CALTRANS

DEPARTMENT OF TRANSPORTATION

INFILTRATION BASIN SITE SELECTION STUDY

VOLUME I

REPORT NO. CTSW-RT-03-025

June 2003

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VOLUME II

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VOLUME III

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EXECUTIVE SUMMARY

The following summary provides information regarding the history of the Los Angeles Infiltration Basin (IFB) Site Selection Study and key findings from work completed for Stage 3, Phase I - Priorities 1, 2, and 3, and Phase II - Priorities 4, 5, 6, and 7, as defined in the following paragraphs.

The IFB Site Selection Study was conducted in accordance with the Stipulation and Order Regarding La Costa Infiltration Basin Retrofit Pilot Project, U.S. District Court, Central District of California, Case No. 93-6073-ER (JRX), (the Stipulation). The representative parties named in the Stipulation include the Natural Resources Defense Council, Santa Monica Baykeeper, as the plaintiffs, and the California Department of Transportation, as the defendant. The Stipulation mandated that the study be completed within two years from the Stipulation date of April 27, 2001.

The designated area of the study was within Los Angeles County, California along selected freeway corridors under the jurisdiction of Caltrans District 7 (the Department). The Department identified seven (7) corridors for this study and ranked the corridors in order of importance as Priorities 1 through 7. The corridors were prioritized as Phase I or Phase II corridors based on conducting siting studies in conjunction with future highway construction. The corridor ranking is as follows:

Phase I

Priority 1 – Interstate 405 (I-405) northbound from State Route 90 (SR-90) to Interstate 10 (I-10)

Priority 2 – I-405 southbound from SR-90 to I-10

Priority 3 – SR-71 both directions from SR-60 to I-10

Phase II

Priority 4 – Interstate 710 (I-710) both directions from I-10 to Interstate 105 (I-105)

Priority 5 – I-405 both directions from I-10 to State Route 101 (SR-101)

Priority 6 – Interstate 5 (I-5) both directions from Los Angeles/Orange County line to Interstate 605 (I-605)

Priority 7 – I-5 both directions from I-605 to I-710

According to the Stipulation, work was to proceed on Phase I selected corridors in accordance to their ranking. Work associated with Phase II corridors was contingent upon remaining funds available upon completion of Phase I. The IFB Site Selection Study was conducted according to Recommended Site Evaluation Procedures cited in Exhibit A of the Stipulation. These procedures consist of a preliminary research study, and secondary and detailed field investigations.

Preliminary Site Selection Investigations consisted of:

- Identifying Potential Basin Sites
- Evaluating Site per Recommended Site Evaluation Procedures
- Recommending Sites for Secondary Investigation based on Exhibit A Criteria.

Initially, no potential IFB sites were identified during the preliminary site selection process for Priorities 1 (I-405 northbound) and 2 (I-405 southbound). Field reconnaissance along these corridors established that the undeveloped land along the corridors was either located in topographically high (above freeway) areas, along steep slopes (cutslopes and embankments), or they failed to meet the present setback criteria from bridge piers and other structures as described in the Site Evaluation Procedures. In addition, no potential sites were identified outside the Department's right-of way along these corridors. However, during a re-evaluation of the corridors, one potential site was identified at the Department's Westdale Maintenance Yard. Further review showed that the site was located on fill, and was therefore eliminated from further consideration. It should also be noted that some sites eliminated because of setback criteria violations could be viable with reassessment and possible revision of the criteria.

Potential IFB sites were identified on all other Priorities. Furthermore, potential sites were identified outside the Department's right-of-way along Priorities 2, 4, 6, and 7.

Secondary Site Screening investigations consisted of:

- Characterizing Subsurface Lithology
- Establishing Groundwater Monitoring Wells to Evaluate Seasonal Groundwater Variations
- Environmental Screening of Soils
- Recommending Sites for Detailed Investigation.

Detailed Investigations consisted of:

- Conducting In-Hole Hydraulic Conductivity Tests
- Recommending Potential Infiltration Basin Sites for Preliminary Design.

The infiltration basin site selection process was modified for Phase II - Priority 6 (Orange/Los Angeles County border to I-605) and Priority 7 (I-605 to I-710) along the I-5. These corridors were the lowest ranked priorities, and the last to be funded for investigation. The key factors involved with modifying the selection process included the following:

- Land availability associated with the proposed widening project along I-5
- Available time for investigation within the time frame of the Stipulation.

With the planned widening of I-5, future land availability for potential IFB sites was unknown. Land could be acquired by the Department that is not currently available for investigation and land that is presently available may be required for freeway design. In addition to the land issue, there were just over two months remaining to complete the study by the Stipulation deadline of April 27, 2003.

Given these conditions, it was mutually agreed upon by the Department and the Plaintiff's consultant to evaluate the infiltration potential along the corridors by reaches, with the intent of defining potential areas where future siting studies could focus. In essence, this is the same evaluation as applied to all the previous corridors during the preliminary site selection process. However, instead of conducting

secondary and detailed investigations to characterize a specific site, the information from the secondary and detailed investigations was used to characterize reaches. Completion of preliminary studies was concurrent with the combined secondary and detailed investigations. Environmental Site Assessment reports, drainage modifications, and evaluation of catchment areas were excluded from the preliminary portion of the study. Environmental screening of soils was excluded from the secondary portion of the study. However, comparison of the current design plans for the I-5 widening project and the area associated with the existing sites investigated during this study indicate that there will be minimal conflict of land use. Therefore, these sites have been counted as potential IFB sites, even though they have not been fully evaluated.

As shown in the table below, 11 sites advanced through secondary and detailed investigations. Six of the sites identified were located along the I-5 corridor, with four sites from Priority 6 and two sites from Priority 7. It was found that some of the best areas for infiltration documented in this study are along the central portion of these corridors, in an area north of Coyote Creek to the Rio Hondo River. This area is coincident with the Montebello Forebay area, an area of significant recharge to the Central Groundwater Basin.

Of the five remaining sites, four were identified along Priority 4 (I-710) and one from Priority 3 (SR-71). All of the I-710 sites (i.e., I-710-2c I-710-2b, I-710-5e, and I-710-5f) have restrictive layers that could inhibit vertical flow. Detailed infiltration tests, consisting of successive 48-hour tests, are recommended for I-710-2 and I-710-5 sites prior to recommending the sites for future design.

In addition, there was not a reliable indication that the groundwater-invert separation distance is greater than 10 feet (3 meters) at the I-710-5 sites. The Los Angeles Regional Water Quality Control Board (LARWQCB) should be consulted regarding conditions at Sites I-710-5e and f, and additional groundwater monitoring should be completed prior to recommending the site for design.

The available surface areas originally identified for sites 710-2b, 710-2c, and 71S-3 were re-configured to position the potential basin in an area that contained soils meeting the Stipulation criterion for hydraulic conductivity. All three of these re-configured sites have enough surface area to accommodate the cumulative water quality volume available to the site. However, to make sites 71S-3 and 710-2c feasible as IFBs, approximately 7 feet (2.1 meters) of fine-grained soil would need to be excavated and backfilled with a permeable material. Backfilling the excavation would facilitate gravity drainage of any proposed IFB constructed at the site.

Site characteristics for the 11 potential sites that can be used for design purposes are listed in the following table:

Potential IFB Design Parameters

Priority	Site	Surface Area ft² (m²)	Total IFB WQ Volume ft³ (m³) (1)	Minor Modifications Cumulative WQ Catchment Volume ft³ (m³) (2)	Total Cumulative WQ Catchment Volume ft³ (m³)(3)	Depth to Historic Highest Groundwater ft (m)	Measured Depth to Groundwater ft (m)	Geometric Mean of Hydraulic Conductivity Tests (1) (inches/Hour) (4)	Comments
3	71S-3	12,236 (1,137)	19,577 (554)	6,349 (180)	12,104 (343)	35 (10.7)	>30 (>9.1)	0.8	Feasibility of basin requires excavation and backfill
4	710-2b	18,242 (1,695)	20,066 (568)	4,072 (115)	7,874 (223)	15 - 20 (4.6 - 6.1)	>50 (>15.2)	0.55	LACDPW easement for box culvert through site
4	710-2c	29,187 (2,712)	97,484 (2,760)	5,582 (158)	11,769 (333)	30 (9.1)	>16 (>4.9)	1.67	Feasibility of basin requires excavation and backfill
4	710-5e	25,534 (2,372)	120,010 (3,398)	14,547 (412)	14,547 (412)	8 - 10 (2.4 - 3)	11.5 (3.5)	2.35	Consult with LARWQCB concerning high hydraulic conductivity values and shallow groundwater
4	710-5f	24,616 (2,287)	60,063 (1,701)	18,668 (529)	18,668 (529)	8 - 10 (2.4 - 3)	22 (6.8)	1.22	Divert catchment to 710-5e
6	5-2	35,000 (3,252)	109,900 (3,112)	Not Calculated	Not Calculated	8 (2.4)	16 (4.9)	1.57	Need to excavate 3 -7.6 ft (1 -2 m) thick surface clay layer
6	5-4d	15,625 (1,452)	19,062 (540)	Not Calculated	Not Calculated	8 (2.4)	>30 (>9.1)	0.61	Minor surface grading
6	5-5b	70,000 (6,503)	133,000 (3,766)	Not Calculated	Not Calculated	9 (2.7)	25.6 (7.8)	0.95	Minor surface grading
6	5-8b	18,750 (1,742)	41,250 (1,168)	Not Calculated	Not Calculated	9 (2.7)	>30 (>9.1)	1.1	Minor surface grading
7	5-10b	30,000 (2,787)	56,400 (1,597)	Not Calculated	Not Calculated	9 (2.7)	>30 (>9.1	0.94	Minor surface grading
7	5-11b	17,671 (1,642)	32,161 (911)	Not Calculated	Not Calculated	14 9 (4.3)	>30 (>9.1	0.91	Minor surface grading

1. Water Quality Volume calculated per Equation 1 of Exhibit A (V=Akt), using the geometric mean hydraulic conductivity value for (k). A = Surface area, t = time allowed for infiltration.
2. Minor Modification Cumulative Volume is the sum of the catchment areas needing only minor drainage modifications to feed basin.
3. Total Cumulative Volume is the sum of catchment areas requiring either minor or major drainage modifications.
4. Geometric mean calculated from hydraulic conductivity values from all tests conducted at respective sites, except for sites that were re-configured (71S-3, 710-2b, 710-2c). The geometric mean for these sites was calculated only from in-hole hydraulic conductivity tests that would represent the native soil left in place after excavation.

Note: Minor drainage modification includes all modifications not requiring jacking under freeway. Major modifications generally require jacking under freeway to get catchment area runoff to basin.

In addition to the sites listed above, 11 sites were identified as potential IFB sites that were located outside of the Department's right-of-way. As agreed upon by the Department and the Plaintiff, these sites were noted as potential IFB sites, but were not evaluated past the preliminary site selection portion of this study. However, the potential of these sites was qualitatively estimated based on the preliminary site

selection results and correlations with nearby sites where secondary and detailed investigations were completed. Of the 11 sites, three sites were considered to have moderate potential as IFBs:

Priority 3 (SR-71)	71N-2 and 71S-7
Priority 7 (I-5)	5-15c

Two sites are currently being utilized as part of the Rio Hondo Spreading Grounds:

Priority 7 (I-5)	5-15a and 5-15b

The remaining six sites are considered to have low to no potential as IFBs.

1.0 INTRODUCTION

1.1 BACKGROUND

An Infiltration Basin (IFB) Site Selection Study was conducted in accordance with the Stipulation and Order Regarding La Costa Infiltration Basin Retrofit Pilot Project, U.S. District Court, Central District of California, Case No. 93-6073-ER (JRX), (the Stipulation). The Stipulation mandates that a study be completed within two years from the Stipulation date of April 27, 2001. As outlined in the Stipulation, the IFB study is to be completed in the following four stages.

