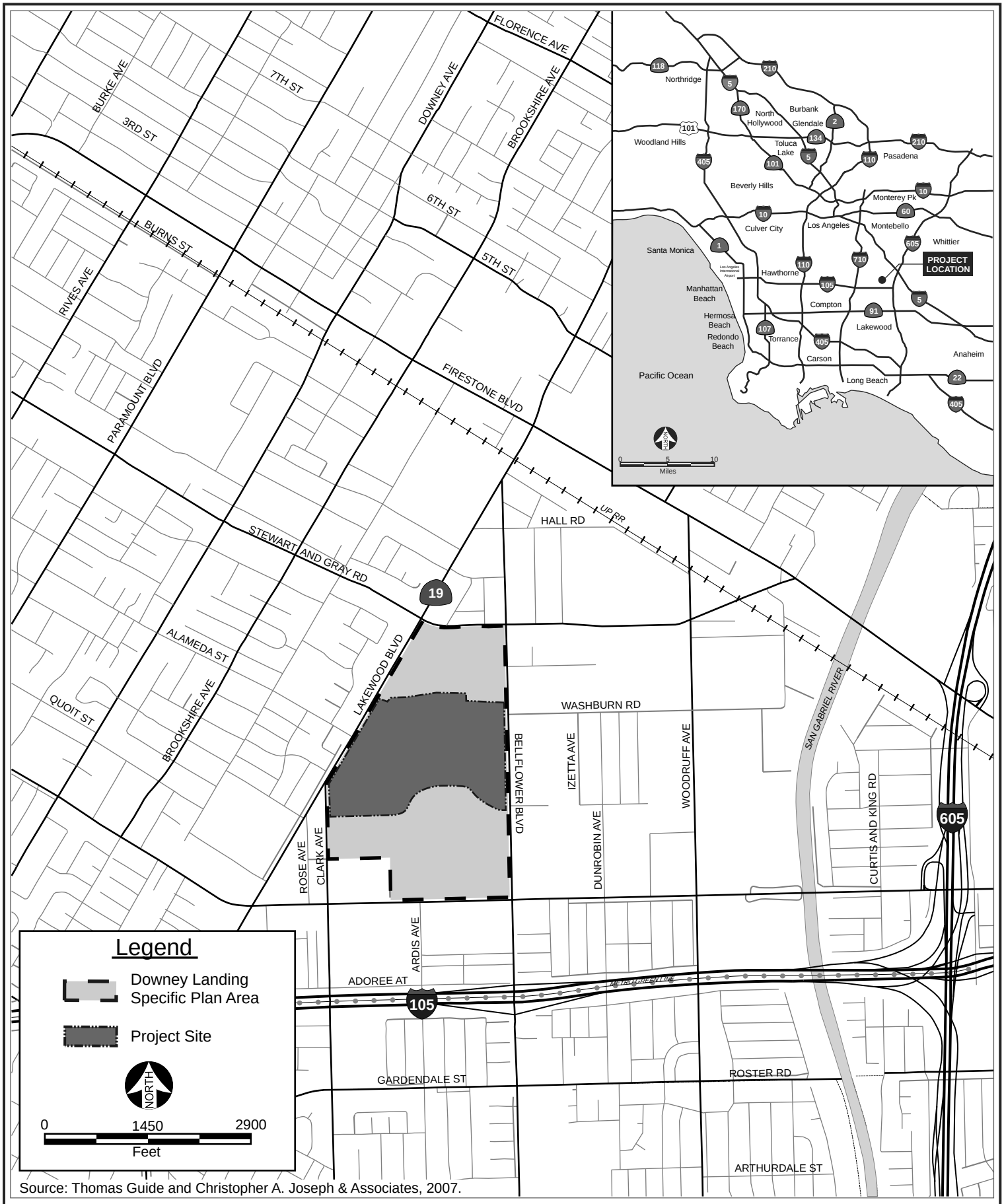
- Amendment to the existing Downey Landing Specific Plan;
- Amendment of the General Plan;
- Development Agreement;
- Amendment of the Downey Zoning Code;
- Subdivision Map Act Approval;
- Specific Plan Water, Wastewater, and Reclaimed Water Masters Plans Approval;
- Conditional Use Permit(s);
- Haul Route;
- Ministerial building permits;
- Other Actions from local, regional, state, and federal agencies;
- Any additional actions as may be deemed necessary.

ATTACHMENT A

III. PROBABLE ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT

The proposed Project will or may have the following significant effects, either by itself or with existing and proposed development in the area:

- Aesthetics
- Air Quality
- Cultural Resources
- Geology/Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use Planning
- Noise
- Population and Housing
- Public Services (Fire Protection, Police Protection, Schools, Recreation and Parks, Libraries)
- Transportation and Traffic
- Utilities and Service Systems (Sewer, Water Supply, Solid Waste, Electricity, Natural Gas)



Source: Thomas Guide and Christopher A. Joseph & Associates, 2007.

CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

Figure 1
Regional and Project Vicinity Map

Source: TRC and WesPac Energy Group, May 23, 2007.

CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

Figure 2
Aerial Photograph

APPENDIX I-2

Responses to the NOP

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DIVISION OF AERONAUTICS – M.S.#40
1120 N STREET
P. O. BOX 942873
SACRAMENTO, CA 94273-0001
PHONE (916) 654-4959
FAX (916) 653-9531
TTY 711

Flex your power!
Be energy efficient

May 16, 2008

Mr. Mark Sellheim
City of Downey
11111Brookshire Avenue
Downey, CA 90241

Dear Mr. Sellheim:

Notice of Preparation of a Draft Environmental Impact Report for the Downey Studios Specific Plan; SCH# 2008051022

The California Department of Transportation (Caltrans), Division of Aeronautics (Division), reviewed the above-referenced document with respect to airport-related noise and safety impacts and regional aviation land use planning issues pursuant to the California Environmental Quality Act (CEQA). The Division has technical expertise in the areas of airport operations safety, noise and airport land use compatibility. We are a funding agency for airport projects and we have permit authority for public-use and special-use airports and heliports.

The proposal is for the construction of up to 3,950,000 square feet of residential, commercial, and office uses on 168 acres. The project site is east of Lakewood Boulevard and south of Stewart and Gray Road in the City of Downey.

If any buildings or structures exceed 200 feet in height, Federal Aviation Regulation, Part 77 "Objects Affecting Navigable Airspace" requires a Notice of Proposed Construction or Alteration (Form 7460-1) be submitted to the Federal Aviation Administration (FAA). Form 7460-1 is available on-line at https://oeaaa.faa.gov/oeaaa/external/portal.jsp and should be submitted electronically to the FAA.

These comments reflect the areas of concern to the Division with respect to airport-related noise and safety impacts and regional airport land use planning issues. We advise you to contact our Caltrans District 7 office concerning surface transportation issues.

Thank you for the opportunity to review and comment on this proposal. If you have any questions, please call me at (916) 654-5314.

Sincerely,

Sandy Hesnard

SANDY HESNARD
Aviation Environmental Specialist

cc: State Clearinghouse

STATE OF CALIFORNIA--BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
100 SO. MAIN ST.
LOS ANGELES, CA 90012
PHONE (213) 897-6536
FAX (213) 897-1337
E-Mail:NersesYerjanian@dot.ca.gov

Flex your power!
Be energy efficient!

Mr. Mark Sellheim, Principal Planner
City of Downey
11111 Brookshire Ave.
Downey, CA. 90241

RECEIVED
MAY 15 2008
PLANNING

IGR/CEQA# 080510/NY
NOP/Downey Studios Specific Plan
SCH# 2008051022
LA/105,605

May 12, 2008

Dear Mr. Sellheim:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the proposed Downey Studios Specific Plan, consisting of 3,950,000 SF residential, commercial and office uses in the City of Downey.

Based on the information received, and to assist us in our efforts to completely evaluate and assess the impacts of this project on the State transportation system, a traffic study in advance of the DEIR should be prepared to analyze the following information:

Please reference the Department's **Traffic Impact Study Guideline** on the Internet at http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

1. Presentations of assumptions and methods used to develop trip generation, trip distribution, choice of travel mode, and assignments of trips to State Route 105 and 605.

2. Consistency of project travel modeling with other regional and local modeling forecasts and with travel data. The IGR/CEQA office may use indices to check results. Differences or inconsistencies must be thoroughly explained.

3. Analysis of ADT, AM, and PM peak-hour volumes for both existing and future conditions in the affected area. This should include freeways, interchanges, and intersections, and all HOV facilities.

Interchange Level of Service should be specified (HCM2000 method requested). Utilization of transit lines and vehicles, and of all facilities, should be realistically estimated. Future conditions would include build-out of all projects (see next item) and any plan-horizon years.

4. Inclusion of all appropriate traffic volumes. Analysis should include traffic from the project, cumulative traffic generated from all specific approved developments in the area, and traffic growth other than from the project and developments. That is, include: existing + project + other projects + other growth.

5. Discussion of mitigation measures appropriate to alleviate anticipated traffic impacts. These mitigation discussions should include, but not be limited to, the following:

- description of transportation infrastructure improvements
- financial costs, funding sources and financing
- sequence and scheduling considerations
- implementation responsibilities, controls and monitoring

Any mitigation involving transit, HOV, or TDM must be rigorously justified and its effects conservatively estimated. Improvements involving dedication of land or physical construction may be favorably considered.

6. Specification of developer's percent share of the cost, as well as a plan of realistic mitigation measures under the control of the developer. The following ratio should be estimated: Additional traffic volume due to project implementation is divided by the total increase in the traffic volume (see Appendix "B" of the Guidelines). That ratio would be the project equitable share responsibility.

We note for purposes of determining project share of costs, the number of trips from the project on each traveling segment or element is estimated in the context of forecasted traffic volumes which include build-out of all approved and not yet approved projects, and other sources of growth. Analytical methods such as select-zone travel forecast modeling might be used.

The Department as a commenting agency under CEQA has jurisdiction superceding that of MTA in identifying the freeway analysis needed for this project. Caltrans is responsible for obtaining measures that will off-set project vehicle trip generation that worsens Caltrans facilities and hence, it does not adhere to the CMP guide of 150 or more vehicle trips added before freeway analysis is needed. MTA's Congestion Management Program in acknowledging the Department's role, stipulates that Caltrans must be consulted to identify specific locations to be analyzed on the State Highway System. Therefore State Route(s) mentioned in item #1 and it's facilities must be analyzed per the Department's **Traffic Impact Study Guidelines.**

Mr. Sellheim May 12, 2008

We look forward to reviewing the DEIR. We expect to receive a copy from the State Clearinghouse. However, to expedite the review process, you may send two copies in advance to the undersigned at the following address:

Nerses Armand Yerjanian
IGR/CEQA Project Engineer/Coordinator
Caltrans District 07
Regional Transportation Planning Office
100 S. Main St., Los Angeles, CA 90012

If you have any questions regarding this response, please call the Project Engineer/Coordinator Mr. Yerjanian at (213) 897-6536 and refer to IGR/CEQA # 080510/NY.

Sincerely,

Nerses A. Yerjanian

Nerses Armand Yerjanian
IGR/CEQA Project Engineer/Coordinator
Regional Transportation Planning

Metro

Metropolitan Transportation Authority

One Gateway Plaza
Los Angeles, CA 90012-2952

213.922.2000 Tel
metro.net

May 20, 2008

RECEIVED
MAY 27 2008
PLANNING

Mark Sellheim
Principal Planner
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

Dear Mr. Sellheim:

Thank you for the opportunity to comment on the Notice of Preparation (NOP) for the Downey Studios Specific Plan project. This letter conveys recommendations from the Los Angeles County Metropolitan Transportation Authority (Metro) concerning issues that are germane to our agency's statutory responsibilities in relation to the proposed project.

A Traffic Impact Analysis (TIA), with highway, freeway, and transit components, is required under the State of California Congestion Management Program (CMP) statute. The CMP TIA Guidelines are published in the "2004 Congestion Management Program for Los Angeles County", Appendix D. The geographic area examined in the TIA must include the following, at a minimum:

1. All CMP arterial monitoring intersections, including monitored freeway on/off-ramp intersections, where the proposed project will add 50 or more trips during either the a.m. or p.m. weekday peak hour (of adjacent street traffic); and
2. Mainline freeway-monitoring locations where the project will add 150 or more trips, in either direction, during either the a.m. or p.m. weekday peak hour.

Among the required steps for the analysis of development-related impacts to transit are:

3. Evidence that in addition to Metro, all affected Municipal transit operators received the NOP for the Draft EIR;
4. A summary of the existing transit services in the area;
5. Estimated project trip generation and mode assignment for both morning and evening peak periods;
6. Documentation on the assumptions/analyses used to determine the number and percentage of trips assigned to transit;
7. Information on facilities and/or programs that will be incorporated into the development plan that will encourage public transit usage and transportation demand management (TDM) policies and programs; and
8. An analysis of the expected project impacts on current and future transit services along with proposed project mitigation.

Metro looks forward to reviewing the Draft EIR. If you have any questions regarding this response, please call me at 213-922-6908 or by email at chapmans@metro.net. Please send the Draft EIR to the following address:

Metro CEQA Review Coordination
One Gateway Plaza MS 99-23-2
Los Angeles, CA 90012-2952
Attn: Susan Chapman

Sincerely,

Susan Chapman
Program Manager, Long Range Planning

Mark Sellheim

From: Christine Fernandez [fernande@scag.ca.gov]

Sent: Wednesday, May 28, 2008 10:02 AM

To: Mark Sellheim

Subject: SCAG comments for the Downey Studios Specific Plan NOP

Dear Mr. Sellheim,

Attached are comments from the Southern California Association of Governments regarding the NOP for the Downey Studios Specific Plan -- SCAG No. I20080271.

Please contact me if you have questions or have difficultly with the attached file.

Thank you,
- Christine Fernandez

Assistant Regional Planner
Southern California Association of Governments
818 W. 7th St., 12th Floor
Los Angeles, CA 90017
(213) 236-1923
(213) 236-1963 (fax)
fernande@scag.ca.gov

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

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Richard Dixon, Lake Forest

Community, Economic and Human Development
Jon Edney, El Centro

Energy and Environment
Debbie Cook, Huntington Beach

Transportation and Communications
Mike Ten, South Pasadena

May 27, 2008

Mark Sellheim, Principal Planner
City of Downey
11111 Brookshire Ave.
Downey, CA 90241
(562) 904-7158 / (562) 904-7135 fax

RE: SCAG Comments on the Notice of Preparation for a Draft Environmental Impact Report for the Downey Studios Specific Plan - SCAG No. I20080271

Dear Mr. Sellheim,

Thank you for submitting the **Notice of Preparation for a Draft Environmental Impact Report for the Downey Studios Specific Plan - SCAG No. I20080271**, to the Southern California Association of Governments (SCAG) for review and comment. SCAG is the authorized regional agency for Inter-Governmental Review of Programs proposed for federal financial assistance and direct development activities, pursuant to Presidential Executive Order 12372 (replacing A-95 Review). Additionally, pursuant to Public Resources Code Section 21083(d) SCAG reviews Environmental Impacts Reports of projects of regional significance for consistency with regional plans per the California Environmental Quality Act Guidelines, Sections 15125(d) and 15206(a)(1). SCAG is also the designated Regional Transportation Planning Agency and as such is responsible for both preparation of the Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP) under California Government Code Section 65080 and 65082.

SCAG staff has reviewed the aforementioned NOP and has determined that the proposed project is regionally significant per the California Environmental Quality Act (CEQA) Guidelines (Section 15125(d) and 15206). The project proposes the demolition of existing structures and the construction of up to 3,950,000 square feet of residential, commercial, and office uses including up to 675,000 square feet of commercial/office use; 1,200,000 square feet of commercial/retail use;375,000 square feet of hotel use; and 1,700,000 square feet of residential use. CEQA requires that EIRs discuss any inconsistencies between the proposed project and applicable general plans and regional plans (Section 15125 [d]). If there are inconsistencies, an explanation and rationalization for such inconsistencies should be provided. We expect the DEIR to specifically cite all SCAG policies and address the manner in which the project is consistent, not-consistent, or not applicable to these policies and provide supportive analysis as to why it is consistent, not-consistent, or not applicable.

Policies of SCAG's Regional Comprehensive Plan and Guide (RCPG), Regional Transportation Plan (RTP), and Compass Growth Vision (CGV) that may be applicable to your project are outlined in the attachment. The RCPG, RTP and CGV can be found on the SCAG web site at: http://scag.ca.gov/igr. For ease of review, we would encourage you to use a side-by-side comparison of all SCAG policies with a discussion of the consistency, non-consistency or non-applicability of the policy and supportive analysis in a table format (example attached).

The attached detailed comments are meant to provide guidance for considering the proposed project within the context of our regional goals and policies. **Please provide a minimum of 45 days for SCAG to review the DEIR and associated plans when these documents are available.** If you have any questions regarding the attached comments, please contact Christine Fernandez at (213) 236-1923. Thank you.

Sincerely,

Jacob Lieb, Program Manager
Environmental Planning Division

DOCS# 146217

May 27, 2008
Mr. Mark Sellheim

SCAG No. I20080271

COMMENTS ON THE NOTICE OF PREPARATION FOR A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE DOWNEY STUDIOS SPECIFIC PLAN - SCAG NO. I20080271

PROJECT DESCRIPTION

The proposed project is intended to promote development of a mixed-use, urban infill, comprehensively-designed and coordinated development that implements state-of-the-art planning concepts on the presently, underutilized proposed. Development of the proposed project would involve demolition of existing on-site structures and the construction of up to 3, 950,000 square feet of residential, commercial, and office uses including up to 675,000 square feet of commercial/office use; 1,200,000 square feet of commercial/retail use; 375,000 square feet of hotel use; and 1,700,000 square feet (approximately 1,500 units) of residential use. The proposed project also includes approximately 125,000 square feet of open space and 850,000 square feet of parking within several multi-level parking structures, on-street parking, and surface parking lots.

The project site is located at 12214 Lakewood Boulevard in the City of Downey. The site is approximately 79 acres located within the 168-acre Downey Landing Specific Plan area. It is generally bounded to the north by the Downey Landing Retail Center, an outdoor shopping complex; to the east by Bellflower Boulevard, to the south by the city park learning center, and the Kaiser Permanente Hospital and Medical Center; and to the west by Lakewood Boulevard. Regional access to the site is provided by the 5, 605, 105, and 710 Freeways.

CONSISTENCY WITH REGIONAL COMPREHENSIVE PLAN AND GUIDE POLICIES

The **Growth Management Chapter (GMC)** of the Regional Comprehensive Plan and Guide (RCPG) contains the following policies that are particularly applicable and should be addressed in the draft EIR.

Regional Growth Forecasts

The DEIR should reflect the most current SCAG forecasts, which are the 2008 RTP (May 2008) Population, Household and Employment forecasts. The forecasts for your region, subregion, and cities are as follows:

Adopted SCAG Regionwide Forecasts[1]

	2010	2015	2020	2025	2030	2035
Population	19,418,344	20,465,830	21,468,948	22,395,121	23,255,377	24,057,286
Households	6,086,986	6,474,074	6,840,328	7,156,645	7,449,484	7,710,722
Employment	8,349,453	8,811,406	9,183,029	9,546,773	9,913,376	10,287,125

Adopted Gateway Cities Council of Governments (GCCOG) Subregion Forecasts[1]

	2010	2015	2020	2025	2030	2035
Population	2,143,979	2,190,471	2,236,253	2,280,588	2,323,438	2,364,199
Households	591,028	607,440	623,862	636,482	648,759	658,696
Employment	762,987	776,857	785,715	796,129	807,251	817,891

Adopted GCCOG Subregion - Unincorporated Forecasts[1]

	2010	2015	2020	2025	2030	2035
Population	350,853	358,727	367,065	375,093	382,816	390,183
Households	85,356	89,168	93,186	96,323	99,353	101,847
Employment	86,142	88,293	89,666	91,281	93,006	94,656

May 27, 2008
Mr. Mark Sellheim

SCAG No. I20080271

Adopted City of Downey Forecasts[1]

	2010	2015	2020	2025	2030	2035
Population	115,973	118,011	120,207	122,323	124,358	126,301
Households	34,767	35,279	35,818	36,239	36,646	36,981
Employment	40,580	41,544	42,160	42,885	43,658	44,398

1. The 2008 RTP growth forecast at the regional, county and subregional level was adopted by the Regional Council in May 2008. City totals are the sum of small area data and should be used for advisory purposes only.

3.01 *The population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies shall be used by SCAG in all phases of implementation and review.*

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL STANDARD OF LIVING

The Growth Management goals to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. The evaluation of the proposed project in relation to the following policies would be intended to guide efforts toward achievement of such goals and does not infer regional interference with local land use powers.

3.04 *Encourage local jurisdictions' efforts to achieve a balance between the types of jobs they seek to attract and housing prices.*

3.05 *Encourage patterns of urban development and land use which reduce costs on infrastructure construction and make better use of existing facilities.*

3.06 *Support public education efforts regarding the costs of various alternative types of growth and development.*

3.09 *Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of services.*

3.10 *Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.*

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL QUALITY OF LIFE

The Growth Management goals to attain mobility and clean air goals and to develop urban forms that enhance quality of life, that accommodate a diversity of life styles, that preserve open space and natural resources, and that are aesthetically pleasing and preserve the character of communities, enhance the regional strategic goal of maintaining the regional quality of life. The evaluation of the proposed project in relation to the following policies would be intended to provide direction for plan implementation, and does not allude to regional mandates.

3.11 *Support provisions and incentives created by local jurisdictions to attract housing growth in job-rich subregions and job growth in housing-rich subregions.*

3.12 *Encourage existing or proposed local jurisdictions' programs aimed at designing land uses which encourage the use of transit and thus reduce the need for roadway expansion, reduce the # of auto trips and vehicle miles traveled, and create opportunities for residents to walk and bike.*

3.13 *Encourage local jurisdictions' plans that maximize the use of existing urbanized areas accessible to transit through infill and redevelopment.*

3.14 *Support local plans to increase density of future development located at strategic points along the regional commuter rail, transit systems, and activity centers.*

3.15 *Support local jurisdictions' strategies to establish mixed-use clusters and other transit-oriented developments around transit stations and along transit corridors.*

3.16 *Encourage developments in and around activity centers, transportation corridors, underutilized infrastructure systems, and areas needing recycling and redevelopment.*

3.17 *Support and encourage settlement patterns, which contain a range of urban densities.*

3.18 *Encourage planned development in locations least likely to cause adverse environmental impact.*

3.19 *Support policies and actions that preserve open space areas identified in local, state, and federal plans.*

3.20 *Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.*

3.21 *Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.*

3.22 *Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.*

3.23 *Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.*

GMC POLICIES RELATED TO THE RCPG GOAL TO PROVIDE SOCIAL, POLITICAL, AND CULTURAL EQUITY

The Growth Management goals to develop urban forms that avoid economic and social polarization promotes the regional strategic goal of minimizing social and geographic disparities and of reaching equity among all segments of society. The evaluation of the proposed project in relation to the policy stated below is intended guide direction for the accomplishment of this goal, and does not infer regional mandates and interference with local land use powers.

3.24 *Encourage efforts of local jurisdictions in the implementation of programs that increase the supply and quality of housing and provide affordable housing as evaluated in the Regional Housing Needs Assessment.*

3.27 *Support local jurisdictions and other service providers in their efforts to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection.*

AIR QUALITY CHAPTER

The **Air Quality Chapter** core actions related to the proposed project include:

5.07 *Determine specific programs and associated actions needed (e.g., indirect source rules, enhanced use of telecommunications, provision of community-based shuttle services, provision of demand management based programs, or vehicle-miles-traveled/emission fees) so that options to command and control regulation can be assessed.*

5.11 *Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional, and local) consider air quality, land use,*

transportation, and economic relationships to ensure consistency and minimize conflicts.

OPEN SPACE AND CONSERVATION CHAPTER

The **Open Space and Conservation Chapter** goals related to the proposed project include:

- ***9.01*** *Provide adequate land resources to meet the outdoor recreation needs of the present and future residents in the region.*
- ***9.02*** *Increase the accessibility to open space lands for outdoor recreation.*
- ***9.03*** *Promote self-sustaining regional recreation resources and facilities.*
- ***9.04*** *Maintain open space for adequate protection to lives and properties against natural and manmade hazards.*
- ***9.05*** *Minimize potentially hazardous developments in hillsides, canyons, areas susceptible to flooding, earthquakes, wildfire and other known hazards, and areas with limited access for emergency equipments.*
- ***9.08*** *Develop well-managed viable ecosystems or known habitats of rare, threatened and endangered species, including wetlands.*

WATER QUALITY CHAPTER RECOMMENDATIONS AND POLICY OPTIONS

The **Water Quality Chapter** goals related to the proposed project include:

- ***11.02*** *Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts.*
- ***11.07*** *Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.*

REGIONAL TRANSPORTATION PLAN

The **2004 Regional Transportation Plan (RTP)** also has goals and policies that are pertinent to this proposed project. This RTP links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption, promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socio-economic, geographic and commercial limitations. The RTP continues to support all applicable federal and state laws in implementing the proposed project. Among the relevant goals and policies of the RTP are the following:

Regional Transportation Plan Goals:

- ***RTP G1*** *Maximize mobility and accessibility for all people and goods in the region.*
- ***RTP G2*** *Ensure travel safety and reliability for all people and goods in the region.*
- ***RTP G3*** *Preserve and ensure a sustainable regional transportation system.*
- ***RTP G4*** *Maximize the productivity of our transportation system.*
- ***RTP G5*** *Protect the environment, improve air quality and promote energy efficiency.*
- ***RTP G6*** *Encourage land use and growth patterns that complement our transportation investments.*
- ***RTP G7*** *Maximize the security of our transportation system through improved system monitoring, rapid recovery planning, and coordination with other security agencies.*

May 27, 2008
Mr. Mark Sellheim

SCAG No. I20080271

GROWTH VISIONING

The fundamental goal of the **Compass Growth Visioning** effort is to make the SCAG region a better place to live, work and play for all residents regardless of race, ethnicity or income class. Thus, decisions regarding growth, transportation, land use, and economic development should be made to promote and sustain for future generations the region's mobility, livability and prosperity. The following "Regional Growth Principles" are proposed to provide a framework for local and regional decision making that improves the quality of life for all SCAG residents. Each principle is followed by a specific set of strategies intended to achieve this goal.

A portion of the City of Downey is located within a Compass 2% Strategy Area, where development is intended to balance employment, housing, and services to reduce vehicle trips and emissions, enhance livability, expand prosperity, and increase sustainability. Please demonstrate how the proposed project does or does not support these principles. More information and maps can be found at http://www.compassblueprint.org/2percent/areas.

Principle 1: Improve mobility for all residents.

- ***GV P1.1*** *Encourage transportation investments and land use decisions that are mutually supportive.*
- ***GV P1.2*** *Locate new housing near existing jobs and new jobs near existing housing.*
- ***GV P1.3*** *Encourage transit-oriented development.*
- ***GV P1.4*** *Promote a variety of travel choices*

Principle 2: Foster livability in all communities.

- ***GV P2.1*** *Promote infill development and redevelopment to revitalize existing communities.*
- ***GV P2.2*** *Promote developments, which provide a mix of uses.*
- ***GV P2.3*** *Promote "people scaled," walkable communities.*
- ***GV P2.4*** *Support the preservation of stable, single-family neighborhoods.*

Principle 3: Enable prosperity for all people.

- ***GV P3.1*** *Provide, in each community, a variety of housing types to meet the housing needs of all income levels.*
- ***GV P3.2*** *Support educational opportunities that promote balanced growth.*
- ***GV P3.3*** *Ensure environmental justice regardless of race, ethnicity or income class.*
- ***GV P3.4*** *Support local and state fiscal policies that encourage balanced growth*
- ***GV P3.5*** *Encourage civic engagement.*

Principle 4: Promote sustainability for future generations.

- ***GV P4.1*** *Preserve rural, agricultural, recreational, and environmentally sensitive areas.*
- ***GV P4.2*** *Focus development in urban centers and existing cities.*
- ***GV P4.3*** *Develop strategies to accommodate growth that uses resources efficiently, eliminate pollution and significantly reduce waste.*
- ***GV P4.4*** *Utilize "green" development techniques*

CONCLUSION

All feasible measures needed to mitigate any potentially negative regional impacts associated with the proposed project should be implemented and monitored, as required by CEQA.

When a project is of statewide, regional, or areawide significance, transportation information generated by a required monitoring or reporting program shall be submitted to SCAG as such information becomes reasonably available, in accordance with CEQA, Public Resource Code Section 21018.7, and CEQA Guidelines Section 15097 (g).

May 27, 2008
Mr. Mark Sellheim

SCAG No. I20080271

SUGGESTED SIDE BY SIDE FORMAT - COMPARISON TABLE OF SCAG POLICIES

For ease of review, we would encourage the use of a side-by-side comparison of all SCAG policies with a discussion of the consistency, non-consistency or not applicable of the policy and supportive analysis in a table format. All policies and goals must be evaluated as to impacts. Suggested format is as follows:

The complete table can be found at: *http://scag.ca.gov/igr/doc/SCAG_IGRpolicies.DOC*

SCAG RCPG (RTP and/or CGV) Policies		
Growth Management Chapter		
Policy Number	**Policy Text**	**Statement of Consistency, Non-Consistency, or Not Applicable**
3.01	The population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies shall be used by SCAG in all phases of implementation and review.	Consistent: Statement as to why Not-Consistent: Statement as to why Not Applicable: Statement as to why
3.02	In areas with large seasonal population fluctuations, such as resort areas, forecast permanent populations. However, appropriate infrastructure systems should be sized to serve high-season population totals.	Consistent: Statement as to why Not-Consistent: Statement as to why Not Applicable: Statement as to why
3.03	The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.	Consistent: Statement as to why Not-Consistent: Statement as to why Not Applicable: Statement as to why
Etc.	Etc.	Etc.

Southern California Gas Company

A Sempra Energy utility℠

1919 S. State College Blvd.
Anaheim, CA 92806-6114

RECEIVED
MAY 12 2008
PLANNING

May 8, 2008

City of Downey
11111 Brookshire Ave.
Downey, CA 90241

Attention: Mark Sellheim

Subject: EIR for Downey Studios Specific Plan at 12214 Lakewood Blvd.

Thank you for providing the opportunity to respond to this E.I.R. Document. We are pleased to inform you that Southern California Gas Company has facilities in the area where the aforementioned project is proposed. Gas service to the project can be provided from an existing gas main located in various locations. The service will be in accordance with the Company's policies and extension rules on file with the California Public Utilities Commission when the contractual arrangements are made.

This letter is not a contractual commitment to serve the proposed project but is only provided as an informational service. The availability of natural gas service is based upon conditions of gas supply and regulatory agencies. As a public utility, Southern California Gas Company is under the jurisdiction of the California Public Utilities Commission. Our ability to serve can also be affected by actions of federal regulatory agencies. Should these agencies take any action, which affect gas supply or the conditions under which service is available, gas service will be provided in accordance with the revised conditions.

This letter is also provided without considering any conditions or non-utility laws and regulations (such as environmental regulations), which could affect construction of a main and/or service line extension (i.e., if hazardous wastes were encountered in the process of installing the line). The regulations can only be determined around the time contractual arrangements are made and construction has begun.

Estimates of gas usage for residential and non-residential projects are developed on an individual basis and are obtained from the Commercial-Industrial/Residential Market Services Staff by calling (800) 427-2000 (Commercial/Industrial Customers) (800) 427-2200 (Residential Customers). We have developed several programs, which are available upon request to provide assistance in selecting the most energy efficient appliances or systems for a particular project. If you desire further information on any of our energy conservation programs, please contact this office for assistance.

Sincerely,

Paul Simonoff
Technical Services Supervisor
Pacific Coast Region - Anaheim

PS/mr
eir02.doc

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

May 5, 2008

RECEIVED
MAY 08 2008
PLANNING

To: Reviewing Agencies

Re: Downey Studios Specific Plan
SCH# 2008051022

Attached for your review and comment is the Notice of Preparation (NOP) for the Downey Studios Specific Plan draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Mark Sellheim
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Project Analyst, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2008051022
Project Title Downey Studios Specific Plan
Lead Agency Downey, City of

Type NOP Notice of Preparation

Description Development of the proposed Project would involve demolition of on-site structures and the construction of up to 3,950,000 square feet of residential, commercial, and office uses, including up to 675,000 square feet of commercial/office use; 1,200,000 square feet of commercial/retail uses; 375,000 square feet of hotel use; and 1,700,000 square feet (approximately 1,500 units) of residential use, including live-work units, for-sale units, and for-rent units. The proposed Project also includes approximately 125,000 square feet of open space.

Lead Agency Contact

Name Mark Sellheim
Agency City of Downey
Phone 562 904-7158 **Fax**
email
Address 11111 Brookshire Avenue
City Downey **State** CA **Zip** 90241

Project Location

County Los Angeles
City Downey
Region
Cross Streets Lakewood Boulevard and Imperial Highway and Bellflower Bouelvard
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways 105
Airports
Railways Union Pacific
Waterways
Schools
Land Use Downey Studios/Downey Landing Specific Plan

Project Issues Aesthetic/Visual; Air Quality; Archaeologic-Historic; Drainage/Absorption; Economics/Jobs; Flood Plain/Flooding; Fiscal Impacts; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Septic System; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Water Quality; Water Supply; Growth Inducing; Landuse; Cumulative Effects; Geologic/Seismic; Traffic/Circulation

Reviewing Agencies Resources Agency; Department of Conservation; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 5; Native American Heritage Commission; Public Utilities Commission; Caltrans, Division of Aeronautics; California Highway Patrol; Department of Housing and Community Development; Caltrans, District 7; Air Resources Board, Major Industrial Projects; Integrated Waste Management Board; Department of Toxic Substances Control; Regional Water Quality Control Board, Region 4

Date Received 05/05/2008 **Start of Review** 05/05/2008 **End of Review** 06/03/2008

County: Los Angeles SCH# 2008051022

Resources Agency

- [x] Resources Agency
  Nadell Gayou
- [ ] Dept. of Boating & Waterways
  David Johnson
- [ ] California Coastal Commission
  Elizabeth A. Fuchs
- [ ] Colorado River Board
  Gerald R. Zimmerman
- [x] Dept. of Conservation
  Sharon Howell
- [ ] California Energy Commission
  Dale Edwards
- [ ] Cal Fire
  Allen Robertson
- [ ] Office of Historic Preservation
  Wayne Donaldson
- [x] Dept of Parks & Recreation
  Environmental Stewardship Section
- [ ] Central Valley Flood Protection Board
  Mark Herald
- [ ] S.F. Bay Conservation & Dev't. Comm.
  Steve McAdam
- [x] Dept. of Water Resources
  Resources Agency
  Nadell Gayou
- [ ] _____
  Conservancy

Fish and Game

- [ ] Depart. of Fish & Game
  Scott Flint
  Environmental Services Division
- [ ] Fish & Game Region 1
  Donald Koch
- [ ] Fish & Game Region 1E
  Laurie Harnsberger
- [ ] Fish & Game Region 2
  Jeff Drongesen
- [ ] Fish & Game Region 3
  Robert Floerke
- [ ] Fish & Game Region 4
  Julie Vance
- [x] Fish & Game Region 5
  Don Chadwick
  Habitat Conservation Program
- [ ] Fish & Game Region 6
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] Fish & Game Region 6 I/M
  Gabrina Gatchel
  Inyo/Mono, Habitat Conservation Program
- [ ] Dept. of Fish & Game M
  George Isaac
  Marine Region

Other Departments

- [ ] Food & Agriculture
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] Depart. of General Services
  Public School Construction
- [ ] Dept. of General Services
  Robert Sleppy
  Environmental Services Section
- [ ] Dept. of Health Services
  Veronica Malloy
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] Delta Protection Commission
  Debby Eddy
- [ ] Office of Emergency Services
  Dennis Castrillo
- [ ] Governor's Office of Planning & Research
  State Clearinghouse
- [x] Native American Heritage Comm.
  Debbie Treadway
- [x] Public Utilities Commission
  Ken Lewis
- [ ] Santa Monica Bay Restoration
  Guangyu Wang
- [ ] State Lands Commission
  Marina Brand
- [ ] Tahoe Regional Planning Agency (TRPA)
  Cherry Jacques

Business, Trans & Housing

- [x] Caltrans - Division of Aeronautics
  Sandy Hesnard
- [ ] Caltrans - Planning
  Terri Pencovic
- [x] California Highway Patrol
  Shirley Kelly
  Office of Special Projects
- [x] Housing & Community Development
  Lisa Nichols
  Housing Policy Division

Dept. of Transportation

- [ ] Caltrans, District 1
  Rex Jackman
- [ ] Caltrans, District 2
  Marcelino Gonzalez
- [ ] Caltrans, District 3
  Jeff Pulverman
- [ ] Caltrans, District 4
  Tim Sable
- [ ] Caltrans, District 5
  David Murray
- [ ] Caltrans, District 6
  Moses Stites
- [x] Caltrans, District 7
  Vin Kumar
- [ ] Caltrans, District 8
  Dan Kopulsky
- [ ] Caltrans, District 9
  Gayle Rosander
- [ ] Caltrans, District 10
  Tom Dumas
- [ ] Caltrans, District 11
  Jacob Armstrong
- [ ] Caltrans, District 12
  Ryan P. Chamberlain

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Ravi Ramalingam
  - [x] Industrial Projects
    Mike Tollstrup
- [x] California Integrated Waste Management Board
  Sue O'Leary
- [ ] State Water Resources Control Board
  Regional Programs Unit
  Division of Financial Assistance
- [ ] State Water Resources Control Board
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] State Water Resouces Control Board
  Steven Herrera
  Division of Water Rights
- [x] Dept. of Toxic Substances Control
  CEQA Tracking Center
- [ ] Department of Pesticide Regulation

Regional Water Quality Control Board (RWQCB)

- [ ] RWQCB 1
  Cathleen Hudson
  North Coast Region (1)
- [ ] RWQCB 2
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] RWQCB 3
  Central Coast Region (3)
- [x] RWQCB 4
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] RWQCB 5S
  Central Valley Region (5)
  - [ ] RWQCB 5F
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] RWQCB 5R
    Central Valley Region (5)
    Redding Branch Office
- [ ] RWQCB 6
  Lahontan Region (6)
  - [ ] RWQCB 6V
    Lahontan Region (6)
    Victorville Branch Office
- [ ] RWQCB 7
  Colorado River Basin Region (7)
- [ ] RWQCB 8
  Santa Ana Region (8)
- [ ] RWQCB 9
  San Diego Region (9)

- [ ] Other _____

Last Updated on 03/03/2008

COUNTY SANITATION DISTRICTS
OF LOS ANGELES COUNTY

1955 Workman Mill Road, Whittier, CA 90601-1400
Mailing Address: P.O. Box 4998, Whittier, CA 90607-4998
Telephone: (562) 699-7411, FAX: (562) 699-5422
www.lacsd.org

STEPHEN R. MAGUIN
Chief Engineer and General Manager

May 15, 2008

File No: 02-00.04-09

RECEIVED
MAY 19 2008
PLANNING

Mr. Mark Sellheim, Principal Planner
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

Dear Mr. Sellheim:

Downey Studios Specific Plan

The County Sanitation Districts of Los Angeles County (Districts) received a Notice of Preparation of a Draft Environmental Impact Report for the subject project on May 8, 2008. The proposed development is located within the jurisdictional boundaries of District No. 2. We offer the following comments regarding sewerage service:

1. The wastewater flow originating from the proposed project will discharge to a local sewer line, which is not maintained by the Districts, for conveyance to the Districts' Downey-Bellflower Trunk Sewer, located in Clark Avenue at James Street. This 21-inch diameter trunk sewer has a design capacity of 4.5 million gallons per day (mgd) and conveyed a peak flow of 2.4 mgd when last measured in 2006.

2. The wastewater generated by the proposed project will be treated at the Joint Water Pollution Control Plant located in the City of Carson, which has a design capacity of 400 mgd and currently processes an average flow of 310.9 mgd, or the Los Coyotes Water Reclamation Plant located in the City of Cerritos, which has a design capacity of 37.5 mgd and currently processes an average flow of 23.5 mgd.

3. The expected average wastewater flow from the project site is approximately 600,000 gallons per day. For a copy of the Districts' average wastewater generation factors, go to www.lacsd.org, Information Center, Will Serve Program, Obtain Will Serve Letter, and click on the appropriate link on page 2.

4. The Districts are authorized by the California Health and Safety Code to charge a fee for the privilege of connecting (directly or indirectly) to the Districts' Sewerage System or increasing the strength or quantity of wastewater attributable to a particular parcel or operation already connected. This connection fee is a capital facilities fee that is imposed in an amount sufficient to construct an incremental expansion of the Sewerage System to accommodate the proposed project. Payment of a connection fee will be required before a permit to connect to the sewer is issued. For a copy of the Connection Fee Information Sheet, go to www.lacsd.org, Information Center, Will Serve Program, Obtain Will Serve Letter, and click on the appropriate link on

page 2. For more specific information regarding the connection fee application procedure and fees, please contact the Connection Fee Counter at extension 2727.

5. In order for the Districts to conform to the requirements of the Federal Clean Air Act (CAA), the design capacities of the Districts' wastewater treatment facilities are based on the regional growth forecast adopted by the Southern California Association of Governments (SCAG). Specific policies included in the development of the SCAG regional growth forecast are incorporated into clean air plans, which are prepared by the South Coast and Antelope Valley Air Quality Management Districts in order to improve air quality in the South Coast and Mojave Desert Air Basins as mandated by the CAA. All expansions of Districts' facilities must be sized and service phased in a manner that will be consistent with the SCAG regional growth forecast for the counties of Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial. The available capacity of the Districts' treatment facilities will, therefore, be limited to levels associated with the approved growth identified by SCAG. As such, this letter does not constitute a guarantee of wastewater service, but is to advise you that the Districts intend to provide this service up to the levels that are legally permitted and to inform you of the currently existing capacity and any proposed expansion of the Districts' facilities.

If you have any questions, please contact the undersigned at (562) 908-4288, extension 2717.

Very truly yours,

Stephen R. Maguin

Ruth I. Frazen

Ruth I. Frazen
Customer Service Specialist
Facilities Planning Department

RIF:rf

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390
www.nahc.ca.gov
ds_nahc@pacbell.net

RECEIVED
MAY 19 2008
PLANNING

May 12, 2008

Mr. Mark Selheim
CITY OF DOWNEY
11111 Brookshire Avenue
Downey, CA 902441

Re: SCH# 2008051022; CEQA Notice of Preparation (NOP) draft Environmental Impact Report (DEIR) for Downey Studios Specific Plan; City of Downey; Los Angeles County, California

Dear Mr. Selheim:

Thank you for the opportunity to comment on the above-referenced document. The Native American Heritage Commission is the state agency designated for the protection of California's Native American cultural resources. The California Environmental Quality Act (CEQA) requires that any project that causes a substantial adverse change in the significance of an historical resource, that includes archeological resources, is a 'significant effect' requiring the preparation of an Environmental Impact Report (EIR per the California Code of Regulations § 15064.5(b)(c) (CEQA Guidelines). In order to comply with this provision, the lead agency is required to assess whether the project will have an adverse impact on these resources within the 'area of potential effect (APE),' and if so, to mitigate that effect. To adequately assess the project-related impacts on historical resources, the Commission recommends the following action:

√ Contact the appropriate California Historic Resources Information Center (CHRIS). Contact information for the 'Information Center' nearest you is available from the State Office of Historic Preservation in Sacramento (916/653-7278). The record search will determine:

- If a part or the entire (APE) has been previously surveyed for cultural resources.
- If any known cultural resources have already been recorded in or adjacent to the APE.
- If the probability is low, moderate, or high that cultural resources are located in the APE.
- If a survey is required to determine whether previously unrecorded cultural resources are present.

√ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.

- The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for pubic disclosure.
- The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.

√ Contact the Native American Heritage Commission (NAHC) for:

* A Sacred Lands File (SLF) search of the project area and information on tribal contacts in the project vicinity who may have information on cultural resources in or near the APE. Please provide us site identification as follows: USGS 7.5-minute quadrangle citation with name, township, range and section. This will assist us with the SLF.

- Also, we recommend that you contact the Native American contacts on the attached list to get their input on the effect of potential project (e.g. APE) impact. In many cases a culturally-affiliated Native American tribe or person will be the only source of information about the existence of a cultural resource.

√ Lack of surface evidence of archeological resources does not preclude their subsurface existence.

- Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5 (f)of the California Code of Regulations (CEQA Guidelines). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
- Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.

√ Lead agencies should include provisions for discovery of Native American human remains or unmarked cemeteries in their mitigations plans.

- CEQA Guidelines §15064.5(d) requires the lead agency to work with the Native Americans identified by this Commission if the Initial Study identifies the presence or likely presence of Native American human remains within the APE. CEQA Guidelines provide for agreements with Native American groups, identified by the NAHE, to ensure the appropriate and dignified treatment of Native American human remains and any associated grave goods.
- Health and Safety Code §7050.5, Public Resources Code §5097.98 and CEQA Guidelines §15064.5(d) mandate procedures to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

√ Lead agencies should consider avoidance, as defined in CEQA Guidelines §15370 when significant cultural resources are discovered during the course of project planning or execution.

Please feel free to contact me at (916) 653-6251 if you have any questions.

Sincerely,

Dave Singleton
Program Analyst

Attachment: Native American Contact List.

Cc: State Clearinghouse

Native American Contacts
Los Angeles County
May 12, 2008

LA City/County Native American Indian Comm
Ron Andrade, Director
3175 West 6th Street, Rm. 403
Los Angeles , CA 90020
(213) 351-5324
(213) 386-3995 FAX

Gabrielino/Tongva Council / Gabrielino Tongva Nation
Sam Dunlap, Tribal Secretary
761 Terminal Street; Bldg 1, 2nd floor Gabrielino Tongva
Los Angeles , CA 90021
office @tongvatribe.net
(213) 489-5001 - Office
(909) 262-9351 - cell
(213) 489-5002 Fax

Ti'At Society
Cindi Alvitre
6515 E. Seaside Walk, #C Gabrielino
Long Beach , CA 90803
calvitre@yahoo.com
(714) 504-2468 Cell

Gabrielino Tongva Indians of California Tribal Council
Robert Dorame, Tribal Chair/Cultural Resources
5450 Slauson, Ave, Suite 151 PMB Gabrielino Tongva
Culver City , CA 90230
gtongva@verizon.net
562-761-6417 - voice
562-925-7989 - fax

Tongva Ancestral Territorial Tribal Nation
John Tommy Rosas, Tribal Admin.
, Gabrielino Tongva
tattnlaw@gmail.com
310-570-6567

Gabrieleno/Tongva San Gabriel Band of Mission
Anthony Morales, Chairperson
PO Box 693 Gabrielino Tongva
San Gabriel , CA 91778
ChiefRBwife@aol.com
(626) 286-1632
(626) 286-1758 - Home
(626) 286-1262 Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native American with regard to cultural resources for the proposed, Downey Studios Specific Plan; located in the City of Downey; Los Angeles County, California.

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 · www.aqmd.gov

May 9, 2008

RECEIVED
MAY 19 2008
PLANNING

Mr. Mark Sellheim
Principal Planner
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

Dear Mr. Sellheim:

Notice of Preparation of a Draft Environmental Impact Report (Draft EIR) for the Downey Studios Specific Plan

The South Coast Air Quality Management District (SCAQMD) appreciates the opportunity to comment on the above-mentioned document. The SCAQMD's comments are recommendations regarding the analysis of potential air quality impacts from the proposed project that should be included in the draft environmental impact report (EIR). Please send the SCAQMD a copy of the Draft EIR upon its completion. **In addition, please send with the draft EIR all appendices or technical documents related to the air quality analysis and electronic versions of all air quality modeling and health risk assessment files. Without all files and supporting air quality documentation, the SCAQMD will be unable to complete its review of the air quality analysis in a timely manner. Any delays in providing all supporting air quality documentation will require additional time for review beyond the end of the comment period.**

Air Quality Analysis

The SCAQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. The SCAQMD recommends that the Lead Agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from the SCAQMD's Subscription Services Department by calling (909) 396-3720. Alternatively, the lead agency may wish to consider using the California Air Resources Board (CARB) approved URBEMIS 2007 Model. This model is available on the SCAQMD Website at: www.urbemis.com.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project. Air quality impacts from both construction (including demolition, if any) and operations should be calculated. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, that is, sources that generate or attract vehicular trips should be included in the analysis.

The SCAQMD has developed a methodology for calculating PM2.5 emissions from construction and operational activities and processes. In connection with developing PM2.5 calculation methodologies, the SCAQMD has also developed both regional and localized significance thresholds. The SCAQMD requests that the lead agency quantify PM2.5 emissions and compare the results to the recommended PM2.5 significance thresholds. Guidance for calculating PM2.5 emissions and PM2.5 significance thresholds can be found at the following internet address: http://www.aqmd.gov/ceqa/handbook/PM2_5/PM2_5.html.

In addition to analyzing regional air quality impacts the SCAQMD recommends calculating localized air quality impacts and comparing the results to localized significance thresholds (LSTs). LST's can be used in addition to the recommended regional significance thresholds as a second indication of air quality impacts when preparing a CEQA document. Therefore, when preparing the air quality analysis for the proposed project, it is recommended that the lead agency perform a localized significance analysis by either using the LSTs developed by the SCAQMD or performing dispersion modeling as necessary. Guidance for performing a localized air quality analysis can be found at http://www.aqmd.gov/ceqa/handbook/LST/LST.html.

It is recommended that lead agencies for projects generating or attracting vehicular trips, especially heavy-duty diesel-fueled vehicles, perform a mobile source health risk assessment. Guidance for performing a mobile source health risk assessment ("Health Risk Assessment Guidance for Analyzing Cancer Risk from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis") can be found on the SCAQMD's CEQA web pages at the following internet address: http://www.aqmd.gov/ceqa/handbook/mobile_toxic/mobile_toxic.html. An analysis of all toxic air contaminant impacts due to the decommissioning or use of equipment potentially generating such air pollutants should also be included.

Mitigation Measures

In the event that the project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures that go beyond what is required by law be utilized during project construction and operation to minimize or eliminate significant adverse air quality impacts. To assist the Lead Agency with identifying possible mitigation measures for the project, please refer to Chapter 11 of the SCAQMD CEQA Air Quality Handbook for sample air quality mitigation measures. Additional mitigation measures can be found on the SCAQMD's CEQA web pages at the following internet address: www.aqmd.gov/ceqa/handbook/mitigation/MM_intro.html Additionally, SCAQMD's Rule 403 – Fugitive Dust, and the Implementation Handbook contain numerous measures for controlling construction-related emissions that should be considered for use as CEQA mitigation if not otherwise required. Other measures to reduce air quality impacts from land use projects can be found in the SCAQMD's Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning. This document can be found at the following internet address: http://www.aqmd.gov/prdas/aqguide/aqguide.html. In addition, guidance on sitting incompatible land uses can be found in the California Air Resources Board's Air Quality and Land Use Handbook: A Community Perspective, which can be found at the following internet address: http://www.arb.ca.gov/ch/handbook.pdf. Pursuant to state CEQA Guidelines §15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed.

Data Sources

SCAQMD rules and relevant air quality reports and data are available by calling the SCAQMD's Public Information Center at (909) 396-2039. Much of the information available through the Public Information Center is also available via the SCAQMD's World Wide Web Homepage (http://www.aqmd.gov).

The SCAQMD is willing to work with the Lead Agency to ensure that project-related emissions are accurately identified, categorized, and evaluated. Please call Gordon Mize, Ph.D., Air Quality Specialist, CEQA Section, at (909) 396-3302 if you have any questions regarding this letter.

Sincerely,

Steve Smith, Ph.D.
Program Supervisor, CEQA Section
Planning, Rule Development and Area Sources

SS:CB:AK
LAC080508-05AK
Control Number

STATE OF CALIFORNIA
ARNOLD SCHWARZENEGGER, *Governor*
PUBLIC UTILITIES COMMISSION
320 WEST 4TH STREET, SUITE 500
LOS ANGELES, CA 90013

May 29, 2008

Mark Sellheim
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

RECEIVED
JUN 0 2 2008
PLANNING

Dear Mr. Sellheim:

Re: SCH# 2008051022; Downey Studios Specific Plan

The California Public Utilities Commission (Commission) has jurisdiction over the safety of highway-rail crossings (crossings) in California. The California Public Utilities Code requires Commission approval for the construction or alteration of crossings and grants the Commission exclusive power on the design, alteration, and closure of crossings.

The Commission is in receipt of the *Notice of Completion & Environmental Document Transmittal-NOP* from the State Clearinghouse. Commission staff is concerned that proposed project at Lakewood Boulevard and Imperial Highway (lat= 33.916868, long=-118.137531) may increase congestion at the Lakewood Boulevard (DOT# 748105H), Woodruff Avenue (DOT# 748107W), and Stewart & Gray Road (DOT# 748108D) crossings. This includes considering pedestrian circulation patterns/destinations with respect to railroad Union Pacific Railroad Company right-of-way.

Mitigation measures to consider include, but are not limited to, the planning for grade separations for major thoroughfares, improvements to existing at-grade highway-rail crossings due to increase in traffic volumes and continuous vandal resistant fencing or other appropriate barriers to limit the access of trespassers onto the railroad right-of-way.

If you have any questions, please contact Varouj Jinbachian, Senior Utilities Engineer at 213-576-7081, vsj@cpuc.ca.gov, or me at rxm@cpuc.ca.gov, 213-576-7078.

Sincerely,

Rosa Muñoz, PE
Utilities Engineer
Rail Crossings Engineering Section
Consumer Protection & Safety Division

C: Dan Miller, UP

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Executive Office

June 2, 2008

Via E-mail and Fed-Ex

Mark Sellheim
Principal Planner
City of Downey
11111 Brookshire Avenue
Downey, California 90241

Dear Mr. Sellheim:

Notice of Preparation of an
Draft Environmental Impact Report (DEIR) for the Downey Studios Specific Plan

The Metropolitan Water District of Southern California (Metropolitan) has received a copy of the Notice of Preparation of an Environmental Impact Report for the Downey Studios Specific Plan (Project). The city of Downey is acting as the Lead Agency under the California Environmental Quality Act (CEQA) for this Project. The Project proposes an amendment to the existing Downey Landing Specific Plan and the General Plan to promote development of mixed-use communities consisting of residential housing, retail, entertainment, and open space. The Project would also include demolishing on-site structures, constructing internal street network, and sewer, water, and storm drain infrastructures. The proposed Project is located at Lakewood Boulevard, at the southeast corner of Imperial Highway and Bellflower Boulevard in the city of Downey within Los Angeles County. This letter contains Metropolitan's response to the NOP as a potentially affected public agency.

Our review of the Notice indicates that Metropolitan owns and operates a facility adjacent to the boundaries of the proposed project location. Metropolitan's Lower Feeder, a 77-inch steel pipeline runs in a north-westerly to south-easterly direction along Stewart and Gray Road, Bellflower Boulevard, and Washburn Road, is located adjacent to the proposed Project. Metropolitan is concerned with potential impacts to this facility associated with future excavation, construction, utilities or any redevelopment that may occur as a result of activity under the proposed Project. Development and redevelopment associated with the proposed Project must not restrict any of Metropolitan's day-to-day operations and/or its access to facilities.

In order to avoid potential conflicts with Metropolitan's rights-of-way, we request that any design plans for any activity in the area of Metropolitan's pipelines or other facilities be submitted for our review and written approval. Metropolitan must also be allowed to maintain its rights-of-way and access to all of its facilities at all times in order to repair and maintain the current condition of those facilities.

Detailed prints of drawings of Metropolitan's pipelines and rights-of-way may be obtained by calling Metropolitan's Substructures Information Line at (213) 217-6564. To assist in preparing plans that are compatible with Metropolitan's facilities and easements, we have enclosed a copy of the "Guidelines for Developments in the Area of Facilities, Fee Properties, and/or Easements of The Metropolitan Water District of Southern California." Please note that all submitted designs or plans must clearly identify Metropolitan's facilities and rights-of-way.

Page 5 of the NOP states: *"environmental remediation would continue for at least a portion of the period of implementation of the proposed Specific Plan."* Further details need to be provided regarding this, as we would want to ensure that the implementation of the property use changes identified in the Specific Plan do not inhibit the remediation progress, should there be any contamination at this site that could have potential water quality impacts to nearby water supply infrastructure. The DEIR should elaborate on the site's hazardous waste history; including the uses causing the contamination, the contaminants of concern, any resulting impacts, and remediation progress.

We appreciate the opportunity to provide input to your planning process and we look forward to receiving future environmental documentation and the DEIR on this Project. If we can be of further assistance, please contact Ms. Brenda S. Marines at (213) 217-7902.

Very truly yours,

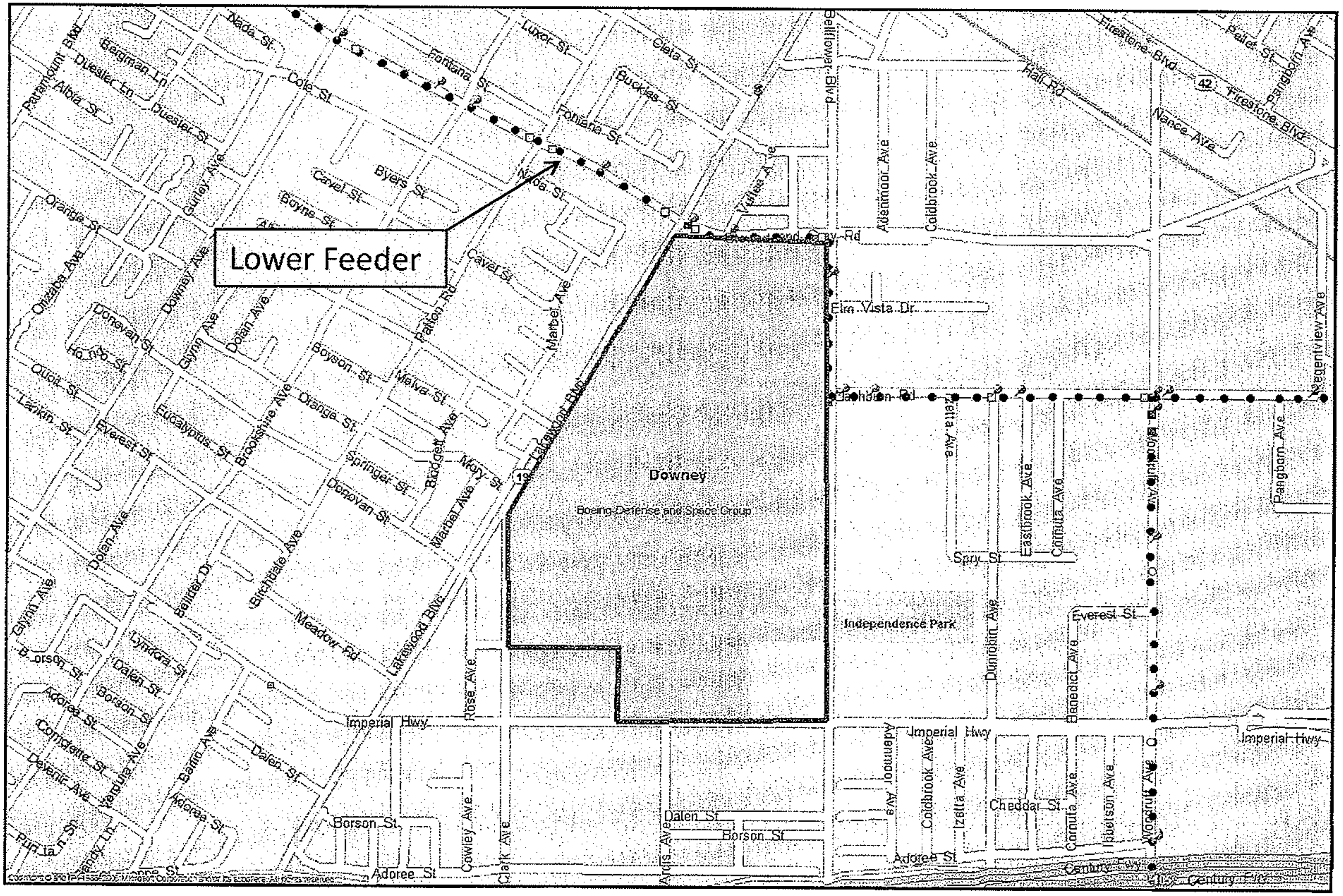
David Clark
for

Delaine W. Shane
Manager, Environmental Planning Team

BSM/bsm
(Public Folders/EPU/Letters/27-MAY-08A.doc – Mark Sellheim, Downey Studios Specific Plan)

Enclosures: Map
Planning Guidelines

The Metropolitan Water District of Southern California Facilities and the North Downey Studios Specific Plan Project



Metropolitan Water District of Southern California.

June 2008

Guidelines for Developments in the Area of Facilities, Fee Properties, and/or Easements of The Metropolitan Water District of Southern California

1. Introduction

a. The following general guidelines should be followed for the design of proposed facilities and developments in the area of Metropolitan's facilities, fee properties, and/or easements.

b. We require that 3 copies of your tentative and final record maps, grading, paving, street improvement, landscape, storm drain, and utility plans be submitted for our review and written approval as they pertain to Metropolitan's facilities, fee properties and/or easements, prior to the commencement of any construction work.

2. Plans, Parcel and Tract Maps

The following are Metropolitan's requirements for the identification of its facilities, fee properties, and/or easements on your plans, parcel maps and tract maps:

a. Metropolitan's fee properties and/or easements and its pipelines and other facilities must be fully shown and identified as Metropolitan's on all applicable plans.

b. Metropolitan's fee properties and/or easements must be shown and identified as Metropolitan's with the official recording data on all applicable parcel and tract maps.

c. Metropolitan's fee properties and/or easements and existing survey monuments must be dimensionally tied to the parcel or tract boundaries.

d. Metropolitan's records of surveys must be referenced on the parcel and tract maps.

3. Maintenance of Access Along Metropolitan's Rights-of-Way

a. Proposed cut or fill slopes exceeding 10 percent are normally not allowed within Metropolitan's fee properties or easements. This is required to facilitate the use of construction and maintenance equipment, and provide access to its aboveground and belowground facilities.

b. We require that 16-foot-wide commercial-type driveway approaches be constructed on both sides of all streets crossing Metropolitan's rights-of-way. Openings are required in any median island. Access ramps, if necessary, must be at least 16-feet-wide. Grades of ramps are normally not allowed to exceed 10 percent. If the slope of an access ramp must exceed 10 percent due to the topography, the ramp must be paved. We require a 40-foot-long level area on the driveway approach to access ramps where the ramp meets the street. At Metropolitan's fee properties, we may require fences and gates.

c. The terms of Metropolitan's permanent easement deeds normally preclude the building or maintenance of structures of any nature or kind within its easements, to ensure safety and avoid interference with operation and maintenance of Metropolitan's pipelines or other facilities. Metropolitan must have vehicular access along the easements at all times for inspection, patrolling, and for maintenance of the pipelines and other facilities on a routine basis. We require a 20-foot-wide clear zone around all above-ground facilities for this routine access. This clear zone should slope away from our facility on a grade not to exceed 2 percent. We must also have access along the easements with construction equipment. An example of this is shown on Figure 1.

d. The footings of any proposed buildings adjacent to Metropolitan's fee properties and/or easements must not encroach into the fee property or easement or impose additional loading on Metropolitan's pipelines or other facilities therein. A typical situation is shown on Figure 2. Prints of the detail plans of the footings for any building or structure adjacent to the fee property or easement must be submitted for our review and written approval as they pertain to the pipeline or other facilities therein. Also, roof eaves of buildings adjacent to the easement or fee property must not overhang into the fee property or easement area.

e. Metropolitan's pipelines and other facilities, e.g. structures, manholes, equipment, survey monuments, etc. within its fee properties and/or easements must be protected from damage by the easement holder on Metropolitan's property or the property owner where Metropolitan has an easement, at no expense to Metropolitan. If the facility is a cathodic protection station it shall be located prior to any grading or excavation. The exact location, description and way of protection shall be shown on the related plans for the easement area.

4. Easements on Metropolitan's Property

a. We encourage the use of Metropolitan's fee rights-of-way by governmental agencies for public street and utility purposes, provided that such use does not interfere with Metropolitan's use of the property, the entire width of the property is accepted into the agency's public street system and fair market value is paid for such use of the right-of-way.

b. Please contact the Director of Metropolitan's Right of Way and Land Division, telephone (213) 250-6302, concerning easements for landscaping, street, storm drain, sewer, water or other public facilities proposed within Metropolitan's fee properties. A map and legal description of the requested easements must be submitted. Also, written evidence must be submitted that shows the city or county will accept the easement for the specific purposes into its public system. The grant of the easement will be subject to Metropolitan's rights to use its land for water pipelines and related purposes to the same extent as if such grant had not been made. There will be a charge for the easement. Please note that, if entry is required on the property prior to issuance of the easement, an entry permit must be obtained. There will also be a charge for the entry permit.

5. Landscaping

Metropolitan's landscape guidelines for its fee properties and/or easements are as follows:

a. A green belt may be allowed within Metropolitan's fee property or easement.

b. All landscape plans shall show the location and size of Metropolitan's fee property and/or easement and the location and size of Metropolitan's pipeline or other facilities therein.

c. Absolutely no trees will be allowed within 15 feet of the centerline of Metropolitan's existing or future pipelines and facilities.

d. Deep-rooted trees are prohibited within Metropolitan's fee properties and/or easements. Shallow-rooted trees are the only trees allowed. The shallow-rooted trees will not be permitted any closer than 15 feet from the centerline of the pipeline, and such trees shall not be taller than 25 feet with a root spread no greater than 20 feet in diameter at maturity. Shrubs, bushes, vines, and ground cover are permitted, but larger shrubs and bushes should not be planted directly over our pipeline. Turf is acceptable. We require submittal of landscape plans for Metropolitan's prior review and written approval. (See Figure 3).

e. The landscape plans must contain provisions for Metropolitan's vehicular access at all times along its rights-of-way to its pipelines or facilities therein. Gates capable of accepting Metropolitan's locks are required in any fences across its rights-of-way. Also, any walks or drainage facilities across its access route must be constructed to AASHTO H-20 loading standards.

f. Rights to landscape any of Metropolitan's fee properties must be acquired from its Right of Way and Land Division. Appropriate entry permits must be obtained prior to any entry on its property. There will be a charge for any entry permit or easements required.

6. <u>Fencing</u>

Metropolitan requires that perimeter fencing of its fee properties and facilities be constructed of universal chain link, 6 feet in height and topped with 3 strands of barbed wire angled upward and outward at a 45 degree angle or an approved equal for a total fence height of 7 feet. Suitable substitute fencing may be considered by Metropolitan. (Please see Figure 5 for details).

7. <u>Utilities in Metropolitan's Fee Properties and/or Easements or Adjacent to Its Pipeline in Public Streets</u>

Metropolitan's policy for the alinement of utilities permitted within its fee properties and/or easements and street rights-of-way is as follows:

a. Permanent structures, including catch basins, manholes, power poles, telephone riser boxes, etc., shall not be located within its fee properties and/or easements.

b. We request that permanent utility structures within public streets, in which Metropolitan's facilities are constructed under the Metropolitan Water District Act, be placed as far from our pipeline as possible, but not closer than 5 feet from the outside of our pipeline.

c. The installation of utilities over or under Metropolitan's pipeline(s) must be in accordance with the requirements shown on the enclosed prints of Drawings Nos. C-11632 and C-9547. Whenever possible we request a minimum of one foot clearance between Metropolitan's pipe and your facility. Temporary support of Metropolitan's pipe may also be required at undercrossings of its pipe in an open trench. The temporary support plans must be reviewed and approved by Metropolitan.

d. Lateral utility crossings of Metropolitan's pipelines must be as perpendicular to its pipeline alinement as practical. Prior to any excavation our pipeline shall be located manually and any excavation within two feet of our pipeline must be done by hand. This shall be noted on the appropriate drawings.

e. Utilities constructed longitudinally within Metropolitan's rights-of-way must be located outside the theoretical trench prism for uncovering its pipeline and must be located parallel to and as close to its rights-of-way lines as practical.

f. When piping is jacked or installed in jacked casing or tunnel under Metropolitan's pipe, there must be at least two feet of vertical clearance between the bottom of Metropolitan's pipe and the top of the jacked pipe, jacked casing or tunnel. We also require that detail drawings of the shoring for the jacking or tunneling pits be submitted for our review and approval. Provisions must be made to grout any voids around the exterior of the jacked pipe, jacked casing or tunnel. If the piping is installed in a jacked casing or tunnel the annular space between the piping and the jacked casing or tunnel must be filled with grout.

g. Overhead electrical and telephone line requirements:

1) Conductor clearances are to conform to the California State Public Utilities Commission, General Order 95, for Overhead Electrical Line Construction or at a greater clearance if required by Metropolitan. Under no circumstances shall clearance be less than 35 feet.

2) A marker must be attached to the power pole showing the ground clearance and line voltage, to help prevent damage to your facilities during maintenance or other work being done in the area.

3) Line clearance over Metropolitan's fee properties and/or easements shall be shown on the drawing to indicate the lowest point of the line under the most adverse conditions including consideration of sag, wind load, temperature change, and support type. We require that overhead lines be located at least 30 feet laterally away from all above-ground structures on the pipelines.

4) When underground electrical conduits, 120 volts or greater, are installed within Metropolitan's fee property and/or easement, the conduits must be incased in a minimum of three inches of red concrete. Where possible, above ground warning signs must also be placed at the right-of-way lines where the conduits enter and exit the right-of-way.

h. The construction of sewerlines in Metropolitan's fee properties and/or easements must conform to the California Department of Health Services Criteria for the Separation of Water Mains and Sanitary Services and the local City or County Health Code Ordinance as it relates to installation of sewers in the vicinity of pressure waterlines. The construction of sewerlines should also conform to these standards in street rights-of- way.

i. Cross sections shall be provided for all pipeline crossings showing Metropolitan's fee property and/or easement limits and the location of our pipeline(s). The exact locations of the crossing pipelines and their elevations shall be marked on as-built drawings for our information.

j. Potholing of Metropolitan's pipeline is required if the vertical clearance between a utility and Metropolitan's pipeline is indicated on the plan to be one foot or less. If the indicated clearance is between one and two feet, potholing is suggested. Metropolitan will provide a representative to assists others in locating and identifying its pipeline. Two-working days notice is requested.

k. Adequate shoring and bracing is required for the full depth of the trench when the excavation encroaches within the zone shown on Figure 4.

l. The location of utilities within Metropolitan's fee property and/or easement shall be plainly marked to help prevent damage during maintenance or other work done in the area. Detectable tape over buried utilities should be placed a minimum of 12 inches above the utility and shall conform to the following requirements:

1) Water pipeline: A two-inch blue warning tape shall be imprinted with:

"CAUTION BURIED WATER PIPELINE"

2) Gas, oil, or chemical pipeline: A two-inch yellow warning tape shall be imprinted with:

"CAUTION BURIED _____ PIPELINE"

3) Sewer or storm drain pipeline: A two-inch green warning tape shall be imprinted with:

"CAUTION BURIED _____ PIPELINE"

4) Electric, street lighting, or traffic signals conduit: A two-inch red warning tape shall be imprinted with:

"CAUTION BURIED _____ CONDUIT"

5) Telephone, or television conduit: A two-inch orange warning tape shall be imprinted with:

"CAUTION BURIED _____ CONDUIT"

m. Cathodic Protection requirements:

1) If there is a cathodic protection station for Metropolitan's pipeline in the area of the proposed work, it shall be located prior to any grading or excavation. The exact location, description and manner of protection shall be shown on all applicable plans. Please contact Metropolitan's Corrosion Engineering Section, located at Metropolitan's F. E. Weymouth Softening and Filtration Plant, 700 North Moreno Avenue, La Verne, California 91750, telephone (714) 593-7474, for the locations of Metropolitan's cathodic protection stations.

2) If an induced-current cathodic protection system is to be installed on any pipeline crossing Metropolitan's pipeline, please contact Mr. Wayne E. Risner at (714) 593-7474 or (213) 250-5085. He will review the proposed system and determine if any conflicts will arise with the existing cathodic protection systems installed by Metropolitan.

3) Within Metropolitan's rights-of-way, pipelines and carrier pipes (casings) shall be coated with an approved protective coating to conform to Metropolitan's requirements, and shall be maintained in a neat and orderly condition as directed by Metropolitan. The application and monitoring of cathodic protection on the pipeline and casing shall conform to Title 49 of the Code of Federal Regulations, Part 195.

4) If a steel carrier pipe (casing) is used:

(a) Cathodic protection shall be provided by use of a sacrificial magnesium anode (a sketch showing the cathodic protection details can be provided for the designers information).

(b) The steel carrier pipe shall be protected with a coal tar enamel coating inside and out in accordance with AWWA C203 specification.

n. All trenches shall be excavated to comply with the CAL/OSHA Construction Safety Orders, Article 6, beginning with Sections 1539 through 1547. Trench backfill shall be placed in 8-inch lifts and shall be compacted to 95 percent relative compaction (ASTM D698) across roadways and through protective dikes. Trench backfill elsewhere will be compacted to 90 percent relative compaction (ASTM D698).

o. Control cables connected with the operation of Metropolitan's system are buried within streets, its fee properties and/or easements. The locations and elevations of these cables shall be shown on the drawings. The drawings shall note that prior to any excavation in the area, the control cables shall be located and measures shall be taken by the contractor to protect the cables in place.

p. Metropolitan is a member of Underground Service Alert (USA). The contractor (excavator) shall contact USA at 1-800-422-4133 (Southern California) at least 48 hours prior to starting any excavation work. The contractor will be liable for any damage to Metropolitan's facilities as a result of the construction.

8. Paramount Right

Facilities constructed within Metropolitan's fee properties and/or easements shall be subject to the paramount right of Metropolitan to use its fee properties and/or easements for the purpose for which they were acquired. If at any time Metropolitan or its assigns should, in the exercise of their rights, find it necessary to remove any of the facilities from the fee properties and/or easements, such removal and replacement shall be at the expense of the owner of the facility.

9. Modification of Metropolitan's Facilities

When a manhole or other of Metropolitan's facilities must be modified to accommodate your construction or reconstruction, Metropolitan will modify the facilities with its forces. This should be noted on the construction plans. The estimated cost to perform this modification will be given to you and we will require a deposit for this amount before the work is performed. Once the deposit is received, we will schedule the work. Our forces will coordinate the work with your contractor. Our final billing will be based on actual cost incurred, and will include materials, construction, engineering plan review, inspection, and administrative overhead charges calculated in accordance with Metropolitan's standard accounting practices. If the cost is less than the deposit, a refund will be made; however, if the cost exceeds the deposit, an invoice will be forwarded for payment of the additional amount.

10. Drainage

a. Residential or commercial development typically increases and concentrates the peak storm water runoff as well as the total yearly storm runoff from an area, thereby increasing the requirements for storm drain facilities downstream of the development. Also, throughout the year water from landscape irrigation, car washing, and other outdoor domestic water uses flows into the storm drainage system resulting in weed abatement, insect infestation, obstructed access and other problems. Therefore, it is Metropolitan's usual practice not to approve plans that show discharge of drainage from developments onto its fee properties and/or easements.

b. If water must be carried across or discharged onto Metropolitan's fee properties and/or easements, Metropolitan will insist that plans for development provide that it be carried by closed conduit or lined open channel approved in writing by Metropolitan. Also the drainage facilities must be maintained by others, e.g., city, county, homeowners association, etc. If the development proposes changes to existing drainage features, then the developer shall make provisions to provide for replacement and these changes must be approved by Metropolitan in writing.

11. Construction Coordination

During construction, Metropolitan's field representative will make periodic inspections. We request that a stipulation be added to the plans or specifications for notification of Mr. _____ of Metropolitan's Operations Services Branch, telephone (213) 250-____, at least two working days prior to any work in the vicinity of our facilities.

12. Pipeline Loading Restrictions

a. Metropolitan's pipelines and conduits vary in structural strength, and some are not adequate for AASHTO H-20 loading. Therefore, specific loads over the specific sections of pipe or conduit must be reviewed and approved by Metropolitan. However, Metropolitan's pipelines are typically adequate for AASHTO H-20 loading provided that the cover over the pipeline is not less than four feet or the cover is not substantially increased. If the temporary cover over the pipeline during construction is between three and four feet, equipment must restricted to that which

imposes loads no greater than AASHTO H-10. If the cover is between two and three feet, equipment must be restricted to that of a Caterpillar D-4 tract-type tractor. If the cover is less than two feet, only hand equipment may be used. Also, if the contractor plans to use any equipment over Metropolitan's pipeline which will impose loads greater than AASHTO H-20, it will be necessary to submit the specifications of such equipment for our review and approval at least one week prior to its use. More restrictive requirements may apply to the loading guideline over the San Diego Pipelines 1 and 2, portions of the Orange County Feeder, and the Colorado River Aqueduct. Please contact us for loading restrictions on all of Metropolitan's pipelines and conduits.

b. The existing cover over the pipeline shall be maintained unless Metropolitan determines that proposed changes do not pose a hazard to the integrity of the pipeline or an impediment to its maintenance.

13. <u>Blasting</u>

a. At least 20 days prior to the start of any drilling for rock excavation blasting, or any blasting, in the vicinity of Metropolitan's facilities, a two-part preliminary conceptual plan shall be submitted to Metropolitan as follows:

2) In order to ensure compliance with the regulations implementing CEQA where Metropolitan is not the Lead Agency, the following minimum procedures to ensure compliance with the Act have been established:

a) Metropolitan shall be timely advised of any determination that a Categorical Exemption applies to the project. The Lead Agency is to advise Metropolitan that it and other agencies participating in the project have complied with the requirements of CEQA prior to Metropolitan's participation.

b) Metropolitan is to be consulted during the preparation of the Negative Declaration or EIR.

c) Metropolitan is to review and submit any necessary comments on the Negative Declaration or draft EIR.

d) Metropolitan is to be indemnified for any costs or liability arising out of any violation of any laws or regulations including but not limited to the California Environmental Quality Act and its implementing regulations.

b. <u>When Environmental Documents Have Been Prepared</u>

If environmental documents have been prepared for your project, please furnish us a copy for our review and files in a timely manner so that we may have sufficient time to review and comment. The following steps must also be accomplished:

1) The Lead Agency is to advise Metropolitan that it and other agencies participating in the project have complied with the requirements of CEQA prior to Metropolitan's participation.

2) You must agree to indemnify Metropolitan, its officers, engineers, and agents for any costs or liability arising out of any violation of any laws or regulations including but not limited to the California Environmental Quality Act and its implementing regulations.

15. <u>Metropolitan's Plan-Review Cost</u>

a. An engineering review of your proposed facilities and developments and the preparation of a letter response

giving Metropolitan's comments, requirements and/or approval that will require 8 man-hours or less of effort is typically performed at no cost to the developer, unless a facility must be modified where Metropolitan has superior rights. If an engineering review and letter response requires more than 8 man-hours of effort by Metropolitan to determine if the proposed facility or development is compatible with its facilities, or if modifications to Metropolitan's manhole(s) or other facilities will be required, then all of Metropolitan's costs associated with the project must be paid by the developer, unless the developer has superior rights.

b. A deposit of funds will be required from the developer before Metropolitan can begin its detailed engineering plan review that will exceed 8 hours. The amount of the required deposit will be determined after a cursory review of the plans for the proposed development.

c. Metropolitan's final billing will be based on actual cost incurred, and will include engineering plan review, inspection, materials, construction, and administrative overhead charges calculated in accordance with Metropolitan's standard accounting practices. If the cost is less than the deposit, a refund will be made; however, if the cost exceeds the deposit, an invoice will be forwarded for payment of the additional amount. Additional deposits may be required if the cost of Metropolitan's review exceeds the amount of the initial deposit.

16. <u>Caution</u>

We advise you that Metropolitan's plan reviews and responses are based upon information available to Metropolitan which was prepared by or on behalf of Metropolitan for general record purposes only. Such information may not be sufficiently detailed or accurate for your purposes. No warranty of any kind, either express or implied, is attached to the information therein conveyed as to its accuracy, and no inference should be drawn from Metropolitan's failure to comment on any aspect of your project. You are therefore cautioned to make such surveys and other field investigations as you may deem prudent to assure yourself that any plans for your project are correct.

17. Additional Information

Should you require additional information, please contact:

Civil Engineering Substructures Section
Metropolitan Water District
of Southern California
P.O. Box 54153
Los Angeles, California 90054-0153
(213) 217-6000

JEH/MRW/lk

Rev. January 22, 1989

Encl.

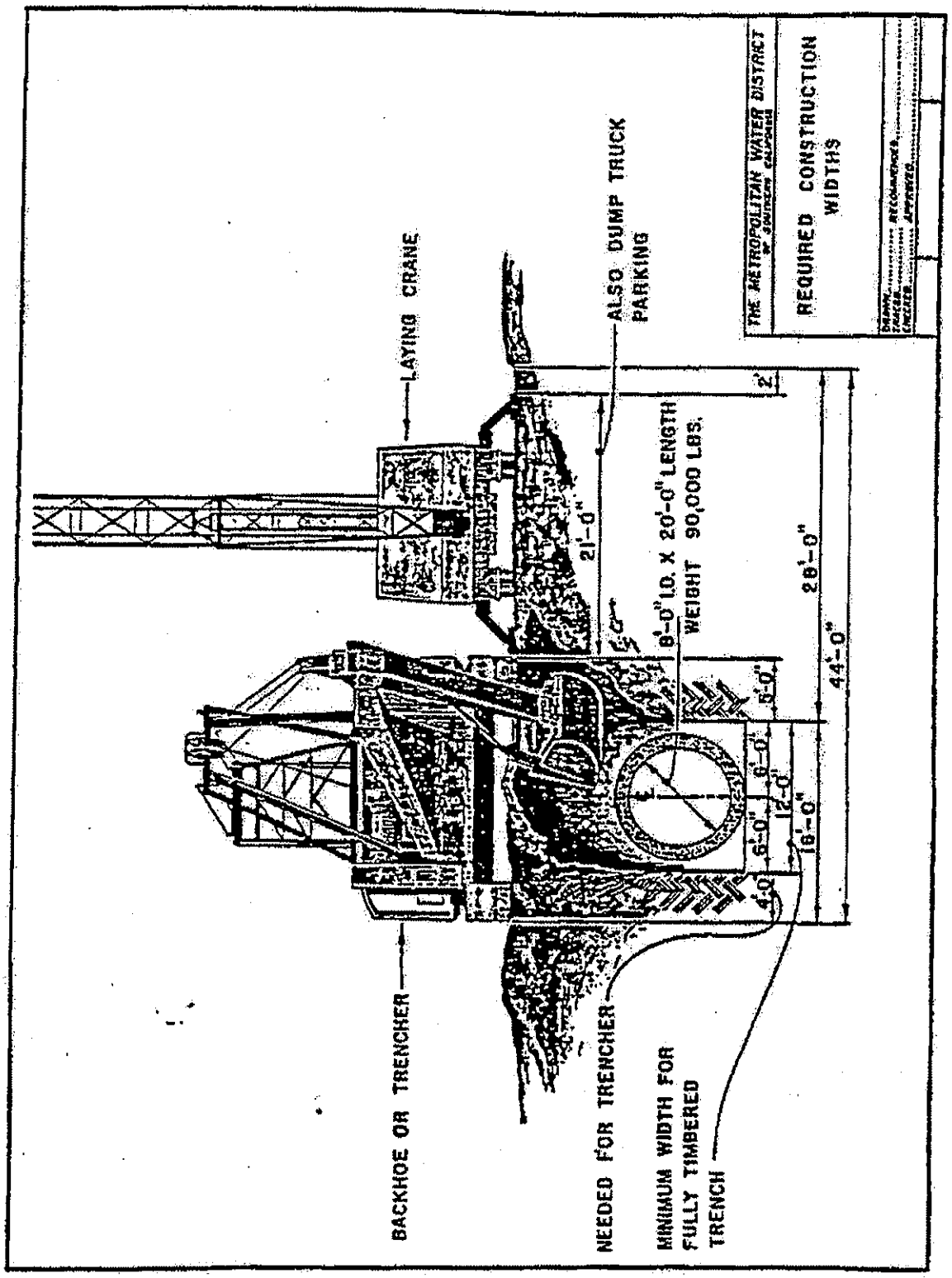
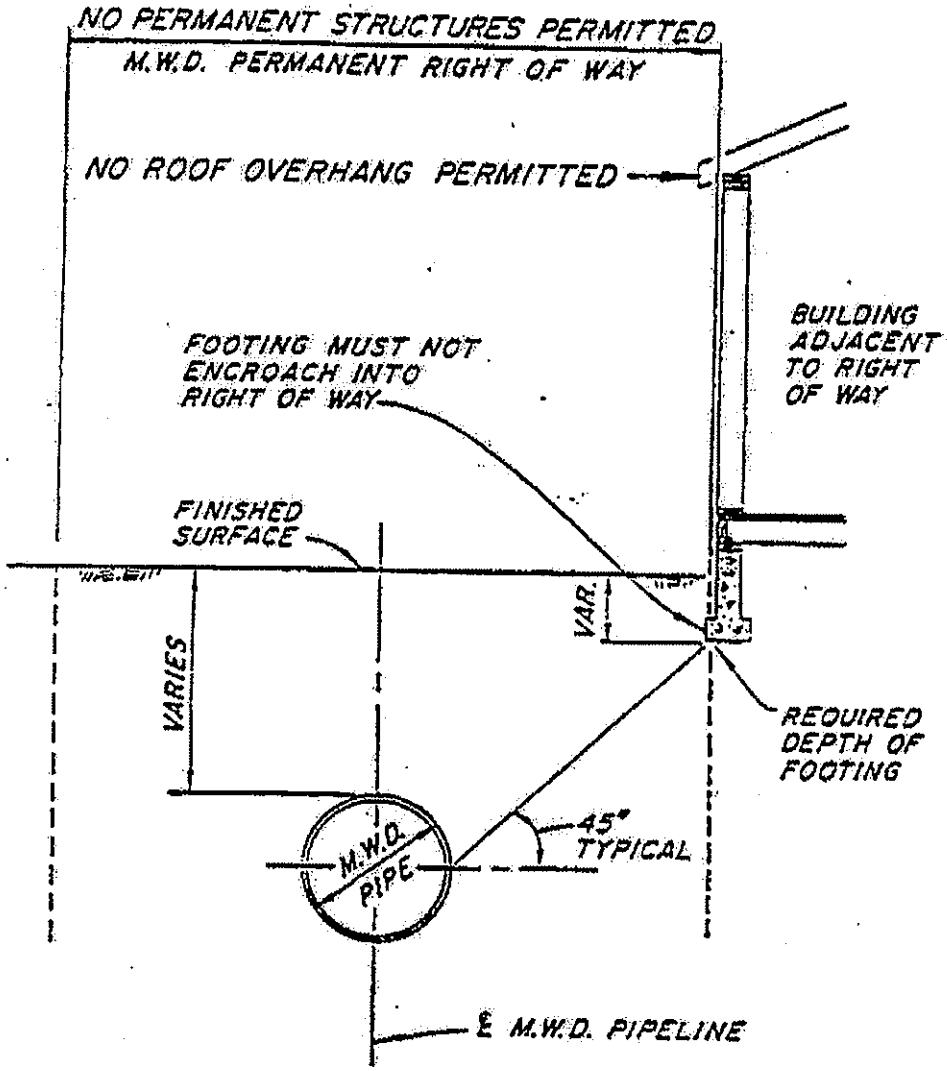

LAYING CRANE
ALSO DUMP TRUCK PARKING
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
REQUIRED CONSTRUCTION WIDTHS
DRAWN
TRACED
CHECKED
RECOMMENDED
APPROVED
2'
21'-0"
8'-0" I.D. X 20'-0" LENGTH
WEIGHT 90,000 LBS.
28'-0"
44'-0"
5'-0"
6'-0"
12'-0"
16'-0"
6'-0"
4'-0"
BACKHOE OR TRENCHER
NEEDED FOR TRENCHER
MINIMUM WIDTH FOR FULLY TIMBERED TRENCH

FIGURE 1



NOTE: M.W.D. PIPELINE SIZE, DEPTH, LOCATION AND WIDTH OF PERMANENT RIGHT OF WAY VARIES.

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

REQUIREMENTS FOR BUILDINGS AND FOOTINGS ADJACENT TO M.W.D. RIGHT OF WAY

DRAWN
TRACED
CHECKED
RECOMMENDED
APPROVED

FIGURE 2

11-87 SKETCHCHECK-POST CLEARPRINT 1000

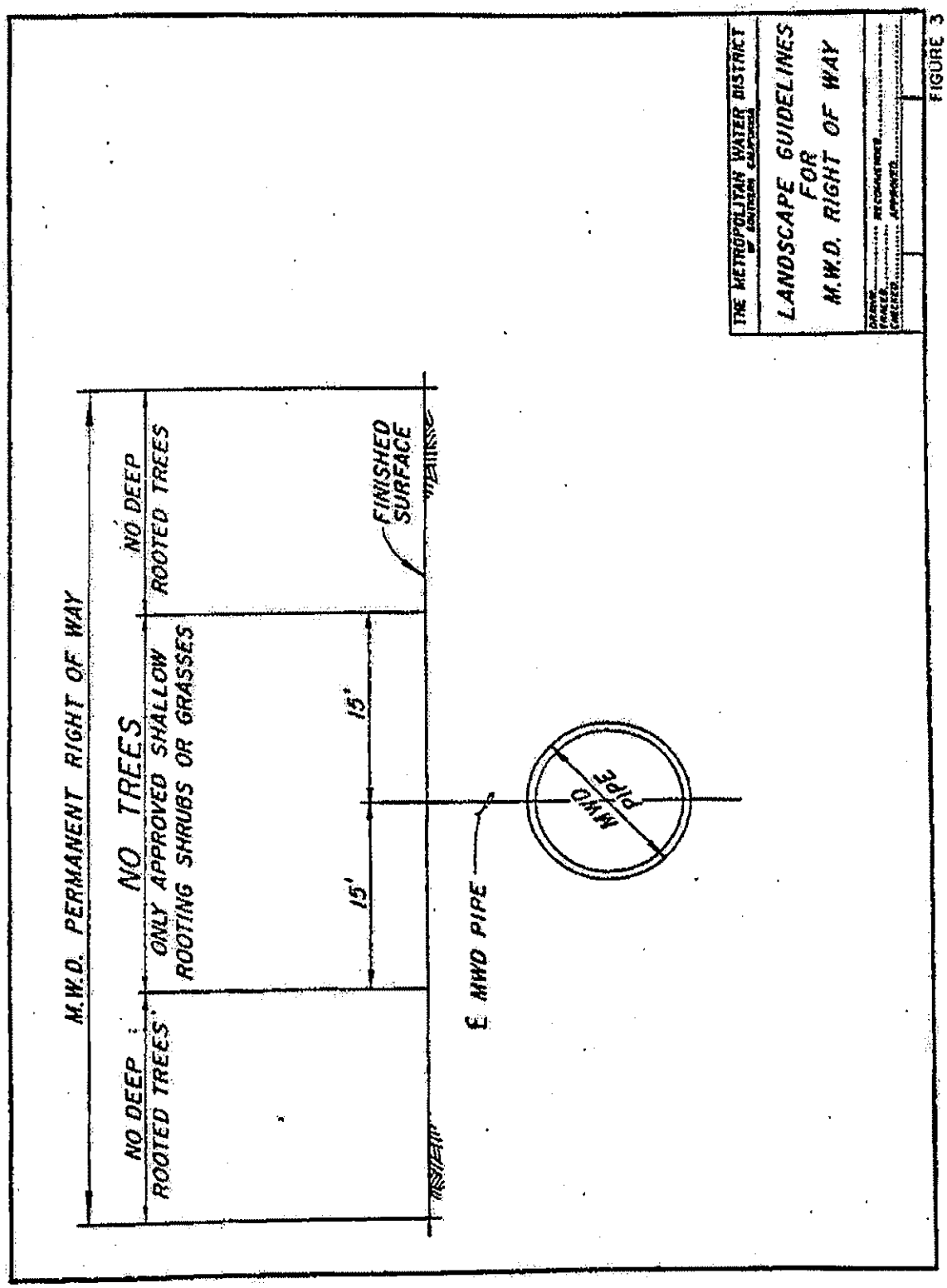
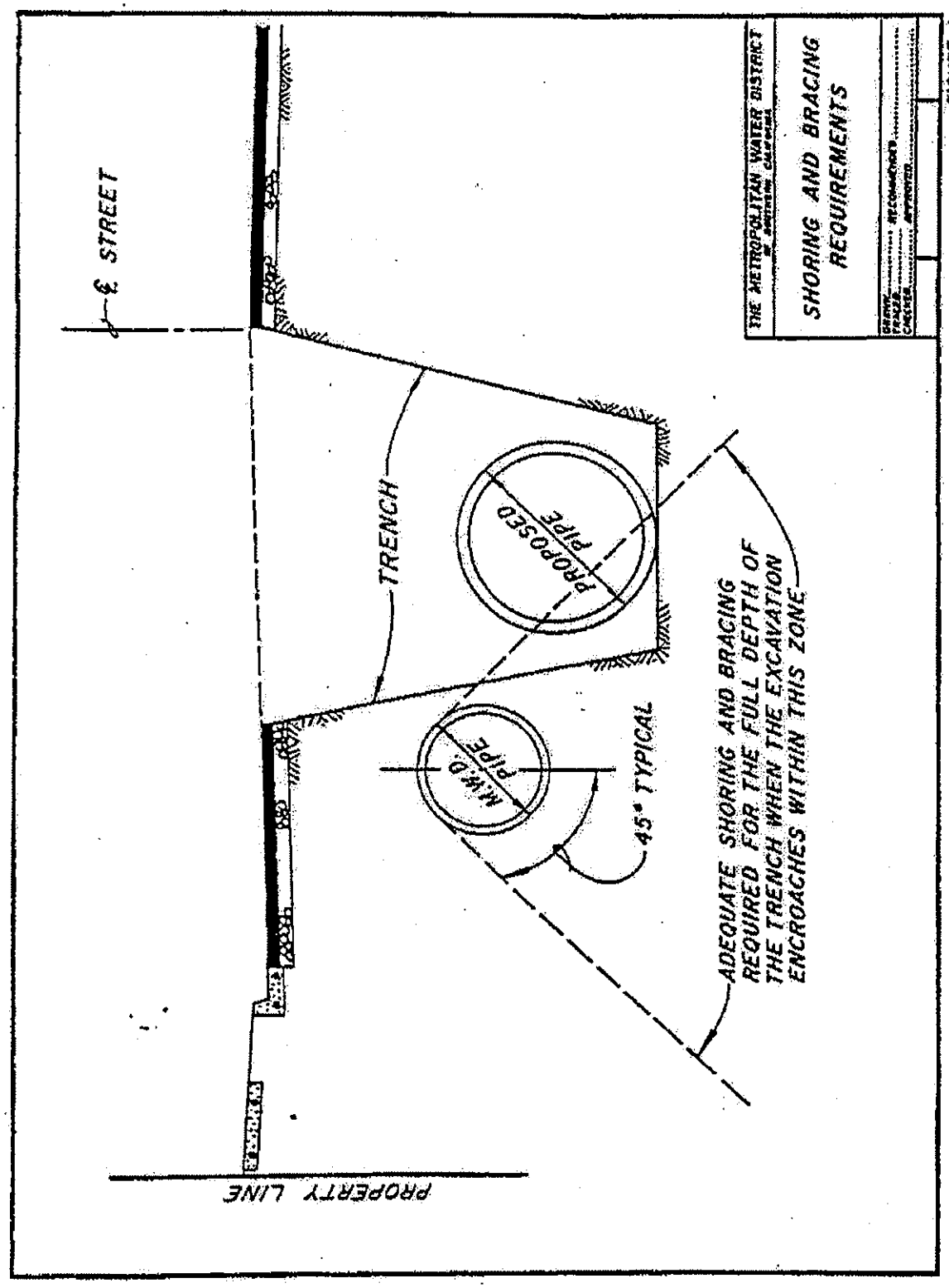

M.W.D. PERMANENT RIGHT OF WAY
NO DEEP
ROOTED TREES
NO TREES
ONLY APPROVED SHALLOW
ROOTING SHRUBS OR GRASSES
NO DEEP
ROOTED TREES
15'
15'
FINISHED
SURFACE
℄ MWD PIPE
MWD
PIPE
THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
LANDSCAPE GUIDELINES
FOR
M.W.D. RIGHT OF WAY
DRAWN
TRACED
CHECKED
RECOMMENDED
APPROVED

FIGURE 3


℄ STREET
TRENCH
PROPOSED PIPE
M.W.D. PIPE
45° TYPICAL
ADEQUATE SHORING AND BRACING REQUIRED FOR THE FULL DEPTH OF THE TRENCH WHEN THE EXCAVATION ENCROACHES WITHIN THIS ZONE
PROPERTY LINE
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
SHORING AND BRACING REQUIREMENTS
FIGURE 4

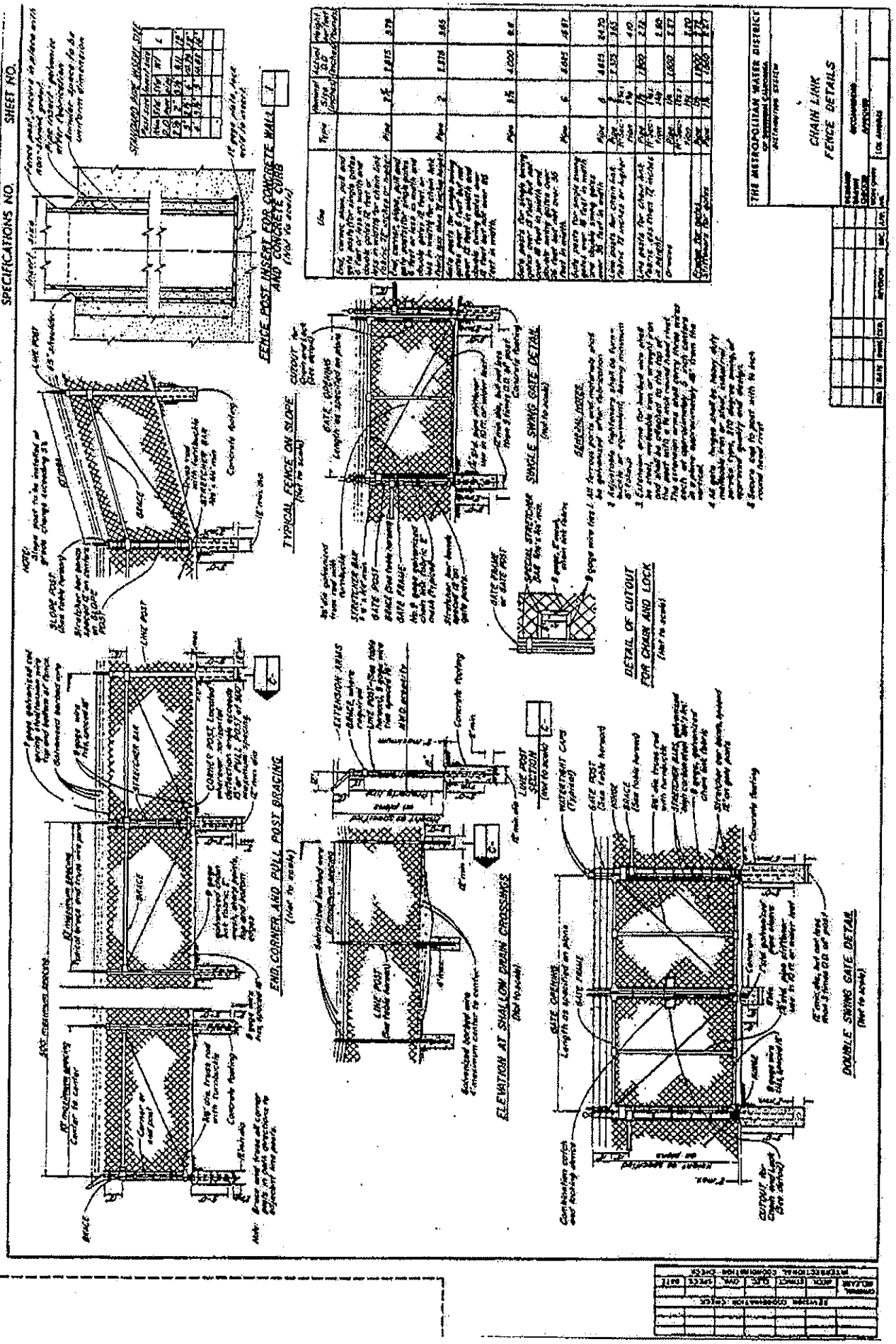
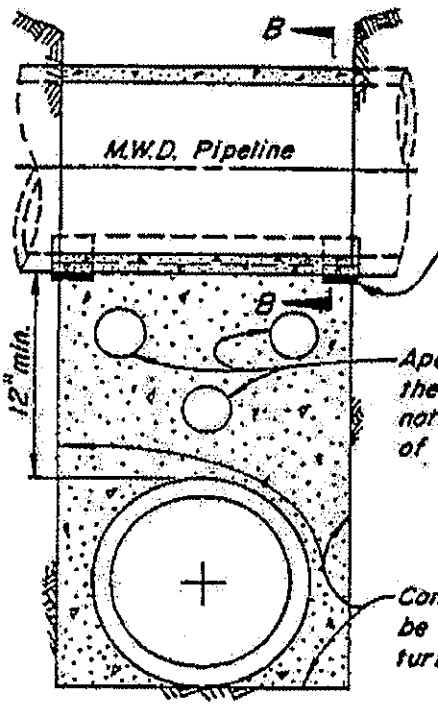
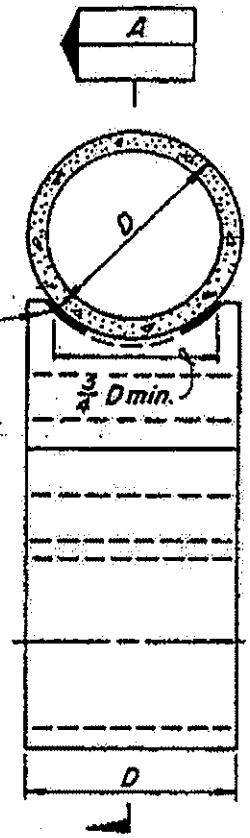

SPECIFICATIONS NO.
SHEET NO.
FENCE POST INSERT FOR CONCRETE WALL AND CONCRETE CURB
TYPICAL FENCE ON SLOPE
SINGLE SWING GATE DETAIL
END CORNER AND PULL POST BRACING
ELEVATION AT SHALLOW DRAIN CROSSINGS
DOUBLE SWING GATE DETAIL
DETAIL OF CUTOUT FOR CHAIN AND LOCK
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
CHAIN LINK FENCE DETAILS

FIGURE 5

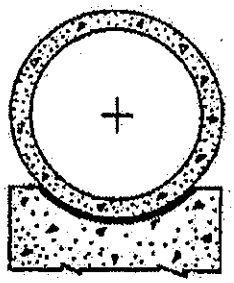


SECTION "A-A"



CROSS SECTION

1. Supporting wall shall have a firm bearing on the subgrade and against the side of the excavation.
2. Premolded expansion joint filler per ASTM D-1751-73 to be used in support for steel pipe only.
3. If trench width is 4 feet or greater, measured along centerline of M.W.D. pipe, concrete support must be constructed.
4. If trench width is less than 4 feet, clean sand backfill, compacted to 90% density in accordance with the provisions of ASTM Standard D-1557-70 may be used in lieu of the concrete support wall.



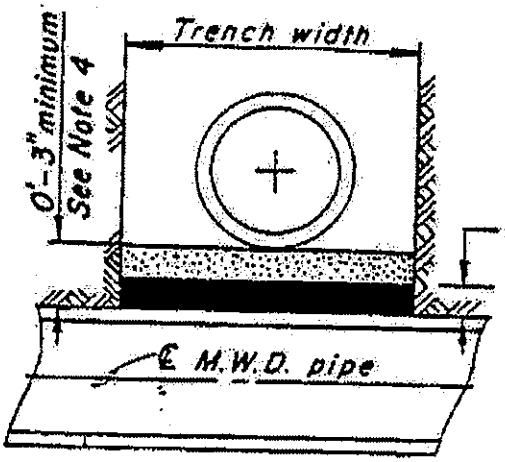
SECTION "B-B"

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

TYPICAL SUPPORT FOR M.W.D. PIPELINE

DRAWN ____ RECOMMENDED ____
TRACED ____
CHECKED ____ APPROVED ____

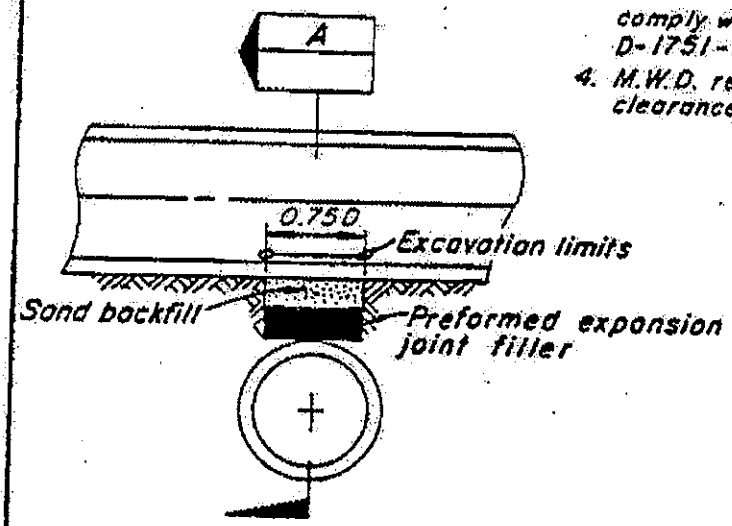
C-9547



SECTION A

NOTES

1. This method to be used where the utility line is 24" or greater in diameter and the clearance between the utility line and M.W.D. pipe is 12" or less.
2. Special protection may be required if the utility line diameter is greater than M.W.D. pipe or if the cover over the utility line to the street surface is minimal and there is 12" or less clearance between M.W.D. pipe and the utility line.
3. Preformed expansion joint filler to comply with ASTM designation D-1751-73.
4. M.W.D. requests 12" minimum clearance whenever possible.



CROSS SECTION

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

TYPICAL EXPANSION JOINT FILLER PROTECTION FOR OVERCROSSING OF M.W.D. PIPELINE

DRAWN ..... RECOMMENDED .....
TRACED .....
CHECKED ..... APPROVED .....

C-11632

11-57 DIETERICH-POST BLUEPRINT 1063

CITY OF DOWNEY COMMENT CARD

Mail to: Mark Sellheim, Principal Planner
City of Downey, 11111 Brookshire Avenue, Downey, CA 90241
msellheim@downeyca.org

DATE: May 15, 2008
MEETING: Environmental Public Scoping Meeting
LOCATION: Apollo Park Gymnasium Activity Room, 12540 Rives Avenue, Downey, CA 90242
NAME: Michael Hutchinson
ADDRESS: 9661 Gainford Street Downey, CA 90240
PHONE/E-MAIL: (562) 896-2000
This Comment is regarding: (Please check all that apply)

- ☒ Aesthetics
- ☐ Agricultural Resources
- ☐ Air Quality
- ☐ Biological Resources
- ☐ Cultural Resources
- ☐ Geology & Soils
- ☐ Hazards & Hazardous Materials
- ☐ Hydrology & Water Quality
- ☐ Land Use & Planning
- ☐ Mineral Resources
- ☐ Noise
- ☒ Population & Housing
- ☐ Public Services
- ☒ Recreation
- ☒ Transportation/ Circulation
- ☒ Utilities

COMMENT:

Density is my primary concern; the project is located in an already dense neighborhood, and the strain on traffic and utilities will presumably be great. Specifically, with Lakewood + Bellflower being ~~the~~ primary arteries to the site, these two streets will funnel the increased northbound traffic into several tight intersections. I wonder whether even the revamped Firestone/Lakewood intersection will be able to handle this convergence. Also, with an average housing unit size of a little over 1,000 sq. feet for 1,500 units, this would appear to be a tight fit + raises quality of life issues for the prospective residents. I am also concerned that the open space dedication is not sufficiently large for the site; less than 5% of total acreage. The Columbia Center + Park could be added to the total, but then so too could the Downey Landing be considered

see back

which has none. Increasing open space could decrease density, taking out two birds with one stone. ~~I~~ Back to traffic issues, I would recommend housing be located with greater density toward Lakewood than Bellflower, as Bellflower is less able to handle the load.

I strongly recommend that the City insist on lower density.

CITY OF DOWNEY COMMENT CARD

Mail to: Mark Sellheim, Principal Planner
City of Downey, 11111 Brookshire Avenue, Downey, CA 90241
msellheim@downeyca.org

DATE: May 15, 2008
MEETING: Environmental Public Scoping Meeting
LOCATION: Apollo Park Gymnasium Activity Room, 12540 Rives Avenue, Downey, CA 90242
NAME: HOWARD J. BARE
ADDRESS: 12203 LAKEWOOD BLVD 90242 DOWNEY
PHONE/E-MAIL:
This Comment is regarding: (Please check all that apply)

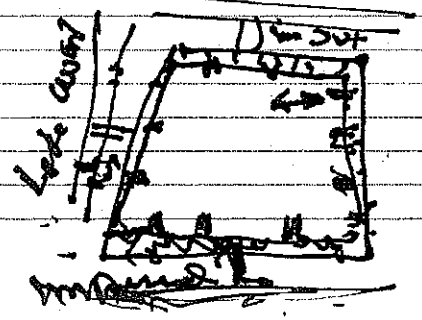
- ☐ Aesthetics
- ☐ Agricultural Resources
- ☐ Air Quality
- ☐ Biological Resources
- ☐ Cultural Resources
- ☐ Geology & Soils
- ☐ Hazards & Hazardous Materials
- ☐ Hydrology & Water Quality
- ☐ Land Use & Planning
- ☐ Mineral Resources
- ☐ Noise
- ☐ Population & Housing
- ☐ Public Services
- ☐ Recreation
- ■ Transportation/ Circulation
- ☐ Utilities
- ■ PARKING

COMMENT:

MUST - PLAN TRAFFIC FLOW
NO ISE
PARKING

SUGGEST ROAD ENTRANCE COMPLETE AREA & AS MUCH W/OUT AS DEPOSITED

GOOD TO HAVE MEETING FOR THE PEOPLE AFFECTED



CITY OF DOWNEY COMMENT CARD

Mail to: Mark Sellheim, Principal Planner
City of Downey, 11111 Brookshire Avenue, Downey, CA 90241
msellheim@downeyca.org

DATE: May 15, 2008
MEETING: Environmental Public Scoping Meeting
LOCATION: Apollo Park Gymnasium Activity Room, 12540 Rives Avenue, Downey, CA 90242
NAME: Eugenia Brunel
ADDRESS: 11736 Vulter Ave
PHONE/E-MAIL: 562-923-0403 - Fire Lady 1120@ yahoo
This Comment is regarding: (Please check all that apply)

- ☐ Aesthetics
- ☐ Agricultural Resources
- ☐ Air Quality
- ☐ Biological Resources
- ☐ Cultural Resources
- ☐ Geology & Soils
- ☑ Hazards & Hazardous Materials
- ☐ Hydrology & Water Quality
- ☐ Land Use & Planning
- ☐ Mineral Resources
- ☑ Noise
- ☑ Population & Housing
- ☐ Public Services
- ☐ Recreation
- ☑ Transportation/ Circulation
- ☐ Utilities

COMMENT:

looks great
Some concerns.
Hope it happens.

R8 near proposed sites,

Congestions has impacted area since Downey landing. Increase? Bellflower?

CITY OF DOWNEY COMMENT CARD

Mail to: Mark Sellheim, Principal Planner
City of Downey, 11111 Brookshire Avenue, Downey, CA 90241
msellheim@downeyca.org

DATE: May 15, 2008
MEETING: Environmental Public Scoping Meeting
LOCATION: Apollo Park Gymnasium Activity Room, 12540 Rives Avenue, Downey, CA 90242
NAME: Judith Jones Fred Jones
ADDRESS: 1777 Market Downey, CA 90242
PHONE/E-MAIL: 562-861-2023
This Comment is regarding: (Please check all that apply)

- ☐ Aesthetics
- ☐ Agricultural Resources
- ☐ Air Quality
- ☐ Biological Resources
- ☐ Cultural Resources
- ☐ Geology & Soils
- ☐ Hazards & Hazardous Materials
- ☒ Hydrology & Water Quality
- ☒ Land Use & Planning
- ☐ Mineral Resources
- ☐ Noise
- ☒ Population & Housing
- ☐ Public Services
- ☐ Recreation
- ☐ Transportation/ Circulation
- ☐ Utilities

COMMENT:

Do we have enough water?

Do we need more housing?

DOWNEY STUDIOS SPECIFIC PLAN PROJECT
EIR SCOPING MEETING
May 15, 2008
6:30 p.m. – 8:30 p.m.
SIGN-IN SHEET

Name/Affiliation	Mailing Address/Phone Number/E-Mail
ROBERT THOMPSON	12731 KIPAWAY DR. DOWNEY, CA. 90242 (562) 861-4347
Judith and Fred Jones	12227 Marbel AVE Downey, CA 90242 562-861-2023
Diana J. Tison Howard Bare	12203 Lakewood Blvd Downey 90242
Eugenia & Latteche Brunet	11736 Vultee Ave Downey CA 90241
Andrew Ho, Principal Planner City of Bellflower	16600 Civic Center Drive Bellflower, CA 90706 562.804.1424 x2226 andrew.ho@bellflower.org
SKYLER DENNISTON	805 COLORADO BLVD. Suite # [illegible] Los Angeles, CA 90[illegible]41
HAROLD TEKLEARS	7828 8TH ST DOWNEY CA 90241
Michael Hutchinson Project Area Committee	9661 Gainford St Downey, CA 90240 (562) 896-2000 mikehutchinson9@netscape.net

DOWNEY STUDIOS SPECIFIC PLAN PROJECT
EIR SCOPING MEETING
May 15, 2008
6:30 p.m. – 8:30 p.m.
SIGN-IN SHEET

Name/Affiliation	Mailing Address/Phone Number/E-Mail
MARTIN REINER ENOVIS	MARTY@ENOVIS.COM
Ed Norris	(562) 904-7109 / enorris@downeyca.org
Louise Fiorillo	562/862-6677 l-fiorillo@hotmail.com

APPENDIX IV.C-1

Air Quality Calculations

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

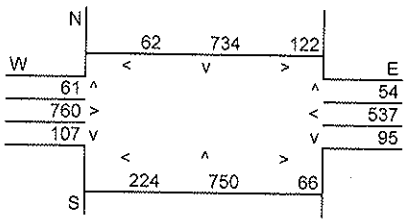
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

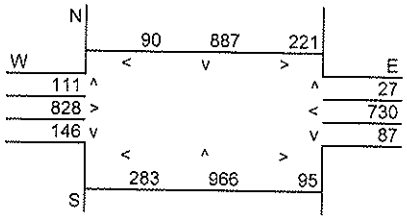
Intersection: Lakewood Boulevard & Stewart and Gray Road
Analysis Condition: Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Lakewood Boulevard	At Grade	6	20	15
East-West Roadway:	Stewart and Gray Road	At Grade	4	20	15

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	1,976	N-S Road:	2,464
E-W Road:	1,751	E-W Road:	2,188

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	9.5	6.1	4.9	3.5	1,976	5.39	1.01	0.65	0.52	0.37
East-West Road	3.3	2.6	2.2	1.7	1,751	5.39	0.31	0.25	0.21	0.16
P.M. Peak Traffic Hour										
North-South Road	9.5	6.1	4.9	3.5	2,464	6.29	1.47	0.94	0.76	0.54
East-West Road	3.3	2.6	2.2	1.7	2,188	6.29	0.45	0.36	0.30	0.23

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.3	9.9	6.4
25 Feet from Roadway Edge	8.9	9.3	6.0
50 Feet from Roadway Edge	8.7	9.1	5.8
100 Feet from Roadway Edge	8.5	8.8	5.6

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

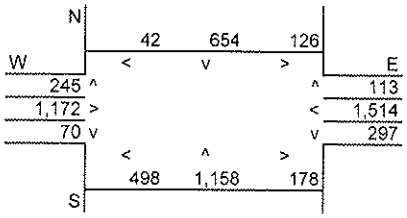
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

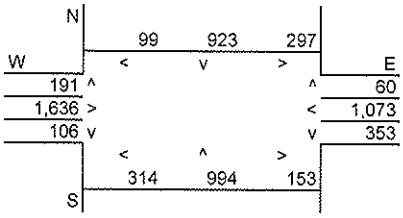
Intersection: Bellflower Boulevard & Imperial Highway
Analysis Condition: Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Bellflower Boulevard	At Grade	4	5	5
East-West Roadway:	Imperial Highway	At Grade	6	5	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	2,855	N-S Road:	2,843
E-W Road:	3,541	E-W Road:	3,572

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	3.3	2.6	2.2	1.7	2,855	9.44	0.89	0.70	0.59	0.46
East-West Road	9.5	6.1	4.9	3.5	3,541	9.44	3.18	2.04	1.64	1.17
P.M. Peak Traffic Hour										
North-South Road	3.3	2.6	2.2	1.7	2,843	9.44	0.89	0.70	0.59	0.46
East-West Road	9.5	6.1	4.9	3.5	3,572	9.44	3.20	2.06	1.65	1.18

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	12.1	12.1	8.0
25 Feet from Roadway Edge	10.7	10.8	7.0
50 Feet from Roadway Edge	10.2	10.2	6.7
100 Feet from Roadway Edge	9.6	9.6	6.2

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

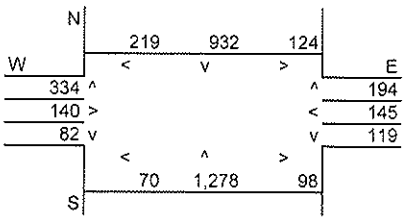
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

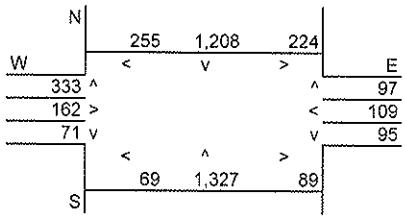
Intersection: Lakewood Boulevard & Gallatin Road
Analysis Condition: Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Lakewood Boulevard	At Grade	4	10	10
East-West Roadway:	Gallatin Road	At Grade	2	10	10

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	3,081	N-S Road:	3,444
E-W Road:	990	E-W Road:	999

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,081	7.57	2.78	1.63	1.26	0.89
East-West Road	3.7	2.7	2.2	1.7	990	7.57	0.28	0.20	0.16	0.13
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,444	7.57	3.10	1.83	1.41	0.99
East-West Road	3.7	2.7	2.2	1.7	999	7.57	0.28	0.20	0.17	0.13

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	11.1	11.4	7.5
25 Feet from Roadway Edge	9.8	10.0	6.5
50 Feet from Roadway Edge	9.4	9.6	6.2
100 Feet from Roadway Edge	9.0	9.1	5.9

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

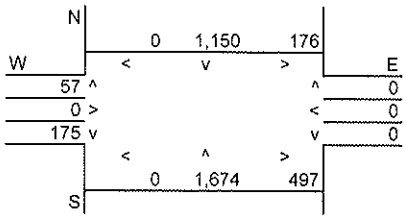
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

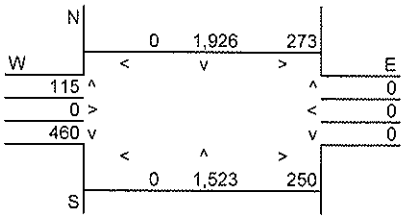
Intersection: Paramount Boulevard & I-5 Southbound Ramps
Analysis Condition: Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Paramount Boulevard	At Grade	4	5	5
East-West Roadway:	I-5 Southbound Ramps	At Grade	2	5	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	3,496	N-S Road:	4,159
E-W Road:	673	E-W Road:	575

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,496	9.44	3.93	2.31	1.78	1.25
East-West Road	3.7	2.7	2.2	1.7	673	9.44	0.24	0.17	0.14	0.11
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	4,159	9.44	4.67	2.75	2.12	1.49
East-West Road	3.7	2.7	2.2	1.7	575	9.44	0.20	0.15	0.12	0.09

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	12.2	12.9	8.5
25 Feet from Roadway Edge	10.5	10.9	7.1
50 Feet from Roadway Edge	9.9	10.2	6.7
100 Feet from Roadway Edge	9.4	9.6	6.2

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

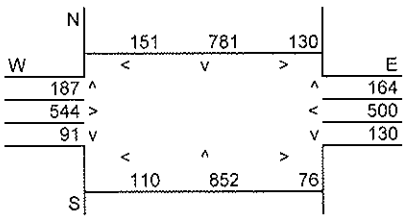
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

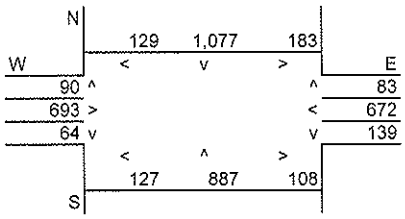
Intersection:	Paramount Boulevard & Stewart and Gray Road
Analysis Condition:	Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Paramount Boulevard	At Grade	4	20	15
East-West Roadway:	Stewart and Gray Road	At Grade	4	20	15

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	2,265	N-S Road:	2,449
E-W Road:	1,583	E-W Road:	1,878

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	2,265	5.39	1.45	0.85	0.66	0.46
East-West Road	3.3	2.6	2.2	1.7	1,583	5.39	0.28	0.22	0.19	0.15
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	2,449	6.29	1.83	1.08	0.83	0.58
East-West Road	3.3	2.6	2.2	1.7	1,878	6.29	0.39	0.31	0.26	0.20

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.7	10.2	6.7
25 Feet from Roadway Edge	9.1	9.4	6.1
50 Feet from Roadway Edge	8.8	9.1	5.9
100 Feet from Roadway Edge	8.6	8.8	5.6

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

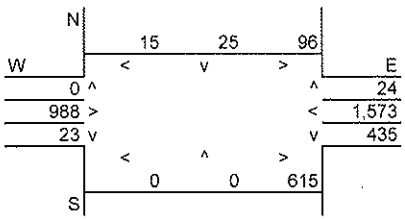
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2008

Roadway Data

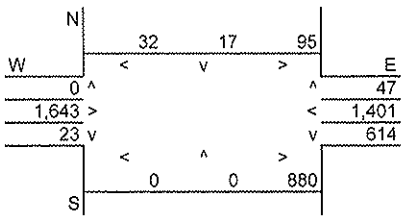
Intersection:	Stewart and Gray Road & Firestone Boulevard
Analysis Condition:	Existing (2008) Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Stewart and Gray Road	At Grade	2	20	15
East-West Roadway:	Firestone Boulevard	At Grade	4	20	15

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	1,098	N-S Road:	1,534
E-W Road:	3,731	E-W Road:	4,680

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
A.M. Peak Traffic Hour										
North-South Road	3.7	2.7	2.2	1.7	1,098	5.39	0.22	0.16	0.13	0.10
East-West Road	11.9	7.0	5.4	3.8	3,731	5.39	2.39	1.41	1.09	0.76
P.M. Peak Traffic Hour										
North-South Road	3.7	2.7	2.2	1.7	1,534	6.29	0.36	0.26	0.21	0.16
East-West Road	11.9	7.0	5.4	3.8	4,680	6.29	3.50	2.06	1.59	1.12

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	10.6	11.9	7.8
25 Feet from Roadway Edge	9.6	10.3	6.7
50 Feet from Roadway Edge	9.2	9.8	6.4
100 Feet from Roadway Edge	8.9	9.3	6.0

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

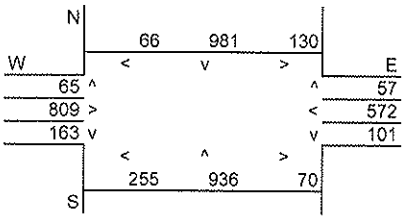
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

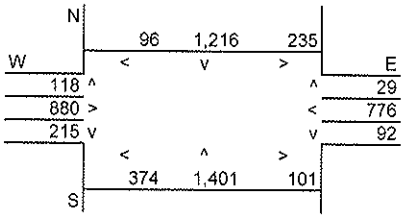
Intersection:	Lakewood Boulevard & Stewart and Gray Road
Analysis Condition:	Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Lakewood Boulevard	At Grade	6	15	5
East-West Roadway:	Stewart and Gray Road	At Grade	4	15	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	2,506	N-S Road:	3,399
E-W Road:	1,930	E-W Road:	2,459

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	9.5	6.1	4.9	3.5	2,506	2.22	0.53	0.34	0.27	0.19
East-West Road	3.3	2.6	2.2	1.7	1,930	2.22	0.14	0.11	0.09	0.07
P.M. Peak Traffic Hour										
North-South Road	9.5	6.1	4.9	3.5	3,399	3.14	1.01	0.65	0.52	0.37
East-West Road	3.3	2.6	2.2	1.7	2,459	3.14	0.25	0.20	0.17	0.13

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	8.7	9.3	6.0
25 Feet from Roadway Edge	8.4	8.9	5.7
50 Feet from Roadway Edge	8.4	8.7	5.6
100 Feet from Roadway Edge	8.3	8.5	5.5

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

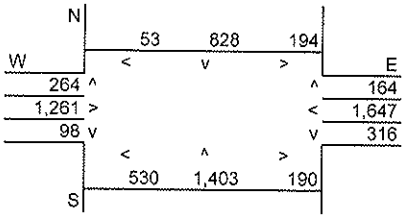
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

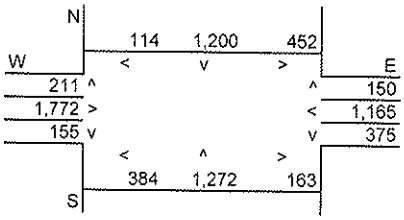
Intersection: Bellflower Boulevard & Imperial Highway
Analysis Condition: Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Bellflower Boulevard	At Grade	4	5	5
East-West Roadway:	Imperial Highway	At Grade	6	5	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	3,365	N-S Road:	3,549
E-W Road:	3,853	E-W Road:	4,077

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
A.M. Peak Traffic Hour										
North-South Road	3.3	2.6	2.2	1.7	3,365	3.14	0.35	0.27	0.23	0.18
East-West Road	9.5	6.1	4.9	3.5	3,853	3.14	1.15	0.74	0.59	0.42
P.M. Peak Traffic Hour										
North-South Road	3.3	2.6	2.2	1.7	3,549	3.14	0.37	0.29	0.25	0.19
East-West Road	9.5	6.1	4.9	3.5	4,077	3.14	1.22	0.78	0.63	0.45

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.5	9.6	6.2
25 Feet from Roadway Edge	9.0	9.1	5.8
50 Feet from Roadway Edge	8.8	8.9	5.7
100 Feet from Roadway Edge	8.6	8.6	5.5

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

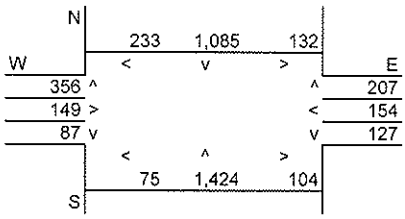
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

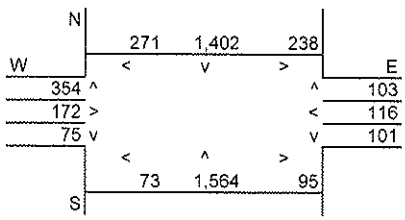
Intersection:	Lakewood Boulevard & Gallatin Road
Analysis Condition:	Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Lakewood Boulevard	At Grade	4	5	5
East-West Roadway:	Gallatin Road	At Grade	2	5	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	3,437	N-S Road:	3,932
E-W Road:	1,054	E-W Road:	1,061

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,437	3.14	1.28	0.76	0.58	0.41
East-West Road	3.7	2.7	2.2	1.7	1,054	3.14	0.12	0.09	0.07	0.06
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,932	3.14	1.47	0.86	0.67	0.47
East-West Road	3.7	2.7	2.2	1.7	1,061	3.14	0.12	0.09	0.07	0.06

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.4	9.6	6.2
25 Feet from Roadway Edge	8.8	9.0	5.8
50 Feet from Roadway Edge	8.7	8.7	5.6
100 Feet from Roadway Edge	8.5	8.5	5.5

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

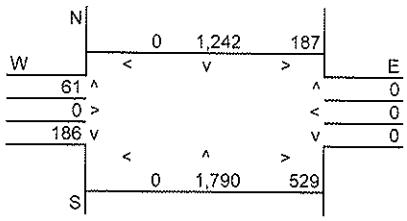
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

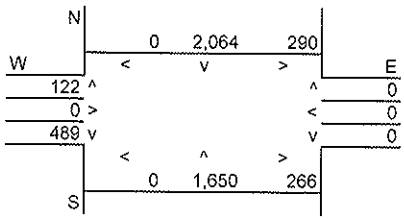
Intersection:	Paramount Boulevard & I-5 Southbound Ramps
Analysis Condition:	Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Paramount Boulevard	At Grade	4	5	5
East-West Roadway:	I-5 Southbound Ramps	At Grade	2	5	5

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	3,747	N-S Road:	4,469
E-W Road:	716	E-W Road:	611

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	3,747	3.14	1.40	0.82	0.64	0.45
East-West Road	3.7	2.7	2.2	1.7	716	3.14	0.08	0.06	0.05	0.04
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	4,469	3.14	1.67	0.98	0.76	0.53
East-West Road	3.7	2.7	2.2	1.7	611	3.14	0.07	0.05	0.04	0.03

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.5	9.7	6.3
25 Feet from Roadway Edge	8.9	9.0	5.8
50 Feet from Roadway Edge	8.7	8.8	5.7
100 Feet from Roadway Edge	8.5	8.6	5.5

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

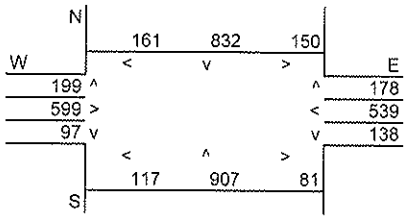
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

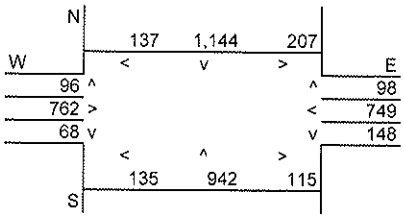
Intersection:	Paramount Boulevard & Stewart and Gray Road
Analysis Condition:	Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Paramount Boulevard	At Grade	4	15	10
East-West Roadway:	Stewart and Gray Road	At Grade	4	15	10

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	2,427	N-S Road:	2,624
E-W Road:	1,712	E-W Road:	2,079

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 Reference CO Concentrations E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
A.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	2,427	2.22	0.64	0.38	0.29	0.20
East-West Road	3.3	2.6	2.2	1.7	1,712	2.22	0.13	0.10	0.08	0.06
P.M. Peak Traffic Hour										
North-South Road	11.9	7.0	5.4	3.8	2,624	2.60	0.81	0.48	0.37	0.26
East-West Road	3.3	2.6	2.2	1.7	2,079	2.60	0.18	0.14	0.12	0.09

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	8.8	9.0	5.8
25 Feet from Roadway Edge	8.5	8.6	5.5
50 Feet from Roadway Edge	8.4	8.5	5.4
100 Feet from Roadway Edge	8.3	8.4	5.3

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

SIMPLIFIED CALINE4 CARBON MONOXIDE ANALYSIS

Project Title: Tierra Luna Specific Plan EIR

Background Information

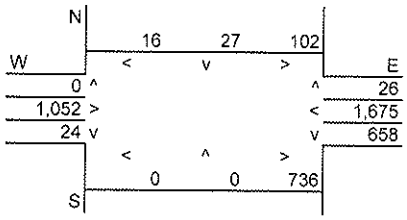
Nearest Air Monitoring Station measuring CO:	SCAQMD Station 70084
Background 1-hour CO Concentration (ppm):	8.0
Background 8-hour CO Concentration (ppm):	5.1
Persistence Factor:	0.7
Analysis Year:	2020

Roadway Data

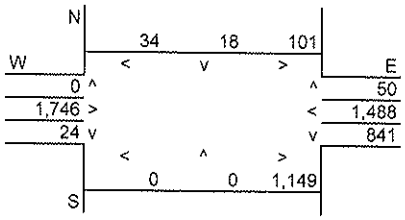
Intersection:	Stewart and Gray Road & Firestone Boulevard
Analysis Condition:	Future (2020) with Project Traffic Volumes

		Roadway Type	No. of Lanes	Average Speed A.M.	Average Speed P.M.
North-South Roadway:	Stewart and Gray Road	At Grade	2	20	10
East-West Roadway:	Firestone Boulevard	At Grade	4	20	10

A.M. Peak Hour Traffic Volumes



P.M. Peak Hour Traffic Volumes



Highest Traffic Volumes (Vehicles per Hour)

N-S Road:	1,445	N-S Road:	2,032
E-W Road:	4,249	E-W Road:	5,375

Roadway CO Contributions and Concentrations

Emissions = (A x B x C) / 100,000[1]

Roadway	A_1 E.O.R.	A_2 25 Feet	A_3 50 Feet	A_4 100 Feet	B Traffic Volume	C Emission Factors[2]	Estimated CO Concentrations E.O.R.	25 Feet	50 Feet	100 Feet
	Reference CO Concentrations									
A.M. Peak Traffic Hour										
North-South Road	3.7	2.7	2.2	1.7	1,445	1.95	0.10	0.08	0.06	0.05
East-West Road	11.9	7.0	5.4	3.8	4,249	1.95	0.99	0.58	0.45	0.31
P.M. Peak Traffic Hour										
North-South Road	3.7	2.7	2.2	1.7	2,032	2.60	0.20	0.14	0.12	0.09
East-West Road	11.9	7.0	5.4	3.8	5,375	2.60	1.66	0.98	0.76	0.53

[1] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).
[2] Emission factors from EMFAC2002 (2003).

Total Roadway CO Concentrations

Peak Hour Emissions = North-South Concentration + East-West Concentration + Background 1-hour Concentration[2]
8-Hour Emissions = ((Highest Peak Hour Concentration - Background 1-hour Concentration) x Persistence Factor) + Background 8-hour Concentration[2]

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
Roadway Edge	9.1	9.9	6.4
25 Feet from Roadway Edge	8.7	9.1	5.9
50 Feet from Roadway Edge	8.5	8.9	5.7
100 Feet from Roadway Edge	8.4	8.6	5.5

[2] Methodology from Bay Area Air Quality Management District *BAAQMD CEQA Guidelines* (1996).

1

Hours of Operation 8

Demo Avg Time	x/Q ug/m3/(g/s)
Receptor 1	
1-HR	237.17
8-HR	69.43
PM 10 24-HR	22.44
PM 2.5 24-HR	20.54
Receptor 2	
1-HR	332.82
8-HR	44.33
PM 10 24-HR	28.1
PM 2.5 24-HR	23.26
Receptor 3	
1-HR	242.3
8-HR	30.29
PM 10 24-HR	12.83
PM 2.5 24-HR	12.04
Receptor 4	
1-HR	317.26
8-HR	53.73
PM 10 24-HR	26.41
PM 2.5 24-HR	16.32
Receptor 5	
1-HR	194.62
8-HR	44.7
PM 10 24-HR	21.41
PM 2.5 24-HR	17
Receptor 6	
1-HR	367.3
8-HR	77.76
PM 10 24-HR	35.52

Site Prep, Build, & Asphalting Peak Avg Time	x/Q ug/m3/(g/s)
Receptor 1	
1-HR	1393.58
8-HR	455.94
PM 10 24-HR	169.46
PM 2.5 24-HR	55.55
Receptor 2	
1-HR	901.74
8-HR	318.26
PM 10 24-HR	145.05
PM 2.5 24-HR	109.53
Receptor 3	
1-HR	657.94
8-HR	129.8
PM 10 24-HR	54.73
PM 2.5 24-HR	51.88
Receptor 4	
1-HR	676.16
8-HR	281.07
PM 10 24-HR	130.19
PM 2.5 24-HR	108.55
Receptor 5	
1-HR	768
8-HR	225.59
PM 10 24-HR	93.29
PM 2.5 24-HR	84.56
Receptor 6	
1-HR	1173.72
8-HR	674.45
PM 10 24-HR	275.11

PM 2.5 24-HR	26.53
Receptor 7	
1-HR	294.86
8-HR	46.17
PM 10 24-HR	21.77
PM 2.5 24-HR	17.67
Receptor 8	
1-HR	443.95
8-HR	68.65
PM 10 24-HR	34.45
PM 2.5 24-HR	23.09
Receptor 9	
1-HR	353.57
8-HR	99.67
PM 10 24-HR	35.84
PM 2.5 24-HR	29.25
Receptor 10	
1-HR	293.98
8-HR	86.77
PM 10 24-HR	34.6
PM 2.5 24-HR	29.01
Receptor 11	
1-HR	220.97
8-HR	52.01
PM 10 24-HR	20.43
PM 2.5 24-HR	19.92
Receptor 12	
1-HR	277.37
8-HR	100.17
PM 10 24-HR	38.8
PM 2.5 24-HR	31.74

PM 2.5 24-HR	246.48
Receptor 7	
1-HR	1271.81
8-HR	265.87
PM 10 24-HR	106.52
PM 2.5 24-HR	104.16
Receptor 8	
1-HR	1025.18
8-HR	287.12
PM 10 24-HR	114.02
PM 2.5 24-HR	109.32
Receptor 9	
1-HR	1029.94
8-HR	363.22
PM 10 24-HR	138.49
PM 2.5 24-HR	150.34
Receptor 10	
1-HR	846.06
8-HR	363.36
PM 10 24-HR	154.9
PM 2.5 24-HR	133.8
Receptor 11	
1-HR	889.25
8-HR	244.8
PM 10 24-HR	106.01
PM 2.5 24-HR	105.78
Receptor 12	
1-HR	1173.3
8-HR	474.49
PM 10 24-HR	228.64
PM 2.5 24-HR	194.31

Per Area

	Nox	CO	PM10	PM2.5
Area	**lbs/day**	**lbs/day**	**lbs/day**	**lbs/day**
Demo	0	0	0	0
Site Prep	54.15	23.19	6.21	3.56
Build	43.11	21.59	2.7	2.48
Asphalt	27.88	15.4	1.98	1.82

Whole Site

Demo	162.53	78.9	13.55	9.65

Construction Hours
8

2007 Air Quality SCAQMD

SRA	Nox 1 Hr	CO 1 HR	CO 8 Hr	PM10	PM2.5
12	0.1	8	5.1		
Threshold	0.18	20	9	10.4	10.4

Construction Area/Phase	Nitrogen Dioxide ER g/s	1-Hr Site ug/m3	1-Hr Total ppm	Exceed Threshold 0.18	Carbon Monoxide ER g/s	1-Hr Site ug/m3	1-Hr Total ppm	Exceed Threshold 20	8-Hr Site ug/m3	8-Hr Total ppm	Exceed Threshold 9	Particulate Matter 10 ER g/s	24-hr ug/m3	Exceed Threshold 10.4	Particulate Matter 2.5 ER g/s	24-HR ug/m3	Exceed Threshold 10.4
Receptor 1																	
Demo	2.556	606	**0.42**	YES	1.241	294	**8.26**	NO	86	**5.18**	NO	0.21	**4.78**	NO	0.15	**3.12**	NO
Site Prep	0.852	1187	**0.73**	YES	0.365	508	**8.44**	NO	166	**5.25**	NO	0.10	**16.55**	YES	0.06	**3.11**	NO
Build	0.678	945	**0.60**	YES	0.340	473	**8.41**	NO	155	**5.24**	NO	0.04	**7.20**	NO	0.04	**2.17**	NO
Asphalt	0.439	611	**0.42**	YES	0.242	338	**8.29**	NO	110	**5.20**	NO	0.03	**5.28**	NO	0.03	**1.59**	NO
Receptor 2																	
Demo	2.556	851	**0.55**	YES	1.241	413	**8.36**	NO	55	**5.15**	NO	0.21	**5.99**	NO	0.15	**3.53**	NO
Site Prep	0.852	768	**0.51**	YES	0.365	329	**8.29**	NO	116	**5.20**	NO	0.10	**14.17**	YES	0.06	**6.13**	NO
Build	0.678	611	**0.42**	YES	0.340	306	**8.27**	NO	108	**5.19**	NO	0.04	**6.16**	NO	0.04	**4.27**	NO
Asphalt	0.439	395	**0.31**	YES	0.242	218	**8.19**	NO	77	**5.17**	NO	0.03	**4.52**	NO	0.03	**3.14**	NO
Receptor 3																	
Demo	2.556	619	**0.43**	YES	1.241	301	**8.26**	NO	38	**5.13**	NO	0.21	**2.73**	NO	0.15	**1.83**	NO
Site Prep	0.852	560	**0.40**	YES	0.365	240	**8.21**	NO	47	**5.14**	NO	0.10	**5.35**	NO	0.06	**2.91**	NO
Build	0.678	446	**0.34**	YES	0.340	223	**8.20**	NO	44	**5.14**	NO	0.04	**2.32**	NO	0.04	**2.02**	NO
Asphalt	0.439	289	**0.25**	YES	0.242	159	**8.14**	NO	31	**5.13**	NO	0.03	**1.70**	NO	0.03	**1.49**	NO
Receptor 4																	
Demo	2.556	811	**0.53**	YES	1.241	394	**8.34**	NO	67	**5.16**	NO	0.21	**5.63**	NO	0.15	**2.48**	NO
Site Prep	0.852	576	**0.41**	YES	0.365	247	**8.22**	NO	103	**5.19**	NO	0.10	**12.72**	YES	0.06	**6.08**	NO
Build	0.678	458	**0.34**	YES	0.340	230	**8.20**	NO	95	**5.18**	NO	0.04	**5.53**	NO	0.04	**4.23**	NO
Asphalt	0.439	297	**0.26**	YES	0.242	164	**8.14**	NO	68	**5.16**	NO	0.03	**4.05**	NO	0.03	**3.11**	NO
Receptor 5																	
Demo	2.556	498	**0.36**	YES	1.241	242	**8.21**	NO	55	**5.15**	NO	0.21	**4.56**	NO	0.15	**2.58**	NO
Site Prep	0.852	654	**0.45**	YES	0.365	280	**8.24**	NO	82	**5.17**	NO	0.10	**9.11**	NO	0.06	**4.74**	NO
Build	0.678	521	**0.38**	YES	0.340	261	**8.23**	NO	77	**5.17**	NO	0.04	**3.96**	NO	0.04	**3.30**	NO
Asphalt	0.439	337	**0.28**	YES	0.242	186	**8.16**	NO	55	**5.15**	NO	0.03	**2.91**	NO	0.03	**2.42**	NO
Receptor 6																	
Demo	2.556	939	**0.60**	YES	1.241	456	**8.40**	NO	97	**5.18**	NO	0.21	**7.57**	NO	0.15	**4.03**	NO
Site Prep	0.852	1000	**0.63**	YES	0.365	428	**8.37**	NO	246	**5.31**	NO	0.10	**26.87**	YES	0.06	**13.80**	YES
Build	0.678	796	**0.52**	YES	0.340	399	**8.35**	NO	229	**5.30**	NO	0.04	**11.68**	YES	0.04	**9.61**	NO
Asphalt	0.439	515	**0.37**	YES	0.242	284	**8.25**	NO	163	**5.24**	NO	0.03	**8.57**	NO	0.03	**7.06**	NO
Receptor 7																	
Demo	2.556	754	**0.50**	YES	1.241	366	**8.32**	NO	57	**5.15**	NO	0.21	**4.64**	NO	0.15	**2.68**	NO
Site Prep	0.852	1083	**0.68**	YES	0.365	464	**8.41**	NO	97	**5.18**	NO	0.10	**10.40**	YES	0.06	**5.83**	NO
Build	0.678	862	**0.56**	YES	0.340	432	**8.38**	NO	90	**5.18**	NO	0.04	**4.52**	NO	0.04	**4.06**	NO
Asphalt	0.439	558	**0.40**	YES	0.242	308	**8.27**	NO	64	**5.16**	NO	0.03	**3.32**	NO	0.03	**2.98**	NO
Receptor 8																	
Demo	2.556	1135	**0.70**	YES	1.241	551	**8.48**	NO	85	**5.17**	NO	0.21	**7.34**	NO	0.15	**3.50**	NO
Site Prep	0.852	873	**0.56**	YES	0.365	374	**8.33**	NO	105	**5.19**	NO	0.10	**11.14**	YES	0.06	**6.12**	NO
Build	0.678	695	**0.47**	YES	0.340	348	**8.30**	NO	98	**5.19**	NO	0.04	**4.84**	NO	0.04	**4.26**	NO
Asphalt	0.439	450	**0.34**	YES	0.242	248	**8.22**	NO	70	**5.16**	NO	0.03	**3.55**	NO	0.03	**3.13**	NO
Receptor 9																	
Demo	2.556	904	**0.58**	YES	1.241	439	**8.38**	NO	124	**5.21**	NO	0.21	**7.64**	NO	0.15	**4.44**	NO
Site Prep	0.852	877	**0.57**	YES	0.365	376	**8.33**	NO	132	**5.22**	NO	0.10	**13.53**	YES	0.06	**8.42**	NO
Build	0.678	698	**0.47**	YES	0.340	350	**8.31**	NO	123	**5.21**	NO	0.04	**5.88**	NO	0.04	**5.86**	NO
Asphalt	0.439	452	**0.34**	YES	0.242	249	**8.22**	NO	88	**5.18**	NO	0.03	**4.31**	NO	0.03	**4.30**	NO
Receptor 10																	
Demo	2.556	752	**0.50**	YES	1.241	365	**8.32**	NO	108	**5.19**	NO	0.21	**7.37**	NO	0.15	**4.40**	NO
Site Prep	0.852	721	**0.48**	YES	0.365	309	**8.27**	NO	133	**5.22**	NO	0.10	**15.13**	YES	0.06	**7.49**	NO
Build	0.678	574	**0.40**	YES	0.340	287	**8.25**	NO	123	**5.21**	NO	0.04	**6.58**	NO	0.04	**5.22**	NO
Asphalt	0.439	371	**0.30**	YES	0.242	205	**8.18**	NO	88	**5.18**	NO	0.03	**4.82**	NO	0.03	**3.83**	NO
Receptor 11																	
Demo	2.556	565	**0.40**	YES	1.241	274	**8.24**	NO	65	**5.16**	NO	0.21	**4.35**	NO	0.15	**3.02**	NO
Site Prep	0.852	757	**0.50**	YES	0.365	324	**8.28**	NO	89	**5.18**	NO	0.10	**10.35**	NO	0.06	**5.92**	NO
Build	0.678	603	**0.42**	YES	0.340	302	**8.26**	NO	83	**5.17**	NO	0.04	**4.50**	NO	0.04	**4.13**	NO
Asphalt	0.439	390	**0.31**	YES	0.242	215	**8.19**	NO	59	**5.15**	NO	0.03	**3.30**	NO	0.03	**3.03**	NO
Receptor 12																	
Demo	2.556	709	**0.48**	YES	1.241	344	**8.30**	NO	124	**5.21**	NO	0.21	**8.27**	NO	0.15	**4.82**	NO
Site Prep	0.852	999	**0.63**	YES	0.365	428	**8.37**	NO	173	**5.25**	NO	0.10	**22.33**	YES	0.06	**10.88**	YES
Build	0.678	796	**0.52**	YES	0.340	398	**8.35**	NO	161	**5.24**	NO	0.04	**9.71**	NO	0.04	**7.58**	NO
Asphalt	0.439	515	**0.37**	YES	0.242	284	**8.25**	NO	115	**5.20**	NO	0.03	**7.12**	NO	0.03	**5.56**	NO

Pollutant Concentrations with Mitigation

Hours of Operation 8

Demo Avg Time	x/Q ug/m3/(g/s)	**Site Prep, Build, & Asphalting Peak** Avg Time	x/Q ug/m3/(g/s)
Receptor 1		Receptor 1	
1-HR	237.17	1-HR	1393.58
8-HR	69.43	8-HR	455.94
PM 10 24-HR	22.44	PM 10 24-HR	169.46
PM 2.5 24-HR	20.54	PM 2.5 24-HR	55.55
Receptor 2		Receptor 2	
1-HR	332.82	1-HR	901.74
8-HR	44.33	8-HR	318.26
PM 10 24-HR	28.1	PM 10 24-HR	145.05
PM 2.5 24-HR	23.26	PM 2.5 24-HR	109.53
Receptor 3		Receptor 3	
1-HR	242.3	1-HR	657.94
8-HR	30.29	8-HR	129.8
PM 10 24-HR	12.83	PM 10 24-HR	54.73
PM 2.5 24-HR	12.04	PM 2.5 24-HR	51.88
Receptor 4		Receptor 4	
1-HR	317.26	1-HR	676.16
8-HR	53.73	8-HR	281.07
PM 10 24-HR	26.41	PM 10 24-HR	130.19
PM 2.5 24-HR	16.32	PM 2.5 24-HR	108.55
Receptor 5		Receptor 5	
1-HR	194.62	1-HR	768
8-HR	44.7	8-HR	225.59
PM 10 24-HR	21.41	PM 10 24-HR	93.29
PM 2.5 24-HR	17	PM 2.5 24-HR	84.56
Receptor 6		Receptor 6	

1-HR	367.3	1-HR	1173.72
8-HR	77.76	8-HR	674.45
PM 10 24-HR	35.52	PM 10 24-HR	275.11
PM 2.5 24-HR	26.53	PM 2.5 24-HR	246.48
Receptor 7		Receptor 7	
1-HR	294.86	1-HR	1271.81
8-HR	46.17	8-HR	265.87
PM 10 24-HR	21.77	PM 10 24-HR	106.52
PM 2.5 24-HR	17.67	PM 2.5 24-HR	104.16
Receptor 8		Receptor 8	
1-HR	443.95	1-HR	1025.18
8-HR	68.65	8-HR	287.12
PM 10 24-HR	34.45	PM 10 24-HR	114.02
PM 2.5 24-HR	23.09	PM 2.5 24-HR	109.32
Receptor 9		Receptor 9	
1-HR	353.57	1-HR	1029.94
8-HR	99.67	8-HR	363.22
PM 10 24-HR	35.84	PM 10 24-HR	138.49
PM 2.5 24-HR	29.25	PM 2.5 24-HR	150.34
Receptor 10		Receptor 10	
1-HR	293.98	1-HR	846.06
8-HR	86.77	8-HR	363.36
PM 10 24-HR	34.6	PM 10 24-HR	154.9
PM 2.5 24-HR	29.01	PM 2.5 24-HR	133.8
Receptor 11		Receptor 11	
1-HR	220.97	1-HR	889.25
8-HR	52.01	8-HR	244.8
PM 10 24-HR	20.43	PM 10 24-HR	106.01
PM 2.5 24-HR	19.92	PM 2.5 24-HR	105.78
Receptor 12		Receptor 12	
1-HR	277.37	1-HR	1173.3
8-HR	100.17	8-HR	474.49
PM 10 24-HR	38.8	PM 10 24-HR	228.64
PM 2.5 24-HR	31.74	PM 2.5 24-HR	194.31

Construction Emissions with Mitigation

Per Area

	Nox	CO	PM10	PM2.5
Area	**lbs/day**	**lbs/day**	**lbs/day**	**lbs/day**
Demo	0	0	0	0
Site Prep	36.81	23.19	3.97	1.5
Build	25.93	21.59	0.41	0.38
Asphalt	16.91	15.4	0.32	0.29

Whole Site

Demo	101.53	78.9	5.84	2.55

Construction Hours
8

2007 Air Quality SCAQMD

SRA	Nox 1 Hr	CO 1 HR	CO 8 Hr	PM10	PM2.5
12	0.1	8	5.1		
Threshold	0.18	20	9	10.4	10.4

Pollutant Concentratons with Mitigation

Construction Area/Phase	Nitrogen Dioxide ER g/s	1-Hr Site ug/m3	1-Hr Total ppm	Exceed Threshold 0.18	Carbon Monoxide ER g/s	1-Hr Site ug/m3	1-Hr Total ppm	Exceed Threshold 20	8-Hr Site ug/m3	8-Hr Total ppm	Exceed Threshold 9	Particulate Matter 10 ER g/s	24-hr ug/m3	Exceed Threshold 10.4	Particulate Matter 2.5 ER g/s	24-HR ug/m3	Exceed Threshold 10.4
Receptor 1																	
Demo	1.597	379	**0.30**	YES	1.241	294	**8.26**	NO	86	**5.18**	NO	0.09	**2.06**	NO	0.04	**0.82**	NO
Site Prep	0.579	807	**0.53**	YES	0.365	508	**8.44**	NO	166	**5.25**	NO	0.06	**10.58**	YES	0.02	**1.31**	NO
Build	0.408	568	**0.40**	YES	0.340	473	**8.41**	NO	155	**5.24**	NO	0.01	**1.09**	NO	0.01	**0.33**	NO
Asphalt	0.266	371	**0.30**	YES	0.242	338	**8.29**	NO	110	**5.20**	NO	0.01	**0.85**	NO	0.00	**0.25**	NO
Receptor 2																	
Demo	1.597	532	**0.38**	YES	1.241	413	**8.36**	NO	55	**5.15**	NO	0.09	**2.58**	NO	0.04	**0.93**	NO
Site Prep	0.579	522	**0.38**	YES	0.365	329	**8.29**	NO	116	**5.20**	NO	0.06	**9.06**	NO	0.02	**2.58**	NO
Build	0.408	368	**0.30**	YES	0.340	306	**8.27**	NO	108	**5.19**	NO	0.01	**0.94**	NO	0.01	**0.65**	NO
Asphalt	0.266	240	**0.23**	YES	0.242	218	**8.19**	NO	77	**5.17**	NO	0.01	**0.73**	NO	0.00	**0.50**	NO
Receptor 3																	
Demo	1.597	387	**0.31**	YES	1.241	301	**8.26**	NO	38	**5.13**	NO	0.09	**1.18**	NO	0.04	**0.48**	NO
Site Prep	0.579	381	**0.30**	YES	0.365	240	**8.21**	NO	47	**5.14**	NO	0.06	**3.42**	NO	0.02	**1.22**	NO
Build	0.408	268	**0.24**	YES	0.340	223	**8.20**	NO	44	**5.14**	NO	0.01	**0.35**	NO	0.01	**0.31**	NO
Asphalt	0.266	175	**0.19**	YES	0.242	159	**8.14**	NO	31	**5.13**	NO	0.01	**0.28**	NO	0.00	**0.24**	NO
Receptor 4																	
Demo	1.597	507	**0.37**	YES	1.241	394	**8.34**	NO	67	**5.16**	NO	0.09	**2.43**	NO	0.04	**0.65**	NO
Site Prep	0.579	391	**0.31**	YES	0.365	247	**8.22**	NO	103	**5.19**	NO	0.06	**8.13**	NO	0.02	**2.56**	NO
Build	0.408	276	**0.25**	YES	0.340	230	**8.20**	NO	95	**5.18**	NO	0.01	**0.84**	NO	0.01	**0.65**	NO
Asphalt	0.266	180	**0.20**	YES	0.242	164	**8.14**	NO	68	**5.16**	NO	0.01	**0.66**	NO	0.00	**0.50**	NO
Receptor 5																	
Demo	1.597	311	**0.27**	YES	1.241	242	**8.21**	NO	55	**5.15**	NO	0.09	**1.97**	NO	0.04	**0.68**	NO
Site Prep	0.579	445	**0.34**	YES	0.365	280	**8.24**	NO	82	**5.17**	NO	0.06	**5.83**	NO	0.02	**2.00**	NO
Build	0.408	313	**0.27**	YES	0.340	261	**8.23**	NO	77	**5.17**	NO	0.01	**0.60**	NO	0.01	**0.51**	NO
Asphalt	0.266	204	**0.21**	YES	0.242	186	**8.16**	NO	55	**5.15**	NO	0.01	**0.47**	NO	0.00	**0.39**	NO
Receptor 6																	
Demo	1.597	587	**0.41**	YES	1.241	456	**8.40**	NO	97	**5.18**	NO	0.09	**3.26**	NO	0.04	**1.06**	NO
Site Prep	0.579	680	**0.46**	YES	0.365	428	**8.37**	NO	246	**5.31**	NO	0.06	**17.18**	YES	0.02	**5.82**	NO
Build	0.408	479	**0.35**	YES	0.340	399	**8.35**	NO	229	**5.30**	NO	0.01	**1.77**	NO	0.01	**1.47**	NO
Asphalt	0.266	312	**0.27**	YES	0.242	284	**8.25**	NO	163	**5.24**	NO	0.01	**1.38**	NO	0.00	**1.12**	NO
Receptor 7																	
Demo	1.597	471	**0.35**	YES	1.241	366	**8.32**	NO	57	**5.15**	NO	0.09	**2.00**	NO	0.04	**0.71**	NO
Site Prep	0.579	736	**0.49**	YES	0.365	464	**8.41**	NO	97	**5.18**	NO	0.06	**6.65**	NO	0.02	**2.46**	NO
Build	0.408	519	**0.38**	YES	0.340	432	**8.38**	NO	90	**5.18**	NO	0.01	**0.69**	NO	0.01	**0.62**	NO
Asphalt	0.266	338	**0.28**	YES	0.242	308	**8.27**	NO	64	**5.16**	NO	0.01	**0.54**	NO	0.00	**0.48**	NO
Receptor 8																	
Demo	1.597	709	**0.48**	YES	1.241	551	**8.48**	NO	85	**5.17**	NO	0.09	**3.16**	NO	0.04	**0.93**	NO
Site Prep	0.579	594	**0.42**	YES	0.365	374	**8.33**	NO	105	**5.19**	NO	0.06	**7.12**	NO	0.02	**2.58**	NO
Build	0.408	418	**0.32**	YES	0.340	348	**8.30**	NO	98	**5.19**	NO	0.01	**0.74**	NO	0.01	**0.65**	NO
Asphalt	0.266	273	**0.24**	YES	0.242	248	**8.22**	NO	70	**5.16**	NO	0.01	**0.57**	NO	0.00	**0.50**	NO
Receptor 9																	
Demo	1.597	565	**0.40**	YES	1.241	439	**8.38**	NO	124	**5.21**	NO	0.09	**3.29**	NO	0.04	**1.17**	NO
Site Prep	0.579	596	**0.42**	YES	0.365	376	**8.33**	NO	132	**5.22**	NO	0.06	**8.65**	NO	0.02	**3.55**	NO
Build	0.408	420	**0.32**	YES	0.340	350	**8.31**	NO	123	**5.21**	NO	0.01	**0.89**	NO	0.01	**0.90**	NO
Asphalt	0.266	274	**0.25**	YES	0.242	249	**8.22**	NO	88	**5.18**	NO	0.01	**0.70**	NO	0.00	**0.69**	NO
Receptor 10																	
Demo	1.597	469	**0.35**	YES	1.241	365	**8.32**	NO	108	**5.19**	NO	0.09	**3.18**	NO	0.04	**1.16**	NO
Site Prep	0.579	490	**0.36**	YES	0.365	309	**8.27**	NO	133	**5.22**	NO	0.06	**9.67**	NO	0.02	**3.16**	NO
Build	0.408	345	**0.28**	YES	0.340	287	**8.25**	NO	123	**5.21**	NO	0.01	**1.00**	NO	0.01	**0.80**	NO
Asphalt	0.266	225	**0.22**	YES	0.242	205	**8.18**	NO	88	**5.18**	NO	0.01	**0.78**	NO	0.00	**0.61**	NO
Receptor 11																	
Demo	1.597	353	**0.29**	YES	1.241	274	**8.24**	NO	65	**5.16**	NO	0.09	**1.88**	NO	0.04	**0.80**	NO
Site Prep	0.579	515	**0.37**	YES	0.365	324	**8.28**	NO	89	**5.18**	NO	0.06	**6.62**	NO	0.02	**2.50**	NO
Build	0.408	363	**0.29**	YES	0.340	302	**8.26**	NO	83	**5.17**	NO	0.01	**0.68**	NO	0.01	**0.63**	NO
Asphalt	0.266	237	**0.23**	YES	0.242	215	**8.19**	NO	59	**5.15**	NO	0.01	**0.53**	NO	0.00	**0.48**	NO
Receptor 12																	
Demo	1.597	443	**0.34**	YES	1.241	344	**8.30**	NO	124	**5.21**	NO	0.09	**3.56**	NO	0.04	**1.27**	NO
Site Prep	0.579	679	**0.46**	YES	0.365	428	**8.37**	NO	173	**5.25**	NO	0.06	**14.28**	YES	0.02	**4.58**	NO
Build	0.408	479	**0.35**	YES	0.340	398	**8.35**	NO	161	**5.24**	NO	0.01	**1.47**	NO	0.01	**1.16**	NO
Asphalt	0.266	312	**0.27**	YES	0.242	284	**8.25**	NO	115	**5.20**	NO	0.01	**1.15**	NO	0.00	**0.89**	NO

Five Acre Site Example - Architectural Coating and Asphalt Paving

		Construction Activity
Parcel I (7.69 acres)		Architectural Coatings and Asphalt Paving (2010)
Construction Schedule -	**11**	**days**[a]

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Pavers	1	8.0	8
Rollers	1	8.0	
Paving Equipment	1	8.0	
Cement and Mortar Mixers	4	6.0	
Tractors/Loaders/Backhoes	1	7.0	

Construction Equipment Combustion Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Pavers	0.564	0.987	0.071
Rollers	0.421	0.775	0.055
Paving Equipment	0.448	0.896	0.063
Cement and Mortar Mixers	0.043	0.060	0.004
Tractors/Loaders/Backhoes	0.393	0.675	0.052

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[d]	0.01195456	0.03822102	0.00183062

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Delivery Truck[e]	10	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Architectural Coating and Asphalt Paving

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day

	CO	NOx	PM10
Equipment Type	lb/day	lb/day	lb/day
Pavers	4.52	7.89	0.57
Rollers	3.37	6.20	0.44
Paving Equipment	3.58	7.17	0.50
Cement and Mortar Mixers	1.04	1.44	0.08
Tractors/Loaders/Backhoes	2.75	4.72	0.36
Total	**15.26**	**27.42**	**1.96**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Delivery Truck	0.14	0.46	0.02
Water Truck	0.00	0	0
Total	**0.14**	**0.46**	**0.02**

Total Incremental Combustion Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-Site Emissions	**15.40**	**27.88**	**1.98**

Combustion and Fugitive Summary	**PM2.5 Fraction[g]**	**PM10**	**PM2.5**
		lb/day	lb/day
Combustion (Offroad)	0.92	1.96	1.80
Combustion (Onroad)	0.96	0.02	0.02
Fugitive	0.21	0.00	0.00
Total		**1.98**	**1.82**

Five Acre Site Example - Architectural Coating and Asphalt Paving

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Structure Construction

	Construction Activity		
Parcel I (7.69 acres)	Building (2009)	621,000	Square Foot Structure[a]

Construction Schedule

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Cranes	1	8.0	n/a
Forklifts	2	8.0	
Skid Steer Loaders	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	
Generator Sets	1	8.0	
Welders	3	8.0	

Construction Equipment Combustion Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Cranes	0.571	1.529	0.068
Forklifts	0.237	0.556	0.030
Skid Steer Loaders	0.257	0.306	0.028
Tractors/Loaders/Backhoes	0.399	0.723	0.056
Generator Sets	0.338	0.672	0.041
Welders	0.228	0.301	0.028

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[d]	0.01282236	0.04184591	0.00199572

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Flatbed Truck[a,e]	3	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Structure Construction

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Cranes	4.56	12.23	0.54
Forklifts	3.79	8.90	0.48
Skid Steer Loaders	4.10	4.89	0.44
Tractors/Loaders/Backhoes	6.39	11.56	0.89
Generator Sets	2.70	5.37	0.33
Welders	N/A	N/A	N/A
Total	**21.55**	**42.96**	**2.69**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Flatbed Truck	0.05	0.15	0.01
Water Truck	0.00	0.00	0.00
Total	**0.05**	**0.15**	**0.01**

Total Incremental Combustion Emissions from Construction Activities

Sources	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
On-Site Emissions	**21.59**	**43.11**	**2.70**

Combustion and Fugitive Summary	**PM2.5 Fraction**[g]	**PM10** lb/day	**PM2.5** lb/day
Combustion (Offroad)	0.92	2.69	2.48
Combustion (Onroad)	0.96	0.01	0.01
Fugitive	0.21	0.00	0.00
Total		**2.70**	**2.48**

Five Acre Site Example - Structure Construction

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b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Structure Construction

	Construction Activity		
Parcel I (7.69 acres)	Building (2010)	621,000	Square Foot Structure[a]

Construction Schedule

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Cranes	1	8.0	n/a
Forklifts	2	8.0	
Skid Steer Loaders	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	
Generator Sets	1	8.0	
Welders	3	8.0	

Construction Equipment Combustion Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Cranes	0.543	1.451	0.064
Forklifts	0.232	0.516	0.028
Skid Steer Loaders	0.249	0.292	0.025
Tractors/Loaders/Backhoes	0.393	0.675	0.052
Generator Sets	0.329	0.644	0.040
Welders	0.225	0.292	0.027

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[d]	0.01195456	0.03822102	0.00183062

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Flatbed Truck[a,e]	3	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Structure Construction

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Cranes	4.35	11.61	0.51
Forklifts	3.71	8.26	0.45
Skid Steer Loaders	3.98	4.67	0.40
Tractors/Loaders/Backhoes	6.29	10.80	0.83
Generator Sets	2.63	5.15	0.32
Welders	N/A	N/A	N/A
Total	**20.96**	**40.49**	**2.52**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Flatbed Truck	0.04	0.14	0.01
Water Truck	0.00	0.00	0.00
Total	**0.04**	**0.14**	**0.01**

Total Incremental Combustion Emissions from Construction Activities

Sources	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
On-Site Emissions	**21.00**	**40.63**	**2.52**

Combustion and Fugitive Summary	**PM2.5 Fraction**[g]	**PM10** lb/day	**PM2.5** lb/day
Combustion (Offroad)	0.92	2.52	2.32
Combustion (Onroad)	0.96	0.01	0.01
Fugitive	0.21	0.00	0.00
Total		**2.52**	**2.32**

Five Acre Site Example - Structure Construction

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c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Demolition Phase

	Construction Activity		
Entire 76.49-acre site	Demolition of Existing Buildings (2009)	1,435,968	Square Foot Structure[a]
Demolition Schedule -	**22**	**days[a]**	

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Concrete/Industrial Saws	8	8.0	n/a
Other Material Handling Equipment	2	8.0	
Rubber Tired Loaders	2	8.0	
Rubber Tired Dozers	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Concrete/Industrial Saws	0.434	0.691	0.058
Other Material Handling Equipment	0.580	1.694	0.075
Rubber Tired Loaders	0.521	1.225	0.069
Rubber Tired Dozers	1.502	3.125	0.135
Tractors/Loaders/Backhoes	0.399	0.723	0.056

Building Dimensions

Description[a]	**Width of Building**	**Length of Building**	**Height of Building**
	ft	ft	ft
Total Project	n/a	n/a	n/a

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[d]	**Mean Wind Speed[e]**	**Moisture Content[f]**	**Debris Handled[g]**	
	mph		ton/day	* The amt. of dailyu debris handled has been modified to correspond to the input into the URBEMIS model.
0.35	10	2.0	2,267	

Construction Vehicle (Mobile Source) Emission Factors

	CO	**NOx**	**PM10**
	lb/mile	lb/mile	lb/mile
Heavy-Duty Truck[h]	0.01282236	0.04184591	0.00199572

Five Acre Site Example - Demolition Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	Trip Length (miles)
Haul Truck	200	0.6

Incremental Increase in Onsite Combustion Emissions from Construction Equipmen

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Concrete/Industrial Saws	27.78	44.20	3.72
Other Material Handling Equipment	9.28	27.11	1.20
Rubber Tired Loaders	8.34	19.61	1.10
Rubber Tired Dozers	24.03	50.01	2.15
Tractors/Loaders/Backhoes	6.39	11.56	0.89
Total	**75.82**	**152.48**	**9.07**

Incremental Increase in Onsite Fugitive Dust Emissions from Construction Equipmen

Material Handling[k]: (0.0032 x Aerodynamic Particle Size Multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x debris handled (ton/day)) x (1 - control efficiency) = PM10 Emissions (lb/day)

Description	Control Efficiency %	PM10 Mitigated[m] lb/day
Material Handling (Demolition)[l]	68	2.00
Material Handling (Debris)	68	2.00
Total		**4.00**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicle

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	CO lb/day	NOx lb/day	PM10 lb/day
Offsite (Haul Truck)	3.08	10.04	0.479
Total	**3.08**	**10.04**	**0.479**

Five Acre Site Example - Demolition Phase

Total Incremental Localized Emissions from Construction Activitie			
	CO	**NOx**	**PM10**
Sources	lb/day	lb/day	lb/day
On-site Emissions (Mitigated)	**78.90**	**162.53**	**13.55**

Combustion and Fugitive Summary	**PM2.5 Fraction[o]**	**PM10**	**PM2.5**
		lb/day	lb/day
Combustion (Offroad)	0.92	9.07	8.35
Combustion (Onroad)	0.96	0.48	0.46
Fugitive	0.21	4.00	0.84
Total		**13.55**	**9.65**

Five Acre Site Example - Demolition Phase

Notes:

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically.

c) SCAB values provided by the ARB, Oct 2006. Assumed equipment is diesel fueled.

d) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

e) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

f) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, equation 2-13, p 2-28

g) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, p 2-28. Debris weight to area ratio = 0.046 ton/sq ft

h) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

i) Assumed 14 cubic yd truck capacity [(2267 tons/day x 2,000 lb/ton x cyd/1,620 lb = 2799 cyd)/14 cyd/truck = 200 one-way truck trips/day, where building debris density is assumed to be 1,620 lb/cyd] Mulitple trucks may be used.

j) Assumed trucks travel 0.6 mile through project site.

k) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, equation 2-13, p 2-28. EPA suggusts using the material handling equation for demolition emission estimates.

l) EPA suggests using the material handling equation for demolition emission estimates.

m) Includes watering at least three times a day per Rule 403 (68% control efficiency)

n) Illustration purpose showing the most stringent LSTs. Please consult App. C of the Methodology Paper for applicable LSTs.

o) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Grading Phase

Construction Activity			
Parcel I (7.69 acres)	Grading (2009)	334,820	Square Feet[a]
Grading Schedule -	**39**	**days[a]**	

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Rubber Tired Loaders	2	8.0	n/a
Graders	1	8.0	
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Rubber Tired Loaders	0.521	1.225	0.069
Graders	0.643	1.524	0.080
Tractors/Loaders/Backhoes	0.399	0.723	0.056

Fugitive Dust Grading Parameters

Vehicle Speed (mph)[d]	**Vehicle Miles Traveled[e]**
3	0.15

Fugitive Dust Stockpiling Parameters

Silt Content[f]	**Precipitation Days[g]**	**Mean Wind Speed Percent[h]**	**TSP Fraction**	**Area[i] (acres)**
6.9	10	100	0.5	0.21

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[j]	**Mean Wind Speed[k]** mph	**Moisture Content[f]**	**Dirt Handled[a]** cy	**Dirt Handled[l]** lb/day
0.35	10	7.9	88,300	6,250,000

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[m]	0.01282236	0.04184591	0.00199572

Five Acre Site Example - Grading Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	One WayTrip Length (miles)
Haul Truck[n]	162	0.6
Water Truck[o]	3	10.6

Incremental Increase in Onsite Combustion Emissions from Construction Equipmen

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Rubber Tired Loaders	8.34	19.61	1.10
Graders	5.14	12.19	0.64
Tractors/Loaders/Backhoes	6.39	11.56	0.89
Total	**19.87**	**43.36**	**2.63**

Incremental Increase in Fugitive Dust Emissions from Construction Operation

Equations:

Gradingp: PM10 Emissions (lb/day) = 0.60 x 0.051 x mean vehicle speed$^{2.0}$ x VMT x (1 - control efficiency)

Storage Piles[q]: PM10 Emissions (lb/day) = 1.7 x (silt content/1.5) x ((365-precipitation days)/235) x wind speed percent/15 x TSP fraction x Area) x (1 - control efficiency)

Material Handling[r]: PM10 Emissions (lb/day) = (0.0032 x aerodynamic particle size multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x dirt handled (lb/day)/2,000 (lb/ton) (1 - control efficiency)

Description	Control Efficiency %	Unmitigated PM10[s] lb/day
Earthmoving	68	0.01
Storage Piles	68	2.65
Material Handling	68	0.4
Total		**3.06**

Five Acre Site Example - Grading Phase

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicle

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Haul Truck	2.49	8.13	0.39
Water Truck	0.82	2.66	0.13
Total	**3.31**	**10.79**	**0.52**

Total Incremental Localized Emissions from Construction Activitie

Sources	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
On-site Emissions	**23.19**	**54.15**	**6.21**

Combustion and Fugitive Summary	**PM2.5 Fraction**[u]	**PM10** lb/day	**PM2.5** lb/day
Combustion (Offroad)	0.92	2.63	2.42
Combustion (Onroad)	0.96	0.52	0.50
Fugitive	0.21	3.06	0.64
Total		**6.21**	**3.56**

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006. Assumed equipment is diesel fueled.

d) Caterpillar Performance Handbook, Edition 33, October 2003 Operating Speeds, p 2-3.

e) Assumed 13 foot wide blade with 2 foot overlap (11 foot wide). Vehicle miles traveled (VMT) = (334,820 sq ft/11 foot x mile/5,280 ft)/ 39 days = 0.15 miles

f) USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Corection Factors Applicable to the Predictive Emission Factor Equations

g) Table A9-9-E2, SCAQMD CEQA Air Quality Handbook, 1993

h) Mean wind speed percent - percent of time mean wind speed exceeds 12 mph. At least one meteorological site recorded wind speeds greater than 12 mph over a 24-hour period in 1981.

i) Assumed storage piles are 0.21 acres in size

j) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

k) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

l) The daily amount of dirt handled has been modified to correspond with the input into the URBEMIS model.

m) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

n) Assumed 14 cubic yd truck capacity 88,300 cyd of dirt [(88,300 cyd x truck/14 cyd)/39 days = 162 one-way truck trips/day]. Assumed haul truck travels 0.6 miles through facility

o) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

p) USEPA, AP-42, July 1998, Table 11.9-1, Equation for Site Grading ≤ 10 µm

q) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, Equation 1

r) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, Sept 1992, EPA-450/2-92-004, Equation 2-12

s) Includes watering at least three times a day per Rule 403 (68% control efficiency).

t) Illustration purpose showing the most stringent LSTs. Please consult App. C of the Methodology Paper for applicable LSTs.

u) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Architectural Coating and Asphalt Paving

		Construction Activity with Mitigation
Parcel I (7.69 acres)		Architectural Coatings and Asphalt Paving (2010)
Construction Schedule -	**11**	**days**[a]

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Pavers	1	8.0	8
Rollers	1	8.0	
Paving Equipment	1	8.0	
Cement and Mortar Mixers	4	6.0	
Tractors/Loaders/Backhoes	1	7.0	

Construction Equipment Combustion Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Pavers	0.564	0.592	0.011
Rollers	0.421	0.465	0.008
Paving Equipment	0.448	0.538	0.009
Cement and Mortar Mixers	0.043	0.036	0.001
Tractors/Loaders/Backhoes	0.393	0.405	0.008

Construction Vehicle (Mobile Source) Emission Factors

	CO	**NOx**	**PM10**
	lb/mile	lb/mile	lb/mile
Heavy-Duty Truck[d]	0.01195456	0.03822102	0.00183062

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Delivery Truck[e]	10	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Architectural Coating and Asphalt Paving

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day

	CO	**NOx**	**PM10**
Equipment Type	lb/day	lb/day	lb/day
Pavers	4.52	4.74	0.09
Rollers	3.37	3.72	0.07
Paving Equipment	3.58	4.30	0.08
Cement and Mortar Mixers	1.04	0.86	0.01
Tractors/Loaders/Backhoes	2.75	2.83	0.05
Total	**15.26**	**16.45**	**0.29**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	**NOx**	**PM10**
Vehicle	lb/day	lb/day	lb/day
Delivery Truck	0.14	0.46	0.02
Water Truck	0.00	0	0
Total	**0.14**	**0.46**	**0.02**

Total Incremental Combustion Emissions from Construction Activities

	CO	**NOx**	**PM10**
Sources	lb/day	lb/day	lb/day
On-Site Emissions	**15.40**	**16.91**	**0.32**

Combustion and Fugitive Summary	**PM2.5 Fraction[g]**	**PM10**	**PM2.5**
		lb/day	lb/day
Combustion (Offroad)	0.92	0.29	0.27
Combustion (Onroad)	0.96	0.02	0.02
Fugitive	0.21	0.00	0.00
Total		**0.32**	**0.29**

Five Acre Site Example - Architectural Coating and Asphalt Paving

Notes:

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Structure Construction

	Construction Activity with Mitigation		
Parcel I (7.69 acres)	Building (2009)	621,000	Square Foot Structure[a]
Construction Schedule			

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Cranes	1	8.0	n/a
Forklifts	2	8.0	
Skid Steer Loaders	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	
Generator Sets	1	8.0	
Welders	3	8.0	

Construction Equipment Combustion Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Cranes	0.571	0.918	0.010
Forklifts	0.237	0.334	0.005
Skid Steer Loaders	0.257	0.183	0.004
Tractors/Loaders/Backhoes	0.399	0.434	0.008
Generator Sets	0.338	0.403	0.006
Welders	0.228	0.181	0.004

Construction Vehicle (Mobile Source) Emission Factors

	CO	**NOx**	**PM10**
	lb/mile	lb/mile	lb/mile
Heavy-Duty Truck[d]	0.01282236	0.04184591	0.00199572

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Flatbed Truck[a,e]	3	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Structure Construction

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Cranes	4.56	7.34	0.08
Forklifts	3.79	5.34	0.07
Skid Steer Loaders	4.10	2.93	0.07
Tractors/Loaders/Backhoes	6.39	6.94	0.13
Generator Sets	2.70	3.22	0.05
Welders	N/A	N/A	N/A
Total	**21.55**	**25.78**	**0.40**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Flatbed Truck	0.05	0.15	0.01
Water Truck	0.00	0.00	0.00
Total	**0.05**	**0.15**	**0.01**

Total Incremental Combustion Emissions from Construction Activities

Sources	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
On-Site Emissions	**21.59**	**25.93**	**0.41**

Combustion and Fugitive Summary	**PM2.5 Fraction**[g]	**PM10** lb/day	**PM2.5** lb/day
Combustion (Offroad)	0.92	0.40	0.37
Combustion (Onroad)	0.96	0.01	0.01
Fugitive	0.21	0.00	0.00
Total		**0.41**	**0.38**

Five Acre Site Example - Structure Construction

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Structure Construction

Construction Activity with Mitigation			
Parcel I (7.69 acres)	Building (2010)	621,000	Square Foot Structure[a]

Construction Schedule

Equipment Type[a,b]	No. of Equipment	hr/day	Crew Size
Cranes	1	8.0	n/a
Forklifts	2	8.0	
Skid Steer Loaders	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	
Generator Sets	1	8.0	
Welders	3	8.0	

Construction Equipment Combustion Emission Factors

Equipment Type[c]	CO lb/hr	NOx lb/hr	PM10 lb/hr
Cranes	0.543	0.871	0.010
Forklifts	0.232	0.310	0.004
Skid Steer Loaders	0.249	0.175	0.004
Tractors/Loaders/Backhoes	0.393	0.405	0.008
Generator Sets	0.329	0.386	0.006
Welders	0.225	0.175	0.004

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	NOx lb/mile	PM10 lb/mile
Heavy-Duty Truck[d]	0.01195456	0.03822102	0.00183062

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	Trip Length (miles)
Flatbed Truck[a,e]	3	0.6
Water Truck[f]	0	10.6

Five Acre Site Example - Structure Construction

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Cranes	4.35	6.97	0.08
Forklifts	3.71	4.95	0.07
Skid Steer Loaders	3.98	2.80	0.06
Tractors/Loaders/Backhoes	6.29	6.48	0.12
Generator Sets	2.63	3.09	0.05
Welders	N/A	N/A	N/A
Total	**20.96**	**24.29**	**0.38**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
Flatbed Truck	0.04	0.14	0.01
Water Truck	0.00	0.00	0.00
Total	**0.04**	**0.14**	**0.01**

Total Incremental Combustion Emissions from Construction Activities

Sources	**CO** lb/day	**NOx** lb/day	**PM10** lb/day
On-Site Emissions	**21.00**	**24.43**	**0.38**

Combustion and Fugitive Summary	**PM2.5 Fraction**[g]	**PM10** lb/day	**PM2.5** lb/day
Combustion (Offroad)	0.92	0.38	0.35
Combustion (Onroad)	0.96	0.01	0.01
Fugitive	0.21	0.00	0.00
Total		**0.38**	**0.35**

Five Acre Site Example - Structure Construction

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a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006.

d) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.6 miles through facility

f) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

g) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Demolition Phase

	Construction Activity with Mitigation		
Entire 76.49-acre site	Demolition of Existing Buildings (2009)	1,435,968	Square Foot Structure[a]
Demolition Schedule -	**22**	**days[a]**	

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Concrete/Industrial Saws	8	8.0	n/a
Other Material Handling Equipment	2	8.0	
Rubber Tired Loaders	2	8.0	
Rubber Tired Dozers	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Concrete/Industrial Saws	0.434	0.414	0.009
Other Material Handling Equipment	0.580	1.017	0.011
Rubber Tired Loaders	0.521	0.735	0.010
Rubber Tired Dozers	1.502	1.875	0.020
Tractors/Loaders/Backhoes	0.399	0.434	0.008

Building Dimensions

Description[a]	**Width of Building** ft	**Length of Building** ft	**Height of Building** ft
Total Project	n/a	n/a	n/a

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[d]	**Mean Wind Speed[e]** mph	**Moisture Content[f]**	**Debris Handled[g]** ton/day	* The amt. of dailyu debris handled has been modified to correspond to the input into the URBEMIS model.
0.35	10	2.0	2,267	

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[h]	0.01282236	0.04184591	0.00199572

Five Acre Site Example - Demolition Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	Trip Length (miles)
Haul Truck	200	0.6

Incremental Increase in Onsite Combustion Emissions from Construction Equipmen

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Concrete/Industrial Saws	27.78	26.52	0.56
Other Material Handling Equipment	9.28	16.27	0.18
Rubber Tired Loaders	8.34	11.76	0.17
Rubber Tired Dozers	24.03	30.00	0.32
Tractors/Loaders/Backhoes	6.39	6.94	0.13
Total	**75.82**	**91.49**	**1.36**

Incremental Increase in Onsite Fugitive Dust Emissions from Construction Equipmen

Material Handling[k]: (0.0032 x Aerodynamic Particle Size Multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x debris handled (ton/day)) x (1 - control efficiency) = PM10 Emissions (lb/day)

Description	Control Efficiency %	PM10 Mitigated[m] lb/day
Material Handling (Demolition)[l]	68	2.00
Material Handling (Debris)	68	2.00
Total		**4.00**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicle

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

Vehicle	CO lb/day	NOx lb/day	PM10 lb/day
Offsite (Haul Truck)	3.08	10.04	0.479
Total	**3.08**	**10.04**	**0.479**

Five Acre Site Example - Demolition Phase

Total Incremental Localized Emissions from Construction Activitie			
	CO	**NOx**	**PM10**
Sources	lb/day	lb/day	lb/day
On-site Emissions (Mitigated)	**78.90**	**101.53**	**5.84**

Combustion and Fugitive Summary	**PM2.5 Fraction[o]**	**PM10**	**PM2.5**
		lb/day	lb/day
Combustion (Offroad)	0.92	1.36	1.25
Combustion (Onroad)	0.96	0.48	0.46
Fugitive	0.21	4.00	0.84
Total		**5.84**	**2.55**

Five Acre Site Example - Demolition Phase

Notes:

Project specific data may be entered into shaded cells. Changing the values in the shaded cells will not affect the integrity of the worksheets. Verify that units of values entered match units for cell.

Adding lines or entering values with units different than those associated with the shaded cells may alter the integrity of the sheets or produce incorrect results.

a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically.

c) SCAB values provided by the ARB, Oct 2006. Assumed equipment is diesel fueled.

d) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

e) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

f) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, equation 2-13, p 2-28

g) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, p 2-28. Debris weight to area ratio = 0.046 ton/sq ft

h) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

i) Assumed 14 cubic yd truck capacity [(2267 tons/day x 2,000 lb/ton x cyd/1,620 lb = 2799 cyd)/14 cyd/truck = 200 one-way truck trips/day, where building debris density is assumed to be 1,620 lb/cyd] Mulitple trucks may be used.

j) Assumed trucks travel 0.6 mile through project site.

k) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, equation 2-13, p 2-28. EPA suggusts using the material handling equation for demolition emission estimates.

l) EPA suggests using the material handling equation for demolition emission estimates.

m) Includes watering at least three times a day per Rule 403 (68% control efficiency)

n) Illustration purpose showing the most stringent LSTs. Please consult App. C of the Methodology Paper for applicable LSTs.

o) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

Five Acre Site Example - Grading Phase

Construction Activity with Mitigation			
Parcel I (7.69 acres)	Grading (2009)	334,820	Square Feet[a]
Grading Schedule -	**39**	**days[a]**	

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Rubber Tired Loaders	2	8.0	n/a
Graders	1	8.0	
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Rubber Tired Loaders	0.521	0.735	0.010
Graders	0.643	0.914	0.012
Tractors/Loaders/Backhoes	0.399	0.434	0.008

Fugitive Dust Grading Parameters

Vehicle Speed (mph)[d]	**Vehicle Miles Traveled[e]**
3	0.15

Fugitive Dust Stockpiling Parameters

Silt Content[f]	**Precipitation Days[g]**	**Mean Wind Speed Percent[h]**	**TSP Fraction**	**Area[i] (acres)**
6.9	10	100	0.5	0.21

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[j]	**Mean Wind Speed[k]**	**Moisture Content[f]**	**Dirt Handled[a]**	**Dirt Handled[l]**
	mph		cy	lb/day
0.35	10	7.9	88,300	6,250,000

Construction Vehicle (Mobile Source) Emission Factors

	CO	**NOx**	**PM10**
	lb/mile	lb/mile	lb/mile
Heavy-Duty Truck[m]	0.01282236	0.04184591	0.00199572

Five Acre Site Example - Grading Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	One WayTrip Length (miles)
Haul Truck[n]	162	0.6
Water Truck[o]	3	10.6

Incremental Increase in Onsite Combustion Emissions from Construction Equipmen

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Rubber Tired Loaders	8.34	11.76	0.17
Graders	5.14	7.31	0.10
Tractors/Loaders/Backhoes	6.39	6.94	0.13
Total	**19.87**	**26.02**	**0.39**

Incremental Increase in Fugitive Dust Emissions from Construction Operation

Equations:

Gradingp: PM10 Emissions (lb/day) = 0.60 x 0.051 x mean vehicle speed$^{2.0}$ x VMT x (1 - control efficiency)

Storage Piles[q]: PM10 Emissions (lb/day) = 1.7 x (silt content/1.5) x ((365-precipitation days)/235) x wind speed percent/15 x TSP fraction x Area) x (1 - control efficiency)

Material Handling[r]: PM10 Emissions (lb/day) = (0.0032 x aerodynamic particle size multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x dirt handled (lb/day)/2,000 (lb/ton) (1 - control efficiency)

Description	Control Efficiency %	Unmitigated PM10[s] lb/day
Earthmoving	68	0.01
Storage Piles	68	2.65
Material Handling	68	0.4
Total		**3.06**

Five Acre Site Example - Grading Phase

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicle

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Haul Truck	2.49	8.13	0.39
Water Truck	0.82	2.66	0.13
Total	**3.31**	**10.79**	**0.52**

Total Incremental Localized Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-site Emissions	**23.19**	**36.81**	**3.97**

Combustion and Fugitive Summary	**PM2.5 Fraction[u]**	**PM10**	**PM2.5**
		lb/day	lb/day
Combustion (Offroad)	0.92	0.39	0.36
Combustion (Onroad)	0.96	0.52	0.50
Fugitive	0.21	3.06	0.64
Total		**3.97**	**1.50**

Notes:

Project specific data may be entered into shaded cells. Changing the values in the shaded cells will not affect the integrity of the worksheets. Verify that units of values entered match units for cell.

Adding lines or entering values with units different than those associated with the shaded cells may alter the integrity of the sheets or produce incorrect results.

a) Estimated construction data for Project.