Stage 1 – Selection of the corridor or corridors to be studied

Stage 2 – Preparation of a scope of work and budgetary milestones

Stage 3 – Identification of potentially suitable IFB sites and report

Stage 4 – Application of the IFB siting and design lessons learned and report

Each stage is further described in the following paragraphs.

1.2 STAGE 1 – SELECTION OF CORRIDORS

Caltrans District 7 (the Department) has identified seven (7) corridors for this study and has ranked the corridors in order of importance as Priorities 1 through 7. The corridors are further grouped by importance as Phase I or Phase II corridors. The corridor ranking is as follows:

Phase I

Priority 1 – Interstate 405 (I-405) northbound from State Route 90 (SR-90) to Interstate 10 (I-10)

Priority 2 – I-405 southbound from SR-90 to I-10

Priority 3 – SR-71 both directions from SR-60 to I-10

Phase II

Priority 4 – Interstate 710 (I-710) both directions from I-10 to Interstate 105 (I-105)

Priority 5 – I-405 both directions from I-10 to State Route 101 (SR-101)

Priority 6 – Interstate 5 (I-5) both directions from Los Angeles/Orange County line to Interstate 605 (I-605)

Priority 7 – I-5 both directions from I-605 to Interstate 710 (I-710)

The location of the Phase I - Priorities 1, 2 (I-405), and 3 (SR-71) corridors, and the Phase II - Priorities 4 (I-710), 5 (I-405), and Priorities 6 and 7 (I-5) corridors are shown on Figure 1.

1.3 STAGE 2 – SCOPE OF WORK

The scope of work for this study is defined under Contract Number 43A0054, Task Order Number 31. Under this scope of work, all Stage 3 and Stage 4 work for Phase I - Priorities 1, 2 (I-405), and 3 (SR-71) corridors will be completed. Additional Stage 3 and Stage 4 work for Phase II corridors was authorized during the course of the study as funding became available. As the project progressed, modifications to the scope of work were implemented upon mutual agreement between the Department and the Plaintiff. A letter documenting modifications to the scope of work is presented in Appendix A. An outside peer review was performed at the completion of the study.

1.4 STAGE 3 – IDENTIFICATION OF IFB SITES AND REPORT

Identification of potentially suitable IFB sites was conducted in accordance with the preliminary selection considerations cited in the Recommended Site Evaluation Procedure in Exhibit A of the Stipulation (Appendix A). The Preliminary Site Selection Methodology is described in Section 3. These considerations are summarized as follows:

- The soils at the IFB sites must be Hydrologic Soil Group type A, B, or C, as defined by the U.S. Department of Agriculture Natural Resources Conservation Services (USDA)
- Based on USDA soil survey table, soils must have characteristics conducive to infiltration, such as low silt and clay content, absence of restrictive subsurface layers, and high permeability
- The seasonal groundwater table must be greater than 4 feet (1.2 meters) below basin invert elevation
- The IFBs must have the following setbacks:
  - 30 feet (9.1 meters) from the edge of the traveled way
  - 20 feet (6.1 meters) from slopes, buildings, and highway pavement
  - 100 feet (30.5 meters) from bridge structures
  - 100 feet (30.5 meters) from wells
- The sites must have adequate area for maintenance access
- The sites must have sufficient area (per equation provided in the Stipulation) for basin footprint and assumed infiltration rate
- The sites should not be constructed on man-made fill
- The sites should not be constructed on slopes greater than 15%
- Base flow should not be present in the tributary watershed to the sites
- Modifications to existing drainage system should be feasible.

Given these criteria, particularly the geometric criteria, the most likely sites for the establishment of infiltration basins are interchanges, which typically encompass a relatively large land area.

The results of Stage 3 potential IFB sites that were identified for Phase I and Phase II Priorities and sites recommended for Stage 4 investigations are documented within this report.

In accordance with an oral agreement made on February 1, 2002 between the Plaintiff's consultant and the Department, only sites within the Department's right-of-way or sites owned by other public agencies will be considered as potential IFB sites. Private land adjacent to the study corridors that may appear to have adequate space for an IFB will be noted in this report, but not evaluated per the Stage 3 and Stage 4 requirements.

1.5 STAGE 4 – APPLICATION OF THE IFB SITING AND DESIGN LESSONS LEARNED

For each potential IFB site recommended under Stage 3, detailed evaluations were conducted under this stage. The Stage 4 evaluation procedure was performed in accordance with the Secondary Screening and Detailed Investigation requirements cited in Exhibit A of the Stipulation. Secondary Site Screening Methodologies are described in Section 4. Detailed Site Investigation Methodology is described in Section 5. The procedure is briefly summarized as follows:

- Perform soil borings at potential sites to evaluate soil types, groundwater elevation, and potential impacts to structures or slopes
- Establish groundwater monitoring wells to evaluate seasonal groundwater variations
- Conduct in-hole conductivity tests to determine soil hydraulic conductivity.

The above criteria are described and summarized in this report for all Phase I and Phase II Priorities.

2.0 SCOPE OF SERVICES AND INTENT

The initial scope of services for this study is to complete Stage 3 and Stage 4 studies for the Phase I - Priorities 1, 2 (I-405), and 3 (SR-71) corridors in accordance with the Recommended Site Evaluation Procedures cited in Exhibit A of the Stipulation. The scope of services expanded to include Phase II - Priorities 4 (I-710) and 5 (I-405) investigations to be completed concurrently with Phase I work. Upon completion of Stage 3 and Stage 4 studies on Priorities 1 through 4, the scope of services were further expanded to include modified Stage 3 and Stage 4 studies for Priorities 6 (I-5) and 7 (I-5) in a sequential process as funding became available and schedule permitted.

3.0 PRELIMINARY SITE SELECTION METHODOLOGY

Completion of the Preliminary Site Selection for Phase I - Priorities 1, 2 (I-405), and 3 (SR-71) corridors, and Phase II – Priorities 4 (I-710) and 5 (I-405) corridors, consisted of the process listed below:

1. Literature Review
2. Field Reconnaissance
3. Final Review and Evaluation
4. Drainage Modifications Review
5. Catchment Areas Review.

Completion of the Preliminary Site Selection for Phase II - Priority 6 (I-5) and 7 (I-5) followed the same multi-step process, except these corridors were evaluated with the intent of characterizing infiltration potential along only segments or reaches of the corridors. This process was agreed upon between the Department and the Plaintiff's consultant because future land availability associated with the widening of I-5 was not known. For this reason, drainage modifications and catchment area reviews were not included in the evaluation process.

Descriptions of the steps associated with the Preliminary Site Selection studies are provided in the following sections.

3.1 LITERATURE REVIEW

The literature review focused on obtaining information that was relevant to the site selection process and addressed the Recommended Site Evaluation Procedures cited in Exhibit A of the Stipulation. Characterization of site surface and near surface conditions included the review of surface soils as mapped by the USDA soil survey and soil parameters from soil survey tables. Information provided by the USDA included the soils per Hydrologic Soil Group (i.e., A, B, C, or D) as defined on Figure 2. The USDA soil information also included gradation and other soil classification data that was used to classify the soils in general accordance with the Unified Soil Classification System (USCS) as described in the Soil and Rock Logging Classification Manual (State of California, Department of Transportation, Engineering Service Center, Office of Structural Foundations, August, 1996).

In addition, characterization of site surface conditions was aided by reviewing surface geology from published geologic maps, and surface and near-surface soil conditions from boring logs completed during previous geotechnical investigations by the Department along the selected corridors. A summary of the boring logs is presented in Appendix B.

Geologic maps of the study corridors were used in conjunction with the USDA Soil Survey Maps to identify the distribution of Quaternary sediments (i.e., gravel, sand, silt, and clay), and to identify mapped bedrock exposures and areas where bedrock is interpreted to be present at shallow depths. Additionally,

the maps were checked for any geologic structures that could potentially cause adverse effects regarding infiltration.

Near-surface and subsurface conditions were evaluated from the logs of borings that were advanced during previous Department geotechnical investigations along the study corridors. The borings were reviewed with respect to the presence and depth of man-made fill, near-surface soil types, subsurface restrictive layers, depth to bedrock, and depth to groundwater. Logs of test borings completed during the previous bridge investigations were reviewed.

The boring logs provided a means to verify the soil survey maps at the bridge sites, taking into account grading and other construction that may have occurred since the soil survey maps were published. On the basis of the borehole data, interchange sites were ranked with respect to infiltration potential on a scale of 1 to 5, with 1 having the lowest infiltration potential and 5 having the highest. These rankings were later used to focus the field reconnaissance effort.

Aerial photographs were also reviewed to help identify potential IFB sites. This included sites within Department right-of-way and on adjoining properties.

Depth to historically highest groundwater from data compiled for liquefaction studies completed by the California Division of Mines and Geology (CDMG) (renamed California Geological Survey [CGS]) and recorded depths to groundwater from Department borings were used to estimate seasonally high groundwater conditions along the corridors. The CDMG groundwater contour maps show depth to historically highest groundwater or perched groundwater with depths less than 40 feet (12 meters) for areas along the corridors. The CDMG groundwater evaluation relied on turn-of-the-century water-well logs (Mendenhall, 1905), and water measurements from borehole logs collected for CDMG liquefaction studies.

Information from the literature review was converted into Geographic Information Systems (GIS) format and geo-referenced on aerial photographs of the study corridors. Composite maps were generated with a combination of information depicting the distribution of USDA soil types, surface geology, groundwater contours, and locations and ranking of subsurface borehole data. A table showing the USDA soil types, USDA Hydrologic Soil Groups, USCS Soil Groups, and USCS Soil Descriptions are included within the Legend of each soil distribution map.

3.2 FIELD RECONNAISSANCE

A field reconnaissance was conducted at selected locations to verify the surface soil conditions identified during the literature review and to check the physical characteristics of potential IFB sites. Activities of the field reconnaissance included characterizing surface soil types, identifying the presence of any man-made fill, verifying mapped geologic contacts, and identifying areas that meet the setback, slope, and base flow criteria. In addition, observations were made concerning possible drainage modifications at the sites.

The potential IFB sites and examples of areas not suitable as potential IFB sites were photo-documented along the length of all corridors. Photographs were recorded digitally and are presented in the following appendices: Appendix C (Priorities 1 and 2), Appendix D (Priority 3), Appendix E (Priority 4), Appendix F (Priority 5), Appendix G (Priority 6), and Appendix H (Priority 7).

3.3 FINAL REVIEW AND EVALUATION

Sites that were considered as potential IFB sites upon completion of the literature review and field reconnaissance were also reviewed against the criteria as stated in Exhibit A of the Stipulation. Additional field checks were conducted when necessary to confirm or to supply missing information. Any potential sites not meeting all of the required criteria were eliminated from further consideration.

Potential IFB sites were checked against proposed design improvements to establish any conflicting land use issues. Sites with conflicting issues among the various project requirements, including stormwater management, were identified so they could be considered in the space allocation decision process during project development. Potential IFB sites were not eliminated from further consideration based on any proposed improvements. However, the drainage modifications and catchment areas for sites where roadway improvements are proposed were not evaluated. Potential IFB sites where catchment areas were evaluated have adequate land area to accommodate the water quality volumes for respective catchments.

As part of the final evaluation of the preliminary site selection process, it was required to confirm that the potential IFB site was not within a 30-meter (100-foot) radius of a groundwater well. A search for wells in the vicinity of the remaining sites included checking federal and state groundwater well databases and records from local City Government Public Works/Engineering Departments. Any potential sites within a 30-meter radius were eliminated from further consideration.

The next steps in the preliminary site selection process were to evaluate the drainage modifications and catchment areas for the potential IFB sites.

3.4 DRAINAGE MODIFICATIONS REVIEW

Additional field reconnaissance was conducted to evaluate the required drainage modifications for each site identified as satisfying all of the criteria as discussed in Section 3.3. Existing Department as-built drainage plans were used as a basis for field observations. Drainage devices such as drop inlets and culverts were verified in the field. Road surface high and low points as well as the runoff flow direction were visually approximated.

Field sketches for each of the potential IFB sites were prepared. The sketches indicated the location of the site limits of catchment areas associated with each site and required drainage modifications.

Field reconnaissance for drainage modifications was conducted only for potential IFB sites within existing areas of freeway. Potential IFB sites within areas where no freeway exists or where existing freeway alignment and grade will be modified were not evaluated in detail.

3.5 CATCHMENT AREAS REVIEW

Potential IFB sites were evaluated and shown on the drainage modification sketches. The maximum allowable surface area for each potential IFB was shown on the sketches and was estimated based on required setbacks and other geometric constraints. An assumed infiltration rate of 1 inch per hour multiplied by a safety factor of 0.5 (as required by the Stipulation) was used to estimate the design capacity of each potential IFB. This rate with the applied safety factor approximates typical infiltration rates for soil types with Hydrologic Soil Group B and C classifications that were expected based on the USDA mapped soils along the Priorities 1, 2 (I-405), and 3 (SR-71) corridors.

The catchment areas associated with each potential IFB site were evaluated and also shown on the drainage modification sketches. The runoff developed by the catchment areas associated with each potential IFB site was calculated using the equation Q=CiA, with (Q) equal to the Water Quality Flow, (c) an assumed runoff coefficient of 1.0, (i) equal to the water quality design storm, and (A) being the catchment area. The value of (i) used in this study was 0.75 inches as recommended by the Los Angeles Regional Water Quality Control Board (LARWQCB). For future design of IFBs, more detailed analyses of the water quality design storm must be conducted. The calculated runoff was then compared to the estimated capacity of each potential IFB site.

4.0 SECONDARY SITE SCREENING METHODOLOGY

Potential IFB sites that met the criteria of the preliminary selection considerations cited in the Recommended Site Evaluation Procedure in Exhibit A of the Stipulation were recommended for Secondary Site Screening. Secondary Site Screening was completed for both Phase I and Phase II selected corridors, and included Environmental Site Assessments and characterization of subsurface conditions. The Secondary Site Screening consisted of a multi-step process that included the following:

- Environmental Review
  - Initial Site Assessment (ISA) Reports
  - Compliance with LARWQCB
- Subsurface Characterization
  - Drilling and Soil Sampling
  - Geotechnical Laboratory Testing
  - Environmental Laboratory Testing
  - Monitoring Well Installation
  - Construction of Geologic Cross-Sections
- Groundwater Monitoring
  - Monthly Groundwater Level Monitoring
  - Review of Historic Rainfall Records

Partial secondary screening, consisting of installing one monitoring well, was conducted at three Priority 4 (I-710) sites. These three sites were initially considered to have less potential due to reported depth of historic high groundwater that was identified as part of the Preliminary Site Selection process. Because the potential for shallow groundwater could have been a reason for eliminating for these sites, it was decided to first evaluate the depth to groundwater prior to allocating the resources for a full secondary site characterization. The partial secondary screening included installing groundwater monitoring wells prior to the end of the 2001/2002 wet season. The monitoring well borings were logged in detail, and geotechnical and environmental samples were collected for testing.

Partial secondary screening was also conducted along reaches of Priority 7 with the sole purpose of characterizing lithology in order to help classify the infiltration potential. The screening consisted of advancing two borings, geotechnical soil sampling, and detailed geologic logging.

4.1 ENVIRONMENTAL REVIEW

A modification to the Secondary Site Screening process that was mutually agreed upon by the Plaintiff and the Department was to complete or review existing Environmental Site Assessment reports for the potential IFB sites identified during the Preliminary Site Selection process. The potential sites were evaluated with the purpose of gathering information regarding whether features and conditions of potential environmental concern exist in association with the subject sites and the adjoining properties.

In addition, findings from the environmental site assessment reports, and information acquired during the preliminary and secondary investigations for Priorities 1 through 5 were presented to LARWQCB for their review and compliance. The Department and the Plaintiff's consultant agreed that the environmental review process would not be performed along Priorities 6 and 7 (I-5). The environmental reviews for these corridors would be incorporated into subsequent site investigations associated with the planned widening of those corridors.

4.1.1 Environmental Site Assessments

Environmental Site Assessment reports that were previously completed by the Department for SR-71 (Priority 3) were reviewed and ISA reports were completed for this study on sites along I-710 (Priority 4) and I-405 (Priority 5). The ISA reports are provided as Appendices I, J, K, L, and M. Environmental Site Assessments along Priorities 6 and 7 (I-5) will be completed as part of future work along the I-5 widening project.

The ISA reports were prepared in general conformance with the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM Standard E 1527-00). This standard defines a Recognized Environmental Condition (REC) as, "The presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies."

The ISA reports specifically did not include: testing for asbestos, lead-based paint, radon gas, or lead in drinking water; sampling or testing of soil or groundwater; or evaluating wetlands or cultural resources. In addition, the ISA reports did not include a compliance audit.

Data used for the ISA reports was obtained from local agencies for the known problem sites in the area of the potential IFB sites from the LARWQCB, the Los Angeles County Department of Public Works Solid Waste Division (LACDPW), the Cal Environmental Protection Agency (Cal EPA) Department of Toxic Substances Control (DTSC), and the City of Vernon Environmental Health Department.

4.1.2 Compliance with LARWQCB

As part of the Secondary Site Screening and prior to conducting any detailed investigations, the Department requested the LARWQCB to review information and identify any concerns or conditions of approval regarding potential IFB site locations. The LARWQCB review of site locations focused on known contamination sites, particularly Leaking Underground Storage Tank (LUST) sites in the vicinity of the potential IFB sites, and the location of the potential basin sites with regard to vulnerable aquifer areas.

In addition, the LARWQCB requested information regarding soil type, results of environmental soil analysis, depth to groundwater, and depths to historic highest groundwater. Based on these data the LARWQCB evaluated the potential IFB sites regarding their potential risks to waters of the state and either approved or conditionally approved the potential IFB sites.

4.2 SUBSURFACE CHARACTERIZATION

Characterization of the subsurface conditions for the potential IFB sites included evaluating the soil types and soil stratigraphy (the lateral and vertical distribution of soil types, including variations in layer thickness for the soils present at a given site), and establishing thickness of the unsaturated zone in relation to the Recommended Site Evaluation Procedures cited in Exhibit A of the Stipulation.

Key factors in evaluating the suitability of a potential IFB site were to: 1) characterize fine-grained soils that could inhibit the rate or quantity of infiltration, and 2) develop an understanding of how storm water runoff will move in the soil, both vertically and horizontally. The methods employed to address these requirements are described in the following subsections.

4.2.1 Drilling and Sampling

Conventional and limited access hollow stem drill rigs were the primary method of advancing soil borings. The borings were continuously sampled from the surface to depths of approximately 15 feet (4.6 meters) below ground surface (bgs), and at 5-foot (1.5 meters) intervals from 15 feet (4.6 meters) bgs to total depth of the boring. In addition to the hollow stem borings, several borings were advanced with a Geoprobe, a direct push method of drilling that recovers continuous core in plastic liners. The soil investigations were typically confined to the upper 30 feet (9.1 meters) bgs, however some site investigations along Priority 4 (I-710) and Priority 5 (I-405) were completed to depths ranging from approximately 50 to 90 feet (15.2 to 27.4 meters) bgs.

Modified California and Standard Penetration samplers were used to collect soil samples from the hollow stem borings. The samplers were driven approximately 18 inches (45.7 cm) bgs and the blow counts were recorded on the boring logs. Soil borings were logged and soil samples were classified in the field according to procedures outlined in the Department's Soil and Rock Logging Classification Manual. The Department soil classification is based on the USCS, with only slight modifications. Field classifications of soil types were confirmed or refined by subsequent review and geotechnical laboratory analysis. The results of the analysis are included on the final versions of the boring logs.

The boring logs have been grouped by individual potential IFB site for each Priority. The borings logs and site maps showing the location of the respective borings are presented in the appendices as follows: Appendix D (Priority 3), Appendix E (Priority 4), Appendix F (Priority 5), Appendix G (Priority 6) and Appendix H (Priority 7).

4.2.2 Geotechnical Laboratory Testing

Laboratory tests were performed to characterize the soil on samples of the material recovered from the borings. The following types of tests were performed:

- Water content
- Liquid limit and plastic limit
- Particle-size distribution, including sieve, wash and hydrometer analysis
- Hydraulic conductivity (permeability)
- Organic content, pH, and cation exchange capacity.

Laboratory test data for each site investigated has been summarized in tables, graphs, on individual boring logs, and on site-specific geologic cross-sections by site and Priority. These data are presented in the following appendices: Appendix D (Priority 3), Appendix E (Priority 4), Appendix F (Priority 5), Appendix G (Priority 6), and Appendix H (Priority 7).

4.2.3 Environmental Soil Analysis

Screening for soil contamination was incorporated into the Secondary Site Screening process for Phase II - Priority 4 (I-710) and Priority 5 (I-405) sites only. Screening for soil contamination was not completed on Phase I - Priorities 1 and 2 because no sites were identified along the Priority 1 and 2 corridors. The Environmental Site Assessment report completed by the Department along Priority 3 (SR-71) prior to this study indicated that soil contamination was not an issue for potential IFB sites identified along Priority 3 (SR-71). Therefore, Priority 3 (SR-71) sites were not screened for soil contamination, as agreed to by the Department and the Plaintiff's consultant.

The Department and the Plaintiff's consultant mutually agreed not to screen for soil contamination for Priorities 6 and 7 (I-5) sites as part of the Secondary Site Screening process. Soil contamination studies, if required, will be incorporated into subsequent land acquisition and design studies associated with the widening of I-5.

Soil contamination screening for sites identified along Priority 4 (I-710) and Priority 5 (I-405) consisted of collecting soil samples every 5 feet (1.5 meters) with a Modified California split-spoon sampler lined with stainless steel tubes. Soil samples selected for analysis were collected at 5 feet (1.5 meters) bgs and at the base of the boring or immediately above groundwater if encountered. Samples were collected at a minimum depth of 5 feet (1.5 meters) bgs in order to increase the chances of detecting volatile constituents. Additional samples were submitted for analysis if visual observations indicated signs of contamination or if high Photo Ionization Detector (PID) readings were obtained during the sampling process. Encore samples were collected from the Modified California samplers for volatile organic compounds (VOCs). All samples collected were stored in chilled coolers and transported the same day to the analytical laboratory. Completed chain-of-custody forms were prepared for each set of samples and accompanied the samples to the laboratory. Samples were taken to a laboratory certified by Cal-EPA to

conduct tests for organic and inorganic chemicals. A QA/QC program that consists of internal checks and external audits on the precision and accuracy of the analytical results was performed.

Laboratory test data sheets are included in Appendix N.

4.2.4 Geologic Cross-Sections

Geologic cross-sections were constructed from the boring logs for potential IFB sites to aid in interpreting the soil stratigraphy. Cross-sections were constructed at a one-centimeter to 5-meter horizontal scale with a 5 times vertical exaggeration. The cross-sections are presented with their respective sites in Appendices D through H for Priorities 3 through 7, respectively.

4.2.5 Monitoring Well Installation

Upon completion of the drilling and sampling for the subsurface investigation, a field judgment was made regarding whether the soils encountered meet the criteria for soil types as stated in Exhibit A of the Stipulation. If the soils appeared to meet the criteria, a monitoring well was installed at the potential IFB site. The monitoring wells were installed in order to evaluate seasonal high groundwater elevations. All potential Phase I sites had monitoring wells installed prior to April 30, 2002, as required by the Stipulation. Phase II monitoring wells were installed between July 2002 and February 2003, also in accordance with the Stipulation.