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Oct 2006. Assumed equipment is diesel fueled.

d) Caterpillar Performance Handbook, Edition 33, October 2003 Operating Speeds, p 2-3.

e) Assumed 13 foot wide blade with 2 foot overlap (11 foot wide). Vehicle miles traveled (VMT) = (334,820 sq ft/11 foot x mile/5,280 ft)/ 39 days = 0.15 miles

f) USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Corection Factors Applicable to the Predictive Emission Factor Equations

g) Table A9-9-E2, SCAQMD CEQA Air Quality Handbook, 1993

h) Mean wind speed percent - percent of time mean wind speed exceeds 12 mph. At least one meteorological site recorded wind speeds greater than 12 mph over a 24-hour period in 1981.

i) Assumed storage piles are 0.21 acres in size

j) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

k) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

l) The daily amount of dirt handled has been modified to correspond with the input into the URBEMIS model.

m) CARB, EMFAC2007 (version 2.3) Burden Model, Winter 2007, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

n) Assumed 14 cubic yd truck capacity 88,300 cyd of dirt [(88,300 cyd x truck/14 cyd)/39 days = 162 one-way truck trips/day]. Assumed haul truck travels 0.6 miles through facility

o) Assumed six foot wide water truck traverses over 334,820 square feet of disturbed area

p) USEPA, AP-42, July 1998, Table 11.9-1, Equation for Site Grading ≤ 10 µm

q) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggregate Handling and Storage Piles, Equation 1

r) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, Sept 1992, EPA-450/2-92-004, Equation 2-12

s) Includes watering at least three times a day per Rule 403 (68% control efficiency).

t) Illustration purpose showing the most stringent LSTs. Please consult App. C of the Methodology Paper for applicable LSTs.

u) ARB's CEIDARS database PM2.5 fractions - construction dust category for fugitive and diesel vehicle exhaust category for combustion.

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Existing Uses Operational Emissions.urb924

Project Name: Tierra Luna Specific Plan EIR - Existing Uses Operational Emissions

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	9.24	9.72	8.16	0.00	0.02	0.02	11,658.16

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	24.88	13.34	163.51	0.13	22.41	4.26	12,357.82
TOTALS (lbs/day, mitigated)	24.26	12.67	155.34	0.12	21.29	4.05	11,739.93
Percent Reduction	2.49	5.02	5.00	7.69	5.00	4.93	5.00

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	34.12	23.06	171.67	0.13	22.43	4.28	24,015.98

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.71	9.72	8.16	0.00	0.02	0.02	11,658.16
Hearth							
Landscape							
Consumer Products							
Architectural Coatings	8.53						
TOTALS (lbs/day, unmitigated)	9.24	9.72	8.16	0.00	0.02	0.02	11,658.16

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
General office building	24.88	13.34	163.51	0.13	22.41	4.26	12,357.82
TOTALS (lbs/day, unmitigated)	24.88	13.34	163.51	0.13	22.41	4.26	12,357.82

Operational Mitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
General office building	24.26	12.67	155.34	0.12	21.29	4.05	11,739.93
TOTALS (lbs/day, mitigated)	24.26	12.67	155.34	0.12	21.29	4.05	11,739.93

Operational Settings:

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Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2008 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
General office building		0.88	1000 sq ft	1,457.27	1,282.40	13,051.60
					1,282.40	13,051.60

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	59.0	1.7	97.9	0.4
Light Truck < 3750 lbs	8.5	4.1	91.8	4.1
Light Truck 3751-5750 lbs	26.2	0.9	99.1	0.0
Med Truck 5751-8500 lbs	1.4	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.2	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.1	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.1	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.1	0.0	0.0	100.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.2	78.6	21.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.0	11.1	77.8	11.1

2/3/2009 6:03:23 PM

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
General office building				35.0	17.5	47.5

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Existing Uses Operational Emissions.urb924

Project Name: Tierra Luna Specific Plan EIR - Existing Uses Operational Emissions

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	9.24	9.72	8.16	0.00	0.02	0.02	11,658.16

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	19.86	16.48	158.01	0.10	22.41	4.26	11,137.00
TOTALS (lbs/day, mitigated)	19.14	15.66	150.11	0.10	21.29	4.05	10,580.15
Percent Reduction	3.63	4.98	5.00	0.00	5.00	4.93	5.00

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	29.10	26.20	166.17	0.10	22.43	4.28	22,795.16

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

2/3/2009 6:04:38 PM

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.71	9.72	8.16	0.00	0.02	0.02	11,658.16
Hearth							
Landscape							
Consumer Products							
Architectural Coatings	8.53						
TOTALS (lbs/day, unmitigated)	9.24	9.72	8.16	0.00	0.02	0.02	11,658.16

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
General office building	19.86	16.48	158.01	0.10	22.41	4.26	11,137.00
TOTALS (lbs/day, unmitigated)	19.86	16.48	158.01	0.10	22.41	4.26	11,137.00

Operational Mitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
General office building	19.14	15.66	150.11	0.10	21.29	4.05	10,580.15
TOTALS (lbs/day, mitigated)	19.14	15.66	150.11	0.10	21.29	4.05	10,580.15

Operational Settings:

2/3/2009 6:04:38 PM

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2008 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
General office building		0.88	1000 sq ft	1,457.27	1,282.40	13,051.60
					1,282.40	13,051.60

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	59.0	1.7	97.9	0.4
Light Truck < 3750 lbs	8.5	4.1	91.8	4.1
Light Truck 3751-5750 lbs	26.2	0.9	99.1	0.0
Med Truck 5751-8500 lbs	1.4	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.2	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.1	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.1	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.1	0.0	0.0	100.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.2	78.6	21.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.0	11.1	77.8	11.1

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
General office building				35.0	17.5	47.5

10/30/2008 3:11:31 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Proposed Project Construction Emissions - Worst Case Scenario (with MM).urb924

Project Name: Proposed Project Construction Emissions - Worst Case Scenario with MMs

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2009 TOTALS (lbs/day unmitigated)	23.72	274.27	116.59	0.24	365.46	11.96	372.06	76.38	11.00	82.45	31,768.77
2009 TOTALS (lbs/day mitigated)	23.72	247.99	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
2010 TOTALS (lbs/day unmitigated)	108.40	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
2010 TOTALS (lbs/day mitigated)	68.63	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

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Time Slice 4/1/2009-4/30/2009 Active Days: 22	23.72	**274.27**	**116.59**	**0.24**	127.76	**11.96**	139.71	26.68	**11.00**	37.68	**31,768.77**
Demolition 04/01/2009-04/30/2009	23.72	274.27	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
Fugitive Dust	0.00	0.00	0.00	0.00	126.89	0.00	126.89	26.39	0.00	26.39	0.00
Demo Off Road Diesel	8.18	69.04	33.43	0.00	0.00	3.37	3.37	0.00	3.10	3.10	5,864.89
Demo On Road Diesel	15.39	204.95	78.65	0.24	0.85	8.57	9.41	0.28	7.88	8.16	25,406.16
Demo Worker Trips	0.14	0.27	4.51	0.01	0.02	0.01	0.04	0.01	0.01	0.02	497.72
Time Slice 5/1/2009-6/24/2009 Active Days: 39	12.56	142.57	59.82	0.13	**365.46**	6.59	**372.06**	**76.38**	6.07	**82.45**	16,697.88
Mass Grading 05/01/2009-06/24/2009	12.56	142.57	59.82	0.13	365.46	6.59	372.06	76.38	6.07	82.45	16,697.88
Mass Grading Dust	0.00	0.00	0.00	0.00	365.00	0.00	365.00	76.23	0.00	76.23	0.00
Mass Grading Off Road Diesel	4.20	31.88	15.69	0.00	0.00	1.97	1.97	0.00	1.81	1.81	2,802.41
Mass Grading On Road Diesel	8.31	110.59	42.44	0.13	0.46	4.62	5.08	0.15	4.25	4.40	13,708.82
Mass Grading Worker Trips	0.05	0.10	1.69	0.00	0.01	0.01	0.01	0.00	0.00	0.01	186.65
Time Slice 7/1/2009-12/31/2009 Active Days: 132	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building 07/01/2009-08/31/2010	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building Off Road Diesel	5.44	23.80	16.54	0.00	0.00	1.88	1.88	0.00	1.73	1.73	2,215.47
Building Vendor Trips	0.92	10.74	8.31	0.02	0.06	0.45	0.52	0.02	0.42	0.44	1,827.69
Building Worker Trips	1.40	2.60	43.43	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,794.07
Time Slice 1/1/2010-4/30/2010 Active Days: 86	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68

10/30/2008 3:11:31 PM

Time Slice 5/3/2010-8/16/2010 Active Days: 76	104.56	34.99	66.05	0.07	0.30	2.29	2.59	0.11	2.10	2.20	9,053.08
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Time Slice 8/17/2010-8/31/2010 Active Days: 11	**108.40**	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
Asphalt 08/17/2010-08/31/2010	3.84	20.29	13.07	0.01	0.03	1.62	1.64	0.01	1.49	1.50	2,021.25
Paving Off-Gas	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.83	17.11	9.81	0.00	0.00	1.49	1.49	0.00	1.37	1.37	1,357.52
Paving On Road Diesel	0.23	3.05	1.17	0.00	0.01	0.12	0.14	0.00	0.11	0.12	414.94
Paving Worker Trips	0.07	0.12	2.10	0.00	0.01	0.01	0.02	0.00	0.01	0.01	248.79
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18

Phase Assumptions

Phase: Demolition 4/1/2009 - 4/30/2009 - Default Demolition Description

10/30/2008 3:11:31 PM

Building Volume Total (cubic feet): 1435249

Building Volume Daily (cubic feet): 302111.7

On Road Truck Travel (VMT): 5994.28

Off-Road Equipment:

8 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day

2 Other Material Handling Equipment (191 hp) operating at a 0.59 load factor for 8 hours per day

2 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Mass Grading 5/1/2009 - 6/24/2009 - Default Mass Site Grading/Excavation Description

Total Acres Disturbed: 7.69

Maximum Daily Acreage Disturbed: 7

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 2500 cubic yards/day; Offsite Cut/Fill: 0 cubic yards/day

On Road Truck Travel (VMT): 3234.43

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 8/17/2010 - 8/31/2010 - Default Building Construction Description

Acres to be Paved: 3

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

1 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

10/30/2008 3:11:31 PM

Phase: Building Construction 7/1/2009 - 8/31/2010 - Default Paving Description

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 5/3/2010 - 8/31/2010 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

10/30/2008 3:11:31 PM

Time Slice 4/1/2009-4/30/2009 Active Days: 22	23.72	247.99	**116.59**	**0.24**	127.76	**11.96**	139.71	26.68	**11.00**	37.68	**31,768.77**
Demolition 04/01/2009-04/30/2009	23.72	247.99	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
Fugitive Dust	0.00	0.00	0.00	0.00	126.89	0.00	126.89	26.39	0.00	26.39	0.00
Demo Off Road Diesel	8.18	42.77	33.43	0.00	0.00	3.37	3.37	0.00	3.10	3.10	5,864.89
Demo On Road Diesel	15.39	204.95	78.65	0.24	0.85	8.57	9.41	0.28	7.88	8.16	25,406.16
Demo Worker Trips	0.14	0.27	4.51	0.01	0.02	0.01	0.04	0.01	0.01	0.02	497.72
Time Slice 5/1/2009-6/24/2009 Active Days: 39	12.56	129.82	59.82	0.13	111.98	6.59	118.57	23.44	6.07	29.51	16,697.88
Mass Grading 05/01/2009-06/24/2009	12.56	129.82	59.82	0.13	111.98	6.59	118.57	23.44	6.07	29.51	16,697.88
Mass Grading Dust	0.00	0.00	0.00	0.00	111.51	0.00	111.51	23.29	0.00	23.29	0.00
Mass Grading Off Road Diesel	4.20	19.13	15.69	0.00	0.00	1.97	1.97	0.00	1.81	1.81	2,802.41
Mass Grading On Road Diesel	8.31	110.59	42.44	0.13	0.46	4.62	5.08	0.15	4.25	4.40	13,708.82
Mass Grading Worker Trips	0.05	0.10	1.69	0.00	0.01	0.01	0.01	0.00	0.00	0.01	186.65
Time Slice 7/1/2009-12/31/2009 Active Days: 132	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building 07/01/2009-08/31/2010	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building Off Road Diesel	5.44	23.80	16.54	0.00	0.00	1.88	1.88	0.00	1.73	1.73	2,215.47
Building Vendor Trips	0.92	10.74	8.31	0.02	0.06	0.45	0.52	0.02	0.42	0.44	1,827.69
Building Worker Trips	1.40	2.60	43.43	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,794.07
Time Slice 1/1/2010-4/30/2010 Active Days: 86	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68

10/30/2008 3:11:31 PM

Time Slice 5/3/2010-8/16/2010 Active Days: 76	64.79	34.99	66.05	0.07	0.30	2.29	2.59	0.11	2.10	2.20	9,053.08
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	57.62	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	57.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Time Slice 8/17/2010-8/31/2010 Active Days: 11	68.63	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
Asphalt 08/17/2010-08/31/2010	3.84	20.29	13.07	0.01	0.03	1.62	1.64	0.01	1.49	1.50	2,021.25
Paving Off-Gas	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.83	17.11	9.81	0.00	0.00	1.49	1.49	0.00	1.37	1.37	1,357.52
Paving On Road Diesel	0.23	3.05	1.17	0.00	0.01	0.12	0.14	0.00	0.11	0.12	414.94
Paving Worker Trips	0.07	0.12	2.10	0.00	0.01	0.01	0.02	0.00	0.01	0.01	248.79
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	57.62	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	57.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Demolition 4/1/2009 - 4/30/2009 - Default Demolition Description

10/30/2008 3:11:31 PM

For Rubber Tired Dozers, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Tractors/Loaders/Backhoes, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Other Material Handling Equipment, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Rubber Tired Loaders, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

The following mitigation measures apply to Phase: Mass Grading 5/1/2009 - 6/24/2009 - Default Mass Site Grading/Excavation Description

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Graders, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Tractors/Loaders/Backhoes, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Water Trucks, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

For Rubber Tired Loaders, the Diesel Oxidation Catalyst 40% mitigation reduces emissions by:

NOX: 40%

The following mitigation measures apply to Phase: Architectural Coating 5/3/2010 - 8/31/2010 - Default Architectural Coating Description

For Nonresidential Architectural Coating Measures, the Nonresidential Exterior: Use Low VOC Coatings mitigation reduces emissions by:

ROG: 50%

For Nonresidential Architectural Coating Measures, the Nonresidential Interior: Use Low VOC Coatings mitigation reduces emissions by:

ROG: 50%

10/22/2008 5:59:16 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Proposed Project Construction Emissions - Worst Case Scenario.urb924

Project Name: Proposed Project Construction Emissions - Worst Case Scenario

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2009 TOTALS (lbs/day unmitigated)	23.72	274.27	116.59	0.24	365.46	11.96	372.06	76.38	11.00	82.45	31,768.77
2009 TOTALS (lbs/day mitigated)	23.72	274.27	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
2010 TOTALS (lbs/day unmitigated)	108.40	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
2010 TOTALS (lbs/day mitigated)	108.40	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

10/22/2008 5:59:16 PM

Time Slice 4/1/2009-4/30/2009 Active Days: 22	23.72	**274.27**	**116.59**	**0.24**	127.76	**11.96**	139.71	26.68	**11.00**	37.68	**31,768.77**
Demolition 04/01/2009-04/30/2009	23.72	274.27	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
Fugitive Dust	0.00	0.00	0.00	0.00	126.89	0.00	126.89	26.39	0.00	26.39	0.00
Demo Off Road Diesel	8.18	69.04	33.43	0.00	0.00	3.37	3.37	0.00	3.10	3.10	5,864.89
Demo On Road Diesel	15.39	204.95	78.65	0.24	0.85	8.57	9.41	0.28	7.88	8.16	25,406.16
Demo Worker Trips	0.14	0.27	4.51	0.01	0.02	0.01	0.04	0.01	0.01	0.02	497.72
Time Slice 5/1/2009-6/24/2009 Active Days: 39	12.56	142.57	59.82	0.13	**365.46**	6.59	**372.06**	**76.38**	6.07	**82.45**	16,697.88
Mass Grading 05/01/2009-06/24/2009	12.56	142.57	59.82	0.13	365.46	6.59	372.06	76.38	6.07	82.45	16,697.88
Mass Grading Dust	0.00	0.00	0.00	0.00	365.00	0.00	365.00	76.23	0.00	76.23	0.00
Mass Grading Off Road Diesel	4.20	31.88	15.69	0.00	0.00	1.97	1.97	0.00	1.81	1.81	2,802.41
Mass Grading On Road Diesel	8.31	110.59	42.44	0.13	0.46	4.62	5.08	0.15	4.25	4.40	13,708.82
Mass Grading Worker Trips	0.05	0.10	1.69	0.00	0.01	0.01	0.01	0.00	0.00	0.01	186.65
Time Slice 7/1/2009-12/31/2009 Active Days: 132	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building 07/01/2009-08/31/2010	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building Off Road Diesel	5.44	23.80	16.54	0.00	0.00	1.88	1.88	0.00	1.73	1.73	2,215.47
Building Vendor Trips	0.92	10.74	8.31	0.02	0.06	0.45	0.52	0.02	0.42	0.44	1,827.69
Building Worker Trips	1.40	2.60	43.43	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,794.07
Time Slice 1/1/2010-4/30/2010 Active Days: 86	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68

10/22/2008 5:59:16 PM

Time Slice 5/3/2010-8/16/2010 Active Days: 76	104.56	34.99	66.05	0.07	0.30	2.29	2.59	0.11	2.10	2.20	9,053.08
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Time Slice 8/17/2010-8/31/2010 Active Days: 11	**108.40**	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
Asphalt 08/17/2010-08/31/2010	3.84	20.29	13.07	0.01	0.03	1.62	1.64	0.01	1.49	1.50	2,021.25
Paving Off-Gas	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.83	17.11	9.81	0.00	0.00	1.49	1.49	0.00	1.37	1.37	1,357.52
Paving On Road Diesel	0.23	3.05	1.17	0.00	0.01	0.12	0.14	0.00	0.11	0.12	414.94
Paving Worker Trips	0.07	0.12	2.10	0.00	0.01	0.01	0.02	0.00	0.01	0.01	248.79
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18

Phase Assumptions

Phase: Demolition 4/1/2009 - 4/30/2009 - Default Demolition Description

10/22/2008 5:59:16 PM

Building Volume Total (cubic feet): 1435249

Building Volume Daily (cubic feet): 302111.7

On Road Truck Travel (VMT): 5994.28

Off-Road Equipment:

8 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day

2 Other Material Handling Equipment (191 hp) operating at a 0.59 load factor for 8 hours per day

2 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Mass Grading 5/1/2009 - 6/24/2009 - Default Mass Site Grading/Excavation Description

Total Acres Disturbed: 7.69

Maximum Daily Acreage Disturbed: 7

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 2500 cubic yards/day; Offsite Cut/Fill: 0 cubic yards/day

On Road Truck Travel (VMT): 3234.43

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 8/17/2010 - 8/31/2010 - Default Building Construction Description

Acres to be Paved: 3

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

1 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

10/22/2008 5:59:16 PM

Phase: Building Construction 7/1/2009 - 8/31/2010 - Default Paving Description

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 5/3/2010 - 8/31/2010 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

10/22/2008 5:59:16 PM

Time Slice 4/1/2009-4/30/2009 Active Days: 22	23.72	**274.27**	**116.59**	**0.24**	127.76	**11.96**	139.71	26.68	**11.00**	37.68	**31,768.77**
Demolition 04/01/2009-04/30/2009	23.72	274.27	116.59	0.24	127.76	11.96	139.71	26.68	11.00	37.68	31,768.77
Fugitive Dust	0.00	0.00	0.00	0.00	126.89	0.00	126.89	26.39	0.00	26.39	0.00
Demo Off Road Diesel	8.18	69.04	33.43	0.00	0.00	3.37	3.37	0.00	3.10	3.10	5,864.89
Demo On Road Diesel	15.39	204.95	78.65	0.24	0.85	8.57	9.41	0.28	7.88	8.16	25,406.16
Demo Worker Trips	0.14	0.27	4.51	0.01	0.02	0.01	0.04	0.01	0.01	0.02	497.72
Time Slice 5/1/2009-6/24/2009 Active Days: 39	12.56	142.57	59.82	0.13	82.41	6.59	89.01	17.27	6.07	23.33	16,697.88
Mass Grading 05/01/2009-06/24/2009	12.56	142.57	59.82	0.13	82.41	6.59	89.01	17.27	6.07	23.33	16,697.88
Mass Grading Dust	0.00	0.00	0.00	0.00	81.95	0.00	81.95	17.11	0.00	17.11	0.00
Mass Grading Off Road Diesel	4.20	31.88	15.69	0.00	0.00	1.97	1.97	0.00	1.81	1.81	2,802.41
Mass Grading On Road Diesel	8.31	110.59	42.44	0.13	0.46	4.62	5.08	0.15	4.25	4.40	13,708.82
Mass Grading Worker Trips	0.05	0.10	1.69	0.00	0.01	0.01	0.01	0.00	0.00	0.01	186.65
Time Slice 7/1/2009-12/31/2009 Active Days: 132	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building 07/01/2009-08/31/2010	7.75	37.15	68.28	0.07	0.29	2.46	2.75	0.10	2.25	2.36	8,837.23
Building Off Road Diesel	5.44	23.80	16.54	0.00	0.00	1.88	1.88	0.00	1.73	1.73	2,215.47
Building Vendor Trips	0.92	10.74	8.31	0.02	0.06	0.45	0.52	0.02	0.42	0.44	1,827.69
Building Worker Trips	1.40	2.60	43.43	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,794.07
Time Slice 1/1/2010-4/30/2010 Active Days: 86	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68

10/22/2008 5:59:16 PM

Time Slice 5/3/2010-8/16/2010 Active Days: 76	104.56	34.99	66.05	0.07	0.30	2.29	2.59	0.11	2.10	2.20	9,053.08
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Time Slice 8/17/2010-8/31/2010 Active Days: 11	**108.40**	55.28	79.13	0.08	0.33	3.91	4.24	0.12	3.58	3.70	11,074.33
Asphalt 08/17/2010-08/31/2010	3.84	20.29	13.07	0.01	0.03	1.62	1.64	0.01	1.49	1.50	2,021.25
Paving Off-Gas	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.83	17.11	9.81	0.00	0.00	1.49	1.49	0.00	1.37	1.37	1,357.52
Paving On Road Diesel	0.23	3.05	1.17	0.00	0.01	0.12	0.14	0.00	0.11	0.12	414.94
Paving Worker Trips	0.07	0.12	2.10	0.00	0.01	0.01	0.02	0.00	0.01	0.01	248.79
Building 07/01/2009-08/31/2010	7.17	34.89	64.22	0.07	0.29	2.29	2.58	0.10	2.09	2.20	8,835.90
Building Off Road Diesel	5.05	22.71	16.11	0.00	0.00	1.75	1.75	0.00	1.61	1.61	2,215.47
Building Vendor Trips	0.85	9.79	7.73	0.02	0.06	0.41	0.47	0.02	0.37	0.40	1,827.74
Building Worker Trips	1.27	2.38	40.39	0.05	0.23	0.13	0.36	0.08	0.11	0.19	4,792.68
Coating 05/03/2010-08/31/2010	97.39	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18
Architectural Coating	97.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.06	0.11	1.83	0.00	0.01	0.01	0.02	0.00	0.00	0.01	217.18

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/1/2009 - 6/24/2009 - Default Mass Site Grading/Excavation Description

10/22/2008 5:59:16 PM

For Soil Stablizing Measures, the Apply soil stabilizers to inactive areas mitigation reduces emissions by:

PM10: 84% PM25: 84%

For Soil Stablizing Measures, the Replace ground cover in disturbed areas quickly mitigation reduces emissions by:

PM10: 5% PM25: 5%

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

9/22/2008 4:17:40 PM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Proposed Project Operational Emissions.urb924

Project Name: Tierra Luna Specific Plan EIR - Proposed Project Operational Emissions

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	94.86	34.49	28.99	0.00	0.08	0.08	42,425.06

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	165.51	130.73	1,628.19	3.08	539.05	103.37	297,140.61
TOTALS (lbs/day, mitigated)	156.71	122.71	1,527.65	2.90	505.71	96.98	278,764.17
Percent Reduction	5.32	6.13	6.17	5.84	6.18	6.18	6.18

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	260.37	165.22	1,657.18	3.08	539.13	103.45	339,565.67

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

9/22/2008 4:17:40 PM

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	2.57	34.41	22.81	0.00	0.06	0.06	42,413.82
Hearth							
Landscape	0.49	0.08	6.18	0.00	0.02	0.02	11.24
Consumer Products	76.95						
Architectural Coatings	14.85						
TOTALS (lbs/day, unmitigated)	94.86	34.49	28.99	0.00	0.08	0.08	42,425.06

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Condo/townhouse general	31.61	23.86	309.67	0.59	103.19	19.78	56,949.17
Hotel	13.11	10.08	124.49	0.24	42.09	8.06	23,113.14
Regnl shop. center	96.79	76.70	938.24	1.76	307.41	58.98	169,571.48
General office building	24.00	20.09	255.79	0.49	86.36	16.55	47,506.82
TOTALS (lbs/day, unmitigated)	165.51	130.73	1,628.19	3.08	539.05	103.37	297,140.61

9/22/2008 4:17:40 PM

Operational Mitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Condo/townhouse general	28.92	21.19	275.05	0.53	91.65	17.57	50,582.31
Hotel	12.57	9.58	118.27	0.23	39.98	7.66	21,957.48
Regnl shop. center	92.25	72.86	891.33	1.67	292.04	56.03	161,092.90
General office building	22.97	19.08	243.00	0.47	82.04	15.72	45,131.48
TOTALS (lbs/day, mitigated)	156.71	122.71	1,527.65	2.90	505.71	96.98	278,764.17

Operational Settings:

Includes correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2020 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Condo/townhouse general	79.00	4.28	dwelling units	1,500.00	6,420.00	59,995.48
Hotel		8.12	rooms	450.00	3,654.00	24,475.75
Regnl shop. center		28.46	1000 sq ft	1,200.00	34,152.00	178,703.91
General office building		8.60	1000 sq ft	675.00	5,805.00	50,218.33
					50,031.00	313,393.47

9/22/2008 4:17:41 PM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	58.4	0.0	100.0	0.0
Light Truck < 3750 lbs	8.3	0.0	98.6	1.4
Light Truck 3751-5750 lbs	26.9	0.0	100.0	0.0
Med Truck 5751-8500 lbs	1.4	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.2	0.0	82.4	17.6
Lite-Heavy Truck 10,001-14,000 lbs	0.1	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.1	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.1	0.0	0.0	100.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.3	41.4	58.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.0	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			

9/22/2008 4:17:41 PM

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
% of Trips - Commercial (by land use)						
Hotel				5.0	2.5	92.5
Regnl shop. center				2.0	1.0	97.0
General office building				35.0	17.5	47.5

9/22/2008 4:14:41 PM

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: F:\MSWord 2007 Projects\Downey Mixed-Use Development\AQ Data\URBEMIS Runs\Proposed Project Operational Emissions.urb924

Project Name: Tierra Luna Specific Plan EIR - Proposed Project Operational Emissions

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	94.37	34.41	22.81	0.00	0.06	0.06	42,413.82

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	180.09	159.73	1,568.43	2.44	539.05	103.37	266,751.98
TOTALS (lbs/day, mitigated)	169.85	149.93	1,471.97	2.29	505.71	96.98	250,254.50
Percent Reduction	5.69	6.14	6.15	6.15	6.18	6.18	6.18

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	274.46	194.14	1,591.24	2.44	539.11	103.43	309,165.80

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

9/22/2008 4:14:41 PM

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	2.57	34.41	22.81	0.00	0.06	0.06	42,413.82
Hearth							
Landscaping - No Winter Emissions							
Consumer Products	76.95						
Architectural Coatings	14.85						
TOTALS (lbs/day, unmitigated)	94.37	34.41	22.81	0.00	0.06	0.06	42,413.82

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Condo/townhouse general	31.19	29.25	292.10	0.47	103.19	19.78	51,131.63
Hotel	13.71	12.33	119.53	0.19	42.09	8.06	20,739.81
Regnl shop. center	109.79	93.54	915.16	1.39	307.41	58.98	152,243.21
General office building	25.40	24.61	241.64	0.39	86.36	16.55	42,637.33
TOTALS (lbs/day, unmitigated)	180.09	159.73	1,568.43	2.44	539.05	103.37	266,751.98

9/22/2008 4:14:42 PM

Operational Mitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Condo/townhouse general	28.11	25.98	259.45	0.42	91.65	17.57	45,415.16
Hotel	13.08	11.71	113.56	0.18	39.98	7.66	19,702.82
Regnl shop. center	104.45	88.86	869.40	1.32	292.04	56.03	144,631.05
General office building	24.21	23.38	229.56	0.37	82.04	15.72	40,505.47
TOTALS (lbs/day, mitigated)	169.85	149.93	1,471.97	2.29	505.71	96.98	250,254.50

Operational Settings:

Includes correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2020 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Condo/townhouse general	79.00	4.28	dwelling units	1,500.00	6,420.00	59,995.48
Hotel		8.12	rooms	450.00	3,654.00	24,475.75
Regnl shop. center		28.46	1000 sq ft	1,200.00	34,152.00	178,703.91
General office building		8.60	1000 sq ft	675.00	5,805.00	50,218.33
					50,031.00	313,393.47

9/22/2008 4:14:42 PM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	58.4	0.0	100.0	0.0
Light Truck < 3750 lbs	8.3	0.0	98.6	1.4
Light Truck 3751-5750 lbs	26.9	0.0	100.0	0.0
Med Truck 5751-8500 lbs	1.4	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	0.2	0.0	82.4	17.6
Lite-Heavy Truck 10,001-14,000 lbs	0.1	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.1	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.1	0.0	0.0	100.0
Other Bus	0.0	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	3.3	41.4	58.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.0	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			

9/22/2008 4:14:42 PM

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
% of Trips - Commercial (by land use)						
Hotel				5.0	2.5	92.5
Regnl shop. center				2.0	1.0	97.0
General office building				35.0	17.5	47.5

EXPLANATION OF CHANGES MADE TO DEFAULT SETTINGS IN URBEMIS 2002

Project Name: Tierra Luna Specific Plan EIR
nalysis Scenario: Existing Uses Fleet Mix

The following pages include the printed results of the air pollutant emissions modeling for one of the land use components of the proposed project. The air emissions modeling was conducted using the URBEMIS 2007 for Windows computer program. URBEMIS 2007 is programmed with EMFAC 2007 emission factors developed by the California Air Resources Board.

As part of this analysis, changes have been made to several of the default values programmed into URBEMIS 2007. These changes were made to more accurately reflect the nature of the proposed land use. Each of

Vehicle Trip Rates
The default vehicle trip rate values were changed to be consistent with the traffic impact analysis prepared

Vehicle Fleet Mix
URBEMIS 2007 is programmed with the following state-wide average vehicle fleet mix:

State-Wide Vehicle Type	Total	
Automobiles	51.6%	
Light-Duty Trucks <3,750 pounds	7.4%	
Light-Duty Trucks 3,751-5,750 pounds	22.9%	
Medium-Duty Trucks 5,751-8,500 pounds	10.6%	
Light-Heavy-Duty Trucks 8,501-10,000 pounds	1.6%	14.20% Total Trucl
Light-Heavy-Duty Trucks 10,001-14,000 pound	0.5%	
Medium-Heavy-Duty Trucks 14,001-33,000 pou	0.9%	
Heavy-Heavy-Duty Trucks 33,001-60,000 poun	0.5%	
Line-Haul Vehicles	0.1%	
Urban Buses	0.1%	
Motorcycles	2.8%	
School Buses	0.1%	
Motor Homes	0.9%	

However, this state-wide average fleet mix is not appropriate for the majority of land use analyses. The project land use assessed in this analysis is identified below along with the total percentage of trucks (medium and heavy) that are expected for this land use. The following vehicle mix was calculated based on the percentage of trucks associated with this land use. The percentage of trucks for each land use

ITE Code	Project Land Use:	Truck %	ADT	Truck #
710	General Office	1.84%	1,280	24
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
		Project Totals:	1,280	24
		Project Truck %:	1.84%	

*As there is no ITE code available for studio uses, the ITE code for General Office Use is used to represent the existing uses at the project site.

Vehicle Type	Total	
Automobiles	59.03%	
Light-Duty Trucks <3,750 pounds	8.47%	
Light-Duty Trucks 3,751-5,750 pounds	26.20%	
Medium-Duty Trucks 5,751-8,500 pounds	1.37%	
Light-Heavy-Duty Trucks 8,501-10,000 pounds	0.21%	1.84% Total Trucl
Light-Heavy-Duty Trucks 10,001-14,000 pound	0.06%	
Medium-Heavy-Duty Trucks 14,001-33,000 pou	0.12%	
Heavy-Heavy-Duty Trucks 33,001-60,000 poun	0.06%	
Line-Haul Vehicles	0.01%	
Urban Buses	0.11%	
Motorcycles	3.20%	
School Buses	0.11%	
Motor Homes	1.03%	

EXPLANATION OF CHANGES MADE TO DEFAULT SETTINGS IN URBEMIS 2002

Project Name: Tierra Luna Specific Plan EIR
nalysis Scenario: Proposed Project Fleet Mix

The following pages include the printed results of the air pollutant emissions modeling for one of the land use components of the proposed project. The air emissions modeling was conducted using the URBEMIS 2007 for Windows computer program . URBEMIS 2007 is programmed with EMFAC 2007 emission factors developed by the California Air Resources Board.

As part of this analysis, changes have been made to several of the default values programmed into URBEMIS 2007. These changes were made to more accurately reflect the nature of the proposed land use.

Vehicle Trip Rates

The default vehicle trip rate values were changed to be consistent with the traffic impact analysis prepared

Vehicle Fleet Mix

URBEMIS 2007 is programmed with the following state-wide average vehicle fleet mix:

State-Wide Vehicle Type	Total	
Automobiles	50.6%	
Light-Duty Trucks <3,750 pounds	7.2%	
Light-Duty Trucks 3,751-5,750 pounds	23.3%	
Medium-Duty Trucks 5,751-8,500 pounds	11.0%	
Light-Heavy-Duty Trucks 8,501-10,000 pounds	1.7%	
Light-Heavy-Duty Trucks 10,001-14,000 pound	0.5%	14.90% Total Trucl
Medium-Heavy-Duty Trucks 14,001-33,000 poı	1.0%	
Heavy-Heavy-Duty Trucks 33,001-60,000 pour	0.6%	
Line-Haul Vehicles	0.1%	
Urban Buses	0.1%	
Motorcycles	2.9%	
School Buses	0.1%	
Motor Homes	0.9%	

However, this state-wide average fleet mix is not appropriate for the majority of land use analyses. The project land use assessed in this analysis is identified below along with the total percentage of trucks (medium and heavy) that are expected for this land use. The following vehicle mix was calculated based on the percentage of trucks associated with this land use. The percentage of trucks for each land use

ITE Code	Project Land Use:	Truck %	ADT	Truck #
230	Residential Condo	0.88%	4,774	42
310	Hotel	1.84%	2,719	50
710	General Office	1.84%	4,319	79
820	Shopping Center	2.10%	25,415	534
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
0			0	0
		Project Totals:	37,227	705
		Project Truck %:	1.89%	

Vehicle Type	Total	
Automobiles	58.33%	
Light-Duty Trucks <3,750 pounds	8.30%	
Light-Duty Trucks 3,751-5,750 pounds	26.86%	
Medium-Duty Trucks 5,751-8,500 pounds	1.40%	
Light-Heavy-Duty Trucks 8,501-10,000 pounds	0.22%	
Light-Heavy-Duty Trucks 10,001-14,000 pound	0.06%	1.89% Total Trucl
Medium-Heavy-Duty Trucks 14,001-33,000 poı	0.13%	
Heavy-Heavy-Duty Trucks 33,001-60,000 pour	0.08%	
Line-Haul Vehicles	0.01%	
Urban Buses	0.12%	
Motorcycles	3.34%	
School Buses	0.12%	
Motor Homes	1.04%	

APPENDIX IV.C-2

Global Warming Technical Report

CTG: 66030

Global Warming Technical Report

Tierra Luna Specific Plan

Prepared for

City of Downey

Prepared by
CTG Energetics, Inc.
Irvine, CA

January 2009

Contents

I. Overview of Project and Project Site 4

II. Introduction to Global Climate Change 5

III. Regulatory Setting 8

IV. Project Impacts – GHG Emissions 12

V. Impact of changing climatic conditions 13

VI. Scope of GHG Emissions Inventory 15

VII. Sources of GHG Emissions 16

VIII. Consistency with AB 32 ("Business-As-Usual") 17

- **A. Business-As-Usual without State Actions or Mandates** 19
- **B. Business-As-Usual with State Actions and Mandates for 2020** 19
  - California Renewables Portfolio Standard 19
  - Federal Corporate Average Fuel Economy (CAFE) Standards 20
- **C. Proposed Project with Project Design Features and 2020 Mandates** 21

IX. Quantifying GHG emissions 21

- **A. Assumptions** 21
- **B. Hotel** 21
- **C. Commercial Uses** 22
- **D. Residential Uses** 22
- **E. Water and Wastewater** 22
  - Embodied Energy and Carbon Factors for Potable Water 23
  - Embodied Energy and Carbon Factors for Recycled Water 25
  - Embodied Energy and Carbon Factors for Wastewater 26
  - Total Embodied Energy and Carbon in the Project's Annual Water Use (Business As Usual, Specific Plan EIR Baseline) 27
  - Total Embodied Energy and Carbon in the Project's Annual Water Use and Savings Potential for Mitigation Measures 28
- **F.** Storm Water 34
  - Embodied Energy and Carbon Factor for Storm Water Runoff 34
  - Total Embodied Energy and Carbon In the Project's Storm Water Runoff 35
- **G. Solid waste** 37
- **H. Transportation** 37
- **I. Construction** 39

X. Analysis of Project Design Features 39

A. Hotel Uses 40
B. Commercial Uses 40
Office Uses 40
Restaurant Uses 40
Single-Story Retail Uses 40
Multi-story Retail Uses 41
Assembly Uses 41
C. Residential Uses 41
Overview 41
Emissions 41
A. Infrastructure 42
B. Water and Wastewater 42
Project Design Features Reducing Outdoor Water Use 42
Project Design Features Reducing Indoor Water Use 43
C. Solid Waste 44
D. Transportation 44
CalTrans Climate Action Plan 44
Transportation Demand Management Program 45
E. Summary of GHG Emissions Reduction from Project Design Features 46

XI. Cumulative GHG Impacts 47

I. Overview of Project and Project Site

The Tierra Luna Specific Plan project (the "Project Site") is comprised of approximately 79 acres located at 12214 Lakewood Boulevard in the City of Downey. The Project Site is located approximately 0.25 miles north of Interstate 105 and 1.25 miles west of Interstate 605. The Project Site is bounded by the Downey Landing Retail Center to the north, by Bellflower Boulevard to the east, by the City park learning center and the Kaiser Permanente Hospital and Medical Center to the south, and by Lakewood Boulevard to the west.

The Project Site is currently developed with the Downey Studios production facility including sound stages, studio, production, and office uses, an outdoor suburban street movie set, 20 acres of back lot space, and associated parking lots. The Project Site is also a former aerospace manufacturing and National Aeronautics and Space Administration (NASA) industrial facility with connections to the U.S. manned spaceflight program dating to the 1960s. A total of 25 buildings comprised of approximately 1.5 million square feet of improvements and the aforementioned Downey Studios structures exist on the Project Site. Of the 1.5 million square feet of development approximately 750,000 square feet is currently in use as television and movie studios, studio parking and a 20 acre back lot. The surrounding area is relatively flat and developed with single- and multi-family residential, commercial and retail uses, restaurant uses, auto mechanic uses, religious structures, industrial uses, park space, as well as health care facilities.

The Proposed Project involves amending the existing Downey Landing Specific Plan by removing the 79-acre Project Site from the plan area and replace it with a new specific plan, the Tierra Luna Specific Plan (the Plan), intended to promote the development of a mixed-use, urban infill, comprehensively-designed and coordinated development that implements state-of-the-art planning concepts and principles at the presently underutilized Project Site. Development of the Proposed Project would involve the demolition of most of the on-site structures (the front portion of Building 1 which includes the front section of the original EMCO building, the Kauffman wing, and another wing attributed to Kauffman would not be demolished) and the construction of up to 3,950,000 square feet of residential, commercial, office, and public open space uses, including up to 675,000 square feet of commercial/office uses, 1,200,000 square feet of commercial/retail uses, 450 hotel rooms, and 1,700,000 square feet (approximately 1,500 units) of residential use to include live/work units, for-sale units, and for-rent units. The Proposed Project would also develop up to 200,000 square feet of open space, feature 850,000 square feet of parking facilities dispersed between several multi-level parking structures, on-street parking, and surface parking lots. The Proposed Project would include improvements to the streetscape as well as environmental management standards and amenities related to stormwater management, energy consumption, and water conservation. The Proposed

Project would develop its own internal street network, connected to surrounding arterials, with all necessary infrastructure and utility systems required to support development of the entire community.

II. Introduction to Global Climate Change

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, and storms. Global warming, a related concept, is the observed increase in average temperature of the Earth's surface and atmosphere. One identified cause of global warming is an increase of greenhouse gases (GHGs) in the atmosphere. GHGs are those compounds in the Earth's atmosphere that play a critical role in determining the Earth's surface temperature. Specifically, GHGs allow high-frequency solar radiation to enter the Earth's atmosphere, but trap the low frequency, longwave energy which is radiated back from the Earth to space, resulting in a warming of the atmosphere. The earthward movement of this longwave radiation is known as the "greenhouse effect."

Studies indicate that the effects of global climate change may include rising surface temperatures, loss of snow pack, sea level rise, more extreme heat days per year, and more drought years.[1] Understanding of the fundamental processes responsible for global climate change has improved over the past decade and predictive capabilities are advancing. However, there remain scientific uncertainties surrounding the response of the Earth's climate system to combinations of changes, particularly at regional and local scales. Consequently, the scientific community has systematically developed a range of scenarios reflecting a range of social and economic responses and considered them with multiple, independent computer simulation models. The result is a range of potential future conditions given differences in social and economic conditions and the response of the Earth's climate system to anthropogenic perturbations, such as continued emissions of heat-trapping greenhouse gases.

The six most globally important GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).[2] Carbon

[1] Existing climate change models also show that climate warming portends a variety of impacts on agriculture, including loss of microclimates that support specific crops, increased pressure from invasive weeds and diseases, and loss of productivity due to changes in water reliability and availability.

[2] California Health & Safety Code § 38505(g) recognizes the six listed gases as greenhouse gases. Recently, some groups have advocated for the inclusion of "black carbon" in analyses of climate change under CEQA. Black carbon is a form of particulate air pollution that is most often produced from the burning of biomass, cooking with solid fuels, and diesel exhaust. Some studies have implicated black carbon as a source of global climate change; however, the potential impact of black carbon on climate change is currently under substantial dispute. Some studies indicate that less than 15% of the man-made portion of global warming is due to black carbon. "Effects of Black Carbon and Other Non-Kyoto Pollutants on Climate," Mark Z. Jacobson, Stanford University, Presentation to the Economic and Technology Advancement Advisory Committee California Air

dioxide is the most abundant GHG. As such, GHG emissions typically are measured in metric tons of carbon dioxide equivalent ("CO_2e") units. A metric ton is approximately 2,205 lbs. These gases have different potentials for trapping heat in the atmosphere, called global warming potential ("GWP"). For example, one pound of methane has 21 times more heat capturing potential than one pound of carbon dioxide, nitrous oxide has 310 times more heat capturing potential than one pound of carbon dioxide, and sulfur hexafluoride has 3,200 times more heat capturing potential than one pound of carbon dioxide. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes. The GWPs for common GHGs are shown in Table 1.

Table 1
Global Warming Potentials (GWP)

Gas	Atmospheric Lifetime (years)	Global Warming Potential (CO_2e)
Carbon Dioxide	50 - 200	1
Methane	12	21
Nitrous Oxide	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
PFC: Tetrafluoromethane (CF_4)	50,000	6,500
PFC: Hexafluoroethane (C_2F_6)	10,000	9,200
Sulfur Hexafluoride (SF_6)	3,200	23,900

Source: EPA 2006. Non CO_2 Gases Economic Analysis and inventory. http://www.epa.gov/nonco2/econ-inv/table.html), December 2006

Resources Board, September 6, 2007. A high-end estimate indicates that black carbon could be responsible for 60 percent of the global warming. Ramanathan and Carmichael, "Global and Regional Climate Changes Due to Black Carbon," Nature Geoscience, 2008. Black carbon is not assessed in this report for three primary reasons. First, no regulatory authority has classified black carbon as a greenhouse gas and it is not regulated under AB 32 or any other law implemented to address global climate change. Second, the tools are simply not available to quantify black carbon emissions at this time. Emissions factors for black carbon have not been published by the California Air Resources Board, the U.S. Environmental Protection Agency, or other reputable bodies. While some calculation methodologies have been postulated, the methodologies have not been confirmed by actual measurements of sources. Third, no guidance on the importance, evaluation, or mitigation of black carbon has been provided by the agencies leading the climate change issue. The South Coast Air Quality Management District (SCAQMD) has not included black carbon in their discussion of GHG significance thresholds. There does not appear to be any guidance provided in recent guidelines released by the California Office of Planning and Research (OPR) or the California Air Pollution Control Officers Association (CAPCOA). Nor does black carbon appear to be addressed in current efforts to implement AB 32, the primary legislation designed to reduce California's impact on climate change. Therefore, while the Proposed Project will generate some black carbon, the quantities are indeterminable at this time. The potential impact of the black carbon emissions on climate change is also unknown at this time. As such, black carbon is not analyzed herein.

GHGs are the result of both natural and anthropogenic activities. Forest fires, decomposition, industrial processes, landfills, and consumption of fossil fuels for power generation, transportation, heating, and cooling are the primary sources of GHG emissions. Without human intervention, the Earth maintains an approximate inter-annual balance between the emission of GHGs into the atmosphere and its storage in oceans and terrestrial ecosystems. Events and activities, such as the industrial revolution and the increased combustion of fossil fuels (e.g., gasoline, diesel, coal, etc.), have contributed to the rapid increase in atmospheric levels of GHGs over the last 150 years. As reported by the California Energy Commission (CEC), California contributes 1.4 percent of global and 6.2 percent of national GHG emissions.[3] The GHG inventory for California is presented in Table 2. Approximately 80 percent of GHGs in California are from fossil fuel combustion and over 70 percent of GHG emissions are carbon dioxide emissions.

[3] California Energy Commission (CEC), 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004, CEC-600-2006-013, October 2006. Source: California Air Resources Board (ARB), 2007. Draft California Greenhouse Inventory by IPCC Category, August 2007 (available at http://www.arb.ca.gov/cc/ccei/inventory/tables/rpt_inventory_ipcc_sum_2007-11- 19.pdf).

Table 2
California GHG Emissions and Sinks Summary (Million metric tonnes of CO2 equivalence)

Categories Included in the Inventory	1990	2004
ENERGY	**386.41**	**420.91**
Fuel Combustion Activities	**381.16**	**416.29**
Energy Industries	157.33	166.43
Manufacturing Industries & Construction	24.24	19.45
Transport	150.02	181.95
Other Sectors	48.19	46.29
Non-Specified	1.38	2.16
Fugitive Emissions from Fuels	**5.25**	**4.62**
Oil and Natural Gas	2.94	2.54
Other Emissions from Energy Production	2.31	2.07
INDUSTRIAL PROCESSES & PRODUCT USE	**18.34**	**30.78**
Mineral Industry	4.85	5.90
Chemical Industry	2.34	1.32
Non-Energy Products from Fuels & Solvent Use	2.29	1.37
Electronics Industry	0.59	0.88
Product Uses as Substitutes for Ozone Depleting Substances	0.04	13.97
Other Product Manufacture & Use Other	3.18	1.60
Other	5.05	5.74
AGRICULTURE, FORESTRY, & OTHER LAND USE	**19.11**	**23.28**
Livestock	11.67	13.92
Land	0.19	0.19
Aggregate Sources & Non-CO_2 Emissions Sources on Land	7.26	9.17
WASTE	**9.42**	**9.44**
Solid Waste Disposal	6.26	5.62
Wastewater Treatment & Discharge	3.17	3.82
EMISSION SUMMARY		
Gross California Emissions	**433.29**	**484.4**
Sinks and Sequestrations	**-6.69**	**-4.66**
Net California Emissions	**426.60**	**479.74**

III. Regulatory Setting

In response to growing scientific and political concern regarding global climate change, California adopted a series of laws to reduce both the level of GHGs in the atmosphere and to reduce emissions of GHGs from commercial and private activities within the State. In September 2002, Governor Gray Davis signed Assembly Bill (AB) 1493, requiring the development and adoption of regulations to achieve "the maximum feasible reduction of greenhouse gases" emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation in the State. However, setting emission standards on automobiles is the responsibility of the federal Environmental Protection Agency (USEPA). The Federal Clean Air Act allows California to set state-specific emission standards on automobiles if it first obtains a waiver from the USEPA. On

December 19, 2007, the USEPA denied California's request for a waiver. In response, California sued the USEPA claiming that the denial was not based on the scientific data.

In June 2005, Governor Schwarzenegger signed Executive Order S-3-05, which established GHG emissions targets for the State, as well as a process to ensure the targets are met. As a result of this Executive Order, the California Climate Action Team (CAT), led by the Secretary of the California Environmental Protection Agency, was formed. The CAT published a report in March 2006, in which it laid out several recommendations and strategies for reducing GHG emissions and reaching the targets established in the Executive Order.[4] The GHG targets are:

- By 2010, reduce to 2000 emission levels;
- By 2020, reduce to 1990 emission levels; and
- By 2050, reduce to 80 percent below 1990 levels.

In September 2006, Governor Arnold Schwarzenegger signed the California Global Warming Solutions Act of 2006, also known as AB 32, into law. AB 32 commits the State to achieving the following:

- 2000 GHG emission levels by 2010 (which represents an approximately 11 percent reduction from "business-as-usual")
- 1990 levels by 2020 (approximately 30% percent below "business-as-usual")

To achieve these goals, AB 32 mandates that the California Air Resources Board (ARB) establish a quantified emissions cap, institute a schedule to meet the cap, implement regulations to reduce Statewide GHG emissions from stationary sources, and develop tracking, reporting, and enforcement mechanisms to ensure that reductions are achieved.

The California Air Resources Board recently released a Climate Change Scoping Plan required by AB 32.[5] ARB described the discussion draft version of the Scoping Plan as a "framework for change." The Scoping Plan proposes a "comprehensive set of actions designed to reduce overall carbon emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, and enhance public health while creating new jobs and enhancing growth in California's economy." The Scoping Plan indicates that "reducing greenhouse gas emissions to 1990 levels **means cutting approximately 30 percent from business-as-usual emission levels projected for 2020, or about 15 percent from today's [absolute] levels**". The Scoping Plan defines "business-as-usual" (BAU) as emissions in the absence of GHG reduction measures (i.e., the 2020 BAU forecast does not take credit for reduction from AB 1493 GHG emissions reduction standards for vehicles, implementation of the

[4] California Climate Action Team. Climate Action Team Report to Governor Schwarzenegger and the Legislature, 2006.
[5] Available at http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

Renewables Portfolio Standard, or reductions in emissions associated with the Low Carbon Fuel Standard).

The Scoping Plan calls for a "coordinated set of solutions" to address all major categories of GHG emissions:

- Transportation emissions will be addressed through a combination of higher standards for vehicle fuel economy, implementation of the Low Carbon Fuel Standard, and greater consideration to reducing trip length and generation through land use planning and transit-oriented development.[6]
- Buildings, land use, and industrial operations will be encouraged and, sometimes, required to use energy more efficiently.
- Utility energy supplies will change to include more renewable energy sources through implementation of the Renewables Portfolio Standard. This will be complemented with emphasis on local generation, including rooftop photovoltaics and solar hot water installations.

The Scoping Plan emphasizes opportunities for households and businesses to save energy and money through increasing energy efficiency. The Scoping Plan indicates that substantial savings of electricity and natural gas will be accomplished through "improving energy efficiency by 25 percent." The Scoping Plan identifies a number of specific issues relevant to the proposed Project including:

- Discrete Early Actions, including regulation of landfills, motor vehicles, refrigerants, and roofing materials.
- The Scoping Plan recognizes the potential of using the green building framework as a mechanism which could enable GHG emissions reductions in other sectors [i.e., electricity, natural gas]. The Plan notes that "green buildings exceed minimum energy efficiency standards, decrease consumption of potable water, reduce solid waste during construction and operation, and incorporate sustainable and low-emitting materials that contribute to healthy indoor air quality, which protects human health and minimizes impacts to the environment."
- The Scoping Plan notes the importance of increasing the supply and utilization of green power and lower carbon intensity energy sources. Broadly defined, this includes implementation of the utility-based Renewables Portfolio Standard (RPS), use of Solar Hot Water Heating (pursuant with the SB 1470 goal), support for the Million Solar Roofs

[6] There has also been California legislative activity acknowledging the relationship between land use planning and transportation sector GHG emissions. California Senate Bill 375 (passed Assembly on 8/25/2008; passed Senate on 8/30/2008; signed by the Governor on September 30, 2008) links regional planning for housing and transportation with the greenhouse gas reduction goals outlined in AB 32. Reductions in GHG emissions would be achieved by, for example, locating housing closer to jobs, retail, and transit. Under the bill, each Metropolitan Planning Organization would be required to adopt a sustainable community strategy to encourage compact development so that the region will meet a target, created by ARB, for reducing GHG emissions.

Program (including the California Solar Initiative and the New Solar Homes Partnership), and increased use of combined heat and power.

- The Scoping Plan notes that water use requires significant amounts of energy, including approximately one-fifth of state-wide electricity. The Scoping Plan emphasizes the importance of supporting the Department of Water Resources' work to implement the Governor's objective to reduce per capita water use by 20% by 2020. Specific measures to achieve this goal include water use efficiency, water recycling, and reuse of urban runoff.
- The Scoping Plan encourages local governments to set quantifiable emissions reduction targets for their jurisdictions and use their influence and authority to encourage reductions in emissions caused by energy use, waste and recycling, water and wastewater systems, transportation, and community design.

The extent to which the proposed Project supports AB 32 and the State goals and the strategies described in the Scoping Plan will be discussed qualitatively in the following sections.

California Senate Bill 97 (SB 97), passed in August 2007, is designed to work in conjunction with CEQA and AB 32. SB 97 requires the Governor's Office of Planning and Research (OPR) to prepare and develop guidelines for the mitigation of GHG emissions or the effects thereof, including but not limited to, effects associated with transportation and energy consumption. These guidelines must be transmitted to the Resources Agency by July 1, 2009, to be certified and adopted by January 1, 2010. The OPR and the Resources Agency shall periodically update these guidelines to incorporate new information or criteria established by ARB. SB 97 will apply retroactively to any Environmental Impact Report (EIR), negative declaration, mitigated negative declaration, or other document required by CEQA, which has not been finalized. Under SB 97, transportation projects funded under the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, and projects funded under the Disaster Preparedness and Flood Prevention Bond Act of 2006 are exempted from analyzing the effects of GHGs in an EIR, negative declaration, mitigated negative declaration, or other CEQA document.

There has also been activity at the federal level with respect to the regulation of GHGs. In *Massachusetts v. Environmental Protection Agency*, 127 S.Ct. 1438 (2007), the U.S. Supreme Court held that not only did the USEPA have authority to regulate GHGs, but that the agency's reasons for not regulating this area did not fit the statutory requirements. The U.S. Supreme Court ruled that CO_2 and other GHGs are pollutants under the Federal Clean Air Act, which USEPA must regulate if it determines they pose an endangerment to public health or welfare. To date, the USEPA has not made such a finding or developed a regulatory program for GHG emissions.

The South Coast Air Quality Management District (SCAQMD) adopted a "Policy on Global Warming and Stratospheric Ozone Depletion" on April 6, 1990. The policy commits the SCAQMD to consider global impacts in rulemaking and in drafting revisions to the Air Quality Management Plan (AQMP). In March 1992, the SCAQMD Governing Board reaffirmed this policy and adopted amendments to the policy to include the following directives:

- Phase out the use and corresponding emissions of chlorofluorocarbons (CFCs), methyl chloroform (1,1,1-trichloroethane or TCA), carbon tetrachloride, and halons by December 1995;
- Phase out the large quantity use and corresponding emissions of hydrochlorofluorocarbons (HCFCs) by the year 2000;
- Develop recycling regulations for HCFCs (e.g., SCAQMD Rules 1411 and 1415);
- Develop an emissions inventory and control strategy for methyl bromide; and
- Support the adoption of a California GHG emission reduction goal.

The legislative and regulatory activity detailed above is expected to require significant development and implementation of energy efficient technologies and shifting of energy production to renewable sources.

IV. Project Impacts – GHG Emissions

Climate change is a long-term, multi-faceted issue with global impacts caused by the accumulation of innumerable individual decisions regarding the use of energy. It has been called the world's foremost economic externality. In other words, the costs of emitting GHG emissions currently do not account for their costs on present and future generations. In most jurisdictions, lead agencies and state regulators have articulated that climate change should be considered in CEQA documentation. However, most lead agencies have yet to provide explicit guidance on the evaluation of GHG emissions or climate change vulnerabilities.

The analysis of GHGs is significantly different from the analysis of criteria pollutants for the following reasons. For criteria pollutants, significance thresholds are based on daily emissions because determinations of attainment or non-attainment are based on daily exceedances of applicable ambient air quality standards. Further, several ambient air quality standards are based on relatively short-term exposure effects on human health, e.g., one-hour and eight-hour exposures. Since GHG's have a long residence time in the atmosphere (e.g., CO_2 is approximately 100 years), GHGs affect global climate over a relatively long time frame. As a result, the SCAQMD's current position is to evaluate GHG effects over a longer timeframe than a single day.

While GHG emissions can be calculated, such emissions cannot be precisely correlated with specific impacts based on currently available science. No air agency, including the SCAQMD,[7] or municipality, including the City of Downey, has yet established project-level significance thresholds for

[7] The SCAQMD has formed a GHG Significance Threshold Working Group. More information on this Working Group is available at http://www.aqmd.gov/ceqa/handbook/GHG/GHG.html (last visited 5/5/2008).

GHG emissions. In its January 2008 CEQA and Climate Change white paper, the California Air Pollution Control Officers Association (CAPCOA) identified a number of potential approaches for determining the significance of GHG emissions in CEQA documents. In this white paper, CAPCOA suggests making significance determinations on a case-by-case basis when no significance thresholds have been adopted. OPR, in its June 19, 2008 Technical Advisory, recognizes that CEQA Guidelines have not been adopted to provide guidance as to how climate change is to be addressed under CEQA. OPR also notes that it is continuing to consult with ARB technical staff regarding appropriate thresholds of significance to use for climate change analysis, but that such guidance is not yet available. OPR has provided the following "informal guidance" regarding the following steps for addressing climate change impacts under CEQA:

(1) Identify and quantify the GHG emissions;

(2) Assess the significance of the impact on climate change; and

(3) If significant, identify alternatives and/or mitigation measures that will reduce impacts below significance.[8]

For all these reasons, in the absence of regulatory guidance, and before the resolution of various legal challenges related to global climate change analysis and the selection of significance thresholds, a significance determination will be made on a case-by-case basis.

In addition, the regulations required to meet the goals under AB 32 are still under development, but are expected to be implemented no later than January 1, 2012.[9] At this time, there are no universally accepted standards by which the approval of a real estate development project can be judged to support or hinder attainment of the State's goals relating to GHG abatement.

V. Impact of changing climatic conditions

This report emphasizes the relationship between the Project and GHG emissions, the primary drivers of anthropogenic climate change and the focus of California's climate change policy. It is important to recognize that the climatic conditions experienced by the Project over its designed lifetime are likely to be substantially different from those observed over the past century. Consequently, it is

[8] OPR Technical Advisory, p. 5.

[9] ARB's list of discrete early action measures that can be adopted and implemented before January 1, 2010, was approved on June 21, 2007. The three adopted discrete early action measures are: (1) a low-carbon fuel standard, which reduces carbon intensity in fuels state-wide; (2) reduction of refrigerant losses from motor vehicle air conditioning system maintenance; and (3) increased methane capture from landfills, which includes requiring the use of state-of-the-art capture technologies.

useful to consider the implications of changing climatic conditions for Project performance. Scenarios[10] for 2100 modeled in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (FAR) include:

Temperature Increase

- Low Emissions Scenario: 1.8°C (best estimate), with a range of 1.1°C to 2.9°C
- High Emissions Scenario: 4.0°C (best estimate), with a range of 2.4°C to 6.4°C

Sea Level Rise

- Low Emissions Scenario: 0.18 to 0.38 meters (range)
- High Emissions Scenario: 0.26 to 0.59 meters (range)

Potential implications for the project include:

Sea level: Rising sea levels are unlikely to directly impact the proposed Project due to its distance from the coast and relative elevation.

Temperature: Rising temperatures could have a variety of impacts, including stress on sensitive populations (e.g., sick and elderly), additional burden on building systems (e.g., demand for air conditioning), and, indirectly, increasing emissions of greenhouse gases and criteria pollutants associated with energy generation. It is not possible to reliably quantify these risks at local and regional scales at this time.

Precipitation: Climate change is expected to alter seasonal and inter-annual patterns of precipitation. These changes continue to be one of the most uncertain aspects of future scenarios. For this Project, the most relevant direct impacts are likely to be changes in the timing and volume of stormwater runoff and changes in demand for irrigation. It is not possible to reliably quantify the implications of these changes at local and regional scales at this time.

Wildfire: Changes in temperature and precipitation may combine to alter risks of wildfire. Changes in wildfire hazard have little potential to impact the Project given the relative distance to undeveloped, non-irrigated open space.

[10] Future GHG emissions are the product of very complex dynamic systems, determined by driving forces such as demographic development, socio-economic development, and technological change. Their future evolution is highly uncertain. Scenarios are alternative images of how the future might unfold and are an appropriate tool with which to analyze how driving forces may influence future emission outcomes and to assess the associated uncertainties. They assist in climate change analysis, including climate modeling and the assessment of impacts, adaptation, and mitigation. The possibility that any single emissions path will occur as described in scenarios is highly uncertain. More information on the IPCC's selection of scenarios is available at http://www.ipcc.ch/ipccreports/sres/emission/index.htm.

Water supply reliability: Changes in temperature and precipitation may also influence seasonal and inter-annual availability of water supplies. Consequently, it is reasonable to consider that climate change may affect water supply reliability. It is not possible to reliably quantify these risks for the Project at this time. For more information on the Project's water supply, please refer to the Water Supply Assessment in the EIR.

VI. Scope of GHG Emissions Inventory

Although no numerical thresholds of significance have been developed, the California Climate Action Registry (CCAR) General Reporting Protocol (GRP) provides a number of basic procedures and guidelines for calculating and reporting GHG emissions from a number of general and industry-specific activities.[11] No specific protocols are available for land use projects, so the CCAR GRP has been adapted to address GHG emissions from the Project. The information provided in this section is consistent the CCAR GRP's minimum reporting requirements.

The CCAR GRP recommends the separation of GHG emissions into three categories that reflect different aspects of ownership or control over emissions. They include:

- Scope 1: Direct, on-site combustion of fossil fuels (e.g., natural gas, propane, gasoline, and diesel)
- Scope 2: Indirect, off-site emissions associated with purchased electricity or purchased steam.
- Scope 3: Indirect emissions associated with other emissions sources, such as third-party vehicles and embodied energy of water. [12]

The CCAR GRP provides a range of basic calculation methods; however, CCAR GRP calculations are typically designed for existing buildings or facilities. These retrospective calculation methods are not directly applicable to planning and development situations where buildings do not yet exist.

ARB believes that consideration of so-called indirect emissions provides a more complete picture of the GHG footprint of a facility: "As facilities consider changes that would affect their emissions – addition of a cogeneration unit to boost overall efficiency even as it increases direct emissions, for example – the relative impact on total (direct plus indirect) emissions by the facility should be monitored. Annually reported indirect energy usage also aids the conservation awareness of the facility and provides information" to ARB to be considered for future strategies by the industrial

[11] California Climate Action Registry, General Reporting Protocol Version 3, April 2008. http://www.climateregistry.org/resources/docs/protocols/grp/GRP_V3_April2008_FINAL.pdf.

[12] Embodied energy refers to the quantity of energy required to manufacture, and supply to the point of use, a product, material, or service.

sector.[13] For these reasons, ARB has proposed requiring the calculation of direct and indirect GHG emissions as part of the AB 32 reporting requirements.

ARB's requirements are supported by interpretations of settlements between local jurisdictions and the California Attorney General. For example, the County of San Bernardino is preparing a comprehensive GHG inventory that includes "…all direct (all stationary, area, and mobile source emissions) and indirect (emissions resulting from the use of electricity, pumping and treatment of water and wastewater, and the transport and disposal of solid waste) sources of GHG emissions…".[14]

Additionally, OPR is of the opinion that lead agencies "should make a good-faith effort, based on available information, to calculate, model, or estimate…GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities."[15] Therefore, direct and indirect emissions have been calculated for the proposed Project.

A fundamental difficulty in analysis of GHG emissions is the global nature of the existing and cumulative future conditions. Changes in GHG emissions can be difficult to attribute to a particular planning program or project because the planning effort or project may cause a shift in the locale for some type of GHG emissions, rather than causing "new" GHG emissions. Whether this represents a net global increase, reduction, or no change depends on the GHGs that would exist if the project were not implemented.

VII. Sources of GHG Emissions

As indicated in the Scoping Plan, buildings and land use are major contributors to California's GHG emissions. The existing site and the proposed Project are associated with direct and indirect GHG emissions that cut across different types of industries and emissions sources, including:

- *Building operations:* emissions associated with space heating and cooling, water heating, and lighting
- *Studio operations:* emissions associated with the studio production operations
- *Transportation:* emissions associated with residential, service and commercial vehicles, and transit

[13] California Air Resources Board (ARB), 2007a. Initial Statement of Reasons for Rulemaking, Proposed Regulation for Mandatory Reporting of Greenhouse Gas Emissions Pursuant to the California Global Warming Solutions Act of 2006 (Assembly Bill 32). Planning and Technical Support Division Emission Inventory Branch, October 19, 2007.
[14] Request for Countywide GHG Emissions Reduction Plan. County of San Bernardino, June 13, 2008.
[15] OPR Technical Advisory, p. 5.

- *Construction:* emissions associated with site preparation, excavation, grading, construction
- *Water:* emissions associated with energy used to pump, convey, treat, deliver, and re-treat water (embodied energy of water)
- *Solid waste:* emissions associated with residential and commercial waste streams (embodied energy of materials)
- *Materials:* emissions associated with the production and distribution of materials (embodied energy of materials)
- *Land cover conversion:* emissions associated with changes in carbon sequestration associated with the conversation of pre-development land cover to post-development land cover

Conventional GHG emissions accounting protocols spread the ownership and control of emissions across many actors (e.g., land owners, vehicle owners, construction contractors, utilities, etc.). However, as suggested by the Scoping Plan, this analysis recognizes that buildings and land-use represent a nexus that brings these factors together and offer opportunities to reduce emissions through changes in transportation, land use, and building design, construction, and operations.

VIII. Consistency with AB 32 ("Business-As-Usual")

As discussed above, there currently are no adopted significance thresholds for GHG emissions. Based on the currently available guidance, this report assesses whether the Project's GHG impacts are significant based on the Project's consistency with California's goals to reduce GHG emissions under AB 32. A particularly illustrative method to determine consistency with AB 32, and one that has the co-benefit of being based on quantification of emissions, is to compare a project's emissions as proposed to that project's emissions if it were to be built utilizing "business-as-usual" (BAU) design, methodology, and technology. If a project constitutes an equivalent or larger break from BAU than has been determined by ARB to be necessary to meet AB 32's goals (approximately 30% for 2020), then that project can be considered consistent with AB 32 and, therefore, will not have a significant impact on the environment due to its GHG emissions. This is the average level of emissions reduction performance that would need to be achieved across *all sectors* of the economy to meet AB 32 goals (i.e., applied to both new and existing GHG emissions sources), and the ARB and other state agencies have indicated that specific sectors of the economy may be required to contribute greater levels of reduction. This report utilizes this 'break from BAU' method to determine consistency with AB 32. This approach mirrors concepts used in the ARB Scoping Plan for the implementation of AB 32.

The ARB Scoping Plan and guidance from a wide-variety of state agencies has repeatedly emphasized that achieving the State's GHG emissions reduction goals requires a substantial change from BAU. Comparing a project's emissions to BAU emissions is fundamental to ARB's calculation that

achieving AB 32 mandates requires approximately a 30% reduction in emissions from BAU. However, the notion of state-wide BAU used in the ARB Scoping Plan is not directly applicable at local or regional scales. The state-wide BAU is based on historic trends across entire economic sectors – not the activity of local governments or individual projects (i.e., it is a top-down estimate of anticipated future emissions). Consequently, evaluating the proposition that a project constitutes a break from BAU requires providing a quantitative estimate of BAU based on the specific circumstances of the proposed project in the context of relevant State activities and mandates. This essentially requires two complementary GHG emissions inventories:

- "Business-As-Usual" project GHG emissions without state actions and mandates
- "As proposed" project GHG emissions with project design features and state actions and mandates expected to be in force in 2020

The following sections describe the assumptions used in the three scenarios above. The following analysis includes potential emissions under BAU scenarios and from the Project at build-out based on actions and mandates expected to be in force in 2020. Note that the Project is not anticipated to reach build out until 2030; however, policies and programs mandated beyond 2020 are unknown or uncertain. Consequently, the emissions estimates contained herein reflect the Project at build-out (2030) and the best possible current estimate of mandated conditions based on requirements through 2020. In other words, this technical report does not terminate its analysis of the Project at 2020; rather, it quantifies expected emissions as of build out in 2030. It is only the regulatory requirements post-2020, with their concomitant effect on GHG emissions, which are unclear and speculative to assess at this time. In fact, by not speculating on what mandated regulatory conditions will be in 2030, this technical report takes a conservative approach that likely overestimates the Project's GHG emissions at the 2030 build out.

Local governments and project teams use 2020 as a target date for GHG reductions. It is also an important target date for supporting legislation and regulation, including mandates for implementation of the Low Carbon Fuel Standard (LCFS) and the Federal CAFE fuel economy standards. This 2020 target date reflects California's AB 32 mandate for GHG emissions reductions based on the following Air Resources Board timeline:[16]

- January 1, 2009 California Air Resources Board adopts a "scoping plan" indicating how emissions reductions will be achieved.
- January 1, 2010 Early-action measures take effect
- January 1, 2012 GHG rules and market mechanisms adopted by the Air Resources Board are legally enforceable

[16] California Air Resource Board, http://www.arb.ca.gov/cc/cc.htm.

- December 31, 2020 Deadline for achieving 2020 GHG emission cap

A. Business-As-Usual without State Actions or Mandates

The Project proposes to replace the existing structures with a mixed-use development including 1,500 residential dwelling units, 675,000 square feet of commercial/office uses, 1,200,000 square feet of commercial/retail uses, 464,070 square feet of hotel uses, 125,000 square feet of open space, and 850,000 square feet of parking. The circumstances associated with this Project are similar to those associated with many large developments. For this project, Business-As-Usual is defined a project matching the general land-use characteristics of the proposed Project, yet lacking in design features that contribute to GHG emissions reductions. For example, new buildings are assumed to be constructed in minimal compliance with Title-24 (2005) energy code. Other sources of emissions track local or regional average conditions. In some cases, this requires professional judgment about typical development standards. BAU specifications include:

- Minimum compliance with Title-24 (2005) energy code;
- Average rates of domestic and landscape water consumption;
- Average rates of solid waste recycling for the region (approximately 50% diversion); and
- Trip generation rates and trip lengths typical of conventional development in the region.

B. Business-As-Usual with State Actions and Mandates for 2020

BAU scenario described above provides a basis for evaluating the relative performance of a project. It is useful to consider the performance of the "business-as-usual" project and the "as proposed" Project with respect to both current and anticipated future regulatory conditions. Consideration of the proposed Project's performance under current regulatory conditions provides a conservative estimate of project emissions, as future regulatory action is expected to result in a range of infrastructure changes that will reduce emissions over time. Consideration of the proposed Project's performance under regulatory conditions anticipated for 2020 provides a more realistic measure of actual emissions associated with the Project in operation. Assuming full implementation of current state mandates by 2020 provides a relative *lower-bound* on the proposed Project's emissions. Estimates for Project performance at 2020 are designed to be used in conjunction with estimates based on current conditions to bracket a plausible range of actual performance given changing circumstances. California and the Federal government have established a number of mandates that will help reduce GHG emissions from the Project and State overall by 2020. Two of the most important quantifiable factors include California's state-wide Renewables Portfolio Standard (RPS) and the Federal CAFE fuel economy standards.

California Renewables Portfolio Standard

The ARB Scoping Plan makes it clear that implementation of the Renewables Portfolio Standard (RPS) is a foundational element of the State's emissions reduction plan. In 2002, Senate Bill 1078 established the California RPS program, requiring 20% renewable energy by 2017. In 2006, Senate Bill 107 advanced the 20% deadline to 2010, a goal which was expanded to 33% by 2020 in the 2005 Energy

Action Plan II. These mandates apply directly to investor-owned utilities, in this case Southern California Edison (SCE).[17] Consequently, the 2020 scenario with State mandates considered in this analysis assumes that both utilities will reduce the carbon intensity of delivered electricity equivalent to meeting the 20% RPS goal by 2020. A variety of goals and targets call for higher levels of performance, but these are difficult to quantify and, in most cases, non-binding on SCE; therefore, it was not included in the 2020 scenario in this analysis.

Federal Corporate Average Fuel Economy (CAFE) Standards

The 2007 Energy Bill creates new Federal requirements for increases in fleet-wide fuel economy for passenger vehicles and light trucks. The Federal legislation requires a fleet-wide average of 35 miles per gallon (mpg) to be achieved by 2020. The National Highway Traffic Safety Administration is directed to phase-in requirements to achieve this goal. Analysis by the California Air Resources Board suggests that this will require an annual improvement of approximately 3.4% between now and 2020.[18] California has petitioned USEPA to allow more stringent standards and California executive agencies have repeated their commitment to higher mileage standards, but to date, the required waiver from the USEPA has not been secured. Consequently, this analysis utilizes a conservative assumption and only incorporates Federal CAFE standards to estimate California fleet fuel economy in 2020.

Table 3 summarizes Business-as-Usual (BAU) Project GHG emissions by Scope as defined by the California Climate Action Registry General Reporting Protocol, with and without 2020 mandates. Construction emissions are an episodic, Scope 3 source. The total for all construction phases is reported on a separate line to distinguish them for all other emissions which reflect annual operational emissions for Project build out in 2030. All emissions are reported in metric tonnes CO_2 equivalent. Percentages indicate the fraction of emissions associated with each category of emissions.

Table 3

BAU Project Emissions by Scope. All emissions are reported in metric tonnes of CO2 equivalent. Calculation methods vary by Scope as described below. Construction emissions are a episodic emission, and they are reported separately to distinguish them from operational emissions (i.e., emissions per year).

	Emissions without LCFS, RPS, and CAFE	%	Emissions with LCFS, RPS, and CAFE	%
Scope 1: Direct combustion	3,674	1.2%	3,674	1.6%
Scope 2: Purchased electricity	10,307	3.2%	9,816	5.0%
Scope 3: Transportation	297,640	93.6%	202,493	90.5%
Scope 3: Water	592	0.2%	592	0.3%
Scope 3: Solid waste	6,297	2.0%	6,297	2.8%
TOTAL	**318,511**		**222,873**	

[17] SCE Renewable Energy (source: http://www.sce.com/PowerandEnvironment/renewables/)

[18] California Air Resources Board comparison between Pavley AB 1493 and the Federal 2007 CAFE standards (http://www.arb.ca.gov/cc/ccms/ab1493_v_cafe_study.pdf)

Scope 3: Construction	11,121	

C. Proposed Project with Project Design Features and 2020 Mandates

The performance of the "as proposed" Project (described in more detail in the following sections) was considered under both existing and anticipated 2020 conditions. As described above, existing conditions reflect the current generation of electricity and the current characteristics of California's vehicle fleet. The 2020 conditions reflect full implementation of the 20% RPS standard for SCE and implementation of the Federal CAFE standards. Both of these assumptions are conservative since there are a variety of targets and goals for an RPS of up to 33% by 2020 and issuance of a Federal waiver could allow implementation of more aggressive tailpipe standards in California under AB 1493 (Pavley).

IX. Quantifying GHG emissions

A. Assumptions

Downey Studios is a unique combination of land uses, including office buildings and studio operation uses. Based on how natural gas and electricity are metered, it is difficult to isolate existing energy use for individual land uses. For example, offices and studio activities are likely to have significantly different energy use characteristics; however, both types of land uses are recorded on a single electricity meter.

Direct combustion GHG emissions (Scope 1) are associated with a variety of liquid fuels, including diesel, gasoline, propane, and natural gas. These fuels are used to various studio operations.

Historically, electricity has been supplied to the Project Site by Southern California Edison (SCE). SCE electricity emits approximately 0.29 metric tonnes of CO_2e per MW/hr. This compares to a California average of 0.366 metric tonnes for MW/hr (California Climate Action Registry).

The proposed Project would result in the demolition of nearly all onsite buildings and ceasing studio operations. A BAU scenario includes the assumption that all new buildings will meet minimum Title-24 energy code requirements in effect at the time of construction. Under the proposed Project scenario older-buildings are replaced by buildings that meet or exceed Title-24 (2005) by 15% -- assumed to approximately equivalent to Title-24 (2008). As a result, the Project will reduce energy use intensity by replacing older buildings with new buildings that meet or exceed current energy code.

B. Hotel

The proposed Project would allow for 464,070 square feet of hotel rooms and related facilities (450 rooms). EnergyPro was used to estimate energy consumption for a typical hotel in this climate zone. The model results indicated that the expected hotel uses would demand 7.61 kwhr/sf/year and

0.19 therms/sf/year of electricity and natural gas, respectively. Electricity used by the hotel uses was assumed to be supplied by SCE and generates Scope 2 emissions based on SCE's current and anticipated 2020 carbon intensity per delivered MW/hr.

C. Commercial Uses

The proposed Project calls for 1,875,000 square feet of various retail and office commercial uses. Various DEER models, which have been developed by utilities to estimate energy demand of various land uses, were used to estimate energy consumption for a typical California hotel in a similar climate zone. Electricity used by these uses were assumed to be supplied by SCE and generates Scope 2 emissions based on SCE's current and anticipated 2020 carbon intensity per delivered MW/hr.

D. Residential Uses

Energy use for residential building types was estimated using a combination of energy simulation models, including Energy-10.[19] These models were used to simulate code-compliant buildings for the distribution of land uses indicated for the Proposed Project. The models were then used to develop alternative packages of features capable of reducing energy consumption and associated GHG emissions. The simulation models provided annual energy use intensity estimates for purchased electricity and natural gas for different dwelling unit types and configurations. Electricity usage was assumed to be supplied by SCE. Resulting Scope 2 emissions generated are based on SCE's current and anticipated 2020 carbon intensity per delivered MW/hr.

E. Water and Wastewater

Water pumping, conveyance, distribution, treatment and wastewater treatment are major electricity end-uses in California. The California Energy Commission (CEC) estimates that statewide water-related energy consumption accounts for approximately 19.2% of the state's total electricity use[20]. The embodied energy and carbon in the water supply is highly dependent upon a number of factors, including the source of the water, the water treatment processes, distance the water is conveyed, local pumping and distribution requirements, etc. The following three subsections present a detailed analysis of the embodied energy and carbon factors in the Project's various water flows on a unit basis (e.g., kWh/gallon, mTCO2e/gallon). This is followed by an analysis of the total embodied energy and carbon in the Project's total projected annual water use and savings for the various water conservation mitigation measures.

[19] eQUEST and Energy-10 are energy modeling applications verified by the US Department of Energy as credible hourly building energy simulation programs. Residential building energy consumption was estimated using these models based on proposed building types for the Project.

[20] Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," December 2006. California Energy Commission document number CEC-500-2006-118.

Embodied Energy and Carbon Factors for Potable Water

The City of Downey is currently the only supplier of potable water to the Project site. The City currently relies on groundwater to supply 100% of its potable water needs. The City extracts groundwater from City-operated wells. The nearest domestic water supply well to the site is the City of Downey Well No. 30, which draws water from approximately 384 to 620 feet below ground surface[21].

The aquifers beneath the City are part of the Central Groundwater Basin (Central Basin). From the 1940's, more water has been pumped from the basin than rain and other natural recharge can sustain. In response to severe basin over-pumping and rapidly dropping ground water levels, the Central Basin Municipal Water District (CBMWD) was established in 1952 as a member of the Metropolitan Water District of California (MWD). Since more water is pumped from the basin than is naturally replenished, the basin requires supplemental recharge with imported water purchased from the Metropolitan Water District of Southern California (MWD) and with recycled water from the County Sanitation Districts of Los Angeles County. The Water Replenishment District of Southern California (WRD) is a complementary organization to the Department of Water Resources that is responsible for managing the Central Basin's supplemental recharge. The CBMWD projects that from 2010 through 2030, total annual groundwater withdrawals from the Central Basin and West Coast Basin will be 202,000 acre-feet per year (AFY), and that annual supplemental water replenishment requirements will be 27,600 AFY (13.7% of total water withdrawals) from imported water from MWD, and 50,000 AFY (24.8% of total withdrawals) from recycled water[22]. The remaining water is supplied by natural recharge. Thus, while the Project Site will be supplied with 100% locally extracted groundwater, this groundwater is made up of ~14% imported water and ~25% recycled water, each with significant amounts of embodied energy and carbon.

MWD imports water from the Colorado River via the Colorado River Aqueduct and from Northern California via the California Aqueduct. During an average year (based on 1922 – 2004 hydrologies), MWD receives 1,722,000 AF of water from the California Aqueduct and 711,000 AF from the Colorado Aqueduct[23] (71.4% and 28.6% from each source, respectively). Utilizing this ratio, approximately 4% of the Central Basin's groundwater is supplied by the Colorado River and 10% from Northern California.

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[21] Tierra Luna Specific Plan EIR, Section IV.G., Hydrology/ Water Quality

[22] Central Basin Municipal Water District, "2005 Urban Water Management Plan," Table ES-1. http://www.centralbasin.org/publications/Central-Basin-2005-UWMP-FINAL.pdf.

23 Metropolitan Water District of Southern California, "The Regional Urban Water Management Plan, Metropolitan Water District of Southern California," November 2005. Table II-9: "Average Year Supply Capability & Projected Demands (Average of 1922 – 2004 Hydrologies)." http://www.mwdh2o.com/mwdh2o/pages/yourwater/RUWMP/RUWMP_2005.pdf

The CEC has funded research to identify the embodied energy of the water supply system in California. This research has provided estimates on the embodied energy added in each segment of the water supply system (e.g., supply, conveyance, treatment, distribution, wastewater treatment, etc.). This allows the development of custom water-energy-factors (WEFs) for specific locations. WEF's represent the total embodied energy per unit of water used (kWh/AF) for individual utilities or water sources. The report "Refining Estimates of Water-Related Energy Use in California"[24] provides the most recent WEF data. This analysis uses the CEC methodology and data to develop custom WEFs for potable water use, recycled water use, and wastewater flows generated by the project. The following table summarizes the estimated embodied energy, or WEF, for the City of Downey's potable water supplied to the project. The adjusted WEF is the component WEF multiplied by the percent of total water supply that is made up of the component. The total embodied energy in the Project's potable water supply is 1,787 kWh/AF.

The electricity used in the water supply chain occurs in various parts of the state depending on where individual processes occur. The most appropriate electricity emission factor for electricity used in the water supply chain is the California state average electricity carbon emission factor. This analysis uses the EPA's eGRID 2004 data (the most recent data available at the time of analysis), with an average California electricity emission factor of 0.7646 lb of CO2e per kWh (3.4682e-4 metric ton of C02e (mTCO2e) per kWh)[25]. This includes 8.4% transmission and distribution losses from the electricity grid. This results in a water carbon factor (WCF) of 1,787 kWh/AF * 0.7646 lb CO2e/kWh = 1,366 lb of CO2e/AF (0.620 mTCO2e/AF).

[24] Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," December 2006. California Energy Commission document number CEC-500-2006-118.

[25] U.S. Environmental Protection Agency, "eGRID2006 Version 2.1 (Emissions & Generation Resource Integrated Database)." April 20, 2007. http://www.epa.gov/cleanenergy/egrid/index.htm

Table 4
Embodied energy in the City of Downey's Potable Water Supply

Component	Description	WEF (kWh / AF)	% of Total Water Supply	Adjusted WEF (kWh/AF)	Notes
Water Supply and Conveyance	Supplemental recharge water from MWD (Imported Water from the Colorado River Aqueduct)	2,000	4%	78	[26]
	Supplemental recharge water from MWD (Imported Water from the California Aqueduct)	3,000	10%	293	[27]
	Supplemental recharge water from recycled water	1,607	25%	399	[28]
Groundwater Pumping	Groundwater Pumping (390 foot typical depth)	566	100%	566	[29]
Water Treatment		36	100%	36	[30]
Water Distribution		414	100%	414	
Total				**1,787**	

Embodied Energy and Carbon Factors for Recycled Water

The following table summarizes the estimated WEF for recycled water that may be available to the project, and which is used for supplemental groundwater basin recharge. Estimated energy content of recycled water is composed of two parts: the wastewater treatment process, and distribution pumping/pressurization. Total WEF is 1,067 kWh/AF.

[26] 13.7% of the Central Basin's groundwater is provided by supplemental water recharge from imported water supplied by MWD. 28.6% of MWD's water comes from the Colorado River Aqueduct. Multiplying the two values results in 4% of project's total water supply coming from the Colorado River Aqueduct, which has 2,000 kWh/AF of embodied energy delivered to Southern California (Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Appendix B, Index No. 3. December 2006. CEC document number CEC-500-2006-118.)

[27] 13.7% of the Central Basin's groundwater is provided by supplemental water recharge from imported water supplied by MWD. 71.4% of MWD's water comes from the California Aqueduct. Multiplying the two values results in 10% of project's total water supply coming from the California Aqueduct, which has 3,000 kWh/AF of embodied energy delivered to Southern California (Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Appendix B, Index No. 5. December 2006. CEC document number CEC-500-2006-118.).

[28] Refer to the following section for the energy content of recycled water.

[29] The typical Well 30 City of Downy pumping depth of 384 - 620 feet is multiplied by 1.45 kWH/AF/ft for a total estimated pumping energy of 566 kWh/AF. The pumping energy is from typical/recommended data provided in (Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Table 9. December 2006. CEC document number CEC-500-2006-118.).

[30] Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Table 6. December 2006. CEC document number CEC-500-2006-118.

Table 5
Embodied energy in the Recycled Water Supply

Component	Description	WEF (kWh/AF)	% of Total Water Supply	Adjusted WEF (kWh/AF)	Notes
Wastewater Treatment	Average for Southern California	652	100%	652	[31]
Water Distribution	Pumping, pressurization, and related recycled water distribution energy	414	100%	414	
Total				**1,067**	

This analysis uses the EPA's eGRID 2004 statewide average California electricity emission factor of 0.7646 lb of CO2e per kWh (3.4682e-4 mTCO2e/kWh)[32]. This includes 8.4% transmission and distribution losses from the electricity grid (Western Interconnect average). This results in a water carbon factor (WCF) of 1,067 kWh/AF * 0.7646 lb CO2e/kWh = 816 lb of CO2e/AF (0.370 mTCO2e/AF).

Embodied Energy and Carbon Factors for Wastewater

The Project is served by the Sanitation Districts of Los Angeles County (SDLAC). The Project's wastewater is treated by two different SDLAC plants. Approximately 50% of the wastewater will be conveyed to and treated by the Joint Water Pollution Control Plant (JWPCP), and the remaining 50% would be conveyed to and treated by the Los Coyotes WRP[33]. Specific energy consumption data per gallon of waste treated for each plant is not available. The best available energy intensity for wastewater treatment is approximately 652 kWh/AF (the average embodied energy in Southern California wastewater treatment plants)[34].

This analysis uses the EPA's eGRID 2004 statewide average California electricity emission factor of 0.7646 lb of CO2e/kWh (3.4682e-4 mTCO2e/kWh)[35]. This includes 8.4% transmission and distribution losses from the electricity grid (Western Interconnect average). This results in a water carbon factor (WCF) of 654 kWh/AF * 0.7646 lb CO2e/kWh = 500 lb of CO2e/AF (0.227 mTCO2e/AF).

[31] Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Table 6 and Appendix B Index number 56. December 2006. CEC document number CEC-500-2006-118.
[32] U.S. Environmental Protection Agency, "eGRID2006 Version 2.1 (Emissions & Generation Resource Integrated Database)." April 20, 2007. http://www.epa.gov/cleanenergy/egrid/index.htm
[33] Tierra Luna Specific Plan EIR, Section IV.M (Utilities).
[34] Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Table 6 and Appendix B Index number 56. December 2006. CEC document number CEC-500-2006-118.
[35] U.S. Environmental Protection Agency, "eGRID2006 Version 2.1 (Emissions & Generation Resource Integrated Database)." April 20, 2007. http://www.epa.gov/cleanenergy/egrid/index.htm

Total Embodied Energy and Carbon in the Project's Annual Water Use (Business As Usual, Specific Plan EIR Baseline)

The following table summarizes the embodied energy and carbon in the project's water supply, based on the estimated water use in the Tierra Luna Specific Plan EIR, Section IV.M. The embodied energy and carbon values shown in the table do not include associated wastewater treatment or water heating energy use. The table also assumes that all plumbing fixtures and landscape irrigation use potable water for this business as usual (BAU) scenario. Finally, it should be noted that the base unit water consumption numbers are based on statistical average consumption data for existing facilities, and represents average water use for a wide range of fixture efficiency levels and conditions.

Table 6
Embodied Energy and Carbon in the Proposed Project Water Supply (BAU)

Land Use	Size	Consumption Rate	Total (gallons/day)	Total (gallons/year)[c]	Total Energy (kWh/year)[d]	Total CO2 (mTCO2e/ year)[e]
Office	675,000 sf	192 gal./1,000 sf/day	129,600	47,304,000	259,419	91
Retail	1,200,000 sf	102.4 gal/1,000 sf/day	122,880	44,851,200	245,967	87
Hotel	450 rooms	166.4 gal/room/day	33,280	12,147,200	66,616	53
Residential	1,700,000 sf (approx. 1,500 units)	188.8 gal/unit/day	283,200	103,368,000	566,877	200
Open Space	200,000 sf	120 gal/1,000 sf/day[a]	24,000	8,760,000	48,040	17
Parking Facilities	850,000 sf	24 gal/1,000 sf/day[b]	20,400	7,446,000	40,834	14
Proposed Project Total			**654,960**	**239,060,400**	**1,311,007**	**462**
Existing Uses Total			**13,123**	**4,789,895**	**26,268**	**9**
Net Increase in Water Consumption			**641,837**	**234,270,505**	**1,284,739**	**453**

sf = square feet

[a] *Los Angeles County Sanitation District, Average Wastewater Generation Factors, Table 1, Loadings for Each Class of Land Use, March 23, 2004, "Golf Course, Camp, and Park" generation factor.*

[b] *Los Angeles County Sanitation District, Average Wastewater Generation Factors, Table 1, Loadings for Each Class of Land Use, March 23, 2004.*

Source: City of Los Angeles Bureau of Sanitation, Sewer Generation Rates Table, March 20, 2002; calculated as 118 % of wastewater generation for residential uses and 128% of wastewater generation for non-residential uses.

Source (table): Christopher A. Joseph & Associates, July 2008.

[c] *Calculated by multiplying daily use by 365 days/year*

[d] *Potable water has an embodied energy content of 1,787 kWh per acre-foot of water (1 acre-foot (AF) = 325,852.8 US gallons) = 0.005484 kWh/gal*

[e] *Potable water has an embodied carbon content of 0.620 mTCO2e/acre-foot (AF) of water =1.933e-6 mTCO2e/gal*

The following table summarizes the embodied energy and carbon in the project's wastewater generation due to pumping and wastewater treatment. The wastewater generation rates are based on the estimated wastewater use in the Tierra Luna Specific Plan EIR, Section IV.M.

Table 7
Embodied Energy and Carbon in the Proposed Project Wastewater Generation (BAU)

Land Use	Size	Generation Rate	Total (gallons/day)	Total (gallons/year)[d]	Total Energy (kWh/year)[e]	Total CO2 (MTCO2e/ year)[f]
Office	675,000 sf	150 gal./1,000 sf/day	101,250	36,956,250	73,913	26
Retail	1,200,000 sf	80 gal/1,000 sf/day[a]	96,000	35,040,000	70,080	24
Hotel	450 rooms	130 gal/room/day	58,500	21,352,500	42,705	15
Residential	1,700,000 sf (approx. 1,500 units)	148 gal/unit/day[b]	222,000	81,030,000	162,060	56
Open Space	200,000 sf	94 gal/1,000 sf/day[c]	18,800	6,862,000	13,724	5
Parking Facilities	850,000 sf	19 gal/1,000 sf/day	16,150	5,894,750	11,790	4
Proposed Project Total			**512,700**	**187,135,500**	**374,271**	**130**
Existing Uses Total			**10,252**	**3,741,980**	**7,510**	**3**
Net Increase in Wastewater Generation			**502,448**	**183,393,520**	**366,761**	**127**

sf = square feet
[a] *Calculated utilizing the "Store" generation factor.*
[b] *Calculated utilizing the "Five Units or More" residential generation factor.*
[c] *Calculated utilizing the "Golf Course, Camp, and Park" generation factor.*
Source: City of Los Angeles Bureau of Sanitation, Sewer Generation Rates Table, March 20, 2002.
Source (table): Christopher A. Joseph & Associates, July 2008.
[d] *Calculated by multiplying daily use by 365 days/year*
[e] *Wastewater has an embodied energy content of 654 kWh per acre-foot of water (1 acre-foot (AF) = 325,852.8 US gallons) = 0.002 kWh/gal*
[f] *Wastewater has an embodied carbon content of 0.227 mTCO2e/acre-foot (AF) of water =6.966e-7 mTCO2e/gal kWh/gal*

Total Embodied Energy and Carbon Savings Potential for Mitigation Measures

The Tierra Luna Specific Plan EIR, Section IV.M (Utilities) provides estimated daily water use and wastewater generation for the project. These are based on statistical sewer generation rates from

existing facilities[36,37, 38] (refer to the Tierra Luna Specific Plan EIR, Section IV.M for further details). These numbers are representative of a wide range of plumbing fixture efficiency levels, landscaping designs, and other factors.

Analyzing the embodied carbon and energy savings from various water conservation measures at Tierra Luna requires a finer-resolution analysis of water use for the Project. A more detailed analysis of plumbing fixture and landscaping water use, and the related embodied energy and carbon has been performed.