Monitoring wells were permitted through the Los Angeles County Department of Health Services, with the exception of monitoring wells installed at Priority 4 site 710-2 (Atlantic and Bandini). These wells were permitted through the City of Vernon Department of Health Services.

Typically, one groundwater monitoring well was installed at each potential IFB site. However, one site 710-3 (Florence Avenue) had two wells installed in order to monitor for groundwater and perched water.

When lithology could be correlated between sub-sites with a reasonable degree of confidence, monitoring wells were completed at different depths. This provided an opportunity to monitor for perched water at various elevations in the stratigraphic column. Monitoring well construction diagrams are included with site data and are presented with their respective sites in Appendices D through H for Priorities 3 through 7, respectively. Well construction procedures and well construction details for each well are summarized in Appendix O.

4.3 GROUNDWATER MONITORING

As stated in Exhibit A of the Stipulation, groundwater wells should be installed to obtain an initial indication of seasonal high groundwater levels. If groundwater was within 4 feet of the proposed basin invert, then the basin was to be removed from further consideration. If there is a reliable indication that groundwater is at a depth of 10 feet (3 meters) or greater below the proposed invert, then in-hole hydraulic conductivity testing (detailed investigations) would proceed. If there was not a reliable indication that the seasonal high groundwater was below 10 feet (3 meters) of the proposed basin invert,

then a more detailed groundwater investigation is required. A more detailed investigation was to have at least two monitoring wells installed at the site and monitored over a wet and dry season. If the wet season produces rainfall below 80% of a normal year, then an additional year of monitoring is required.

The steps taken to develop an understanding of the seasonal groundwater levels are provided below:

- Conduct groundwater monitoring of on-site wells
- Compare annual rainfall to yearly rainfall averages
- Generate hydrographs from water production wells in vicinity of potential IFB site.

The data from these activities were then compared to the historic high groundwater levels that were compiled during the preliminary site selection studies and groundwater data from previous investigations in order to develop an understanding of seasonal groundwater conditions at each site.

4.3.1 Monthly Groundwater Level Monitoring

Indications of groundwater were recorded at the time of drilling and each well was sounded with a water level meter at least 24-hours after drilling. Once a well was installed, monitoring was performed on a monthly basis. If wells were observed to be consistently dry, the monitoring schedule was adjusted to sound the well at least every two months. Sounding of the wells was done with a Slope Indicator electronic well sounder. A permanent mark was placed on well casings as a reference point to record future measurements.

4.3.2 Review of Historic Rainfall Records

In order to establish if the rainfall during the period of monitoring was within 20% of normal, average rainfall records for the Los Angeles area were obtained from the National Oceanic and Atmospheric Administration (NOAA). These data were compared to recorded rainfall on a month-to-month basis throughout the monitoring period.

4.3.3 Hydrographs from Water Wells Near Potential IFB Sites

In addition, groundwater levels records obtained from the U.S. Geological Survey (USGS), CDMG, and LACDPW from groundwater production wells located within an approximate 1-mile radius of each site was completed for Priority 3 (SR-71), Priority 4 (I-710), and Priority 5 (I-405) corridors. Hydrographs of the groundwater levels were compiled for the last 20 years from the five closest groundwater wells. Hydrographs are presented in Appendix D (Priority 3), Appendix E (Priority 4), and Appendix F (Priority 5).

5.0 DETAILED SITE INVESTIGATION METHODOLOGY

Potential IFB sites that met the criteria of the Preliminary Site Selection, and Secondary Site Screening considerations cited in the Recommended Site Evaluation Procedure in Exhibit A of the Stipulation were recommended for detailed site investigations. Detailed site investigations were completed for sites from both Phase I and Phase II selected corridors. The detailed investigation consisted of installing in-hole hydraulic conductivity test wells and testing the hydraulic conductivity of the various soil layers at a given site according to the U.S. Bureau of Reclamation (USBR) 7300-89 or Bouwer-Rice slug test procedures. The latter method was to be used if groundwater was encountered in the test boring. However, groundwater was not encountered in any of the test wells. Therefore, all in-hole conductivity tests were conducted according to the USBR 7300-89 test procedures.

5.1 IN-HOLE HYDRAULIC CONDUCTIVITY TEST SITE SELECTION

According to the Stipulation, a minimum of three in-hole hydraulic conductivity tests were required with two in the proposed basin and one downgradient of the proposed basin. The tests are designed to measure hydraulic conductivity of the soils within 3 meters of the proposed basin invert. However, during the siting study the limits of the basin area and invert depth were not well defined. As a result, the in-hole conductivity tests were conducted within the available open areas between freeways, ramps, and frontage roads, within Department right-of-way, and according to the setback criteria stated in Exhibit A of the Stipulation. It was assumed that basin inverts would not be greater than 10 feet (3 meters) below existing grade. The test wells were designed to characterize the hydraulic conductivity in the predominant soil types within the upper 10 feet (3 meters) of the existing ground surface, with emphasis on the coarser-grained soil layers encountered at a given site. A minimum of four in-hole conductivity tests were installed at each potential IFB site.

Test wells and locations were typically selected based on interpretations of the geologic cross-sections that were generated in the Secondary Site Screening process. However, at some sites the locations of the test wells were selected based on field classification and interpretations of soil stratigraphy in the field during Secondary Site Screening investigation drilling.

Additional in-hole tests were performed at select potential IFB sites in order to better define the extent of soils with hydraulic conductivities that met the criterion of Exhibit A of the Stipulation.

All test holes were drilled, sampled and logged according to the procedures outlined in Section 4.2.1, Drilling and Sampling, and the data were incorporated into the respective geologic cross-sections that are presented in Appendices D through G for Priorities 3 through 7, respectively.

5.2 IN-HOLE HYDRAULIC CONDUCTIVITY TEST PROCEDURES

In–hole hydraulic conductivity tests followed the procedures of USBR 7300-89. In–hole hydraulic conductivity test wells were drilled with 6- to 8- inch (15- to 20-centimeter) diameter augers to depths ranging from 2 to 10 feet (0.6 to 3 meters) bgs. The boreholes were backfilled with coarse aquarium sand

through the augers from the bottom of the hole to the top of the selected test section. A 4-inch (10 cm) blank polyvinyl chloride (PVC) casing was placed on top of the sand and approximately 6-inches to 1-foot of additional sand was added around this pipe. The remainder of the annular space was backfilled with native material and sealed at the surface with hydrated bentonite chips. A diaphragm float valve connected to plastic tubing was lowered to approximately 6-inches (15.2 cm) above the top of sand/bottom of casing. The other end of the plastic tubing was attached to a 60-gallon reservoir. Water temperatures were measured down hole and within the reservoir. The water from the reservoir was allowed to gravity flow into the test well and the rate of flow was recorded for a minimum of 6 hours or until the flow rate stabilized.

6.0 PRIORITIES 1 AND 2 PRELIMINARY SITE SELECTION

6.1 PRIORITIES 1 AND 2 LITERATURE REVIEW

Characteristics of the surface and near surface conditions along the I-405, Priorities 1 and 2 (I-405) corridors are summarized on the Priorities 1 and 2 (I-405) Soil Distribution Map, Figure 3, and the Priorities 1 and 2 (I-405) Geologic Map, Figure 4. Figure 3 shows the aerial distribution of soil associations, which are a group of defined and described soils that are regularly geographically associated. The soil associations consist of a soil series and differ from other soil associations by having contrasting soil properties. The soil associations shown on Figure 3 were modified from the 1916 "USDA Soil Survey of the Los Angeles Area" soil survey map and from the 1969 "USDA Report and General Soil Map of Los Angeles County". As shown on Figure 3, three soil associations were mapped along the I-405 corridor. These include the Hanford Association, Pleasanton-Ojai Association, and the Chino Association. The soil characteristics of these soil associations are presented below.

Soil Association	Soil Type	Soil Hydrologic Group	Rate of Infiltration	Rate of Transmission
Hanford	Sandy loam	B	Moderate	Moderate
Pleasanton-Ojai	Sandy silt with clay	C	Slow	Very Slow
Chino	Clay loam Silt loam	C	Slow	Very Slow

(1) Information provided from USDA, Soil Survey Report and General Map (1969)

A description of Hydrologic Soil Groups is presented on Figure 2. All of these soils meet the criterion of Exhibit A of the Stipulation, although Group C soils are marginally acceptable, and have a high potential of having greater than 40% silt and clay content, and therefore could possibly fail the gradation criterion as provided in Exhibit A of the Stipulation.

As shown on Figure 3, the clayey loam and silty loam soils of the Chino Association are mapped in the southern portion of the I-405 study corridor. Logs of borings reviewed from this area indicate that fine-grained soils extend to approximately 15 to 30 feet (4.6 to 9.1 meters) bgs (Appendix B). This is reflected in the grouping of borehole sites with a low infiltration potential ranking (Figures 3 and 4). The Geologic map, Figure 4, depicts this area as alternating sequences of clay, silt, and very fine-to medium-grained sand within the upper 40 feet (12 meters) of the surface.

The sandy silt with clay soils of the Pleasanton-Ojai Association are mapped approximately 400 feet (122 meters) north of the Venice Boulevard undercrossing and extend for approximately 2,400 feet (730 meters) north along the corridor. The boring logs at the Palm Avenue undercrossing indicate that subsurface conditions in this area consist of interlayered silt, silty and clayey sand, silty sand, sand, and occasional gravel layers (Appendix B). This is consistent with the lithologies mapped as Quaternary

marine deposits by CDMG (1998a) and Castle (1960). Castle considered these deposits to be formational. There was no borehole data available to rank the subsurface conditions associated with the Pleasanton-Ojai Association.

The remaining area along the I-405, Priorities 1 and 2 corridors is mapped as artificial fill having a soil cover of sandy loam within the Hanford Association. The artificial fill appears to have been placed in association with the construction of I-405 and is typically present along stretches of freeway approaches to overcrossings (Figure 4). Logs of borings within the Hanford Association indicate that the subsurface consists primarily of sandy silt, silt, silty sand, and occasional gravel and clayey silt to clayey sand layers (Appendix B). Ranking of infiltration potential borehole data at sites located within the Hanford Association ranged between 1 and 3.

Contours of depth bgs of historically highest groundwater (CDMG 1998a,b) are shown on both Figures 3 and 4. The groundwater contours depict a northeast trending groundwater high in the southern portion of the corridor that corresponds with the location of the Chino Association soils in this area. Depth to groundwater from the bridge boring logs shows a similar trend in groundwater levels, with shallower groundwater recorded in the southern portion of the corridor. Typically, the depths to groundwater recorded in the borings are between 10 to greater than 25 feet (3 to 7.6 meters) lower than the historically high-recorded levels. This probably reflects a combination of groundwater withdrawal over the years and seasonal variations in groundwater levels.

Based on the literature review for the I-405, Priorities 1 and 2 corridors, the area south of Culver Boulevard within the Chino Association was eliminated from further consideration for potential IFB sites due to the fine-grained nature of the soils. The area within the mapped distribution of Pleasanton-Ojai Association appears marginally suitable for IFB sites due to the interlayers of fine-grained silty and clayey soils. The area with the highest potential for IFB sites is within the mapped area of the Hanford Association, particularly north of the Washington Boulevard undercrossing (Figure 3).

6.2 PRIORITIES 1 AND 2 - RESULTS OF FIELD OBSERVATION

Initially, no potential IFB sites were identified during the preliminary site selection process for Priorities 1 (I-405 northbound) and 2 (I-405 southbound). Field reconnaissance along these corridors established that the undeveloped land along the corridors were either located in topographically high areas (above freeway), along steep slopes (cutslopes and embankments), or they failed to meet the present setback criteria from bridge piers and other structures as described in the Site Evaluation Procedures. In addition, no potential sites were identified outside the Department's right-of way along these corridors. However, during a re-evaluation of the corridors, one potential site was identified at the Department's Westdale Maintenance Yard. Further review showed that the site was located on fill, and was eliminated from further consideration. Therefore, there were no potential IFB sites along the I-405, Priorities 1 and 2 corridors recommended for secondary site screening. Photographs documenting characteristics of the available land along these corridors, such as steep slopes and/or minimal to no setbacks from traveled ways and bridges, are presented in Appendix C. Drainage modifications and catchment areas were not reviewed.

7.0 PRIORITY 3 PRELIMINARY SITE SELECTION

7.1 RESULTS OF PRIORITY 3 LITERATURE REVIEW

Characteristics of the surface and near surface conditions along the SR-71, Priority 3 corridor are summarized on Figures 5 and 6. The soil associations shown on Figure 5 are from the 1969 "Report and General Soil Map of Los Angeles County." Five soil associations were mapped along the SR-71 corridor. The soil associations and their reported characteristics are presented in the following table.

Soil Association	Soil Type(s)	Soil Hydrologic Group	Rate of Infiltration	Rate of Transmission
Hanford	Sandy loam	B	Moderate	Moderate
Chino	Loam, Silt loam to clay loam	C	Slow	Very Slow
San Benito-Soper	Loam, sandy clay loam and clay	C	Slow	Very Slow
Diablo-Altamont	Clay	D	Very Slow	Very Slow
Altamont-Diablo	Clay	D	Very Slow	Very Slow

The primary difference between Diablo-Altamont and Altamont-Diablo Associations is the steepness of the slopes on which they are located. These two soil associations have a Hydrologic Soil Group D classification, which indicates very slow infiltration and transmission rates. Areas covered with soils of this Hydraulic Group classification fail to meet the criterion as stated in Exhibit A, Step 1 of the Recommended Site Evaluation Procedures. The Hanford, Chino, and the San Benito-Soper Association soils meet the criterion of Exhibit A, although locally Group C soils could have a potential of having greater than 40% silt and clay content, and therefore could possibly fail the gradation criterion stated in Exhibit A.

The Chino Association soils are mapped over the majority of the SR-71 corridor. Review of logs from borings that were completed within this soil association indicate that soils types vary along the corridor, with predominantly silty clay soils in the south, to sandy silt to silty sand progressively to the north (Appendix B). This pattern of increasing coarseness from south to north is clearly depicted on Figure 6. Bedrock consisting of Cretaceous granitic rock and Miocene siltstone and claystone of the Puente Formation are exposed at the surface along portions of SR-71 south of Phillips Road as shown on Figure 6. Sediments comprised predominantly of clay are shown flanking these bedrock exposures and covering the southern portion of SR-71. The location of these clay dominated surface sediments indicates that they were eroded from the adjacent siltstone and claystone bedrock highs. Depth to bedrock in borings south of Phillips Road is within 25 feet (7.6 meters) of the surface, and is typically within 13 feet (4.0 meters) of the surface. Fill or clayey soil overlies the bedrock in this area (Appendix B).

To the north of Phillips Road along SR-71, the pattern of surface sediments is interpreted to be the result of recent alluvial processes, with sandy sediments concentrated along the San Jose Flood Control

Channel. These sandy sediments are flanked by progressively finer sediments, consisting of silt and clayey silt, with increasing distance away from the channel as shown on Figure 5. The sandy alluvial sediments mapped along the San Jose Flood Control Channel are interpreted to be the Hanford Association soils, as shown on Figure 5.

Based on the literature review, the areas with the highest potential for IFB sites correspond with the distribution of the Hanford soil association. An exception to this correlation is in the area between I-10 and the San Jose Flood Control Channel along the SR-71 corridor. In this area, the Diablo-Altamont Association (Hydrologic Group D soils) has been mapped (Figure 5). However, based on the boring data in this area, the infiltration potential is considered to be favorable, as shown by the Number 4 ranking of exploration sites at Ridgeway Street Undercrossing (formerly Rosecrans Street), and the San Jose FC Channel Bridge (Figure 5 and Appendix B). This indicates that the surface soils were either removed subsequent to the original soil survey mapping, or the original mapped soil contact requires slight modification based on the additional data now available. The geologic map (Figure 6) is consistent with the boring data in this area.

Contours of depths to historically highest groundwater contours (CDMG 1998c) are shown on both Figures 5 and 6. The groundwater contours and the depth to groundwater observed in the borings north of Phillips Road indicate that groundwater levels are greater than 25 feet (7.6 meters) bgs. South of Phillips Road groundwater contours indicate historically high groundwater levels between 15 and 30 feet (4.6 meters and 9.1 meters) bgs. However, groundwater was observed as shallow as 3 feet (0.9 meters) bgs in one boring at Rio Ranch Road/Philadelphia Street overpass (Figure 5).

Based on the literature review for the SR-71, Priority 3 corridor, the area south of Phillips Road was considered to have a relatively low potential for development of IFB sites due to the fine-grained nature of the soil, shallow depths to bedrock, and mapped bedrock exposures. The area north of Phillips Road within the mapped distribution of Chino Association has moderate potential for IFB sites. The area with the highest potential for IFB development is north of the Southern Pacific Railroad overpass and south of I-10.

7.2 RESULTS OF PRIORITY 3 FIELD OBSERVATIONS

Nine potential sites were initially identified during the field reconnaissance along the SR-71, Priority 3 corridor. The locations of these sites are shown of Figure 7. The conditions of these sites and their status in the Preliminary Selection Process are summarized in Table 1. All potential sites that satisfied the geometric criteria, as cited in Exhibit A of the Stipulation, were considered and detailed reconnaissance of the site was completed.

During the field reconnaissance, the mapped USDA surface soils and geologic contacts were confirmed, and shallow bedrock was indicated at sites south of Phillips Road from siltstone and claystone rock fragments in gopher hole soil mounds.

Three private property sites adjacent to the Department's right-of-way were identified during the field reconnaissance. Two of these sites are at Mission Road in the parking lots of the former General

Dynamics and Convair plants as shown on Figure 7 (Sites 71S-7 and 71N-2). Sites outside the Department's right-of-way were not evaluated, as agreed upon between the Department and the Plaintiff's consultant. However, the sites are noted as potential IFB locations. Additionally, an open area belonging to the City of Pomona north of the existing Auto Center Drive was identified as shown on Figure 7 as site 71N-3. This site is currently under construction and was not given further consideration as a possible IFB site. The potential of these sites was evaluated upon completion of preliminary site selection studies and secondary and detailed investigations that were subsequently conducted in their vicinity. The potential of these sites is discussed in more detail in Section 14.4.

7.3 RESULTS OF FINAL REVIEW AND EVALUATION

After further evaluation, four of the nine potential sites within the Department's right-of-way were eliminated because of either unfavorable soil/shallow bedrock conditions or they were located on fill. These sites are identified on Figure 7. The five remaining sites were further evaluated by checking for proximity to groundwater wells, feasibility of the site regarding water quality capture, and configuring the required drainage modifications. These sites are also identified on Figure 7 as sites recommended for Secondary Site Screening evaluation. Site maps and photographs for each potential IFB site identified are included in Appendix D.

Upon review of the USGS, California Department of Water Resource (CDWR), LACDPW, and City of Pomona, Department of Engineering Records, no groundwater wells were identified as being within a 100-foot (30-meter) radius of any of the sites recommended for Secondary Site Screening.

7.4 RESULTS OF PRIORITY 3 DRAINAGE MODIFICATIONS REVIEW

Out of the five sites recommended for secondary screening, three sites were investigated for required drainage modifications. The sites investigated include Sites 71S-2 (Ridgeway Street Bridge), 71S-3 (Valley Blvd Bridge) and 71S-4 (Pomona Blvd). Site 71S-5 (Phillips Road) was not investigated for drainage modifications because the freeway does not exist at this site. In addition, Site 71S-5 (Phillips Road) receives runoff from both the Phillips Ranch housing development as well as from the SR-71 roadway. An additional study would be required to determine the quantity of flow received from Phillips Ranch. Drainage modifications were evaluated for Site 71N-1 (Valley/Holt Blvd off ramp), however, subsequent information indicated that the site area would be covered by embankments from the proposed improvements for the SR-71 widening. In addition, the site had poor lithology, as determined from the secondary site screenings. Therefore, because the site was eliminated from further consideration, the drainage modifications are not presented in this report. Drainage modification requirements as well as catchment areas are summarized in the following paragraphs.

Drainage modifications were designated as "minor modifications" or "major modifications." Minor modifications include extensions of culverts from existing headwalls or drop inlets to potential IFBs. In addition, culvert extensions that must pass under existing ramp roadways are also considered minor modifications. Modifications requiring jacking culverts below freeway lanes are considered major modifications.

7.4.1 Site 71S-2 (Ridgeway Street Bridge)

Site 71S-2 is located adjacent to the Ridgeway Street bridge near Campus Drive as shown on Figures 7 and 8. The maximum available surface area for an IFB is approximately 7,340 square feet (682 m^2). Using an assumed infiltration rate of 1.0 inch (2.5 cm) per hour (multiplied by a safety factor of 0.5), the maximum available IFB water quality volume per Equation 1 of Exhibit A of the Stipulation is calculated as follows:

$V = Akt$

$= 7{,}340\ ft^2\ (682\ m^2) \times \{0.5 \times 1.0\ in/hr\ (2.5\ cm/hr)\} \times 48\ hr \div 12\ in/ft\ (100\ cm/m)$

$= 14{,}680\ ft^3\ (416\ m^3)$

The water quality volume to be treated is calculated using a water quality storm of 0.75 inches (1.9 cm) as recommended by the LARWQCB. The following table lists the runoff quantities from each catchment area as well as the cumulative runoff for multiple catchment areas[1]. The runoff quantities or water quality volumes are calculated using the following equation:

$Q = CiA$

Q = water quality flow units ft^3 (m^3)

i = the water quality design storm value of 0.75 inches (1.9 cm)

C = the runoff coefficient, assumed as 1.0

For Catchment Area A, the water quality volume is calculated as follows:

$= 1.0 \times 0.75$ inches (1.9 cm) $\div$ 12 in/ft (100 cm/m) $\times\ 67{,}360\ ft^2\ (6{,}258\ m^2)$

$= 4{,}210\ ft^3\ (119\ m^3)$

Drainage modifications required for each catchment area are also summarized on the following table.

[1] Note that the area of the basin itself is neglected.

Catchment Areas and Drainage Modifications for 71S-2 (Ridgeway Street Bridge)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
A	67,360 (6,258)	4,210 (119)	4,210 (119)	None required.
B	34,750 (3,228)	2,172 (62)	6,382 (181)	None required.
C	21,645 (2,011)	1,353 (38)	7,735 (219)	None required.
D	22,995 (2,136)	1,437 (41)	9,172 (260)	None required.
E, F	56,870 (5,283)	3,554 (101)	12,726 (360)	Extend new pipe to V-ditch. (minor)
G	32,075 (2,980)	2,005 (57)	14,731 (417)	Jack new pipe under freeway. (major)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 14,700-ft^3 (416 m^3). The total cumulative water quality volume requiring treatment is 12,726 ft^3 (360 m^3) for all minor modifications, and, 14,731-ft^3 (417 m^3) when including major modifications. Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume for all minor drainage modifications. Drainage modifications to the basin will include removing a v-ditch, constructing a new inlet, and constructing a new outlet at the 66-inch storm drain. The outlet construction is considered a major modification.

7.4.2 Site 71S-3 (Valley Blvd Bridge)

Site 71S-3 is located in the on-ramp loop from Valley Boulevard westbound to SR-71 southbound as shown on Figures 7 and 9. The maximum available area for an IFB is 21,075 square feet (1958 m^2). The maximum water quality volume available is 42,150 cubic feet (1194 m^3) at the assumed 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 71S-3 (Valley Blvd Bridge)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
H	37,350 (3,470)	2,334 (66)	2,334 (66)	Extend culvert. (minor)
I	9,170 (852)	573 (16)	2,908 (82)	Connect to DI and construct new pipe to IFB. (minor)
J	55,060 (5,115)	3,441 (97)	6,349 (180)	Construct new pipe to IFB and increase IFB outlet pipe size. (minor)
K	92,085 (8,555)	5,755 (163)	12,104 (343)	Jack new pipe under freeway to catchment J outlet. (major)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 42,150-ft^3 (1194 m^3). The total cumulative water quality volume requiring treatment is 12,104-ft^3 (343 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet. The outlet construction is considered to be a minor modification.