The Project's plumbing fixture water use and wastewater generation is analyzed on a fixture by fixture basis for each use category using the methodology outlined in the U.S. Green Building Councils' Leadership in Energy and Environmental Design (LEED)® Reference Manual[39]. Water use for the following fixtures is analyzed: toilets, urinals, bathroom lavatories, kitchen sinks and showers. Base-case, or business as usual water use is based on standard code-compliant fixture efficiency levels using potable water. The anticipated project design-case uses efficient water fixtures typical of those specified in the Tierra Luna Specific Plan EIR. The fixture-level water use calculations are performed for both male and female water use (this analysis assumes a 50/50 split between male and female occupants) for each space type. Water calculations are summarized as follows:

- Daily fixture water use (gal/day) = fixture flow rate (gpm) * use time of fixture (min/use) * uses/day * people
    - e.g., bathroom sinks: 2 gpm * .25 minutes/use * 4 uses/day * 3.255 people/DU = 4.4 gal/day
- Annual water use (gal/year) = daily water use * 365 days/year.
- Hot water use = total water use * ($T_{use} – T_{mains}$)/ ($T_{use} – T_{DHWsetpoint}$). For this analysis, T_{use} ~ 100F (the typical temperature of water coming out of the sink), T_{mains} = 65F (the average water supply temperature from the mains[40]), $T_{DHWsetpoint}$ = 120F (the typical DHW setpoint)
- Energy required to heat the water (Therms) = m*Cp*ΔT/efficiency = (gallons of Hot Water Used)/(7.48 gal/ft^3)*(62.32 lb_m/ft^3)*(1 BTU/lb_m-F)*ΔT/EF/(100,000 BTU/therm)
    - EF is the efficiency factor for the DHW heating system.
    - ΔT is the difference between the cold water supply and hot water setpoint temperatures.

[36] Los Angeles County Sanitation District, Average Wastewater Generation Factors, Table 1, Loadings for Each Class of Land Use, March 23, 2004.
[37] City of Los Angeles Bureau of Sanitation, Sewer Generation Rates Table, March 20, 2002.
[38] Christopher A. Joseph & Associates, July 2008.
[39] LEED NC v2.2 Reference Manual
[40] Average mains temperature is estimated to be the same as the groundwater temperature, based on data from www.epa.gov/athens/learn2model/part-two/onsite/tempmap.htm.

- The WEF and WCF factors developed for each water source are then applied to the fixture water use and wastewater generation values.

Irrigation water use is estimated using the "WUCOLS" methodology[41], which is a standard methodology for estimating landscape water use based on average reference evapotranspiration data and landscaping design parameters.

The project will likely use a mixture of water and air-cooled condensing equipment. There is not enough design data to accurately estimate process water savings (e.g., cooling tower water use, etc.) at the present time.

The Tierra Luna Specific Plan specifies a wide range of plumbing fixture efficiency measures and water-efficient landscaping measures. The following list of water efficiency measures are the measures specified that can be quantitatively analyzed to determine their impacts on the embodied energy and carbon in the water supply.

- **Recycled Irrigation Water:** Recycled water offsets the use of potable water and has lower embodied energy and carbon.
- **"Smart" Irrigation Controller:** A "Smart" irrigation controller (a.k.a. weather-based controller, evapotranspiration controller, or ET controller) automatically adjusts the irrigation schedule based on plant evapotranspiration requirements and current weather conditions. This saves significant water compared to traditional timer-based irrigation controllers.
- **Efficient Drip Irrigation:** There is a significant variation in how efficiently different sprinkler systems distribute water. A base case irrigation efficiency of 63% (typical of conventional automatic sprinkler systems) is compared to a high-efficiency scenario (e.g., extensive use of drip irrigation and good design practices) with a 90% irrigation efficiency.
- **Efficient Landscaping Palette:** The use of water efficient, drought tolerant landscaping palettes (e.g., MWD's "California Friendly" landscaping program[42], xeriscaping, etc.) can save significant water. The impacts of reducing the plant species factor (Ks) by 0.3 (representative of specifying a "California Friendly" landscaping design verses typical Southern California landscaping design) are examined.
- **Dual Plumbing:** The installation of dual plumbing in all commercial buildings and the hotel is examined. Dual plumbing is the installation of recycled water lines in buildings. This can be used for toilet flushing and other non-potable uses. This analysis only considers the use of recycled water in toilets and urinals.
- **High-Efficiency Water Heaters:** The use of code-compliant standard efficiency tank type water heaters verses efficient water heaters is examined.

[41] University of California Cooperative Extension, and California Department of Water Resources. A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California: The Landscape Coefficient Method and WUCOLS III. 2000. www.owue.water.ca.gov/docs/wucols00.pdf.

[42] The Metropolitan Water District of Southern California (MWD)'s California Friendly Landscaping program, http://www.bewaterwise.com/index.html

- **Low-Flow Showers :** The use of low-flow showers with a flow rate of 1.8 GPM verses 2.5 GPM are analyzed in Residences and Hotels.
- **Low-Flow Kitchen Sinks:** The use of low-flow kitchen sinks with a flow rate of 1.8 GPM verses 2.5 GPM are analyzed.
- **Low-Flow Lavatories:** The use of low-flow bathroom sinks with a flow rate of 1.8 GPM verses 2.5 GPM are analyzed in Residences and Hotels. Current code already requires very low flow aerators on commercial lavatories.
- **Low-Flow Urinals:** The use of low-flow 0.5 GPF verses standard 1.0 GPF urinals are analyzed, assuming use of recycled water.
- **Efficient Toilets (1.1 GPF):** The use of very efficient low-flow toilets are examined. This analysis assumes an average flush volume of 1.1 GPF, typical of some of the high efficient toilets currently on the market (e.g., Sloan Flushmate IV equipped toilets and some dual-flush toilets). Current code requirement is 1.6 GPF, assuming use of recycled water.

The following table summarizes the water, and related energy/carbon savings from each of the water conservation measures analyzed. This table represents the savings for each measure implemented incrementally[43]. The last row, "All Measures," shows the savings for implementing all of the measures together. This table clearly shows which measures have the largest embodied carbon savings potentials. The measures which also reduce water heating energy use have the most significant impacts.

[43] This assumes that all of the measures are implemented. This captures the impacts from measures that interact with each other. For example, low-flow showerheads significantly reduce the amount of hot water used, which in turn reduces the savings potential for installing a high efficiency water heater.

Table 8
Water, Energy, and Carbon Savings for Each Water Efficiency Measure

Measure	Water Use (gal/year)	Sewer Generation (gal/year)	Embodied Electricity in Water (kWh/year)	Embodied Electricity in Sewer (kWh/year)	Total Embodied Electricity (kWh/year)	DHW Energy (Therms/ year)	Embodied Carbon in Water Supply (metric tonnes CO2e/ year)	Embodied Carbon in Sewer Treatment (metric tonnes CO2e/ year)	Embodied Carbon in Water Heating (metric tonnes CO2e/ year)	Total Embodied Carbon (metric tonnes CO2e/ year)
Recycled Irrigation Water	-	-	11,549	-	11,549	-	4	-	-	4.0
ET Irrigation Controller	498,599	-	9,912	-	9,912	-	3	-	-	3.4
Drip Irrigation (90% vs 63% eff)	853,816	-	16,974	-	16,974	-	6	-	-	5.9
Efficient Landscaping Palette (Increase Ks by 0.3	4,191,462	-	83,325	-	83,325	-	29	-	-	28.9
Dual Plumbing/Recycled Water for Toilet Flushing	-	-	20,885	-	20,885	-	7	-	-	7.2
High-Efficiency Water Heaters	-	-	-	-	-	7,547	-	-	41.0	41.0
Low-Flow Showers (1.8 GPM) in Residences & Hotels	1,498,447	1,256,144	8,218	2,998	11,216	7,406	3	1.0	40.2	44.1
Low-Flow Kitchen Sinks (1.8 GPM vs 2.5 GPM)	2,021,492	1,678,814	11,086	4,045	15,131	9,991	4	1.4	54.3	59.5
Low-Flow Lavatories (1.8 GPM) in Residences & Hotels	2,148,141	1,767,470	11,781	4,298	16,079	10,617	4	1.5	57.7	63.3
Low-Flow Urinals (0.5 GPF)	809,844	632,690	4,441	1,620	6,062	-	2	0.6	-	2.1
Efficient Toilets (1.1 GPF)	9,361,385	7,719,168	51,339	18,731	70,070	-	18	6.5	-	24.3
All Measures	21,383,186	13,054,287	229,510	31,693	261,202	35,561	80	11.0	193.2	283.8

The following table presents detailed summary of water, wastewater, energy and carbon savings resulting from implementing all of the water efficiency measures.

Table 9
Detailed Savings Summary for All Water-Efficiency Measures

	Water Use (gal/year)	Sewer Generation (gal/year)	Embodied Electricity in Water (kWh/year)	Embodied Electricity in Sewer (kWh/year)	Total Embodied Electricity (kWh/year)	DHW Energy (Therms/ year)	Embodied Carbon in Water Supply (metric tonnes CO2/year)	Embodied Carbon in Sewer Treatment (metric tonnes CO2/year)	Embodied Carbon in Water Heating (metric tonnes CO2/year)	Total Embodied Carbon (metric tonnes CO2/year)
Plumbing-Commercial/Office	1,934,660	1,511,453	17,224	3,871	21,095	1,609	6.0	1.3	8.7	16.1
Plumbing-Commercial/Retail	938,233	732,994	8,637	1,877	10,515	499	3.0	0.7	2.7	6.4
Plumbing-Hotel	2,698,312	2,108,056	25,577	5,399	30,976	6,524	8.9	1.9	35.4	46.2
Plumbing-Residential	10,268,105	8,701,784	56,311	20,545	76,857	26,930	19.5	7.1	146.3	173.0
Landscaping	5,543,876	-	121,760	-	121,760	-	42.2	-	-	42.2
Totals	21,383,186	13,054,287	229,510	31,693	261,202	35,561	80	11	193	284

F. Storm Water

Urbanization in the Los Angeles Basin has significantly increased the amount of impermeable surfaces (e.g., roads, parking lots, roofs, etc.). This reduces natural infiltration of storm water flows into the underlying aquifers. Traditional stormwater management practices in Southern California (e.g., the use of concrete lined channels and similar systems to convey storm water flows out of the area as quickly as possible) further reduce groundwater recharge. In effect, rainfall is being exported out of the groundwater basin, resulting in decreased groundwater recharge. Imported water must be used to replace this lost recharge.

To illustrate the cumulative impacts this can have, it has been estimated that development and stormwater management practices in the Chino Basin have resulted in the loss of more than 40,000 acre-feet per year that otherwise would have recharged local aquifers. This stormwater has an average energy content of 2,250 kWh per acre-foot, because water must be imported from MWD to make up for lost recharge[44].

An analysis of the embodied energy and carbon of the Project's stormwater has been performed to estimate the carbon savings for the various stormwater mitigation measures specified in the Tierra Luna Specific Plan EIR.

Embodied Energy and Carbon Factor for Storm Water Runoff

The Project lies over the Central Groundwater Basin. The Central Groundwater Basin is over-allocated, with more water pumped from the basin than supplied by natural recharge. Therefore, imported and recycled water is injected into the groundwater basin to meet the pumping requirements. A total of 38.5% of the Central Groundwater Basin's recharge water is provided by imported and recycled water supplemental recharge (13.7% of the supply is imported water from MWD, and 24.8% is from recycled water)[45]. The following table summarizes the embodied energy in this recharge water. This is equal to the resulting energy content of "lost" stormwater that is not infiltrated into the groundwater basin.

[44] California Energy Commission. The Role of Land Use in Meeting California's Energy and Climate Change Goals. 2007. www.energy.ca.gov/2007publications/CEC-600-2007-008/CEC-600-2007-008-SF.PDF.

[45] Central Basin Municipal Water District, "2005 Urban Water Management Plan," Table ES-1. http://www.centralbasin.org/publications/Central-Basin-2005-UWMP-FINAL.pdf.

Table 10
Embodied energy in the City of Downey's Potable Water Supply

Component	Description	WEF (kWh/ AF)	% of Recharge Water	Adjusted WEF (kWh/AF)	Notes
Water Supply and Conveyance	Supplemental recharge water from MWD (Imported Water from the Colorado River Aqueduct)	2,000	10%	205	46
	Supplemental recharge water from MWD (Imported Water from the California Aqueduct)	3,000	26%	769	47
	Supplemental recharge water from recycled water	1,607	64%	1,030	48
Total				**2,005**	

This analysis uses the EPA's eGRID 2004 statewide average California electricity emission factor of 0.7646 lb of CO2e per kWh (3.4682e-4 metric ton of C02e (mTCO2e) per kWh)[49]. This includes 8.4% transmission and distribution losses from the electricity grid (Western Interconnect average). This results in a water carbon factor (WCF) for stormwater of 2,005 kWh/AF * 0.7646 lb CO2e/kWh = 1,533 lb of CO2e/AF (0.695 mTCO2e/AF).

Total Embodied Energy and Carbon In the Project's Storm Water Runoff

Most of the project site is currently covered with impermeable surfaces except for intermittent areas of landscaping. The existing storm drains transport off-site and on-site runoff to the municipal storm drain system and eventually into either the Los Angeles or San Gabriel Rivers[50]. There is currently negligible local infiltration of precipitation falling on the site. Nearly all of the precipitation on the site

[46] 13.7% of the Central Basin's groundwater is provided by supplemental water recharge from imported water supplied by MWD. 28.6% of MWD's water comes from the Colorado River Aqueduct, which has 2,000 kWh/AF of embodied energy delivered to Southern California (Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Appendix B, Index No. 3. December 2006. CEC document number CEC-500-2006-118.)

[47] 13.7% of the Central Basin's groundwater is provided by supplemental water recharge from imported water supplied by MWD. 71.4% of MWD's water comes from the California Aqueduct, which has 3,000 kWh/AF of embodied energy delivered to Southern California (Navigant Consulting, Inc. "Refining Estimates of Water-Related Energy Use in California," Appendix B, Index No. 5. December 2006. CEC document number CEC-500-2006-118.).

[48] 24.8% of the Central Basin's groundwater is provided by supplemental water recharge from recycled water, Central Basin Municipal Water District, "2005 Urban Water Management Plan," Table ES-1. http://www.centralbasin.org/publications/Central-Basin-2005-UWMP-FINAL.pdf.

[49] U.S. Environmental Protection Agency, "eGRID2006 Version 2.1 (Emissions & Generation Resource Integrated Database)." April 20, 2007. http://www.epa.gov/cleanenergy/egrid/index.htm

[50] Tierra Luna Specific Plan EIR page IV.G-6

will flow into the stormwater system. A very minimal amount of the current site-generated stormwater is believed to recharge the underlying groundwater basins.

The Tierra Luna Specific Plane EIR Section Chapter 4 specifies a wide variety of Low Impact Development (LID) stormwater management practices that are designed to reduce stormwater flows and increase groundwater recharge. The stated design criterion is to retain the first ¾ inches of rainfall onsite.

A detailed stormwater analysis has not yet been performed for the project. In order to estimate the total embodied carbon impacts of the Project's stormwater management measures, a preliminary estimate of the total stormwater generation and infiltration has been made:

- Historical hourly precipitation data from the nearest California Irrigation Management Information System (CIMIS) weather station was obtained[51]. The data was processed to remove missing data (e.g., sensor removed or otherwise not working)[52].
  - The average annual precipitation is 10.4 inches per year, with an average of 43 precipitation events per year.
  - Total precipitation on the site is 822 acre-feet (AF)53.
  - Total stormwater runoff from the site is currently approximately 822 AF/year, since the site is nearly completely impervious.
  - This stormwater has an estimated embodied energy content of 1,648,110 kWh and an embodied carbon content of 571 mTCO2e.54
- The hourly precipitation data was analyzed to determine how much stormwater is retained if the first ¾ inches of each rain event is retained and infiltrated onsite.
  - An average of 6.4 inches per year, or 62% of the total rainfall, is infiltrated if the first ¾ inches of each precipitation event is captured.
  - Total stormwater infiltration on the site is 506 acre-feet (AF)55 after the stormwater mitigation measures are implemented.
  - This infiltrated stormwater helps to recharge local aquifers, offsetting the amount of supplemental groundwater recharge required in the region.56 This saves an estimated 1,014,530 kWh of embodied energy in supplemental groundwater recharge, which has an embodied carbon content of 352 mTCO2e.57

[51] CIMIS Station 174 (Long Beach). Hourly precipitation data was available for 2002-2007. http://wwwcimis.water.ca.gov/cimis/

[52] This results in 47,200 hours (5.4 years) of precipitation data. Average annual precipitation is 10.4 inches. This is slightly lower than the 92 year average annual precipitation for Los Angeles County of 14.92 inches/year, http://www.wrh.noaa.gov/lox/hydrology/files/LAC_PRECIP.png

[53] 10.4 inches/year * 79 acres = 822 AF annual precipitation on the Project site

[54] 822 AF/year of stormwater * 2,005 kWh/AF = 1,648,110 kWh/year; 822 AF of stormwater * 0.695 mTCO2e/AF = 571 mTCO2e.

[55] 6.4 inches/year * 79 acres = 506 AF annual infiltration on the Project site

[56] The underlying water hydrology is complex and will require further study to refine these estimates.

[57] 506 AF/year of stormwater * 2,005 kWh/AF = 1,014,530 kWh/year; 506 AF of stormwater * 0.695 mTCO2e/AF = 352 mTCO2e.

- Some of this water will also be used by the landscaping, which will help to offset irrigation water needs (landscape irrigation has a similar embodied energy/carbon content and will not substantially change the total estimated energy/carbon content).

Thus, the stormwater mitigation measures also help reduce the Project's carbon footprint, which is on the same order of magnitude as the embodied carbon savings from water efficiency measures.

G. Solid waste

Solid waste is associated with embodied energy. Residential waste generation was based on the median from statistics from the California Integrated Waste Management Board.[58] The working value was 5.73 lbs/household/day. Solid waste from non-residential areas is based on statistics for office buildings. The estimate for other land use types was 0.0011 tonnes per square foot per year.[59] These generation rates were reduced to account for the LA regional solid waste diversion rate of 49%. The remaining operational (i.e., annually reoccurring) solid waste streams were converted to GHG emissions based on the generic emissions factor of 0.23 metric T CO_2e/tonnes of waste. This is an average value based on the US EPA's Waste Reduction Model (WARM).

H. Transportation

Mobile source emission calculations associated with operation of the proposed Project utilize a projection of annual vehicle miles traveled, which is derived from the transportation study prepared for the proposed Project.[60] The transportation study provided a variety of metrics describing transportation-related activity, including intersection loading and peak hour trips. However, transportation analyses are not typically designed to address the key issue in GHG analysis: total annual GHG emissions. This is the sum of daily operational transportation during a typical year of operation. Consequently, this analysis adapted results from the transportation study to estimate annual GHG emissions.

It is important to recognize that even though transportation-related emissions are ultimately reported in the same units as building and infrastructure-related emissions (metric tonnes CO_2e), the basis for these types of emissions estimates are *significantly different*, as is their relative accuracy. GHG emissions from buildings and infrastructure are tightly connected to the Project and relatively well-constrained by a combination of historic observations of energy use, statistical databases, energy code, and simulation models. Transportation emissions are inherently associated with larger-scale

[58] http://www.ciwmb.ca.gov/WasteChar/WasteGenRates/Residential.htm.

[59] http://www.ciwmb.ca.gov/WasteChar/WasteGenRates/Commercial.htm California Integrated Waste Management Board, Estimated Solid Waste Generation Rates, website: http://www.ciwmb.ca.gov/wastechar/wastegenrates/default.htm, July 15, 2008.

[60] Additional information is available in the Traffic Impact Analysis Section.

connections between the Project, the surrounding area and region, and choices about transportation technology made by a variety of third parties. This means that it is not clear what fraction of annual GHG emissions should be associated with the Project, and there is no widely-accepted protocol for assessing transportation-related GHG emissions. For example, the California Climate Action Registry categorizes transportation emissions as Scope 3 indirect emissions – a classification that makes reporting optional.

As indicated in the introduction, this analysis takes a comprehensive view of Project-related GHG emissions and recognizes the potential influence of the project location and design on transportation emissions. This analysis makes a number of conservative assumptions that are likely to over-estimate *absolute* greenhouse gas emissions while maintaining statistically-accurate *relative* changes in transportation between Project scenarios. In other words, the *absolute* amount of annual greenhouse gas emissions is likely to be high while the *relative* changes in emissions reflect current understanding of the implications of the Project location and project design features. The result is that transportation emissions presented in Table 4 are likely to overstate the fractional contribution of transportation, while the emissions presented in Table 6 reflect an accurate level of relative emissions reduction between BAU and the Project.

Average annual transportation-related emissions were estimated by combining information on the number of trips, average trip distance, and vehicle fleet characteristics. The transportation study provided an estimate of peak afternoon trips (one hour average). The estimate of average daily trips (ADT) was based on the statistical relationship between peak afternoon trips and daily trips, often approximately 10% for urban environments. This ratio was used to estimate average daily trips associated with the Project assuming that travel during the peak afternoon hour represents 10% of daily trips. Average trip length was also provided by the Project Traffic Engineer, Raju Associates, and used here as an estimate for all trips to provide an estimate of average trip distance and, when combined with the total number of daily trips, daily Project-related vehicle miles traveled. Daily miles traveled were converted to annual miles traveled by multiplying by 350, a common scaler for converting from daily to annual mileage for Southern California. This factor integrated daily and seasonal variation in transportation activity.

Annual miles traveled were multiplied by fleet average emissions factors from the California Air Resources Board (ARB) which are available for both 2008 (current conditions) and 2020. ARB's 2020 emissions factors include current Federal CAFE mandates, but they do not include reductions associated with proposed legislation (e.g., Pavley) or implementation of the Low Carbon Fuel Standard (LCFS). As noted in the ARB Scoping Plan, the realized benefit of the LCFS is currently the subject of significant uncertainty. Consequently, again the calculations would provide a conservative overestimate of total transportation-related emissions during project build-out if these additional policies are implemented by 2020.

I. Construction

Construction emissions represent an episodic, Scope 3 source of GHG emissions. Construction emissions are distinct from operational emissions, i.e., emissions are reoccur year-over-year during the operational life of the project. Emissions are associated with the operation of construction equipment. Emissions are also associated with construction waste streams. However, waste stream characteristics were not available for the project, and these emissions were not quantified in this analysis.

To be consistent with guidance from the SCAQMD for calculating criteria pollutant emissions from construction activities, only GHG emissions from on-site demolition and construction activities and off-site hauling and construction worker commuting are considered as project-generated. As explained by CAPCOA, the information needed to characterize GHG emissions from manufacture, transport, and end-of-life of construction materials would be speculative at the CEQA analysis level (CAPCOA at 65). CEQA does not require an evaluation of speculative impacts (CEQA Guidelines § 15145). Therefore, the construction analysis does not assess such GHG emissions. Furthermore, it is reasonable and consistent with criteria pollutant calculations to consider only the GHG emissions resulting from the incremental increase in usage of on-road mobile vehicles, electricity, and natural gas upon implementation of the Project as project-related.

On-site construction equipment emissions were calculated using the OFFROAD2007 model. The OFFROAD2007 model, which was created by ARB, accounts for Los Angeles County specific construction equipment in its emission inventory. The output values used in this analysis were adjusted to be Project-specific, based on usage rates, type of fuel, and construction schedule. These values were then applied to the construction phasing assumptions used in the criteria pollutant analysis to generate GHG emissions values for each construction year. Mobile source emission methodology for on-road construction emissions, associated with worker commute and delivery of materials, utilizes a vehicle miles traveled (VMT) rate calculated by URBEMIS2007 in order to generate values for annual emissions. Emission factors are derived from the EMFAC2007 model using light duty automobile (LDA) factors for worker commute and heavy duty truck (HDT) factors for deliveries. A more complete description of construction emissions calculations is available in the Air Quality Technical Report. Total construction CO_2e emissions are estimated at 11,121 metric tonnes.

There are few effective measures to reduce or control episodic construction phase GHG emissions, and therefore, they are not included in subsequent discussion of strategies to reduce operational GHG emissions.

X. Analysis of Project Design Features

The Project is designed to represent a break from business-as-usual. This is achieved through a combination of project design features that work together to reduce the relative rate of GHG emissions

associated with the project. The following sections provide details about emissions-reducing project design features associated with each component of the Project.

A. Hotel Uses

As the specific designs of the hotel uses are not known at this time, energy savings opportunities were evaluated with respect to the building type performance data in the EnergyPro database. Typical hotel uses are expected to generate demand of approximately 7.61 kwhr/sf/year and 0.19 therms/sf/year. The Project will reduce energy consumption by 15% relative to Title 24 (2005). This may be accomplished through a combination of energy efficiency and green power purchasing. Design features may include measures such as low E windows, low solar heat gain curtain walls, sealed and tested ducts, and high efficiency water source heat pumps.

B. Commercial Uses

BAU for the commercial uses is defined as buildings meeting the minimum requirements of the Title-24 (2005) energy code and typical design, construction, and operational practices. Energy savings opportunities were evaluated with respect to the building type performance data using various DEER models.

Office Uses

Typical office uses are expected generate demand of approximately 13.464 kwhr/sf/year and 0.128 therms/sf/year. The Project will reduce energy consumption of office uses by 15% relative to Title 24 (2005). This may be accomplished through a 20% lighting power reduction design feature, cool roofs, high efficiency glass, high efficiency domestic hot water heater (84% efficiency), high efficiency boiler (84% efficiency) hot water reset controls, and central plant efficiency measures.

Restaurant Uses

Typical restaurant uses are expected generate demand of approximately 17.590 kwhr/sf/year and 0.377 therms/sf/year. The Project will reduce energy consumption of restaurant uses by 15% relative to Title 24 (2005). This may be accomplished through a 30% lighting power reduction design feature, cool roofs, high efficiency glass, high efficiency domestic hot water heater, and high efficiency packaged units (12 EER, 90% AFUE).

Single-Story Retail Uses

Typical single-story retail uses are expected generate demand of approximately 12.723 kwhr/sf/year and 0.030 therms/sf/year. The Project will reduce energy consumption of single-story retail uses by 15% relative to Title 24 (2005). This may be accomplished through a 20% lighting power reduction design feature, cool roofs, high efficiency glass, high efficiency domestic hot water heater, and high efficiency packaged units (12 EER, 90% AFUE).

Multi-story Retail Uses

Typical multi-story retail uses are expected generate demand of approximately 11.447 kwhr/sf/year and 0.067 therms/sf/year. The Project will reduce energy consumption of multi-story retail uses by 15% relative to Title 24 (2005). This may be accomplished through a 15% lighting power reduction design feature, a cool roof, a high efficiency domestic hot water heater, central plant (built-up VAV with reheat – standard centrifugal chillers), high efficiency boiler (84% efficiency), and hot water reset controls.

Assembly Uses

Typical assembly uses are expected generate demand of approximately 19.357 kwhr/sf/year and 0.579 therms/sf/year. The Project will reduce energy consumption of assembly uses by 15% relative to Title 24 (2005). This may be accomplished through a 30% lighting power reduction design feature, cool roofs, high efficiency glass, high efficiency hot water heater (84% efficiency), and high efficiency packaged units (12 EER, 90% AFUE).

C. Residential Uses

Overview

The Tierra Luna project is a new mixed-use residential development. BAU for the residential uses is defined as buildings meeting the minimum requirements of the Title-24 (2005) energy code and typical design, construction, and operational practices. The proposed Project assumes two general construction types: multi story flats and condos and low-rise row homes and carriage units.

Emissions

Residential uses will be designed to exceed Title-24 (2005) by 15%. These emissions reductions for residential land uses can be achieved through a combination of existing technologies. The following bullets describe the combinations of features that can achieve the specified targets for each residential land use category with existing technology. As described in the preceding section, these packages of features are based on whole-building energy simulations. They represent only one of many possible combinations of design features, and, over time, it is likely that new technologies and building techniques may provide alternative strategies to reach the same performance levels. That is, this list is meant to be representative of the ways in which the project will achieve the specified energy performance targets relative to Title-24 (2005).

Multi-story Flats and Condos

Multi-story flats and condos will be designed to exceed Title-24 (2005) by 15% with features that may include:

- R-19 Optimum Value Engineered framing,
- Radiant barriers,
- High performance windows (0.33 U-Value, 0.35 SHGC), and

- Sealed and tested ducts.

Row Homes and Carriage Units

Row homes and carriage units will be designed to exceed Title-24 (2005) by 15% with features that may include:

- R-19 Optimum Value Engineered Framing,
- Radiant barriers,
- High performance windows (0.33 U-Value, 0.35 SHGC),
- Sealed and tested ducts, and
- Window overhangs (shading).

A. Infrastructure

The broad category of infrastructure provides numerous opportunities for energy savings and emissions reductions. These include the design and operation of subterranean parking garages. Technologies exist to improve substantially over standard practice.

Subterranean Garages

Underground parking facilities use a surprising amount of electricity and are associated with a corresponding amount of GHG emissions. The proposed infrastructure will include the following emissions reducing features:

- Demand control ventilation: Ventilation provided in response to actual number of occupants and occupant activity and
- Efficient lighting.

B. Water and Wastewater

The Project can achieve energy savings and emissions reductions through a number of indoor and outdoor water conservation measures. Reducing potable water use is consistent with the goal of reducing potable water use outlined in the Scoping Plan.

Project Design Features Reducing Outdoor Water Use

BAU water consumption for outdoor, landscaped areas was defined with respect to past use on the site and conditions anticipated in the Project Water Supply Assessment. Emissions reductions will be achieved through:

- **Recycled Irrigation Water:** Recycled water offsets the use of potable water and has lower embodied energy and carbon.
- **"Smart" Irrigation Controller:** A "Smart" irrigation controller (a.k.a. weather-based controller, evapotranspiration controller, or ET controller) automatically adjusts the irrigation schedule based on plant evapotranspiration requirements and current weather conditions. This saves significant water compared to traditional timer-based irrigation controllers.

- **Efficient Drip Irrigation:** There is a significant variation in how efficiently different sprinkler systems distribute water. A base case irrigation efficiency of 63% (typical of conventional automatic sprinkler systems) is compared to a high-efficiency scenario (e.g., extensive use of drip irrigation and good design practices) with a 90% irrigation efficiency.
- **Efficient Landscaping Palette:** The use of water efficient, drought tolerant landscaping palettes (e.g., MWD's "California Friendly" landscaping program[61], xeriscaping, etc.) can save significant water. The impacts of reducing the plant species factor (Ks) by 0.3 (representative of specifying a "California Friendly" landscaping design verses typical Southern California landscaping design) are examined.

Project Design Features Reducing Indoor Water Use

BAU water consumption for indoor applications was defined using fixture and flow rates specified in the National Efficiency Standards and Specifications for Residential and Commercial Water-Using Fixtures and Appliances outlined in the Energy Policy Act of 1992, 2005 (EPAct 1992, EPAct 2005). Project emissions reductions targets will be achieved by specifying indoor water fixtures that meet or exceed the following performance levels:

- **Dual Plumbing:** The installation of dual plumbing in all commercial buildings and the hotel is examined. Dual plumbing is the installation of recycled water lines in buildings. This can be used for toilet flushing and other non-potable uses. This analysis only considers the use of recycled water in toilets and urinals.
- **High-Efficiency Water Heaters:** Code-compliant standard efficiency tank type water heaters versus the use of efficient water heaters.
- **Low-Flow Showers:** The use of low-flow showers with a flow rate of 1.8 GPM verses 2.5 GPM in Residences and Hotels.
- **Low-Flow Kitchen Sinks:** The use of low-flow kitchen sinks with a flow rate of 1.8 GPM verses 2.5 GPM.
- **Low-Flow Lavatories:** The use of low-flow bathroom sinks with a flow rate of 1.8 GPM verses 2.5 GPM are analyzed in Residences and Hotels. Current code already requires very low flow aerators on commercial lavatories.
- **Low-Flow Urinals:** The use of low-flow 0.5 GPF verses standard 1.0 GPF urinals.
- **Efficient Toilets (1.1 GPF):** The use of very efficient low-flow toilets are examined. This analysis assumes an average flush volume of 1.1 GPF, typical of some of the high efficient toilets currently on the market (e.g., Sloan Flushmate IV equipped toilets and some dual-flush toilets). Current code requirement is 1.6 GPF.

By specifying the above indoor water conserving fixtures, the Project will reduce fixture-level potable and recycled water consumption by 33% (equivalent to the performance level required to achieve the US Green Building Council LEED for New Construction (version 2.2) Water Efficiency credit 3.1) and reduce equivalent fixture-level wastewater generation by 29%.

[61] The Metropolitan Water District of Southern California (MWD)'s California Friendly Landscaping program, http://www.bewaterwise.com/index.html

C. Solid Waste

The BAU scenario for the project includes the regional solid waste diversion rate of 50%. The Project as proposed does not set a solid waste diversion target beyond the 50% BAU scenario for operational waste. The Project will also establish a construction waste diversion program to divert up to 50% of construction related waste. In addition, recycling centers will be provided in readily accessible areas with the building for depositing, storage, and collection of non-hazardous materials for recycling.

D. Transportation

GHG emissions reductions from the Project can be evaluated in two respects. First, they can be considered with respect to the goals of the CalTrans Climate Action Plan. Second, they can be considered with respect to reductions anticipated through implementation of the Project's Transportation Demand Management (TDM) program.

CalTrans Climate Action Plan

The GHG emissions reduction performance of transportation-related project features can be evaluated with respect to the CalTrans Climate Action Plan. The CalTrans plan suggests that local project design features may be able to influence approximately 10-30% of overall GHG emissions through so-called Smart Land Use and Intelligent Transportation Systems. CalTrans identifies the goal of these measures as the reduction in per capita vehicle travel, relief from congestion, and improvement in travel time in congested corridors and result in:

> *"…more compact, accessible, multi-model communities where travel distances are shorter, people have more travel options, and it is possible [to] walk and bicycle to more destinations…" (page 11)*

The CalTrans action plan calls for "Local Development/Intergovernmental Review" that ensures that local land use planning and development decisions include the provision of:

- *Transportation choices*
  - Including transit, intercity rail, passenger service, air service, walking, biking
- *Land use design*
  - Including urban infill development, mixed used development, transit oriented development

The Project includes a number of features that support the CalTrans climate action plan goals. The Project's location as a regional in-fill site and the association of jobs, housing, and transit are consistent with the CalTrans intent to promote transportation choices, urban infill, mixed-use, and transit oriented development.

The comparison to the CalTrans goals provides a qualitative measure of the consistency of the Project with state plans for emissions reduction.

Transportation Demand Management Program

The proposed Project is a mixed-use, urban infill, comprehensively-designed, and coordinated development that is consistent with the goal of promoting higher density mixed-used development that provides a variety of multi-modal transportation choices. The Project's TDM plan is a set of strategies that will encourage Project employees and patrons to reduce vehicular traffic on street and freeway systems during the most congested time periods of the day by promoting non-auto travel through pedestrian-friendly design and orientation that facilitates transit use.

The value of TDM strategies for reducing auto-related GHG emissions reduction can be evaluated with the following equation:

Transportation GHG emissions = (Miles traveled) x (miles per gallon) x (GHG per gallon)

This equation can be adapted to consider the implications of non-auto transit modes.

The following bullets evaluate the components of the TDM project with respect to their potential impact on GHG emissions:

- Flexible work schedules and telecommuting programs
  - *Impact on GHG emissions:* Reduce miles traveled
- Alternative work schedules
  - *Impact on GHG emissions:* Reduce miles traveled
- Mixed-used development
  - *Impact on GHG emissions:* Reduced miles traveled
- Bicycle and pedestrian-friendly environment
  - *Impact on GHG emissions:* Reduce miles traveled
- Rideshare/carpool/vanpool promotion and support
  - *Impact on GHG emissions:* Increase (net) miles per gallon
- Shuttle buses operated residential HOA
  - *Impact on GHG emissions:* Increase (net) miles per gallon
- Transit passes for employees and residents
  - *Impact on GHG emissions:* Increase (net) miles per gallon
- Education and information on alternative modes
  - *Impact on GHG emissions:* Reduce miles traveled, potentially increase net miles per gallon (e.g., rideshare/carpool/vanpool)
- Transportation Information Center
  - *Impact on GHG emissions:* Reduce miles traveled, potentially increase net miles per gallon (e.g., rideshare/carpool/vanpool)

- Transportation Management Association
    - *Impact on GHG emissions:* Reduce miles traveled, potentially increase net miles per gallon (e.g., rideshare/carpool/vanpool)

In addition to the proposed TDM, the Project proposes a Transit Mitigation Program. The premise of the Project's Transit Mitigation Program is to maximize the utilization of the existing transit through provision of improved connectivity, better and improved transit speeds and facilitation of coordinated transfers between and to these transit infrastructure elements. In addition, viable and practical connections to pedestrian and bicycle networks and provision of kiosks offering real-time information regarding location, schedule adherence, and service provisions for trip planning purposes are all proposed as part of the Transit Improvement Program for the project.

The Proposed Project will provide a potentially intelligent demand-responsive shuttle system to serve residents, employees, visitors, and the surrounding community, focusing on providing coordinated connections to the regional mass transit stations for transfers to Metro Green Line, Blue Line, and the Metrolink trains. The connections to the regional transit service would be provided at the Lakewood Green Line Station, Firestone Blue Line Station, and Norwalk Station.

The shuttles will be low-emission or zero emission busses sized appropriate to their role within the project. These shuttles would be equipped with GPS or other vehicle tracking system devices and communication system in order to be able to provide locational and schedule status information and to potentially respond to calls from the service areas on a real-time basis. Patrons at bus stops outside of the central system core will also have the ability to call for a shuttle bus at the bus stops on-site. Information on the status of the shuttle and wait-time will be given to the patron

The transportation study for the Project concludes that the TDM program and transit proximity can be credited with a 27 % reduction in trip generation, including a reduction in trip length, and by extension a reduction in transportation-related GHG emissions. The average trip distance anticipated for this Project is 5.0 miles which is a 33% reduction from the regional average of 7.5 miles per trip. Due to the proposed Project's proximity to the Metro Green Line Station located within half a mile from the Project Site and the anticipated rerouting of local bus routes through the project site, the reduction in trip length is calculated at 33%. This reduction is reflected as an emissions reduction project design feature in the GHG emissions calculation presented herein.

Additional information is available in the traffic and circulation section of the EIR.

E. Summary of GHG Emissions Reduction from Project Design Features

The following summary illustrates emissions reductions possible with the proposed combination of energy efficiency measures and green power purchasing from utilities. Table 6 illustrates the Project's annual operating greenhouse gas emissions. These calculations reflect the potential reductions associated with the implementation of the combination of project design features described in the preceding sections and the full implementation of current state mandates. Actual performance may

vary based on a number of factors, including the details of the developed land use, mixture of building sizes and types, and available technologies.

Table 11
Operational GHG Emissions Summary. All operational emissions are reported in metric tonnes of CO2e per year.

Description*	BAU project emissions	BAU project emissions with state action**	Proposed Project	Reduction due to Project Design Features
Residential	4,032	3,936	3,415	-13%
Hotel/Commercial	9,950	9,555	7,538	-21%
Water	592	592	497	-16%
Solid waste	6,297	6,297	6,297	0%
Transportation	297,640	202,493	98,547	-51%
Subtotal buildings and infrastructure only	20,871	20,380	17,747	-13%
Subtotal transportation-only	297,640	202,493	98,547	-51%
TOTAL EMISSIONS	**318,511**	**222,873**	**116,294**	
Total reduction from BAU based on state actions and PDFs			63%	
Reduction from state action (mT/year)			95,638	
Reduction from PDFs (mT/year)			106,579	

**Construction emissions episodic and not considered operational emissions. They are reported in Table 4.*

***State actions include 20% Renewables Portfolio Standard, Federal CAFE fuel economy standards, and California Low Carbon Fuel Standard.*

XI. Cumulative GHG Impacts

While the proposed Project is expected to emit GHGs, the emission of GHGs by a single project into the atmosphere is not itself necessarily an adverse environmental effect. Rather, it is the increased accumulation of GHGs from many project and many sources in the atmosphere that cumulatively contribute global climate change. The resultant consequences of that climate change can cause adverse impacts on people and the environment. A project's GHG emissions typically will be very small in comparison to state or global GHG emissions and, consequently, they will, in isolation, have no significant direct impact on climate change. Due to the complex physical, chemical, and atmospheric mechanisms involved in global climate change, it is likely impossible to identify the specific impact, if any, to global climate change from one project's incremental increase in global GHG emissions. As such, the project's GHG emissions and the resulting significance of potential impacts are more properly assessed on a cumulative basis. Therefore, the significance of potential impacts from the proposed Project's GHG emissions is determined on a cumulative basis.

The State has mandated a goal of reducing state-wide emissions to 1990 levels by 2020, even though State-wide population and commerce is predicted to continue to expand. In order to achieve

this goal, ARB is in the process of establishing and implementing regulations to reduce Statewide GHG emissions. However, currently there are no significance thresholds, specific reduction targets, and no approved policy or guidance to assist in determining significance at the project or cumulative level. Additionally, there is currently no generally accepted methodology to determine whether GHG emissions associated with a specific project represents new emissions or existing, displaced emissions.

Table 6 illustrates that the Project's project design features will contribute to a relative reduction in greenhouse gas emissions. These reductions represent a break from BAU and supports State goals for emissions reduction. The methods used to establish this relative reduction is consistent with the approach used in the Air Resources Board Scoping Plan for the implementation of AB 32 through 2020. The Project also identifies appropriate circumstances for the consideration for specific Early Action measures described by the California Climate Action Team.

The California Attorney General's Office has taken an active role in addressing climate change via CEQA, including, but not limited to: submitting comment letters on draft CEQA documents; filing CEQA lawsuits; and entering into related settlement agreements. In particular and most pertinent for our purposes here, the Attorney General's Office has created and routinely updates a Fact Sheet listing project design features to reduce GHG emissions.[62] The Attorney General's Office created this Fact Sheet primarily for the benefit of local agencies processing CEQA documents, acknowledging that "local agencies will help to move the State away from 'business as usual' and toward a low-carbon future."[63] The Fact Sheet explains that the listed "measures can be included as design features of a project," but emphasizes that they "should not be considered in isolation, but as part of a larger set of measures that, working together, will reduce GHG emissions and the effects of global warming."[64]

The Project is consistent with the Fact Sheet and plans to utilize many of the measures listed therein. As recommended by the Attorney General, the Project does not consider design features in isolation, and the Project explicitly includes an integrated set of emissions reducing features addressing each land use type proposed for the Project. The result will be reduction in GHG emissions in comparison to BAU. The Project also considered and described specific combinations of current technologies and construction techniques that can achieve targeted emissions reductions under current conditions. However, the Project also explicitly recognizes that the construction practices and energy-related technologies are changing quickly. Consequently, it is necessary and prudent to provide flexibility to select the most cost-effective options available to meet emissions reduction targets when

[62] CA Attorney General's Office Fact Sheet, *The California Environmental Quality Act – Addressing Global Warming Impacts at the Local Agency Level.* (Source: http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf) (Last visited 5/15/2008).
[63] Id.
[64] Id.

each phase of development actually takes place. This flexible approach is consistent with the recommendations of the Attorney General, aspirations expressed by the Governor, and AB 32.

The location and design of the Project reflect and support efforts to reduce transportation-related greenhouse gas emissions. For example, this is demonstrated through the Project's consistency with the CalTrans Climate Action Plan goals and substantial relative reductions in trip generation rates and trip length. These relative reductions provide the majority of the Project's proposed emissions reductions and demonstrate relative advantage of an urban infill location, connectivity, and an extensive TDM program for achieving emissions reductions.

In the absence of standards and established significance thresholds, and given the Project's relative emissions reductions, the contribution to the cumulative impact of global climate change is considered less than significant. As such, no mitigation is required.

APPENDIX IV.D

Tierra Luna Specific Plan Project Historic Resources Report

TIERRA LUNA SPECIFIC PLAN PROJECT

Historic Resource Report

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July 28, 2008

1. INTRODUCTION

1.1 Purpose

The purpose of this report is to determine and set forth whether or not a development project (sometimes referred to as the "Project") on the Downey Studios property will impact historic resources. The property is located in the City of Downey on what were Parcels I and II of the National Aeronautics and Space Administration (NASA) Industrial Plant. It is bounded by Lakewood Boulevard on the northwest, Clark Avenue on the west, Imperial Highway on the south, Stewart and Gray Road on the north, and Bellflower Boulevard on the east. The property is currently owned by Industrial Realty Group, which has leased space to Downey Studios. Downey Studios is a production company that makes commercials and aids in the production of films.

The proposed Project involves amending the existing Downey Landing Specific Plan to remove the 78-acre project site from the plan area and the development of a new specific plan, the Tierra Luna Specific Plan (the Plan), intended to promote the development of a mixed-use and coordinated development. The Project would promote the creation and restoration of diverse, walkable, compact, and vibrant, mixed-use communities composed of the same program components as conventional developments but assembled in a more integrated fashion in the form of complete communities.

Development of the Project would involve the demolition of most of the on-site structures and the construction of up to 3,950,000 square feet of residential, commercial, office, and public open space uses, including up to 675,000 square feet of commercial/office uses, 1,200.000 square feet of commercial/retail uses, 375,000 of hotel use, and 1,700,000 square feet (approximately 1,500 units) of residential use to include live/work units, for-sale units, and for-rent units. The Project would also develop up to 125,000 square feet of open space, feature 850,000 square feet of parking facilities between several multi-level parking structures, on-street parking, and surface parking lots throughout the project site. The Project would include improvements to the streetscape as well as environmental management standards and amenities related to storm water management, energy consumption, and water conservation. The Project would develop its own internal street network, connected to surrounding arterials, with all necessary infrastructure and utilities systems required to support development of the entire community.

1.2 Previous Evaluation of Historic Significance

In 1992, NASA's Program Operational Plan contained budget directives to reduce real estate holdings, and as a result, in 1993, the Downey Industrial Plant was declared excess to NASA's needs. At that time, the plant encompassed 166.1 acres. For ease of transfer, the site was divided into six parcels, with Parcels III, IV, V, and VI being offered for immediate excess. They were then transferred to the City of Downey.

Initially, Parcels I and II were retained for continued use by Boeing for the Space Shuttle program. However, the company was restructured in 1998, which led to a redistribution and consolidation of its holdings. As a result the Downey Industrial Plan was no longer needed. In turn, NASA declared Parcels I and II excess to their needs as well.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, NASA initiated a historic assessment of the property. The Section 106 process involves the identification of historic resources that may be affected by a particular project. Historic resources are properties that are listed or eligible for listing in the National Register. The Section 106 review for the property was conducted in November of 1999. At the time, the property was occupied by 123 buildings or structures on 97.7 acres. The 19 buildings and structures listed in Table I were identified as potentially eligible for listing in the National Register. A complex or group of buildings is usually analyzed as a historic district. The boundaries of the potential historic district were not identified, but were presumably the site itself, i.e. the combined

boundaries of Parcels I and II. Furthermore, Buildings 1 and 6/290 were identified as potentially eligible for individual listing. The Section 106 review should have led to a formal determination of eligibility, but that does not appear to be the case. None of the buildings on the project site are included in the California Historic Resource Inventory System or the National Register Information System.

TABLE I
NATIONAL REGISTER ELIGIBLE BUILDINGS AND STRUCTURES

Resource #	Resource Name	Date of Construction	Status
1		1929	Extant, Planned for Demo/HABS, altered for studio use
6		1955	Extant, Planned for Demo/HABS, altered for studio use
10		1929	Demolished
11		1941	Extant, Planned for Demo/HABS
25		1942	Demolished
36		1942	Extant, Planned for Demo/HABS, no changes
39		1940	Extant, Planned for Demo/HABS, no changes
41		1942	Demolished
42		1942	Demolished
108		1944 circa	Extant, Planned for Demo/HABS, no changes
120		1941	Demolished
123		1941	Extant, Planned for Demo/HABS, no changes
125		1941	Extant, Planned for Demo/HABS, no changes
126		1941	Extant, Planned for Demo/HABS, no changes
127		1941	Extant, Planned for Demo/HABS, no changes
128		1941	Extant, Planned for Demo/HABS, no changes
130		1941	Extant, Planned for Demo/HABS, no changes
288		1964	Demolished
290		1965	Extant, Planned for Demo/HABS

At any rate, a Memorandum of Agreement (MOA) was established between the City of Downey, NASA, the State Office of Historic Preservation, and the General Services Administration regarding the disposal of property. The MOA acknowledged that the transfer of the property to the City of Downey may have an adverse effect on the buildings and structures identified as National Register eligible. The MOA stipulated the following:

- The front portion of Building 1 shall be preserved and rehabilitated according to the Secretary of the Interior's Standards for the Treatment of Historic Buildings.

- The brick lined concrete walkway panels in front of Building 290 shall be preserved, although they may be relocated.

- The future development of the property shall incorporate interpretative displays highlighting the significant events and persons associated with the property.

The site is currently owned by Industrial Realty Group, which has leased space to Downey Studios. Downey Studios is a production company that makes commercials and aids in the production of films. Many of the ancillary structures and small buildings have been demolished. Including some that were identified as potentially eligible for listing in the National Register. Historic American Engineering Record (HAER) reports have been prepared for Buildings 1, 6, 11, 36, 39, and 290. **(Note to team: What**

about the others?) The history and description of these buildings found in section 2.2 of this report are drawn from the HAER reports.

2. REGULATORY ENVIRONMENT

2.1 Regulatory Environment

Generally, a lead agency must consider a property a historic resource under the California Environmental Quality Act if it is eligible for listing in the California Register of Historical Resources (California Register). The California Register is modeled after the National Register of Historic Places (National Register). Furthermore, a property is presumed to be historically significant if it is listed in a local register of historic resources or has been identified as historically significant in a historic resources survey (provided certain criteria and requirements are satisfied) unless a preponderance of evidence demonstrates that the property is not historically or culturally significant.[1] The National and California Register designation programs are discussed below.

National Register of Historic Places

The National Register is "an authoritative guide to be used by federal, state, and local governments, private groups and citizens to identify the nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment." [2]

Criteria

To be eligible for listing in the National Register, a property must be at least 50 years of age and possess significance in American history and culture, architecture, or archaeology. A property of potential significance must meet one or more of four established criteria: [3]

A. Associated with events that have made a significant contribution to the broad patterns of our history; or

B. Associated with the lives of persons significant in our past; or

C. Embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Yield, or may be likely to yield, information important in prehistory or history.

Physical Integrity

According to National Register Bulletin 15, “to be eligible for listing in the National Register, a property must not only be shown to be significant under National Register criteria, but it also must have integrity.” Integrity is defined in National Register Bulletin 15 as "the ability of a property to convey its significance.”[4] Within the concept of integrity, the National Register recognizes seven aspects or qualities

[1] Public Resources Code Section 5024.1 and 14 CCR Section 4850.
[2] Title 36 Code of Federal Regulations Part 60.2.
[3] Title 36 Code of Federal Regulations Part 60.4.
[4] National Register Bulletin #15, pp. 44-45.

that in various combinations define integrity. They are feeling, association, workmanship, location, design, setting, and materials.

Context

To be eligible for listing in the National Register, a property must also be significant within a historic context. National Register Bulletin 15 states that the significance of a historic property can be judged only when it is evaluated within its historic context. Historic contexts are "those patterns, themes, or trends in history by which a specific...property or site is understood and its meaning...is made clear."[5] A property must represent an important aspect of the area's history or prehistory and possess the requisite integrity to qualify for the National Register.

Historic Districts

The National Register includes significant properties, which are classified as buildings, sites, districts, structures, or objects. A historic district "derives its importance from being a unified entity, even though it is often composed of a variety of resources. The identity of a district results from the interrelationship of its resources, which can be an arrangement of historically or functionally related properties."[6]

A district is defined as a geographically definable area of land containing a significant concentration of buildings, sites, structures, or objects united by past events or aesthetically by plan or physical development.[7] A district's significance and historic integrity should help determine the boundaries. Other factors include:

- Visual barriers that mark a change in historic character of the area or that break the continuity of the district, such as new construction, highways, or development of a different character;

- Visual changes in the character of the area due to different architectural styles, types, or periods, or to a decline in the concentration of contributing resources;

- Boundaries at a specific time in history, such as the original city limits or the legally recorded boundaries of a housing subdivision, estate, or ranch; and

- Clearly differentiated patterns of historical development, such as commercial versus residential or industrial.[8]

Within historic districts, properties are identified as contributing and noncontributing. A contributing building, site, structure, or object adds to the historic associations, historic architectural qualities, or archeological values for which a district is significant because:

- It was present during the period of significance, relates to the significance of the district, and retains its physical integrity; or

- It independently meets the criterion for listing as the National Register.[9]

[5] National Register Bulletin #15, p. 7.
[6] National Register Bulletin #15, p. 5.
[7] Title 36 Code of Federal Regulations Part 60.3(d).
[8] National Register Bulletin #21, p. 12.
[9] National Register Bulletin #12, p. 13.

Period of Significance

To be eligible for listing in the National Register, a property must be historically or architecturally significant within a specific period of time. The National Register defines the "period of significance" as "the length of time when a property was associated with important events, activities, or persons, or attained the characteristics which qualify it for National Register listing."[10] The period of significance usually begins with the date when significant activities or events began giving the property its historic significance; this is often a date of construction. National Register Bulletin 15 provides guidelines for selecting and evaluating the periods of significance relevant to each Criterion.

- Criterion A: For the site of an important event, the period of significance is the time when the event occurred. For properties associated with historic trends, such as commercial development, the period of significance is the span of time when the property actively contributed to the trend.

- Criterion B: The period of significance for a property eligible under Criterion B is usually the length of time the property was associated with the important person.

- Criterion C: For architecturally significant properties, the period of significance is the date of construction and/or the dates of any significant alterations and additions.

- Criterion D: The period of significance for an archeological site is the estimated time when it was occupied or used for reasons related to its importance, for example, 3000-2500 BC.

The following additional guidelines on periods of significance pertain to all criteria:

- The property must possess historic integrity for all periods of significance entered.

- Continued use or activity does not necessarily justify continuing the period of significance. The period of significance is based upon the time when the property made the contributions or achieved the character on which significance is based.

- 50 years ago is used as the closing date for periods of significance where activities begun historically continued to have importance and no more specific date can be defined to end the historic period. (Events and activities occurring within the past 50 years must be exceptionally important to be recognized as "historic" and to justify extending a period of significance beyond the limit of 50 years ago.)

Criteria Consideration G

Certain kinds of properties, like those less than 50 years of age, are not usually considered eligible for listing in the National Register. 50 years is the general estimate of the time needed to develop historical perspective and to evaluate significance. These properties can be eligible for listing, however, if they meet special requirements called Criteria Considerations, in addition to meeting the regular requirements. National Register Bulletin 15 states that a property less than 50 years of age may be eligible for the National Register if it is of exceptional importance.[11] Demonstrating exceptional importance requires the development of a historic context statement for the resource being evaluated, a comparative analysis with similar resources, and scholarly sources on the property type and historic context. National Register Bulletin 22 provides further guidance on preparing nominations for properties that have achieved significance within the past 50 years:

[10] Ibid.

[11] National Register Bulletin #15, p. 2.

- In evaluating and justifying exceptional importance, it is especially critical to identify the properties in the geographical area that portray the same values or associations and determine those that best illustrate or represent the architectural, cultural, or historical values being considered.[12]

- The case for exceptional importance is bolstered when there is a substantial amount of professional, documented materials on the resource and the resource type. A property listed in the National Register 10 or 15 years after it has achieved significance requires clear, widespread recognition of its value to demonstrate exceptional importance.[13]

California Register of Historical Resources

In 1992, Governor Wilson signed Assembly Bill 2881 into law establishing the California Register. The California Register is an authoritative guide used by state and local agencies, private groups and citizens to identify historic resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse impacts.

The California Register consists of properties that are listed automatically as well as those that must be nominated through an application and public hearing process.[14] The California Register automatically includes the following:

- California properties listed in the National Register and those formally Determined Eligible for the National Register;

- California Registered Historical Landmarks from No. 0770 onward; and

- Those California Points of Historical Interest that have been evaluated by the Office of Historic Preservation (OHP) and have been recommended to the State Historical Resources Commission for inclusion on the California Register.

The criteria for eligibility of listing in the California Register are based upon National Register criteria, but are identified as 1-4 instead of A-D. To be eligible for listing in the California Register, a property must be at least 50 years of age and possess significance at the local, state, or national level, under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or

2. It is associated with the lives of persons important to local, California, or national history; or

3. It embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values; or

4. It has yielded, or has the potential to yield, information important in the prehistory or history of the local area, California, or the nation.

[12] National Register Bulletin #22, p. 3.
[13] National Register Bulletin #22, p. 7.
[14] Public Resources Code Section 5024.1.

Historic resources eligible for listing in the California Register may include buildings, sites, structures, objects, and historic districts. Resources less than 50 years of age may be eligible if it can be demonstrated that sufficient time has passed to understand its historical importance. While the enabling legislation for the California Register is less rigorous with regard to the issue of integrity, there is the expectation that properties reflect their appearance during their period of significance.[15]

The California Register may also include properties identified during historic resource surveys. However, the survey must meet all of the following criteria:[16]

1. The survey has been or will be included in the State Historic Resources Inventory.

2. The survey and the survey documentation were prepared in accordance with office [SOHP] procedures and requirements.

3. The resource is evaluated and determined by the office [SOHP] to have a significance rating of Category 1 to 5 on a DPR Form 523.

4. If the survey is five or more years old at the time of its nomination for inclusion in the California Register, the survey is updated to identify historical resources which have become eligible or ineligible due to changed circumstances or further documentation and those which have been demolished or altered in a manner that substantially diminishes the significance of the resource.

OHP Survey Methodology

The evaluation instructions and classification system proscribed by OHP in its *Instructions for Recording Historical Resources* provide a three-digit evaluation code for use in classifying potential historic resources. In 2003, the codes were revised to address the California Register. The first digit indicates the general category of evaluation. The second digit is a letter code to indicate whether the resource is separately eligible (S), eligible as part of a district (D), or both (B). The third digit is a number, which is coded to describe some of the circumstances or conditions of the evaluation. The general evaluation categories are as follows:

1. Listed in the National Register or the California Register.

2. Determined eligible for listing in the National Register or the California Register.

3. Appears eligible for listing in the National Register or the California Register through survey evaluation.

4. Appears eligible for listing in the National Register or the California Register through other evaluation.

5. Recognized as historically significant by local government.

6. Not eligible for listing or designation as specified.

7. Not evaluated or needs re-evaluation.

[15] Public Resources Code Section 4852.
[16] Public Resources Code Section 5024.1.

2.2 History and Description

The property currently known as Downey Studios has been called by a variety of names and is associated with the history of the American aeronautics and aerospace industries. Originally constructed on farmland, the earliest buildings were constructed in 1929 by EMSCO, an emerging aircraft company. The property mushroomed in size during the late 1930s and early 1940s under the control of Vultee Aircraft Inc. and its successor company, Convair. Buildings were added and expanded to produce aircraft for WWII. After WWII, the use of the property shifted to defense-related research and development and aerospace programs. The location of the historic buildings are clustered in the center of the property (see Figure 1 from HAER No. CA-370-R).

Building 1

Building 1 was constructed between 1929 and 1966. It is associated with the early use of the property by EMSCO, a small aircraft company. E.M. Smith, a wealthy industrialist and aircraft enthusiast, founded EMSCO in 1911. The company manufactured transmission belting, rubber products, and hydraulic break linings. Among other things, Smith owned the EMSCO Asbestos products factory in Downey and the newly purchased Albatross Company, a small aircraft company in Long Beach. Envisioning a landing field that could be used by both commercial and private pilots, Smith purchased a 73-acre tract of land in Downey owned by James Hughan. At the time of the purchase, Hughan was farming the land – largely orange groves and castor beans – and there were a few farm buildings standing.

Smith organized and financed the EMSCO Aircraft Company at the Downey site to manufacture a complete line of land and water aircraft and hired W.A. "Billy" Williams, a well known World War I test pilot, to be his sales manager. The facility consisted of two hard surface runways, a main assembly plant, and various shop buildings.

The main assembly plant was the genesis of Building 1. It was a long rectangular shaped building with an east-west orientation. The main entrance was located on the west elevation, which faces Lakewood Boulevard. This elevation is still visible and sheathed in brick laid in a Flemish bond pattern. Thin pilaster divide the elevation into four bays. The main entrance was located in the third bay from the north. It has since been closed. The first, second, and fourth bays were identical in design and featured three sets of steel sash windows on the first and second stories. The brick wrapped around the corners of the building for the narrow portion that was used as office space. The vast majority of the building that extended to the east was used for aircraft manufacturing. It was covered by a saw tooth roof with clearstory windows facing north, corresponding to the four bays (see Figure 1.)

For all intents and purposes, this building no longer exists. Additions were made to the north, south, and east elevations (discussed below). In so doing, the exterior walls were entirely removed. All that remains is the west elevation and the roof.

Sufficiently capitalized, EMSCO continued to build airplanes after the stock market crash. By 1931, however, there was little work due to the Depression. Eight bombers were ordered by the Mexican government, and a special stunt plane was built for Prince Ionel Ghica of Rumania; but otherwise production was slow. Nonetheless, EMSCO was still serious about its place in the aircraft industry, and in 1931, the company hired Gerald "Jerry" Vultee away from Lockheed to be their chief design engineer. Vultee stayed with EMSCO for one year, and in February 1932, the company leased the plant to Champion Aircraft Corporation of America, and Vultee moved to Glendale to organize his own aircraft company. Champion was only in business for a short while before turning the property over to Security National Aircraft Corporation. Between 1933 and 1936, the Baker Oil Tools Company leased the original buildings constructed for EMSCO.

Leased under Baker Oil Tools Company in 1936, under the leadership of Jerry Vultee, a new kind of aircraft production was brought to the plant. Vultee began to utilize the original EMSCO Building 1 for his production of V-11 military aircraft. However, at this time the American military was uninterested in his aircraft, so he was forced to direct his production and sales efforts towards foreign markets. While Vultee was creating prototypes and producing aircraft for foreign countries, additional space was needed. In 1936, Vultee began modifications and construction on the Downey plant. By the end of 1937, Vultee had built another section of what would later be considered part of Building 1. This new building was a 46,000 square foot hangar that sat east of the original EMSCO building. It was a long rectangular structure with a north-south orientation. The roof was significantly higher than the original EMSCO building, but also had a sawtooth pattern with clerestory windows facing north. The steel framed structure was sheathed in steel panels and had no window openings, but doors on all four sides.

Early in 1938, Jerry Vultee and his wife were killed in a plane crash over Nevada. At this time, Richard W. Miller succeeded Jerry Vultee and renamed the company Vultee Aircraft Inc. Soon after Vultee's death; the American Army Air Corps placed its first order for the V-II-GBs. Under Miller the need for additional modifications to Vultee's aircraft were required in order to keep up with the market. Building 1 was utilized for prototype manufacturing and testing at the time. In 1939 the V-12 was on the market.

Due to the onset of a large market for aircraft, Miller recognized that additional space would be required. He decided to add on to Building 1 again. To accommodate the addition, many existing buildings, including Buildings 11 and 25, had to be moved to new locations. In 1939, three new areas were added to Building 1. The first part of the construction in 1939 was a 90,000 square foot addition on the south façade of the original EMSCO building. This new rectangular structure had a steel frame and truss system. This new area would be used entirely as factory space. The second area of construction was to connect the original EMSCO building with that of the structure built under the Aviation Manufacturing Corporation in 1936. This new 42,000 square foot rectangular addition would connect all of the areas of Building 1 to make it one building. The third and last area of construction completed in 1939 was an addition onto the east façade of Building 1. This new 48,000 square foot rectangular structure was built to match the existing portions of Building 1 constructed under the Aviation Manufacturing Corporation. This new section is taller than the rest of Building 1. By the end of 1939, Building 1 would consist of a single, 300,000 square foot metal-framed structure (see Figure 2.)

At the onset of WWII, the demand for military aircraft increased greatly. Vultee would play a critical role in the manufacturing of large quantities of aircraft. In 1940, Vultee continued to grow and the space in Building 1 was sill not adequate for the increased production. Another addition was made to Building 1 in four stages. The first stage was a 208,000 square foot addition on the north side of the original EMSCO building. This required the closure of the road and the relocation of several buildings that occupied this space.

The second stage of construction would take place at the east façade of Building 1. Built in 1939, the east façade was taller than the rest of the existing Building 1; therefore, the new 128,000 square foot area being constructed during the second stage of construction in 1940, would match the taller building height. This made the entire east portion of Building 1 taller than the west portion. This new east section of Building1 is significant because it is the location of two Firguson doors of nearly 200 feet. "At the time of installation, it was one of the largest one-piece doors in the world."

The third stage of construction was on the south façade of Building 1. At this location an additional 53,000 square feet was added. This section was mainly factory space, but a small area was also designated as the service hangar. This new addition would cause Building 11 to become connected on its south façade. The last stage of construction on Building 1, in 1940, was again on the south façade; however this new 24,000 square foot addition would also connect Building 1 to the west façade of Building 11.

The original EMSCO building was constructed in 1929. Between 1936 and 1940 it grew to a million square foot building. The same construction techniques were used to build the various additions. The entire building is constructed with steel beams that support a steel truss system used to support the metal vaulted roofs. The only areas of Building 1 that vary in style is the 71,000 square foot area known as the Kauffman wings, in honor of the architect Gordon Kauffman. However, only the southern wing can be definitively attributed to the architect. In 1939, Kauffman was hired to design an addition to house administrative office and engineering space. It is located south of the original EMCO building, facing Lakewood Boulevard. It varies in height from one to two stories and is designed in the Art Moderne style. Constructed of brick laid in a common bond pattern, the building has five distinct components. The main entrance is located on the ground floor of a two-story rotunda (see Figure 5.) A reception room is located within and still contains the terrazzo insignia of the Consolidated Vultee Aircraft Corporation on the floor. In the center of the insignia is a bronze benchmark on which the Kaufmann wing was aligned to true north. The benchmark is also the "zero point" from which the plant's grid system is arranged. A flat canopy divides the first story from the second, and at one point in time metal letters were perched on the edge spelling the name of the company. On the second story was a shallow balcony, which is no longer used and a band of steel-framed windows. The second story was an executive office suite. To the south are four identical one-story bays each progressively longer than the next. The southernmost bay was not part of the original construction and was probably added around 1941. The bays have an east-west orientation and curve at the corners. Steel-framed sash windows, five-panes high are distributed regularly across the street-facing elevation. The raised flat parapets disguise the bow truss roofs over each bay. The current owner remodeled this portion of the Kaufmann wing into office space and conference rooms. A new entry area has been added to the south elevation. The wood truss roof system has been exposed and the floors are polished concrete. The Kauffman wing is connected to the remainder of Building 1 through the original EMSCO building, which is described above.

North of the original EMSCO building is another wing. It has been attributed to Gordon Kauffman, although there is no evidence to support such a conclusion. The wing is two stories in height, constructed of board-formed concrete, and sits parallel to Lakewood Boulevard (see Figure 6.) The date of construction is unknown, but a comparison of historic photographs places the date around 1941 (see Figure 3.) On the first and second stories, steel-framed sash windows, three panes high and three sections wide, are evenly distributed along the length of the street-facing elevation. Between the windows the concrete is scored into narrow bands. At each end of the wing is a protruding concrete frame. At the south end it is filled with fixed steel-framed windows that light the staircase within. It appears that the north end once contained an entryway.

At the beginning of 1942, Vultee Aircraft Inc. purchased 34 percent operating control over Consolidated Aircraft Corporation and renamed the company Convair or Consolidated Vultee Aircraft Corporation. Convair would continue to sell Vultee aircraft during WWII. Just prior to the end of WWII, the production of military aircraft was winding down and the Navy brought a new area of interest to the site. This new program would be the research and development of an antiaircraft missile called LARK. However, the program was quickly cancelled. After WWII, Convair continued to build aircraft for select markets as well as the production of prefabricated, two-bedroom homes.

In 1947 North American Aviation leased space from Convair at the Downey plant. Building 1 was used for the production of the first four-jet airplanes developed in the United States and the first jet bomber to fly non-stop across the Pacific Ocean. Also brought to the Downey plant was North American Aviations' Aerophysic Laboratory, which was involved in the research and development of missiles. However, this program was terminated towards the end of 1948. Prior to the program being cancelled, an area of Building 1 was renovated to incorporate new offices, laboratories, and machine shops for development and research of missiles. North American Aviation would also construct additional buildings on the site.

In 1950 North American Aviation bought the Downey plant from Convair in order to produce their trainer aircraft and operation tactical missiles. In 1951, the facility became known as MACE (for Missile, Airframe, and Control Equipment). However, in 1953 the plant was transferred under the Air Force and was renamed Air Force Plant 16. North American Aviation still worked on the Downey site; however, they were no longer in charge of it.

The Air Force used North American Aviation in a contract for the Navahoe program. This was the development of a new missile concept. During this period, Building 1 was remodeled into new research and development areas. Also many missile concepts were tested inside Building 1. The new process of chemical milling was created at Downey and the research and development of chemical milling was conducted in Building 1. The Navahoe program functioned on the Downey site from 1953 until 1957. The technology developed under the Navahoe program would play a critical role in subsequent space vehicles.

In 1957 the Navahoe program was terminated and the Hound Dog Air-to-Ground Missile program was introduced. This program utilized the site from 1958 until 1963. Also during this period, the Downey plant was contracted to produce the Little Joe Launch Vehicle to test the Mercury space capsules. Large areas of Building 1 were dedicated to the production of the Little Joe Launch Vehicle, while the rest of the building was utilized for the research and development of the Hound Dog program.

In 1960 the Missile Division of the Downey plant was coming to an end and a new interest in space was brought to the site. After the launch of the Russian Sputnik 1 in 1958, Congress passed the National Aeronautics and Space Act that established NASA and the race for space began. In 1961 NASA contracted North American Aviation to work on three programs: NASA S-II (1962-1969), the Project Apollo Spacecraft Development Program (1963-1975), and the Skylab Space Program (1961-1975). With these three programs Downey became the industrial center for America's lunar missions. During this period Building 1 was converted from research and development work areas into factory type hangar for the production of spacecraft. The key areas of Building 1 were utilized as follows: the northeast corner was manufacturing and assemble area, the southwest corner was the location of the space shuttle mock-up area, and the north and southwest corners were office support areas. In 1964 the site was transferred from the Air Force to NASA and renamed the NASA Industrial Plant, Downey.

Building 6

North American Aviation constructed building 6 in 1955. Due to the progress of the Navaho program, which was accelerated to compete with the Soviets, North American Aviation created three new operating divisions in 1955: Autonetics, Propulsion, and Missile. Building 6 was constructed for the Autonetics Division, which was formed to concentrate on missile guidance. Three projects were based here: from 1955 to 1957 the Navaho and from 1958 to 1963, the Hound Dog Air-to-Ground Missile program or GAM program (GAM77), and the Little Joe Launch Vehicle that tested the Mercury capsules.

Building 6 is two-story structure, encompassing 209,216 square feet. It is located on the southwest section of the Downey plant. The structure has a steel frame with sheet metal and 6 inch-tilt-up concrete walls. The steel truss roof spans 40 feet and consists of a metal deck covered with 4 ½ inches of concrete. The roof supports suspended ceilings. 12-foot caisson footings support different sized W-shaped steel columns that support the roof. The boiler room had an additional 3 inches of concrete deck to support the mechanical systems. The floors are mostly concrete with a laminate flooring system. Due to the nature of the research and development done here, the building has no windows. There are four pedestrian entrances and five commercial doors and openings.

Though the functions of the building changed according to the programs that needed space at the time, the floor plan generally remained the same over the years (see Figure 2: Circa 1999 from Figure 1 from HAER No. CA-370-R). The work areas had gypsum plaster walls dividing the spaces. The offices were

built on the borders of the rectangular space. Identical managerial offices were on the north edge. Administrative offices were on the east side of the first and second floors. The west border had classrooms or training rooms. The south border had training rooms on the first floor and utility rooms on the southeast corner. The utility rooms had soundproof walls. The second floor was in the same configuration as the first floor; expect there were also executive offices there. The area in the center of the building was known as the "bullpen" and had steel columns.

From 1955 to 1960, the building housed the Autonetics Division, which filled the bullpen with desks divided by cubicle partitions for the engineers. Historically, the most significant part of the building during this time was the second floor where the test facilities were housed. The southeast part of second floor was used as a laboratory for radar testing. This program was very important to the use of radar in flight and for the missile program. On the south wall of Building 6 were two large garage doors. Autonetics engineers opened up the doors and tested radar outside, aiming at specific signs in the distance.

By 1960, Lee Atwood, then Corporate President of North American Aviation, realized that while the last of the Hound Dogs were being produced, there was no prospective missile work. He began to redirect the company away from missile production and toward space exploration. In 1960, the main division, Missile, was renamed the Space and Information Systems Division (S&ID). North American Aviation still worked on the Hound Dog missile until the program was transferred to Tulsa, Oklahoma on July 24, 1964 and the Little Joe booster wasn't launched with a dummy Apollo spacecraft until August 28, 1963. However, the creation of the S&ID division marked the shifting of work at the Downey plant to the space program. On May 1, 1967, S&ID was renamed the Space division. Atwood assembled a team for the S&ID division. He transferred to Downey the development team of the X-15 rocket plane from the company's Los Angeles division and the advanced programs management personnel from the Columbus, Ohio division. He also recruited launch vehicle experts from Rocketdyne and hired about fifty scientists from various corporate laboratories.

In 1961, President John F. Kennedy made a speech to Congress where he set out the goal of putting a man on the moon before the end of the decade. That same year, NASA put out for bid two space program contracts. The first was for the Saturn S-II, the second stage of a launch vehicle system (the Saturn V Lunar Launch Vehicle) designed to send payloads into space. The second was for the Project Apollo Spacecraft Development Program, including the command module that carried the crew and equipment as well as an attached service module for propulsion, electrical power and storage. The command/service module is significant to the space program, because it was one of the two spacecraft (the other being the lunar module) used to land astronauts on the moon. In an unprecedented award, the S&ID won both contracts: the Saturn S-II one September 11, 1961 and the Apollo one November 28, 1961.

In 1963, the northwest corner of first floor became the site of the Mission Support Area. The Mission Support Area housed telemetry support identical to the ones at Johnson Space Center in Houston, Texas and Kennedy Space Center in Cape Canaveral, Florida. Telemetry involves the readings from the various instruments and sensors on the shuttle transmitted by radio. The 5,600 square feet support area had one main room of approximately 1,625 square feet and eleven smaller rooms. During this time, the bullpen area was open and full of drafting tables for the engineers. The engineers provided real-time support for all Apollo and Space Shuttle launches until the end of the program in 1999.

The main room had television monitors, time zone clocks and telecommunications systems. A conference table allowed the program manager, chief engineer and others to watch the television and computer monitors that directly communicated with the Apollo and Space Shuttle systems. A continuous white board along the entire east wall was used by engineers to track and clock all incidents starting fifteen days prior to launches and extending through the orbit and the landing. Teleconferences with the President of the United States and high-level space officials also were held in this room.

There were smaller rooms along the west side. Engineers used a conference room that had a sightline into the main room and its monitors to work out issues discovered in the main room. A computer support room housed the mainframe computers running the telemetry programs and feeds to the other NASA centers. This room had raised floors to accommodate the electrical and mechanical systems and to cool and ventilate these rooms. A "customer viewing" room gave policymakers and others with clearance to observe the mission support area and to watch the activities through a glass panel and on a large television monitor. Opposite the glass paneled wall was a raised deck with padded chairs for NASA officials, senators and congressmen.

A Department of Defense room or "war room" was used to track top-secret flights and events of the Defense Department and was only occupied only occasionally. Only individuals with the highest level of clearance were allowed in this room. It had thicker walls, encrypted data cabling, and ciphered locks to protect the information. The walls had extra sheathing to prevent radio waves from penetrating the room. It also had its own power system for the security.

Small rooms called support rooms were dedicated to computer tape and disk storage and a Support Panels Room. The Support Panel Room was a switchboard of sorts to connect all communications devices from different parts of the Mission Support Area. It stored racks of communications equipment and headsets used by the engineers on the support teams.

One of the most significant rooms in the Downey plant is the "stand-up" room of the Mission Support Area. It was located adjacent to the "customer viewing" room and had walls covered with magnetic boards and a wall with a timeline. A meeting was held in this room every morning to review the location of vehicles in space and to check project milestones on the timeline.

The northeast corner of the first floor of Building 6 was remodeled in 1965 for the Clean Room Area. A 9,950 square feet area was created from a portion of the bullpen area on the first floor. It was here where the fabrication and assemblage of critical Apollo hardware took place. Then from 1972 to 1999, the Clean Room was used for the design and testing of Space Shuttle Orbiters. The Clean Room Area was a class 100,000 clean room with limited capabilities up to class 10,000. In a class 100,000 room (the lowest class) the air contained no more than 100,000 particles per cubic meter. To maintain this condition, Building 6 had mechanical systems with large-scale HEPA filters. Entering the Clean Room entailed walking through the guarded entry, then a "man cleaner" to blow away dust and debris, three more blowers, and the "air lock" area to pick up sanitized coats and hats. There was a locker room to store clothing and personal items. As a precaution, only a few people could be in the room at one time, so observation glass was used throughout the room to let people observe without being in the room itself.

An assembly, tube facility and support area was part of the Clean Room complex. These rooms were used to build the Apollo Reaction Control System panels. The assembly area had electrical feeds hanging from the ceiling to allow power and coaxial cables to be at the individual workstations where equipment was being tested. The tube facility was a 9,000 square foot area for brazing and welding of the tubing to components and assembly installation to panels. The support area had radiography of spacecraft hardware and components, pressure testing and fluid flush cleaning. Radiography was done in a two-room X-ray facility with lead-lined walls and next door was the X-ray film processing room.

On September 22, 1967 North Amerian Aviation and Rockwell Standard merged into North American Rockwell (NAR). Then on February 15, 1973, NAR merged with Rockwell Manufacturing Company to form Rockwell International. In 1985, a section of the existing Clean Room area and several offices were converted into a computer center called the Rockwell Operational Software Engineering System (ROSES) Software Development Area. It was located along the east wall of the first floor. The approximately 8,500 square foot centers was where engineers created the software, such as flight and ground equipment design

software, and the instrumentation for the Space Shuttle. There were administrative offices and support rooms. The ROSAS area also had vaults, where magnetic computer data tapes were stored on hand-cranked racks. The print station, separated from the ROSES area by glass panels, had printers to print out the data on the tapes.

The ROSES Area had a large simulation conference and training room or "marketing room" with back panel screen and rear projection systems. The engineers met clients in this room to review software programs in progress. Engineers landed software development contracts with the National Transportation Agency to develop AMTRAK, the Interior Department to develop programs for the Forest Department, and the Coast Guard to develop software to enhance the drug interdiction network. Work done in the ROSES Area contributed not only to the aerospace industry, but also to other industries that needed systems integration and information technology. Building 6 was retrofitted in the mid-1990s and work in the ROSES Area continued until 1999. The ground floor of the building was gutted by the current owner.

Building 290

Building 290 was constructed in 1965 by North American Aviation to support the Apollo space program (see Figure 7.) It is on the west side of Building 6 and the proximity of the two buildings allowed coordination between their associated activities (see Figure 2: 1986 from HAER No. CA-370-R). In 1967, Building 290 was attached to Building 6 by the addition of roofing over the alleyway between the buildings. Like Building 6, Building 290 also handled the NASA Saturn S-II Program (1962-1969) and the Project Apollo Spacecraft Development Program (1963-1975). Building 290 also exclusively housed the Skylab Space Program (1961-1975). Skylab was the first space station of the United States and Apollo astronauts visited it three times (May 25-July 4, 1973, July 28-October 5, 1973, and November 16-February 8, 1974). After a few mergers North American Aviation became Rockwell International and the Downey plant became involved with the Space Shuttle orbiters contract awarded to the company while it was still North American Rockwell in July 1972. The Space Shuttle program developed reusable spacecraft. Building 290 was used for Space Shuttle orbiters design and assembly areas until 1999.

The two-story steel-framed building has reinforced concrete, protected metal exterior walls and a flat metal roof. Its 170,000 square feet rectangular plan consists of four main north-south sections. On the east side is the east wing, a two-story, approximately 68,000 square foot area. On the west side is the west wing, a two-story, 60,000 square foot area. In between these two wings are two bays. The taller eastern side (60 feet bay, 63 x 320 feet) was called the Hi-bay and a shorter western side (40 feet bay, 50 by 320 feet) called the Lo-bay. Pedestrian entrances and industrial doors are at ground level on the north, west and east sides. There are industrial doors and loading docks at the upper level and some triple metal windows at the upper level west side.

The entryway starts at the hallway between Building 6 and 290 that leads through double doors into the main hallway. The main hallway had a staff elevator to the second floor. From here there was access to the Clean Room area and the rest of the east wing. A pass-through window in the main hallway connected to the Clean Room of Lo-bay. Documents would be placed in the window and then a person inside the clean room could pick them up easily. The hallway also opened to an underground tunnel that went under the Clean Room and connected the east and west wings. This way people could walk from one side of the building without the having to cross the Clean Room. However, it was considered creepy and eventually converted into a fall-out shelter in case of bomb attacks.

The most important part of Building 290 was the Clean Room on the northeast corner of the first floor of the east wing. It was a certified, class 100,000 capacity clean room 113 x 320 feet large. The area was made of several smaller rooms. Before entering the Clean Room area, workers proceeded into a mini-airlock, through the "man-cleaner" to get debris blown off and then enter a locker room to change into protective clothing before entering the Clean Room area. The Clean Room area was filled with stations

for the Apollo program. They were called receiving areas because they would remove packaging on small parts and test components here before the material was transferred to the assembly area in the Hi- and Lo-bays. In this pre-assembly area was an x-ray area. Many parts were being assembled and sometimes they had to be x-rayed to ensure that they were properly welded together and had no leaks.

In the 1980s, a portion of the Clean Room area was converted into the first virtual dome flight simulator, the Video Simulation laboratory. A rear projection screen showed simulations of the Space Shuttle flights. Computer consoles were along the wall and people sat on a platform structure resembling a theater. Engineers also created, designed and tested virtual prototypes here before actually building them.

Besides the Clean Room area, the east wing consisted of the support area. The support area is on the southeast corner of first floor and contained Apollo subcontractor operations, bench maintenance, system support, ground support equipment and manufacturing ready rooms. The bench maintenance area was a 7,000 square feet area for functional testing, malfunction isolation and minor repairs of Apollo systems and subsystems. The southeast area housed astronauts from the Apollo program when they were at the Downey plant for training and testing before the missions. They also worked with the engineers and technicians on the modules. This southeast space was used similarly for the Space Shuttle program, except that the dormitories moved to the northwest section on the second floor. The Space Shuttle program also used the southeast corner for a chemical laboratory, astronaut ready room, space-suit clean room and building equipment rooms.

The east wing also had a second floor work area located on the east wall of Building 290. The southeast corner had a large utility room with soundproof walls to mute the noise from the mechanical equipment. This area held the equipment needed to filter the air in the clean rooms. It also had boilers and water systems. Adjacent to the utility rooms was the engineering design area, a carpeted open area with soft partitions and portable cubicles for the engineers. In the northeast corner were the quality engineering offices and conference rooms. Quality engineering was the quality control branch of the Downey plant. The conference rooms had viewing windows to allow people to see the work being produced below in the Hi-and Lo-bays.

To the west of the east wing, the Lo-bay was used for fabrication and critical assembly of Apollo and Space Shuttle hardware. It also housed automatic welding equipment for welding operations. Both the Lo- and Hi-bays are clean rooms, which was necessary to assemble a spacecraft without dust. In space, dust floats in the air and can damage equipment. Both are class 100,000 clean rooms. They had high-gloss epoxy paint on the walls and ceilings to prevent cracking that would create contaminants. The Hi-bay also had an easy-to-clean concrete floor.

The north and south airlocks helped maintain the integrity of the Lo-bay clean room. On the north side of the Lo-bay, the north airlock was a room between the outside and the clean room. The interior doors would be closed to separate the outside air from the air in the clean room. The large exterior doors would be opened for the materials and equipment to be delivered. The doors would close on all sides. In the airlock, the materials and equipment would be unpackaged while the air in the airlock was being cleaned and filtered. When the air in the airlock had equalized to match the standards used in the clean room, the interior door of the airlock would open. Then the equipment could be taken to the right place to be assembled and tested. On the southeast side of the Lo-bay, the south airlock was a lot larger than the north airlock to allow large tractor-trailers to load the completed modules. The south airlock worked similarly to that in the north airlock.

To the west of the Lo-bay, the Hi-bay was used for systems Integration and a checkout facility for the Apollo and Space Shuttle programs. Here is where the final assembly for the Apollo service and command modules happened, as well as the Space Shuttle crew modules and aft thrust structures. In 1969, along the west wall of the Hi-bay, blue steel support structures were constructed to extend out from

the wall. They were used for the construction and testing of the modules. The large test stands allowed the modules to be dropped down and worked on from any direction. Being connected to the wall, the stands allowed wires and cable runs from the other side of the wall to directly connect to the equipment.

On the southwest side, a 40-50 feet deep and 70 feet high pit was constructed. During the Apollo program, it was used to test ground support equipment and pressure testing. Working in the pit kept the clean room area of the Hi-bay protected if anything happened to explode and spray debris. During the Space Shuttle program, the pit held a mock-up shuttle built in 1977. It was used to test payload sizes and wiring to see if the payload would fit in the real shuttle. A basement supported the activities in the pit. The basement including the area of the pit was approximately 6,000 square feet.

The west wing is entered through a flat-roof canopied main entrance. The western façade is distinguished by "spider"-like legs that are vertical beams evenly spaced out, but only attached to the wall by rectangular panels at the top and middle. The sides have double beams and the center where the entrance is has single beams. All the beams are a little taller than the building itself. Inside, the building has offices, conference rooms, support areas and the Acceptance Checkout Equipment facilities (ACE) on its first floor. The ACE is in the center of the first floor and has a control and computer room cabled to a common terminal facility room. So from the ACE, any control computer room could be patched to any vehicle checkout stations in the Hi-bay. Adjacent to the ACE are support areas with servicing equipment to support the spacecraft test stations in the Hi-bay. Along the west wall and northwest corner of the first floor are administrative offices and conference rooms. These were used for clients and engineers to discuss the Apollo and Space Shuttle programs.

The west wing second floor had temporary astronaut dormitories, conference rooms, computers rooms and communication rooms. It had suspended ceilings, carpeted floors and gypsum board walls. In the 1980s, the Space Shuttle program housed astronauts here. The quality conference rooms had viewing windows that allowed people in meetings to look down at work being done in the Hi and Lo-bays. In the 1980s, the Department of Defense converted a section into a proposal area for top-secret programs by adding solid wall partitions, sealed areas, and siphoned locks. The communication room controlled communications between people in the clean rooms and people in other areas of the building.

Three other notable historic artifacts are surrounding Building 290. The first one is on top of the northwest wall and original to when the building opened in 1965. It is a lighted sign featuring the emblem of North American Aviation. The other two artifacts are connected to the Space Shuttle program. Memorial plaques on west façade list the names of the astronauts that participated in the Space Shuttle program. On the northeast side, in front of the building are astronaut and crew signatures on a concrete walkway lined with brick. Each mission from 1971 to 1983 is represented by one square.

<u>Building 11</u>

Building 11 is composed of seven buildings that were constructed between 1929 and 1942, and brought together in 1942 to form one large building. It is now 48,000 square feet in size. The oldest two portions of Building 11 are wood-framed structures with a wood truss system supporting gabled roofs. Later portions of Building 11 have steel-framed structures with steel truss systems supporting vaulted roofs. The entire building is sheathed in metal. All of the various buildings making up Building 11 had their own function and use; however, Building 11 has generally been used for heavy manufacturing, prototype development, chemical processing, logistics, office, and data storage.

<u>Building 36</u>

Building 36 was constructed in 1942 when the Downey plant was being expanded to accommodate increased production of military aircraft. It is a concrete brick building approximately 400 square feet in

size. Used as a pump house, the building lies over a subterranean, circular concrete reservoir (holding tank) originally designed as an emergency reservoir for fire fighting. There are ribbon windows on each façade that have nine sashes centered at the upper third of each of façade. The only entrance to the building is through the metal door centered on the east façade. Built to fight fires, Building 36 was designed to collect water from the site and bring it back to the reservoir. This was a very efficient form of recycling water.

Building 39

From the time it was constructed in 1940 through 1955, Building 39 was used as a recycling facility and storage area. It was originally a rectangular pavilion with wide overhanging eaves and few walls. When a new building was needed to support missile research and development, Building 39 was moved to its current location just southeast of Building 1. After the move in approximately 1955, the sides were enclosed and the interior space was utilized as offices and storage. Also at this time, a second floor was created. Later, the first floor was converted into test equipment areas. Engineers occupied the second floor offices to support ongoing programs.

Building 108

Building 108 is a shed attached to Building 1.

Building 123

Building 123 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. Building 123 was used as a pyrotechnic test laboratory. It is an irregular shaped concrete block and steel structure. It has a low-pitched shed steel roof and incorporates 4,000 square feet.

Building 125

Building 125 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. Building 125 is used as a cryogenic test laboratory and hazardous materials storage unit. It is rectangular in shape with a flat roof and incorporates an area of 1,125 square feet.

Building 126

Building 126 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. Building 126 is used a hazardous materials storage unit. It is a single story concrete structure with a flat roof and incorporates 1,060 square feet. Small ventilation openings line the south façade, near the roofline. A pedestrian entrance on the north façade provides access to the building.

Building 127

Building 127 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. Building 127 is used as a mechanical testing laboratory. It is a rectangular concrete structure with a flat roof. It incorporates 1,060 square feet. Fenestration includes a series of glazed pedestrian doors as well as small ventilation holes along the roofline.

Building 128

Building 128 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. It is used as a propellant test laboratory. Building 128 is a steel-framed concrete block structure that is L-shaped in plan and incorporates 1,515 square feet.

Building 130

Building 130 was constructed in 1941 when the Downey plant was constructing bomb shelters and other buildings for explosives testing and storage. It is used as an ultra-high temperature facility. Building 130 is a single-story concrete structure with a flat roof. It is roughly L-shaped in plan and incorporates 1,005 square feet. At the north corner of the west façade is a small metal awning covered stoop.

Conclusion

The aforementioned buildings are historic resources subject to CEQA as they have been determined by consensus to be eligible for listing in the National Register.

3. PROJECT IMPACTS

3.1 Determining the Significance of Impacts on Historical Resources

In enacting the California Register, the Legislature amended CEQA to clarify which properties are significant, as well as which project impacts are considered to be significantly adverse.

> A project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment.[17]
>
> A substantial adverse change means demolition, destruction, relocation, or alteration of the resource such that the significance of a historical resource is materially impaired.[18]

The State CEQA Guidelines include a slightly different definition of "substantial adverse change:"

> Substantial adverse change in the significance of a historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource is materially impaired.[19]

The Guidelines go on to state that "the significance of a historic resource is materially impaired when a project demolishes or materially alters in an adverse manner those physical characteristics that convey its significance and that justify its inclusion in or eligibility for inclusion in the California Register, local register, or its identification in a historic resources survey."[20]

3.2 Secretary of the Interior's Standards

Projects, which may affect historic resources, are considered to be mitigated to a level of less than significant, if they conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.[21] Projects with no other potential impacts qualify for a Class 31 exemption under CEQA if

[17] Public Resource Code Section 21084.1.
[18] Public Resource Code Section 5020.1(q).
[19] 14 CCR Section 15064.5(b)(2)(A).
[20] 14 CCR Section 15064.5(b)(2).
[21] 14 CCR Section 15126.4(b).

they meet the Standards.[22] The Standards were issued by the National Park Service. They were not intended to be prescriptive, but to "…promote responsible preservation practices that help protect our Nation's irreplaceable cultural resources."[23] The Standards are accompanied by Guidelines for four types of treatments for historic buildings: preservation, rehabilitation, restoration, and reconstruction.

The definition of rehabilitation assumes that at least some repair or alteration of the historic building will be needed in order to provide for an efficient contemporary use; however these repairs and alterations must not damage or destroy materials, features, or finishes that are important in defining the building's historic character.

The Standards are as follows:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

4. Changes to a property that have acquired significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

10. New additions and adjacent or related new construction will be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

[22] 14 CCR Section 155331.

[23] U.S. Department of the Interior, Factors to Consider When Selecting An Appropriate Treatment, website: http://www.nps.gov/history/HPS/hli/landscape_guidelines/factors.htm, January 28, 2008.

The primary application of the Standards is in connection with approval of rehabilitation work for the 20% federal rehabilitation tax credit. Projects only receive the 20% credit if they meet the Standards. The State Office of Historic Preservation reviews tax credit projects and the National Park Service makes final certification.

3.3 Project Description

The proposed Project involves amending of the existing Downey Landing Specific Plan to remove the 78-acre project site from the plan area and the development of a new specific plan, the Tierra Luna Specific Plan (the Plan), intended to promote the development of a mixed-use and coordinated development. Development of the Project would involve the demolition of most of the on-site structures and the construction of up to 3,950,000 square feet of residential, commercial, office, and public open space uses, including up to 675,000 square feet of commercial/office uses, 1,200.000 square feet of commercial/retail uses, 375,000 of hotel use, and 1,700,000 square feet (approximately 1,500 units) of residential use to include live/work units, for-sale units, and for-rent units. The Project would also develop up to 125,000 square feet of open space, feature 850,000 square feet of parking facilities between several multi-level parking structures, on-street parking, and surface parking lots throughout the project site. The Project would include improvements to the streetscape as well as environmental management standards and amenities related to storm water management, energy consumption, and water conservation. The Project would develop its own internal street network, connected to surrounding arterials, with all necessary infrastructure and utilities systems required to support development of the entire community.

The Project would include six areas of concentration in the final design to include: the Central Plaza, Hotels/Lodging, the Lakewood Boulevard Corridor, the East Neighborhood, the Stephen Horn Way Edge, and the Downey Landing Edge. The Project would also include mechanisms to allow for the interchange of type, location, and character of the uses and facilities given that total on-site development does not exceed the caps for each type of use detailed above.

The illustrative version of the specific plan represents one possible scenario for future development of the project site. Though carrying out the development of each of the elements of this plan incrementally over a period of time may change many of the specific details of the illustrative plan, the fundamental character, qualities, and intentions would remain intact. The illustrative vision of the plan is detailed below.

<u>Central Plaza</u>

The Central Plaza is a 2.4 acre public space that would act as an anchor to the surrounding buildings, up to 9.5-stories in height. It is envisioned that the Central Plaza would include a hardscaped square with the surrounding roadway paved similarly to remind drivers of the pedestrian oriented nature of the Central Plaza. The perimeter of the Plaza would be shaped by the most active uses such as major restaurant tenants, movie theaters, national retail anchors, and hotels. A large fountain is envisioned to be located at the center of the plaza to add ambiance by lessening noise of nearby traffic and other urban noises. It is ultimately envisioned to include restaurants flanking the edges of the Central Plaza with opportunities for outdoor overflow dining areas.