7.4.3 Site 71S-4 (Pomona Blvd)

Site 71S-4 is located in the ramp area for Pomona Boulevard to and from SR 71 southbound as shown on Figures 7 and 10. This section of limited access highway will be redesigned and modified for the new SR-71 freeway. As such, volumes and modifications shown here are for the existing roadway configuration, but will be revised under the final freeway design. The maximum available surface area for an IFB is 17,455 square feet (1622 m^2) with maximum water quality volume of 34,910 cubic feet (989 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 71S-4 (Pomona Blvd)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
L	32,360 (3,006)	2,023 (57)	2,023 (57)	Extend new pipe to IFB. (minor)
M	29,050 (2,699)	1,816 (51)	3,838 (109)	Construct new catch basin and pipe. (minor)
N	8,350 (776)	522 (15)	4,360 (123)	Construct new pipe under new freeway. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 34,910-ft^3 (989 m^3). The total cumulative water quality volume requiring treatment is 4,360-ft^3 (343 m^3). Therefore it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure and outlet pipe. The outlet construction is considered to be a minor modification.

7.4.4 Site 71S-5 (Phillips Road)

Site 71S-5 is located adjacent to the existing boulevard portion of SR-71 at the Phillips Road crossing. The location of the site is shown on Figure 7. A drainage plan for this site was not prepared since this portion of roadway will be completely redesigned for the new freeway. This site is presently being used as an infiltration basin for the Phillips Ranch development and receives a portion of runoff from SR-71. The overall surface area of the existing basin is 115,600 square feet (10,740 m^2). However, estimates of water quality capacity cannot be made until the quantity of the Phillips Ranch contribution is determined.

8.0 PRIORITY 4 PRELIMINARY SITE SELECTION

8.1 RESULTS OF PRIORITY 4 LITERATURE REVIEW

Characteristics of the surface and near surface conditions along Priority 4 (I-710) corridor are summarized on the Priority 4 (I-710) Composite Map, that contains a Soil Distribution Map, Figure 11A, a Geologic Map, Figure 11B, a subsurface boring data map with the depth to historic highest groundwater contours, Figure 11C, and a potential IFB site location map, Figure 11D. The soil associations shown on Figure 11a are from the 1969 "Report and General Soil Map of Los Angeles County." As shown on Figure 11A, six soil associations were mapped along the I-710 corridor. The soil associations and characteristic soils are presented in the following table.

Soil Association	Soil Type(s)	Soil Hydrologic Group	Rate of Infiltration	Rate of Transmission
Hanford	Sandy loam Fine sand loam	B	Moderate	Moderate
Tujunga-Soboba	Sand	A	High	High
Romona-Placentia	Loam, sandy clay loam, and clay	C	Slow	Very Slow
Diablo-Altamont	Clay, clay loam	D	Very Slow	Very Slow
Altamont-Diablo	Clay, clay loam	D	Very Slow	Very Slow
Yolo	Loam, clay loam	B	Moderate	Moderate

The primary difference between Diablo-Altamont and Altamont-Diablo Associations is the steepness of the slopes on which they are located. These two soil associations have a Hydrologic Soil Group D classification. Areas covered with soils of this Hydraulic Group classification fail to meet the criterion as stated in Exhibit A, Step 1 of the Recommended Site Evaluation Procedures. The Romona-Placentia Association soils have soils with a Hydrologic Group C classification. Hydrologic Group C soils meet the criterion of Exhibit A of the Stipulation, although locally Group C soils could have a potential of having greater than 40% silt and clay content, and therefore could possibly fail the gradation criterion stated in Exhibit A. These three soils types are mapped north of the I-5/I-710 interchange and extend to the northern end of the Priority 4 (I-710) corridor (Figure 11a). This corresponds with older weakly consolidated alluvial deposits and bedrock outcrops of the Fernando and Puente formations that make up the Repetto Hills (Figure 11b). The combination of low permeability soils, shallow bedrock, and relatively steep topography limit the potential for any IFB sites in the area.

To the south of the I-5/I-710 interchange, the soils consist almost exclusively of the Hanford and Tujunga-Soboba Associations, which have Hydrologic Soil Group classifications of B and A, respectively. The Tujunga-Soboba and Hanford Associations consist of sands associated with the Los Angeles and Rio Hondo river deposits and surrounding flood plain (Figure 11A). These soils have moderate to high infiltration and transmission rates and indicate a potential for IFB locations. However,

depth to historically high groundwater along the southern (south of I-5) portion of the corridor shows shallow groundwater conditions, with depths ranging from 10 to 60 feet (3 to 18.3 meters) bgs, from the I-5/I-710 interchange to the Atlantic/Bandini interchange. South of Atlantic and Bandini the historic high groundwater is predominantly around 8 feet (2.4 meters) bgs.

Review of the borings from pervious geotechnical investigations along the Priority 4 (I-710) corridor shows that the subsurface deposits consists of a relatively fine-grained sequence of silty sands, silts and clays with zones of sand and some gravel.

Based on the literature review for Priority 4 (I-710), there is a low probability for finding a potential IFB site north of the I-5/I-710 interchange. To the south, there is potential for locating sand layers that have a potential for infiltration. However, historic high groundwater levels are shallow, especially south of the Atlantic/Bandini interchange.

8.2 RESULTS OF PRIORITY 4 FIELD OBSERVATIONS

Potential areas for IFB sites identified along Priority 4 (I-710) were categorized as either sites or sub-sites. Sites were identified at interchange areas, such as the Florence Avenue "cloverleaf" at I-710, which is identified as Site 710-3. Sub-sites were smaller areas within the interchange or "cloverleaf" were identified by the site number followed by a letter, such as 710-3a. The locations of these sites and sub-sites are shown on Figure 11D. Thirty-three potential IFB sites/sub-sites were identified within the Department's right-of-way (seven sites and 31 sub-sites). The conditions of these potential IFBs and their status in the Preliminary Selection Process are summarized in Table 2. Site maps and photographs for each potential IFB site identified are included in Appendix E. A detailed reconnaissance of the site was completed for potential sites that satisfied the geometric criteria, as cited in Exhibit A of the Stipulation.

Three private or public property sites adjacent to Department's right-of-way were identified during the field reconnaissance. One site is under private ownership adjacent to the I-710/Atlantic/Bandini interchange. The second site is a developed flood control basin at the I-710/Floral interchange and the third site is within the Flood Control District right-of-way adjacent to the Los Angeles River near the I-710/I-105 interchange. As agreed upon between the Department and the Plaintiff's consultant sites outside the Department's right-of-way were not evaluated. However, the sites are noted as potential IFB locations. The potential of these sites was evaluated upon completion of preliminary site selection studies and secondary and detailed investigations that were subsequently conducted in their vicinity. The potential of these sites is discussed in more detail in Section 14.4.

8.3 RESULTS OF PRIORITY 4 FINAL EVALUATION AND REVIEW

After further evaluation, one of the seven potential sites, 710-1 (710/10 interchange), was eliminated because of unfavorable soil conditions. A second site, 710-3 (Firestone Ave), was eliminated because of groundwater contamination due to a nearby fuel transfer facility. These sites are identified on Figure 11D. The five remaining sites were further evaluated for proximity to groundwater wells and to

determine the feasibility of the site concerning water quality capture and required drainage modifications. These sites are also identified on Figure 11D. The conditions of these sites are summarized in Table 2.

Upon review of the USGS, CDWR, LACDPW, and Cities of Commerce, Vernon, Bell, Bell Gardens, Southgate and Lynwood records, no groundwater wells were identified as being within 100 feet (30 meters) of any of the five remaining potential sites.

Exhibit A of the Stipulation requires that monitoring wells be established within proposed basins prior to the end of the wet season. Monitoring wells are generally installed as part of the Secondary Site Screening work tasks, however, in order to have the wells installed prior to the end of the wet season, it was decided to conduct secondary screening work tasks concurrently with preliminary site selection tasks. Full secondary screening was completed for sites with historically low groundwater, including 710-10 (Olympic Blvd) and 710-2 (Atlantic/Bandini). Partial secondary screening (installation of monitoring wells only) was completed at sites with historically high groundwater including 710-3 (Florence Ave), 710-5 (Imperial Hwy) and 710-6 (710/105 Interchange).

Upon completion of the secondary screening work, two additional sites were eliminated for unfavorable soil conditions. Site 710-5 (Olympic Blvd) was eliminated due to clay soil layers and Site 710-6 (710/105 Interchange) was eliminated due to clay fill and shallow groundwater conditions. Further preliminary site selection work on these sites was subsequently stopped.

8.4 RESULTS OF PRIORITY 4 DRAINAGE MODIFICATIONS

Three sites were investigated for required drainage modifications. The three sites include Sites 710-2 (Atlantic/Bandini), 710-3 (Florence Avenue), and 710-5 (Imperial Highway). Drainage modifications are designated as "minor modifications" or "major modifications." Minor modifications include extensions of culverts from existing headwalls or drop inlets to proposed IFBs. Also considered minor modifications were culvert extensions that must pass under existing ramp roadways. Modifications requiring jacking culverts below freeway lanes were considered major modifications. Drainage modifications requirements as well as catchment areas are summarized in the following paragraphs.

8.4.1 Site 710-2 (Atlantic/Bandini)

Site 710-2 consists of multiple sub-sites that are located within the various ramps in the Atlantic/Bandini interchange. The site layout is shown on Figure 12. The individual sub-basins are described in the following paragraphs.

8.4.1.1 Site 710-2a

Site 710-2a is located within the area of the on-ramp from Atlantic Boulevard westbound to I-710 southbound and is shown on Figure 13. The maximum available surface area for an IFB is approximately 28,507 square feet (2,648 m^2). Using an assumed infiltration rate of 1.0 inch (2.5 cm) per hour (multiplied by a safety factor of 0.5), the maximum available IFB water quality volume per Equation 1 of Exhibit A of the Stipulation is calculated as follows:

V = Akt

= 28,507 ft^2 (2648 m^2) x {0.5 x 1.0 in/hr (2.5 cm/hr)} x 48 hr ÷ 12 in/ft (100 cm/m)

= 57,014 ft^3 (1614 m^3)

The water quality volume to be treated is calculated using a water quality storm of 0.75 inches (1.9 cm) as recommended by the LARWQCB. The following table lists the runoff quantities from each catchment area as well as the cumulative runoff for multiple catchment areas. The runoff quantities, or water quality volume, are calculated using the following equation:

Q = CiA

Q = water quality volume ft^3 (m^3)

i = the water quality design storm value of 0.75 inches (1.9 cm)

C = the runoff coefficient, assumed as 1.0

For Catchment Area T, the water quality volume is calculated as follows:

= 1.0 x 0.75 inches (1.9 cm) ÷ 12 in/ft (100 cm/m) x 1 x 2,810 ft^2 (261 m^2)

= 176 ft^3 (5 m^3)

Drainage modifications required for each catchment area are also summarized in the following table.