Fronting the west end of the Central Plaza is envisioned to be a Main Street retail corridor. It would be located at street level and provide approximately 600,000 square feet of mixed-use space for both smaller local and regional retailers, as well as restaurants, offices, and hotels. The streetscape would include wide sidewalks and landscaping.

Fronting the southeast corner of the Central Plaza is envisioned to be an additional Main Street retail corridor. It would also be would be located at street level could include a theater and retail that would be open at all hours of the day to maintain constant activity in and around the central plaza. The theater would also be mixed-use and would be lined on all sides that provide street frontage with housing or office over ground level retail. Adjacent to the theater's southern front would be a parking structure lined with retail and residential uses. East Main Street would define the eastern edge of the commercial core of the Project.

Hotels/Lodging

Two hotels for a total of 200 hotel rooms are envisioned to be included along the southern end of West Main Street. The hotels would be included to contribute to pedestrian nightlife. They are envisioned to be developed near the Central Plaza and the West Main Street retail shops to locate tourist residences near the commercial core.

East Neighborhood

It is envisioned that this piece would be located on the eastern-most portion of the project site, on approximately 20 acres of land fronting Bellflower Boulevard. The East Neighborhood would be developed with up to 500 residential units of varying types and densities including live/work units, courtyard housing, and row houses. The East neighborhood would be served by the retail, office, entertainment, and grocery store uses found in the other pieces of the Project while maintain the feel and character of a more traditional quiet neighborhood. Because the East Neighborhood would be adjacent to the nearby Kaiser Permanente facility, the structures nearest this hospital could also be developed as completely or partially residential or entirely office to provide a transition between nearby uses. Providing a buffer between the dense and active Central Plaza area and the East Neighborhood, an approximately one-acre park or greenspace is also envisioned and would be located between the East Neighborhood and East Main Street.

Lakewood Boulevard Corridor

The western edge of the Project is envisioned to serve as a transition between the residential neighborhood to the west across Lakewood Boulevard and the more intensive commercial core in and around the Central Plaza. A range of development possibilities are envisioned for this corridor, all of which would incorporate the front portion of Building 1 as specified in the Memorandum of Agreement. On one end of the spectrum, smaller buildings with on-street parking could frame the Project's internal roadways while surface parking would be provided off of the rear entrances. A 40,000 to 60,000 square foot grocery store could be included on the southern end of the Lakewood corridor. At the other end of the spectrum, two- and three-story mixed-use buildings with subterranean or podium parking and ground level commercial with housing or office above could be developed.

Stephen Horn Way Edge

The southern edge of the Project would provide a major thoroughfare through the project site between Lakewood and Bellflower Boulevards. Because this end of the project site is adjacent to a Kaiser Permanente facility and a future park, it would be necessary to develop Stephen Horn Way such that it is appropriately interactive with the park and hospital uses while be intensive enough such that it is not treated as an edge or rear of the project site. The grocery store envisioned as part of the Lakewood Corridor would front Stephen Horn Way and would be located across Stephen Horn Way to the north of the future park. Also envisioned are a retail lined parking structure to provide parking for all nearby uses and several mixed-use office buildings that could provide ancillary office and retail uses for hospital needs.

Downey Landing Edge

The northern edge of the project site fronts the backside of the adjacent Downey Landing Retail Center. Because this limits the types of uses available to be included in this area, it is envisioned that the Project could develop a service alley along the northern edge of the project site with a buffer of trees to create a boundary for the Project and distract from the aesthetically displeasing view of the back side of the Downey Landing retail structures. The Downey Landing Edge could also include retail-lined multi-level parking structures. The mixed-use nature of these parking facilities would serve to extend pedestrian activity up to this boundary piece of the project site.

Landscaping and Open Space

One goal of the realization of the Plan is the creation of a landscaping and open space network. Each of the Plan elements discussed above would incorporate its own landscaping vision including specific species of trees and shrubs chosen to create a particular feeling associated with each element and based upon each species' formal qualities. Such species of tree include: the Medjool Date Palm, the California Fan Palm, the Chinese Flame Tree, the London Plane Tree, the Sunburst Honey Locust, the Deodar Cedar, and the Cape Chestnut. The internal roadway network would include a street tree program designed to tie different locations within the Plan together and encourage pedestrian activity. These roadways would be landscaped according to their hierarchy ranging between regional boulevards and local-serving streets.

Parking

The Project would provide 5,608 parking spaces in several parking structures and surface parking lots dispersed throughout the entire project site. An additional four parking spaces would be designed into the Project during the entitlement process. The total amount of parking provided is based on the opportunity for shared parking spaces determined by periods of highest and lowest use throughout the day and week.

3.4 Project Impacts

All of the historic resources on the site would be demolished, with the exception of the front portion of Building 1. The historic resources to be demolished include Buildings 6, 11, 36, 39, 108, 123, 125, 126, 127, 128, 130, and 290. The demolition of historic resources cannot be mitigated to a less than significant level. Therefore, the Project will have a significant impact on historic resource. The portion of Building 1 that will be preserved includes the front section of the original EMCO building (1929), the Kauffman wing (1939-41), and another wing attributed to Kauffman (1941). The use and treatment of this portion of Building 1 is unknown. However, the impact any alterations would have on this portion of Building 1 would be mitigated by compliance with the Secretary of the Interior's Standards.

3.5 Mitigation Measures

CEQA requires the Lead Agency to examine and impose mitigation measures that would avoid or minimize any impacts or potential impacts to historic resources. The following mitigation measures are recommended:

Documentation

Historic American Engineering Record (HAER) reports were prepared for all of the historic resources on the project site in 2006. These reports were prepared as mitigation pursuant to the Memorandum of Agreement (MOA). However, the HAER report for Building 1 did not document that portion planned for

preservation. Although the Project will preserve that same portion of Building 1, the report should be completed so that the entirety of Building 1 is documented.

Prior to the commencement of the Project, Level II Historic American Buildings Survey (HABS) documentation shall be prepared for that portion of Building 1 planned for preservation. One original copy of the report as specified above shall be assembled and offered to the National Park Service, State Office of Historic Preservation, and the City of Downey.

Compliance with the Secretary of the Interior's Standards

The rehabilitation of the remaining historic resources on the project site shall comply with the Secretary of the Interior's Standards. According to the schematic plans, the Project appears to comply with the Standards. However, the plans are expected to evolve to a greater level of detail, including construction materials and treatment of features. As such, a qualified historic architect shall monitor the design and the construction of the Project to ensure that it continues to comply with the Standards. The historic architect shall prepare a report at the conclusion of the design and development phase of the Project analyzing compliance with the Standards. That report shall be submitted to the City of Downey for their review and approval.

Interpretive Program

Create interpretive exhibits dealing with the history of the site to enhance the visitor experience. The exhibits may be rotating temporary displays on various aspects of the site's history or permanent displays that comprehensively illustrate the history of the site. The exhibits may incorporate moving and still images, sounds, text, and graphics to provide information. The interpretive exhibits shall be created and installed prior to the issuance of the Certificate of Occupancy.

Educational Program

Develop an educational program to foster awareness of the site and its impact on the development of the City of Downey and its role in American aeronautics and aerospace industries. The program shall be consistent with the History-Social Studies Content Standards for California Public Schools. The City of Downey may chose to hire a qualified educational consultant and/or to work through the local school district. The educational program shall be developed and ready for implementation within one year from the issuance of the Certificate of Occupancy.

3.6 Impacts on Historic Resources after Mitigation

The mitigation measures listed above would reduce the impacts to historic resources and are consistent with the Memorandum of Agreement. However, the mitigation measures would not eliminate the significant impacts from the demolition of historic resources on the project site. Therefore, the Project would have a significant adverse impact on historic resources located within the project site after mitigation.

3.7 Cumulative Impacts

Cumulative impacts on historic resources evaluate whether impacts of the Project and related projects, when taken as a whole, substantially diminish the number of historic resources within the same or similar context or property type. Impacts to historic resources, if any, tend to be site-specific. No historic

resources were identified in the immediate vicinity of the project site. There are no other historic resources in the City of Downey significant for their association with the American aeronautical or aerospace industries. Therefore, the impacts to historic resources on the project site would not affect the historic resources in the immediate vicinity within the same or similar context or property type. Moreover, it is anticipated that historic resources that are potentially affected by related projects would also be subject to the same requirements of CEQA. These determinations would be made on a case-by-case basis and the effects of cumulative development on historic resources would be mitigated to the extent feasible in accordance with CEQA and other applicable legal requirements.

4. SOURCES

Memorandum of Agreement, 2001.

Final Historic Buildings and Structures Inventory and Evaluation, National Aeronautics and Space Administration Industrial Plant, Parcel I and II, Downey California, Earth Tech Inc., November 1999.

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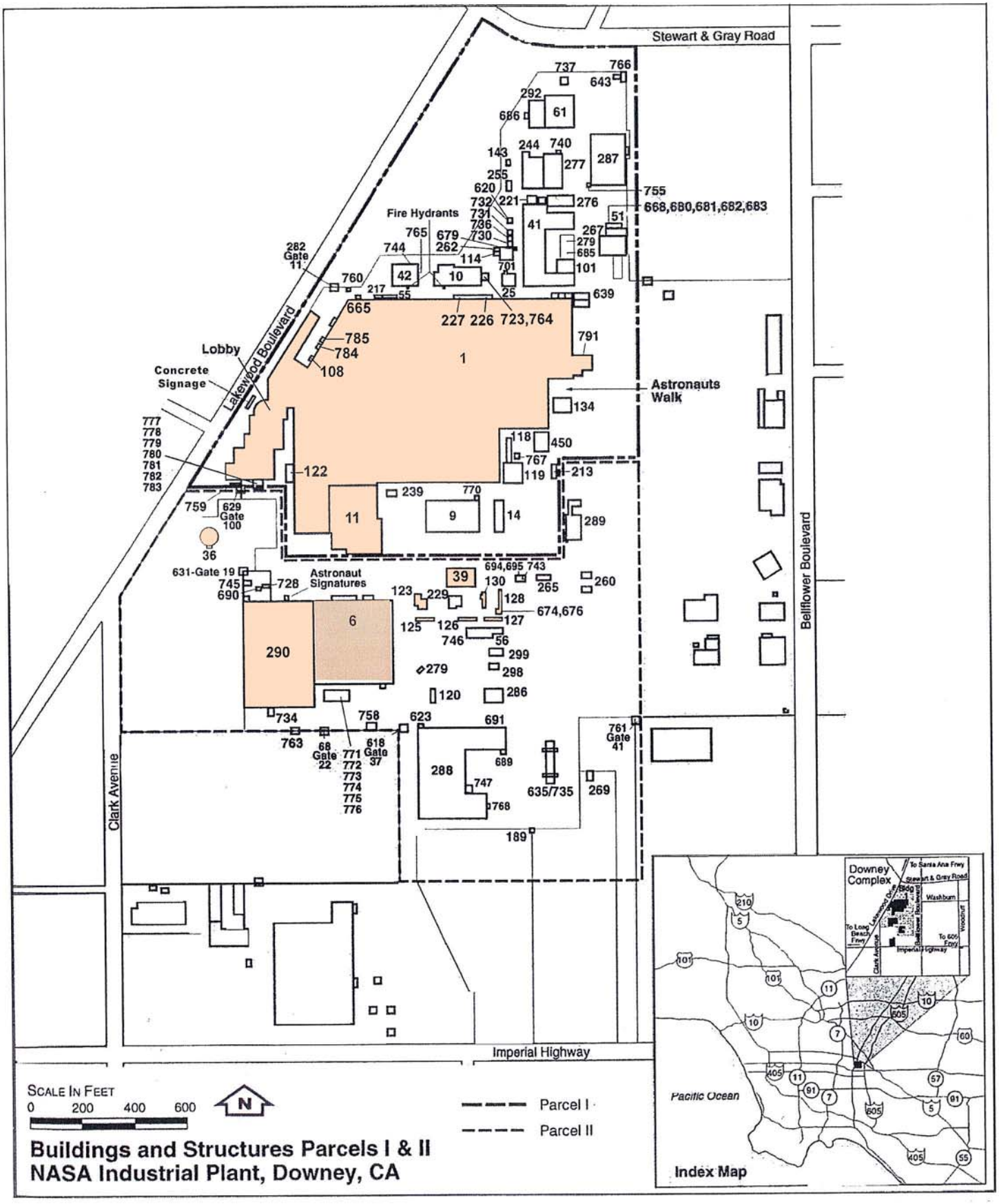
Stewart & Gray Road
Lakewood Boulevard
Bellflower Boulevard
Clark Avenue
Imperial Highway
Lobby
Concrete Signage
Fire Hydrants
Astronauts Walk
Astronaut Signatures
282 Gate 11
629 Gate 100
631-Gate 19
68 Gate 22
618 Gate 37
761 Gate 41
1
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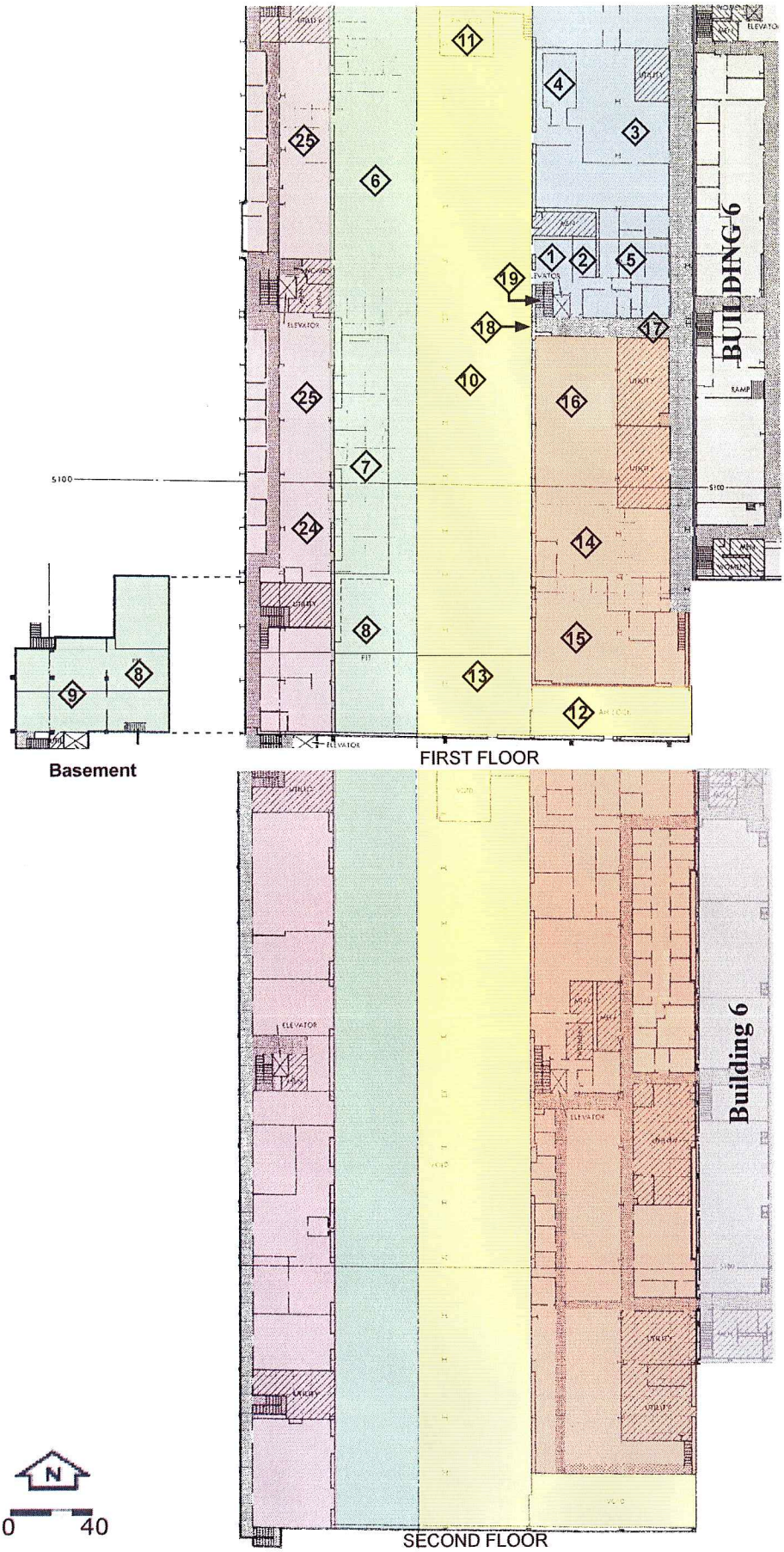
9
10
11
14
39
41
42
51
61
287
288
290
Scale In Feet
0 200 400 600
N
Parcel I
Parcel II
Buildings and Structures Parcels I & II
NASA Industrial Plant, Downey, CA
Downey Complex
Pacific Ocean
Index Map

Figure 2 : Circa 1986



Clean Room

1. Man-Cleaner
2. Locker Rooms
3. Receiving Area
4. X-Ray Area
5. Video Simulation Laboratory

Hi-Bay

6. High Bay
7. Ground Support Stands
8. Pit with Shuttle Mock-Up
9. Pit Support Area

Low-Bay

10. Low Bay
11. North Airlock
12. South Airlock
13. Tumbler Locations

East Wing (1st & 2nd Floor)

14. Support Maintenance
15. Bench Maintenance
16. Temporary Astronaut Dormitory
17. Entryway
18. Pass-Thru Window
19. Underground Tunnel (31)
20. Utility Room
21. Engineering Design Area
22. Quality Engineering Offices
23. Quality Conference Rooms

West Wing (1st & 2nd Floor)

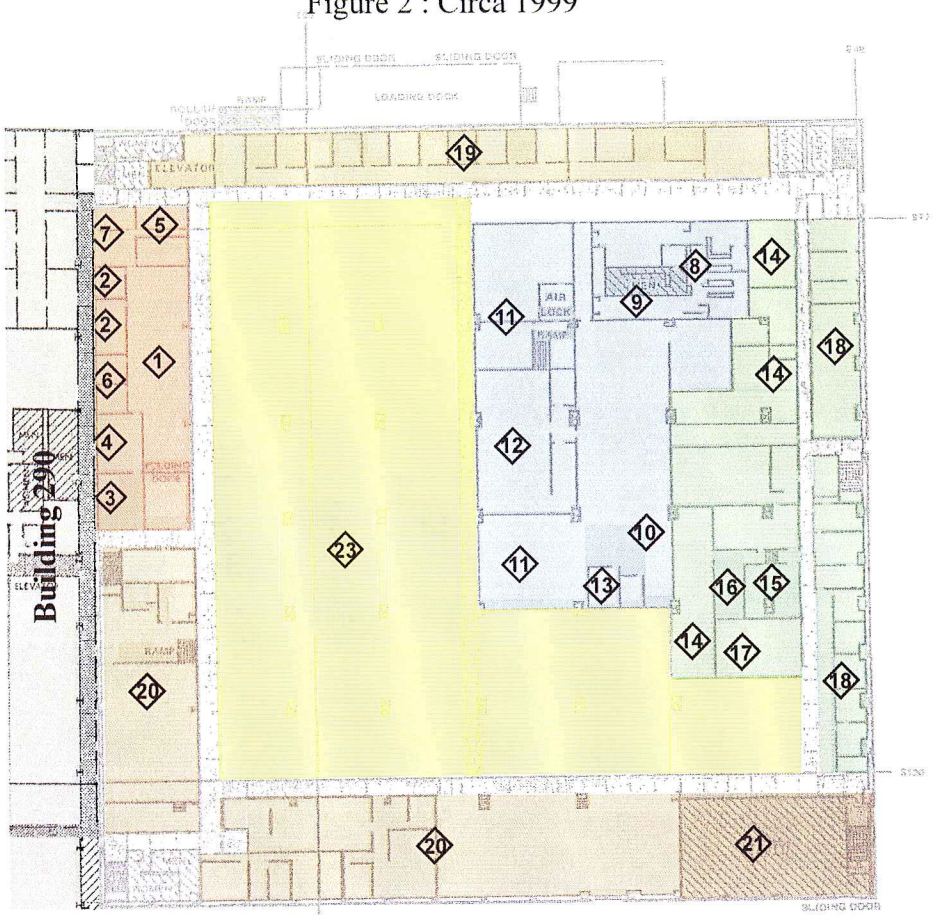
24. ACEArea
25. Support Areas
26. Temporary Astronaut Dormitory
27. Quality Conference Room
28. Communication Rooms
29. Computer Rooms

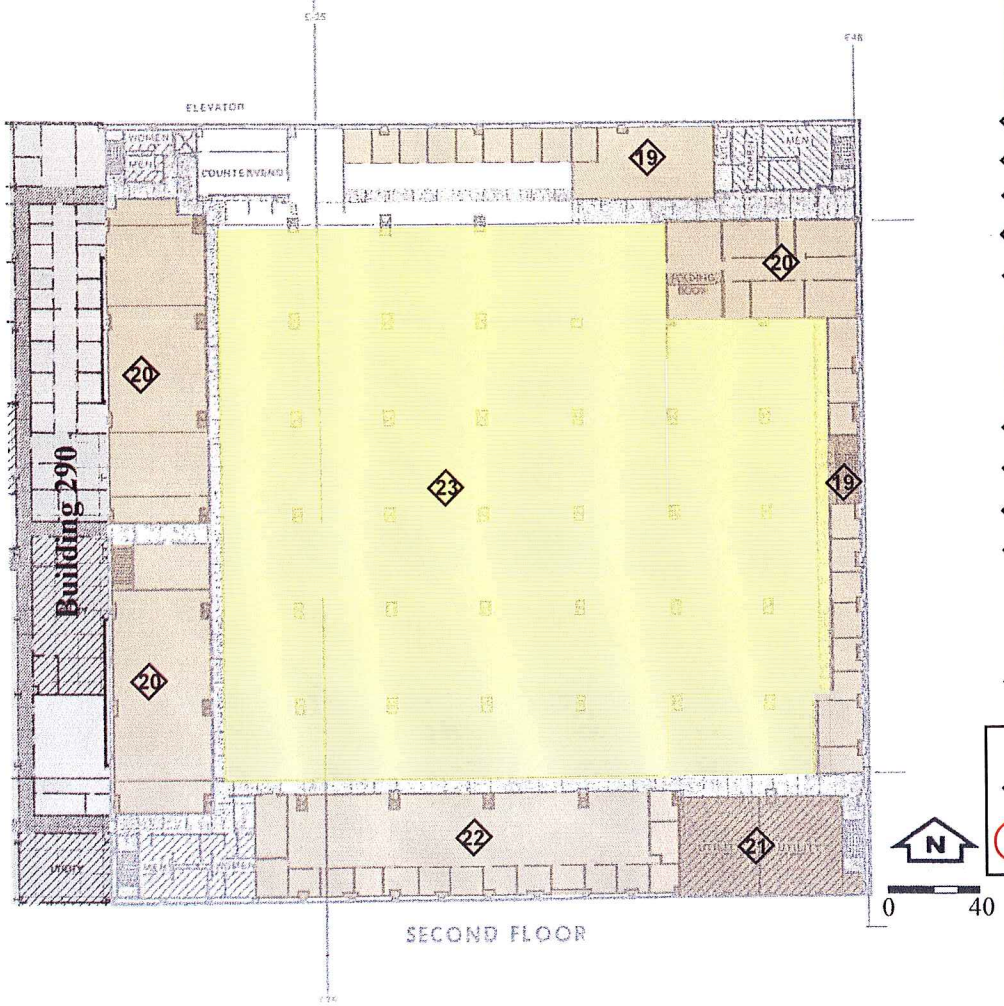
Legend

Key Areas of Building 6

Location of Photograph See Coinciding Image

Figure 2 : Circa 1999





Mission Support

1. Main Room
2. Working Conference Room & Temp. Dormitory for Astronauts
3. DOD Computer Room
4. DOD Secuirity Room
5. Customer Viewing Room
6. Support Rooms
7. Stand-Up Room

Clean Room Complex

8. Man Cleaner Blowers
9. Locker Room
10. Air Bearing Table
11. Assembly and Support Area
12. Tubing Facility
13. X-Ray Room

ROSES Computer Center

14. Support Rooms
15. Vaults
16. Print Room
17. Simulation Conference Room
18. Administrative Offices

Offices/Other

19. Manager Offices
20. Training Rooms/Offices
21. Utility Rooms
22. Original Autonetics Area

Bullpen

23. Open Work Area/Bullpen

Legend

Key Areas of Building 6

Location of Photograph See Coinciding Image

N

0 40

Figure 1: The original EMSCO building was constructed in 1929.

Figure 2: The EMSCO plant circa 1939.

Figure 3: The Vultee Aircraft plant circa 1941.

Figure 4: The North American Aviation plan circa 1965.

Figure 5: The Kauffman wing was constructed in 1939.

Figure 6: This wing was added along Lakewood Boulevard around 1942.

Figure 7: Building 290 was constructed in 1965.

APPENDIX IV.E

Geotechnical Evaluation for EIR Proposed Downey Studios Specific Plan

GEOTECHNICAL EVALUATION FOR EIR
PROPOSED DOWNEY STUDIOS SPECIFIC PLAN

DOWNEY STUDIOS
12214 LAKEWOOD BOULEVARD
DOWNEY, CALIFORNIA

Prepared for:

CHRISTOPHER A. JOSEPH AND ASSOCIATES

Los Angeles, California

August 22, 2008

MACTEC Project 4953-08-1351

MACTEC

MACTEC

engineering and constructing a better tomorrow

August 22, 2008

Ms. Jenny Mailhot
Christopher A. Joseph and Associates
11849 West Olympic Boulevard, Suite 101
Los Angeles, California 90064

Subject: **Report of Geotechnical Evaluation for EIR**
Proposed Downey Studios Specific Plan
12214 Lakewood Boulevard
Downey, California
MACTEC Project 4953-08-1351

Dear Ms. Mailhot:

We are pleased to submit this report presenting the results of our geotechnical evaluation for preparation of the EIR for the proposed Downey Studios Specific Plan in Downey, California. Our evaluation has been prepared in accordance with the scope of our contract with Christopher A. Joseph and Associates dated June 11, 2008.

Our report is based on a review of our geotechnical reports for projects in the immediate area and based on a review of available published and unpublished geologic and seismic literature pertinent to the study area. The City of Downey Seismic Safety Element of the Comprehensive General Plan (1975) and the Vision 2025, General Plan, Downey, California (2005) were reviewed as part of our scope. We previously performed numerous geotechnical investigations for the nearby Downey Regional Medical Center. We have used the data from those subsurface investigations in our evaluation. Some of the prior explorations at the subject site were performed by MACTEC's legacy firms LeRoy Crandall and Associates and Law/Crandall.

The location of the proposed development is shown in Figure 1, Regional and Project Vicinity Map.

The assessment of general site environmental conditions for the presence of pollutants in the soils and ground water of the site was beyond the scope of this investigation.

MACTEC Engineering and Consulting, Inc.
5628 East Slauson • Los Angeles, CA 90040-1554 • Phone: 323.889.5300 • 323.889-5398

It has been a pleasure to be of professional service to you. Please call if you have any questions or if we can be of further assistance.

Sincerely,

MACTEC Engineering and Consulting, Inc.

Rosalind Munro
Senior Engineering Geologist

Martin B. Hudson, Ph.D.
Senior Principal
Chief Engineer

p:\4953 geotech\2008-proj\81351 caja downey studios\4.1 reports\4953-08-1351r01 08-22-08.doc/RM:ps
(2 copies submitted)

REPORT OF GEOTECHNICAL EVALUATION FOR EIR
PROPOSED DOWNEY STUDIOS SPECIFIC PLAN

DOWNEY STUDIOS
12214 LAKEWOOD BOULEVARD
DOWNEY, CALIFORNIA

Prepared for:

CHRISTOPHER A. JOSEPH AND ASSOCIATES
Los Angeles, California

MACTEC Engineering and Consulting, Inc.

Los Angeles, California

August 22, 2008

MACTEC Project 4953-08-1351

TABLE OF CONTENTS

Page

LIST OF TABLES AND FIGURES ii

1.0 SCOPE 1

2.0 PROJECT location 2

3.0 project description 3

4.0 GEOLOGY 4
- 4.1 GEOLOGIC SETTING 4
- 4.2 GEOLOGIC MATERIALS 5
- 4.3 GROUND WATER 5
- 4.4 FAULTS 6
- 4.5 GEOLOGIC-SEISMIC HAZARDS 11
- 4.6 CONCLUSIONS 14

5.0 MITIGATION MEASURES 16
- 5.1 GENERAL 16
- 5.2 GROUND SHAKING 16
- 5.3 LIQUEFACTION 17
- 5.4 EXPANSIVE AND CORROSIVE SOILS 17
- 5.5 GRADING 18
- 5.6 STABILITY OF TEMPORARY EXCAVATIONS 18

6.0 BIBLIOGRAPHY 19

TABLES

FIGURES

LIST OF TABLES AND FIGURES

Tables

1 Major Named Faults Considered to be Active in Southern California
2 Major Named Faults Considered to be Potentially Active in Southern California
3 List of Historic Earthquake of Magnitude 4.0 or Greater

Figures

1 Regional and Project Vicinity Map
2 Geologic Map
3 Regional Faults and Seismicity
4 Seismic Hazards Zone Map

1.0 SCOPE

This report presents the results of our geotechnical evaluation for preparation of the EIR for the proposed Downey Studios Specific Plan in Downey, California. Our evaluation has been prepared in accordance with the scope of our contract with Christopher A. Joseph and Associates dated June 11, 2008.

Our report is based on a review of our geotechnical reports for projects in the immediate area and based on a review of available published and unpublished geologic and seismic literature pertinent to the study area. The City of Downey Seismic Safety Element of the Comprehensive General Plan (1975) and the Vision 2025, General Plan, Downey, California (2005) were reviewed as part of our scope. We previously performed numerous geotechnical investigations for the nearby Downey Regional Medical Center. We have used the data from those subsurface investigations in our evaluation. Some of the prior explorations at the subject site were performed by MACTEC's legacy firms LeRoy Crandall and Associates and Law/Crandall.

The location of the proposed development is shown in Figure 1, Regional and Project Vicinity Map.

The assessment of general site environmental conditions for the presence of pollutants in the soils and ground water of the site was beyond the scope of this investigation.

The information in this report represents professional opinions that have been developed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for the Christopher Joseph and Associates and their consultants to be used solely in the preparation of the EIR for the proposed Downey Studios Specific Plan. The report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties or other uses.

2.0 PROJECT LOCATION

The proposed project is located at 12241 Lakewood Boulevard in the City of Downey, California (see Figure 1). The project site is approximately 79 acres generally bounded to the north by the Downey Landing Retail Center, to the east by Bellflower Boulevard, to the south by the City Park Learning Center and the Kaiser Permanente Hospital and Medical Center and to the west by Lakewood Boulevard. The project site is located within the 168-acre Downey Landing Specific Plan area.

The project site was an aircraft manufacturing and National Aeronautics and Space Administration (NASA) industrial facility dating to the 1960's. A total of 25 buildings related to this industry exist on the project site along with current improvements related to movie set usage. At present, the project site is occupied by a television and movie studio production facility called Downey Studios, and includes studio, production and office uses, an outdoor suburban street movie set, 20 acres of back lot space, and parking lots.

The proposed project site is listed on the Hazardous Waste and Substances Sites List, commonly known as the "Cortese List." It is our understanding that an environmental remediation program associated with these previous industrial uses on the site is underway.

3.0 PROJECT DESCRIPTION

The proposed project is intended to promote development of a mixed-use, urban infill, comprehensively-designed and coordinated development. The project will contain housing, work places, shops, entertainment, parks and civic facilities. Development of the project would involve demolition of on-site structures and the construction of up to 3,950,000 square feet of residential, commercial, and office uses. The project includes approximately 125,000 square feet of open space and 850,000 square feet of parking. The proposed project would include construction of an internal street network and all infrastructure required to support development within the new community.

4.0 GEOLOGY

4.1 GEOLOGIC SETTING

The site is located in the Los Angeles Basin approximately 11 miles from the Pacific Ocean. The ground surface elevation at the site is approximately 100 feet above mean sea level. The Los Angeles Basin is a coastal plain between the Santa Monica Mountains to the north, the Puente Hills and Whittier fault to the east, the Palos Verdes Peninsula and Pacific Ocean on the west, and the Santa Ana Mountains and San Joaquin Hills on the south. The Los Angeles Basin is located in the northern portion of the Peninsular Ranges geomorphic province and is a northwest-trending alluviated lowland plain, sometimes called the Coastal Plain of Los Angeles. The basin is underlain by a deep structural depression which has been filled by both marine and continental sedimentary deposits, which rest on a basement complex of presumably igneous and metamorphic composition (Yerkes, et al, 1965). The basement surface within the central portion of the basin extends to a maximum depth of 32,000 feet below sea level. The prominent structural features within the Los Angeles Basin include the central lowland plain, the uplifted Palos Verdes Hills, and the northwest trending line of low hills and mesas (underlain by the Newport-Inglewood fault zone).

On a regional scale, the site lies within the Peninsular Ranges geomorphic province, which extends northwesterly from Baja California into the Los Angeles Basin and westerly into the offshore area, including Santa Catalina, Santa Barbara, San Clemente and San Nicolas islands. The northern boundary of the province is the Transverse Ranges along the Malibu, Santa Monica, Hollywood, Raymond, Sierra Madre, and Cucamonga faults. The province is characterized by elongate, northwest-trending mountain ranges separated by sediment-filled valleys and basins that are oriented roughly parallel to the mountain ranges. The northwest trend is reflected in the direction of the dominant geologic structural features of the province, including northwest to west-northwest trending folds and faults.

The relationship of the site to local geologic features is depicted in Figure 2, Geologic Map. The locations of major faults and earthquake epicenters in Southern California are shown on Figure 3.

4.2 GEOLOGIC MATERIALS

Based on our prior borings drilled at a nearby site, the site is underlain by Holocene age alluvial deposits. The alluvium extends to an approximate depth of 130 feet. As encountered in those explorations, the alluvium generally consists of interlayered silty sand, sandy silt, and clay of varying consistency.

The Holocene age alluvium is underlain by sediments of the late Pleistocene age Lakewood Formation. The Lakewood Formation materials consist of marine and continental gravel, sand sandy silt, silt, and clay that extend to a depth of approximately 350 feet beneath the site. Beneath the Lakewood Formation materials are gravel, sand, silt and clay deposits of the early Pleistocene age San Pedro Formation. The early Pleistocene age materials are approximately 600 feet thick and are underlain by Tertiary age sedimentary rocks (California Department of Water Resources, 1961).

4.3 GROUND WATER

The site is located within the Central Hydrologic Subarea in the Los Angeles-San Gabriel River Hydrologic Unit. Water level measurements in October, 2007 in wells around the site had depth to ground water from the ground surface ranging from 53 to 88 feet. Ground water levels were shallower to the north of the site than east or west.

The site is located along the northern edge of the original artesian area of the late 1800's, delineated by Mendenhall. However, the site is not within the artesian area later identified by Mendenhall in 1905. Since the early 1900's, the artesian area became much smaller, due to increased pumping of ground water and a decrease in irrigation from farming in the area. Based on a ground water contour map published by the California Division of Mines and Geology (1998), the historic high ground water level beneath the site is about 8 feet below the ground surface. For the purpose of evaluating liquefaction and other future ground-water related phenomena, the highest future ground-water level may be taken as 40 feet below the ground surface because the ground-water level is not expected to return to the historic high level.

4.4 FAULTS

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (previously the California Division of Mines and Geology) for the Alquist-Priolo Earthquake Fault Zoning Program (Hart, 1999). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (last 1.6 million years). Inactive faults have not moved in the last 1.6 million years. A list of nearby active faults (those included in CGS, 2003) and the distance in kilometers between the site and the nearest point on the fault, the maximum magnitude, and the slip rate for the fault is given in Table 1. A similar list for potentially active faults is presented in Table 2. The faults in the vicinity of the site are shown in Figure 3.

Active Faults

Whittier Fault

The closest active fault to the site is the Whittier fault is located approximately 7 miles to the northeast. The northwest-trending Whittier fault extends along the south flank of the Puente Hills from the Santa Ana River on the southeast to Whittier Narrows on the northwest. According to Yeats, at Whittier Narrows the Whittier fault turns more northwesterly becoming the East Montebello fault. The main Whittier fault trace is a high-angle reverse fault, with the north side uplifted over the south side at an angle of approximately 70 degrees, although late Quaternary movement has been nearly pure strike slip and total right displacement may be around 8 to 9 kilometers (Yeats, 2004). In the Brea-Olinda Oil Field, the Whittier fault displaces Pleistocene age alluvium, and Carbon Canyon Creek is offset in a right lateral sense by the Whittier fault.

Newport-Inglewood Fault

The active Cherry Hill fault of the Newport-Inglewood fault zone is about 7 miles southwest of the site. This fault zone is composed of a series of discontinuous northwest-trending en echelon faults extending from Ballona Gap southeastward to the area offshore of Newport Beach. This zone is reflected at the surface by a line of geomorphically young anticlinal hills and mesas formed by the

folding and faulting of a thick sequence of Pleistocene age sediments and Tertiary age sedimentary rocks (Barrows, 1974). Fault-plane solutions for 39 small earthquakes (between 1977 and 1985) show mostly strike-slip faulting with some reverse faulting along the north segment (north of Dominguez Hills) and some normal faulting along the south segment (south of Dominguez Hills to Newport Beach) (Hauksson, 1987). Investigations by Law/Crandall (1993) in the Huntington Beach area indicate that the North Branch segment of the Newport-Inglewood fault zone offsets Holocene age alluvial deposits in the vicinity of the Santa Ana River.

Raymond Fault

The active Raymond fault is located about 13 miles north of the site. The fault is primarily a left-lateral strike-slip fault with a minor component of high-angle reverse offset, placing basement rocks north of the fault over alluvial sediments south of the fault. The Raymond fault has long been recognized as a ground-water barrier in the Pasadena/San Marino area and numerous geomorphic features along its entire length (such as fault scarps, sag ponds, springs, and pressure ridges) attest to the fault's activity during the Holocene epoch (last 11,000 years). Within the last 36-41,000 years, five to eight separate earthquake events have been recognized along the Raymond fault (Crook et al., 1987, Weaver and Dolon, 2000). The most recent fault movement, based on radiocarbon ages from materials collected in an excavation exposing the fault, occurred sometime between 2,160 ± 105 and 1,630 ± 100 years before present (LeRoy Crandall and Associates, 1978; Crook et al., 1987; Weaver and Dolan, 2000). An average slip rate of 1.5 mm/yr and a maximum magnitude of 6.5 are estimated by the California Geological Survey (2003) for the Raymond fault.

San Andreas Fault Zone

The active San Andreas fault zone is located about 39 miles northeast of the site. This fault zone, California's most prominent geological feature, trends generally northwest for almost the entire length of the state. The southern segment of the fault is approximately 450 kilometers long and extends from the Transverse Ranges west of Tejon Pass on the north to the Mexican border and beyond on the south. The 1857 Fort Tejon earthquake was the last major earthquake along the San Andreas fault zone in Southern California.

Blind Thrust Fault Zones

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3 kilometers. These faults do not present a potential surface fault rupture hazard. However, the following described blind thrust faults are considered active and potential sources for future earthquakes.

Puente Hills Blind Thrust

The Puente Hills Blind Thrust fault (PHBT) is defined based on seismic reflection profiles, petroleum well data, and precisely located seismicity (Shaw et al., 2002). This blind thrust fault system extends eastward from downtown Los Angeles to Brea (in northern Orange County). The PHBT includes three north-dipping segments, named from east to west as the Coyote Hills segment, the Santa Fe Springs segment, and the Los Angeles segment. These segments are overlain by folds expressed at the surface as the Coyote Hills, Santa Fe Springs Anticline, and the Montebello Hills. The PHBT underlies the site at depth.

The Santa Fe Springs segment of the PHBT is believed to be the causative fault of the October 1, 1987 Whittier Narrows Earthquake (Shaw et al., 2002). Postulated earthquake scenarios for the PHBT include single segment fault ruptures capable of producing an earthquake of magnitude 6.5 to 6.6 (M_w) and a multiple segment fault rupture capable of producing an earthquake of magnitude 7.1 (M_w). The PHBT is not exposed at the ground surface and does not present a potential for surface fault rupture. However, based on deformation of late Quaternary age sediments above this fault system and the occurrence of the Whittier Narrows earthquake, the PHBT is considered an active fault capable of generating future earthquakes beneath the Los Angeles Basin. An average slip rate of 0.7 mm/yr and a maximum magnitude of 7.1 are estimated by the California Geological Survey (2003) for the Puente Hills Blind Thrust.

Upper Elysian Park Thrust

The Upper Elysian Park fault is a blind thrust fault that overlies the Los Angeles and Santa Fe Springs segments of the Puente Hills Thrust (Oskin et al., 2000 and Shaw et al., 2002). The eastern edge of the Upper Elysian Park fault is defined by the northwest-trending Whittier fault zone. The

vertical surface projection of the Upper Elysian Park fault is approximately 7 miles north of the site at its closest point. Like other blind thrust faults in the Los Angeles area, the Upper Elysian Park fault is not exposed at the surface and does not present a potential surface rupture hazard; however, the Upper Elysian Park fault should be considered an active feature capable of generating future earthquakes. An average slip rate of 1.3 mm/yr and a maximum magnitude of 6.4 are estimated by the California Geological Survey (2003) for the Upper Elysian Park fault.

San Joaquin Hills Thrust

Until recently, the southern Los Angeles Basin has been estimated to have a low seismic hazard relative to the greater Los Angeles region. This estimation is generally based on the fewer number of known active faults and the lower rates of historic seismicity for this area. However, several recent studies by Grant et al. (1999, 2002) suggest that an active blind thrust fault system underlies the San Joaquin Hills. This postulated blind thrust fault is believed to be a faulted anticlinal fold, parallel to the Newport-Inglewood fault zone (NIFZ) but considered a distinctly separate seismic source (Grant et al., 2002). The recency of movement and Holocene slip rate of this fault are not known. However, the fault has been estimated to be capable of producing a Magnitude 6.8 to 7.3 earthquake (Grant et al., 2002). This estimation is based primarily on coastal geomorphology and age-dating of marsh deposits that are elevated above the current coastline.

The vertical surface projection of the postulated San Joaquin Hills Thrust is about 20 miles southeast of the site at the closest point. This thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard. The California Geological Survey (2003) considers this postulated fault to be active and estimates an average slip rate of 0.5 mm/yr and a maximum moment magnitude of 6.6 for the San Joaquin Hills Thrust.

Northridge Thrust

The Northridge Thrust is located beneath the majority of the San Fernando Valley and was the causative fault of the January 17, 1994 Northridge earthquake. This thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard. However, the Northridge Thrust is an active feature that can generate future earthquakes. The vertical surface projection of the Northridge Thrust is about 25 miles northwest of the site at the closest point. The California Geological Survey (2003) estimates an average slip rate of 1.5 mm/yr. and a maximum magnitude of

of 7.0 for the Northridge Thrust.

Potentially Active Faults

Norwalk Fault

The closest potentially active fault to the site is the Norwalk fault located approximately 2.3 miles to the southeast. The fault is a known ground-water barrier along the southern edge of the Coyote Hills, trending southeasterly toward the Santa Ana Mountains. The fault is thought to be a north-dipping reverse oblique fault along which the Coyote Hills have been uplifted. This fault offsets lower Pleistocene age and older deposits near the mouth of the Santa Ana Canyon. However, there is no evidence that this fault has offset Holocene age alluvial deposits (Ziony and Jones, 1989). Additionally, Jennings shows this fault to be potentially active (Jennings, 1994).

Los Alamitos Fault

The potentially active Los Alamitos fault is located approximately 5.6 miles south of the site. This fault trends northwest-southeast from the northern boundary of the City of Lakewood southeastward to the Los Alamitos Armed Forces Reserve Center. The fault, considered a southeasterly extension of the Paramount Syncline, appears to be a vertical fault with the early Pleistocene age materials on the west side of the fault displaced up relative to the east side. There is no evidence that this fault has offset Holocene age alluvial deposits (Ziony and Jones, 1989). Additionally, the "Fault Activity Map of California" published by the California Division of Mines and Geology (Jennings, 1994) considers this fault to be potentially active.

MacArthur Park Fault

The potentially active inferred MacArthur Park fault is located approximately 11 miles northwest of the site. The fault, inferred west of downtown Los Angeles, has been located based on south-facing scarps, truncated drainages, and other geomorphic features (Dolan and Sieh, 1993). The fault is approximately 8 kilometers (5 miles) long, extending northwest from the Pershing Square area in downtown Los Angeles through MacArthur Park to the Paramount Studios area in Hollywood. Current information suggests the fault is potentially active.

4.5 GEOLOGIC-SEISMIC HAZARDS

Fault Rupture

The site is not within a currently established Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located directly beneath or projecting toward the site. Therefore, the potential for surface rupture due to fault plane displacement propagating to the surface at the site during the design life of the project is considered low.

Seismicity

Earthquake Catalog Data

The seismicity of the region surrounding the site was determined from research of an electronic database of seismic data (Southern California Seismographic Network, 2004). This database includes earthquake data compiled by the California Institute of Technology from 1932 through 2007 and data for 1812 to 1931 compiled by Richter and the U.S. National Oceanic Atmospheric Administration (NOAA). The search for earthquakes that occurred within 100 kilometers of the site indicates that 402 earthquakes of Richter magnitude 4.0 and greater occurred from 1932 through 2007; 3 earthquakes of magnitude 6.0 or greater occurred between 1906 and 1931; and 1 earthquake of magnitude 7.0 or greater occurred between 1812 and 1905. A list of these earthquakes is presented as Table 3. Epicenters of moderate and major earthquakes (greater than magnitude 5.0) are shown in Figure 3.

The information for each earthquake includes date and time in Greenwich Civil Time (GCT), location of the epicenter in latitude and longitude, quality of epicentral determination (Q), depth in kilometers, distance from the site in kilometers, and magnitude. Where a depth of 0.0 is given, the solution was based on an assumed 16-kilometer focal depth. The explanation of the letter code for the quality factor of the data is presented on the first page of the table.

Historic Earthquakes

A number of earthquakes of moderate to major magnitude have occurred in the Southern California area within the last approximately 100 years. A partial list of these earthquakes is included in the following table.

List of Historic Earthquakes

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Bernardino Mtns.	September 20, 1907	6.0	61	ENE
Lake Elsinore	May 15, 1910	6.0	46	SE
Loma Linda area	July 23, 1923	6.3	60	E
Long Beach	March 10, 1933	6.4	22	SSE
Tehachapi	July 21, 1952	7.5	90	NW
San Fernando	February 9, 1971	6.6	37	NNW
Whittier Narrows	October 1, 1987	5.9	10	N
Sierra Madre	June 28, 1991	5.8	25	NNE
Landers	June 28, 1992	7.3	99	ENE
Big Bear	June 28, 1992	6.4	77	ENE
Northridge	January 17, 1994	6.7	31	NW
Hector Mine	October 16, 1999	7.1	116	WNW

Prepared by: RM

Checked by: PRK

The site could be subjected to strong ground shaking in the event of an earthquake. The site is within an area in the Los Angeles basin where the depth is great to bedrock with high shear wave velocities. Recent simulations indicate this area could be subject to higher ground motions than other sites towards the edges of the Los Angeles basin. Current ground motion design coefficients contained in the 2007 edition of the California Building Code do not contain a specific correction for these "basin effects." However, newer ground motion attenuation relations (known as the "Next-Generation Attenuation Relations" have been developed to account for basin effects. Therefore, site-specific ground motion studies have the capacity of modeling the shaking hazard at the site. Nevertheless, the basin effects are only significant in long-period ground motions (such as those above a period of 1 second), therefore for high-rise and other long-period structures, it would be recommended that site-specific ground motion studies be performed. For the types of structures contemplated at the site, the periods of the structures would be considered low-enough that the code-based site ground motion parameters are sufficient. The hazard of ground shaking is common in Southern California and the effects of ground shaking can be mitigated by proper engineering design and construction in

design and construction in conformance with current building codes and engineering practices.

Slope Stability

The site is on nearly level ground. The relatively flat-lying topography at the site precludes both stability problems and the potential for lurching (earth movement at right angles to a cliff or steep slope during ground shaking). According to the City of Downey Seismic Safety Element (1975) and the County of Los Angeles Seismic Safety Element (1990), the site is not within an area identified as having a potential for slope instability. There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Additionally, the site is not located within an area identified as having a potential for seismic slope instability (California Division of Mines and Geology, 1999).

Liquefaction and Seismically-Induced Settlement

Liquefaction potential is greatest where the ground water level is shallow, and submerged loose, fine sands occur within a depth of about 50 feet or less. Liquefaction potential decreases as grain size and clay and gravel content increase. As ground acceleration and shaking duration increase during an earthquake, liquefaction potential increases.

According to the California Geological Survey (California Division of Mines and Geology, 1999) the site in located within an area that has a potential for liquefaction. However, according to the County of Los Angeles Seismic Safety Element (1990), the site is within an area identified as having a very low potential for liquefaction.

The alluvium underlying the site may be loose and susceptible to liquefaction in the event of an earthquake. The site is within an area that historically (prior to the 1960s) has had very shallow ground water levels (within 8 feet of the ground surface), although current groundwater levels are deeper than 50 feet. The future ground water level is not expected to rise above a depth of 40 feet below the ground surface.

Seismically-induced settlement is often caused by loose to medium-dense granular soils densified during ground shaking. At the current groundwater levels, the potential for seismically-induced settlement is moderate.

Tsunamis, Inundation, Seiches, and Flooding

The site is not in a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site.

According to the County of Los Angeles Seismic Safety Element (1990), the site is located within a potential inundation area for an earthquake-induced dam failure from Whittier Narrows Dam. However, this dam, as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. The possibility of dam failures during an earthquake has been addressed by the California Geological Survey in the earthquake planning scenarios for a magnitude 8.3 earthquake on the San Andreas fault zone (Davis et al., 1982) and a magnitude 7.0 earthquake on the Newport-Inglewood fault zone (Toppozada et al., 1988). As stated in both reports, catastrophic failure of a major dam as a result of a scenario earthquake is regarded as unlikely. Current design and construction practices, and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum credible earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

The site is not in 100-year flood zone (Downey, 2005).

Subsidence

The site is not within an area of known subsidence associated with fluid withdrawal (ground water or petroleum), peat oxidation, or hydrocompaction.

4.6 CONCLUSIONS

Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the site. In our opinion, the potential for surface rupture at the site due to fault plane displacement propagating to the ground surface during the design life of the project is considered low. Although the site could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern

Southern California and the effects of ground shaking can be mitigated by proper engineering design and construction in conformance with current building codes and engineering practices.

However, based on the postulated future ground-water level, the potential for liquefaction and liquefaction-induced settlement is considered moderate. A site-specific liquefaction evaluation will need to be performed for the project.

The site is relatively level and the absence of nearby slopes precludes slope stability hazards. The potential for other geologic hazards such as tsunamis, inundation, seiches, flooding, and subsidence affecting the site is considered low.

5.0 MITIGATION MEASURES

5.1 GENERAL

As part of the mitigation measures for the development as a whole, the proposed project will be designed and built in compliance with City of Downey, California building code requirements (currently based on the 2007 edition of the California Building Code). The City of Downey will require that the results of the comprehensive geotechnical investigation be submitted as part of the permitting process for the project. The City of Downey will require that the specific design recommendations presented in the comprehensive geotechnical report be incorporated into the design and construction of the proposed project.

Proper engineering design and conformance with recommendations presented in the comprehensive geotechnical report for the project, in compliance with current building codes as required by the City of Downey, will reduce the identified potential geotechnical impacts to a level that is less than significant.

5.2 GROUND SHAKING

The site could be subjected to strong ground shaking. However, the hazards associated with ground shaking are common in seismically active Southern California. The location of the site relative to known active or potentially active faults indicates the site is not exposed to a greater seismic risk than other sites in the Downey area.

The proposed development will be designed and built in accordance with applicable local and state building codes, which in general provide life safety for occupants of the structures in the event of the strong earthquake ground motions expected to occur in the vicinity of the site, as determined during the comprehensive geotechnical investigation for the proposed development. If development of the site were to include high-rise or other long-period structures, the geotechnical investigation for the proposed development should include a site-specific ground motion evaluation, which takes into account the basin effects observed in the Los Angeles basin. For the types of structures contemplated at the site, the ground-motion parameters presented in the code are considered sufficient. Potential impacts that could significantly affect the proposed structures as a result of ground shaking can be

ground shaking can be reduced to a less than significant level with proper engineering design and conformance with City building code requirements.

5.3 LIQUEFACTION

Based on the results of our preliminary analysis, unless mitigating measures are implemented, ground surface effects due to potential liquefaction in the event of seismic shaking are anticipated to involve ground deformation and associated tilting of structures. Additional explorations, laboratory testing, and analyses, as part of the comprehensive geotechnical investigation, would confirm this opinion during detailed construction level design. The comprehensive geotechnical investigation will provide recommendations for ground improvement and/or the design of foundations and structures to mitigate potential adverse impacts of liquefaction. Ground improvement methods could consist of measures such as vibro-replacement, soil mixing, or compaction grouting. Foundation design could include drilled or driven piles.

5.4 EXPANSIVE AND CORROSIVE SOILS

Based on the soil corrosivity studies performed at nearby sites, the site is soils may be severely corrosive to ferrous metals, aggressive to copper, and the exposure of portland cement concrete to sulfate attack may be moderate. The site soils are anticipated to be low to moderately expansive. However, the comprehensive geotechnical investigation for the proposed project should further evaluate the expansion and corrosion potential of the on-site materials. If the on-site soils are determined to be expansive or corrosive, specific recommendations will be provided in the comprehensive geotechnical report that will reduce any impacts to a level that is less than significant. Mitigation measures to reduce significant impacts from expansive soils to a level that is less than significant could include either mixing the expansive soils with nonexpansive soils to reduce the expansion potential to an acceptable level, selective placement of the expansive soils (i.e. placing these soils in areas where the fill will not support structures), removing the expansive soils from the site, or design of structural elements to withstand the pressures of expansive soils. The most effective mitigation measures for reducing significant impacts from corrosive soils to a level that is less than significant is proper material selection and design prior to construction. These mitigation measures would reduce significant impacts related to expansive soils and corrosive soils to a level that is less than significant.

The impacts of contaminated soils are not a part of this evaluation.

5.5 GRADING

We anticipate that conventional earth-moving equipment will be used in site grading. Where uncertified fill soils and loose surficial soils are present, overexcavation and recompaction of these materials are recommended beneath the structures unless a structural first floor slab is utilized. We expect that onsite soils not impacted by contamination from prior site activities or remediated to applicable regulatory standards would be suitable for use as fill. If any fill is to be placed during grading, it shall be placed in accordance with the regulations of the appropriate governmental agencies. Grading is not anticipated to have a significant impact on the proposed project or the surrounding developments.

5.6 STABILITY OF TEMPORARY EXCAVATIONS

The site is underlain by Quaternary age alluvial sediments. Where there is not sufficient space for sloped embankments, shoring of temporary excavations will be required. The stability of proposed temporary slopes will be analyzed during the comprehensive geotechnical investigation for the proposed development as required by the City of Downey. Shoring should be designed for appropriate lateral earth pressures plus surcharge pressures from nearby structures or equipment.

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TABLES

Table 1
Major Named Faults Considered to be Active
in Southern California

Fault (in increasing distance)	Maximum Magnitude			Slip Rate (mm/yr.)	Distance From Site (miles)	Direction From Site
Puente Hills Blind Thrust	7.1	(a)	BT	0.7	---	---
Whittier	6.8	(a)	SS	2.5	7	NE
Newport-Inglewood Zone	7.1	(a)	SS	1.0	7	SW
Upper Elysian Park	6.4	(a)	BT	1.3	7	N
Raymond	6.5	(a)	RO	1.5	13	N
Palos Verdes	7.3	(a)	SS	3.0	14	SW
Hollywood	6.4	(a)	RO	1.0	15	NNW
Verdugo	6.9	(a)	RO	0.5	15	N
San Jose	6.4	(a)	RO	0.5	15	NE
Santa Monica	6.6	(a)	RO	1.0	16	NW
Sierra Madre	7.2	(a)	RO	2.0	17	NNE
Clamshell-Sawpit	6.5	(a)	RO	0.5	18	NNE
San Joaquin Hills	6.6	(a)	BT	0.5	20	SE
San Gabriel	7.2	(a)	SS	1.0	23	NNE
Chino-Central Avenue	6.7	(a)	RO	1.0	23	ENE
Malibu Coast	6.7	(a)	RO	0.3	24	WNW
Northridge Thrust	7.0	(a)	BT	1.5	25	NW
San Fernando	6.7	(a)	RO	2.0	26	NNW
Cucamonga	6.9	(a)	RO	5.0	28	NE
Elsinore (Glen Ivy Segment)	6.8	(a)	SS	5.0	26	ESE
Anacapa-Dume	7.5	(a)	RO	3.0	33	W
Santa Susana	6.7	(a)	RO	5.0	34	NW
San Andreas (Mojave Segment)	7.4	(a)	SS	30.0	39	NE
San Jacinto (San Bernardino Segment)	6.7	(a)	SS	12.0	41	NE
Simi-Santa Rosa	7.0	(a)	RO	1.0	41	NW

(a) California Geological Survey, 2003
(b) Mark, 1977
(c) Slemmons, 1979
(d) Wesnousky, 1986
(e) Hummon et al., 1994
SS Strike Slip
RO Reverse Oblique
BT Blind Thrust

Prepared by RM
Checked by PRK

Table 2
Major Named Faults Considered to be Potentially Active in Southern California

Fault (in increasing distance)	Maximum Magnitude			Slip Rate (mm/yr.)	Distance From Site (miles)	Direction From Site
Norwalk	6.7	(c)	RO	0.1	2.3	SE
Los Alamitos	6.2	(b)	SS	0.1	5.6	S
MacArthur Park	5.7	(e)	RO	0.1	11	NW
El Modeno	6.5	(b)	NO	0.1	12	SE
Overland	6.0	(c)	SS	0.1	15	WNW
Charnock	6.5	(c)	SS	0.1	15	W
Duarte	6.7	(c)	RO	0.1	17	NNE
Peralta Hills	6.5	(b)	RO	0.1	17	SE
Indian Hill	6.6	(b)	RO	0.1	20	NE

(a) California Geological Survey, 2003
(b) Mark, 1977
(c) Slemmons, 1979
(d) Wesnousky, 1986
(e) Hummon et al., 1994
SS Strike Slip
NO Normal Oblique
RO Reverse Oblique
BT Blind Thrust

Prepared by RM
Checked by PRK

TABLE 3
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
11-01-1932	04:45:00	34.00 N	117.25 W	E	82	.0	4.0
03-11-1933	01:54:07	33.62 N	117.97 W	A	37	.0	6.4
03-11-1933	02:04:00	33.75 N	118.08 W	C	19	.0	4.9
03-11-1933	02:05:00	33.75 N	118.08 W	C	19	.0	4.3
03-11-1933	02:09:00	33.75 N	118.08 W	C	19	.0	5.0
03-11-1933	02:10:00	33.75 N	118.08 W	C	19	.0	4.6
03-11-1933	02:11:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	02:16:00	33.75 N	118.08 W	C	19	.0	4.8
03-11-1933	02:17:00	33.60 N	118.00 W	E	37	.0	4.5
03-11-1933	02:22:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	02:27:00	33.75 N	118.08 W	C	19	.0	4.6
03-11-1933	02:30:00	33.75 N	118.08 W	C	19	.0	5.1
03-11-1933	02:31:00	33.60 N	118.00 W	E	37	.0	4.4
03-11-1933	02:52:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	02:57:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	02:58:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	02:59:00	33.75 N	118.08 W	C	19	.0	4.6
03-11-1933	03:05:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	03:09:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	03:11:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	03:23:00	33.75 N	118.08 W	C	19	.0	5.0
03-11-1933	03:36:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	03:39:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	03:47:00	33.75 N	118.08 W	C	19	.0	4.1
03-11-1933	04:36:00	33.75 N	118.08 W	C	19	.0	4.6
03-11-1933	04:39:00	33.75 N	118.08 W	C	19	.0	4.9
03-11-1933	04:40:00	33.75 N	118.08 W	C	19	.0	4.7
03-11-1933	05:10:22	33.70 N	118.07 W	C	25	.0	5.1
03-11-1933	05:13:00	33.75 N	118.08 W	C	19	.0	4.7
03-11-1933	05:15:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	05:18:04	33.58 N	117.98 W	C	41	.0	5.2
03-11-1933	05:21:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	05:24:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	05:53:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	05:55:00	33.75 N	118.08 W	C	19	.0	4.0

NOTE: Q IS A FACTOR RELATING THE QUALITY OF EPICENTRAL DETERMINATION

A = + 1 km horizontal distance; + 2 km depth
B = + 2 km horizontal distance; + 5 km depth
C = + 5 km horizontal distance; no depth restriction
D = >+ 5 km horizontal distance

Event qualities are highly suspect prior to 1990. Many of these event qualities are based on incomplete information according to Caltech.

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
03-11-1933	06:11:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	06:18:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	06:29:00	33.85 N	118.27 W	C	15	.0	4.4
03-11-1933	06:35:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	06:58:03	33.68 N	118.05 W	C	27	.0	5.5
03-11-1933	07:51:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	07:59:00	33.75 N	118.08 W	C	19	.0	4.1
03-11-1933	08:08:00	33.75 N	118.08 W	C	19	.0	4.5
03-11-1933	08:32:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	08:37:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	08:54:57	33.70 N	118.07 W	C	25	.0	5.1
03-11-1933	09:10:00	33.75 N	118.08 W	C	19	.0	5.1
03-11-1933	09:11:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	09:26:00	33.75 N	118.08 W	C	19	.0	4.1
03-11-1933	10:25:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	10:45:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	11:00:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	11:04:00	33.75 N	118.13 W	C	19	.0	4.6
03-11-1933	11:29:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	11:38:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	11:41:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	11:47:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	12:50:00	33.68 N	118.05 W	C	27	.0	4.4
03-11-1933	13:50:00	33.73 N	118.10 W	C	21	.0	4.4
03-11-1933	13:57:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	14:25:00	33.85 N	118.27 W	C	15	.0	5.0
03-11-1933	14:47:00	33.73 N	118.10 W	C	21	.0	4.4
03-11-1933	14:57:00	33.88 N	118.32 W	C	18	.0	4.9
03-11-1933	15:09:00	33.73 N	118.10 W	C	21	.0	4.4
03-11-1933	15:47:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	16:53:00	33.75 N	118.08 W	C	19	.0	4.8
03-11-1933	19:44:00	33.75 N	118.08 W	C	19	.0	4.0
03-11-1933	19:56:00	33.75 N	118.08 W	C	19	.0	4.2
03-11-1933	22:00:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	22:31:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	22:32:00	33.75 N	118.08 W	C	19	.0	4.1
03-11-1933	22:40:00	33.75 N	118.08 W	C	19	.0	4.4
03-11-1933	23:05:00	33.75 N	118.08 W	C	19	.0	4.2
03-12-1933	00:27:00	33.75 N	118.08 W	C	19	.0	4.4
03-12-1933	00:34:00	33.75 N	118.08 W	C	19	.0	4.0
03-12-1933	04:48:00	33.75 N	118.08 W	C	19	.0	4.0
03-12-1933	05:46:00	33.75 N	118.08 W	C	19	.0	4.4
03-12-1933	06:01:00	33.75 N	118.08 W	C	19	.0	4.2
03-12-1933	06:16:00	33.75 N	118.08 W	C	19	.0	4.6
03-12-1933	07:40:00	33.75 N	118.08 W	C	19	.0	4.2

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
03-12-1933	08:35:00	33.75 N	118.08 W	C	19	.0	4.2
03-12-1933	15:02:00	33.75 N	118.08 W	C	19	.0	4.2
03-12-1933	16:51:00	33.75 N	118.08 W	C	19	.0	4.0
03-12-1933	17:38:00	33.75 N	118.08 W	C	19	.0	4.5
03-12-1933	18:25:00	33.75 N	118.08 W	C	19	.0	4.1
03-12-1933	21:28:00	33.75 N	118.08 W	C	19	.0	4.1
03-12-1933	23:54:00	33.75 N	118.08 W	C	19	.0	4.5
03-13-1933	03:43:00	33.75 N	118.08 W	C	19	.0	4.1
03-13-1933	04:32:00	33.75 N	118.08 W	C	19	.0	4.7
03-13-1933	06:17:00	33.75 N	118.08 W	C	19	.0	4.0
03-13-1933	13:18:28	33.75 N	118.08 W	C	19	.0	5.3
03-13-1933	15:32:00	33.75 N	118.08 W	C	19	.0	4.1
03-13-1933	19:29:00	33.75 N	118.08 W	C	19	.0	4.2
03-14-1933	00:36:00	33.75 N	118.08 W	C	19	.0	4.2
03-14-1933	12:19:00	33.75 N	118.08 W	C	19	.0	4.5
03-14-1933	19:01:50	33.62 N	118.02 W	C	35	.0	5.1
03-14-1933	22:42:00	33.75 N	118.08 W	C	19	.0	4.1
03-15-1933	02:08:00	33.75 N	118.08 W	C	19	.0	4.1
03-15-1933	04:32:00	33.75 N	118.08 W	C	19	.0	4.1
03-15-1933	05:40:00	33.75 N	118.08 W	C	19	.0	4.2
03-15-1933	11:13:32	33.62 N	118.02 W	C	35	.0	4.9
03-16-1933	14:56:00	33.75 N	118.08 W	C	19	.0	4.0
03-16-1933	15:29:00	33.75 N	118.08 W	C	19	.0	4.2
03-16-1933	15:30:00	33.75 N	118.08 W	C	19	.0	4.1
03-17-1933	16:51:00	33.75 N	118.08 W	C	19	.0	4.1
03-18-1933	20:52:00	33.75 N	118.08 W	C	19	.0	4.2
03-19-1933	21:23:00	33.75 N	118.08 W	C	19	.0	4.2
03-20-1933	13:58:00	33.75 N	118.08 W	C	19	.0	4.1
03-21-1933	03:26:00	33.75 N	118.08 W	C	19	.0	4.1
03-23-1933	08:40:00	33.75 N	118.08 W	C	19	.0	4.1
03-23-1933	18:31:00	33.75 N	118.08 W	C	19	.0	4.1
03-25-1933	13:46:00	33.75 N	118.08 W	C	19	.0	4.1
03-30-1933	12:25:00	33.75 N	118.08 W	C	19	.0	4.4
03-31-1933	10:49:00	33.75 N	118.08 W	C	19	.0	4.1
04-01-1933	06:42:00	33.75 N	118.08 W	C	19	.0	4.2
04-02-1933	08:00:00	33.75 N	118.08 W	C	19	.0	4.0
04-02-1933	15:36:00	33.75 N	118.08 W	C	19	.0	4.0
05-16-1933	20:58:55	33.75 N	118.17 W	C	19	.0	4.0
08-04-1933	04:17:48	33.75 N	118.18 W	C	20	.0	4.0
10-02-1933	09:10:17	33.78 N	118.13 W	A	15	.0	5.4
10-02-1933	13:26:01	33.62 N	118.02 W	C	35	.0	4.0
10-25-1933	07:00:46	33.95 N	118.13 W	C	3	.0	4.3
11-13-1933	21:28:00	33.87 N	118.20 W	C	9	.0	4.0
11-20-1933	10:32:00	33.78 N	118.13 W	B	15	.0	4.0
01-09-1934	14:10:00	34.10 N	117.68 W	A	46	.0	4.5

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
01-18-1934	02:14:00	34.10 N	117.68 W	A	46	.0	4.0
01-20-1934	21:17:00	33.62 N	118.12 W	B	34	.0	4.5
04-17-1934	18:33:00	33.57 N	117.98 W	C	41	.0	4.0
10-17-1934	09:38:00	33.63 N	118.40 W	B	40	.0	4.0
11-16-1934	21:26:00	33.75 N	118.00 W	B	22	.0	4.0
06-19-1935	11:17:00	33.72 N	117.52 W	B	61	.0	4.0
07-13-1935	10:54:16	34.20 N	117.90 W	A	38	.0	4.7
09-03-1935	06:47:00	34.03 N	117.32 W	B	76	.0	4.5
12-25-1935	17:15:00	33.60 N	118.02 W	B	37	.0	4.5
02-23-1936	22:20:42	34.13 N	117.34 W	A	77	10.0	4.5
02-26-1936	09:33:27	34.14 N	117.34 W	A	77	10.0	4.0
08-22-1936	05:21:00	33.77 N	117.82 W	B	34	.0	4.0
10-29-1936	22:35:36	34.38 N	118.62 W	C	68	10.0	4.0
01-15-1937	18:35:47	33.56 N	118.06 W	B	40	10.0	4.0
03-19-1937	01:23:38	34.11 N	117.43 W	A	68	10.0	4.0
07-07-1937	11:12:00	33.57 N	117.98 W	B	41	.0	4.0
09-01-1937	13:48:08	34.21 N	117.53 W	A	64	10.0	4.5
09-01-1937	16:35:33	34.18 N	117.55 W	A	61	10.0	4.5
05-21-1938	09:44:00	33.62 N	118.03 W	B	35	.0	4.0
05-31-1938	08:34:55	33.70 N	117.51 W	B	62	10.0	5.2
07-05-1938	18:06:55	33.68 N	117.55 W	A	59	10.0	4.5
08-06-1938	22:00:55	33.72 N	117.51 W	B	62	10.0	4.0
08-31-1938	03:18:14	33.76 N	118.25 W	A	21	10.0	4.5
11-29-1938	19:21:15	33.90 N	118.43 W	A	28	10.0	4.0
12-07-1938	03:38:00	34.00 N	118.42 W	B	28	.0	4.0
12-27-1938	10:09:28	34.13 N	117.52 W	B	61	10.0	4.0
04-03-1939	02:50:44	34.04 N	117.23 W	A	84	10.0	4.0
11-04-1939	21:41:00	33.77 N	118.12 W	B	17	.0	4.0
11-07-1939	18:52:08	34.00 N	117.28 W	A	79	.0	4.7
12-27-1939	19:28:49	33.78 N	118.20 W	A	17	.0	4.7
01-13-1940	07:49:07	33.78 N	118.13 W	B	15	.0	4.0
02-08-1940	16:56:17	33.70 N	118.07 W	B	25	.0	4.0
02-11-1940	19:24:10	33.98 N	118.30 W	B	17	.0	4.0
04-18-1940	18:43:43	34.03 N	117.35 W	A	73	.0	4.4
06-05-1940	08:27:27	33.83 N	117.40 W	B	68	.0	4.0
07-20-1940	04:01:13	33.70 N	118.07 W	B	25	.0	4.0
10-11-1940	05:57:12	33.77 N	118.45 W	A	34	.0	4.7
10-12-1940	00:24:00	33.78 N	118.42 W	B	31	.0	4.0
10-14-1940	20:51:11	33.78 N	118.42 W	B	31	.0	4.0
11-01-1940	07:25:03	33.78 N	118.42 W	B	31	.0	4.0
11-01-1940	20:00:46	33.63 N	118.20 W	B	33	.0	4.0
11-02-1940	02:58:26	33.78 N	118.42 W	B	31	.0	4.0
01-30-1941	01:34:46	33.97 N	118.05 W	A	9	.0	4.1
03-22-1941	08:22:40	33.52 N	118.10 W	B	45	.0	4.0
03-25-1941	23:43:41	34.22 N	117.47 W	B	70	.0	4.0

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
04-11-1941	01:20:24	33.95 N	117.58 W	B	51	.0	4.0
10-22-1941	06:57:18	33.82 N	118.22 W	A	14	.0	4.8
11-14-1941	08:41:36	33.78 N	118.25 W	A	19	.0	4.8
04-16-1942	07:28:33	33.37 N	118.15 W	C	61	.0	4.0
10-24-1943	00:29:21	33.93 N	117.37 W	C	71	.0	4.0
06-19-1944	00:03:33	33.87 N	118.22 W	B	10	.0	4.5
06-19-1944	03:06:07	33.87 N	118.22 W	C	10	.0	4.4
02-24-1946	06:07:52	34.40 N	117.80 W	C	61	.0	4.1
06-01-1946	11:06:31	34.42 N	118.83 W	C	85	.0	4.1
03-01-1948	08:12:13	34.17 N	117.53 W	B	62	.0	4.7
04-16-1948	22:26:24	34.02 N	118.97 W	B	78	.0	4.7
10-03-1948	02:46:28	34.18 N	117.58 W	A	58	.0	4.0
01-11-1950	21:41:35	33.94 N	118.20 W	A	7	.4	4.1
09-22-1951	08:22:39	34.12 N	117.34 W	A	76	11.9	4.3
02-17-1952	12:36:58	34.00 N	117.27 W	A	80	16.0	4.5
08-23-1952	10:09:07	34.52 N	118.20 W	A	67	13.1	5.1
10-26-1954	16:22:26	33.73 N	117.47 W	B	65	.0	4.1
05-15-1955	17:03:25	34.12 N	117.48 W	A	64	7.6	4.0
05-29-1955	16:43:35	33.99 N	119.06 W	B	86	17.4	4.1
01-03-1956	00:25:48	33.72 N	117.50 W	B	62	13.7	4.7
02-07-1956	02:16:56	34.53 N	118.64 W	B	83	16.0	4.2
02-07-1956	03:16:38	34.59 N	118.61 W	A	86	2.6	4.6
03-25-1956	03:32:02	33.60 N	119.11 W	A	97	8.2	4.2
06-28-1960	20:00:48	34.12 N	117.47 W	A	64	12.0	4.1
10-04-1961	02:21:31	33.85 N	117.75 W	B	36	4.3	4.1
10-20-1961	19:49:50	33.65 N	117.99 W	B	32	4.6	4.3
10-20-1961	20:07:14	33.66 N	117.98 W	B	32	6.1	4.0
10-20-1961	21:42:40	33.67 N	117.98 W	B	32	7.2	4.0
10-20-1961	22:35:34	33.67 N	118.01 W	B	30	5.6	4.1
11-20-1961	08:53:34	33.68 N	117.99 W	B	29	4.4	4.0
04-27-1962	09:12:32	33.74 N	117.19 W	B	90	5.7	4.1
09-14-1963	03:51:16	33.54 N	118.34 W	B	46	2.2	4.2
08-30-1964	22:57:37	34.27 N	118.44 W	B	48	15.4	4.0
01-01-1965	08:04:18	34.14 N	117.52 W	B	62	5.9	4.4
04-15-1965	20:08:33	34.13 N	117.43 W	B	69	5.5	4.5
07-16-1965	07:46:22	34.49 N	118.52 W	B	72	15.1	4.0
01-08-1967	07:37:30	33.63 N	118.47 W	B	45	11.4	4.0
01-08-1967	07:38:05	33.66 N	118.41 W	C	39	17.7	4.0
06-15-1967	04:58:05	34.00 N	117.97 W	B	17	10.0	4.1
02-28-1969	04:56:12	34.57 N	118.11 W	A	72	5.3	4.3
05-05-1969	16:02:09	34.30 N	117.57 W	B	67	8.8	4.4
10-27-1969	13:16:02	33.55 N	117.81 W	B	51	6.5	4.5
09-12-1970	14:10:11	34.27 N	117.52 W	A	68	8.0	4.1
09-12-1970	14:30:52	34.27 N	117.54 W	A	67	8.0	5.2
09-13-1970	04:47:48	34.28 N	117.55 W	A	67	8.0	4.4

By RM 8/22/08 Checked MBH 8/22/08

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
02-09-1971	14:00:41	34.41 N	118.40 W	B	60	8.4	6.6
02-09-1971	14:01:08	34.41 N	118.40 W	D	60	8.0	5.8
02-09-1971	14:01:33	34.41 N	118.40 W	D	60	8.0	4.2
02-09-1971	14:01:40	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:01:50	34.41 N	118.40 W	D	60	8.0	4.5
02-09-1971	14:01:54	34.41 N	118.40 W	D	60	8.0	4.2
02-09-1971	14:01:59	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:02:03	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:02:30	34.41 N	118.40 W	D	60	8.0	4.3
02-09-1971	14:02:31	34.41 N	118.40 W	D	60	8.0	4.7
02-09-1971	14:02:44	34.41 N	118.40 W	D	60	8.0	5.8
02-09-1971	14:03:25	34.41 N	118.40 W	D	60	8.0	4.4
02-09-1971	14:03:46	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:04:07	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:04:34	34.41 N	118.40 W	C	60	8.0	4.2
02-09-1971	14:04:39	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:04:44	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:04:46	34.41 N	118.40 W	D	60	8.0	4.2
02-09-1971	14:05:41	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:05:50	34.41 N	118.40 W	D	60	8.0	4.1
02-09-1971	14:07:10	34.41 N	118.40 W	D	60	8.0	4.0
02-09-1971	14:07:30	34.41 N	118.40 W	D	60	8.0	4.0
02-09-1971	14:07:45	34.41 N	118.40 W	D	60	8.0	4.5
02-09-1971	14:08:04	34.41 N	118.40 W	D	60	8.0	4.0
02-09-1971	14:08:07	34.41 N	118.40 W	D	60	8.0	4.2
02-09-1971	14:08:38	34.41 N	118.40 W	D	60	8.0	4.5
02-09-1971	14:08:53	34.41 N	118.40 W	D	60	8.0	4.6
02-09-1971	14:10:21	34.36 N	118.31 W	B	52	5.0	4.7
02-09-1971	14:10:28	34.41 N	118.40 W	D	60	8.0	5.3
02-09-1971	14:16:12	34.34 N	118.33 W	C	50	11.1	4.1
02-09-1971	14:19:50	34.36 N	118.41 W	B	55	11.8	4.0
02-09-1971	14:34:36	34.34 N	118.64 W	C	66	-2.0	4.9
02-09-1971	14:39:17	34.39 N	118.36 W	C	56	-1.6	4.0
02-09-1971	14:40:17	34.43 N	118.40 W	C	62	-2.0	4.1
02-09-1971	14:43:46	34.31 N	118.45 W	B	52	6.2	5.2
02-09-1971	15:58:20	34.33 N	118.33 W	B	50	14.2	4.8
02-09-1971	16:19:26	34.46 N	118.43 W	B	66	-1.0	4.2
02-10-1971	03:12:12	34.37 N	118.30 W	B	52	.8	4.0
02-10-1971	05:06:36	34.41 N	118.33 W	A	57	4.7	4.3
02-10-1971	05:18:07	34.43 N	118.41 W	A	62	5.8	4.5
02-10-1971	11:31:34	34.38 N	118.46 W	A	60	6.0	4.2
02-10-1971	13:49:53	34.40 N	118.42 W	A	59	9.7	4.3
02-10-1971	14:35:26	34.36 N	118.49 W	A	59	4.4	4.2
02-10-1971	17:38:55	34.40 N	118.37 W	A	57	6.2	4.2
02-10-1971	18:54:41	34.45 N	118.44 W	A	65	8.1	4.2

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
02-21-1971	05:50:52	34.40 N	118.44 W	A	60	6.9	4.7
02-21-1971	07:15:11	34.39 N	118.43 W	A	59	7.2	4.5
03-07-1971	01:33:40	34.35 N	118.46 W	A	57	3.3	4.5
03-25-1971	22:54:09	34.36 N	118.47 W	A	58	4.6	4.2
03-30-1971	08:54:43	34.30 N	118.46 W	A	52	2.6	4.1
03-31-1971	14:52:22	34.29 N	118.51 W	A	54	2.1	4.6
04-01-1971	15:03:03	34.43 N	118.41 W	A	62	8.0	4.1
04-02-1971	05:40:25	34.28 N	118.53 W	A	55	3.0	4.0
04-15-1971	11:14:32	34.26 N	118.58 W	B	56	4.2	4.2
04-25-1971	14:48:06	34.37 N	118.31 W	B	53	-2.0	4.0
06-21-1971	16:01:08	34.27 N	118.53 W	B	54	4.1	4.0
06-22-1971	10:41:19	33.75 N	117.48 W	B	63	8.0	4.2
02-21-1973	14:45:57	34.06 N	119.04 W	B	85	8.0	5.3
03-09-1974	00:54:31	34.40 N	118.47 W	C	62	24.4	4.7
08-14-1974	14:45:55	34.43 N	118.37 W	A	61	8.2	4.2
01-01-1976	17:20:12	33.97 N	117.89 W	A	23	6.2	4.2
04-08-1976	15:21:38	34.35 N	118.66 W	A	68	14.5	4.6
08-12-1977	02:19:26	34.38 N	118.46 W	B	59	9.5	4.5
09-24-1977	21:28:24	34.46 N	118.41 W	C	65	5.0	4.2
05-23-1978	09:16:50	33.91 N	119.17 W	C	96	6.0	4.0
01-01-1979	23:14:38	33.94 N	118.68 W	B	51	11.3	5.2
10-17-1979	20:52:37	33.93 N	118.67 W	C	50	5.5	4.2
10-19-1979	12:22:37	34.21 N	117.53 W	B	64	4.9	4.1
09-04-1981	15:50:50	33.65 N	119.09 W	C	94	6.0	5.5
10-23-1981	17:28:17	33.64 N	119.01 W	C	87	6.0	4.6
10-23-1981	19:15:52	33.62 N	119.02 W	A	89	14.8	4.6
04-13-1982	11:02:12	34.06 N	118.97 W	A	79	12.1	4.0
05-25-1982	13:44:30	33.55 N	118.21 W	A	42	12.6	4.3
01-08-1983	07:19:30	34.13 N	117.45 W	A	67	7.8	4.1
02-22-1983	02:18:30	33.03 N	117.94 W	D	100	10.0	4.3
02-27-1984	10:18:15	33.47 N	118.06 W	C	50	6.0	4.0
10-26-1984	17:20:43	34.02 N	118.99 W	A	80	13.3	4.6
04-03-1985	04:04:50	34.38 N	119.04 W	A	98	24.9	4.0
10-02-1985	23:44:12	34.02 N	117.25 W	A	83	15.2	4.8
02-21-1987	23:15:29	34.13 N	117.45 W	A	67	8.5	4.0
10-01-1987	14:42:20	34.06 N	118.08 W	A	16	9.5	5.9
10-01-1987	14:45:41	34.05 N	118.10 W	A	14	13.6	4.7
10-01-1987	14:48:03	34.08 N	118.09 W	A	18	11.7	4.1
10-01-1987	14:49:05	34.06 N	118.10 W	A	16	11.7	4.7
10-01-1987	15:12:31	34.05 N	118.09 W	A	15	10.8	4.7
10-01-1987	15:59:53	34.05 N	118.09 W	A	15	10.4	4.0
10-04-1987	10:59:38	34.07 N	118.10 W	A	17	8.3	5.3
10-24-1987	23:58:33	33.68 N	119.06 W	A	90	12.2	4.1
02-11-1988	15:25:55	34.08 N	118.05 W	A	19	12.5	4.7
06-26-1988	15:04:58	34.14 N	117.71 W	A	46	7.9	4.7

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
11-20-1988	05:39:28	33.51 N	118.07 W	C	46	6.0	4.9
12-03-1988	11:38:26	34.15 N	118.13 W	A	26	14.3	5.0
01-19-1989	06:53:28	33.92 N	118.63 W	A	46	11.9	5.0
02-18-1989	07:17:04	34.01 N	117.74 W	A	37	3.3	4.1
04-07-1989	20:07:30	33.62 N	117.90 W	A	40	12.9	4.7
06-12-1989	16:57:18	34.03 N	118.18 W	A	13	15.6	4.6
06-12-1989	17:22:25	34.02 N	118.18 W	A	12	15.5	4.4
12-28-1989	09:41:08	34.19 N	117.39 W	A	75	14.6	4.3
02-28-1990	23:43:36	34.14 N	117.70 W	A	47	4.5	5.4
03-01-1990	00:34:57	34.13 N	117.70 W	A	46	4.4	4.0
03-01-1990	03:23:03	34.15 N	117.72 W	A	46	11.4	4.7
03-02-1990	17:26:25	34.15 N	117.69 W	A	47	5.6	4.7
04-17-1990	22:32:27	34.11 N	117.72 W	A	43	3.6	4.8
06-28-1991	14:43:54	34.27 N	117.99 W	A	41	9.1	5.8
06-28-1991	17:00:55	34.25 N	117.99 W	A	39	9.5	4.3
07-05-1991	17:41:57	34.50 N	118.56 W	A	75	10.9	4.1
01-17-1994	12:30:55	34.21 N	118.54 W	A	50	18.4	6.7
01-17-1994	12:30:55	34.22 N	118.54 W	A	50	17.4	6.6
01-17-1994	12:31:58	34.27 N	118.49 W	C	52	6.0	5.9
01-17-1994	12:34:18	34.31 N	118.47 W	C	54	6.0	4.4
01-17-1994	12:39:39	34.26 N	118.54 W	C	54	6.0	4.9
01-17-1994	12:40:09	34.32 N	118.51 W	C	56	6.0	4.8
01-17-1994	12:40:36	34.34 N	118.61 W	C	65	6.0	5.2
01-17-1994	12:54:33	34.31 N	118.46 W	C	53	6.0	4.0
01-17-1994	12:55:46	34.28 N	118.58 W	C	57	6.0	4.1
01-17-1994	13:06:28	34.25 N	118.55 W	C	53	6.0	4.6
01-17-1994	13:26:45	34.32 N	118.46 W	C	53	6.0	4.7
01-17-1994	13:28:13	34.27 N	118.58 W	C	57	6.0	4.0
01-17-1994	13:56:02	34.29 N	118.62 W	C	61	6.0	4.4
01-17-1994	14:14:30	34.33 N	118.44 W	C	54	6.0	4.5
01-17-1994	15:07:03	34.30 N	118.47 W	A	53	2.6	4.2
01-17-1994	15:07:35	34.31 N	118.47 W	A	53	1.6	4.1
01-17-1994	15:54:10	34.38 N	118.63 W	A	68	13.0	4.8
01-17-1994	17:56:08	34.23 N	118.57 W	A	53	19.2	4.6
01-17-1994	19:35:34	34.31 N	118.46 W	A	53	2.3	4.0
01-17-1994	19:43:53	34.37 N	118.64 W	A	68	13.9	4.1
01-17-1994	20:46:02	34.30 N	118.57 W	C	58	6.0	4.9
01-17-1994	22:31:53	34.34 N	118.44 W	C	55	6.0	4.1
01-17-1994	23:33:30	34.33 N	118.70 W	A	69	9.8	5.6
01-17-1994	23:49:25	34.34 N	118.67 W	A	68	8.4	4.0
01-18-1994	00:39:35	34.38 N	118.56 W	A	65	7.2	4.4
01-18-1994	00:40:04	34.39 N	118.54 W	A	65	.0	4.2
01-18-1994	00:43:08	34.38 N	118.70 W	A	73	11.3	5.2
01-18-1994	04:01:26	34.36 N	118.62 W	A	67	.9	4.3
01-18-1994	07:23:56	34.33 N	118.62 W	A	65	14.8	4.0

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
01-18-1994	11:35:09	34.22 N	118.61 W	A	55	12.1	4.2
01-18-1994	13:24:44	34.32 N	118.56 W	A	59	1.7	4.3
01-18-1994	15:23:46	34.38 N	118.56 W	A	65	7.7	4.8
01-19-1994	04:40:48	34.36 N	118.57 W	A	64	2.6	4.3
01-19-1994	04:43:14	34.37 N	118.71 W	C	73	6.0	4.0
01-19-1994	09:13:10	34.30 N	118.74 W	A	70	13.0	4.1
01-19-1994	14:09:14	34.22 N	118.51 W	A	48	17.5	4.5
01-19-1994	21:09:28	34.38 N	118.71 W	A	74	14.4	5.1
01-19-1994	21:11:44	34.38 N	118.62 W	A	68	11.4	5.1
01-21-1994	18:39:15	34.30 N	118.47 W	A	52	10.6	4.5
01-21-1994	18:39:47	34.30 N	118.48 W	A	53	11.9	4.0
01-21-1994	18:42:28	34.31 N	118.47 W	A	54	7.9	4.2
01-21-1994	18:52:44	34.30 N	118.45 W	A	52	7.6	4.3
01-21-1994	18:53:44	34.30 N	118.46 W	A	52	7.7	4.3
01-23-1994	08:55:08	34.30 N	118.43 W	A	50	6.0	4.1
01-24-1994	04:15:18	34.35 N	118.55 W	A	61	6.5	4.6
01-24-1994	05:50:24	34.36 N	118.63 W	A	67	12.1	4.3
01-24-1994	05:54:21	34.36 N	118.63 W	A	67	10.9	4.2
01-27-1994	17:19:58	34.27 N	118.56 W	A	56	14.9	4.6
01-28-1994	20:09:53	34.38 N	118.49 W	A	61	.7	4.2
01-29-1994	11:20:35	34.31 N	118.58 W	A	60	1.1	5.1
01-29-1994	12:16:56	34.28 N	118.61 W	A	60	2.7	4.3
02-03-1994	16:23:35	34.30 N	118.44 W	A	51	9.0	4.0
02-05-1994	08:51:29	34.37 N	118.65 W	A	69	15.4	4.0
02-06-1994	13:19:27	34.29 N	118.48 W	A	52	9.3	4.1
02-25-1994	12:59:12	34.36 N	118.48 W	A	58	1.2	4.0
03-20-1994	21:20:12	34.23 N	118.47 W	A	47	13.1	5.2
05-25-1994	12:56:57	34.31 N	118.39 W	A	50	7.0	4.4
06-15-1994	05:59:48	34.31 N	118.40 W	A	50	7.4	4.1
12-06-1994	03:48:34	34.29 N	118.39 W	A	48	9.0	4.5
02-19-1995	21:24:18	34.05 N	118.92 W	A	74	15.6	4.3
06-26-1995	08:40:28	34.39 N	118.67 W	A	72	13.3	5.0
03-20-1996	07:37:59	34.36 N	118.61 W	A	66	13.0	4.1
05-01-1996	19:49:56	34.35 N	118.70 W	A	72	14.4	4.1
04-26-1997	10:37:30	34.37 N	118.67 W	A	71	16.5	5.1
04-26-1997	10:40:29	34.37 N	118.67 W	A	71	14.6	4.0
04-27-1997	11:09:28	34.38 N	118.65 W	A	70	15.2	4.8
06-28-1997	21:45:25	34.17 N	117.34 W	A	78	10.0	4.2
01-05-1998	18:14:06	33.95 N	117.71 W	A	39	11.5	4.3
03-11-1998	12:18:51	34.02 N	117.23 W	A	84	14.9	4.5
08-20-1998	23:49:58	34.37 N	117.65 W	A	67	9.0	4.4
07-22-1999	09:57:24	34.40 N	118.61 W	A	69	11.6	4.0
02-21-2000	13:49:43	34.05 N	117.26 W	A	82	15.0	4.5
03-07-2000	00:20:28	33.81 N	117.72 W	A	40	11.3	4.0
01-14-2001	02:26:14	34.28 N	118.40 W	A	48	8.8	4.3

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR
GREATER WITHIN 100 KM OF THE SITE
(CAL TECH DATA 1932-2007)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
01-14-2001	02:50:53	34.29 N	118.40 W	A	48	8.4	4.0
09-09-2001	23:59:18	34.06 N	118.39 W	A	28	7.9	4.2
10-28-2001	16:27:45	33.92 N	118.27 W	A	13	21.1	4.0
12-14-2001	12:01:35	33.95 N	117.75 W	A	36	13.8	4.0
01-29-2002	05:53:28	34.36 N	118.66 W	A	69	14.1	4.2
09-03-2002	07:08:51	33.92 N	117.78 W	A	33	12.9	4.8
01-06-2005	14:35:27	34.13 N	117.44 W	A	68	4.2	4.4

By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR
GREATER WITHIN 100 KM OF THE SITE

S E A R C H O F E A R T H Q U A K E D A T A F I L E 1

SITE: Downey

COORDINATES OF SITE	33.9204 N 118.1294 W
DISTANCE PER DEGREE	110.9 KM-N 92.5 KM-W
MAGNITUDE LIMITS	4.0 - 8.5
TEMPORAL LIMITS	1932 - 2007
SEARCH RADIUS (KM)	100
NUMBER OF YEARS OF DATA	76.00
NUMBER OF EARTHQUAKES IN FILE	4274
NUMBER OF EARTHQUAKES IN AREA	402

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TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR
GREATER WITHIN 100 KM OF THE SITE
(RICHTER DATA 1906-1931)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
05-15-1910	15:47:00	33.70 N	117.40 W	D	72	.0	6.0
07-23-1923	07:30:26	34.00 N	117.25 W	D	82	.0	6.3

S E A R C H O F E A R T H Q U A K E D A T A F I L E 2

SITE: a

COORDINATES OF SITE ..... 33.9204 N 118.1294 W

DISTANCE PER DEGREE ..... 110.9 KM-N 92.5 KM-W

MAGNITUDE LIMITS ..... 6.0 - 8.5

TEMPORAL LIMITS ..... 1906 - 1931

SEARCH RADIUS (KM) 100

NUMBER OF YEARS OF DATA 26.00

NUMBER OF EARTHQUAKES IN FILE 35

NUMBER OF EARTHQUAKES IN AREA 2

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By RM 8/22/08 Checked MBH 8/22/08

TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR
GREATER WITHIN 100 KM OF THE SITE
(NOAA/CDMG DATA 1812-1905)

DATE	TIME	LATITUDE	LONGITUDE	Q	DIST	DEPTH	MAGNITUDE
02-09-1890	04:06:00	34.00 N	117.50 W	D	59	.0	7.0

S E A R C H O F E A R T H Q U A K E D A T A F I L E 3

SITE: a

COORDINATES OF SITE ..... 33.9204 N 118.1294 W

DISTANCE PER DEGREE ..... 110.9 KM-N 92.5 KM-W

MAGNITUDE LIMITS ..... 7.0 - 8.5

TEMPORAL LIMITS ..... 1812 - 1905

SEARCH RADIUS (KM) 100

NUMBER OF YEARS OF DATA 94.00

NUMBER OF EARTHQUAKES IN FILE 9

NUMBER OF EARTHQUAKES IN AREA 1

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TABLE 3 (cont.)
LIST OF HISTORIC EARTHQUAKES OF MAGNITUDE 4.0 OR
GREATER WITHIN 100 KM OF THE SITE

S U M M A R Y O F E A R T H Q U A K E S E A R C H

* * *

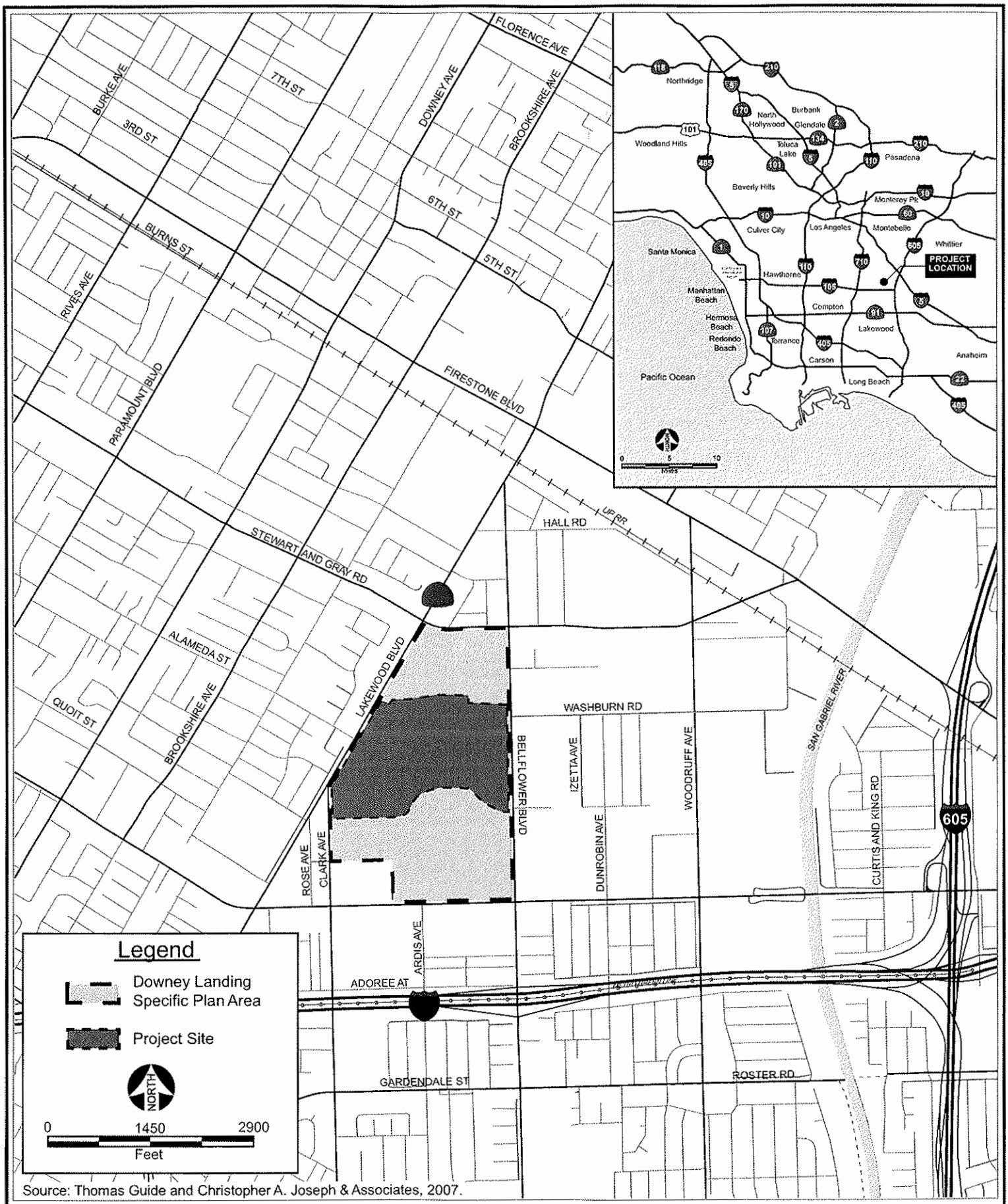
NUMBER OF HISTORIC EARTHQUAKES WITHIN 100 KM RADIUS OF SITE

MAGNITUDE RANGE	NUMBER
4.0 - 4.5	268
4.5 - 5.0	92
5.0 - 5.5	30
5.5 - 6.0	8
6.0 - 6.5	3
6.5 - 7.0	3
7.0 - 7.5	1
7.5 - 8.0	0
8.0 - 8.5	0

* * *

By RM 8/22/08 Checked MBH 8/22/08

FIGURES



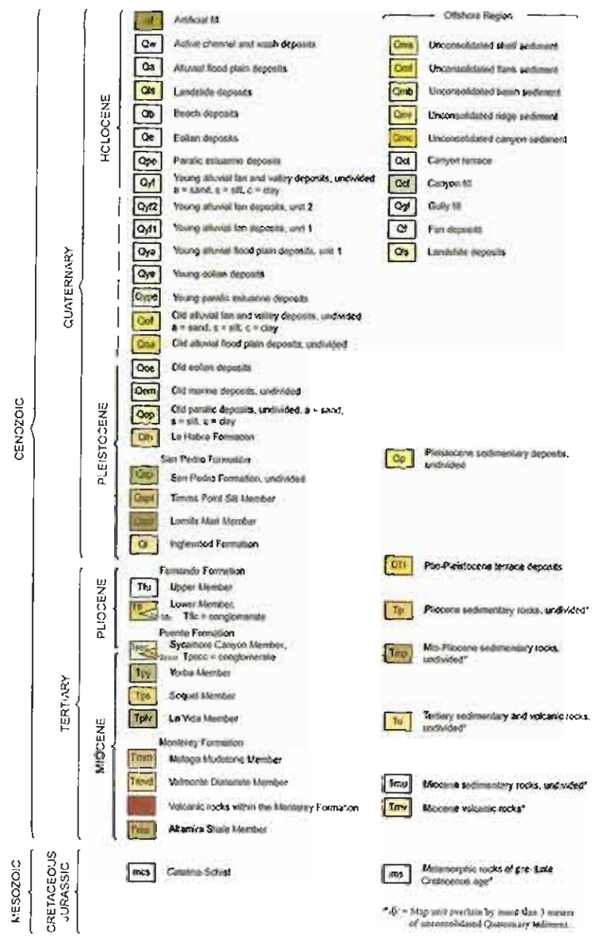
Source: Thomas Guide and Christopher A. Joseph & Associates, 2007.

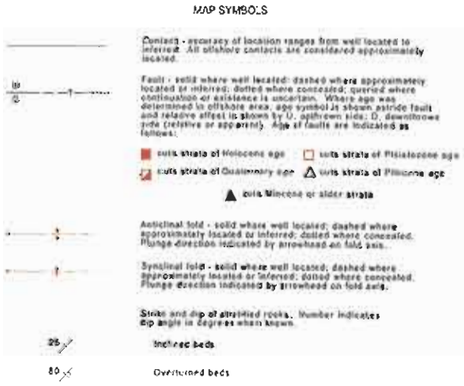
CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

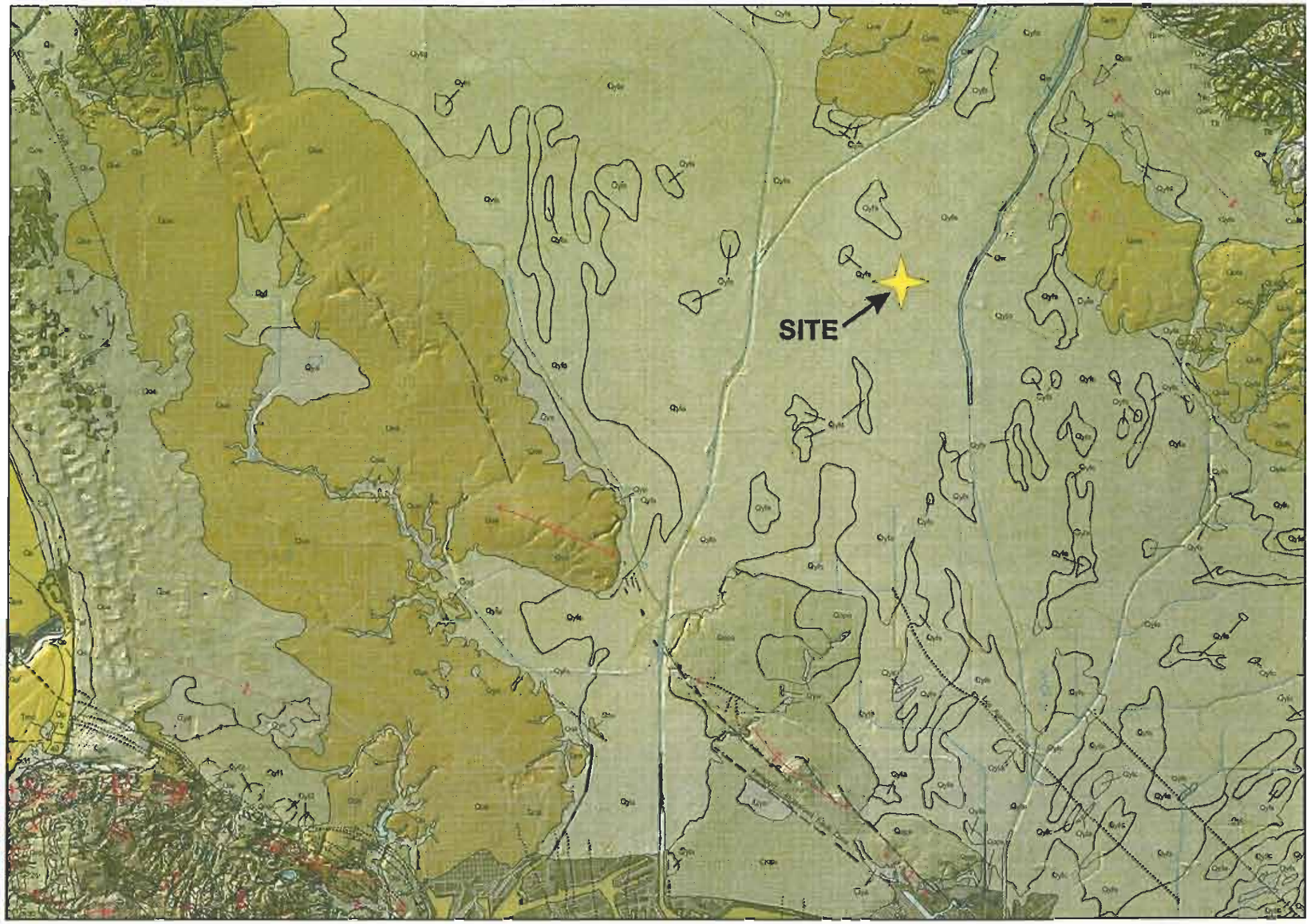
Figure 1
Regional and Project Vicinity Map

Prepared by RM Checked by MBH

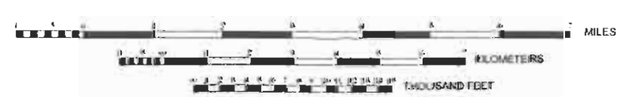
4953-08-1351 MACTEC







Base: California Geological Survey, 2003,
Geologic Map of the Long Beach 30'x 60'
Quadrangle, California, Map No. 5



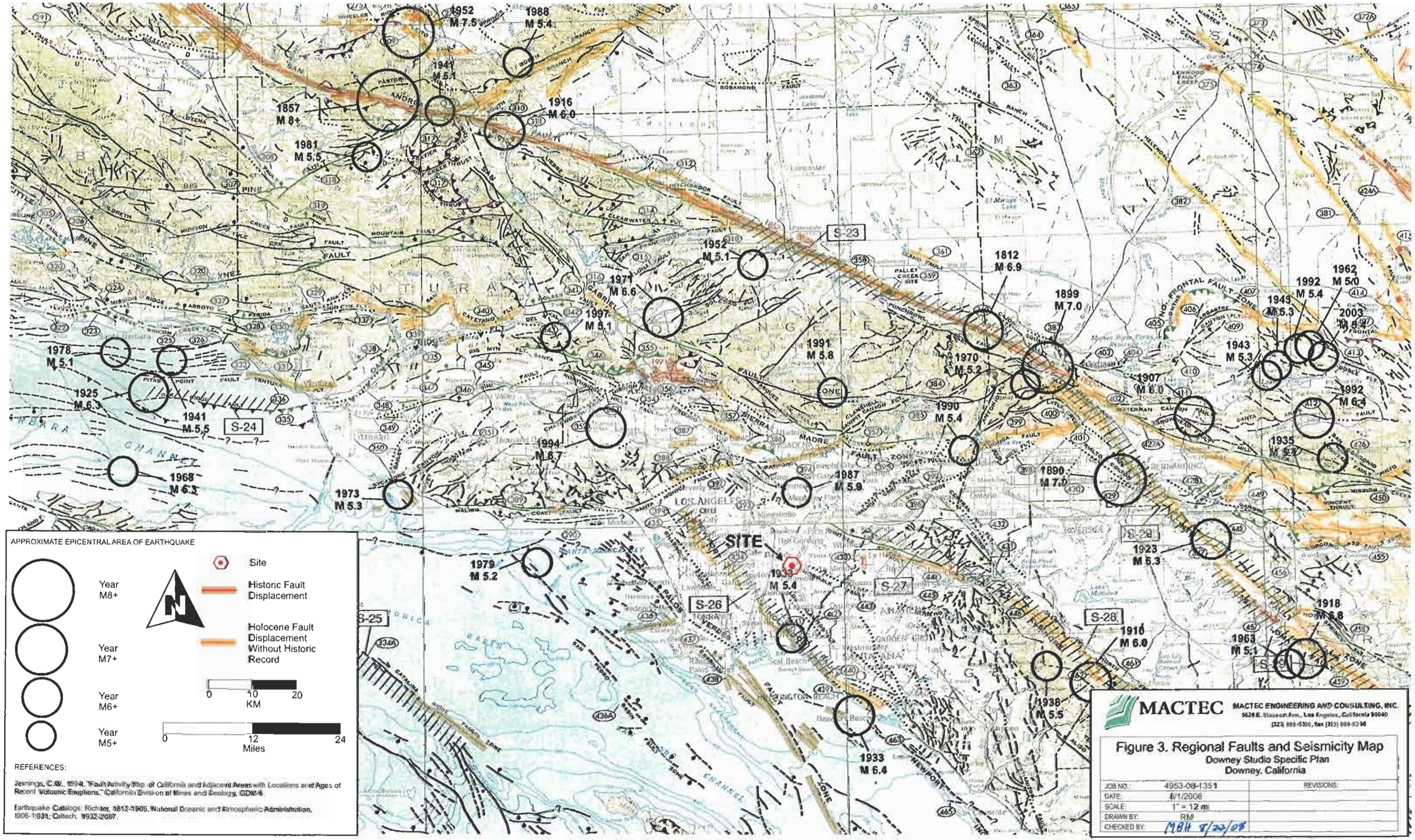
CONTOUR INTERVAL 40 METERS
BATHYMETRIC CONTOUR INTERVAL 100 METERS

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
5628 E. Slauson Ave., LOS ANGELES, CALIFORNIA 90040
(323) 889-5300, fax (323) 889-5398

Figure 2. Geologic Map
Downey Studios Specific Plan
Downey, California

JOB NO.:	4963-08-1351	REVISIONS:
DATE:	08/05/08	
SCALE:	As shown	
DRAWN BY:	RM	
CHECKED BY:	MBH 8/23/08	


1952 M 7.5
1988 M 5.4
1941 M 5.1
1857 M 8+
1916 M 6.0
1981 M 5.5
1952 M 5.1
1971 M 6.6
1997 M 5.1
1812 M 6.9
1899 M 7.0
1962 M 5.0
1992 M 5.4
1949 M 5.3
2003 M 5.2
1943 M 5.3
1978 M 5.1
1925 M 6.3
1941 M 5.5
1991 M 5.8
1970 M 5.2
1907 M 6.0
1992 M 6.4
1935 M 5.2
1994 M 6.7
1990 M 5.4
1968 M 6.2
1973 M 5.3
1987 M 5.9
1890 M 7.0
1923 M 6.3
1979 M 5.2
1933 M 5.4
1918 M 6.8
1963 M 5.1
1918 M 6.0
1938 M 5.5
1933 M 6.4
SITE
S-23
S-24
S-25
S-26
S-27
S-28
S-29
S-30
APPROXIMATE EPICENTRAL AREA OF EARTHQUAKE
Year M8+
Year M7+
Year M6+
Year M5+
Site
Historic Fault Displacement
Holocene Fault Displacement Without Historic Record
0 10 20 KM
0 12 24 Miles
REFERENCES:
Jennings, C.W., 1994, "Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions," California Division of Mines and Geology, CDM-6.
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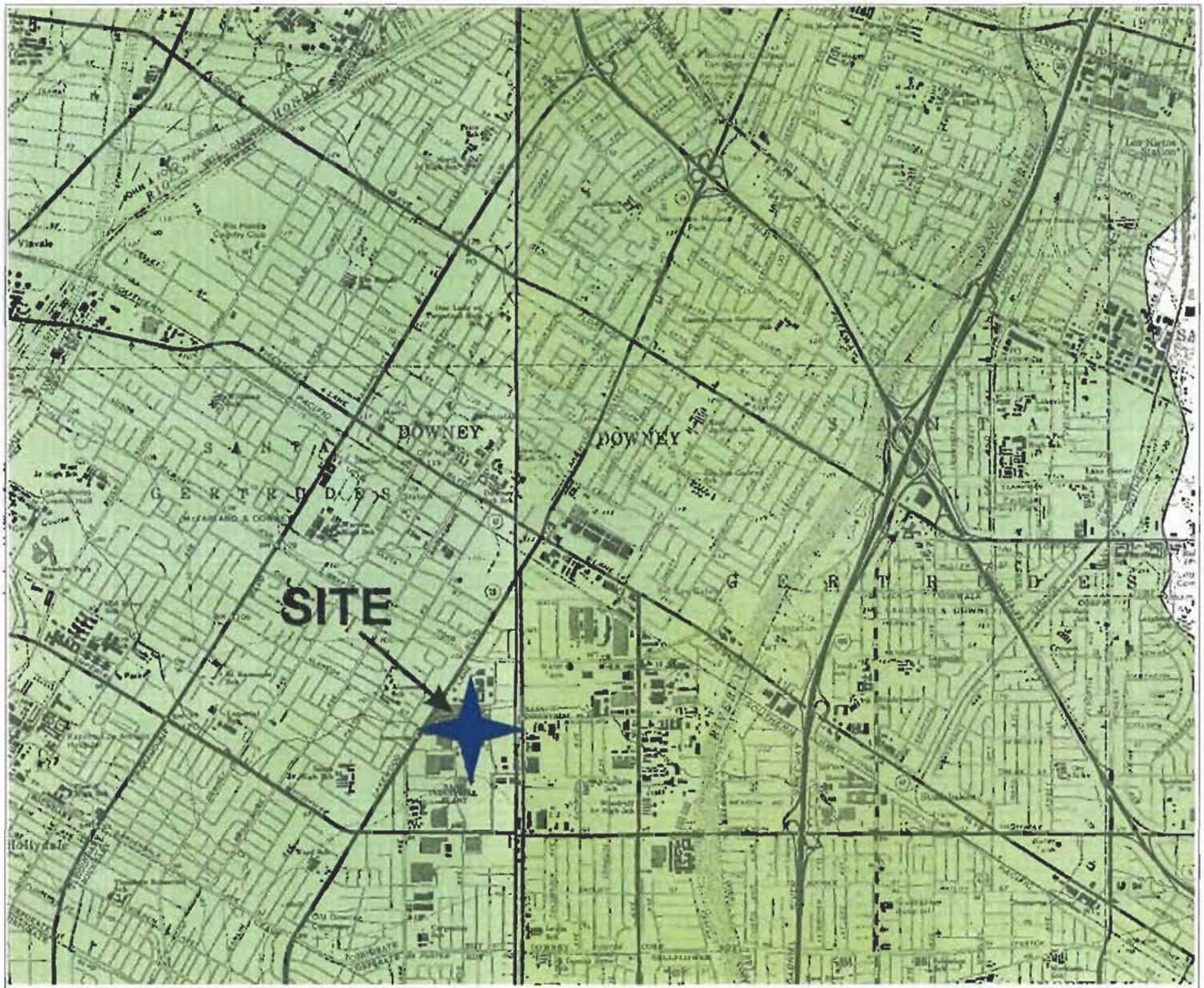
MACTEC
MACTEC ENGINEERING AND CONSULTING, INC.
5628 E. Slauson Ave., Los Angeles, California 90040
(323) 889-5300, fax (323) 889-5398
Figure 3. Regional Faults and Seismicity Map
Downey Studio Specific Plan
Downey, California
JOB NO.: 4953-08-1351
DATE: 8/1/2008
SCALE: 1" = 12 mi
DRAWN BY: RMI
CHECKED BY: MBH 8/22/08
REVISIONS:



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CDMG, 1999, Seismic Hazard Zones, South Gate Quadrangle

CDMG, 1999, Seismic Hazard Zones, Whittier Quadrangle

N

0 1 2

Mile

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

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Figure 4. Seismic Hazards Zone Map Downey Studios Specific Plan		
JOB No.:	4953-08-1351	
DATE:	8/6/2008	
SCALE:	See Bar Scale	
DRAWN BY:	RM	CHECKED BY: MBH 8/22/08

APPENDIX IV.F-1

Soil Gas Survey Central Parcel 2008

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Infrastructure, environment, facilities

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Central Parcel Area Screening Assessment Soil Gas Survey Report

Former NASA Industrial Plant
12214 Lakewood Boulevard
Downey, California

February 28, 2008

ARCADIS

Draft

Central Parcel Screening Assessment
Soil Gas Survey Report

Former NASA Industrial Plant
12214 Lakewood Boulevard
Downey, California

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February 28, 2008

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Table of Contents

1. Introduction **1**

2. Site Description and Background **2**

2.1 Central Parcel Area Ownership Status 2

2.2 Previous Use of Central Parcel Area 2

2.3 Central Parcel Current Uses 3

2.4 Regulatory Status 3

2.5 Hydrogeology 4

3. Previous Investigations **5**

3.1 1993 Investigation – Building 1 (Helipad Area) 5

3.2 NASA Environmental Baseline Surveys (NASA Parcels 1, 2 & 5) 6

3.3 1996 Subsurface Soils Investigation, Former NIP Parcels 4, 5, & 6 6

3.4 1997 Site Investigation, Former NIP Parcels 1 and 2 7

3.5 1997 Investigation – Former NIP Parcels 3, 4, 5, and 6 8

3.6 1999 and 2000 NASA Investigations - Parcels 1 and 2 10

3.7 October 2000 Environmental Sampling - Parcels 1 and 2 11

3.8 Assessment of Emerging Contaminants 12

3.9 Chromium Remediation & Assessment 13

4. 2007 Soil Gas Survey and Soil Sampling – Central Parcel Area Screening Assessment **15**

4.1 Field Procedures 16

4.1.1 Health and Safety Plan 16

4.1.2 Utility Clearance 16

4.1.3 Soil Gas Sampling 16

4.1.4 Soil Sampling 17

Draft

4.2 Analytical Results 19

4.2.1 Soil Gas Sample Results 19

4.2.2 Soil Sample Results 21

5. Data Evaluation 22

6. References 23

Tables

1. Central Parcel Summary Table – Former NASA Industrial Plant
2. Soil Gas Sample Results – EPA Method 8260B
3. Soil Gas Sample Results – TO-14
4. Soil Sample Results

Figures

1. Site Location Map
2. Site Plan
3. Site Plan Showing Historical Boring Locations within the Central Parcel Area
4. Final Soil Gas Boring Locations – October 2007
5. Tetrachloroethene (PCE) Concentrations in Soil Gas at 5 Ft. bgs
6. Trichloroethene (TCE) Concentrations in Soil Gas at 5 Ft. bgs
7. Tetrachloroethene (PCE) Concentrations in Soil Gas at 15 Ft. bgs
8. Trichloroethene (TCE) Concentrations in Soil Gas at 15 Ft. bgs

Appendices

A. Data Excerpts - Previous Site Investigations
B. Laboratory Results - 2007 Central Parcel Area Screening Assessment

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ARCADIS has prepared this site screening assessment soil gas survey report on behalf of International Risk Group, LLC (IRG) for the Central Parcel Area (CPA) of the former NASA Industrial Plan in Downey, California. The purpose of this assessment was to collect sufficient environmental data to evaluate the suitability of the CPA for future redevelopment.

The assessment included a review of available information regarding historical use of the Site to determine potential chemicals of concern, as well as a review of applicable regulatory guidance. Data collected from past environmental site investigations and the ongoing remediation of the Site were also reviewed in order to identify additional data needed in order to adequately assess the suitability of the Site for redevelopment. A sampling program was subsequently developed in order to collect the necessary environmental data.

The investigation included the collection of soil gas samples at depths of 5 and 15-feet below grade for analysis of volatile organic compounds, and collection of targeted soil samples for VOCs, metals, polychlorinated biphenyls (PCBs), petroleum hydrocarbons, and physical properties analyses. The soil gas data were compared to residential and commercial/industrial California Human Health Screening Levels (CHHSLs) for preliminary evaluation. Historical data collected from within the CPA were reviewed and considered along with the data collected from this investigation.

The data collected during this investigation did not identify any new areas of contamination within the CPA. The soil gas data obtained were generally consistent with previous sampling activities conducted within the property boundaries and most VOC concentrations were below the established CHHSLs. Tetrachloroethene (PCE) and TCE were the most commonly detected VOCs and, with the exception of carbon tetrachloride in one sample, were the only VOCs that exceeded one or more of the CHSSLs. Most of the TCE concentrations that exceeded criteria were observed within and around Building No. 1. The PCE exceedances were more sporadic and not concentrated in any one area. Since the CHHSLs are a conservative screening approach, it is recommended that a site specific risk assessment be conducted should redevelopment of the CPA go forward.

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1. Introduction

A site screening assessment of the Central Parcel Area (CPA) of the former NASA Industrial Plant (NIP) was performed by ARCADIS on behalf of International Risk Group, LLC. The Site is located at 12214 Lakewood Boulevard, in Downey, California (Figure 1). The purpose of this assessment is to provide an evaluation of the suitability of the CPA property for potential future redevelopment.

The CPA is located within the central portion of the former NIP, as shown on Figure 2. Previous subsurface investigations, including soil and soil gas surveys, have been conducted within the current CPA boundaries, although at the time of the previous investigations, former NIP nomenclature (i.e. NASA Parcels 1 through 6) was utilized to identify the areas investigated. Boring locations from previous subsurface investigations conducted within the CPA are presented in Figure 3.

This assessment included a review of available information regarding the historical use of the Site to determine potential chemicals of concern, as well as a review of applicable regulatory guidance. Data collected from past environmental Site investigations and the ongoing remediation of the Site were also reviewed in order to identify potential data gaps where it appears there was not sufficient data available to adequately assess the suitability of the Site for future redevelopment. Following the review of Site history and available data, a sampling program was developed in order to collect environmental data to address data gaps and environmental issues identified during the review of the Site history, available data, and current regulatory guidance.

The sampling program developed from the review of available information is described in the September 27, 2007 *Central Parcel Screening Assessment* (ARCADIS, 2007), The work plan recommended implementation of a soil gas sampling program to assess the occurrence and distribution of volatile organic compounds (VOCs) in soil vapor in the CPA, as well as the advancement of selected soil borings to collect soil samples for analysis of chemical quality and physical parameters that would be necessary to model potential vapor intrusion of VOCs in future redevelopment scenarios.

Between October 9 and 23, 2007, ARCADIS oversaw the installation of 88 soil gas borings for the collection of 176 soil gas samples, and 3 soil borings for the collection for 6 soil samples at the CPA of the former NIP.

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Section 2.0 provides a brief description of the Site setting, past and current use of the CPA, and its current regulatory status. A summary of previous data collected within the CPA boundaries is provided in Section 3.0 of this document. The methods and procedures used for this 2007 Site assessment, and the analytical results obtained are discussed in Section 4.0.

2. Site Description and Background

2.1 Central Parcel Area Ownership Status

The CPA of the former NIP is currently owned and leased by PCCP IRG Downey, LLC. PCCP IRG Downey owns the western portion of the former NIP, which covers approximately 59 acres, and leases the 21 acre eastern portion of the Central Parcel from its current owner, the City of Downey. The Central Parcel Area consists of areas previously referred to by NASA (NASA real estate designations) as Parcel 1, Parcel 2, and Parcel 5 (Figure 2).

2.2 Previous Use of Central Parcel Area

Historically, the CPA property was used in support of aerospace development (aircraft, missile fuselages, and space shuttle components). Building 1 (approximately 1,000,000 square feet) occupies the largest area of the CPA. Building 1 was used for manufacturing and office space. The manufacturing activities in Building 1 were primarily conducted in the eastern areas of the structure for piston driven aircraft and support for the Apollo and Space Shuttle programs.

In order to identify potential data gaps to be addressed by this Site assessment, available information on historical use of the Site was reviewed, potential chemical constituents of concern identified, and data obtained from previous environmental investigations was reviewed to determine whether sufficient data was available to assess the suitability of the CPA for potential redevelopment. The results of this review are documented in Table 1, which summarizes the former uses of the property within the Central Parcel Area, a listing of sumps and underground storage tanks, and a brief description of past soil, soil gas, and groundwater sampling performed. Recommendations for additional sampling are included where data gaps were identified. Figure 2 shows the location of the past borings/sampling locations, buildings and structures within the CPA, and the location of former sumps, and underground storage tanks.

draft

2.3 Central Parcel Current Uses

The CPA is currently used for movie production within and east of Building 1. Buildings 290 and 6 are also used for movie production. Building 9, the former cafeteria, is unused, as are Buildings 237, 135, 231, 236, 201, 235, and 246. An area within Building 1, depicted on the site location figures, was excavated to depths between 5 and 20 feet below ground surface (bgs) for installation of a large water tank used for production of a movie in 2003.

2.4 Regulatory Status

The former NIP is under the regulatory oversight of the Los Angeles Regional Water Quality Board (LARWQCB). During the 1990s and continuing until 2002, NASA conducted a number of site assessment and remediation activities under the oversight of the LARWQCB, Department of Toxic Substances Control (DTSC) and the Los Angeles County Department of Public Works (LACDPW). LACDPW was the permitting agency for the diesel underground storage tank removals and closures.

In September 2002, the LARWQCB directed NASA to initiate groundwater remediation at the property. As part of the ownership transfer from NASA to the City of Downey in fall 2003, the City of Downey entered into an agreement with International Risk Assumption Downey, LLC (IRAD) in which IRAD assumed the responsibility for conducting the required groundwater remediation. IRAD subsequently contracted with ARCADIS to perform the site remediation activities. ARCADIS prepared an *In-Situ reactive Zone Interim Measure Source Reduction Remedial Action Plan* (RAP) in May 2003 (ARCADIS 2003a). The RAP was approved by the LARWQCB in July 2003. An addendum to the RAP was approved by the LARWQCB in September 2005 (ARCADIS 2003b). Groundwater remediation activities have been conducted within the CPA since 2006.

Groundwater remediation is currently being conducted within the CPA, consistent with the August 2005 Addendum to the Interim RAP under the continued oversight of the LARWQCB. Groundwater injection and monitoring wells have been installed north and south of Building 1 related to the in-situ groundwater remediation system. Wells associated with the remedial actions are shown on Figure 2, along with the extent of the VOCs in groundwater beneath the CPA.

At the time of the property transfer from NASA to the City of Downey, future commercial/industrial development of the CPA was anticipated. In order to address the potential for encountering soil impacted with contaminants of concern during future development activities, a Risk Management/Soil Management Plan (RMSMP)

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(ARCADIS, 2003c) was prepared and submitted to the LARWQCB by ARCADIS in October 2004. The RMSMP, which was approved by the LARWQCB in April 2005, established a pre-approved protocol for implementation of contingency actions necessary or appropriate to address previously unidentified impacted soil areas discovered during site development activities. The LARWQCB has not required additional assessment within the CPA related to the current land uses and remediation.

2.5 Hydrogeology

The site is located at the southern end of the Montebello Forebay of the Central Groundwater Basin situated within the Downey Plain (DWR 1961). The channel of the Los Angeles River is located approximately 2.5 miles to the west, and the channel of the San Gabriel River is located approximately ¾-miles to the east of the project site. The channel of the Rio Hondo River intersects the Los Angeles River approximately 2.5 miles to the northwest of the project site. Regional groundwater movement measured in wells with screens situated at depth is estimated to be to the south-southwest (LACDPW 1994). Stratigraphic cross-sections developed by the Department of Water Resources (DWR) suggest that the project site is underlain by recent alluvium composed of undifferentiated fine-grained materials followed by coarser-grained materials referred by the DWR as the Gaspur Aquifer. This unit is underlain by the Lakewood Formation, which is composed of the Artesia Aquifer and Gage Aquifer. This formation is underlain by the San Pedro Formation, which is composed of the Hollydale, Lynwood, and Silverado aquifers (DWR 1961).

The stratigraphic information generated in previous investigations suggests that the Site is underlain from the surface to approximately 50-feet bgs with fine-grained sediments consisting of interbedded silty sand, sandy silt, clayey silts, and silty clay. This interbedded fine-grained unit is underlain to approximately 130-feet bgs by a fine to medium-grained sand with occasional medium- to coarse-grained sand and fine gravel. This sandy unit is underlain by silt to the maximum depth investigated to-date (135-feet bgs). First groundwater has been observed within this sandy unit, however historical water elevation data collected from on-site monitoring wells and off-site LACDPW monitoring wells suggest that groundwater elevations may have been 10-to 20-feet higher in the past. Groundwater elevation data collected by previous consultants suggests that the depth to groundwater beneath the Site is generally between 48 and 56 feet bgs, with a range in groundwater surface elevation of 44.58 to 48.06 ft above mean sea level (amsl). Groundwater has been previously documented to flow in a southerly direction at an estimated gradient of 0.001 feet per foot.

3. Previous Investigations

Since the mid-1990s, when NASA began planning for the shutdown of its industrial activities at the NIP, a series of extensive site investigations and remediation activities were conducted at the NIP, which included areas within the current CPA property boundaries. Although the previous investigation areas also included parcels outside of the CPA (former NASA Parcels), this Site assessment report focuses on the data collected from within the CPA for the purposes of evaluating this parcel for future redevelopment.

3.1 1993 Investigation – Building 1 (Helipad Area)

Historically, wastes generated in the manufacturing area of Building 1 may have been released to the ground surface within grassy areas surrounding the Helipad Area, located in the northern portion of the Central Parcel Area (Figure 2) (Fugro-McClelland 1993). In April 1993 an environmental assessment of the Helipad Area was performed on behalf of Rockwell International (Fugro-McClelland 1993). The 1993 investigation was conducted to evaluate shallow stratigraphy and determine the presence or absence of soil contamination in the vicinity of the Helipad Area. A total of 19 soil borings (CPT-1 through CPT-19) were drilled to a maximum depth of 63 feet bgs (for lithology) and soil samples were collected to a maximum depth of 40 feet bgs. The historical soil boring locations are shown on Figure 3. Soil samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) pH, and/or California Assessment Manual (CAM) metals. A copy of the 1993 Fugro-McClelland assessment report entitled *Environmental Site Assessment Helipad Area, NASA Industrial Facility, Downey, California*, which was submitted to DTSC by NASA, is provided in Appendix A (Appendix A-1). A brief summary of the soil analytical results as they pertain to the CPA is provided below.

Trichloroethene (TCE) was the only VOC detected in soils, and the distribution was limited to three soil borings located north of the helipad. TCE was observed in samples from borings CPT-2 [8.6 micrograms per kilogram (µg/kg) at 20-feet bgs], CPT-6 (5.6 µg/kg at 20-feet bgs), CPT-7 (5.6 µg/kg at 27-feet bgs and 15.0 µg/kg at 40-feet bgs). Each of these borings is located north of the helipad. SVOCs were not detected in any of the soil samples analyzed. TPH (in the gasoline to motor oil ranges) was not detected in any of the soil samples analyzed. Metals including arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc were detected in several soil samples, at levels within the naturally occurring limits for these elements (Fugro-McClelland 1993). Soil Ph values ranged from 7.8 to 9.1 with most samples

exhibiting a pH of approximately 8. Based on these results, no further action was performed by NASA at the Helipad area.

3.2 NASA Environmental Baseline Surveys (NASA Parcels 1, 2 & 5)

In the mid-1990s as NASA began planning for the shutdown of its industrial activities at the NIP, it initiated a process to prepare an Environmental Baseline Survey (EBS) for each of the NIP parcels that NASA had designated (Parcels 1 – 6). The EBS process consisted of completing a comprehensive site assessment of the property, and documenting the historical use of the NIP through review of available historical documents regarding site use, chemical use and handling practices, waste disposal practices, review of aerial photos and historical maps, interviews with employees, and performing a visual site inspection of the property and buildings. During this process, potential environmental issues were identified and NASA sponsored the completion of appropriate initial site investigations to evaluate the potential presence of environmental contaminants.

3.3 1996 Subsurface Soils Investigation, Former NIP Parcels 4, 5, & 6

A limited soils investigation of NIP Parcels 4, 5 and 6 consisting of 18 borings to a maximum depth of 45 feet bgs, was conducted in August 1996 (Groundwater Resources Consultants, Inc., 1996). Twelve of the borings (P5-1 through P5-4, P5-6, XP5-1 through XP5-4, and P6-1 through P6-3) were advanced within the footprint of the CPA and 26 soil samples were collected and submitted for analysis of TPH, VOCs, and/or SVOCs. Figure 3 identifies the boring locations within the CPA. Excerpts from the Groundwater Resources Consultants report titled *Subsurface Soil Investigation, Parcels 4, 5 and 6, NASA Industrial Plant, Downey, California* have been provided in Appendix A (Appendix A-2).

Three soils samples (one each from borings P6-1, P6-2 and XP5-3) had detectable concentrations of TCE that ranged from 7.4 to 64 μg/kg (P6-2). One soil sample collected from boring XP5-4 had a reported concentration of TPH (identified as motor oil) of 520 mg/kg. Soil samples collected in the CPA as part of this limited soils investigation were not analyzed for metals. No other detections were noted in soil samples collected in the CPA.

3.4 1997 Site Investigation, Former NIP Parcels 1 and 2

An initial site investigation of NIP Parcels 1 and 2 consisting of the advancement of 35 borings and the collection of soil and groundwater samples was completed in February and March 1997 (Earth Tech, Inc., 1997). The borings were located in areas of suspected contamination based on a review of chemical and hazardous material usage at NIP, as identified in the EBS report. Eleven of the 35 borings (SB-1, SB-19 through SB-24, SB- 26, SB-28, SB-29, and SB-34) were advanced within the footprint of the CPA. The borings drilled in the CPA are shown on Figure 3. One or more soil samples were collected from each advanced boring and selected soil samples were analyzed for VOCs, SVOCs, metals and/or TPH. Additionally, at four of the borings (SB-19, SB-20, SB-24 and SB-34), groundwater samples were collected using a HydroPunch ® sampling device and analyzed VOCs, SVOCs, metals, and/or TPH. Excerpts from the Earth Tech report titled *Initial Site Investigation Report, Parcels I and II, NASA Industrial Plant, 12214 Lakewood Boulevard, Downey, California 90241-7009* have been provided in Appendix A (Appendix A-3).

SVOCs and TPH were not detected at reportable concentrations in analyzed soil samples collected in the CPA. Two boring locations had detectable concentrations of Tetrachloroethene (PCE) (SB-21 @ 10 feet bgs - 16 μg/kg and SB-22 @ 10 feet bgs - 11 μg/kg), three boring locations (SB-19, SB-20 and SB-34) had detectable concentrations of acetone that ranged from 51 to 68 μg/kg, and one boring location had detectable concentrations of methylene chloride (SB-20 @ 35 feet bgs – 21 μg/kg). Acetone and the methylene chloride detections generally occurred between sample depths of 20 to 40 feet bgs and samples collected above and below those depths did not have reportable concentrations of VOCs. PCE detections occurred in soil samples collected in no greater than 10 feet bgs in the CPA as part of this investigation. No other VOCs were detected in soil samples collected and analyzed in the CPA as part of this investigation.

Low concentrations of metals were identified in soil samples collected within the CPA as part of this investigation. Reported metals concentrations did not exceed Total Threshold Limit Concentrations (TTLCs). The arsenic concentrations generally exceed 2004 Environmental Protection Agency (EPA) Region IX residential and industrial Preliminary Remediation Goals (PRGs), although the detected concentrations generally fell within the range of published Southern California background levels of up to 15.2 milligrams per kilogram (mg/kg) (CalEPA, 1992). Four of the borings (SB-1, SB-19, SB-22 and SB-34) had soil samples with detected arsenic concentrations that exceeded the published Southern California background levels, however, all of these

samples were collected at depths of 10 feet bgs or greater. No other metals were identified at concentrations that exceed PRGs.

SVOCs and TPH were not identified in the groundwater samples collected from borings within the CPA. Low concentrations of metals were identified in the four groundwater samples and antimony was reported at or marginally above the published Maximum Contaminant Level (MCL) of 0.006 milligram per liter (mg/l) in two of the samples (SB-20 – 0.010 mg/l and SB-24 – 0.006 mg/l). No other metal was reported at a concentration that exceeded published MCLs for the State of California. TCE was identified in all four groundwater samples at concentrations ranging from 29 to 250 microgram per liter (µg/l) (at SB-19), cis-1,2-dichloroethene was identified in three groundwater samples at concentrations ranging from 6.6 to 24 µg/l (SB-20), and benzene was identified at 6.2 µg/l in SB-20. No other VOC was reported at a concentration that exceeded published MCLs.

3.5 1997 Investigation – Former NIP Parcels 3, 4, 5, and 6

In November and December 1997, 78 soil vapor borings and 13 soil borings were drilled and sampled at the NIP to evaluate soil conditions within former NIP Parcels 3, 4, 5, and 6 (SCS Engineers February, 1998). Of these, 33 of the soil vapor borings SV-9 through SV-30, SV-32 through SV-37, and SV-75 through SV-78), and 4 soil borings (BH5-2 through BH5-5) drilled within (and just outside of) former Parcel 5 correspond to the areas within the boundaries of the CPA (Figure 3). A total of 33 soil vapor samples collected within the CPA were analyzed for VOCs. A total of 22 soil samples collected within the CPA were analyzed for VOCs, TPH, and trace metals. A copy of the boring location map and analytical data tables from the February 1998 SCS Engineers report entitled *Soil Investigation Report Parcels 3, 4, 5, and 6, NASA Facility, Downey, California*, is provided in Appendix A (Appendix A-4). A brief summary of the analytical results from data collected within the current CPA site boundaries is provided below (please note that other data collected from outside of the current CPA boundaries are not discussed).

All of the borings drilled within the current CPA boundaries as part of the 1997 investigation were located in the eastern portion of the CPA. Soil gas samples were collected from 5-feet bgs at each location (33 samples collected within the CPA). The following VOCs were detected in the soil gas samples associated with the CPA:

- PCE: PCE was only detected in 1 soil gas sample (SV-9) collected within the CPA, at a concentration of 19 µg/l.

- 1,1-Dichloroethene (1,1-DCE): 1,1-DCE was detected in 6 of the soil gas samples collected within the CPA (SV-12, SV-13, SV-23, SV-24, SV-26, SV-37), at concentrations ranging from 1 µg/l (SV-13) to 2.9 µg/l (SV-12).

- 1,1,1-Trichloroethane (1,1,1-TCA): 1,1,1-TCA was detected in 2 of the soil gas samples collected within the CPA (SV-25 and SV-26), at concentrations of 39 µg/l and 5.2 µg/l, respectively.

- 1,1,2-trichlorethane (1,1,2-TCA): 1,1,2-TCA was detected in 5 of the soil gas samples collected within the CPA (SV-12, SV-23, SV-24, SV-25, and SV-26) at concentration ranging from 1.5 µg/l (SV-24) to 4.8 µg/l (SV-26).

- Freon 113: Freon 113 was detected in 5 of the soil gas samples collected within the CPA (SV-13, SV-25, SV-19, SV-21, and SV-75) at concentrations ranging from 4.1 µg/l (SV-21) to 41 µg/l (SV-25).

No other VOCs were detected in the soil gas samples collected within the CPA during the 1997 investigation. In general, the highest VOC concentrations within the CPA were observed in Building 235, near the southeastern corner of the parcel boundary (although PCE and TCE were not detected in soil gas samples from these locations). As described below, additional investigation was conducted in this area to further evaluate subsurface soils.

Five soil borings were drilled and soil samples were collected based on the results of the soil gas survey and/or historical uses of the property. Soil borings BH5-1 and BH5-2 were drilled within Building 235 based on soil vapor results and previous use of Building 235 as hazardous waste storage. These borings were sampled to a depth of 40 feet bgs. Borings BH5-3 and BH5-4 were drilled within Building 237 based on visual staining. These borings were sampled to a depth of 10 feet bgs. Boring BH5-5 was drilled in the vicinity of SV-9 based on the soil vapor results. This boring was sampled to a depth of 40 feet bgs.

Low concentrations of chloroform (up to 9 µg/kg) and TCE (up to 12 µg/kg) were reported in the 15- and 20-foot samples of boring BH5-1. Concentrations of TCE and cis-1,2-DCE were detected in the 40-foot soil samples at borings BH5-1 (173 µg/kg and 6 µg/kg, respectively) and BH5-2 (117 µg/kg and 8 µg/kg, respectively). The 40-foot samples were reportedly very moist to wet and appeared to be collected from at or near the soil/groundwater interface. As such, these detections were attributed to a

groundwater source (SCS Engineers 1998). As noted above, groundwater beneath the CPA (and other areas of the former NIP) is currently being remediated.

Low concentrations of PCE were reported in the 5-foot (17 µg/kg), 15-foot (6 µg/kg), and 20-foot (12 µg/kg) soil samples from boring BH5-5. Xylenes (8 µg/kg) were detected also detected in the 5-foot sample from this boring.

No other VOCs were detected in soil samples collected from within the CPA (soil samples from borings BH5-3 and BH5-4, drilled in Building 235, did not exhibit any VOC concentrations). TPH was not detected in any of the soil samples collected from the CPA. Low concentrations of trace metals, typical of background concentrations (SCS Engineers 1998), were detected in samples from all four borings drilled within the CPA.

The data from this investigation documented only minor impacts to soils within the boundary of the CPA. The conclusions were based on the generally low concentrations of VOCs detected in soil gas and low to non-detect concentrations observed in soils above 40-feet bgs. Based on the VOC concentrations detected, it was stated that additional borings did not appear warranted in the areas investigated within the Building 235 area and former NIP Parcel 5 (areas associated with the CPA).

3.6 1999 and 2000 NASA Investigations - Parcels 1 and 2

Between December 1999 and April 2000, three phases of investigation were conducted within former NIP Parcels 1 and 2 to evaluate soil and groundwater beneath these areas under LARWQCB direction and oversight. The LARWQCB case worker at the time visually inspected the site, including walking through Building 1, and selected locations for soil borings near sumps, clarifiers, and chemical process tanks.

Several of the soil gas points and soil borings drilled in April 2000 were located within the current CPA property boundaries. Copies of the boring location maps and analytical data tables from the September 2000 Earth Tech report entitled *Additional Site Assessment Report Parcel I and Parcel II NASA Industrial Plant, 12214 Lakewood Boulevard, Downey, California,* is provided in Appendix A (Appendix A-5). A brief summary of the analytical results from soil and soil gas data collected within the current boundaries of the CPA is provided below (please note that other data collected from outside of the current CPA boundaries are not discussed).

In April 2000, sixteen soil gas points were installed at various locations within the former NIP (Earth Tech 2000). Of these, four soil gas points (NASA B1-SG31-01, NASA B1-SG32-01, NASA TK18SG3301, and NASA TK18SG3401) were installed within the CPA property boundaries. The locations of these soil gas points are shown on Figure 3. The purpose of the sampling efforts was to evaluate soil gas concentrations inside of Building 1 (in the area of a reported former vapor degreaser) and in the vicinity of a former underground storage tank (UST). At each location, soil gas samples were collected from depths 10 feet bgs and analyzed for VOCs.

Both of the 10-foot soil gas samples within Building 1, NASA B1-SG31-01 and NASA B1-SG32-01, contained TCE at concentrations of 8 µg/l and 19 µg/l, respectively. The sample from NASA B1-SG31-01 also contained low concentrations of Freon-113 (2 µg/l), toluene (µg/l), and m,p-xylenes (1 µg/l). No other VOCs were detected. The 10-foot soil gas samples collected near the former UST, NASA TK18SG3301 and NASATK18SG3401, contained concentration of TCE (16 µg/l and 10 µg/l, respectively) and Freon-113 (42 µg/l and 20 µg/l, respectively). No other VOCs were detected.

Also in April 2000, three hand auger soil borings were advanced in Building 1 (B1-HA1-SS through B1-HA3-SS) and 1 hand auger boring was advanced adjacent to Building 290 (B290-HA2-SS) to evaluate shallow soils in these areas. The locations of these soil borings are shown on Figure 3. At each location, soil samples were generally collected from depths of 5- and 10-feet bgs and analyzed for VOCs, SVOCs, and CAM metals.

VOCs and SVOCs were not detected in any of the soil samples collected within the CPA. Low concentrations of metals including antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, vanadium, zinc, and mercury were detected in each sample collected.

Data from the April 2000 investigation activities indicated limited VOC impact to soils within the current CPA boundaries. The report did not document any additional recommended work within the CPA area and the LARWQCB did not direct NASA to conduct any additional assessment of the CPA based on the results of this investigation.

3.7 October 2000 Environmental Sampling - Parcels 1 and 2

Eighteen direct-push soil borings were advanced to a maximum depth of 20 feet bgs at locations of suspected contamination throughout Parcels I and 2 of the NIP, between

October 24 and 26, 2000 (Slosky & Company, Inc., 2000). A soil sample was collected at the termination of each soil boring. Ten of the borings (PIEZGP-4, PIIEZGP-5 through PIIEZGP-12, and PIIEZGP-14) were located within the CPA (Figure 3). Soil samples collected in the CPA were analyzed for VOCs, SVOCs, TPH, RCRA metals and/or cyanide. A copy of the Slosky & Company report titled *Preliminary Results of the October 2000 Environmental Sampling, NASA Industrial Plant, Downey, California* has been provided in Appendix A (Appendix A-6).

The soil sample collected at boring PIIEZGP-5 had the single VOC detections (toluene – 5.2 μg/kg and total xylenes – 15 μg/kg), the sample at PIIEZGP-7 had the single SVOC detection (di-n-butyl phthalate – 580 μg/kg) and the samples at PIIEZGP-5 and PIIEZGP-6 had the two TPH detections (max concentration of 37 mg/kg). All ten soil samples collected in the CPA had concentrations of arsenic (2.6 to 11.2 mg/kg) that exceed the October 2004 EPA Region IX commercial and industrial PRGs, however, the reported concentrations are within the documented range of Southern California background levels for arsenic in soil (CalEPA, 1992). No other detections were noted as part of the investigation conducted in October 2000 within the CPA.

3.8 Assessment of Emerging Contaminants

By letter dated April 11, 2002, the LARWQCB directed NASA to conduct groundwater sampling to evaluate the potential presence of three emerging contaminants: perchlorate, 1,4-dioxane, and N-Nitrosodimethylamine (NDMA). This required sampling was conducted by Earth Tech in April 2002 as part of NASA's groundwater monitoring program (Earth Tech, 2002). Earth Tech collected groundwater samples for analysis of the three emerging contaminants from four monitoring wells located within the CPA (PI-MW-08, PI-MW-09, PII-MW-04 and PII-MW-05) (Figure 2). Excerpts from the Earth Tech report entitled *Groundwater Monitoring and Upgradient Hydropunch Sampling Report – Second Quarter 2002, NASA Industrial Plant, 12214 Lakewood Boulevard, Downey, California 90241-7009* have been provided in Appendix A (Appendix A-7). A summary of results for data collected within the CPA is provided below.

Perchlorate was not detected above the LRL of 4 μg/l in the four wells sampled within the CPA. 1,4-dioxane was detected in all four groundwater well samples at concentrations ranging from 1.4 to 7.7 μg/l (monitoring well PI-MW-09). NDMA was detected in all four groundwater samples at concentrations between 0.0014 and 0.0033 μg/l (monitoring well PI-MW-08).

There are currently no established regulatory drinking water standards (MCLs) for 1,4-dioxane or NDMA. In December 1997, the State of California Department of Health Services issued an Action Level (later termed a Notification Level) of 3 µg/l for 1,4-dioxane concentrations in drinking water, which only the groundwater sample at PI-MW-09 (7.7 µg/l) exceeded. Notification levels are health-based advisory levels for chemicals in drinking water that are not considered to pose a significant health risk to people drinking the water on a daily basis, and which no formal regulatory standards (i.e., MCLs) have been established.

In December 2006, The Office of Environmental Health Hazard Assessment (OEHHA) of the California Environmental Protection Agency announced a Public Health Goal (PHG) concentration of 0.003 µg/l for NDMA in drinking water, which only the groundwater sample collected at PII-MW-08 (0.0033 µg/l) exceeded. PHGs are drinking water contaminant levels at which adverse health effects are not expected to occur over a lifetime of exposure. OEHHA published PHGs may be considered by Department of Health Services (DHS) in the development of future drinking water standards (MCLs).

3.9 Chromium Remediation & Assessment

In July 2003, The City of Downey and Downey Studios undertook the construction of a large concrete-lined pool inside Building 1 of the NIP to be used as a set for movie productions. This structure is located within the CPA, as shown on Figure 2. The construction of the pool included the excavation of soil beneath the building to a depth of 20 feet. No odors or visible staining of soil was reportedly observed during the pool excavation although the excavation was conducted under poor indoor lighting conditions and with water used to minimize dust. Excavated soil was stockpiled on a concrete/asphalt surface outside of Building 1. Soil sampling of the approximately 20,000 cubic yard stockpile was conducted by the City of Downey after stained soil was observed in the stockpile. The results of initial soil sampling revealed concentrations of the metal, chromium, that ranged from 3,300 to 6,800 mg/kg in stained portions of the stockpile (IRG Assumptions, LLC., 2003). A soil sample collected from the stockpile that did not exhibit staining had a chromium concentration of 27 mg/kg.

Upon receiving the analytical results, Downey Studios halted further construction of the pool (excavation work was finished and the pool was 20-percent paved by this time) and arranged for the soil stockpile to be covered with plastic sheeting. The partially completed pool was subsequently subjected to a site investigation in which a grid-

sampling pattern was followed for the collection of 63 soil samples from the open excavation (bottom and sidewall samples). Total chromium in the 63 soil samples ranged from 24 to 62 mg/kg. Hexavalent chromium was detected in 23 of the 63 soil samples ranging in concentration from 0.2 to 1.1 mg/kg. All of the soil sample results were far below the USEPA Region IX PRGs for residential or industrial/commercial land use. The results suggested that it is likely that a limited release of chromium may have occurred during historical operations within Building 1 and that the impacted soil had been completely excavated and relocated to the soil stockpile area. A copy of the IRG Assumptions LLC letter entitled *Transmittal of Soil Sampling Report, Building 1 Water Pool Excavation, Downey Studios Site,* is provided in Appendix A (Appendix A-8).

A previous groundwater investigation conducted by NASA in November 2001 (Earth Tech, 2001) had collected groundwater samples from monitoring wells PI-MW-08 and PI-MW-09 (Figure 2) that had been analyzed for chromium VI at the request of the City of Downey. The groundwater samples had concentrations between 0.53 and 0.83 µg/l, both well below the DHS MCL of 500 µg/l for chromium (total). Groundwater samples from five additional monitoring wells outside of the CPA were also analyzed for chromium VI and none of the additional samples exceeded the DHS MCL. These groundwater results suggest that the elevated concentrations of chromium in soil excavated from within Building 1 had not impacted groundwater in the CPA.

The results of the investigation of the pool excavation were provided to the LARWQCB during a meeting on September 26, 2002 during which an approach to characterizing the stockpiled soil was discussed. A work plan for testing and segregating impacted soil in the soil stockpile was submitted to the LARWQCB (Leymaster, 2003) and approved by letter dated October 22, 2003. Analytical testing and segregation of the soil stockpile was subsequently completed in October 2003 and approximately 6,850 cubic yards of soil identified as chromium impacted was disposed of as non-hazardous waste at the Lancaster Landfill. Non-impacted soil was scheduled for reuse at the Downey Studios site. A final report summarizing the sampling and disposal of the soil stockpile was submitted to the LARWQCB in May 2004 (Leymaster, 2004). By letter dated June 22, 2004, the LARWQB approved the reuse of a portion of the soil stockpile based on the sampling results and no further action was required related to the chromium-impacted soil.

4. 2007 Soil Gas Survey and Soil Sampling – Central Parcel Area Screening Assessment

As discussed above, soil and soil gas sampling has previously been conducted within the CPA to evaluate subsurface conditions at the property. Following a review of information on historical use of the property and previous site assessment data, a sampling plan to collect additional soil gas and soil samples was developed in an effort to fill data gaps necessary to evaluate the CPA for potential redevelopment. This sampling plan was described in the CPA Screening Assessment Work Plan dated September 27, 2007 (ARCADIS, 2007). A soil gas survey consisting of ninety soil vapor points (ASG-01 through ASG-90) was planned for this program, which also included collecting soil samples from borings at three additional locations.

ARCADIS conducted the soil gas survey in the CPA of the former NIP between October 9 and 27, 2007. A total of 88 soil vapor boring were drilled between October 9 and 24, 2007 for the collection of 176 soil gas samples. Refusal was encountered at two of the planned vapor point locations, ASG-10 and ASG-89, which resulted in no sample collection at those locations. Several of the proposed locations in the work plan had to be moved due to safety reasons, traffic, underground pipes, or studio work. The approximate locations of the final soil gas borings are shown on Figure 4. The soil gas sampling was conducted in accordance with the general guidelines set forth in the following agency guidance documents:

- DTSC, 2003. Advisory - Active Soil Gas Investigation, January 28.
- LARWQCB, 1997. Interim Guidance for Active Soil gas Investigation, February 25.
- DTSC, 2004. Vapor Intrusion Guidance Document – final Interim. December 15 (Revised February 7, 2005)

In addition to the soil gas sampling efforts, this investigation included advancement of 3 soil borings (ASB-01 through ASB-03) in the northeast corner of the CPA, for the collection of 6 soil samples (not including quality assurance/quality control samples). The field methods and analytical results from the 2007 investigation activities are provided in the following sections.

4.1 Field Procedures

4.1.1 Health and Safety Plan

A site-specific Health and Safety Plan (HASP) was prepared for the site that identifies potential hazards associated with subsurface investigation activities. The HASP is consistent with current Federal Occupational Safety and Health Administration (OSHA) requirements for hazardous waste operations [29 Code of Federal Regulations (CFR) 1910.120 (e) and (f) and California Code of Regulations (CCR) Title 8, Section 5192]. All field personnel were required to read and sign the HASP prior to performing work at the former NIP. A copy of the HASP and related documentation was kept on site throughout the well installation and sampling program.

4.1.2 Utility Clearance

Underground and overhead utilities were cleared at each location prior to the start of drilling activities. Underground Service Alert (DigAlert) was notified a minimum of 48 hours in advance of drilling activities.

4.1.3 Soil Gas Sampling

InterPhase Environmental, Inc, of Los Angeles, California, was subcontracted to drill and install 88 soil gas points (ASG-01 through ASG-9, ASG-11 through ASG-88, and ASG-90) within the CPA (Figure 4). In general, soil gas samples were collected from target depths of 5- and 15-feet bgs. In instances where refusal was encountered and/or where sufficient flow was unachievable for sample collection, a step-out boring was drilled within 2-feet of the original location and re-sampled. Step-out borings were necessary at locations ASG-45, ASG-47, ASG-68, and ASG-80. The 15-foot vapor samples were collected from step-out locations at borings ASG-45, ASG-68 and ASG-80 due to limited flow from the original location at 15-feet. A 15-foot sample was not collected at ASG-47 due to limited vapor flow at that particular depth in both the original and step-out boring (a vapor sample was successfully collected at the 5-foot depth).

At each vapor point location, a hollow stainless steel probe rod was advanced to 15-feet bgs. Once the target depth was reached, ¼-inch polyethylene tubing equipped with a 9-inch perforated implant was inserted through the rods, and the sample point was backfilled with clean No. 2/12 sand, to approximately 1-foot above the perforated zone, and bentonite grout, to approximately 5-feet bgs. A second vapor point implant

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was installed at 5-feet bgs, in the same manner as the 15-foot sample, for collection of the 5-foot vapor sample. Prior to sample collection at each depth, a digital pump (pre-set to pump at a rate no higher than 200 milliliters [ml] per minute) was connected to the sample tubing. A purge volume for the vapor points was estimated to be approximately 100 mL per volume of soil gas. This estimation was based on a summation of the volumes of the tubing and annulus around the vapor point tip. Each vapor point was initially purged of approximately 3 pore volumes of air prior to collecting a sample. Once the appropriate pore volume had been purged, a vapor sample was collected into a 125 mL glass bulb.

Following collection, the soil gas samples were immediately transferred to an onsite mobile laboratory and analyzed for VOCs by EPA Method 8260B. Centrum Analytical Laboratories, Inc., of Riverside California, provided the mobile laboratory services.

A total of 11 duplicate (confirmation) soil gas samples were collected and submitted to a fixed-base laboratory for confirmation of the field laboratory results. Each confirmation sample was collected into a 6-liter Summa™ canister and transported to Cal Science Environmental Laboratories (Cal Science) of Garden Grove, California, for analysis of VOCs using EPA Method TO-15.

With the exception of vapor points ASG-24, ASG-26, and ASG-37, the tubing for each soil gas sampling point was removed following completion of sampling. Sample points ASG-24, ASG-26, and ASG-37 were left in place for potential future use as methane monitoring points as part of the groundwater remediation program for the NIP.

4.1.4 Soil Sampling

Three soil borings, ASB-01, ASB-02, and ASB-03, were drilled near the southeast corner of the CPA using a direct push drilling rig (Figure 4). The purpose of these soil borings was to evaluate shallow soils in areas associated with historical manufacturing processes and to fill data gaps in areas where soils had not been previously sampled (See Table 1).

At each location, discreet soil samples were collected at 2-feet and 5-feet bgs using a Macrocore™ sampling tool. At each location, the continuous core sampler lined with acetate was drilled to 5-feet bgs. Once retrieved, the sampler was opened and the acetate sleeve was cut at the desired sample depth(s), and capped at each end. The soil samples were sealed, labeled, and packed on ice pending delivery to the analytical laboratory.

The analytical program for soils was based on historical operations at the facility. Borings ASB-01 and ASB-03 are located in the vicinity of former Buildings 201 and 203, which historically housed tooling shops (Table 1). Soil samples from these borings were analyzed for:

- Title 22 Metals by EPA Method 6010B/7471A
- VOCs by EPA Method 8260B

Samples from boring ASB-01 were additionally analyzed for PCBs by EPA Method 8020, due to the presence of former transformers near the southern end of Building 201.

Soil boring ASB-02 is located near a former fuel hydrant system outside of Building 246. Soil samples from this boring, as well as borings ASB-01 and ASB-03, were submitted for a fuel screen for diesel and extractable hydrocarbons using GC/FID methods. The 5-foot sample from boring ASB-03 was analyzed for petroleum hydrocarbons with carbon chain speciation using GCMS/FID.

The laboratory analytical services were provided by Centrum Analytical Laboratories, Inc. of Riverside, California. The soil analytical results are summarized in Section 4.2.2.

In addition to the chemical analyses described above, three additional soil samples were collected from soil gas borings ASB-01, ASB-80, and ASB-90 for analysis of physical properties in support of potential future risk assessment activity. At each location, a soil sample was collected at 5-feet bgs, using the same methods as described above. The soil samples were submitted to PTS Laboratories in Garden Grove, California, and analyzed for the following physical parameters:

- Moisture Content (API RP40/ASTM D2216)
- Dry/Grain Bulk Density (API RP40)
- Porosity (total, air filled, water filled, and effective) (API RP40)
- Total Pore Fluid Saturations (API RP40)
- Total Organic Carbon/Fraction Organic Carbon (Walkley Black)
- Effective/Specific Permeability to Air (API RP40)
- Specific Permeability to Air
- Specific Permeability to Water
- Hydraulic Conductivity (API RP40/D5084)
- Intrinsic Permeability to Water (API RP40/D5084)

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- Atterberg Limits (ASTM D4318)
- Particle Size Distribution (ASTM D422/D4464M)

4.2 Analytical Results

The soil gas sample analytical results are summarized on Table 2 and Table 3 and illustrated on Figures 5 through 8. The chemical data for soils are summarized in Table 4. The laboratory analytical reports are provided in Appendix B.

For purposes of preliminary evaluation, the data collected during this investigation are compared to the commercial/industrial and residential California Human Health Screening Levels (CHHSLs) as documented by the California Environmental Protection Agency (CalEPA) in their January 2005 guidance document entitled, *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties* (CalEPA 2005). The data are summarized in the following sections.

4.2.1 Soil Gas Sample Results

PCE and TCE were the most commonly detected VOCs in soil gas throughout the study area. A limited number of soil gas samples at the 5-foot and 15-foot depths contained PCE and TCE at concentrations that exceeded one or more of the following CHHSLs criteria (CalEPA 2005):

Chemical	Residential Land Use CHHSL (µg/l)	Commercial/Industrial Land Use CHHSL (µg/l)
PCE	0.18	0.603
TCE	0.528	1.77

Low concentrations of other VOCs were detected in soil gas, but with the exception of carbon tetrachloride at one location, the detected concentrations of these other VOCs were below their respective residential and commercial/industrial CHHSLs. Soil vapor sample locations that exhibited PCE and/or TCE concentrations above residential or commercial/industrial CHHSLs are illustrated on Figures 5 through 8. A brief summary of the results at 5-feet and 15-feet bgs are provided below.

Soil Gas Results at 5-feet bgs

The majority of 5-foot soil gas samples did not contain VOCs above documented CHHSLs. PCE and TCE were the most prevalent VOCs detected at 5-feet and these were the only constituents that exceeded CHHSLs at 5-feet bgs. A summary of detections where CHHSLs were exceeded is below.

PCE concentrations exceeded CHHSLs in 20 of the 5-foot soil gas samples. The maximum PCE concentrations detected at 5-feet bgs was in boring ASG-58 (10 µg/l), located north of the former Helipad area, and boring ASG-86 (9.8 µg/L), located within Building 290 (Figure 5). The remaining PCE concentrations that exceeded criteria were relatively lower, ranging from 0.18 µg/l to 3.9 µg/l.

TCE concentrations exceeded CHHSLs in 31 of the 5-foot soil gas samples, with the detections observed primarily within Building 1. The maximum TCE concentration was detected in boring ASG-88 (33 µg/l), located in Building 1 (Figure 6). A relatively elevated TCE concentration (compared to other borings) was also observed at boring ASG-55 (21 µg/L), located in Building 290. The remaining TCE data that exceeded criteria was relatively lower, ranging in concentration from 0.58 µg/L to 18 µg/L.

Soil Gas Results at 15-feet bgs

Similar to the data observed at 5-feet bgs, the majority of 15-foot soil gas samples did not contain VOCs above the respective residential and/or commercial/industrial CHHSLs. PCE and TCE were the most prevalent VOCs detected at 15-feet and, with the exception of carbon tetrachloride in one soil gas sample, these were the only constituents that exceeded CHHSLs at 15-feet bgs.

PCE concentrations exceeded CHHSLs in 22 of the 15-foot soil gas samples. The highest PCE concentrations detected at 15-feet bgs were in borings ASG-85 (5.9 µg/L) and ASG-85 (5.4 µg/L), located north and south, respectively, of the former Helipad Area (Figure 7). The remaining PCE concentrations that exceeded criteria were relatively lower, ranging from 0.20 µg/L to 3.8 µg/L.

TCE concentrations exceeded CHHSLs in 48 of the 15-foot soil gas samples, with the majority of detections observed in Building 1. TCE concentrations in and around Building 1 ranged from 0.93 µg/L to 75 µg/L. Slightly elevated concentrations relative to the rest of the investigation area, were also observed in boring ASG-55, located

outside of building 290. The remaining TCE concentrations that exceeded criteria were relatively lower, ranging in concentration from 0.58 µg/L to 10 µg/L.

The 15-foot sample at location ASG-08 located within Building 1, contained carbon tetrachloride at 0.090J µg/L. This concentration is above the commercial/industrial CHHSLs for shallow soil gas, but below residential CHHSLs.

4.2.2 Soil Sample Results

Soil samples were analyzed for VOCs, metals, PCBs, and/or petroleum hydrocarbons. The sample suite identified for each boring was dependent upon the previous uses of the property in the vicinity of the boring. The rational for each boring is provided on Table 1. A summary of the soil sample analytical results is provided in Table 4.

<u>VOCs</u>

Soil samples from borings ASB-01 and ASB-03 were analyzed for VOCs based on historical locations of tooling shops and sumps. Low concentrations of PCE were detected in the 2-foot (2 µg/kg) and 5-foot (3 µg/kg) samples of boring ASB-01, located in the vicinity of Building 201 (Table 4). VOCs were not detected above the respective laboratory reporting limits (LRLs) in either of the soil samples analyzed from boring ASB-03.

<u>Metals</u>

Soil samples from borings ASB-01 and ASB-03 were analyzed for CAM metals based on previous tooling operations. Metals were detected at various concentrations in each of the four soil samples analyzed (Table 4). With the exception of arsenic, all reported concentrations of metals were below their respective CHHSL. Arsenic was detected in each of the four soil samples analyzed at concentrations ranging from 4.46 mg/kg (ASB-02-2) to 7.10 mg/kg (ASB-01-2), which exceed residential (0.07 mg/kg) and commercial/industrial (0.24 mg/kg) CHHSLs for arsenic. The maximum concentration detected, however, is well within the range of Southern California background levels for arsenic (1.8 to 15.2 mg/kg) (CalEPA 1992) and is similar to the arsenic concentrations detected during previous site investigations at the NIP.

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PCBs

Soil samples from boring ASB-01 were analyzed for PCBs based on the historical presence of transformers n the vicinity of Building 201. PCB's were not detected at or above the respective LRLs in any of the soil samples analyzed (Table 4).

Petroleum Hydrocarbons

Soil samples from all four borings were submitted for a fuel screen by GC/FID. The fuel screen of each soil sample did not identify detectable petroleum hydrocarbons above the respective LRLs (Table 4). Analytical data from the 5-foot sample of ASB-03 served as confirmation that petroleum hydrocarbons were not present in that sample above the respective LRLs.

Physical Properties

Soil samples were collected at a depth of 5-feet bgs from soil boring ASB-01, and soil gas borings ASG-80 and ASG-90, for analysis of various soil physical properties to evaluate vapor transport within the vadose zone. The laboratory analytical report for the physical properties testing is provided in Appendix B. The physical properties data are not tabulated as these data are not being specifically evaluated in this particular document. These data may be used in future modeling for risk assessment purposes. Some of the basic physical properties of the soils are briefly described below.

All three soil samples were classified as lean clay or sandy lean clay with silt and clay fractions ranging from 65 to 93 percent by weight. Total porosities were similar, ranging from 0.391 cubic centimeters (cm^3) to 0.491 cm^3. Effective and specific permeability to air measurements ranged from 0.63 millidarcy (mD) to 67.5 mD, and 2.04 mD to 22.7 mD, respectively.

5. Data Evaluation

The data collected during this investigation did not identify any new areas of contamination within the CPA. The soil gas data obtained were generally consistent with previous sampling activities conducted within the property boundaries and most VOC concentrations were below the respective commercial/industrial and residential CHHSLs. PCE and TCE were the most commonly detected VOCs and, with the exception of carbon tetrachloride in one sample, were the only VOCs that exceeded one or more of the CHSSLs. Most of the TCE concentrations that exceeded CHHSLs

were observed within and around Building No. 1. The PCE exceedances were more sporadic and not concentrated in any one area. Although the CHHSLs are a conservative screening approach, and the data did not indicate areas of gross exceedance of the CHHSLs, it is recommended that a site specific risk assessment be conducted should redevelopment of the CPA go forward.

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APPENDIX IV.F-2

In Situ Reactive Zone Interim Measure Source Reduction Remedial Action Plan

In-Situ Reactive Zone Interim Measure Source Reduction Remedial Action Plan

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Table of Contents

1. Introduction/Background **1**

1.1 Site Hydrogeology 2

1.2 Site Groundwater Quality 3

1.2.1 Up-Gradient Data 3

1.2.2 Northern Area Data 4

1.2.3 Southern Area Data 5

1.2.4 Vertical Extent Data 5

1.3 Site Groundwater Biogeochemistry 6

1.4 Technology Description 6

1.5 Site Applicability & Measures of Success 8

2. IMSR RAP Objectives **9**

3. Groundwater Enhanced Biodegradation IMSR RAP **10**

3.1 Hydraulic Testing 10

3.2 Amendment Point Design and Installation 10

3.3 Carbohydrate Amendment Design 11

3.4 Amendment Addition 11

3.5 IMSR RAP Monitoring and Evaluation 12

4. Interim Measure Source Reduction Program Elements **12**

4.1 Permitting 12

4.2 Hydraulic Tests 13

4.2.1 Hydraulic Test Locations 13

4.2.2 Injection Points 14

4.2.3 Observation Wells 15

4.2.4 Hydraulic Test Steps 15

4.2.5 Evaluation of Hydraulic Conductivity Using Slug Tests 15

4.2.6 Evaluation of Hydraulic Conductivity Using Tracers 16

4.2.7 Evaluation of Optimum Injection Delivery Pressures 17

4.2.8 Tracer Data Collection 17

4.3 Amendment 18

4.3.1 Initial Carbohydrate Amendment Points 18

4.4 Amendment Well Points 19

4.5 Bromide Tracer 20

4.6 IMSR RAP Monitoring 20

4.7 Installation of Additional Monitoring Well Installation 21

4.8 Baseline Monitoring 22

4.9 Process Monitoring 23

4.10 Performance Monitoring 23

4.11 Data Evaluation and Amendment Adjustments 23

4.12 Removal of IMSR RAP System 24

4.13 Post-Test Data Evaluation and Report 24

5. Sampling and Analysis Plan/QA 25

6. Residuals Management 25

7. Schedule 26

8. Health and Safety 26

9. References 26

Tables

1 Summary of Groundwater Quality

2 Carbohydrate Addition and Groundwater Monitoring Schedule

Table of Contents

Figures

1 Site Location Map

2 Site Map with Monitoring Well Locations

3 Site Map with Groundwater Elevations, December 2002

4 Distribution of Tetrachloroethene (TCE) in Groundwater

5 Distribution of Trichloroethene (TCE) in Groundwater

6 Distribution of Total Volatile Organic Compounds (VOC) in Groundwater

7 Common Degradation Pathways and Cycling of Organic Carbon in an IRZ

8 IMSR Treatment Area

9 North Area Hydraulic Test Well Layout

10 South Area Hydraulic Test Well Layout

11 Hydraulic Test Monitoring/Amendment Well Construction Detail

12 Typical Injection Point Construction Detail

13 Typical Groundwater Monitoring Well Construction Detail

Appendices

A Material Safety Data Sheets and Product Information

B Proposed Schedule

C Health and Safety Plan

1. Introduction/Background

ARCADIS has prepared this document to comply with the groundwater remedial action requirements outlined in the Los Angeles Regional Water Quality Control Board (RWQCB) letter dated April 11, 2002 addressed to the National Aeronautics and Space Administration (NASA). The RWQCB letter requested that three separate groundwater remedial action work plans (RAPs) be submitted for the groundwater impact to three areas of concern (AOCs), which included Building 244 (AOC-1), monitoring wells PI-MW-01 through 03 (AOC-2), and monitoring well PII-MW-07R (AOC-3). Due to the scheduled development activities, ARCADIS has elected to submit this work plan to initiate "site-wide" removal of the contaminants of concern (COCs) in groundwater in the AOC 1,2 and 3 areas as an interim remedial action to expedite remediation and facilitate the planned re-development activities. Due to the scheduled demolition of buildings 61 and 287, the requested soil remedial action activities will be address in a separate submittal following the planned re-development activities. Once the interim remedial action activities are completed, ARCADIS will submit a RAP outlining the final remedy for both soil and groundwater. Hereafter this document will be referred to as the Interim Measure Source Reduction (IMSR) Remedial Action Plan (RAP).

This IMSR RAP discusses the utilization of Enhanced Reductive Dechlorination (ERD) to reduce concentrations of chlorinated volatile organic compounds (cVOCs) known to exist in shallow groundwater (groundwater between approximately 45 and 75 feet below ground surface [bgs]) beneath the former NASA Downey facility property. Please refer to Figure 1 for the location of the project site. This document and a Waste Discharge Requirement (WDR) Permit application are being submitted to the RWQCB for approval prior to implementation of the activities outlined in this work plan. This section provides background information on groundwater conditions beneath the site and discusses the viability of ERD for this site. The subsequent sections provide detailed information on ERD and describe the proposed implementation at the site.

Extensive site investigations have been conducted at the NASA Downey site. The investigations found concentrations of cVOCs in soil and groundwater underlying the site. A soil remediation program in the area of Building 244 that included the installation and operation and maintenance (O&M) of a soil vapor extraction (SVE) system began operation in June 2000. Information gathered thus far indicates the need to implement additional investigation and remediation activities for the project site prior to redevelopment. Completion of these activities is expected to take several years with long-term groundwater monitoring and O&M of remediation systems potentially

to take up to 8 years or more. It is the City of Downey's desire to obtained title to the property prior to the completion of remedial activities in order to initiate redevelopment of the site, which is expected to enhance the economy of the City of Downey. The City of Downey intends to transfer the responsibility for implementing environmental remediation to International Risk Group (IRG) through an Environmental Services Cooperative Agreement and an Environmental Responsibility Assumption Agreement and IRG has contracted with ARCADIS to complete the soil and groundwater remediation activities. After acquiring the property from NASA, the City of Downey intends to convey the property to at least two (and perhaps more) developers -- Downey Landing, LLC and Kaiser Permanente. A conceptual master plan for Parcels I through VI has been developed for the site. Please refer to Figure 2 for the layout of the project site. Included in this figure are both current and proposed building structures. The proposed interim measure will allow for development of the NASA Downey site concurrent with the implementation of the site remedy.

1.1 Site Hydrogeology

Numerous investigations have provided information related to the hydrogeologic conditions beneath the project site, primarily conducted by Earth Tech as NASA's environmental consultant. Foster Wheeler summarized the information developed during these investigations, which is presented herein in a series of reports entitled "Environmental Baseline Surveys" for parcels I through VI. Please refer to the reference section at the end of this document for a list of investigation documents. The following presents the information summarized in the Foster Wheeler reports as well as the Earth Tech 2002 groundwater monitoring reports (Foster Wheeler, 2000; 1999; 1996a, b, c, and d) (Earth Tech 2003; 2002).

The stratigraphic information indicates that the site is underlain from the surface to approximately 41 feet bgs with fine grained sediments consisting of interbedded silty sand, sandy silt, silty clay and clayey silts. A sand unit to approximately 66 feet bgs underlies this interbedded unit. Information provided in Department of Water Resources regional cross sections suggests that this sand unit represents the upper portion of the Gasper Aquifer, which is estimated to be 100 to 150 feet thick in the area of the project site. Assuming the top of this sand unit is 41 feet bgs, the estimated bottom would be approximately 140 to 190 feet bgs. Recent groundwater elevation data collected by Earth Tech in the fourth quarter 2002 (Earth Tech 2003) suggests that the depth to groundwater beneath the project site is between 48 and 56 feet bgs, with a range in groundwater surface elevation of 44.58 to 48.06 feet above mean sea level (ft amsl). The Earth Tech data suggests that groundwater flows to the south-southwest at

an estimated gradient of 0.001. The direction of groundwater flow is depicted in Figure 3. As part of the activities outlined in this work plan, data to determine hydraulic conductivity and groundwater velocity is included in the work scope to aid in proper injection design.

1.2 Site Groundwater Quality

Although several volatile organic compounds (VOCs) have been detected in groundwater samples collected from permanent groundwater monitoring wells located on, and adjacent to, the project site, the two compounds detected in the highest concentrations are tetrachloroethene (PCE) and trichloroethene (TCE). Please refer to Table 1 for a summary of the groundwater quality for samples collected by Earth Tech during groundwater monitoring activities completed in 2002. Data summarized in this table for PCE and TCE, along with total VOCs are provided in Figures 4 through 6. Since the groundwater monitoring program implemented in 2002 only included the collection of groundwater samples from selected wells during each event, the data used to develop the attached figures represents water quality data from more than one sampling event. The following discussion of water quality is divided into four categories: up-gradient data, northern area data, southern area data, and vertical extent data.

1.2.1 Up-Gradient Data

The measured direction of groundwater flow beneath the project site is to the south-southwest, which suggests that the north property line represents the up-gradient boundary of the project site. Therefore, groundwater data collected from monitoring wells MW-1, MW-2, MW-3, MW-12 and MW-13 may likely represent the background groundwater quality from off-site sources. Additional up-gradient off-site groundwater quality data was also collected by Earth Tech in April 2002 from two temporary well points (HP-1 and HP-2) located approximately 800 feet north of the property line. The following table provides a summary of the concentrations of PCE and TCE detected in groundwater samples collected in April 2002.

Sample Location	PCE	TCE
MW-1	0.71J	39
MW-2	8.5J	740
MW-3	<0.75	220

Sample Location	PCE	TCE
MW-12	<0.3	69
MW-13	0.64J	24
HP-1	9.6	320
HP-2	<1	1.5

Notes:
Concentrations reported in micrograms per liter (µg/l).

The above data suggests an average dissolved-phase TCE concentration of 202 µg/l in groundwater at or immediately north of the property line. As part of the final Groundwater RAP, this area will be further assessed to confirm these results and the magnitude of the contamination migration from up-gradient areas.

1.2.2 Northern Area Data

PCE is the primary VOC impacting groundwater in this area, which is likely the result of releases from sources in the areas identified by the RWQCB's as AOCs 1 and 2 (RWQCB 2002). The presence of TCE in this area may represent a secondary release or a degradation product of PCE. There are a number of monitoring wells located in the northern portion of the project site, including MW-10, MW-11, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, and MW-27. Each of these monitoring wells have screen sections within what is identified as the "shallow water-bearing zone" from 45 to 75 feet bgs, with the exception of monitoring wells MW-20 and MW-27. These monitoring wells have screen sections situated deeper than 75 feet, and therefore, will be discussed in Section 1.2.4. A review of Figure 4 suggests that the source of the PCE detected in groundwater is likely in the area of building 244. PCE was detected in groundwater samples collected during April 2002 at 910 µg/l and 1,700 µg/l, from monitoring wells MW-10 and MW-11, respectively. It should be noted that the total volatile organic compound concentrations in groundwater have decreased significantly in the area of Building 244, where Earth Tech had been operating a soil vapor extraction system. A review of the data for groundwater samples collected from monitoring well MW-11 indicates that the groundwater concentrations decreased from an average of 9,600 µg/l in fiscal year 2000 to an average of approximately 2,700 µg/l in fiscal year 2002 (Earth Tech 2003). The TCE concentrations detected in groundwater samples collected from monitoring wells MW-10 and MW-11 was 250 µg/l and 1,000 µg/l, respectively. TCE detected in groundwater samples collected in April 2002 from the other wells in this area ranged from 17 µg/l to 170 µg/l east of the main PCE plume footprint. The degradation

compound *cis* 1,2-dichloroethene (*cis*-1,2-DCE) was detected in samples collected from several monitoring wells ranging from 2.6 µg/l to 8.5 µg/l.

1.2.3 Southern Area Data

TCE is the primary VOC impacting groundwater in this area. PCE is detected at concentrations an order of magnitude or more less than those of TCE. The monitoring wells located in the southern portion of the site include: MW-6R, MW-7R, MW-21, MW-22, MW-23, MW-24, MW-25, MW-26S, and MW-26D. Each of these monitoring wells have screen sections within what is identified as the "shallow water-bearing zone" from 45 to 75 feet bgs, with the exception of monitoring well MW-26D. This monitoring well has a screen section situated deeper than 75 feet and, therefore will be discussed in Section 1.2.4. A review of Figure 5 suggests that the source of the TCE detected in groundwater is likely in the vicinity of or immediately north of monitoring well MW-7R and south of monitoring well MW-21. The concentration of TCE detected in groundwater samples collected in September and December 2002 from monitoring wells MW-21, MW-7R, MW-23, and MW-26S were as follows: 120 µg/l (northernmost well), 2,700 µg/l, 1,600 µg/l, and 1,400 µg/l (southernmost well). The PCE concentrations for samples collected from these monitoring wells was 3.4 µg/l (northernmost well), 260 µg/l, 89 µg/l, and below laboratory detection limit (southernmost well). The degradation compound *cis*-1,2-DCE was detected in samples collected from several monitoring wells ranging from 1 µg/l to 55 µg/l. The concentrations of TCE detected in groundwater samples collected from monitoring wells located both west and east of above referenced wells suggests that the VOC plume extends beyond the eastern property line with concentrations of TCE detected at 300 µg/l at MW-22 and 63 µg/l at MW-24. The western extent of the plume appears to reside within the property boundaries with concentrations of TCE ranging from 8.8 µg/l (MW-4) to 9.8 µg/l (MW-6R). The southern extent of the plume has not been defined as suggested by the TCE concentrations detected in groundwater samples collected from monitoring wells MW-25 (380 µg/l) and MW-26S 1,400 µg/l).

1.2.4 Vertical Extent Data

A review of the data from the deeper zone suggests that concentrations of PCE and TCE decrease significantly with depth. There are three on-site monitoring wells with screen sections deeper than 75-feet bgs. These monitoring wells are MW-20, MW-26D, and MW-27. Monitoring wells MW-20 and MW-27 are located in the northern portion of the site, while monitoring well MW-26D is located along the southern property line. The following table provides a summary of PCE and TCE

concentrations detected in groundwater samples collected in December 2002 along with those shallow monitoring wells situated in the vicinity of or adjacent to each of the deeper monitoring wells.

Sample Location	Date Sampled	Depth of Monitoring Well (ft bgs)	PCE	TCE
MW-11	9/19/02	66	920	1,700
MW-20	9/16/02	100 [(a)]	0.93J	5.4
MW-26S	12/17/02	75	15J	1,400
MW-26D	12/12/02	130 [(b)]	1.7	1.6
MW-10	12/17/02	65	1,600	380
MW-27	12/12/02	130 [(b)]	0.67J	1

Notes:
Concentrations reported in µg/l
ft bgs Feet below ground surface.
(a) Monitoring well screened from 90 to 100 ft bgs.
(b) Monitoring well screened from 120 to 130 ft bgs

1.3 Site Groundwater Biogeochemistry

Baseline sampling for selected biogeochemical parameters in groundwater to evaluate natural biodegradation processes will be completed and summarized in the WDR permit, which will be submitted to the LARWQCB in the coming weeks.

1.4 Technology Description

An interim groundwater remediation program will be implemented in a manner that allows site development to proceed concurrent with the development of the final site remedy. This will include coordinating activities with the City of Downey and the site developer(s) and installing and operating remediation systems in a manner to minimize disruption to site development activities and occupancy.

ARCADIS will use ERD to reduce concentrations of cVOCs in groundwater. Through subsurface carbohydrate injection, the ERD technology alters existing aerobic or mildly anoxic aquifers to anaerobic, microbiologically diverse, reactive treatment zones. Within such zones, conditions are conducive for the bioremediation of chlorinated hydrocarbons. The operative principal of ERD is the development of an anaerobic, chemically reductive environment in the area of chlorinated hydrocarbon concentrations.

An *in-situ* reactive zone (IRZ) is created by stimulating indigenous microbiological organisms through the engineered addition of low-cost food grade electron donors (carbohydrates). Microbes metabolize the supplemental organic carbon source and lower the oxidation-reduction potential (ORP) to a strongly reduced state.

By injecting a readily degradable carbon source into the aquifer, the rate and extent of bacterial reductive dechlorination can be enhanced to levels that provide a cost-effective remedial method. Bacterial consumption of the degradable carbon consumes matching quantities of electron acceptor compounds. When the rate of carbon consumption exceeds the rate of high-yield electron acceptor recharge, an IRZ is created that provides full dechlorination of target cVOCs such as PCE, TCE, and 1,1,1-trichloroethane (1,1,1-TCA).

Indigenous heterotrophic microorganisms present in the subsurface can readily degrade the injected carbohydrate. This metabolic degradation process consumes available dissolved oxygen (DO) contained in groundwater, as well as other alternative electron acceptors, and creates an anaerobic reduced state. The bacterial community present in the aquifer prior to carbohydrate addition adapts to the changed biogeochemical aquifer conditions. In the enhanced subsurface environment the bacterial population adjusts and facultative species begin to use alternative electron acceptors and in the absence of oxygen, anaerobic populations begin to proliferate. A bacterial community capable of fermenting carbohydrate sugars develops, producing volatile fatty acids, alcohols, and hydrogen. The volatile fatty acids and alcohols are further degraded to carbon dioxide and water and hydrogen is consumed as part of the reductive dechlorination process.

Hydrolysis and fermentation of carbohydrate ultimately results in the production of acetate, which serves as the most desirable sources of energy for bacteria using sulfate and carbon dioxide (CO_2) as electron acceptors, and hydrogen. Methanogens use CO_2 as an electron acceptor and contribute to the reductive dechlorination process. The reductive dechlorination breakdown pathways, intermediates for cVOCs commonly found as environmental contaminants, and the cycling of organic carbon in an IRZ are presented in Figure 7.

Once organic carbon has been sufficiently delivered throughout the treatment area and an IRZ has been established, subsequent additions of carbohydrate support the enhanced microbial population and maintain the IRZ. This maintenance dosing occurs at intervals sufficient to maintain a target total organic compound level and support the reduced environment resulting from the activities of the enhanced microbial

population. Continued reductive dechlorination can only be achieved when the rate of electron donor consumption exceeds the rate of electron acceptor recharge from up-gradient migration. The carbon source is most effective when highly mobile and readily degradable, and injection rates correspond to the overall flux of groundwater, electron acceptors, and cVOCs that move into the treatment zone. Certain site hydrogeologic characteristics require modification of the IRZ approach, but can still be treated using an IRZ by adjusting the amount and frequency of carbohydrate injection and monitoring groundwater conditions inside the IRZ. The reactive zone performance is measured by monitoring for the target contaminants and relative concentrations of degradation products and other indicator parameters in groundwater such as DO, ORP, pH, and specific conductivity.

The IRZ technology has been accepted by both federal and state regulatory agencies at more than 150 sites throughout the United States. More specifically, several sites in southern California are in progress. These sites are listed below:

- Electronics Manufacturer, City of Industry;
- Aerospace Company, Newbury Park;
- Automotive Manufacturer, Newport Beach;
- Electronics Manufacturer, Santa Ana;
- Dry Cleaner, Mission Viejo; and
- Aerospace Company, San Marcos.

1.5 Site Applicability & Measures of Success

Anaerobic IRZ methods have successfully been applied to PCE, TCE and degradation daughter products in similar geologic settings to those encountered at the project site. The key to success will be engineering the process to deliver adequate organic carbon to insure an appropriate environment in which reductive dechlorination can be maintained so that the process can proceed at an accelerated rate. Based on available site data, daughter products have been detected in several wells on the southern portion of the site. The presence of daughter products (notably *cis*-1,2-DCE) suggests that microbial degradation of PCE and TCE is already occurring at the site, however at a slow and less than optimal rate. The natural rate of reductive dechlorination is likely limited by the availability of electron donor (organic carbon) at the site.

The major goal of the IRZ IMSR RAP is to enhance existing conditions by adding an electron donor to create a more anaerobic and reduced state, and in so doing, degrade the dissolved-phase chlorinated hydrocarbon concentrations. In order to measure the success of the process, four key elements will be monitored over the course of the IMSR RAP:

1. **Delivery of adequate carbon substrate** to the subsurface. This will be measured by tracking total organic carbon (TOC) in the IRZ amendment points and monitoring wells. The target TOC concentration in the IRZ amendment points will be between 1,000 and 10,000 milligrams per liter (mg/l).

2. **Creation and maintenance of a reducing environment** capable of degrading the dissolved-phase cVOCs on site. In order to assure that these conditions are created and maintained, DO and ORP will be measured in the field. These indicators will be supplemented with several laboratory parameters such as nitrate, sulfate, and methane. The IRZ will be marked by strongly reducing conditions, as evidenced by one or more of the following: a significant decrease in ORP and DO in comparison to background, methane, ferrous iron and sulfide concentration increase, and nitrate concentration decrease.

3. **Creation of daughter products will be monitored** using VOC analysis (for *cis*-1,2-DCE, and vinyl chloride), and light hydrocarbon analysis (for ethene and ethane). The molar ratio concentrations of source PCE and TCE to daughter products will be monitored over the course of the IMSR RAP. A decline in the ratio is a positive indicator of success. In addition, a transient increase in the daughter product concentrations and the creation of ethene are also positive indicators of the technology's success.

4. **Reduction of dissolved-phase CVOC concentrations** using VOC analysis (for TCE and PCE). In order to determine if and when the reduction of dissolved-phase concentration of TCE and PCE to below the desired remediation goal is met, the decline of TCE and PCE will be monitored and tracked.

2. IMSR RAP Objectives

The primary objective of the proposed IMSR RAP is to verify the effectiveness of enhanced biodegradation as an effective and efficient remedial method for cVOCs in groundwater. Carbohydrate amendments will be added to create an IRZ to stimulate

the natural cVOC biodegradation processes at the former NASA Downey facility. The IMSR RAP will be designed to:

- Evaluate the ability to stimulate cVOC biodegradation processes;
- Evaluate the rate of cVOC biodegradation and determine amendment mass, concentration, and delivery specifications necessary to achieve optimum degradation rates;
- Evaluate radius of influence per amendment point;
- Evaluate amendment fate and transport characteristics; and
- Develop site-specific IRZ design parameters.
- Establish an IRZ in shallow groundwater impacted by chlorinated volatile organic compounds.
- Design and install a select portion of the permanent injection well network to maintain the IRZ to remediate shallow groundwater.

3. Groundwater Enhanced Biodegradation IMSR RAP

IMSR RAP implementation consists of six different tasks, hydraulic tests, monitoring well design and installation, IRZ carbohydrate injection point design and installation, carbohydrate solution design, carbohydrate solution injection, and IRZ monitoring and evaluation. These tasks are undertaken to assure proper implementation of the technology and to demonstrate its efficacy for achieving the stated objectives.

3.1 Hydraulic Testing

Hydraulic testing will be completed at the start of the IMSR RAP process. The results of the hydraulic tests will serve as the basis to finalize the layout of the IRZ amendment points. Hydraulic testing will also be used to confirm well spacing and construction.

3.2 Amendment Point Design and Installation

Once hydraulic testing results have been analyzed, the IRZ amendment point and monitoring well network design will be finalized and installed. At present, it is estimated that as many as 3,200 initial/temporary IRZ injection point locations, 139

amendment well locations, and 10 new monitoring well locations will be installed in the targeted areas within the cVOC plume.

3.3 Carbohydrate Amendment Design

The goal of applying the carbohydrate is to provide an electron donor (organic substrate) and create a reactive zone in the subsurface that can be easily maintained, inexpensive, and appropriately targets the compounds of concern at the site, cVOCs. Typically an inexpensive and readily available organic substrate is used for the purpose of establishing the reactive zone. Corn syrup, molasses, and cheese whey have been successfully used in the Los Angeles Region for treatment of cVOCs. Other substrates that could potentially be used in the injection solution to develop a reactive zone include methanol, ethanol, sucrose, cellulose, guar, starch, pure hydrogen, and proprietary blends of these and other sources of soluble organic carbon.