Catchment Areas and Drainage Modifications for 710-2a

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
C	21,570 (2,004)	1,348 (38)	1,348 (38)	Jack new pipe under freeway. (major)
D	19,580 (1,819)	1,224 (35)	2,572 (73)	Jack new pipe under freeway. (major)
R	1,530 (1,42)	96 (3)	2,668 (76)	Construct new inlet. (minor)
S	7,940 (738)	496 (14)	3,164 (90)	Construct new inlet. (minor)
T	2,810 (261)	176 (5)	3,339 (95)	Construct new inlet. (minor)
U	5,230 (486)	327 (9)	3,666 (104)	Construct new inlet. (minor)
V	6,540 (608)	409 (12)	4,075 (115)	Construct new inlet. (minor)
W	6,105 (567)	382 (11)	4,457 (126)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 57,014ft^3 (1614 m^3). The total cumulative water quality volume requiring treatment is 4,457-ft^3 (126 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

8.4.1.2 Site 710-2b

Site 710-2b is located within the area of the on-ramp from Atlantic Boulevard eastbound to I-710 southbound and is shown on Figure 14. An existing 12-foot wide x 6-foot deep box culvert bisects the site into Site 710-2b-1 (west side) and Site 710-2b-2 (east side). The maximum available surface area for an IFB at Site 710-2b-1 and Site 710-2b-2 is 18,242 square feet (1,695 m^2) and 12,141 square feet (1,128 m^2), respectively. The maximum water quality volume available, at the assumed 1.0 inch (2.5 cm) per hour infiltration rate, is 36,484 cubic feet (1,033 m^3) for Site 710-2b-1 and 24,282 cubic feet (688 m^3) for Site 710-2b-2. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-2b

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
A	28,615 (2,654)	1,788 (51)	1,788 (51)	Jack new pipe under freeway. (major)
B	29,560 (2,747)	1,848 (52)	3,636 (103)	Jack new pipe under freeway. (major)
X	2,660 (247)	166 (5)	3,802 (108)	Jack new pipe under freeway. (major)
Y	9,470 (880)	592 (17)	4,394 (124)	Construct new inlet. (minor)
Z	8,710 (809)	544 (15)	4,938 (140)	Construct new inlet. (minor)
AA	22,870 (2,125)	1,429 (40)	6,368 (180)	Construct new inlet. (minor)
AB	24,100 (2,239)	1,506 (43)	7,874 (223)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 60,766 ft^3 (1,721 m^3). The total cumulative water quality volume requiring treatment is 7,874-ft^3 (223 m^3). Therefore it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

8.4.1.3 Site 710-2c

Site 710-2c is located in the off-ramp area from I-710 northbound to Bandini Boulevard westbound and is shown on Figure 15. The maximum available surface area for an IFB is 62,248 square feet (5,783 m^2) with a maximum water quality volume of 124,496 cubic feet (3,525 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-2c

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
E	33,370 (3,100)	2,086 (59)	2,086 (59)	Construct new inlet. (minor)
F	40,770 (3,788)	2,548 (72)	4,634 (131)	Construct new inlet. (minor)
G	24,845 (2,308)	1,553 (44)	6,187 (175)	Jack new pipe under freeway. (major)
H	13,108 (1,218)	819 (23)	7,006 (198)	Construct new inlet. (minor)
I	22,770 (2,115)	1,423 (40)	8,429 (239)	Construct new inlet. (minor)
J	27,005 (2,509)	1,688 (48)	10,117 (287)	Construct new inlet. (minor)
K	5,222 (485)	326 (9)	10,443 (296)	Construct new inlet. (minor)
L	4,550 (423)	284 (8)	10,728 (304)	Construct new inlet. (minor)
M	4,320 (401)	270 (8)	10,998 (312)	Construct new inlet. (minor)
N	3,280 (305)	205 (6)	11,203 (317)	Construct new inlet. (minor)
O	9,060 (842)	566 (16)	11,769 (333)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 124,496 ft^3 (3,525 m^3). The total cumulative water quality volume requiring treatment is 11,769-ft^3 (333 m^3). Therefore it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

8.4.1.4 Site 710-2d

Site 710-2d is located in the off-ramp area from I-710 southbound to Bandini Boulevard and is shown on Figure 16. The maximum available surface area for an IFB is 10,460 square feet (972 m^2) with maximum water quality volume of 20,920 cubic feet (592 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-2d

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
P	6,675 (620)	417 (12)	417 (12)	Construct new inlet. (minor)
Q	4,730 (439)	296 (8)	713 (20)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 20,920ft^3 (592 m^3). The total cumulative water quality volume requiring treatment is 713-ft^3 (20 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

8.4.1.5 Site 710-2e

Site 710-2e is a site that will be developed as part of future roadway improvements. Proposed improvements at the Atlantic/Bandini interchange include a new on-ramp from Atlantic Boulevard eastbound to I-710 northbound. Site 710-2e is located within the new on-ramp area and would receive runoff from the new ramp facilities. Site 710-2e is shown on Figure 17. The maximum available surface area for an IFB is 26,670 square feet (2478 m^2) with a maximum water quality volume of 53,340 cubic feet (1510 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-2e

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
AC	48,450 (4,501)	3,028 (86)	3,028 (86)	-- --

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 53,340 ft^3 (1,510 m^3). The total cumulative water quality volume requiring treatment is 3,028-ft^3 (86 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage would be incorporated in the design of the new on-ramp.

8.4.2 Site 710-3 (Florence Avenue)

The I-710 freeway in the vicinity of the Florence Avenue interchange as well as the majority of ramp facilities are located below the surrounding grade. All runoff and drainage for this site are pumped to the Los Angeles River by the existing Florence Avenue pumping station. The 710-3 site layout is shown on Figure 18. In order to implement an IFB at this site, pumping would be required from a collection point at the freeway to the proposed infiltration basin. Ordinarily, the requirement for pumping would

disqualify a potential site. However, the opportunity exists at this site that an additional pump could be installed at the existing pumping station to pump runoff from the existing wet well to the proposed IFB. The additional pump would be sized for the water quality flow and would operate until the water quality volume is satisfied. The advantage to this concept is that water quality volume from the entire interchange area can be pumped to the IFB. Additional stormwater in excess of the water quality volume would be pumped to the river by the existing pumps.

A single IFB is proposed within the off-ramp from I-710 southbound to Florence Avenue eastbound. The maximum available surface area for an IFB is 29,305 square feet (2,723 m^2) with maximum water quality volume of 58,610 cubic feet (1,660 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-3

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
A	15,560 (1,446)	973 (28)	973 (28)	None required.
B	5,817 (540)	364 (10)	1,336 (38)	None required.
C	4,145 (385)	259 (7)	1,595 (45)	None required.
D	4,321 (401)	270 (8)	1,865 (53)	None required.
E	9,956 (925)	622 (18)	2,487 (70)	Construct diversion structure and pipe to IFB. (minor)
F	5,193 (482)	325 (9)	2,812 (80)	None required.
G	14,003 (1,301)	875 (25)	3,687 (104)	Construct new pump in existing pump station (minor)
H	4,104 (381)	257 (7)	3,944 (112)	Construct diversion structure and pipe to IFB. (minor)
I	16,653 (1,547)	1,041 (29)	4,985 (141)	None required.
J	7,411 (689)	463 (13)	5,448 (154)	Construct new pump in existing pump station (minor)
K	24,733 (2,298)	1,546 (44)	6,994 (198)	Construct new pump in existing pump station (minor)
L	19,200 (1,784)	1,200 (34)	8,194 (232)	Construct new pump in existing pump station (minor)
M	10,222 (950)	639 (18)	8,832 (250)	Construct new pump in existing pump station (minor)
N	26,385 (2,451)	1,649 (47)	10,481 (297)	Construct new pump in existing pump station (minor)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
O	19,170 (1,781)	1,198 (34)	11,680 (331)	Construct new pump in existing pump station (minor)
P	26,302 (2,444)	1,644 (47)	13,323 (377)	Construct new pump in existing pump station (minor)
Q	5,777 (537)	361 (10)	13,685 (388)	Construct new pump in existing pump station (minor)
R	6,599 (613)	412 (12)	14,097 (399)	Construct new pump in existing pump station (minor)
S	6,230 (579)	389 (11)	14,486 (410)	Construct new pump in existing pump station (minor)
T	5,621 (522)	351 (10)	14,838 (420)	Construct new pump in existing pump station (minor)
U	30,049 (2,792)	1,878 (53)	16,716 (473)	Construct new pump in existing pump station (minor)
V	16,651 1,547	1,041 (29)	17,756 (503)	Construct new pump in existing pump station (minor)
W	25,159 2,337	1,572 (45)	19,329 (547)	Construct new pump in existing pump station (minor)
X	11,161 1,037	698 (20)	20,026 (567)	Construct new pump in existing pump station (minor)
Y	10,197 947	637 (18)	20,664 (585)	Construct new pump in existing pump station (minor)
Z	4,234 393	265 (7)	20,928 (593)	Construct new pump in existing pump station (minor)
AA	8,200 762	513 (15)	21,441 (607)	None Required
AB	17,228 1,601	1,077 (30)	22,518 (638)	None Required
AC	9,550 887	597 (17)	23,114 (655)	None Required
AD	8,718 810	545 (15)	23,659 (670)	None Required
AE	7,265 675	454 (13)	24,113 (683)	None Required
AF	4,654 432	291 (8)	24,404 (691)	None Required
AG	9,117 847	570 (16)	24,974 (707)	None Required
AH	5,022 467	314 (9)	25,288 (716)	Construct new pump in existing pump station (minor)
AI	7,954 739	497 (14)	25,785 (730)	Construct new pump in existing pump station (minor)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
AJ	15,000 1,394	938 (27)	26,723 (757)	Construct curb outlet and swale. (minor)
AK	12,688 1,179	793 (22)	27,516 (779)	Construct curb outlet and swale. (minor)
AL	4,082 379	255 (7)	27,771 (786)	Construct curb outlet and swale. (minor)
AM	19,002 1,765	1,188 (34)	28,958 (820)	None Required
AN	2,993 278	187 (5)	29,145 (825)	Construct new pump in existing pump station (minor)
AO	3,543 329	221 (6)	29,367 (832)	Construct new pump in existing pump station (minor)
AP	19,300 1,793	1,206 (34)	30,573 (866)	None Required
AQ	17,350 1,612	1,084 (31)	31,657 (896)	Construct new pump in existing pump station (minor)
AR	10,030 932	627 (18)	32,284 (914)	Construct new pump in existing pump station (minor)
AS	15,055 1,399	941 (27)	33,225 (941)	Construct new pump in existing pump station (minor)
AT	16,385 1,522	1,024 (29)	34,249 (970)	Construct new pump in existing pump station (minor)
AU	17,510 1,627	1,094 (31)	35,344 (1,001)	Construct new pump in existing pump station (minor)
AV	33,160 3,081	2,073 (59)	37,416 (1,060)	Construct new pump in existing pump station (minor)
AW	19,550 1,816	1,222 (35)	38,638 (1,094)	Construct new pump in existing pump station (minor)
AX	13,460 1,250	841 (24)	39,479 (1,118)	Construct diversion structure and pipe to IFB (minor)
AY	4,330 402	271 (8)	39,750 (1,126)	Construct new pump in existing pump station (minor)
AZ	16,060 1,492	1,004 (28)	40,754 (1,154)	Construct new pump in existing pump station (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 58,610 ft^3 (1,660 m^3). The total cumulative water quality volume requiring treatment is 40,754-ft^3 (1,154 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new inlet from the existing pumping station outlet structure. The construction is considered to be a minor modification.

8.4.3 Site 710-5 (Imperial Highway)

Site 710-5 consists of two sub-basins that are located within the ramps in the Imperial Highway interchange. The site location is shown on Figure 19. The individual sub-basins are described in the following paragraphs.