The selection and development of the carbohydrate injection substrate mixture is driven primarily by complexity and utilization rate of the material and the unit cost of the material (measured in terms of available soluble organic matter in the reagent) as well as the material availability in a local market and the ease with which the material can be handled and delivered to the subsurface. Many reagents are being selected from the wide variety of food-grade organic carbon sources (molasses, sucrose and whey for example). Additionally, buffering materials are likely to be added to the injection solution to stabilize the pH of the groundwater during the ERD process. Select amounts of Sodium Bicarbonate will be added to the injection solution to enable buffering of the groundwater, as required, to maintain the aquifer pH above 4.5 pH units.

3.4 Amendment Addition

Amendment addition will begin immediately after obtaining WDR permit approval, collection of baseline samples, and completion of the hydraulic tests. A carbohydrate and water solution will be used and injected into the saturated interval to create the IRZ. Based on the response of the natural system to the carbohydrate solution, additional amendment events will be scheduled. In select areas of the IRZ, potassium bromide will be added to the carbohydrate solution to serve as a tracer.

3.5 IMSR RAP Monitoring and Evaluation

Groundwater monitoring events targeting specific process analytes (ORP, DO, electron acceptors, TOC, and cVOCs) will be used to track the development and progress of the IRZ. A select subset of amendment points and monitoring wells will be sampled based on a predetermined schedule. Monitoring frequency may be adjusted based on the results obtained in each sampling event. The ongoing groundwater monitoring program will be modified to supplement the IRZ data collection program. This information will be used to evaluate the following:

- Performance monitoring will be used to make decisions regarding the need, timing, and type of amendment additions, as well as, the success of the treatment process;
- Additional amendments may be applied based on the results of the process and performance monitoring. These amendments may include guar, starch, molasses, cheese whey and/or greater amounts of sodium bicarbonate; and
- The IMSR RAP will run for a period of approximately two years, over which active amendment additions will occur. The IRZ will then be monitored for approximately one additional year after which a summary report will be prepared and submitted to the LARWQCB.

4. Interim Measure Source Reduction Program Elements

This section provides detailed information on the elements that will be completed for the IMSR RAP program for the project site.

4.1 Permitting

ARCADIS is submitting a General WDR permit application, required by the LARWQCB, subsequent to submittal of this work plan. Integral to the implementation of the IMSR RAP is the approval of the permit application and receipt of LARWQCB approval of this work plan. The proposed IMSR RAP schedule anticipates that the WDR permit will be approved by the LARWQCB within 60 days of submission of the permit application to the LARWQCB.

4.2 Hydraulic Tests

The hydraulic test will be conducted within the two proposed treatment areas. The current estimated boundaries of the treatment areas are depicted on Figure 8. The purpose of the test is to evaluate the following:

- The hydraulic conductivity in the remediation areas;
- The radius of influence for an injection point (determined by bromide tracer and water elevation or head pressure);
- The effectiveness of using a ¾-inch diameter casing, installed using a cone penetrometer testing (CPT) rig and injection using a direct-push rig will be evaluated. The effectiveness is defined as how easily the amendment point can be installed, how well the amendment solution is distributed to the targeted zones, and the duration of delivery; and
- Dilution effects of groundwater on the amendment solution.

Two hydraulic test points, two down gradient monitoring points, and one crossgradient monitoring point will be used in two locations, one location in the northern area (identified in Section 1 as predominately a PCE groundwater plume) and one location in the southern area (identified in Section 1 as predominately a TCE groundwater plume). The down gradient monitoring (observation) points will be located 10 and 20 feet down-gradient of the hydraulic test points. The cross-gradient monitoring (observation) points will be located approximately 10 feet from the hydraulic test points. The results of the hydraulic tests will be used to determine the number of amendment points and the method of injection (using temporary ¾" diameter well points or direct-push injection).

4.2.1 Hydraulic Test Locations

The first hydraulic test location will be located near existing monitoring well PI-MW-03, in the northern area. Please refer to Figure 2 or Figure 8 for the location of this monitoring well. Existing monitoring well PI-MW-03 will be used as the 5-foot down-gradient observation point. The 10-foot down gradient and 5-foot cross-gradient observation points will be installed prior to the test and will be constructed as 2-inch diameter amendment wells. Injection points IP-A and DP-A will be installed/advanced as indicated on Figures 8 and 9.

The second hydraulic test location will be located near existing monitoring well MW-21, in the southern area. Existing monitoring well MW-21 will be used as the 10-foot down-gradient observation point. The 5-foot down-gradient observation point and 5-foot cross-gradient observation point will be installed prior to the test and will be constructed as 2-inch diameter amendment wells. The general locations of the hydraulic test points IP-B and DP-B are shown in Figures 8 and 10. Construction detail for hydraulic test monitoring wells is illustrated on Figure 11.

4.2.2 Injection Points

Initially, the direct-push injection points, DP-A and DP-B, will be advanced and used for injection. A direct-push rig will advance a 1-inch diameter hollow rod with a steel tip approximately 20 feet into groundwater to a depth of approximately 70 to 75 feet bgs. When the rods are retracted, a 6-inch section at the bottom of the rod is exposed and used to inject the fluid. Fluid will be injected, using a pump connected to a mixing tank, as the rods are removed from the bottom of the advancement to the top of the encountered saturated zone.

Hydraulic test injection points IP-A and IP-B will be installed using a CPT rig to advance a 2-inch diameter hollow rod with a steel tip approximately 20 feet into groundwater to a depth of approximately 70 to 75 feet bgs. A pre-packed section of 3/4-inch diameter Schedule 40 polyvinyl chloride (PVC) screen and filter sand pack will be inserted into the steel rod to the bottom of the borehole. Schedule 40 PVC casing with 0.02-inch slotted screen, or appropriate slot size, will be set from approximately 55 to 75 feet bgs for test injection point IP-A and set from approximately 50 to 70 feet bgs for test injection point IP-B. Expandable foam bridges will be installed above the pre-packed screen sections to provide a barrier that prevents solids from entering into the screen interval. Bentonite granules will then be placed above the foam bridge and hydrated (using a tremmie pipe) as a seal. Blank Schedule 40 PVC casing will then be placed above the bentonite seals to ground surface. The steel rod of the CPT will be carefully removed, leaving the PVC screen, filter sand pack, and bentonite seal in place. Volclay grout will then be placed in the annular space to ground surface.

The actual depth and length of the screened interval will be determined in the field to suit the conditions of soil encountered and the top of the saturated zone. If refusal is encountered using a CPT rig, a hollow stem auger (HAS) drill rig will be used to install the injection points.

Well construction permits will be obtained from the appropriate County or City agency. Typical injection point construction details are presented in Figure 12.

4.2.3 Observation Wells

The hydraulic test monitoring (observation) wells will be located as indicated on Figures 8, 9 and 10. The observation wells will be installed using a hollow-stem auger drill rig to 70 to 75 feet bgs. The wells will be constructed in a single 8-inch borehole. The well casing will be 2-inches in diameter with 0.01-inch slotted Schedule 40 PVC from approximately 45 to 70 feet bgs (depth to water is approximately 50 feet bgs). The sand filter pack will be placed approximately 2 feet above the top of the well screen from approximately 43 to 70 feet bgs. A bentonite seal will be placed from approximately 38 to 43 feet bgs. Volclay grout will then be placed above the seal at approximately 38 feet bgs to ground surface. The actual depth and length of the screened interval will be determined in the field to suit the conditions of soil encountered. A flush-mounted well box will be set around the well.

A well construction permit will be obtained from the appropriate County or City agency. Typical observation well construction is presented in Figure 11 and is similar in construction to amendment wells.

4.2.4 Hydraulic Test Steps

The hydraulic test will consist of the following four-step process.

- Perform one or more slug tests to evaluate the hydraulic conductivity in the shallow water bearing zone.
- Inject different tracers to evaluate two different delivery processes.
- Evaluate the optimum delivery pressure for the injection program by implementing a solution delivery test using varying pressures.
- Monitor the observation wells for tracer and evaluate for flow and distribution parameters.

4.2.5 Evaluation of Hydraulic Conductivity Using Slug Tests

The existing monitoring wells and the proposed observation wells will be used for the slug test. The two existing monitoring wells are 4-inch diameter wells and will use a 10-foot long, 2-inch diameter, PVC slug. The proposed observation wells are 2-inch

diameter wells and will use a 10-foot long, 1¼-inch diameter, PVC slug. Pressure transducers and a data logger will be set in the north test area wells for at least 24-hours prior to installing the first slug. The slugs will be installed into proposed wells AW-102 and AW-102A and existing well PI-MW-03. When the water level in the test wells have stabilized back to their original level the slug in AW-102A will be removed and the water level monitored with the transducer and data logger. When the water level in the test wells have again stabilized back to their original level the slug in AW-102 will be removed and the water level monitored with the transducer and data logger. When the water level in the test wells have again stabilized back to their original level the slug in PI-MW-03 will be removed and the water level monitored with the transducer and data logger. The saturated interval consists of sands and should have sufficient transmissivity for relatively quick recovery time. Once the water levels return to normal, the transducers and data logger will be moved and installed into the south area test wells. The slug test in the south area will be performed the same as the in the north area test wells, first testing proposed well AW-517A, then well AW-517, and then well MW-21.

After the slug test has been performed, the injection points, IP-A and IP-B, will be installed as described previously.

4.2.6 Evaluation of Hydraulic Conductivity Using Tracers

The second step involves mixing the two different hydraulic test injection solutions. The first hydraulic test injection solution will contain approximately 100 mg/l bromide. A total of 400 - 1000 gallons of this solution will be used for injection into IP-A and 400 - 1000 gallons will be used for injection into IP-B. The second hydraulic test injection solution will contain 10 mg/l flouroscein dye. A total of 400 gallons of this solution will be used for injection into DP-A and 400 gallons into DP-B. Potassium bromide (KBr) powder will be used as the source of bromide. Sodium Fluorescein will be used as the dye. A Material Safety Data Sheet (MSDS) for both are included in Appendix A. The tracers will be used to confirm groundwater flow rates and confirm estimated flow vectors and lateral spread of the IRZ. The concentrations of the tracers are in sufficient magnitude to achieve a reasonable, measurable concentration in groundwater down gradient of the amendment point. The concentration of the tracers will be analyzed from samples collected during the injection process to accurately determine the injection concentrations.

4.2.7 Evaluation of Optimum Injection Delivery Pressures

After the first solution is mixed, the injection system will be connected to test injection well IP-A. Pressure transducers will be installed in the test observation wells, AW-102, AW-102A, and PI-MW-03, and connected to a data logger to evaluate changes in groundwater elevation during and after injection. The pump will be started and the injection pressure will be increased from approximately 10 to approximately 40 pounds per square inch (psi) in approximate 10-psi increments and the elapsed time and associated flow rate will be recorded for each pressure. One sample will be collected from the mixing tank during the injection test. After concluding injection into IP-A, the injection system will be connected to test injection well IP-B. Pressure transducers will be installed in the test observation wells, AW-517, AW-517A, and MW-21, and connected to a data logger to evaluate changes in groundwater elevation during and after injection. Again, the pump will be started and the injection pressure will be increased from approximately 10 to approximately 40 psi in approximate 10-psi increments and the elapsed time and associated flow rate will be recorded for each pressure. A sample of the injection solution will be collected from the mixing tank during the injection test.

Two to five days after this initial injection, direct-push points DP-A and DP-B will be advanced as described previously. These wells will each be injected with 400 – 1000 gallons of the solution containing the fluorescein dye. The data loggers and pressure transducers remaining from the previous injection will continue to monitor changes in pressure in the observation wells. Injection will take place over the entire length of saturated interval encountered in the direct-push points; assuming 25 feet of saturated interval, approximately 10 - 50 gallons per foot will be injected while the direct-push rods are removed.

4.2.8 Tracer Data Collection

The final step will consist of monitoring for bromide, fluorescein, and possibly TOC in the monitoring wells. Samples will be collected prior to and just after the first injections into test injection points IP-A and IP-B, prior to and just after the injection into points DP-A and DP-B, and one week after the injection into points DP-A and DP-B. The samples will be collected from existing monitoring wells PI-MW-03 and MW-21, and proposed observation points AW-102, AW-102A, AW-517, and AW-517A.

4.3 Amendment

The selected carbohydrate solution will be a mixture of molasses, guar, whey, starch and sodium bicarbonate. Molasses is an easily biodegradable carbon source that has a half-life on the order of a few days and the guar and starch have have-lives on the order of weeks to month's dependant on the subsurface environment. In addition, these substrates are edible and an innocuous material; therefore no undesirable effects are expected from its use. A MSDS that contains product information for these materials is included as Appendix A. The IRZ technology using these carbohydrate solutions has been accepted by both federal and state regulatory agencies at more than 150 sites throughout the United States.

Subsequent carbohydrate delivery events may be conducted in order to assure that the target TOC concentration has been achieved as measured during progress monitoring. Other parameters (including pH, ORP, and DO) will also be evaluated and considered before additional carbohydrate is added.

Carbohydrate solution will be mixed with potable water at the Site to create an approximate 10 - 20 percent carbohydrate solution. The carbohydrate solution added to each amendment point will be less than 1 percent of the available pore volume within the estimated radius of influence around each of the IRZ amendment points. The amendment will be degraded in the subsurface as a function of the volume added, the solution strength, the rate of groundwater and electron acceptor flux, the age and stage of development of the microbial population, and the presence and nature of available electron acceptors. The amendment will be consumed as it is metabolized by the microbial population, and diluted via advective and dispersive mechanisms through the groundwater.

4.3.1 Initial Carbohydrate Amendment Points

The initial carbohydrate solution injection event will use direct-push methods to obtain the injection depth required. Depending upon the results of the hydraulic test, either installation of ¾" PVC injection points will be installed, as previously described, or injection into the direct-push rods, or both, will be used to deliver the carbohydrate to initiate ERD and create the IRZ. A portion of the injection points will use the ¾" PVC for delivery and for possible additional carbohydrate injections to maintain the IRZ.

In order to initiate ERD at the site, the initial carbohydrate solution injections, using many temporary injection points, will concentrate injection into the areas on site that

contain elevated cVOC concentrations. Figure 8 indicates two areas, north area and south area, which will be treated using the temporary points. The initial injection points will be spaced approximately 25 feet apart and a carbohydrate solution will be injected at each location to affect an area approximately 15 feet from the injection and target the injection from approximately 45 to 70 feet bgs. This initial injection will be completed using temporary points installed using a high-pressure injection system and a direct-push type rig. The proposed areas of the temporary injection wells are located in the areas where the highest dissolved-phase cVOC concentrations are found to maximize contaminant degradation and initiate the ERD process. The initial injection areas are based on a dissolved concentration of 200 µg/l total VOCs in groundwater. Data collected from the hydraulic test will aid in finalizing the designed injection pattern (distance between injection points) and amount of carbohydrate amendment per point to achieve IRZ throughout the north and south injection areas. Initial assumptions of 25-foot spacing indicate approximately 2,300 points will be used to inject amendment solution to increase the TOC concentration of the two areas to above 100 mg/l.

4.4 Amendment Well Points

IRZ amendment well points will be used to inject additional carbohydrate amendments, as necessary, to maintain the IRZ. Carbohydrate amendment solution will be delivered to amendment well points using slotted screens installed to approximately 25 feet below the groundwater table throughout the site. Due to varying surface elevations and stratigraphic contacts, actual screen depths may be adjusted in the field.

The layout of the delivery system includes rows of closely spaced amendment points placed perpendicular to the direction of groundwater flow. The layout of the amendment points is based on an estimated radius of influence of 25 feet. Within each row, the amendment points will be spaced at approximately 50 feet from center to center. The rows will be spaced to allow for approximately two years of travel distance (approximately 1 foot per day); therefore, the amendment points will be spaced approximately 600 feet from center to center in the direction of groundwater flow. This spacing was based on the results of the review of aquifer testing in the area of the site and final injection well and treatment line spacing may be adjusted based on the hydraulic tests discussed in Section 4.2. Figure 8 illustrates the proposed locations of the IRZ amendment points. The actual locations of the amendment points will be based on access to the points from the property owners, as they will be located to avoid

placement within the planned building footprints or within major vehicular passageways.

The amendment points will be completed with 2-inch schedule 40 PVC with appropriately slotted screens. The amendment points will be completed with a 25-foot long screen. Each of the amendment points will be completed at ground surface. Construction details for the amendment well points are illustrated on Figure 11 and discussed in Section 4.2.3.

The actual depth and length of the screened interval will be determined in the field to suit the conditions of soil encountered and the top of the saturated zone. Well construction permits will be obtained from the local agency prior to installation.

4.5 Bromide Tracer

At the start of amendment injection activities, a small amount of bromide tracer will be dissolved in the amendment solution at IRZ points directly up gradient of existing monitoring well MW-17, MW-2, and MW-25. As in the hydraulic testing activities, the potassium bromide powder will be used as a source of bromide. The tracer will be used to confirm groundwater flow rates and estimated vectors and lateral spread of the IRZ, which will be determined during hydraulic testing activities. The concentration of the bromide solution in the amendment will be approximately 100 mg/l, in order to achieve a reasonable, measurable concentration in groundwater down-gradient of the amendment point.

4.6 IMSR RAP Monitoring

Groundwater sampling for process monitoring will be performed both in select injection wells and associated monitoring wells. The intent is not to verify or quantify the effectiveness of the technology, rather, it will be used for near real-time feedback to control the IRZ and maintain it within the specified pH, DO, ORP and TOC ranges in an attempt to optimize treatment efficiency.

Three types of monitoring events are planned: a baseline sampling event (prior to addition of carbohydrate solution); process monitoring events; and performance monitoring events. Process monitoring will be conducted approximately 2 weeks after the addition of carbohydrate solution amendment and approximately once per month thereafter. This sampling event will include field monitoring for pH and laboratory TOC analysis. Performance monitoring will be conducted approximately 6 weeks after

the initiation of carbohydrate solution amendment addition and approximately every 6 weeks for the first 24 weeks, and then extended frequencies thereafter. The performance monitoring events will consist of a more comprehensive suite of analytes. If additional carbohydrate delivery event(s) are needed, then additional process and performance monitoring event(s) may also be conducted.

Monitoring will be conducted from two groundwater monitoring wells located up-gradient of the Site (PI-MW-1 and MW-13), two monitoring wells located at the down gradient edge of the Site (MW-24 and MW-25), 5 wells located within the north and south areas (proposed wells IRZMW-01 and IRZMW-02 and existing wells PI-MW-03, PI-MW-10, and PI-MW-11 for the north area and proposed wells IRZMW-03, IRZMW-04, and IRZMW-05, existing well MW-2, and replacement monitoring well MW-23-R, for the south area), and 5 proposed wells between the two areas (IRZMW-06 through IRZMW-10). In addition, three IRZ amendment points will be sampled for select parameters.

A sampling schedule is included as Table 2. The frequency, wells and points sampled, and the list of analytes may be changed based on the data collected during each sampling event. Any changes and rationale for the changes will be presented in annual reports. This flexibility is necessary to assure that adequate, relevant water quality data is collected as the test progresses.

4.7 Installation of Additional Monitoring Well Installation

Additional monitoring wells will be installed on site to aid in monitoring changes in groundwater conditions during the IMSR RAP. The monitoring wells will be installed using a hollow-stem auger drill rig to approximately 75 feet bgs. The wells will be constructed in a single 8-inch borehole. The well casing will be 2-inches in diameter with 0.01-inch slotted Schedule 40 PVC from approximately 35 to 70 feet bgs; the depth to water is approximately 45 feet bgs. The sand filter pack will be placed approximately 2 feet above the top of the well screen from approximately 33 to 75 feet bgs. A bentonite seal will be placed from approximately 28 to 33 feet bgs. Volclay grout will then be placed above the seal at approximately 28 feet bgs to ground surface. The actual depth and length of the screened intervals will be determined in the field to suit the conditions of soil encountered. A flush-mounted well box will be set around the well.

A well construction permit will be obtained from the local agency prior to well installation. The locations of the proposed additional monitoring wells are illustrated on Figure 8. Typical monitoring well construction is presented in Figure 13.

4.8 Baseline Monitoring

Groundwater monitoring data exists for the site and for the wells located within the test areas. To augment this database, a baseline groundwater monitoring event will be conducted using the test monitoring wells discussed previously. The analytical results will be used to evaluate and document groundwater conditions prior to carbohydrate addition. These data will be added to the Site groundwater database and will provide a firm basis of conditions against which test performance can be compared. This baseline sampling event may be incorporated into the existing groundwater sampling schedule for the site.

During the baseline sampling event, groundwater samples will be collected and analyzed for a variety of organic and inorganic parameters to evaluate the geochemical environment in the area of concern. These analyses will include general groundwater quality parameters, electron acceptors, biodegradation byproducts, and VOCs. Field parameters (i.e., DO, ORP, temperature, pH, ferrous iron, hydrogen sulfide, and specific conductance) will also be collected from the wells.

General Groundwater Quality Parameters - These parameters are measured in groundwater at the wellhead for the wells associated with the IMSR RAP, and include indicator parameters that can be used to measure the development of the reactive zone in groundwater. The parameters include ORP, pH, temperature, and specific conductance. Additionally, groundwater samples will be collected and submitted to a laboratory for analysis of VOCs and TOC. The relative presence of these compounds can also support the determination of the IRZ and the presence of biodegradation of the VOCs, and provide information for carbohydrate addition frequency and parameters.

Electron Acceptors - Analysis for electron acceptors indicate the relative levels of compounds present in the groundwater, which serve as alternate electron acceptors once oxygen is depleted from the aquifer, and are a key indicator of anticipated success of the remedy. These compounds include DO, nitrate, iron, manganese, sulfate, and CO_2.

Biodegradation Byproducts - Analysis for the biodegradation byproducts indicate the relative levels of compounds formed by biodegradation and are therefore also a good

indicator of reductive dechlorination. These byproducts include VOC daughter products, chloride, CO_2, methane, ethene, and ethane.

Field parameters will be collected using a YSI meter and flow-through cell. Groundwater samples for laboratory analysis will be collected using low-flow purging and sampling methods. Hydrogen sulfide and ferrous iron are measured in the field using colorimetric methods.

4.9 Process Monitoring

Process monitoring is anticipated to be conducted monthly. The purpose of these monitoring events is to measure the effect of the carbohydrate solution on the groundwater conditions at, and near, the IRZ amendment points. This information will be used to help determine the need for subsequent amendment additions. Groundwater samples will be collected using low-flow purge techniques and samples will be analyzed for pH using a field test protocol. Samples will also be sent to the laboratory for TOC analysis. Samples will be collected from the amendment wells discussed previously. Process monitoring will be discontinued once the IRZ is established and stable.

4.10 Performance Monitoring

Performance monitoring is anticipated to be conducted quarterly for the two years of monitoring after the process monitoring event demonstrates that reduced conditions have been established. This monitoring will be more comprehensive than the process monitoring. Samples will be collected from some or all of the monitoring wells in accordance with Table 1. Field parameters will be identical to the baseline event and groundwater grab samples will be collected from the selected monitoring wells and will be analyzed for the parameters listed in Table 2.

This data will be used along with the process monitoring data to evaluate the progress of the reactive zone development and to make decisions regarding supplemental amendment addition events.

4.11 Data Evaluation and Amendment Adjustments

The process data collected in the monitoring program will be used to assess the establishment and maintenance of the IRZ and to determine if subsequent amendment addition(s) are needed. The data will also be used to determine whether to modify or to

maintain the planned monitoring program. ORP, pH, TOC, VOCs, VOC ratios, other biogeochemical indicator parameters (i.e. nitrate, sulfate, sulfide, ferrous iron, etc.), and the bromide tracer will be evaluated in the monitoring wells to define the rate of TOC use and the natural groundwater velocity. The data will also define how well buffered the system is (pH), electron acceptor use, and how well the source-area VOCs are being degraded and to what extent.

The target concentrations or ranges for various field parameters that will be used to measure process and performance are as follows:

- pH - > 4.0 s.u. in the injection wells; > 5.0 s.u. in the monitoring wells;
- DO - < 1.0 mg/l or significantly reduced compared to initial background conditions in both monitoring and injection wells;
- ORP - > -400 mv and < -100 mv in the injection and monitoring wells and/or ORP levels significantly reduced from initial background conditions.
- TOC - >500 mg/l and < 5,000 mg/l in the injection wells and > 50 mg/l in the monitoring wells.
- Conductance – significant increase in the injection and monitoring wells

Groundwater monitoring data will be reviewed and used to determine the need to adjust the strength, frequency, volume, and makeup of the amendment additions. Adjustments could include more frequent amendment additions, an increase or decrease in solution strength, an increase or decrease in solution volume, the use of the percent of complex carbohydrates such as whey, guar, starch, and/or the addition of sodium bicarbonate to control pH.

4.12 Removal of IMSR RAP System

At the completion of the IMSR RAP, the IRZ IMSR RAP system may be decommissioned or incorporated as part of the final groundwater remedy. Decommissioning of the system would include abandonment of the IRZ amendment points and the IRZ monitoring wells. The wells would be abandoned in accordance with permitting agency requirements.

4.13 Post-Test Data Evaluation and Report

Field and analytical data collected from the Site will be evaluated over the IMSR RAP period to closely monitor changes in the groundwater and to adjust the carbohydrate

concentration and frequency, as needed. In addition, other types of amendments, if applicable, will be considered and evaluated for future remediation at the Site. A summary report will be prepared at the conclusion of the two-year period. The report will document IMSR RAP activities, monitoring and sampling activities, analytical results, and IRZ IMSR RAP results. The report will be submitted to the LARWQCB at the conclusion of the IMSR RAP, which is anticipated to occur in January 2006.

5. Sampling and Analysis Plan/QA

Monitoring wells will be gauged prior to collecting groundwater samples to determine static water levels and total well depth. Low-flow purging (less then 250 milliliters per minute) will be used as applicable for all sampling events except grab samples collected for TOC and field parameters collected during process monitoring activities. Low-flow purging is used to minimize disturbance to the groundwater in the well.

Samples collected from each well will be tested for biogeochemical parameters using a YSI unit, field test kits, and fixed-base laboratory analyses. The YSI unit, with flow-through cell, will be used to measure pH, DO, ORP, specific conductance, and temperature. The well will be purged until pH, specific conductance, and temperature values stabilize to within ten percent for two consecutive readings. Hach, Inc. field test kits will be used to measure ferrous iron, DO, and hydrogen sulfide. Following field test kit analyses, groundwater samples will be collected for groundwater quality parameters, terminal electron acceptors, and degradation products. All samples to be analyzed for dissolved analytes, including metals, will be filtered in the field immediately following sample collection at each of the three well locations. For the process monitoring event, a pH meter will be used to measure the pH of bailed groundwater samples.

Samples collected for laboratory analyses will be properly labeled and packaged in cooled ice chests at a temperature of approximately 4 degrees Centigrade (°C) and delivered via commercial carrier to a state-certified laboratory. Samples will also be sent to state-certified laboratory capable of dissolved gas analysis. Samples will be delivered using standard chain-of-custody protocol.

6. Residuals Management

Residuals generated during the implementation of the IMSR RAP will include soil cuttings and groundwater monitoring well development and purge water. Soil cuttings generated during the drilling of the IMSR RAP monitoring wells will be placed in a

roll-off bin. Upon completion of drilling activities, the soil will be sampled and characterized in accordance with Site soil disposition protocols.

All groundwater monitoring well development and purge water will be contained in 55-gallon drums and labeled. The drums will all be stored in a common area of the Site. Upon completion of field activities, the 55-gallon drums will be characterized for proper off-site disposition.

7. Schedule

The estimated duration of this IMSR RAP program is approximately 2 years. Installation of the IRZ amendment points and monitoring wells will follow after acquiring approval of this work plan and after or during demolition of existing site building and re-grading activities at the site, which is estimated to occur in the third and fourth quarter of 2003. Hydraulic testing, baseline monitoring, and the carbohydrate delivery events will begin once the WDR permit is approved. Monitoring events will be conducted as provided in Table 2. An estimated schedule outlining hydraulic testing, well installation, amendment addition, and monitoring is illustrated on the schedule included as Appendix B.

Once amendment activities are initiated, data will be forwarded as generated and an annual status report will be submitted to the LARWQCB. A final report with a summary of the IMSR RAP results, conclusions, and recommendations based on the monitoring data, is estimated to be completed and submitted to the LARWQCB in the second quarter of 2006.

8. Health and Safety

Work will be completed by 40-hour Occupational Safety and Health Administration (OSHA) trained personnel using Level D protection. Work will be conducted in accordance with a Site-specific health and safety plan (HSP). The HSP is included as Appendix C.

9. References

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ARCADIS

Tables

ARCADIS

Table 1. Summary of 2002 Laboratory Results - Groundwater Samples
Former NASA Industrial Plant
Downey, California

Monitoring Well	Total Depth of Well (ft bgs)	Date Sampled	Tetracholorethene (PCE)	Trichloroethene (TCE)	cis 1,2-Dichloroethene (c12- DCE)	trans 1,2-dichloroethene (t 12-DCE)	Vinyl Chloride	1,1,1-Trichoroethane (111-TCA)	1,1-Dichloroethene (11-DCE)	1,1-Dichloroethane (11-DCA)	1,2-Dichloroethane (12-DCA)	Benzene	Toluene	Ethylbenzene	Total Xylenes	1,2,4-Trimethylbezene	1,3,5-Trimethylbezene	Methyl tert-butyl ether (MTBE)	Naphthalene	Dichlorodifluoromethane (CFC12)	1,1,2-Trichlorotrifluoroethane (CFC113)	Total Volatile Organic Compounds	Perchlorate	N-Nitrosodiumethylamine (NDMA)	1,4-Dioxane
MW-1	66	2/20/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/29/2002	0.71J	**39**	<0.75	<0.3	<0.3	<0.2	0.87J	0.70J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	**7.5**	**47**	<4	<2	**1.4**
		9/18/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
		12/12/2002	1.6J	**100**	<0.60	<0.60	<0.60	<0.40	1.8J	**2**	<0.80	<0.60	<0.60	<0.40	<1	<0.60	<0.40	<1	<1	<0.80	**16**	**118**	NA	NA	**NA**
MW-2	70	2/21/2002	7.3J	**620**	3.8J	<3	<3	<2	**17**	9.4J	<4	<3	<3	<2	<5	<3	<2	<5	<5	4.8J	**16**	**653**	NA	NA	NA
		4/30/2002	8.5J	**740**	5.3J	<3	<3	<2	**21**	**13**	<4	<3	<3	<2	<5	<3	<2	<5	<5	<4	**13**	**787**	<4	1.8J	**0.95**
		9/18/2002	<3.8	**430**	4.1J	<3.8	<3.8	<2.5	**13**	9.1J	<5	<3.8	<3.8	<2.5	<6.2	<3.8	<2.5	<6.2	<6.2	<5	<5	**443**	NA	NA	NA
		12/12/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	69	2/20/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/29/2002	<0.75	**220**	**6.3**	1.1J	<0.75	<0.5	1.2J	<0.5	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<0.75	<1.2	<1	1.3J	**226**	<4	<2	<0.95
		9/18/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		12/16/2002	<1.5	**250**	3.7J	<1.5	<1.5	<1	14	7.8	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	2.4J	<2	**272**	NA	NA	NA
MW-4	64	2/20/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/25/2002	**1.9**	**7.6**	0.45J	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.5	<0.4	<0.3	**10**	<4	1.4J	**1.8**
		9/16/2002	**2.4**	**8.8**	0.74J	<0.3	<0.3	<0.2	<0.3	<0.2	<0.2	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**11**	NA	NA	NA
		12/12/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-5	69	2/20/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/26/2002	**21**	**46**	**2.9**	<0.3	<0.3	<0.3	0.96J	0.26J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.4	<0.4	**70**	<4	1.6J	**1.4**
		9/17/2002	**21**	**46**	**2.6**	<0.3	<0.3	<0.2	0.73J	0.23J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**70**	NA	NA	NA
		12/12/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6R	69	2/20/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/26/2002	**18**	**140**	**2.7**	<0.75	<0.75	<0.5	0.88J	<0.5	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<0.75	<1.2	<1	<1	**161**	<4	1.8J	<0.95
		9/18/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		12/13/2002	**2**	**9.8**	**1.1**	<0.3	<0.3	0.44J	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**13**	NA	NA	NA
MW-7R	66	2/21/2002	**230**	**2,400**	**63**	<10	<15	<10	<10	<10	<20	<15	<15	<10	<10	<10	<10	<10	<20	<20	<10	**2,693**	NA	NA	NA
		4/30/2002	**260**	**2,600**	**64**	<15	<15	<10	<15	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**2,924**	<4	**15**	**1.4**
		9/19/2002	**260**	**2,700**	**55**	<15	<15	<10	<15	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**3,015**	NA	NA	NA
		12/12/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	63	2/21/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/29/2002	**4.7**	**180**	**2.8**	<0.75	<0.75	<0.5	1.9J	1.4J	<1	<0.75	<0.75	<1	<2.5	<1.5	<1	<1.5	<2.5	1.2J	<1.2J	**188**	<4	**3.3**	**3.3**
		9/18/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		12/16/2002	**5.1**	**180**	**2.8**	<0.75	<0.75	<0.5	1.8J	1.2J	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	1.8J	<1	**188**	NA	NA	NA
MW-9	67	2/21/2002	**65**	**170**	2J	<0.75	<0.75	<0.5	**3.6**	2.1J	<2.5	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<1.2	<1	<1	<1	**239**	NA	NA	NA
		4/29/2002	**59**	**140**	1.6J	<0.6	<0.6	<0.4	**3.4**	**3.4**	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<0.4	<1	<0.8	<0.8	**206**	<4	**2.1**	**7.7**
		9/18/2002	**43**	**190**	**14**	<1.5	<1.5	<1	3.2J	1.2J	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	<2	**247**	NA	NA	NA
		12/16/2002	**72**	**190**	**5.1**	<0.75	<0.75	<0.5	**3.8**	1.7J	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	<1	<1	**271**	NA	NA	NA
MW-10	65	2/21/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		4/29/2002	**640**	**250**	<3	<3	<3	<2	9.2J	4.5J	<4	<3	<3	<2	<5	<3	<2	<3	<5	<4	<4	**890**	<4	**8.6**	**29**
		9/18/2002	**910**	**320**	<7.5	<7.5	<7.5	<5	10J	5.3J	<10	<7.5	<7.5	<5	<12	<7.5	<5	<12	<12	<10	<10	**1,230**	NA	NA	NA
		12/17/2002	**1,600**	**380**	<7.5	<7.5	<7.5	<5	15J	7.1J	<10	<7.5	<7.5	<5	<12	<7.5	<5	<12	<12	<10	<10	**1,980**	NA	NA	NA
MW-11	66	2/21/2002	**2,200**	**760**	<15	<15	<15	<10	32J	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**2,960**	NA	NA	NA
		4/30/2002	**1,700**	**1,000**	<7.5	<7.5	<7.5	<5	**62**	19J	<10	<7.5	<7.5	<5	<12	<7.5	<5	<12	<12	<10	<10	**2,762**	<4	**3.6**	**91**
		9/19/2002	**1,700**	**920**	<15	<15	<15	<10	45J	16J	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**2,620**	NA	NA	NA
		12/12/2002	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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Table 1. Summary of 2002 Laboratory Results - Groundwater Samples
Former NASA Industrial Plant
Downey, California

Monitoring Well	Total Depth of Well (ft bgs)	Date Sampled	Tetracholorethene (PCE)	Trichloroethene (TCE)	cis 1,2-Dichloroethene (c12- DCE)	trans 1,2-dichloroethene (t 12-DCE)	Vinyl Chloride	1,1,1-Trichoroethane (111-TCA)	1,1-Dichloroethene (11-DCE)	1,1-Dichloroethane (11-DCA)	1,2-Dichloroethane (12-DCA)	Benzene	Toluene	Ethylbenzene	Total Xylenes	1,2,4-Trimethylbezene	1,3,5-Trimethylbezene	Methyl tert-butyl ether (MTBE)	Naphthalene	Dichlorodifluoromethane (CFC12)	1,1,2-Trichlorotrifluoroethane (CFC113)	Total Volatile Organic Compounds	Perchlorate	N-Nitrosodiumethylamine (NDMA)	1,4-Dioxane
MW-12	74	2/20/2002	<0.3	**68**	0.53J	<0.3	<0.3	<0.2	0.69J	<0.2	<0.4	<0.3	**0.37**	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	**3**	**5.3**	**77**	NA	NA	NA
		4/25/2002	<0.3	**69**	**1.5**	<0.3	<0.3	<0.2	0.57J	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	1.7J	**2.8**	**73**	<4	<2	<0.95
		9/18/2002	<0.75	**95**	**5.3**	<0.75	<0.75	<0.5	<0.75	<0.5	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	<1	<1	**100**	NA	NA	NA
		12/13/2002	<0.6	**130**	**8.5**	<0.6	<0.6	<0.4	<0.6	<0.4	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<1	<1	<0.8	<0.8	**139**	NA	NA	NA
MW-13	73	2/20/2002	0.38J	**9.7**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.3	**2.8**	**13**	NA	NA	NA
		4/25/2002	0.64J	**24**	<0.3	<0.3	<0.3	<0.2	0.45J	0.49J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	0.46J	**8.2**	**32**	<4	1.1J	**1.1**
		9/16/2002	<0.3	**7.2**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	0.73J	**7**	NA	NA	NA
		12/12/2002	<0.3	**11**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**11**	NA	NA	NA
MW-14	75	2/20/2002	0.60J	**26**	<0.3	<0.3	<0.3	<0.2	0.79J	<0.2	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.3	**1.1**	**27**	NA	NA	NA
		4/26/2002	**2.3**	**80**	0.31J	<0.3	<0.3	0.68J	**2.2**	**1.3**	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	**2**	<0.5	0.58J	**5.6**	**93**	<4	0.82J	**0.98**
		9/17/2002	**2.4**	**75**	<0.6	<0.6	<0.6	1J	1.1J	1.1J	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	1.8J	<1	<0.8	**5.2**	**83**	NA	NA	NA
		12/13/2002	<0.3	**47**	<0.3	<0.3	<0.3	**1**	0.65J	0.98J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	**2.1**	<0.5	<0.4	**3.5**	**54**	NA	NA	NA
MW-15	75	2/20/2002	0.53J	**22**	<0.3	<0.3	<0.3	<0.2	0.37J	<0.2	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	0.83J	<0.5	<0.3	**1.4**	**23**	NA	NA	NA
		4/26/2002	0.36J	**17**	<0.3	<0.3	<0.3	<0.2	<0.3	0.43J	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	0.82J	<0.5	<0.3	**1.2**	**18**	<4	0.80J	**0.96**
		9/16/2002	0.92J	**48**	<0.3	<0.3	<0.3	0.5J	0.47J	0.91J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	0.51J	<0.5	<0.4	**2.5**	**51**	NA	NA	NA
		12/13/2002	**2.2**	**99**	<0.6	<0.6	<0.6	1.3J	0.96J	**2.3**	<0.8	<0.6	<0.8	<0.4	<1	<0.6	<0.4	<1	<1	<0.8	**3.8**	**107**	NA	NA	NA
MW-16	74	2/21/2002	<0.3	**15**	<0.3	<0.3	<0.3	0.59J	<0.3	0.32J	0.42J	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	**2.2**	<0.5	<0.3	<0.4	**17**	NA	NA	NA
		4/26/2002	<0.3	**18**	<0.3	<0.3	<0.3	0.85J	<0.3	0.3J	<0.4	<0.3	<0.4	<0.2	<0.5	<0.3	<0.2	**1.9**	<0.5	<0.3	<0.4	**20**	<4	1.3J	**3.1**
		9/17/2002	<1.5	**150**	<1.5	<1.5	<1.5	**13**	<1.5	1.9J	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	<2	**163**	NA	NA	NA
		12/16/2002	<0.3	**7.4**	<0.3	<0.3	<0.3	0.24J	<0.3	<0.2	<0.4	<0.3	<0.4	<0.2	<1.2	<0.3	<0.2	**1**	<1	<0.4	<0.4	**8**	NA	NA	NA
MW-17	75	2/21/2002	**15**	**170**	<0.75	<0.75	<0.75	**4**	**2.9**	**4.4**	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	1.3J	<1	**196**	NA	NA	NA
		4/29/2002	**5.2**	**160**	<0.75	<0.75	<0.75	2J	2.1J	**4.6**	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	<1	<1	**170**	<4	<2	**1.6**
		9/18/2002	2.9J	**140**	<1.5	<1.5	<1.5	1.8J	2J	3.3J	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	<2	**140**	NA	NA	NA
		12/13/2002	**5**	**200**	<0.75	<0.75	<0.75	**5.8**	**2.8**	**4.6**	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	<1	<1	**218**	NA	NA	NA
MW-18	75	2/20/2002	**3.2**	**72**	0.58J	<0.3	<0.3	<0.2	**2.2**	**1.3**	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	1J	<0.5	0.55J	**1.5**	**80**	NA	NA	NA
		4/26/2002	**2.2**	**58**	0.58J	<0.3	<0.3	<0.2	0.98J	0.98J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	**1.4**	<0.5	0.72J	**2.3**	**64**	<4	0.42J	**1**
		9/17/2002	**3**	**52**	<0.3	<0.3	<0.3	0.36J	0.89J	0.98J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	**1.7**	<0.5	<0.4	**3.2**	**60**	NA	NA	NA
		12/13/2002	**2.9**	**27**	<0.3	<0.3	<0.3	<0.2	0.33J	0.67J	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	**2**	<0.5	<0.4	**1.6**	**34**	NA	NA	NA
MW-19	75	2/20/2002	**24**	**83**	<0.6	<0.6	<0.6	<0.4	**2**	**2.3**	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<0.6	<1	<0.8	1.1J	**111**	NA	NA	NA
		4/26/2002	**42**	**170**	<0.75	<0.75	<0.75	<0.5	**4**	**4.9**	<1	<0.75	<0.75	<0.5	<1.2	<0.75	<0.5	<1.2	<1.2	<1	1.7J	**221**	<4	**2.5**	**3.2**
		9/18/2002	**58**	**280**	<1.5	<1.5	<1.5	<1	**6.5**	**7**	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	2.2J	**352**	NA	NA	NA
		12/17/2002	**16**	**140**	0.6J	<0.6	<0.6	<0.4	**3.2**	**3.8**	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<1	<1	<0.8	<0.8	**163**	NA	NA	NA
MW-20	100	2/21/2002	**5.8**	**9.4**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**15**	NA	NA	NA
		4/25/2002	**1.7**	**6.6**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**8**	<4	1.9J	**1.1**
		9/16/2002	0.93J	**5.4**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**5**	NA	NA	NA
		12/12/2002	0.53J	**7.7**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**8**	NA	NA	NA
MW-21	75	2/21/2002	<3	**360**	**28**	3J	<3	<3	<3	<2	<4	<3	<3	<3	<3	<3	<3	<5	<3	<4	<4	**388**	NA	NA	NA
		4/29/2002	**2.4**	**60**	**2.7**	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.3	**65**	<4	<2	<0.95
		9/17/2002	3.2J	**190**	**7.6**	<1.5	<1.5	<1	<1.5	<1	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	<2	**198**	NA	NA	NA
		12/16/2002	**3.4**	**120**	**5.3**	0.66J	<0.6	<0.4	<0.6	<0.4	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<1	<1	<0.8	<0.8	**129**	NA	NA	NA
MW-22	75	2/20/2002	**19**	**240**	4.3J	<1.5	<1.5	<1	<1.5	<1	<2	<1.5	<0.5	<1	<2.5	<1.5	<1	<1.5	<2.5	<2	<2	**259**	NA	NA	NA
		4/29/2002	**17**	**190**	**3.3**	<0.75	<0.75	<0.5	<0.75	<0.5	<1	<0.75	<0.75	<05	<1.2	<0.75	<0.5	<0.75	<1.2	<1	<1	**210**	<4	**2.4**	**1.2**
		9/18/2002	**21**	**520**	9.6J	<3.8	<3.8	<2.5	<3.8	<2.5	<5	<3.8	<3.8	<2.5	<6.2	<3.8	<2.5	<6.2	<6.2	<5	<5	**541**	NA	NA	NA
		12/17/2002	**26**	**300**	**6.2**	<1.5	<1.5	<1	<1.5	<1	<2	<1.5	<1.5	<1	<2.5	<1.5	<1	<2.5	<2.5	<2	<2	**332**	NA	NA	NA

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Former NASA Industrial Plant
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Monitoring Well	Total Depth of Well (ft bgs)	Date Sampled	Tetracholorethene (PCE)	Trichloroethene (TCE)	cis 1,2-Dichloroethene (c12- DCE)	trans 1,2-dichloroethene (t 12-DCE)	Vinyl Chloride	1,1,1-Trichoroethane (111-TCA)	1,1-Dichloroethene (11-DCE)	1,1-Dichloroethane (11-DCA)	1,2-Dichloroethane (12-DCA)	Benzene	Toluene	Ethylbenzene	Total Xylenes	1,2,4-Trimethylbezene	1,3,5-Trimethylbezene	Methyl tert-butyl ether (MTBE)	Naphthalene	Dichlorodifluoromethane (CFC12)	1,1,2-Trichlorotrifluoroethane (CFC113)	Total Volatile Organic Compounds	Perchlorate	N-Nitrosodiumethylamine (NDMA)	1,4-Dioxane
MW-23	74	2/20/2002	**74**	**1,500**	**33**	<7.5	<7.5	<5	<7.5	<5	<10	<7.5	<7.5	<5	<12	<7.5	<5	<7.5	<12	<10	<10	**1,607**	NA	NA	NA
		4/30/2002	**110**	**1,900**	39J	<15	<15	<10	<15	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**2,010**	<4	**4.2**	**2**
		9/18/2002	**71**	**1,800**	34J	<15	<15	<10	<15	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**1,871**	NA	NA	NA
		12/17/2002	**89**	**1,600**	**36**	<7.5	<7.5	<5	<7.5	<5	<10	<7.5	<7.5	<5	<12	<7.5	<5	<12	<12	<10	<10	**1,725**	NA	NA	NA
MW-24	75	2/20/2002	0.7J	**63**	**27**	**2.6**	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.4	<0.4	**93**	NA	NA	NA
		4/26/2002	0.99J	**61**	**20**	**2**	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	0.8J	<0.4	<0.4	**83**	<4	0.94J	**1.4**
		9/17/2002	<0.6	**65**	**29**	**4.7**	<0.6	<0.4	<0.6	<0.4	<0.8	<0.6	<0.6	<0.4	<1	<0.6	<0.4	<1	<1	<0.8	<0.8	**99**	NA	NA	NA
		12/13/2002	0.71J	**63**	**28**	**5.5**	<0.3	0.36J	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**97**	NA	NA	NA
MW-25	75	2/20/2002	0.37J	**16**	**1.1**	<0.3	<0.3	<0.2	<0.3	**1.1**	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.4	<0.4	**18**	NA	NA	NA
		4/25/2002	**1.1**	**67**	**1.8**	<0.3	<0.3	<0.2	0.32J	**2.2**	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.3	<0.5	<0.4	<0.4	**72**	<4	0.83J	<0.95
		9/17/2002	5.3J	**330**	6.5J	<3	<3	<2	<3	<2	<4	<3	<3	<2	<5	<3	<2	<5	<5	<4	<4	**330**	NA	NA	NA
		12/17/2002	**9.7**	**380**	**8.2**	<1.5	<1.5	<1	<1.5	<1	<2	<1.5	<1.5	<1	<2.5	<1.5	<1.5	<2.5	<2.5	<2	<2	**398**	NA	NA	NA
MW-26S	75	9/17/2002	18J	**1,800**	45J	<15	<15	<10	<15	<10	<20	<15	<15	<10	<25	<15	<10	<25	<25	<20	<20	**1,800**	NA	NA	NA
		12/17/2002	15J	**1,400**	**57**	<7.5	<7.5	<5	<7.5	<5	<10	<7.5	<7.5	<5	<12	<7.5	<5	<12	<12	<10	<10	**1,457**	NA	NA	NA
MW-26D	130	9/16/2002	<0.3	**1.6**	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	0.78J	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**2**	NA	NA	NA
		12/12/2002	**1.7**	**1.6**	<0.3	<0.3	<0.3	**3.7**	<0.3	<0.2	<0.4	0.47J	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**7**	NA	NA	NA
MW-27	130	9/15/2002	<0.3	0.91J	<0.3	<0.3	<0.3	<0.2	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	ND	NA	NA	NA
		12/12/2002	0.67J	**1**	<0.3	<0.3	<0.3	0.94J	<0.3	<0.2	<0.4	<0.3	<0.3	<0.2	<0.5	<0.3	<0.2	<0.5	<0.5	<0.4	<0.4	**1**	NA	NA	NA

Notes:

< - Not detected at the indicated laboratory detection limit

J - Concentration detected below the laboratory detection (LDL) limit and above the method detection limit (MDL)

NS - Sample not collected during the sampling event.

NA - Sample not analyzed for this compound.

Table 2 earthtech Fourth Quarter 2002 Groundwater Monitoring Report

Table 4 earthtech Second Quarter 2002 Groundwater Monitoring and Upgradient Hydropunch Sampling Report

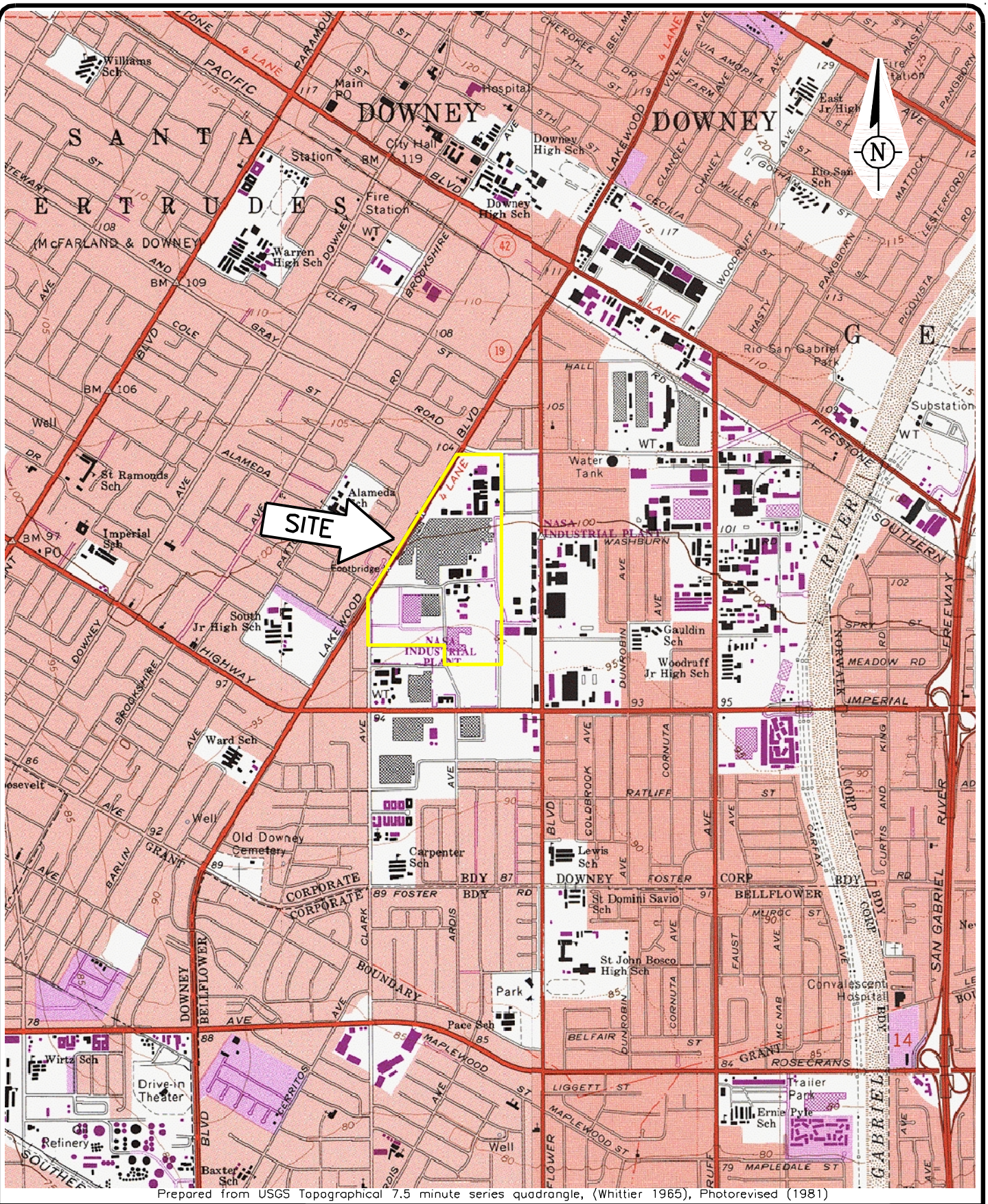
Concentrations reported in mircograms per liter, except MDMA which is reported in nanograms per liter.

Table 2. Process and Preformance Monitoring Schedule
Former NASA Industrial Plant
Downey, California

Week	Monitoring Event Type	Monitoring Well #	pH	Oxidation-Reduction Potential	Dissolved Oxygen	Temperature	Ferrous Iron	Hydrogen Sulfide	Specific Conductance	Total Organic Carbon	Volatile Organic Compounds (by 8260)	Nitrate	Iron (total)	Manganese	Sulfate	Nitrite	Chloride	Dissolved Oxygen	Carbon Dioxide	Nitrogen	Methane	Ethane	Ethene	Bromide
-1	Baseline	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0 - 14	INITIAL CARBOHYDRATE INJECTION EVENT																							
8	Process	MW-24, MW-25, IRZMW-03	X							X														
12	Process	PI-MW-1, MW-24, MW-25, IRZMW-02, IRZMW-03, PI-MW-03, PI-MW-10, PI-MW-11	X							X														
16	Process	PI-MW-1, MW-24, MW-25, IRZMW-02, IRZMW-03, PI-MW-03, PI-MW-10, PI-MW-11	X							X														
20	Process	PI-MW-1, MW-24, MW-25, IRZMW-02, IRZMW-03, PI-MW-03, PI-MW-10, PI-MW-11	X							X														
24	Process	PI-MW-1, MW-24, MW-25, IRZMW-02, IRZMW-03, PI-MW-03, PI-MW-10, PI-MW-12, AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
26	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
39	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
52	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
65	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
78	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
91	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														
104	Performance	PI-MW-1, MW-13, MW-24, MW-25, IRZMW-01, IRZMW-02, IRZMW-03, IRZMW-04, IRZMW-05, IRZMW-06, IRZMW-07, IRZMW-08, IRZMW-09, IRZMW-10, PI-MW-03, PI-MW-10, PI-MW-11,	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Process	AW-107, AW-211, AW-304, AW-704, AW-815	X							X														

ARCADIS

Figures



Prepared from USGS Topographical 7.5 minute series quadrangle, (Whittier 1965), Photorevised (1981)

ARCADIS

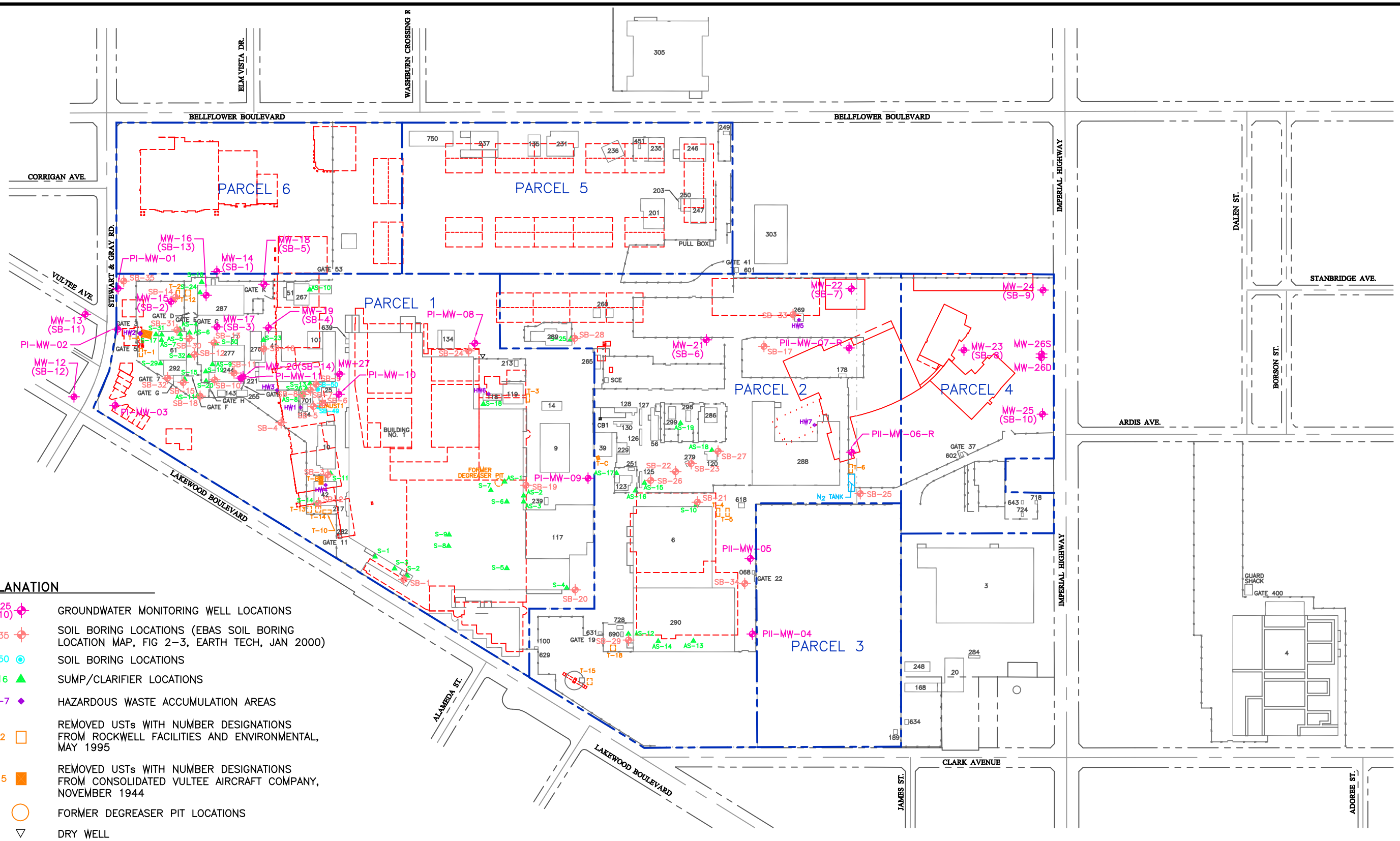
SITE LOCATION

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

1

ART: QUINONES | PM: FRIEDMAN | CHK: FRIEDMAN | FILE: | DWG: G:\drawings\aproject\nasa\Nasa-SL1 | PRJ#: CA 623.01.02 | 13:36 | DATE: 4/9/03



EXPLANATION

MW-25 (SB-10)	GROUNDWATER MONITORING WELL LOCATIONS
SB-35	SOIL BORING LOCATIONS (EBAS SOIL BORING LOCATION MAP, FIG 2-3, EARTH TECH, JAN 2000)
SB-50	SOIL BORING LOCATIONS
S-16	SUMP/CLARIFIER LOCATIONS
HW-7	HAZARDOUS WASTE ACCUMULATION AREAS
T-2	REMOVED USTs WITH NUMBER DESIGNATIONS FROM ROCKWELL FACILITIES AND ENVIRONMENTAL, MAY 1995
T-15	REMOVED USTs WITH NUMBER DESIGNATIONS FROM CONSOLIDATED VULTEE AIRCRAFT COMPANY, NOVEMBER 1944
	FORMER DEGREASER PIT LOCATIONS
	DRY WELL
	CATCH BASIN
	APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
2. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN-BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
3. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

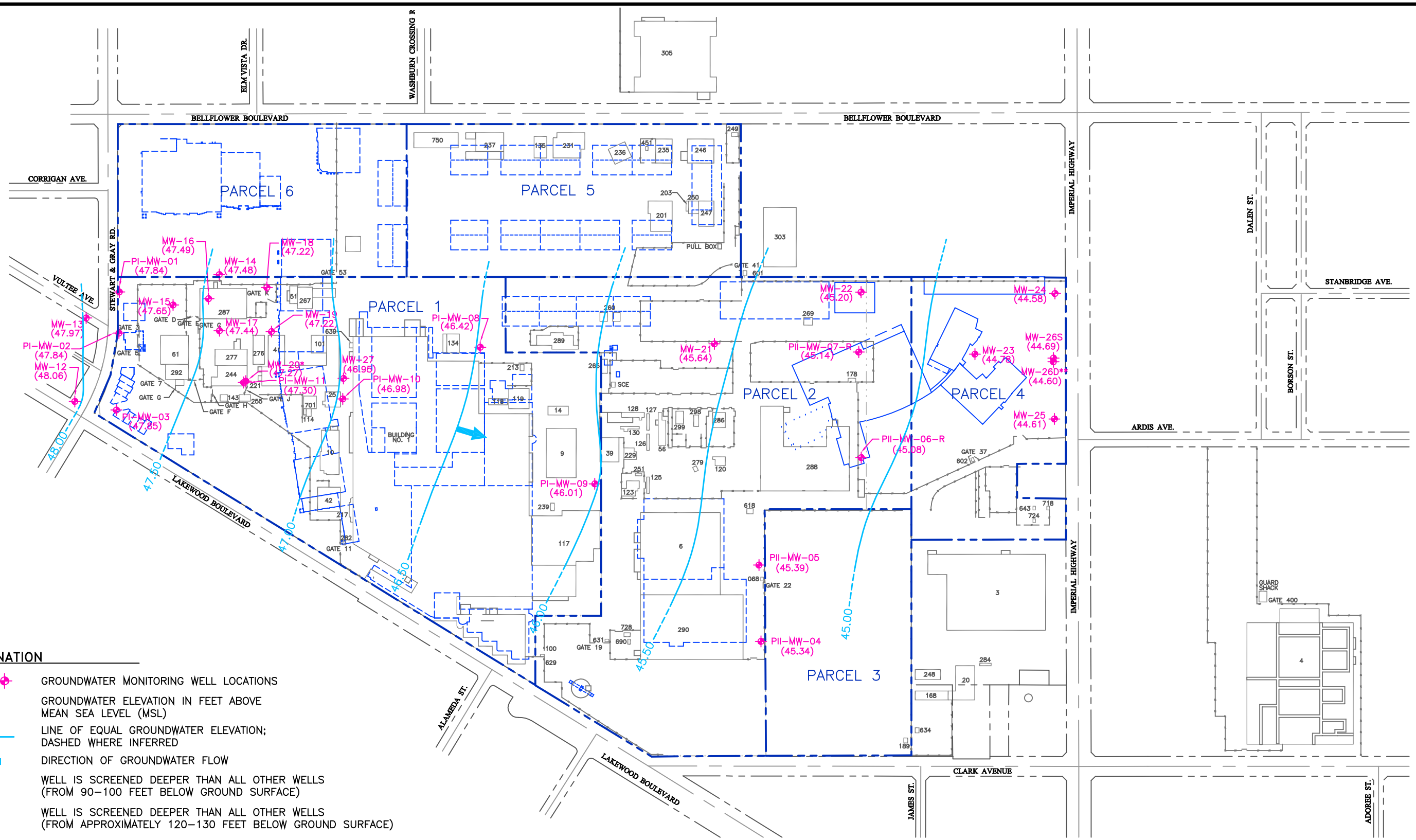
ARCADIS

SITE MAP WITH MONITORING WELL LOCATIONS

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
2

DATE: 4/9/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\site map | FILE: | CHK: FRIEDMAN | PM: FRIEDMAN | ART: QUINONES



EXPLANATION

MW-25	GROUNDWATER MONITORING WELL LOCATIONS
(44.61)	GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (MSL)
	LINE OF EQUAL GROUNDWATER ELEVATION; DASHED WHERE INFERRED
	DIRECTION OF GROUNDWATER FLOW
*	WELL IS SCREENED DEEPER THAN ALL OTHER WELLS (FROM 90–100 FEET BELOW GROUND SURFACE)
**	WELL IS SCREENED DEEPER THAN ALL OTHER WELLS (FROM APPROXIMATELY 120–130 FEET BELOW GROUND SURFACE)
	APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY EARTHTECH, MAP DATED JANUARY 2003.
2. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
3. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN–BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
4. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

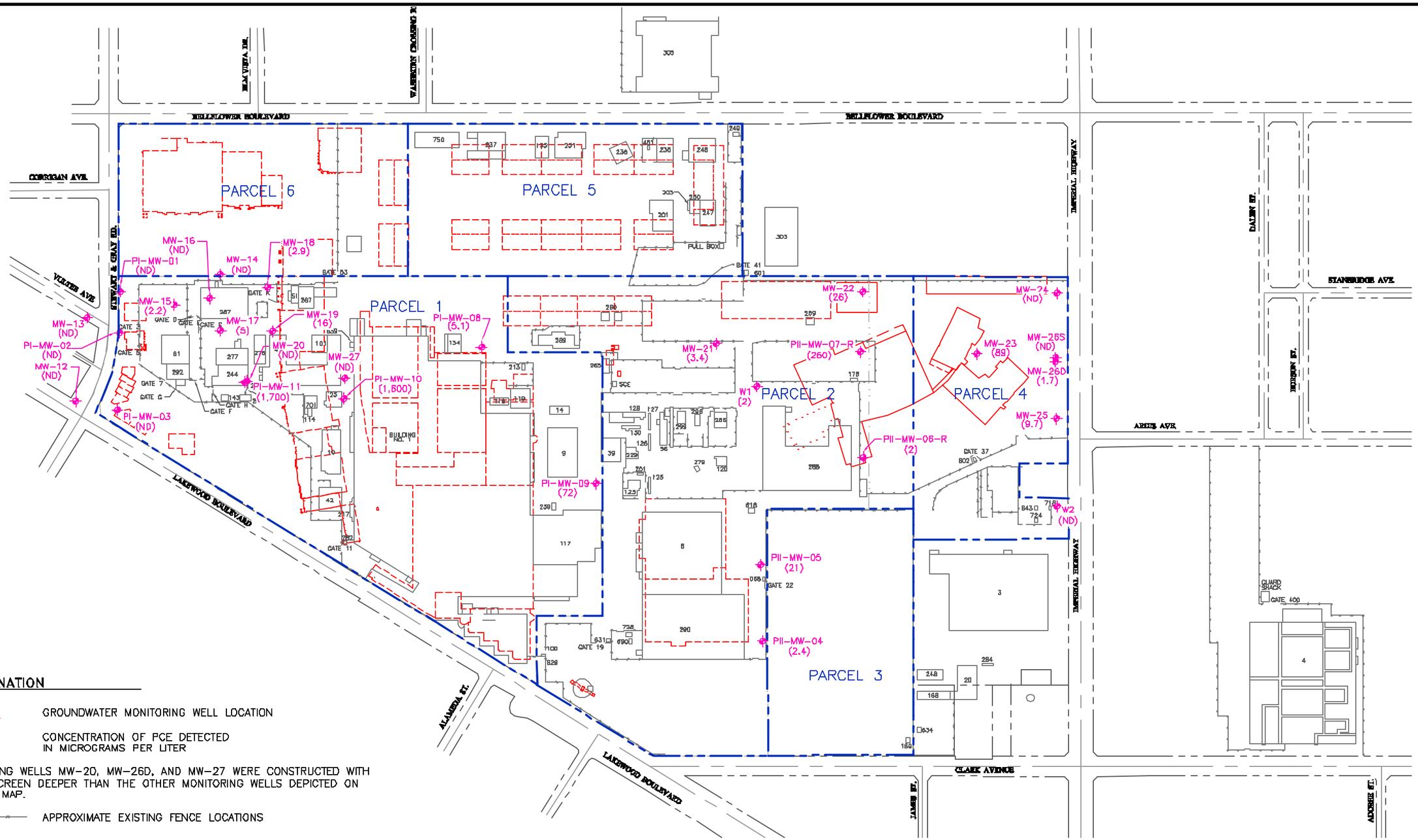
ARCADIS

SITE MAP WITH GROUNDWATER ELEVATIONS DECEMBER 2002

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
3

DATE: 4/9/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\gw-1202 | FILE: | CHK: FRIEDMAN | PM: FRIEDMAN | ART: QUINONES



EXPLANATION

MW-27 — GROUNDWATER MONITORING WELL LOCATION

(1,600) — CONCENTRATION OF PCE DETECTED IN MICROGRAMS PER LITER

MONITORING WELLS MW-20, MW-26D, AND MW-27 WERE CONSTRUCTED WITH WELLS SCREEN DEEPER THAN THE OTHER MONITORING WELLS DEPICTED ON ON THIS MAP.

APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
2. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN-BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
3. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
4. GROUNDWATER QUALITY INFORMATION OBTAINED FROM EARTHTECH 2002 QUARTERLY GROUNDWATER MONITORING REPORTS AND FROM SECOR PHASE II ESA REPORT DATED 11/25/02.
5. SITE FEATURES DEPICTED IN SOLID OR DASHED RED LINES REPRESENT PROPOSED FUTURE DEVELOPMENT.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

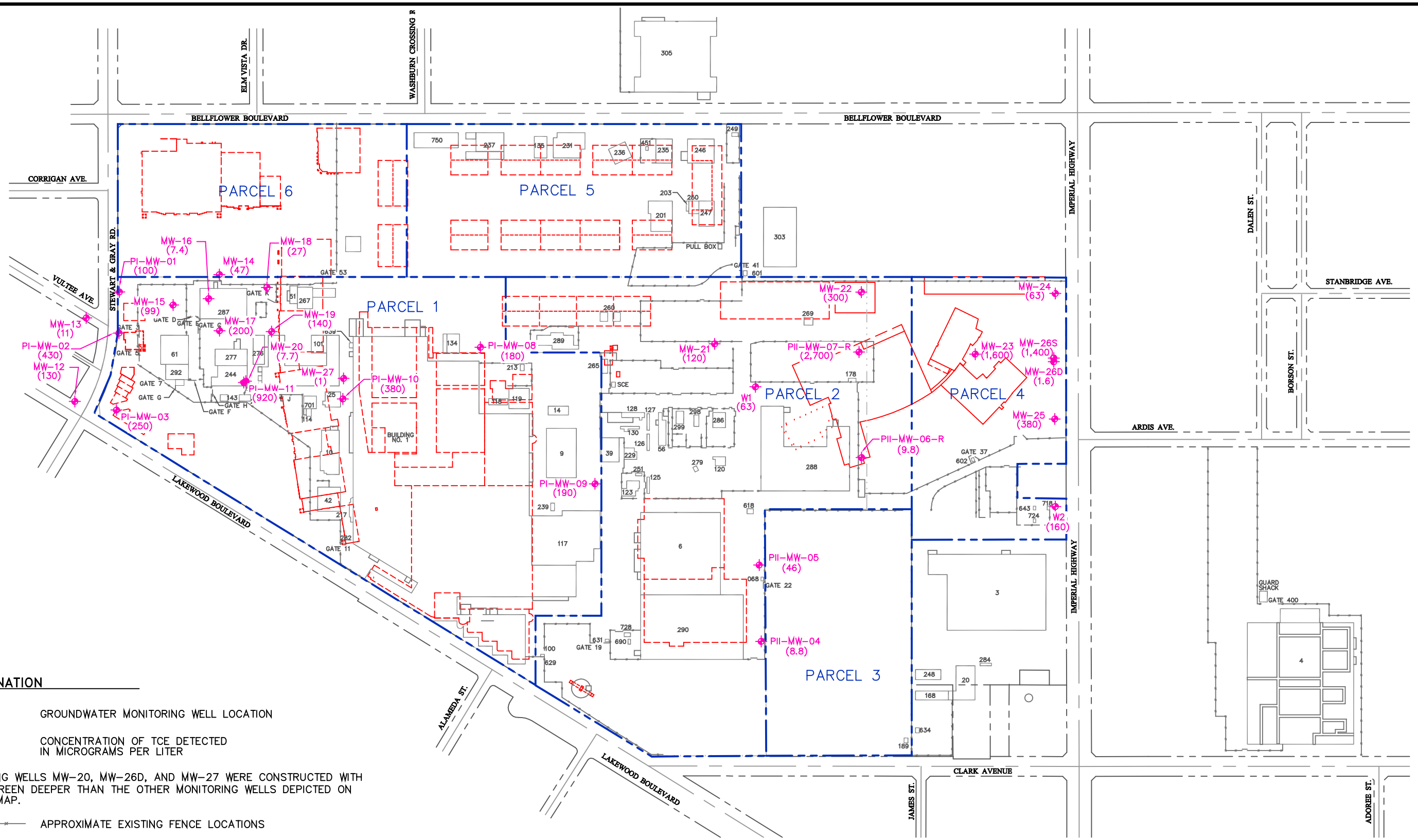
ARCADIS

DISTRIBUTION OF TETRACHLOROETHENE (PCE) IN GROUNDWATER

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
4

DATE: 4/9/03 | 11:30 | PRJ#: CA 623.D1.02 | DWG: G:\drawings\aproject\nasa\GW-PCEchange1 | FILE: | CHK: FRIEDMAN | PM: FRIEDMAN | ART: QUINONES



EXPLANATION

MW-27 — GROUNDWATER MONITORING WELL LOCATION

(2,700) — CONCENTRATION OF TCE DETECTED IN MICROGRAMS PER LITER

MONITORING WELLS MW-20, MW-26D, AND MW-27 WERE CONSTRUCTED WITH WELLS SCREEN DEEPER THAN THE OTHER MONITORING WELLS DEPICTED ON ON THIS MAP.

APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
2. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN-BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
3. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
4. GROUNDWATER QUALITY INFORMATION OBTAINED FROM EARTHTECH 2002 QUARTERLY GROUNDWATER MONITORING REPORTS AND FROM SECOR PHASE II ESA REPORT DATED 11/25/02.
5. SITE FEATURES DEPICTED IN SOLID OR DASHED RED LINES REPRESENT PROPOSED FUTURE DEVELOPMENT.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

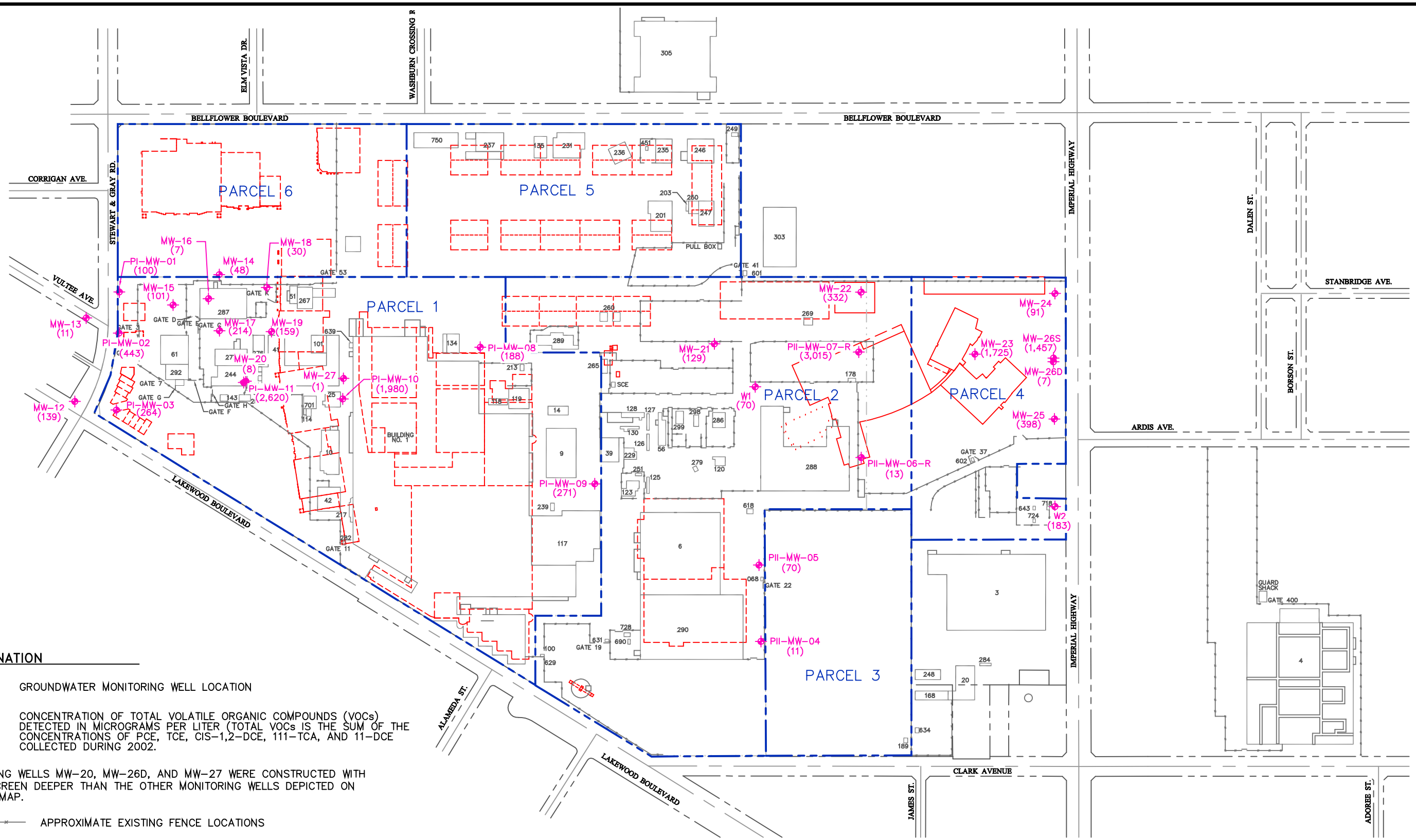
ARCADIS

DISTRIBUTION OF TRICHLOROETHENE (TCE) IN GROUNDWATER

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
5

ART: QUINONES | PM: FRIEDMAN | CHK: FRIEDMAN | FILE: | DWG: G:\drawings\aproject\nasa\GW-TCEchange1 | PRJ#: CA 623.01.02 | 11:30 | DATE: 4/9/03



EXPLANATION

MW-27 — GROUNDWATER MONITORING WELL LOCATION

(3,015) — CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (VOCs) DETECTED IN MICROGRAMS PER LITER (TOTAL VOCs IS THE SUM OF THE CONCENTRATIONS OF PCE, TCE, CIS-1,2-DCE, 111-TCA, AND 11-DCE COLLECTED DURING 2002.

MONITORING WELLS MW-20, MW-26D, AND MW-27 WERE CONSTRUCTED WITH WELLS SCREEN DEEPER THAN THE OTHER MONITORING WELLS DEPICTED ON ON THIS MAP.

APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
2. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN-BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
3. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
4. GROUNDWATER QUALITY INFORMATION OBTAINED FROM EARTHTECH 2002 QUARTERLY GROUNDWATER MONITORING REPORTS AND FROM SECOR PHASE II ESA REPORT DATED 11/25/02.
5. SITE FEATURES DEPICTED IN SOLD OR DASHED RED LINES REPRESENT PROPOSED FUTURE DEVELOPMENT.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

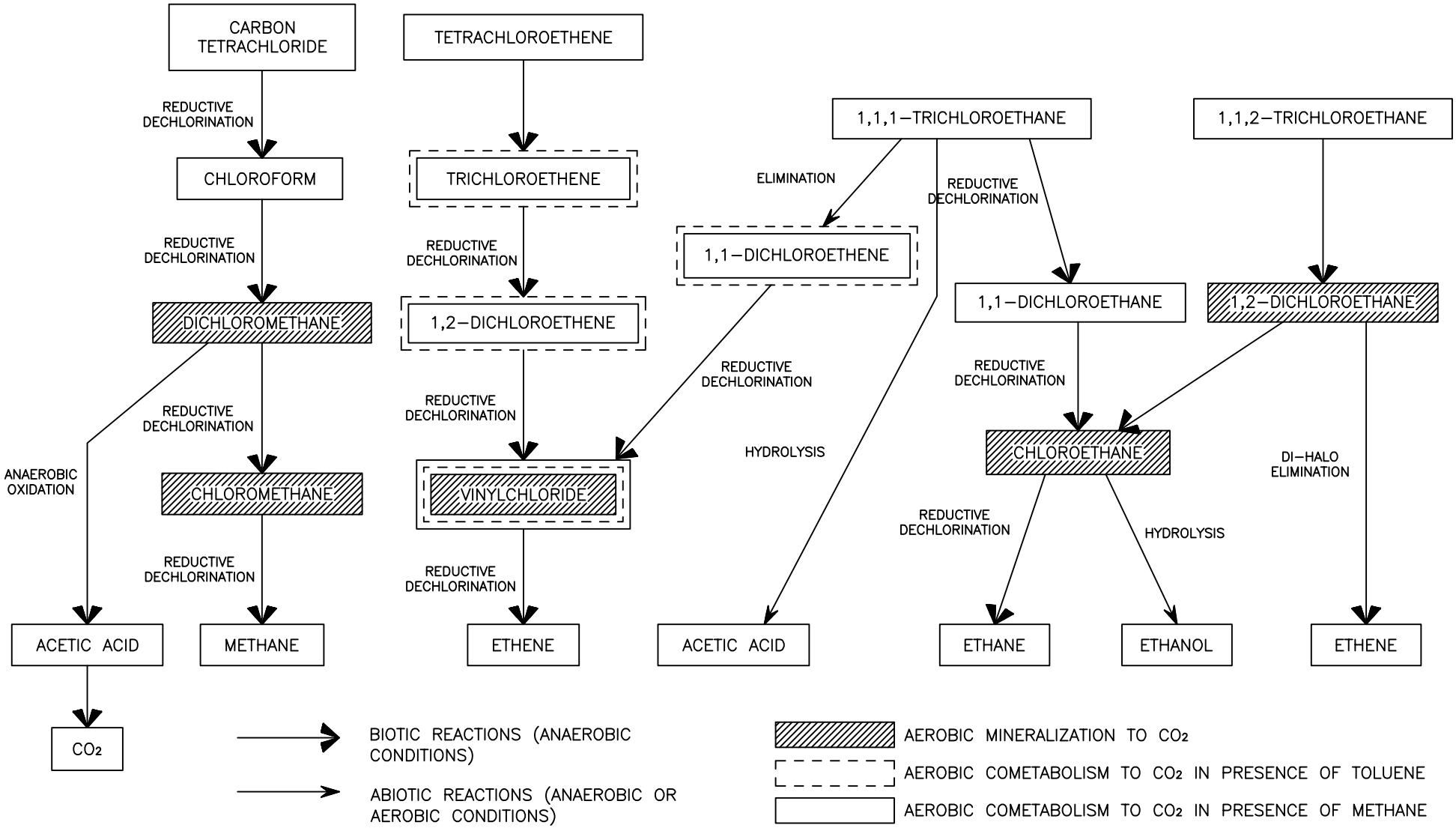
ARCADIS

DISTRIBUTION OF TOTAL VOLATILE ORGANIC COMPOUNDS (VOC) IN GROUNDWATER

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
6

DATE: 4/9/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\GW-VOCchange1 | FILE: | CHK: FRIEDMAN | PM: FRIEDMAN | ART: QUINONES



SOURCE: INTERSTATE TECHNOLOGY AND REGULATORY COOPERATION WORK GROUP (ITRC), MAY 1999, NATURAL ATTENUATION OF CHLORINATED SOLVENTS IN GROUNDWATER: PRINCIPLES AND PRACTICES, WWW.ITRCWEB.ORG

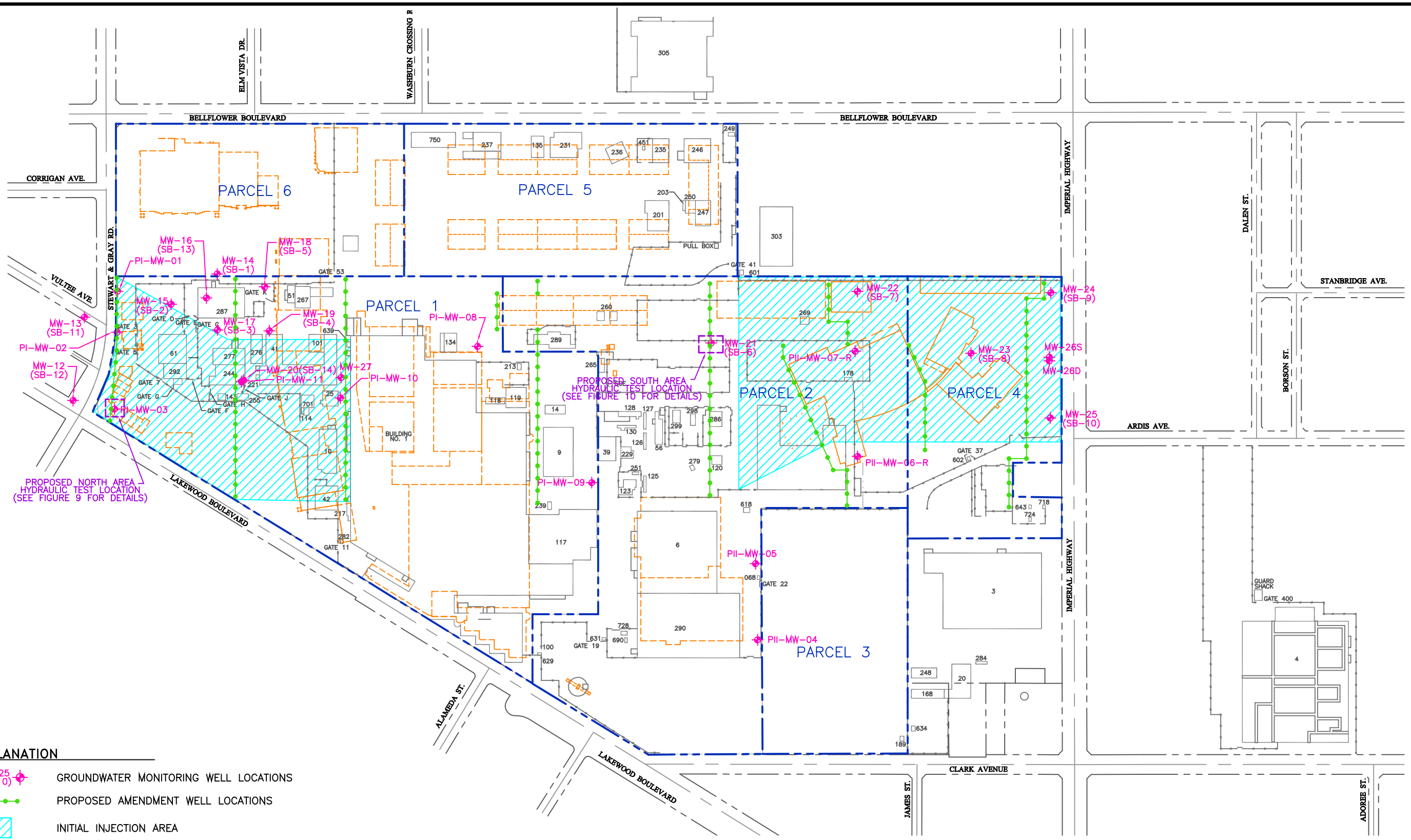
ARCADIS

COMMON DEGRADATION PATHWAYS

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

7



EXPLANATION

- MW-25 (SB-10) — GROUNDWATER MONITORING WELL LOCATIONS
- PROPOSED AMENDMENT WELL LOCATIONS
- INITIAL INJECTION AREA
- APPROXIMATE EXISTING FENCE LOCATIONS

NOTES:

1. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY EARTHTECH, BASE MAP DATED MAY 2002.
2. SOURCE OF MAP: PROVIDED BY NASA INDUSTRIAL PLANT FACILITIES, BY ROCKWELL FACILITIES AND ENVIRONMENTAL, MAP DATED MAY 1995.
3. GROUNDWATER MONITORING WELL LOCATIONS SURVEYED BY DULIN–BOYNTON LICENSED SURVEYORS ON MAY 28, 1998, FEBRUARY 2, 2000, AND JANUARY 30, 2002.
4. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

NORTH

0 400 800

APPROXIMATE SCALE IN FEET
SCALE: 1" = 400'

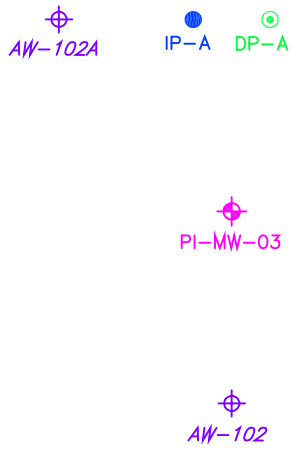
ARCADIS

IMSR TREATMENT AREA

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE
8

DATE: 4/9/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\IMRS Treatment | FILE: | CHK: FRIEDMAN | PM: FRIEDMAN | ART: QUINONES



LEGEND:

PI-MW-03 — *EXISTING MONITORING WELL*

AW-102 — *PROPOSED AMENDMENT WELL*

DP-A — *PROPOSED INJECTION POINT (3/4" TEMPORARY WELL)*

IP-A — *PROPOSED INJECTION POINT (DIRECT PUSH WELL)*

N

0 5

SCALE: 1 INCH = 5 FEET

ARCADIS

NORTH AREA HYDRAULIC TEST WELL LAYOUT

NASA DOWNEY INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

9

DATE: 4/14/03 | 11:30 | PRJ#: CA 623.01.01 | DWG: G:\drawings\aproject\nasa\north area | FILE: | CHK: ORENS | PM: FRIEDMAN | ART: QUINONES

| ART: QUINONES | PM: FRIEDMAN | CHK: ORENS | FILE: | DWG: G:\drawings\aproject\nasa\south area | PRJ#: CA 623.01.01 | 11:30 | DATE: 4/14/03

LEGEND:

MW-21 — *EXISTING MONITORING WELL*

AW-517 — *PROPOSED AMENDMENT WELL*

DP-B — *PROPOSED INJECTION POINT (3/4" TEMPORARY WELL)*

IP-B — *PROPOSED INJECTION POINT (DIRECT PUSH WELL)*

N

0 5

SCALE: 1 INCH = 5 FEET

ARCADIS

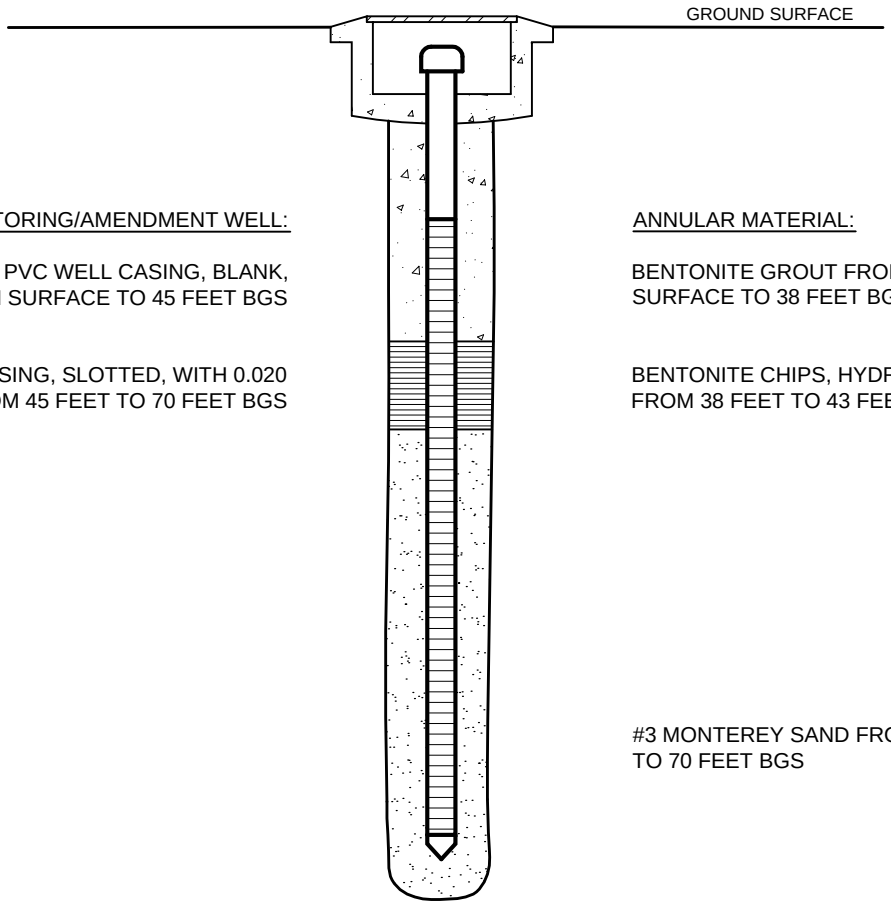
SOUTH AREA HYDRAULIC TEST WELL LAYOUT

NASA DOWNEY INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

10

HYDRAULIC TEST MONITORING/
AMENDMENT WELL



MONITORING/AMENDMENT WELL:

2" PVC WELL CASING, BLANK, FROM SURFACE TO 45 FEET BGS

2" PVC WELL CASING, SLOTTED, WITH 0.020 SLOTS, FROM 45 FEET TO 70 FEET BGS

ANNULAR MATERIAL:

BENTONITE GROUT FROM SURFACE TO 38 FEET BGS

BENTONITE CHIPS, HYDRATE INPLACE FROM 38 FEET TO 43 FEET BGS

#3 MONTEREY SAND FROM 43 FEET TO 70 FEET BGS

LEGEND

PVC	POLYVINYL CHLORIDE
BGS	BELOW GROUND SURFACE

NOTE

WELL DESIGNS PRESENTED ARE CONCEPTUAL. SITE LITHOLOGY MAY DETERMINE SCREEN LENGTH AND PLACEMENT.

NOT TO SCALE

ARCADIS

HYDRAULIC TEST MONITORING/AMENDMENT WELL CONSTRUCTION DETAIL

NASA INDUSTRIAL PLANT
NASA, CALIFORNIA

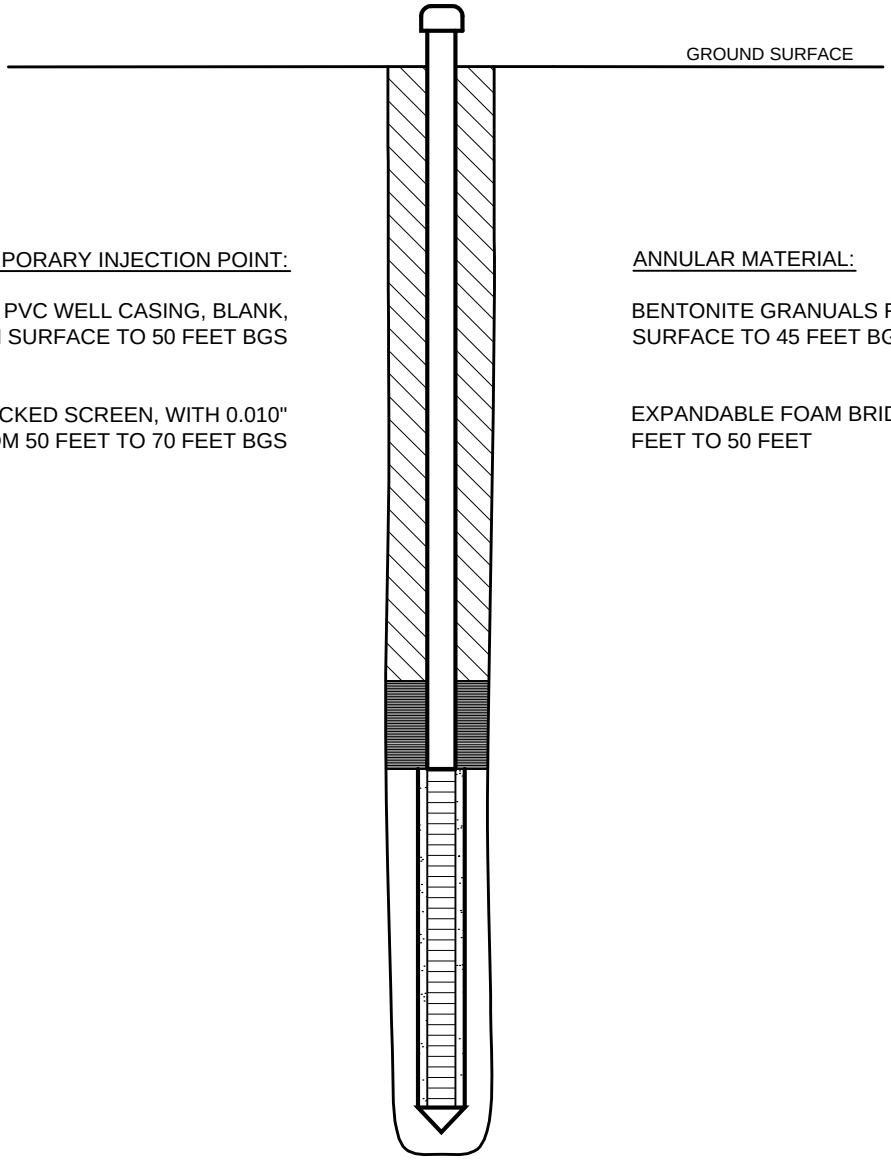
FIGURE

11

DATE: 4/14/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\Hydraulic Well Detail | FILE: | CHK: ORENS | PM: FRIEDMAN | ART: QUINONES

DATE: 4/14/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\Injection Point Detail | FILE: | CHK: ORENS | PM: FRIEDMAN | ART: QUINONES

INJECTION POINT



TEMPORARY INJECTION POINT:

3/4" PVC WELL CASING, BLANK, FROM SURFACE TO 50 FEET BGS

3/4" OD PRE-PACKED SCREEN, WITH 0.010" SLOTS, FROM 50 FEET TO 70 FEET BGS

ANNULAR MATERIAL:

BENTONITE GRANUALS FROM SURFACE TO 45 FEET BGS

EXPANDABLE FOAM BRIDGE FROM 45 FEET TO 50 FEET

LEGEND

PVC	POLYVINYL CHLORIDE
BGS	BELOW GROUND SURFACE
OD	OUTSIDE DIAMETER

NOTE

WELL DESIGNS PRESENTED ARE CONCEPTUAL. SITE LITHOLOGY MAY DETERMINE SCREEN LENGTH AND PLACEMENT.

NOT TO SCALE

ARCADIS

TYPICAL INJECTION POINT CONSTRUCTION DETAIL

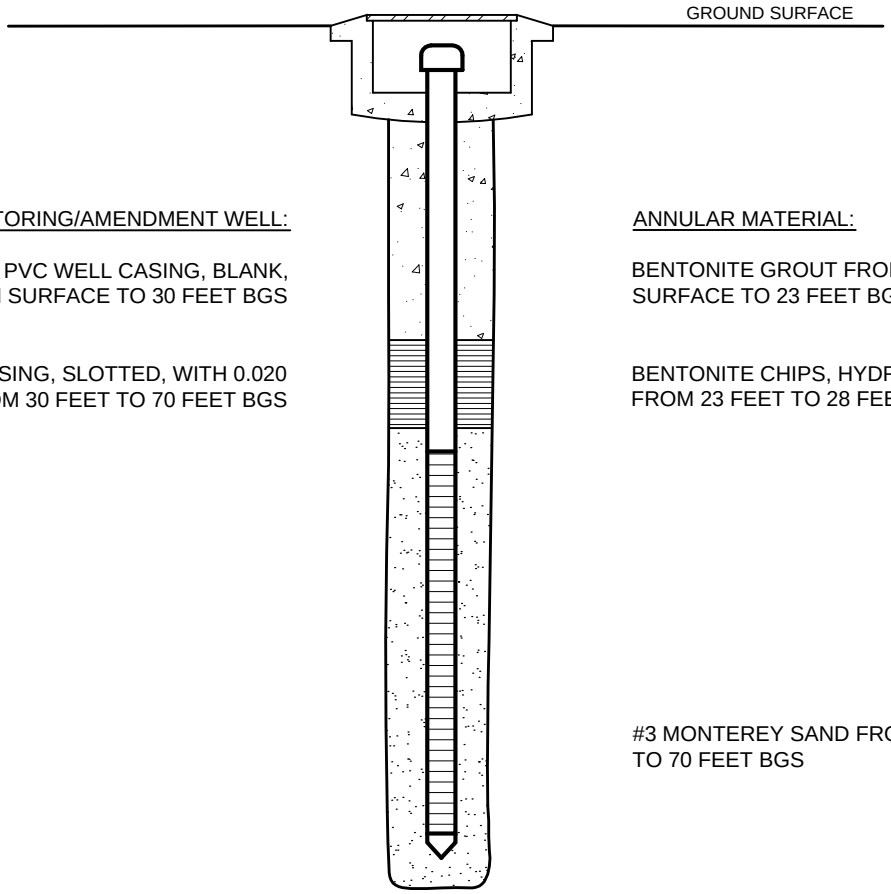
NASA INDUSTRIAL PLANT
NASA, CALIFORNIA

FIGURE

12

DATE: 4/14/03 | 11:30 | PRJ#: CA 623.01.02 | DWG: G:\drawings\aproject\nasa\Monitoring Well Detail | FILE: | CHK: ORENS | PM: FRIEDMAN | ART: QUINONES

GROUNDWATER MONITORING WELL



MONITORING/AMENDMENT WELL:

2" PVC WELL CASING, BLANK, FROM SURFACE TO 30 FEET BGS

2" PVC WELL CASING, SLOTTED, WITH 0.020 SLOTS, FROM 30 FEET TO 70 FEET BGS

ANNULAR MATERIAL:

BENTONITE GROUT FROM SURFACE TO 23 FEET BGS

BENTONITE CHIPS, HYDRATE INPLACE FROM 23 FEET TO 28 FEET BGS

#3 MONTEREY SAND FROM 28 FEET TO 70 FEET BGS

LEGEND

PVC	POLYVINYL CHLORIDE
BGS	BELOW GROUND SURFACE

NOTE

WELL DESIGNS PRESENTED ARE CONCEPTUAL. SITE LITHOLOGY MAY DETERMINE SCREEN LENGTH AND PLACEMENT.

NOT TO SCALE

ARCADIS

TYPICAL GROUNDWATER MONITORING WELL CONSTRUCTION DETAIL

NASA INDUSTRIAL PLANT
NASA, CALIFORNIA

FIGURE

13

ARCADIS

Appendix A

Material Safety Data Sheets and Product Information

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
1533 W.Henrietta Rd.
Avon, New York 14414
(716) 226-6177

MSDS No. MM 602
Effective Date September 30, 1998

SECTION I NAME

Product	Molasses
Chemical Synonyms	N/A
Formula	N/A
Unit Size	up to 4 Lt.
C.A.S. No.	None assigned.

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC
800-424-9300
Day 716-226-6177

NFPA HAZARD RATING

LEAST	SLIGHT	MODERATE	HIGH	EXTREME
0	1	2	3	4

HMIS *

Health	0
Fire	0
Reactivity	0

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Molasses	100%	None listed.

SECTION III PHYSICAL DATA

Melting Point (°F)	N/A	Specific Gravity (H_2O = 1)	1.42
Boiling Point (°F)	230°C	Percent Volatile by Volume (%)	20
Vapor Pressure (mm Hg)	70	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	Data not listed.		
Solubility in Water	Infinite.		
Appearance & Odor	Slight amber to brown colored thick liquid; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable.	Flammable Limits in Air % by Volume	Lower	Upper
Extinguisher Media	None required. Product is non-combustible.			

SPECIAL FIREFIGHTING PROCEDURES

Non-flammable.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Non-explosive.

D.O.T. **NON-REGULATED.**

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

MM 602

Threshold Limited Value

None established. (ACGIH 1992-93).

Effects of Overexposure

Non-hazardous.
No ill effects are expected.

Emergency and First Aid Procedures

Non-hazardous.
Wash thoroughly with mild soap and water.

SECTION VI REACTIVITY DATA

Stability	Unstable		Conditions to Avoid
	Stable	X	Not applicable.

Incompatibility (Materials to Avoid) Not applicable.

Hazardous Decomposition Products Not applicable.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	
	X	Not applicable.

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Non-hazardous.
Absorb with an inert dry material and mop up with soap and water.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws.
These disposal guidelines are intended for the disposal of catalog-size quantities only.

Solid disposal dump or flush to sanitary sewer.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None required in normal handling at room temperatures.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves None needed. **Eye Protection** Chemical safety glasses.

Other Protective Equipment Smock, apron, splash goggles, eye wash station.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.

Store in ventilated tanks equipped with filtered air vents at 105°F - 110°F.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals.

Avoid storage temperatures above 115°F for prolonged periods or discoloration and/or carmelization may occur.

For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Revision	Date	Approved	Chemical Safety Coordinator
No. 1	9/30/98	Michael Raszeja	MR

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

MSDS - Molasses **October 10/2001**

1. Chemical Product and Company Identification

Trade Name: Sweet 45, Sweet 45 Lite, Blackjack and Omalass Dried Molasses
Synonyms: Dried Molasses animal supplement

Distributed by:
Pestell Minerals & Ingredients
141 Hamilton Rd., New Hamburg, ON Canada N0B 2G0

Composition, Information on Ingredients:
CAS Registry No: N/A
ACGIH-TLV-TWA: No Data

2. Hazards Identification

Potential Health Effects
Eyes: Mild irritant if dust gets into eyes
Skin: None
Inhalation: None

3. Physical and Chemical Properties

Appearance: Dark brown coarsely ground meal
Physical State: Solid
Boiling Point: NA
Vapor Pressure: No data
Evaporation Rate: No data
Solubility in Water: Soluble

Odor: Sweet
Specific Gravity: 0.61
Freezing/Melting Point: NA
Volatile, by Volume: No data
Vapor Density in Air: Water Vapor only
pH: NA

4. Fire Fighting Measures

Flashpoint (Method used) Flammable Limits in Air
No flash below 230^0 F (sete flash)
Combustible carrier material
Extinguishing Agents: Water, CO_2, foam
Unusual Fire and Explosion Hazards: Carrier material is combustible. Minimize dust generation. No unusual fire or explosion hazards.

5. Stability and Reactivity

Chemical Stability: Stable
Conditions to Avoid: Excess moisture or heat
Incompatibility with Other Materials: Reacts with concentrated nitric acid or concentrated sulfuric acid
Hazardous Decomposition Products: No data
Hazardous Polymerization: NA

6. Toxicological Information

Acute Toxicity: No data
Exposure Limits: No data

7. Exposure Controls, Personal Protection

Respiratory Protection: May aggravate existing respiratory problems. Use nontoxic particle mask
Ventilation: Local exhaust recommended
Skin Protection: Work Gloves
Eye Protection: Safety Glasses
Hygiene: Wash any exposed area with soap and water. Launder contaminated clothing
Other Control Measures: None

Accidental Release Measures:

Small Release: Stop the source of the release. Recover as much product as possible for reuse. Dispose of unusable material in dumpster.
Large Release: Stop the source of the release. Create diversionary structures to minimize the extent of the release. Prevent the release from entering a waterway or sewer. Recover useable product.

Handling and Storage

Material should be stored indoors or protected from weather

Ecological Information

Prevent releases to land or water. Results in high Biological Oxygen Demand (BOD) and potential oxygen depletion of aquatic system.

Disposal Information

Dispose of waste material at an approved municipal landfill or land application site

Regulatory Information

Discharges to a water of the U.S. are regulated by the Environmental Protection Agency

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8. First Aid Measures

Eyes: Flush eyes for 15 minutes
Skin: Wash with soap and water
Ingestion: No data

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9. Transport Information

Hazardous Materials Description/Proper Shipping Name: NA
DOT Hazard Class: NA
DOT Identification No.: NA
This product is not a DOT hazardous material

---

16. Other Information

The information herein is provided in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. No representation or warranties are made, either express or implied, including with limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein, or the product to which the information refers. Accordingly, we will not be responsible for damages resulting from use of or reliance upon this information.

Material Safety Data Sheet

Provided by:

DPC Industries, Inc. **DX Distributors, Inc.**
DPC Enterprises **DX Systems Company**
DXI Industries, Inc. **DX Terminals**

PO Box 24600
Houston, Tx 77229-4600
281-457-4888
888-647-7717
www.dxgroup.com

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name SODIUM BICARBONATE

Synonyms

Chemical Name SODIUM BICARBONATE

Emergency phone: *281-457-4888* ***Date of Issue:*** 10/1/00
Chemtrec: *800-424-9300* ***Revised Date:*** N/A

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	*PERCENT*	*CAS NO.*
SODIUM BICARBONATE	100%	144-55-8

SECTION 3 - HAZARDS IDENTIFICATION

Potential Health Effects

ACGIH - TLV: 5 mg/cu m

Eye Contact CONTACT MAY CAUSE EYE IRRITATION.

Skin Contact MAY CAUSE SKIN IRRITATION.

Ingestion MAY CAUSE DIGESTIVE TRACT IRRITATION.

Inhalation MAY CAUSE RESPIRATORY TRACT IRRITATION.

Carcinogenicity: ***NTP*** NO ***IARC*** NO ***OSHA*** NO

SECTION 4 - FIRST AID PROCEDCURES

Eye Contact: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION.

Skin Contact: IMMEDIATELY REMOVE CONTAMINATED CLOTHING OR SHOES, WIPE EXCESS FROM SKIN AND FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. USE SOAP IF AVAILABLE OR FOLLOW BY WASHING WITH SOAP AND WATER. DO NOT REUSE CLOTHING UNTIL THOROUGHLY CLEANED. GET MEDICAL ATTENTION.

Inhalation: REMOVE VICTIM TO FRESH AIR AND PROVIDE OXYGEN IF BREATHING IS DIFFICULT. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

Ingestion: INDUCE VOMITING. RINSE MOUTH WITH WATER. IF CONSCIOUS, GIVE LARGE QUANTITIES OF WATER OR MILK AND GET IMMEDIATE MEDICAL ATTENTION. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON!

SECTION 5 -FIRE FIGHTING MEASURES

Flash Point NONCOMBUSTIBLE

Extinguishing Media MEDIA SUITABLE FOR SURROUNDING FIRE.

Special Firefighting Procedures/Precuations	WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE GEAR. STAY UPWIND AND KEEP OUT OF LOW AREAS.

SECTION 6 -ACCIDENTAL RELEASE MEASURES

For Spill: SWEEP OR VACUUM UP AND PLACE IN CONTAINER FOR DISPOSAL. DO NOT FLUSH TO DRAIN.

SECTION 7 - HANDLING AND STORAGE

Keep container tightly closed when not in use. Store in a cool, dry, well-ventilated area, away from heat and incompatible materials. Protect containers from physical damage.

MINIMIZE DUST GENERATION.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection	USE A NIOSH/MSHA APPROVED RESPIRATOR FOLLOWING MANUFACTURER'S RECOMMENDATIONS WHERE DUST OR MIST MAY BE GENERATED.
Ventilation	LOCAL AND MECHANICAL RECOMMENDED.
Protective Gloves	CHEMICAL IMPERVIOUS GLOVES.
Eye/Face Protection	CHEMICAL SAFETY GOGGLES AND/OR FULL-FACE SHIELD.
Other Protection	CHEMICAL RESISTANT CLOTHING SUCH AS COVERALLS/APRON, BOOTS, ETC.
Work Practices	USE GOOD PERSONAL HYGIENE PRACTICES. WASH HANDS BEFORE EATING, DRINKING, SMOKING, OR USING TOILET FACILITIES. PROMPTLY REMOVE SOILED CLOTHING AND WASH THOROUGHLY BEFORE REUSE. SHOWER AFTER WORK USING PLENTY OF SOAP AND WATER.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point (°F):	DECOMPOSES	***Vapor Pressure (mmHg):***	NIL
Freezing Point (°F):	NOT ESTABLISHED	***Vapor Density (Air=1):***	NOT ESTABLISHED
Solubility (H2O):	SOLUBLE	***Specific Gravity (H2O=1):***	2.20
pH	8.5	***Evaporation Rate:***	NOT DETERMINED

Appearance/Odor: WHITE GRANULAR/POWDER SOLID WITH NO APPRECIABLE ODOR.

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability:	YES
Incompatible Materials	MOISTURE, STRONG ACIDS, AND STRONG OXIDIZING AGENTS.
Decomposition Products	OXIDES OF CARBON.
Hazardous Polymerization:	WILL NOT OCCUR.

SECTION 11 - TOXICITY INFORMATION

NO DATA AVAILABLE.

SECTION 12 - ECOLOGICAL INFORMATION

NO DATA AVAILABLE.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSE OF WASTE MATERIALS ACCORDING TO ALL FEDERAL, STATE AND LOCAL REGULATIONS.

SECTION 14 - TRANSPORT INFORMATION

USA DOT Shipping Name: NOT REGULATED.

Hazard Class:

UN/NA Number:

Packing Group:

Subsidiary Hazard

Marine Pollutant: NO

SECTION 15 - REGULATORY INFORMATION

CERCLA RQ (lbs): NOT APPLICABLE

SARA Title III Section 312:

☑ *Acute* ☐ *Chronic* ☐ *Flammable* ☐ *Sudden Release of Pressure* ☐ *Reactive*

SARA Title III Section 313: No

SARA Extremely Hazardous Substance: No

HMIS HAZARD RATING

Health: 1 ***Fire:*** 0 ***Reactivity:*** 0

0 - Least 1 - Slight 2 - Moderate 3 - High 4 - Extreme

SECTION 16 - OTHER INFORMATION

EPA Pesticide Registration Number: NOT APPLICABLE

NSF Maximum Use Level for Potable Water (Standard 60): NOT APPLICABLE

TSCA (Toxic Substance Control Act), 40 CFR 710:

Sources of the raw materials used in this mixture assure that all chemical ingredients present are in compliance with Section 8(b) Chemical Substance Inventory, or are otherwise in compliance with TSCA.

DISCLAIMER

THE DATA PRESENTED IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF; HOWEVER, NEITHER SELLER NOR PREPARER MAKES ANY WARRANTIES, EXPRESSED OR IMPLIED, CONCERNING THE INFORMATION PRESENTED. THE USER IS CAUTIONED TO PERFOM HIS OWN HAZARD EVALUATION AND TO RELY UPON HIS OWN DETERMINATIONS.

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker®

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

POTASSIUM BROMIDE

1. Product Identification

Synonyms: Bromide salt of potassium
CAS No: 7758-02-3
Molecular Weight: 119.00
Chemical Formula: KBr
Product Codes: **J.T. Baker:** 2961, 2998
Mallinckrodt: 0493, 0500, 0505

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Potassium Bromide	7758-02-3	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings

(Provided here for your convenience)

Health:	Flammability:	Reactivity:	Contact:
1 - Slight	0 - None	0 - None	1 - Slight

Lab Protection Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:

Dust may cause irritation to the respiratory tract. Symptoms may include coughing, sore throat, and shortness of breath.

Ingestion:

May cause nausea, vomiting and abdominal pain. Ingestions are usually promptly rejected by vomiting, but sufficient absorption may occur to produce central nervous system, eye and brain effects. Symptoms may include skin rash, blurred vision and other eye effects, drowsiness, irritability, dizziness, mania, hallucinations, and coma.

Skin Contact:

Dry material may cause mild irritation. Solutions may cause irritation, redness, pain, and skin burns.

Eye Contact:

May cause irritation, redness and pain.

Chronic Exposure:

Repeated or prolonged exposure by any route may cause skin rashes (bromaderma). Repeated ingestion of small amounts may cause central nervous system depression, including depression, ataxia, psychoses, memory loss, irritability, and headache.

Aggravation of Pre-existing Conditions:

Persons suffering from debilitation, depression, alcoholism, neurological or psychological disorders may be more susceptible to the effects of this compound.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Wash eyes with plenty of water for at least 15 minutes. Call a physician.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirator (NIOSH Approved)
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Odorless.

Solubility:
70g/100g water @ 25°C (77°F).

Specific Gravity:
2.75 @ 25°C

pH:
Aqueous solution is neutral.

% Volatiles by volume @ 21°C (70°F):
0

Boiling Point:
1435°C (2615°F)

Melting Point:
730°C (1346°F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Oxides of the contained metal and halogen, possibly also free, or ionic halogen.

Hazardous Polymerization:
Will not occur.

Incompatabilities:
For Potassium Bromide: Strong oxidizers, acids, and bromine trifluoride.

Conditions to Avoid:
Incompatibles.

11. Toxicological Information

Potassium bromide: oral rat LD50: 3070 mg/kg; investigated as a mutagen.

Cancer Lists

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Potassium Bromide (7758-02-3)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Inventory Status

Ingredient	TSCA	EC	Japan	Australia	Korea	---Canada--- DSL	NDSL	Phil.
Potassium Bromide (7758-02-3)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Federal, State & International Regulations

Ingredient	---SARA 302--- RQ	TPQ	---------SARA 313--------- List	Chemical Catg.	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Potassium Bromide (7758-02-3)	No	No	No	No	No	No	No

Chemical Weapons Convention: No **TSCA 12(b):** No **CDTA:** No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No Reactivity: No (Pure / Solid)
Warning:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: No information found. **Australian Poison Schedule:** No information found.
WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings:
Health: 2 Flammability: 0 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.

Keep container closed.
Use with adequate ventilation.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

New 16 section MSDS format, all sections have been revised.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared By: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

ARCADIS

Appendix A

Material Safety Data Sheets and Product Information

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
1533 W.Henrietta Rd.
Avon, New York 14414
(716) 226-6177

MSDS No. MM 602
Effective Date September 30, 1998

SECTION I NAME

Product	Molasses
Chemical Synonyms	N/A
Formula	N/A
Unit Size	up to 4 Lt.
C.A.S. No.	None assigned.

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC
800-424-9300
Day 716-226-6177

NFPA HAZARD RATING

LEAST	SLIGHT	MODERATE	HIGH	EXTREME
0	1	2	3	4

HMIS *

Health	0
Fire	0
Reactivity	0

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Molasses	100%	None listed.

SECTION III PHYSICAL DATA

Melting Point (°F)	N/A	Specific Gravity (H_2O = 1)	1.42
Boiling Point (°F)	230°C	Percent Volatile by Volume (%)	20
Vapor Pressure (mm Hg)	70	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	Data not listed.		
Solubility in Water	Infinite.		
Appearance & Odor	Slight amber to brown colored thick liquid; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable.	Flammable Limits in Air % by Volume	Lower	Upper
Extinguisher Media	None required. Product is non-combustible.			

SPECIAL FIREFIGHTING PROCEDURES

Non-flammable.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Non-explosive.

D.O.T. **NON-REGULATED.**

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

MM 602

Threshold Limited Value

None established. (ACGIH 1992-93).

Effects of Overexposure

Non-hazardous.
No ill effects are expected.

Emergency and First Aid Procedures

Non-hazardous.
Wash thoroughly with mild soap and water.

SECTION VI REACTIVITY DATA

Stability	Unstable		Conditions to Avoid
	Stable	X	Not applicable.

Incompatibility (Materials to Avoid) Not applicable.

Hazardous Decomposition Products Not applicable.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	
	X	Not applicable.

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Non-hazardous.
Absorb with an inert dry material and mop up with soap and water.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws.
These disposal guidelines are intended for the disposal of catalog-size quantities only.

Solid disposal dump or flush to sanitary sewer.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None required in normal handling at room temperatures.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves None needed. **Eye Protection** Chemical safety glasses.

Other Protective Equipment Smock, apron, splash goggles, eye wash station.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.

Store in ventilated tanks equipped with filtered air vents at 105°F - 110°F.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals.

Avoid storage temperatures above 115°F for prolonged periods or discoloration and/or carmelization may occur.

For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Revision	Date	Approved	Chemical Safety Coordinator
No. 1	9/30/98	Michael Raszeja	MR

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

MSDS - Molasses **October 10/2001**

1. Chemical Product and Company Identification

Trade Name: Sweet 45, Sweet 45 Lite, Blackjack and Omalass Dried Molasses
Synonyms: Dried Molasses animal supplement

Distributed by:
Pestell Minerals & Ingredients
141 Hamilton Rd., New Hamburg, ON Canada N0B 2G0

Composition, Information on Ingredients:
CAS Registry No: N/A
ACGIH-TLV-TWA: No Data

2. Hazards Identification

Potential Health Effects
Eyes: Mild irritant if dust gets into eyes
Skin: None
Inhalation: None

3. Physical and Chemical Properties

Appearance: Dark brown coarsely ground meal
Physical State: Solid
Boiling Point: NA
Vapor Pressure: No data
Evaporation Rate: No data
Solubility in Water: Soluble

Odor: Sweet
Specific Gravity: 0.61
Freezing/Melting Point: NA
Volatile, by Volume: No data
Vapor Density in Air: Water Vapor only
pH: NA

4. Fire Fighting Measures

Flashpoint (Method used) Flammable Limits in Air
No flash below 230^0 F (sete flash)
Combustible carrier material
Extinguishing Agents: Water, CO_2, foam
Unusual Fire and Explosion Hazards: Carrier material is combustible. Minimize dust generation. No unusual fire or explosion hazards.

5. Stability and Reactivity

Chemical Stability: Stable
Conditions to Avoid: Excess moisture or heat
Incompatibility with Other Materials: Reacts with concentrated nitric acid or concentrated sulfuric acid
Hazardous Decomposition Products: No data
Hazardous Polymerization: NA

6. Toxicological Information

Acute Toxicity: No data
Exposure Limits: No data

7. Exposure Controls, Personal Protection

Respiratory Protection: May aggravate existing respiratory problems. Use nontoxic particle mask
Ventilation: Local exhaust recommended
Skin Protection: Work Gloves
Eye Protection: Safety Glasses
Hygiene: Wash any exposed area with soap and water. Launder contaminated clothing
Other Control Measures: None

Accidental Release Measures:

Small Release: Stop the source of the release. Recover as much product as possible for reuse. Dispose of unusable material in dumpster.
Large Release: Stop the source of the release. Create diversionary structures to minimize the extent of the release. Prevent the release from entering a waterway or sewer. Recover useable product.

Handling and Storage

Material should be stored indoors or protected from weather

Ecological Information

Prevent releases to land or water. Results in high Biological Oxygen Demand (BOD) and potential oxygen depletion of aquatic system.

Disposal Information

Dispose of waste material at an approved municipal landfill or land application site

Regulatory Information

Discharges to a water of the U.S. are regulated by the Environmental Protection Agency

---

8. First Aid Measures

Eyes: Flush eyes for 15 minutes
Skin: Wash with soap and water
Ingestion: No data

---

9. Transport Information

Hazardous Materials Description/Proper Shipping Name: NA
DOT Hazard Class: NA
DOT Identification No.: NA
This product is not a DOT hazardous material

---

16. Other Information

The information herein is provided in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. No representation or warranties are made, either express or implied, including with limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein, or the product to which the information refers. Accordingly, we will not be responsible for damages resulting from use of or reliance upon this information.

Material Safety Data Sheet

Provided by:

DPC Industries, Inc. **DX Distributors, Inc.**
DPC Enterprises **DX Systems Company**
DXI Industries, Inc. **DX Terminals**

PO Box 24600
Houston, Tx 77229-4600
281-457-4888
888-647-7717
www.dxgroup.com

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name SODIUM BICARBONATE

Synonyms

Chemical Name SODIUM BICARBONATE

Emergency phone: *281-457-4888* ***Date of Issue:*** 10/1/00
Chemtrec: *800-424-9300* ***Revised Date:*** N/A

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	*PERCENT*	*CAS NO.*
SODIUM BICARBONATE	100%	144-55-8

SECTION 3 - HAZARDS IDENTIFICATION

Potential Health Effects

ACGIH - TLV: 5 mg/cu m

Eye Contact CONTACT MAY CAUSE EYE IRRITATION.

Skin Contact MAY CAUSE SKIN IRRITATION.

Ingestion MAY CAUSE DIGESTIVE TRACT IRRITATION.

Inhalation MAY CAUSE RESPIRATORY TRACT IRRITATION.

Carcinogenicity: ***NTP*** NO ***IARC*** NO ***OSHA*** NO

SECTION 4 - FIRST AID PROCEDCURES

Eye Contact: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION.

Skin Contact: IMMEDIATELY REMOVE CONTAMINATED CLOTHING OR SHOES, WIPE EXCESS FROM SKIN AND FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. USE SOAP IF AVAILABLE OR FOLLOW BY WASHING WITH SOAP AND WATER. DO NOT REUSE CLOTHING UNTIL THOROUGHLY CLEANED. GET MEDICAL ATTENTION.

Inhalation: REMOVE VICTIM TO FRESH AIR AND PROVIDE OXYGEN IF BREATHING IS DIFFICULT. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

Ingestion: INDUCE VOMITING. RINSE MOUTH WITH WATER. IF CONSCIOUS, GIVE LARGE QUANTITIES OF WATER OR MILK AND GET IMMEDIATE MEDICAL ATTENTION. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON!

SECTION 5 -FIRE FIGHTING MEASURES

Flash Point NONCOMBUSTIBLE

Extinguishing Media MEDIA SUITABLE FOR SURROUNDING FIRE.

Special Firefighting Procedures/Precuations	WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE GEAR. STAY UPWIND AND KEEP OUT OF LOW AREAS.

SECTION 6 -ACCIDENTAL RELEASE MEASURES

For Spill: SWEEP OR VACUUM UP AND PLACE IN CONTAINER FOR DISPOSAL. DO NOT FLUSH TO DRAIN.

SECTION 7 - HANDLING AND STORAGE

Keep container tightly closed when not in use. Store in a cool, dry, well-ventilated area, away from heat and incompatible materials. Protect containers from physical damage.

MINIMIZE DUST GENERATION.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection	USE A NIOSH/MSHA APPROVED RESPIRATOR FOLLOWING MANUFACTURER'S RECOMMENDATIONS WHERE DUST OR MIST MAY BE GENERATED.
Ventilation	LOCAL AND MECHANICAL RECOMMENDED.
Protective Gloves	CHEMICAL IMPERVIOUS GLOVES.
Eye/Face Protection	CHEMICAL SAFETY GOGGLES AND/OR FULL-FACE SHIELD.
Other Protection	CHEMICAL RESISTANT CLOTHING SUCH AS COVERALLS/APRON, BOOTS, ETC.
Work Practices	USE GOOD PERSONAL HYGIENE PRACTICES. WASH HANDS BEFORE EATING, DRINKING, SMOKING, OR USING TOILET FACILITIES. PROMPTLY REMOVE SOILED CLOTHING AND WASH THOROUGHLY BEFORE REUSE. SHOWER AFTER WORK USING PLENTY OF SOAP AND WATER.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point (°F):	DECOMPOSES	***Vapor Pressure (mmHg):***	NIL
Freezing Point (°F):	NOT ESTABLISHED	***Vapor Density (Air=1):***	NOT ESTABLISHED
Solubility (H2O):	SOLUBLE	***Specific Gravity (H2O=1):***	2.20
pH	8.5	***Evaporation Rate:***	NOT DETERMINED

Appearance/Odor: WHITE GRANULAR/POWDER SOLID WITH NO APPRECIABLE ODOR.

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability:	YES
Incompatible Materials	MOISTURE, STRONG ACIDS, AND STRONG OXIDIZING AGENTS.
Decomposition Products	OXIDES OF CARBON.
Hazardous Polymerization:	WILL NOT OCCUR.

SECTION 11 - TOXICITY INFORMATION

NO DATA AVAILABLE.

SECTION 12 - ECOLOGICAL INFORMATION

NO DATA AVAILABLE.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSE OF WASTE MATERIALS ACCORDING TO ALL FEDERAL, STATE AND LOCAL REGULATIONS.

SECTION 14 - TRANSPORT INFORMATION

USA DOT Shipping Name: NOT REGULATED.

Hazard Class:

UN/NA Number:

Packing Group:

Subsidiary Hazard

Marine Pollutant: NO

SECTION 15 - REGULATORY INFORMATION

CERCLA RQ (lbs): NOT APPLICABLE

SARA Title III Section 312:

☑ *Acute* ☐ *Chronic* ☐ *Flammable* ☐ *Sudden Release of Pressure* ☐ *Reactive*

SARA Title III Section 313: No

SARA Extremely Hazardous Substance: No

HMIS HAZARD RATING

Health: 1 ***Fire:*** 0 ***Reactivity:*** 0

0 - Least 1 - Slight 2 - Moderate 3 - High 4 - Extreme

SECTION 16 - OTHER INFORMATION

EPA Pesticide Registration Number: NOT APPLICABLE

NSF Maximum Use Level for Potable Water (Standard 60): NOT APPLICABLE

TSCA (Toxic Substance Control Act), 40 CFR 710:

Sources of the raw materials used in this mixture assure that all chemical ingredients present are in compliance with Section 8(b) Chemical Substance Inventory, or are otherwise in compliance with TSCA.

DISCLAIMER

THE DATA PRESENTED IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF; HOWEVER, NEITHER SELLER NOR PREPARER MAKES ANY WARRANTIES, EXPRESSED OR IMPLIED, CONCERNING THE INFORMATION PRESENTED. THE USER IS CAUTIONED TO PERFOM HIS OWN HAZARD EVALUATION AND TO RELY UPON HIS OWN DETERMINATIONS.

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker®

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

POTASSIUM BROMIDE

1. Product Identification

Synonyms: Bromide salt of potassium
CAS No: 7758-02-3
Molecular Weight: 119.00
Chemical Formula: KBr
Product Codes: **J.T. Baker:** 2961, 2998
Mallinckrodt: 0493, 0500, 0505

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Potassium Bromide	7758-02-3	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings

(Provided here for your convenience)

Health:	Flammability:	Reactivity:	Contact:
1 - Slight	0 - None	0 - None	1 - Slight

Lab Protection Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:

Dust may cause irritation to the respiratory tract. Symptoms may include coughing, sore throat, and shortness of breath.

Ingestion:

May cause nausea, vomiting and abdominal pain. Ingestions are usually promptly rejected by vomiting, but sufficient absorption may occur to produce central nervous system, eye and brain effects. Symptoms may include skin rash, blurred vision and other eye effects, drowsiness, irritability, dizziness, mania, hallucinations, and coma.

Skin Contact:

Dry material may cause mild irritation. Solutions may cause irritation, redness, pain, and skin burns.

Eye Contact:

May cause irritation, redness and pain.

Chronic Exposure:

Repeated or prolonged exposure by any route may cause skin rashes (bromaderma). Repeated ingestion of small amounts may cause central nervous system depression, including depression, ataxia, psychoses, memory loss, irritability, and headache.

Aggravation of Pre-existing Conditions:

Persons suffering from debilitation, depression, alcoholism, neurological or psychological disorders may be more susceptible to the effects of this compound.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Wash eyes with plenty of water for at least 15 minutes. Call a physician.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirator (NIOSH Approved)
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Odorless.

Solubility:
70g/100g water @ 25°C (77°F).

Specific Gravity:
2.75 @ 25°C

pH:
Aqueous solution is neutral.

% Volatiles by volume @ 21°C (70°F):
0

Boiling Point:
1435°C (2615°F)

Melting Point:
730°C (1346°F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Oxides of the contained metal and halogen, possibly also free, or ionic halogen.

Hazardous Polymerization:
Will not occur.

Incompatabilities:
For Potassium Bromide: Strong oxidizers, acids, and bromine trifluoride.

Conditions to Avoid:
Incompatibles.

11. Toxicological Information

Potassium bromide: oral rat LD50: 3070 mg/kg; investigated as a mutagen.

Cancer Lists

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Potassium Bromide (7758-02-3)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Inventory Status

Ingredient	TSCA	EC	Japan	Australia	Korea	---Canada--- DSL	NDSL	Phil.
Potassium Bromide (7758-02-3)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Federal, State & International Regulations

Ingredient	---SARA 302--- RQ	TPQ	---------SARA 313--------- List	Chemical Catg.	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Potassium Bromide (7758-02-3)	No	No	No	No	No	No	No

Chemical Weapons Convention: No **TSCA 12(b):** No **CDTA:** No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No Reactivity: No (Pure / Solid)
Warning:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: No information found. **Australian Poison Schedule:** No information found.
WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings:
Health: 2 Flammability: 0 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.

Keep container closed.
Use with adequate ventilation.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

New 16 section MSDS format, all sections have been revised.

Disclaimer:

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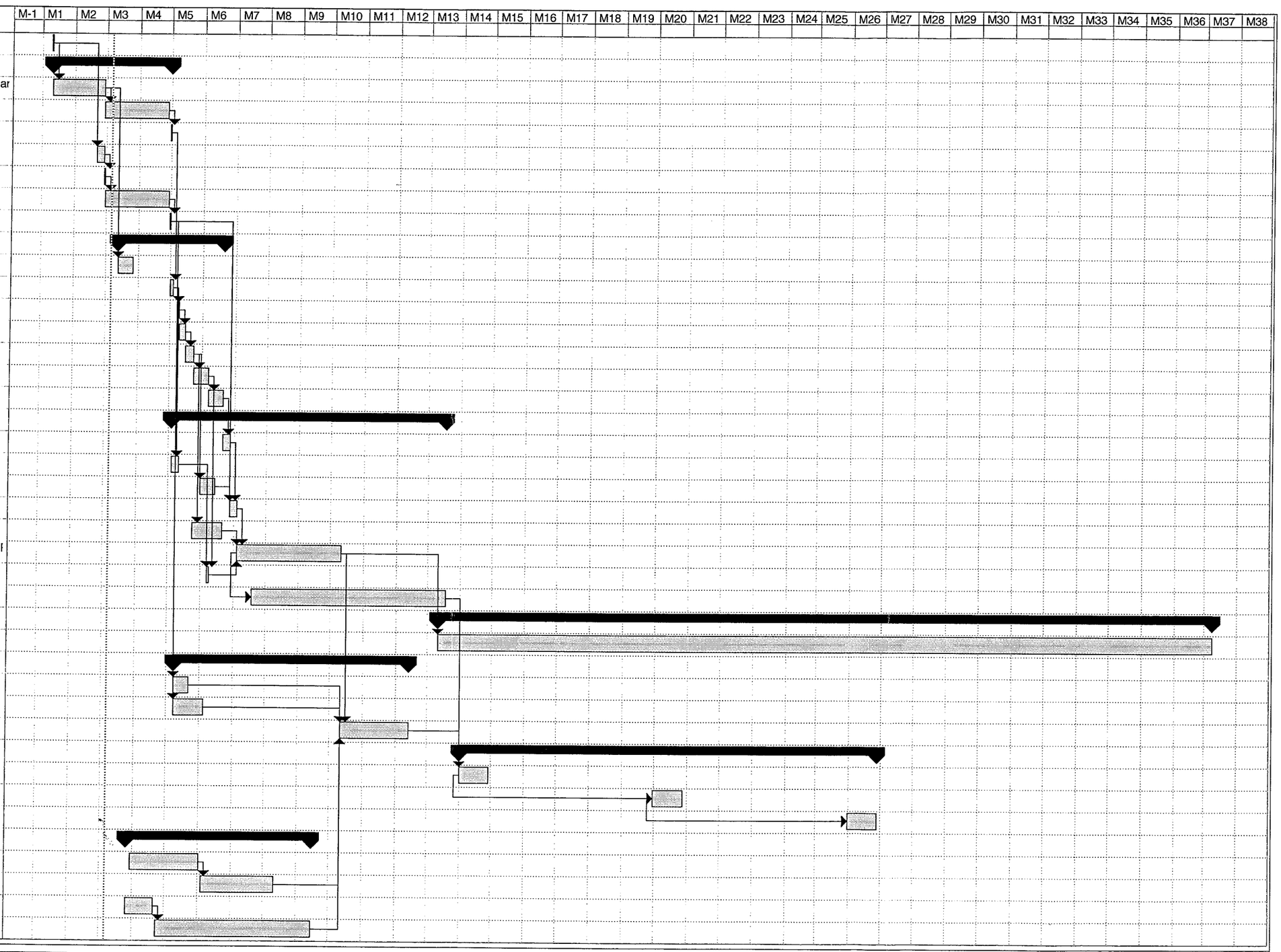
Prepared By: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Appendix B

Proposed Schedule

ID	Task Name
1	Initial Contract Award/Commitment
2	**IRZ Interim Measure Work Plan**
3	IRZ Interim Measure Work Plan Preparation ar
4	RWQCB Review of IRZ Work Plan
5	RWQCB Approval of IRZ Work Plan
6	IRZ Injection Permit Preparation
7	IRZ Injection Permit Submittal
8	RWQCB Review of IRZ Injection Permit
9	RWQCB Approval of IRZ Injection Permit
10	**IRZ Hydraulic Test**
11	Subcontractor Selection
12	Hydraulic Test Obs/Inj Well Installation
13	Baseline Monitoring
14	Slug Tests
15	Hydraulic Test Injections
16	Hydraulic Test Monitoring
17	IRZ Initial Injection Final Design
18	**Initial Injection**
19	Temporary Injection Well Permitting
20	Additional Monitoring Well Installation
21	Subcontractor Selection
22	Subcontractor Mobilization
23	Procurement of Carbohydrate
24	Initiate Injection (Temporary Wells and Direct-I
25	Initial Injection Baseline Monitoring
26	Initial Injection Monitoring
27	**IRZ Monitoring**
28	Quarterly Monitoring
29	**IRZ Amendment Well System Installation**
30	Well Permitting
31	Contractor Procurement
32	Well Installation
33	**Amendment Injections**
34	First Amendment Injection
35	Second Amendment Injection
36	Third Amendment Injection
37	**Site Redevelopment**
38	Downey Landing Building Demolition
39	Downey Landing Site Grading
40	Kaiser Site Preparation
41	Kaiser Site Grading/Foundation Install



Project: ProjectNASAIRZ01
Date: Tue 5/6/03

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

ARCADIS

Appendix C

Health and Safety Plan

Health and Safety Plan
Interim Measure Source Reduction Activities
Former NASA Industrial Plant
Downey, California

ARCADIS

PREPARED FOR

International Risk Assumption
Downey, LLC
7991 Shaffer Parkway, #100
Littleton, CO 80127

ARCADIS

Greg Fiol
Health and Safety Officer

Richard Orens, P.E.
Senior Engineer

Jeffrey Friedman, R.G. No. 5677
Project Manager

Health and Safety Plan
Interim Measure Source Reduction Activities
Former NASA Industrial Plant
Downey, California

Prepared for:
International Risk Assumption
Downey, LLC
7991 Shaffer Parkway, #100
Littleton, CO 80127

Prepared by:
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Our Ref.:
CA000623.0001.00002

Date:
May 22, 2003

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Table of Contents

1. **Introduction** 1

2. **Responsibilities** 1

3. **Site Description** 2

4. **Planned Field Activities** 2

5. **Hazard Evaluation** 2

   5.1 Physical Hazards 2

      5.1.1 Environmental Stresses 3

      5.1.2 Mechanical Hazards 5

      5.1.3 Hazardous Energy 6

      5.1.4 Hand and Power Tools 10

      5.1.5 Fuel Handling 11

      5.1.6 Noise 11

      5.1.7 Drilling 11

      5.1.8 Amendment Addition 11

   5.2 Chemical Hazards 12

      5.2.1 Exposure Via Inhalation 13

      5.2.2 Exposure Via Ingestion 13

      5.2.3 Exposure Via Dermal Contact 14

   5.3 Biological Hazards 14

6. **Air Monitoring** 15

   6.1 Volatile Organic Compounds 15

   6.2 Combustible Vapors 15

   6.3 Dust Monitoring 16

7. **Action Levels** 16

8. Levels of Protection **17**

9. Safe Work Practices **19**

10. Site Control **20**

10.1 Exclusion Zone 20

10.2 Contamination Reduction Zone 21

10.3 Support Zone 21

11. Contamination **22**

11.1 Personnel 22

11.2 Equipment and Vehicles 24

11.3 Decontamination Personnel 24

11.4 Decontamination Waste Disposal 24

11.5 Equipment Needs 24

11.6 Contaminant Containment 25

12. Emergency Plan **26**

13. Injury Reporting **26**

14. Emergency Action Plan **27**

14.1 Emergency Telephone Numbers 27

14.2 Project Personnel Emergency Telephone Numbers 27

14.3 Directions to the Hospital 27

Tables

1 Exposute Limits for Constituents of Concern

2 Summary of Action Levels

Table of Contents

Figures

1 Site Location

2 Hospital Route Map

Appendices

A Material Safety Data Sheets

1. Introduction

ARCADIS has been authorized by International Risk Assumption Downey, LLC (IRAD) to develop an Interim Measure Source Reduction (IMSR) work plan that uses technology for enhanced in-situ reductive dechlorination of chlorinated aliphatic hydrocarbons (CAHs) present in groundwater at the former NASA facility located at 12214 Lakewood Boulevard in Downey, California (Figure 1). IRZ technology involves the addition of a reagent (typically diluted molasses) solution into the subsurface to enhance the ability of indigenous microorganisms to reductively dechlorinate CAHs through metabolic processes, and to increase the rate of reaction such that less time is required by the indigenous microorganisms to initiate the biodegradation of the CAHs. This Health and Safety Plan (HASP) has been developed to address the potential hazards that our workers may face while performing the planned field activities. This HASP establishes procedures to minimize workers' exposures through the use of personal protective equipment (PPE) and safe work practices. This HASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, Title 29, Code of Federal Regulations, Part 1910.120 (20 CFR 1910.120), "Hazardous Waste Operations and Emergency Response." The HASP is intended for the protection of our workers, however, subcontractors, clients, visitors, or any other individuals are welcome to review and follow the procedures it contains.

2. Responsibilities

The on-site geologist/engineer/technician overseeing the installation of the IRZ system will be designated as the Site Safety Officer (SSO). The SSO will be an employee of ARCADIS. The SSO will be responsible for implementing the procedures and safe work practices established in this HASP. In the event that the SSO must leave the site while the work is in progress, an alternate SSO will be designated to ensure that the HASP will continue to be to be followed. The alternate SSO must also be an employee of ARCADIS.

The SSO will report all health and safety matters to the Project Manager, Mr. Jeffrey Friedman., who has responsibility for overseeing the planned activities and liaisons/coordinators with IRAG. Mr. Greg Fiol, Health and Safety Officer for ARCADIS in Fullerton, will assist as needed. In the event that Mr. Jeffrey Friedman is not available, Mr. Fiol will provide direction regarding health and safety issues associated with this technology demonstration.

3. Site Description

This HASP will be used to address health and safety concerns associated with the IRZ system installation, application, and monitoring at the former NASA facility. The site comprises of approximately 10 acres on four parcels of land. Currently, the site maintains a large warehouse, a smaller industrial facility (in operation), a parking lot, and a dirt lot used for storage. There is an operating soil vapor extraction unit with an aboveground well network to dual-phase extraction wells within the large warehouse. Groundwater monitoring wells and several soil vapor extraction wells are located throughout the site (Figure 2).

4. Planned Field Activities

The following is a brief description of the planned field activities for the on-site and off-site work:

- Groundwater monitoring well installation;
- IRZ amendment system installation;
- IRZ amendment system operation and maintenance; and
- Periodic groundwater sampling.

5. Hazard Evaluation

The potential physical, chemical, and biological hazards associated with the planned field activities for this site have been evaluated using existing site information. The hazard evaluation included such considerations as tasks to be performed, site history, and past sampling results. The hazards anticipated during typical IRZ technology operations are found in the following subsections.

5.1 Physical Hazards

The physical hazards associated with the planned field activities include the following potentialities: being struck by equipment and debris, being splashed with contaminated material, slips and falls due to wet or uneven surfaces, noise exposure during the installation of amendment points and advancement of soil borings, and heat stress (this work will occur in warm climate and during the summer months).

5.1.1 Environmental Stresses

From personnel workload and the weather conditions, there is a moderate to high risk depending on the season. This includes heat stress/exhaustion, sunstroke, and adverse weather conditions. Weather conditions change day to day and will be discussed during the daily "tail-gate" health and safety meetings. Conditions that affect site conditions can include high winds, heavy rain, flooding, lightning, dense fog, and sun. During the amendment point installation and amendment addition activities, the SSO will determine the daily monitoring requirements and/or whether work will proceed based on the weather conditions. ARCADIS will be responsible for these activities.

Heat stress will be a significant hazard during the warm weather months if levels of health and safety protection are upgraded from level D to Level C or B. Symptoms of heat stress shall be monitored for all levels of health and safety protection at temperatures above 70 degrees Fahrenheit. Heat stress involves three general categories: heat cramps, heat exhaustion, and heat stroke.

- Heat cramps usually occur first and generally include cramps in the abdomen and legs.

- Heat exhaustion is more serious and signals of this form of heat stress usually involve cool, moist, pale, or flushed skin, headache, nausea, dizziness, weakness, and exhaustion.

- Heat stroke is the most serious form of heat stress, and workers suffering from this condition should get immediate medical attention. The signals of heat stoke include red-hot dry skin, changes in consciousness, rapid weak pulse, and rapid shallow breathing.

Heat stress is caused by a number of interacting factors, including environmental conditions, personal protective equipment, workload, and the individual characteristics of the worker. Each individual has different susceptibilities to heat stress due to many factors. These factors may include age, physical fitness, degree of acclimatization, and the specific task being performed. Symptoms of heat stress are divided into five general categories as follows:

- Behavioral Disorders: A worker suffering from heat-induced fatigue demonstrates symptoms such as the inability to concentrate, impaired performance, and loss of coordination.

- Skin Eruptions: Skin eruptions include profuse, tiny, raised red vesicles (blister-like) on affected areas, prickling sensation during heat exposure, and prickly heat. During heat stress, extensive areas of the skin that do not sweat upon heat exposure, will present a goose-flesh appearance that subsides with cool environments.

- Heat Exhaustion: Heat exhaustion is a condition that results from extensive water and/or salt depletion. Symptoms include fatigue, nausea, headaches, giddiness, clammy skin, pale complexion, and fainting. Heat cramps, which are painful muscle spasms (arms, legs, or abdominal), are also a symptom of heat exhaustion and can occur during or after work hours.

- Heat Syncope: Symptoms associated with this stage of heat stress include fainting and becoming unable to move.

- Heat Stroke: Symptoms usually associated with heat stroke are hot, dry skin, which is usually red, mottled, or blue. Additional symptoms include confusion, loss of consciousness, and convulsions. Individual has stopped sweating and may be experiencing chills.

To minimize worker's exposures to heat stress, it is important for field personnel to recognize the early signs and symptoms of heat stress so that preventive measures can be taken. Preventive measures include work schedule adjustment, rotating personnel, and selection of personal protective equipment.

- Adjustment of Work Schedules: In environments of extreme heat and humidity, work schedules should be modified. Heavy work should be conducted during the cooler hours of the early morning or early evening when the ambient temperature is usually lower. During the hotter hours, usually associated with mid-day, light work tasks should be performed whenever possible. Subcontractors should be informed of the potential for adjusted work schedules.

- Rotation of Personnel: By alternating job functions, a single worker may not be overstressed or overexerted as a result of performing heavy tasks throughout the day.

- Increase in Rest Periods: In extreme environmental conditions, the number of rest periods should be increased. Shaded areas or air-conditioned facilities (trailer,

cars, and buildings) should also be provided for these rest periods so that workers can adequately recover.

Body fluids should also be maintained at normal levels. A good guideline to follow is that fluid intake should equal every ounce of bodily fluid lost in sweat. Water is recommended as the fluid of choice. (No salt should be administered.) Field showers or hose-down areas should be provided to reduce body temperature in the event of a heat related injury.

Early detection and safe work habits are the best measures for preventing heat stress hazards. Site workers exhibiting any of the signs of heat stress above should take preventive measures including getting out of the heat, loosen any tight clothing, applying cool wet cloths, and for conscious victims, consumption of approximately 4 ounces of water every 15 minutes. If the victim refuses water, vomits, or starts to lose consciousness, immediate medical attention should be sought. It is extremely important to drink plenty of fluids during hot weather, even when not thirsty, and to take rest breaks in order for the body to cool down.

Solar radiation is another hazard, and protection against sunburn and the long-term risks of skin cancer are necessary. Site workers should use sunscreen or cover the exposed parts of their bodies to protect against harmful ultraviolet rays. It should be remembered that covering the body as protection against ultraviolet rays might increase the likelihood of heat stress hazards. Keeping alert of warning signs and taking prompt preventive measures is critical to preventing hazards associated with the sun and heat.

5.1.2 Mechanical Hazards

During activities involving heavy equipment (e.g., drill rigs, or other mechanical equipment used during automated reagent injection system construction), care should be taken to avoid the potential for being struck by/against equipment and debris, being splashed with potentially contaminated fluids, and being cut or "pinched" by the moving parts of the equipment. Caution shall be exercised when operating heavy equipment on slippery or uneven surfaces. Hard hats, steel-toed boots, and safety glasses shall be worn at all times by all personnel who are working in close proximity to heavy equipment. Heavy equipment operators must have the required certification or evidence of training that qualifies them to operate the machinery. Equipment delivered to the site should be inspected upon arrival and daily thereafter.

5.1.3 Hazardous Energy

5.1.3.1 Lockout/Tagout

This standard applies to the control of all types of energy (e.g., electrical, thermal, pneumatic, etc.) during servicing and/or maintenance of machines and equipment.

The standard applies to employees: 1) Who actually perform lockout/tagout procedures (Authorized Employees); 2) Who use equipment subject to lockout/tagout procedures (Affected Employees); and, 3) Who work around or in the vicinity of areas where lockout/tagout is being performed (also defined as affected employees). As ARCADIS employees generally fall into the last group (#3), this manual section will cover only the portions of the standard that applies to this group of employees.

5.1.3.1.1 General Requirements

Lockout systems are used whenever possible. A tagout system is used only when equipment is not capable of being locked out.

A written energy control program is developed to ensure that equipment is isolated from the energy source and made inoperable before any service or maintenance is performed.

5.1.3.1.2 Training

Training is required prior to an employee's assignment to work in an area where lockout/tagout procedures may be in use, and will be repeated or expanded if inadequacies are found in the employee's knowledge or an employee's assignment changes.

5.1.3.1.3 Overview of Lockout/Tagout

It is the policy of ARCADIS to comply with the OSHA Lockout/Tagout Standard as it relates to the work we do. Lockout/tagout procedures are used to control energy hazards associated with service and maintenance of energized equipment. The standard applies to all types of energy including kinetic, potential, electrical, chemical, thermal, hydraulic, gravitational, and pneumatic. The standard applies when servicing or performing maintenance on equipment and during normal production operations if personnel are:

- Required to remove or bypass a guard or other safety device,
- Required to place any part of their body in an area where work is being performed; or
- Required to place any part of their body in an area where a danger zone exists during a machine operating cycle.

Employees who work in areas where lockout/tagout procedures are used will be aware of the hazards from stored energy and understand what can and cannot be done in a lockout/tagout situation.

5.1.3.2 Regulatory Guidance

- CFR 1910.147 "The Control of Hazardous Energy"

5.1.3.3 Definitions

- **Energy Isolating Device** is a mechanical device that physically prevents the transmission or release of energy. It does not include control circuit type devices, but rather physical devices that control circuit operation.

- **Lockout Device** is a device that utilizes a positive means, such as a lock, to hold an energy-isolating device in a safe position ensuring that the energy isolating device and equipment cannot be operated.

- **Tagout Device** is a prominent warning device, such as a tag, to indicate that the isolating energy device and equipment may not be operated.

5.1.3.4 Energy Control Program

An Energy Control Program is developed to ensure that before service or maintenance of equipment is performed, the equipment will be isolated from its energy source and made inoperable so that unexpected energizing, startup or release of stored energy during equipment service and maintenance is prevented.

ARCADIS employees working with energized equipment have read ARCADIS' written Energy Control Program. ARCADIS' written Energy Control Program includes:

- Do not operate or perform service/maintenance on machines or equipment where an unexpected energizing, startup or release of stored energy could occur;
- Do not perform energy control procedures and, therefore, we do not conduct periodic inspections; and
- Will participate in training as required in CFR 1910.147(c)(7)(i)(C) and (c)(7)(ii).

5.1.3.5 Lockout/Tagout General

If an energy-isolating device is capable of being locked out, a lockout system will be used. Tagout systems are used only when an energy-isolating device is not capable of being locked out.

Machines or equipment should never be restarted if lockout/tagout devices are in place, and lockout/tagout devices should not be removed or ignored. No portion of your body or any item you are holding should ever be placed in the vicinity of the working portion(s) of a machine or piece of equipment.

Materials used for lockout/tagout devices will be:

- Durable and capable of withstanding the environment it is exposed to;
- Standardized within a facility in color, shape, and/or size (standardization includes the print and format of tagout devices);
- Understandable;
- Legible (tagout);
- Substantial to prevent removal; and
- Identifiable with respect to who applied the device.

Tagout devices will warn against hazardous conditions if the equipment is energized and will include a instructions such as: Do Not Start; Do Not Open; Do Not Close; Do Not Operate; Do Not Energize; etc.

5.1.3.5.1 Application of Lockout/Tagout Devices

Lockout/tagout devices will only be applied by authorized/trained personnel who are performing service or maintenance. If more than one person is working on the

machine/equipment, each will apply his/her own lockout/tagout device. All personnel in the area will be notified that a lockout/tagout procedure is beginning.

5.1.3.5.2 Release of Lockout/Tagout Devices

Lockout/tagout devices will be removed only by the person who applied the device. If more than one person was working on the machine/equipment, each will remove his or her own lockout/tagout device. All personnel will be notified and directed to a safe area prior to restart.

5.1.3.6 Training

Training is required for all employees whose jobs require them to work in an area in which lockout/tagout procedures may occur. Training must occur prior to working in such an area, repeated or expanded if inadequacies are found in the employee's knowledge or if an employee's assignment changes. Affected Employees will be instructed about:

- Energy control procedures;
- The prohibition of removing, damaging or tampering with any lockout/tagout device;
- The prohibition regarding attempts to restart or reenergize equipment that has been locked out/tagged out; and
- The limitations of tagout devices.

If an employee performs lockout/tagout procedures or operates machinery or equipment subject to lockout/tagout procedures, he/she will require more extensive training.

5.1.3.7 Energy Control Procedure

ARCADIS equipment that must be periodically locked out must have a written Energy Control Procedure (ECP) for the device to be locked out and de-energized. The ECP is a written description of how to physically lock out and then de-energize a piece of equipment. It could be something as simple as:

a. Turn equipment OFF

b. Unplug equipment

c. Try to re-start equipment to make sure correct plug was disconnected

d. Tag equipment to prevent re-connection

or may be more complex, such as:

- Turn equipment OFF
- Disconnect electrical break and lockout
- Shut pneumatic valve and bleed excess pressure
- Disconnect and lockout valve
- Try to re-start or pressurize equipment

In addition, the following will be addressed.

1. All Type 3 or greater energized electrical work shall be performed only by qualified personnel.

2. In active facilities, only electricians can verify electrical feeds and disconnect points of concern, unless otherwise specified in the project contract.

3. In inactive facilities, the contractor is responsible for testing all electrical systems before performing any work.

4. In the event of an accident, injury, or illness that should occur to the contractor or subcontractor's employees while on property property, the IRAD coordinator will be notified immediately. Additionally, all near misses that could have led to an injury or illness will also be will be reported to the IRAD coordinator.

5.1.4 Hand and Power Tools

Hand and power tools present serious hazards, especially to fingers and hands, and can cause eye injuries resulting from flying debris. All hand and power tools shall be inspected prior to use to ensure that all are in good condition with properly working parts, and are appropriate for the task. All power tools shall also be inspected for proper wiring and grounding, and to ensure that all of the safety guards and switches provided by the manufacturer are present and in good working condition. If any hand tool does not meet the criteria specified in this section, the tool will be tagged and repaired by a properly trained individual, or replaced.

5.1.5 Fuel Handling

The refueling of gasoline-powered equipment shall not be performed while the equipment is in operation. The engine shall be allowed to cool prior to refueling.

5.1.6 Noise

Noise levels shall be monitored within the work area during activities involving heavy equipment. Hearing protection will be required in all work areas where noise levels are above 85 decibels (dBA). Potential hazardous noise producers will either be surveyed using a sound-level meter, or assumed hazardous. Hearing protection shall be required for personnel working in the area of the equipment.

5.1.7 Drilling

Working within the vicinity of operating drill rigs poses numerous safety considerations. Most hazards, as with other mechanized devices, are physical in nature. For drill rigs, these physical hazards include being struck by a falling or flying object, direct contact with a rotating or moving object (such as the auger), and pinching. Frequently injured body parts include eyes, back, fingers, hands, feet and knees.

Care shall be taken by all personnel to exercise caution when working with all mechanized equipment, primarily drill rigs, to prevent clothing from being caught in moving parts, placing body parts in close vicinity to pinch points on equipment, or using the equipment on slopes or unstable surfaces in excess of manufacturer's recommendations. Site personnel, visitors, or other persons who are not performing necessary work shall remain at a distance of at least 15 ft from the drill rig, and all workers within 15 ft of the equipment are required to wear, at a minimum, hard hats, safety glasses, steel-toed boots, gloves, and hearing protection.

5.1.8 Amendment Addition

During either manual or automatic transfer of amendment solution to the aquifer, it is possible that site workers could be injured due to accidental contact with machinery having moving parts and/or energized modules, such as hoses, pumps or mixers. Care shall be taken by all personnel to exercise caution when working with all mechanized equipment. Care should be taken to avoid the potential for being struck by moving parts, being cut or "pinched" by the moving parts of the equipment, or being splashed with potentially contaminated fluids.

5.2 Chemical Hazards

Chlorinated VOCs have been detected in groundwater samples collected from the site. Given the planned site activities and the physical properties of the chemicals of concern, the potential exists for chemical exposure. The potential chemical exposure pathways are inhalation of volatilized chemicals of concern (chlorinated VOCs only), accidental ingestion of impacted media, and dermal contact with impacted media. Table 1, "Exposure Limits for Constituents of Concern," lists exposure limits for the constituents of concern at the Site in terms of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) as a Time Weighted Average (TWA) and Short Term Exposure Limit (STEL), and the National Institute of Occupational Safety and Health (NIOSH) Immediately Dangerous to Life and Health (IDLH) limit.

Table 1. Exposure Limits for the Constituents of Concern

	TLV-TWA		STEL		IDLH		Media of Concern	
Constituents of Concern*	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3	Air	Soil/Groundwater
Tetrachloroethene	25, A[1]	170, A[1]	100, A[1]	685, A[1]	150	5,370		X
Trichloroethene	50, A[1]	269, A[1]	100, A[1]	537, A[1]	1,000	6,780		X
1,2-Dichloroethene	200	790	--	--	1,000	3,970		X
Hydrogen Sulfide	5	7	--	--	100	140	X	

TLV-TWA	Threshold Limit Value, Time Weighted Average
STEL	Short Term Exposure Limit
IDLH	Immediately Dangerous to Life and Health.
ppm	Parts per million.
mg/m^3	Milligrams per cubic meter.
A[1]	Animal Carcinogen: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that are not considered relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence suggests that the agent is not likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.
--	No entry listed in NIOSH.

The chemical hazards associated with this site are based on the analytical data generated from previous sampling activities. The analytical data indicated that some

potential contaminants of concern (COCs) for these sites may include tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethylene (cis1,2-DCE). Once the IRZ system is constructed, hydrogen sulfide or methane may be a constituent of health and safety concern during operation and maintenance (O&M) activities. Based upon this information, the following exposure pathways have been identified in order to minimize each site worker's potential exposure to COCs:

- Inhalation of vapors, gases, and particulates.
- Direct skin contact with chemicals and particulates.
- Accidental ingestion of chemicals and particulates

5.2.1 Exposure Via Inhalation

VOCs and hydrogen sulfide that may be present in groundwater and soil are potential hazards for exposure via inhalation. Chemical exposure via inhalation of volatilized chemicals will be mitigated through the use of common sense, air monitoring for chemical vapors, and PPE. To minimize potential exposures from inhalation, site personnel shall not be downwind of an impacted area at which intrusive work (i.e. drilling etc.) is being performed. Soil and groundwater samples must not be smelled in an attempt to confirm the presence or absence of contaminants. PPE shall be utilized as necessary (based on specific action levels) to prevent chemical exposure in excess of the exposure limits listed in Table 1. Air monitoring shall be conducted in all work areas as described in the next section. Use of PPE will be initiated based on monitoring and action levels discussed in the following sections.

5.2.2 Exposure Via Ingestion

Chemical exposure via ingestion shall be mitigated through the use of the following personal hygiene practices:

- Eating, drinking, and/or smoking is prohibited in the work area.
- All workers are required to wash their hands and face prior to consuming food, beverages, and/or tobacco products.

5.2.3 Exposure Via Dermal Contact

Chemical exposure via dermal contact will be mitigated through the use of common sense and PPE appropriate to the tasks and hazards. Dermal exposure is possible during the performance of the following tasks:

- Amendment point and monitoring well installation and soil boring classification;
- Amendment point and monitoring well development;
- IRZ system operation and maintenance;
- Contacting airborne dust; and
- Soil and groundwater sampling.

Care shall be taken to minimize direct contact with contaminated liquids and solids. The base level of protection required to prevent chemical exposure via dermal contact will include chemically resistant gloves, safety glasses, and disposable coveralls. The specific type of gloves and coveralls (i.e., nitrile, natural rubber, Tyvek, or Saranex) will be selected based on the manufacturer's data concerning each material's resistance to chemical penetration when exposed to the chemicals of concern at the Site. All PPE will be approved by the SSO before beginning field activities. All O&M work, such as routine pump maintenance, and manual transfer of reagent solution into the injection wells will be done by workers wearing chemically resistance clothing.

5.3 Biological Hazards

There is a possibility that biological hazards may be encountered during the IRZ system installations. The most probable biological hazard to site workers, based on existing site information, is injury due to biological vectors, such as stings from insects, or bites from snakes. There is also the possibility of site workers encountering blood-borne pathogens, either from direct contact with biological vectors, or from infection associated with cuts, abrasions, or puncture wounds sustained while manning heavy equipment. A blood-borne pathogen kit and first aid kit will be maintained at each site as a first response action. Depending on the severity of an injury sustained because of a biological vector, additional medical assistance may be sought by the SSO.

6. Air Monitoring

Air monitoring activities will be performed during all drilling activities. ARCADIS' SSO will be responsible for all site monitoring activities, including monitoring with respect to its employees as well as its subcontractors.

6.1 Volatile Organic Compounds

Air monitoring will be conducted at this site during all planned field activities in order to ensure that the workers are appropriately protected from the identified potential chemical hazards. An intrinsically-safe photoionization detector (PID) or flame-ionization detector (FID) will be used to monitor ambient air for total VOCs during all well installation activities. These instruments are designed to measure trace quantities of total VOCs in air, and depending on the make and model, typically have a sensitivity range of one part per million (ppm). The PID or FID will be calibrated each morning, before field use, and calibration records will be kept.

6.2 Combustible Vapors

If combustible gases or vapors are encountered, a combination meter (e.g., combustible gas indicator [CGI], and oxygen meter) may be used to monitor for the presence of oxygen, flammable/explosive gases and vapors (such as methane). The SSO shall monitor the exclusion zone to ensure that 20 percent of the lower explosive limit (LEL) is not exceeded for the COCs. If explosive vapors are detected at a reading of 20 percent of the LEL or greater, work will be discontinued and the area evacuated until vapor concentrations drop below 20 percent of the LEL. Following evacuation, the cause of the potentially explosive atmosphere shall be identified, and changes in the work plan established as needed.

During the O&M phase, it is likely that the reductive dechlorination process will generate methane and/or hydrogen sulfide gases as byproducts of biodegradation. These gases are typically found at low concentrations. However, if these compounds are suspected of being generated in large volumes, methane and hydrogen sulfide concentrations will be monitored, and appropriate action, such as passive venting, will be undertaken to mitigate the potentially explosive conditions.

6.3 Dust Monitoring

Significant dust emissions are not anticipated at the site as a consequence of installing the IRZ technology. However, appropriate measures (as discussed below) will be taken at sites having the potential for significant emissions of dust containing COCs.

An inhalation hazard could result when dust, and COCs potentially adsorbed to the dust, become airborne. Therefore, dust monitoring shall be required to measure and mitigate any wind-borne dust clouds that may occur. Work practices to minimize dust generation will greatly reduce the risk of inhalation exposure.

7. Action Levels

The following action level procedures have been established for all planned field activities to evaluate whether actual field conditions will require an upgrade in the level of PPE. Table 2 provides a summary of established action levels at each site based on specific compounds expected to be found.

Table 2. Summary of Action Levels.

Air Monitoring	Action Levels	Actions To Take
PID Reading	<25 ppm	Remain in Level D protection.
PID Reading	≥1 ppm[1]	Action Level revised to 50 ppm for trichloroethene (TCE).
PID Reading	>10 ppm	Let work area vent or upgrade to Level C protection.
Hydrogen Sulfide Meter	>10 ppm	Let work area vent.

PID Photoionization detection equipment equipped with a 10.6 eV lamp.
ppm Parts per million.
[1] For 5 minutes.

Prior to the start of each day's activities during construction, background readings in the immediate work area shall be taken using an intrinsically safe PID or FID. An action level of 1 ppm over a sustained period of 5 minutes in the workers' breathing

zone has been established based on the potential presence of TCE. If the first action level is exceeded, the SSO will draw an air sample with detector tubes to measure TCE concentrations in the worker's breathing zone. If the action level for TCE is exceeded, work will be discontinued, the work area will be permitted to vent, and the workers will be moved to an area up wind. Work will not resume until the TCE concentrations fall below the action level.

If the TCE concentration meets or exceeds 50 ppm, work will be discontinued, the workers shall be moved to an area upwind, and the work area permitted to vent until the TCE concentration falls below 50 ppm. If the concentration of TCE does not fall below 50 ppm after 10 minutes, the work will resume with the level of protection upgraded to Level C.

Should the PID or FID readings meet or exceed 10 ppm for a sustained period of 5 minutes, and it has been determined that the reading is not due to TCE (through use of colorimetric tubes), then work will be discontinued; workers will be moved upwind; and the work area will be permitted to vent until the PID or FID readings are less than 10 ppm. If after 10 minutes of venting, the PID or FID readings are still 10 ppm or greater, work can resume with workers upgraded to Level B protection.

As excavation activities are not planned for this site, the generation of dust during work activities is not anticipated. Therefore, the use of a dust meter as part of the air monitoring program will not be required. Once the system is installed, standard O&M of the amendment points will require air monitoring using a hydrogen sulfide (H_2S) meter. If H_2S levels are detected above 10 ppm for a period greater than 5 minutes, the work will cease until the well is vented and levels drop below 10 ppm.

8. Levels of Protection

Based upon the hazard evaluation results, all tasks will be performed in level D protection. In the event that the established action levels are exceeded, the level of protection will be upgraded to level C. The following is a description of the personal protective equipment required for each level:

Work Activity	Required Initial Level of Protection
General Site Work	Level D
Drilling	Level D
Well Development Water	Level D
Operating IRZ System	Level D

The site manager (SM) and the SSO shall have the authority to establish initial protection levels for those activities not specified, and increase or decrease levels of protection, based on the results of the site monitoring and sampling. For example, if established action levels are exceeded, the level of protection may be upgraded to Level C or Level B.

The following is a description of the PPE required for each level:

Level D

- Hard hat
- Disposable coveralls (optional)
- Safety glasses, goggles, or face shield
- Steel-toe and shank, chemical-resistant boots
- Chemical-resistant gloves
- Hearing protection with a noise reduction rating (NRR) of 33 dBA or greater

Level C

- Safety glasses, goggles, or face shield
- Hard hat
- Disposable coveralls
- Full face air purifying respirator equipped with a combination cartridge rated for organic vapors, dusts and mists, and radionuclides

- Steel-toe and shank, chemical-resistant boots
- Chemical-resistant gloves
- Hearing protection with a noise reduction rating (NRR) of 33 decibels or greater

Level B

- Safety glasses, goggles, or face shield
- Hard hat
- Disposable coveralls
- Supplied air respirator
- Steel-toe and shank, chemical-resistant boots
- Chemical-resistant gloves
- Hearing protection with a noise reduction rating (NRR) of 33 decibels or greater

9. Safe Work Practices

- All ARCADIS site personnel will be participants of the company's health and safety program, which includes 40 hours of initial training, annual 8-hour refresher training. ARCADIS personnel acting in a supervisory capacity will have completed 8-hour manager and supervisor training.
- All ARCADIS site personnel are participants of the company's medical surveillance program. Personnel requiring respiratory protection will have a current medical clearance to wear a respirator and a current quantitative fit test meeting the requirements set forth in OSHA's 29CFR1910.134 Respiratory Protection Standard.
- A copy of the HASP will be available for reference at the Site during the planned field activities. Site visitors will be required to sign the Site Visitors Log.
- A pre-entry, tailgate safety meeting will be conducted and recorded on a standardized form in prior to the start of each day's activities to discuss the associated hazards.

- All underground utilities and structures will be marked out and cleared before any ground intrusive work begins.
- The SM and the SSO will inform all subcontractors of the potential hazards associated with the Site and the planned field activities. A copy of the HASP will be made available for their review.
- No eating, drinking, or smoking will be permitted in the work and support zones.
- No sources of ignition, such as matches or lighters, will be permitted in the work and support zones.
- Material Safety Data Sheets (MSDSs) shall be on site for any chemicals that ARCADIS or its subcontractors brings onto the site. In addition, subcontractors shall maintain reference copies of MSDSs for all chemicals brought to the site. A copy of the MSDS for molasses is included in the Appendix A. One copy of all subcontractors' MSDSs shall be provided to the SM.
- During hazardous weather conditions, such as lightning and thunderstorms, work will cease immediately.
- Pregnant women may work in the support areas. However, they shall be restricted from entering the exclusion zone or contamination-reduction zone (CRZ). Upon entering the site, all pregnant women shall discuss their condition with the SM or SSO to obtain a "Declared Pregnant Worker" status.

10. Site Control

Entrance to the actual work site is limited to authorized personnel only. The SSO will determine and identify the following areas of the work site. These areas will be divided into three zones designated as the exclusion zone, the contamination reduction zone (CRZ), and the support zone. The SSO will also specify the equipment, operations, and personnel to occupy these controlled areas.

10.1 Exclusion Zone

The exclusion zone is the zone where contamination exists or could occur. All personnel working in the exclusion zone will wear the prescribed level of protection. An entry and exit checkpoint will be visually defined at the periphery of the exclusion zone to regulate the flow of personnel and equipment into and out of the zone.

Personnel who have not met the medical monitoring and training criteria set forth in this HASP are not permitted to enter the exclusion zone. In addition, pregnant women shall not be allowed to enter the exclusion zone or CRZ under any circumstances.

A visually defined exclusion zone will be established around work areas in which encountering hazardous substances is probable. When established, this zone will be of sufficient size to contain all work activities and resultant waste production. Temporary markers (e.g., traffic cones, barricades, and/or barricade tape) shall be used to clearly delineate the CRZ and other select areas of the Site.

10.2 Contamination Reduction Zone

The area between the exclusion zone and the support zone is the CRZ. This zone provides a transition between a contaminated area (exclusion zone) and non-contaminated area (support zone). The CRZ serves as a buffer to further reduce the possibility of the clean support zone becoming contaminated. It provides additional assurance that the physical transfer of contaminated substances on personnel, equipment, or in the air is limited through a combination of decontamination, distance between exclusion and support zones, air dilution, zone restrictions, and work functions. Decontamination of personnel and sampling equipment will be performed in the contamination-reduction corridor (CRC), which will be situated within the CRZ. The CRC will be established as the entry and exit points to the defined work areas.

All tools, construction equipment, heavy equipment, and drilling equipment shall be decontaminated upon conclusion of site activities before any equipment leaves the CRZ. This measure is to prevent impacted equipment from leaving the CRZ and potentially affecting previously non-impacted areas, or impacting unsuspecting personnel. All subcontractors shall be responsible for decontaminating and scanning their own equipment. However, the SM or the SSO shall check said tools or equipment for quality control measures. Particular focus shall be placed on areas like bobcat buckets, seats, petals, etc.

10.3 Support Zone

The area between the exclusion zone and the support zone is the CRZ. This zone provides a transition between a contaminated area (exclusion zone) and non-contaminated area (support zone). The CRZ serves as a buffer to further reduce the possibility of the clean support zone becoming contaminated. It provides additional assurance that the physical transfer of contaminated substances on personnel,

equipment, or in the air is limited through a combination of decontamination, distance between exclusion and support zones, air dilution, zone restrictions, and work functions. Decontamination of personnel and sampling equipment will be performed in the contamination-reduction corridor (CRC), which will be situated within the CRZ. The CRC will be established as the entry and exit points to the defined work areas.

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11. Contamination

All personnel performing work tasks in the work areas must pass through the CRZ decontamination procedure, regardless of the work task or protection used. The equipment decontamination pack is the primary corridor for passing between the exclusion and support zones. All equipment and tools used within the work area will also undergo decontamination. Final inspection of the equipment prior to leaving the work area is the responsibility of the SSO.

11.1 Personnel

The decontamination procedure discussed below will be employed for those field activities requiring Level B and Level C protection. A similar procedure, with two fewer stations (Stations 4 and 6), will be used by personnel requiring Level D protection.

Station 1: Segregated Equipment Drop

Equipment used in the exclusion zone (tools, monitoring equipment, radios, clipboards, etc.) will be deposited on plastic drop cloths or in different containers with plastic liners. Tools and devices will be washed/wiped in a detergent solution and rinsed with clean water, then stored or serviced for reuse. Tools and similar field equipment may require a high-temperature water/stream wash. This station shall be located adjacent to the CRZ decontamination line.

Station 2: Wash and Rinse Outer Garment, Boots, and Gloves

Outer boots and gloves will be scrubbed with a decontamination solution, consisting of detergent and water. Gloves, boots, and garment will be rinsed with a hand-pump spray bottle or in a plastic bucket or tub.

Station 3: Removal of Outer Gloves

Outer gloves and any accompanying tape will be removed. Tape and disposable gloves should be placed in a container with a plastic liner. Reusable gloves will be cleaned and stored for future use.

Station 4: Cartridge/Bottle Change

If a worker leaves the exclusion zone to change respirator cartridges or supplied air bottles, Station 4 must be the last step in the decontamination procedure. After the worker's cartridges/bottles have been exchanged, the outer glove and boot covers are donned and joints taped, if required. The worker may then return to the exclusion zone.

Station 5: Removal of Boots and Outer Garment

Boots and outer garment will be removed. The outer, disposable, chemical-resistant garment should be deposited in a plastic-lined container. Reusable protective garments will be removed and stored for future use.

Station 6: Removal of Respiratory Protection

The respirator face piece will be removed, and the respirator will be placed in a plastic-lined container for decontamination.

11.2 Equipment and Vehicles

Equipment will be washed with decontamination solution (i.e., detergent and water), rinsed with clean water, and if required, steam cleaned to the satisfaction of the SSO prior to reuse. Vehicles will be decontaminated in a designated area. Support vehicles will be decontaminated as deemed necessary by the SSO.

11.3 Decontamination Personnel

Personnel working the CRZ will wear, at a minimum, the same level of protection as the workers. In addition, face shields will be worn rather than safety glasses or goggles to protect personnel against splashing.

11.4 Decontamination Waste Disposal

Solid wastes (discarded protective clothing, tape, etc.) will be containerized and disposed of in an approved manner.

11.5 Equipment Needs

The following equipment may be used during the decontamination procedure:

Station 1:

Plastic drop cloths.
Plastic 30- or 50-gallon containers.

Station 2:

Hand-operated garden-type sprayers.
Large tubs or wash containers (30- to 50-gallon capacity).
Plastic buckets
Brushes.
Decontamination solution.
(1) Commercially available detergent.

Station 3:

Plastic liners.
Plastic containers (30- to 50-gallon capacity).

Station 4:

Duct tape.
Respirator cartridges.
Supplied air bottles.

Station 5:

Plastic liners.
Plastic containers (30- to 50-gallon capacity).
Detergent and/or boric acid for decontamination of respirators.

Station 6:

Plastic liners.
Plastic containers (30- to 50-gallon capacity).
Bench
Rack for boots.

Other Equipment:

Hand-operated garden-type hose sprayers or garden hose for vehicle and equipment washing and rinsing.

Steam cleaner.

Potable water supply.

Washbasins.

11.6 Contaminant Containment

A housekeeping program will be implemented during the course of the work tasks to avoid the spread of any contaminants beyond the exclusion zone. The housekeeping program will include the following:

Periodic policing of the work areas for debris, including paper products, cans, etc.

Periodic changing of wash and rinse water for hands, face, and equipment.

Periodic removal of all garbage bags and containers used to dispose of disposable clothing. Contaminated materials will be disposed of in an approved manner.

12. Emergency Plan

In the event of an emergency, the work site will be evacuated and the appropriate emergency phone numbers shall be called (Section 14). Work shall not resume at the site until the ARCADIS Project Manager, Health and Safety Manager, and Site Manager have been notified of the emergency and they agree that the Site is safe for continued work. The injured individual will be removed from the exclusion zone or other work area by coworkers (if possible) for transport to the hospital. The SSO will accompany the injured worker and perform (if necessary) a contamination survey of the ambulance/vehicle after the individual is at the hospital for treatment.

Verbal communications may be difficult at times due to PPE and noise. A universal set of hand signals, listed below, will then be used.

- Hand gripping throat: Can't breath
- Grip partner's wrist or Place hands around waist: Leave work area immediately
- Hand on top of head: Need assistance
- Thumbs up: Okay; I'm all right
- Thumbs down: No; Negative

13. Injury Reporting

All job-related injuries and illnesses will be reported to the SM or SSO. If medical attention is needed, the injured worker will be decontaminated, if possible, prior to leaving the Site. The SM or SSO will investigate the cause of the accident, and corrective measures will be taken before the work can resume. It will be the responsibility of the SSO to complete the accident reporting form, OSHA 101, for all injuries. The completed OSHA 101 form should be forwarded to ARCADIS' Fullerton office and the Corporate Administrator of Health and Safety, within 6 days for recording into the OSHA 200 log. In the event of a fatality or three or more workers hospitalized as a result of a single incident, the SM will contact the office health and safety manager immediately for OSHA reporting purposes.

14. Emergency Action Plan

14.1 Emergency Telephone Numbers

All job-related injuries and illnesses will be reported to the SM or SSO. If medical attention is needed, the injured worker will be decontaminated, if possible, prior to leaving the Site. The SM or SSO will investigate the cause of the accident, and corrective measures will be taken before the work can resume. It will be the responsibility of the SSO to complete the accident reporting form, OSHA 101, for all injuries. The completed OSHA 101 form should be forwarded to ARCADIS' Fullerton office and the Corporate Administrator of Health and Safety, within 6 days for recording into the OSHA 200 log. In the event of a fatality or three or more workers hospitalized as a result of a single incident, the SM will contact the office health and safety manager immediately for OSHA reporting purposes.

14.2 Project Personnel Emergency Telephone Numbers

Jeffrey Friedman, Senior Project Manager, ARCADIS,
(714) 278-0992 (Office)
(714) 335-3456 (Cellular)

Greg Fiol, Health and Safety Officer, ARCADIS,
(714) 278-0992 (Office)
(818) 516-1746 (Cellular)

14.3 Directions to the Hospital

Travel south on Lakewood Boulevard to Clarke Avenue. Turn left (south) on Clark Avenue to East Rosecrans Avenue. Turn left (east) on East Rosecrans Avenue and the medical facility will be on the right (south) side of the street.

Kaiser Permanente Medical Center
9400 East Rosecrans Avenue
Bellflower, California 90706

Phone Number: **(562) 461-3000**

Project Personnel List And Safety Plan Acknowledgement Record

ARCADIS G&M Employees

Project staff must sign the master copy of this document, indicating they have read and understand it. The employee's signature indicates his/her acceptance and compliance with the requirements of the HASP. Copies of this document must be made available for their review and readily available at the job site.

LOG OF ARCADIS PROJECT PERSONNEL

Employee Name/Job Title	Date Distributed	Signature

Contractors and Subcontractors

Copies of this document will be provided to contractors and subcontractors who may be affected by activities addressed herein. Contractors and subcontractors must comply with this document (and/or their own HASP if it is equally or more stringent than the ARCADIS G&M HASP), applicable OSHA, EPA, and local government rules and regulations. The contractors' and subcontractors' signatures acknowledge their reading and understanding the HASP and agreeing to comply with the procedures presented therein.

LOG OF CONTRACTOR AND SUBCONTRACTOR PROJECT PERSONNEL

Contractor Name/Company	Signature	Date Distributed

VISITORS: It is ARCADIS G&M's policy that visitors must furnish their own PPE. Visitors are required to sign the Visitor Log and comply with guidelines, rules, and procedures presented herein. If the visitor represents a regulatory agency concerned with site health and safety issues, the SHSO must immediately notify the Project Director.

VISITOR LOG

Name of Visitor	Company Name	Date of Visit	Signature

HEALTH AND SAFETY MEETINGS: Project personnel must receive initial health and safety orientation. Thereafter, a brief tailgate safety meeting is required as deemed necessary by the SHSO. Health and safety meetings will be held at least once every week or when risks and/or hazards change.

HEALTH AND SAFETY MEETING LOG

Date	Topics	Name of Attendee	Company Name

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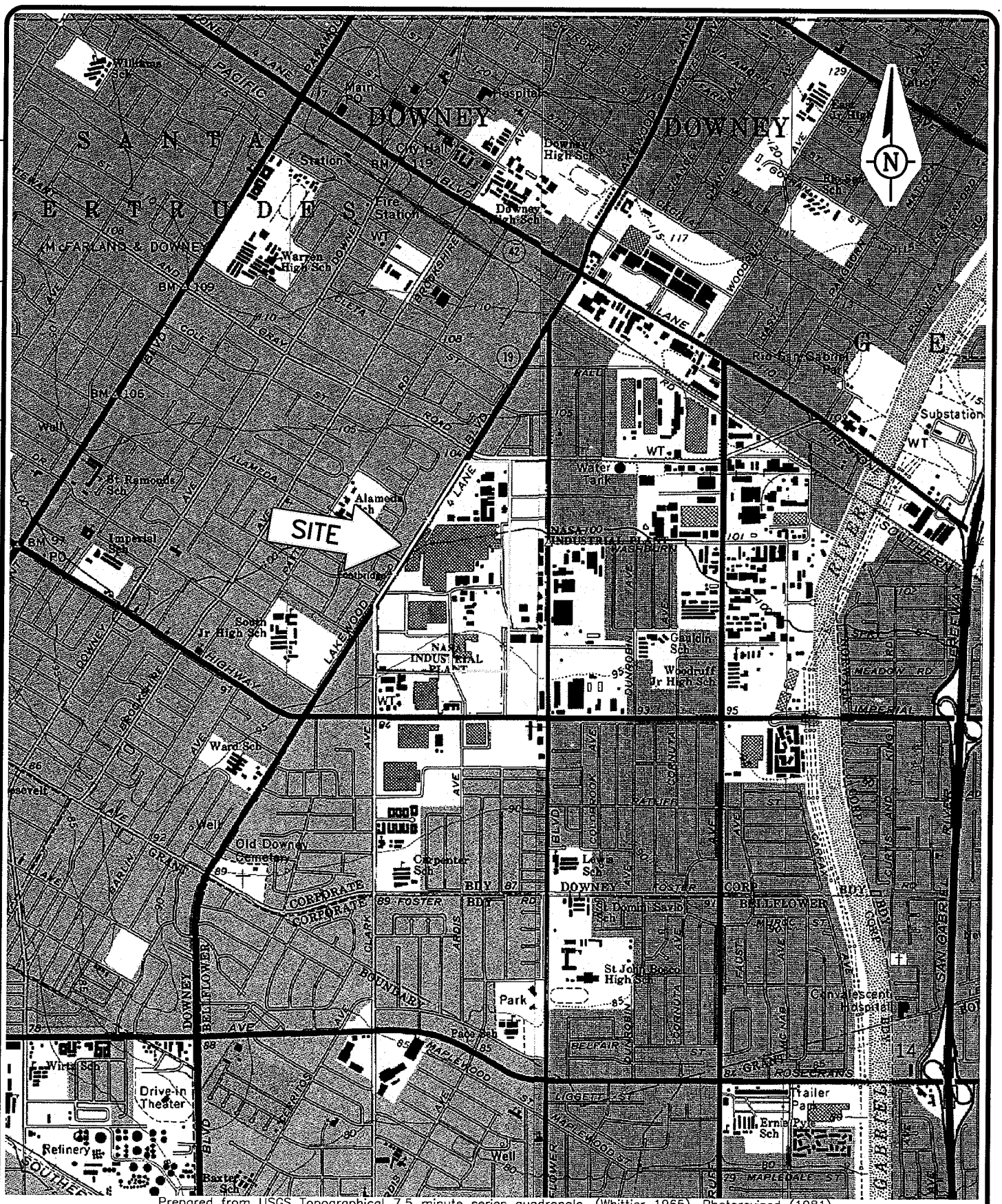
Appendix A

Material Safety Data Sheets



ARCADIS

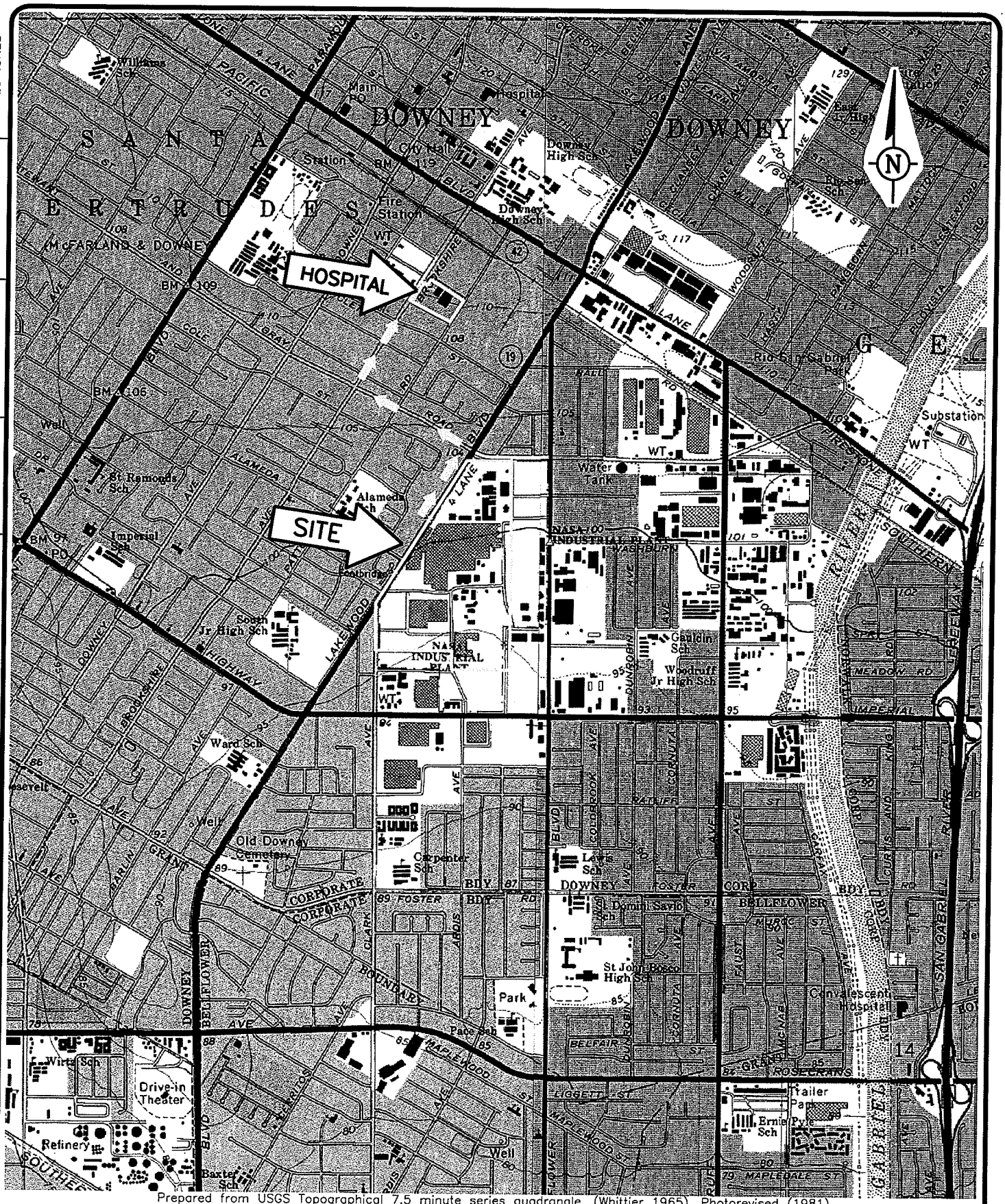
SITE LOCATION

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

1

ART: QUINONES | PM: FRIEDMAN | CHK: FRIEDMAN | FILE: | DWG: G:\drawings\aproject\nasa\Nasa-SL1 | PRJ#: CA 623.01.02 | 13:36 | DATE: 4/9/03



Prepared from USGS Topographical 7.5 minute series quadrangle, (Whittier 1965), Photorevised (1981)

ARCADIS

HOSPITAL ROUTE MAP

NASA INDUSTRIAL PLANT
DOWNEY, CALIFORNIA

FIGURE

2

ART: QUINONES | PM: FRIEDMAN | CHK: FRIEDMAN | FILE: | DWG: G:\drawings\project\nasa\Nasa-Hospital | PRJ#: CA 623.01.02 | 13:36 | DATE: 4/24/03