8.4.3.1 Site 710-5e

Site 710-5e is located within the area of the on-ramp from Imperial Highway eastbound to I-710 northbound and is shown on Figure 20. The maximum available surface area for an IFB is 25,534 square feet (2,372 m^2) with a maximum water quality volume of 51,068 cubic feet (1,446 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 710-5e

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
A	12,020 (1,117)	751 (21)	751 (21)	Construct new inlet. (minor)
B	3,998 (371)	250 (7)	1,001 (28)	Construct new inlet. (minor)
C	2,600 (242)	163 (5)	1,164 (33)	Construct new inlet. (minor)
D	13,581 (1,262)	849 (24)	2,012 (57)	Construct new inlet. (minor)
E	13,301 (1,236)	831 (24)	2,844 (81)	Construct new inlet. (minor)
F	18,132 (1,685)	1,133 (32)	3,977 (113)	Construct new inlet. (minor)
G	17,963 (1,669)	1,123 (32)	5,100 (144)	Construct new inlet. (minor)
H	16,906 (1,571)	1,057 (30)	6,156 (174)	Construct new inlet. (minor)
I	11,471 (1,066)	717 (20)	6,873 (195)	Construct new inlet. (minor)
J	6,322 (587)	395 (11)	7,268 (206)	Construct new inlet. (minor)
K	4,500 (418)	281 (8)	7,550 (214)	Construct new inlet. (minor)
L	3,372 (313)	211 (6)	7,760 (220)	Construct new inlet. (minor)
N	18,068 (1,679)	1,129 (32)	8,890 (252)	Construct new inlet. (minor)
O	7,050 (655)	441 (12)	9,330 (264)	Construct new inlet. (minor)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
P	4,662 (433)	291 (8)	9,622 (272)	Construct new inlet. (minor)
Q	2,984 (277)	187 (5)	9,808 (278)	Construct new inlet. (minor)
R	14,145 (1,314)	884 (25)	10,692 (303)	Construct new inlet. (minor)
S	6,400 (595)	400 (11)	11,092 (314)	Construct new inlet. (minor)
T	4,300 (399)	269 (8)	11,361 (322)	Construct new inlet. (minor)
U	2,203 (205)	138 (4)	11,499 (326)	Construct new inlet. (minor)
V	1,373 128	86 (2)	11,584 (328)	Construct new inlet. (minor)
W	2,931 272	183 (5)	11,768 (333)	Construct new inlet. (minor)
AL	5,200 483	325 (9)	12,093 (342)	Construct new inlet. (minor)
AM	2,267 211	142 (4)	12,234 (346)	Construct new inlet. (minor)
AN	5,233 486	327 (9)	12,561 (356)	Construct new inlet. (minor)
AO	9,722 903	608 (17)	13,169 (373)	Construct new inlet. (minor)
AP	6,142 571	384 (11)	13,553 (384)	Construct new inlet. (minor)
AQ	8,804 818	550 (16)	14,103 (399)	Construct new inlet. (minor)
AR	7,100 660	444 (13)	14,547 (412)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 51,068 ft^3 (1,444 m^3). The total cumulative water quality volume requiring treatment is 14,547-ft^3 (412 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

8.4.3.2 Site 710-5f

Site 710-5f is located within the area of the off-ramp from I-710 northbound to Imperial Highway westbound. This site location is shown on Figure 21. The maximum available surface area for an IFB is 24,616 square feet (2,287 m^2) with a maximum water quality volume of 49,232 cubic feet (1,394 m^3) at 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage

modifications are summarized in the following table. Site 710-5f also includes an unknown component of off-site runoff from the City of South Gate. Additional study would be required to determine the quantity of flow received from the City of South Gate.

Catchment Areas and Drainage Modifications for IFB 710-5f

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
M	22,905 (2,128)	1,432 (41)	1,432 (41)	None required.
X	13,108 (1,218)	819 (23)	2,251 (64)	Construct new inlet. (minor)
Y	9,574 (889)	598 (17)	2,849 (81)	Construct new inlet. (minor)
Z	2,703 (251)	169 (5)	3,018 (85)	Construct new inlet. (minor)
AA	13,049 (1,212)	816 (23)	3,834 (109)	Construct new inlet. (minor)
AB	6,500 (604)	406 (12)	4,240 (120)	Construct new inlet. (minor)
AC	5,750 (534)	359 (10)	4,599 (130)	Construct new inlet. (minor)
AD	16,223 (1,507)	1,014 (29)	5,613 (159)	Construct new inlet. (minor)
AE	33,931 (3,152)	2,121 (60)	7,734 (219)	None required.
AF	36,163 (3,360)	2,260 (64)	9,994 (283)	Construct new inlet. (minor)
AG	29,008 (2,695)	1,813 (51)	11,807 (334)	Construct new inlet. (minor)
AH	40,051 (3,721)	2,503 (71)	14,310 (405)	Construct new inlet. (minor)
AI	6,498 (604)	406 (12)	14,716 (417)	Construct new inlet. (minor)
AJ	8,460 (786)	529 (15)	15,245 (432)	Construct new inlet. (minor)
AK	6,820 (634)	426 (12)	15,671 (444)	Construct new inlet. (minor)
AS	11,485 (1,067)	718 (20)	16,389 (464)	None required.
AT	4,145 (385)	259 (7)	16,648 (471)	None required.
AU	11,662 (1,083)	729 (21)	17,377 (492)	Construct new inlet. (minor)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
AV	12,603 (1,171)	788 (22)	18,165 (514)	Construct new inlet. (minor)
AW	8,055 748	503 (14)	18,668 (529)	Construct new inlet. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 49,232ft^3 (1,394 m^3). The total cumulative water quality volume requiring treatment is 18,668-ft^3 (529 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume. Drainage modifications to the basin will include the construction of a new outlet structure. The outlet construction is considered to be a minor modification.

9.0 PRIORITY 5 PRELIMINARY SITE SELECTION

9.1 RESULTS OF PRIORITY 5 LITERATURE REVIEW

Characteristics of the surface and near surface conditions along Priority 5 (I-405) corridor are summarized on the Priority 5 (I-405) Composite Map, which contains a Geologic Map, Figure 22a and a Soil Distribution Map, Figure 22b. As shown on Figure 22a, the northern half of I-405 corridor crosses bedrock exposures within the Santa Monica Mountains that consist of Upper Cretaceous to Miocene shales, sandstone, and conglomerate, and Jurassic metamorphic rock consisting predominantly of slate and phyllite. Quaternary alluvial deposits consisting of unconsolidated gravel, sand, silt and clay that flank the Santa Monica Mountains to the north and south underlie the remainder of the I-405 corridor. It was anticipated that there would be a low potential for IFB sites along the I-405 within the Santa Monica Mountains due to the steep topography and shallow bedrock, and that potential IFB sites would be restricted to areas within the Quaternary deposits. This was confirmed during a "drive-by" reconnaissance along the corridor that was conducted in tandem with the literature review of the corridor. During the "drive-by "reconnaissance it was also noted that there were no potential IFB sites observed north of the Santa Monica Mountains to the I-405/SR-101 interchange. Potential sites along this portion of the corridor were eliminated due to steep slopes and setback criteria.

Characteristics of the surface and near surface conditions along the I-405, Priority 5 corridor are summarized on Figures 22a and 22b. The soil associations shown on Figure 22a are from the 1969 "Report and General Soil Map of Los Angeles County." Four soil associations were mapped along the Priority 5 corridor. The soil associations and their reported characteristics are presented in the following table.

Soil Association	Soil Type	Soil Hydrologic Group	Rate of Infiltration	Rate of Transmission
Hanford	Sandy Loam	B	Moderate	Moderate
Pleasanton-Ojai	Sand Silt with Clay	C	Slow	Very Slow
Altamont-Diablo	Clay soils	D	Very Slow	Very Slow
Conejo [1]	Clay Loam, Loam	C	Slow	Very Slow

[1] Conejo Soil Association is located north of the Santa Monica Mountains in Figure 22b, in the portion of the freeway where no potential IFB sites were recognized.

The surface soils mapped along the I-405 corridor south of the Santa Monica Mountains include the Hanford and the Pleasanton-Ojai Associations (Figure 22b). Comparison of Figures 22a and 22b shows that the Pleasanton-Ojai soils directly correlate with the Older Quaternary alluvium, which consists of weakly consolidated gravel, sand, silt and clay. The Pleasanton-Ojai soils have been mapped adjacent to the I-405 corridor north of Site 405S-3 (Figure 22b). These soils have a Hydrologic Group C classification. Hydrologic Group C soils meet the criterion of Exhibit A of the Stipulation, although locally, Group C soils could have a potential of having greater than 40% silt and clay content, and therefore could possibly fail the gradation criterion stated in Exhibit A.

The Hanford association is the primary soil mapped along the I-405 corridor south of the Santa Monica Mountains and has a Hydrologic Group B classification. Comparison of Figures 22a and 22b shows that the Hanford soils directly correlate to younger alluvial deposits that are being shed from the Santa Monica Mountains. These deposits consist of unconsolidated gravel, sand, silt and clay. These soils represent the highest potential for IFB sites along the I-405 corridor.

The depth to historically high groundwater contours along the southern portion of the I-405 corridor (Figure 22a) indicates that historically high groundwater is generally between 20 and 40 feet (6.1 to 12.2 meters) bgs with historically high groundwater as shallow as 10 feet (3.0 meters) in isolated areas.

Based on the literature review for Priority 5 (I-405), the highest probability for finding a potential IFB site is south of the Santa Monica Mountains and north of the I-405/I-10 interchange. However, the potential decreases north of Santa Monica Boulevard in areas where the Pleasanton-Ojai soils are mapped along or adjacent to the corridor.

9.2 RESULTS OF PRIORITY 5 FIELD OBSERVATIONS

During the "drive-by "reconnaissance, four potential IFB sites were identified along the I-405 corridor between the I-10 and the Santa Monica Mountains. An additional site (405S-4) was identified during re-evaluation of the Priority 5 corridor. The locations of all five sites identified along the I-405, Priority 5 corridor are shown on Figures 22a and 22b. The conditions at the five sites and their status in the Preliminary Selection Process are summarized in Table 3. Sites 405S-1 (Wilshire Boulevard North) and 405S-2 (Wilshire Boulevard South) satisfied the geometric criteria, as cited in Exhibit A of the Stipulation, and a detailed reconnaissance of these sites was completed. Sites 405S-3 (Southbound I-405/north of Olympic Boulevard) and 405N-1 (Northbound I-405/north of Olympic Boulevard) were restricted by the geometric criteria. Theses sites are long and narrow and could not be utilized as an IFB, but could possibly be utilized as an infiltration trench site. These two sites were not further evaluated as part of this study. Site 405S-4 (I-10/I405 interchange) was originally considered to be to small an area for an IFB, however, a re-evaluation of the setback distances established that a small basin could be located at the site. The site or portions of the site may be covered with fill material based on the findings from the preliminary investigations, however, this needs to be confirmed by secondary site screening investigations. To date, only partial preliminary site investigations have been completed at the site, therefore the site is still considered a potential IFB, pending future completion of catchment area and drainage modification evaluations, and secondary and possibly detailed site investigations. Site maps and photographs for sites 405S-1 and 405S-2 are included in Appendix F.

9.3 RESULTS OF PRIORITY 5 FINAL REVIEW AND EVALUATION

Sites 405S-1 (Wilshire Boulevard North) and 405S-2 (Wilshire Boulevard South) were evaluated for proximity to groundwater wells. Review of the USGS, CDWR, and LACDPW records indicated that no groundwater wells were identified as being within 100 feet (30 meters) of the potential sites. The site were then evaluated for feasibility concerning water quality capture and required drainage modifications

9.4 RESULTS OF PRIORITY 5 DRAINAGE MODIFICATIONS REVIEW

Sites 405S-1 (Wilshire Boulevard North) and 405S-2 (Wilshire Boulevard South), were investigated for catchment water quality capture volumes and required drainage modifications. A detailed location map with the sites locations and associated freeway configurations is shown on Figure 23.

Drainage modifications were designated as "minor modifications" or "major modifications." Minor modifications include extensions of culverts from existing headwalls or drop inlets to proposed IFBs. Also considered minor modifications are culvert extensions that must pass under existing ramp roadways. Modifications requiring jacking culverts below freeway lanes were considered major modifications.

9.4.1 Site 405S-1 (Wilshire Boulevard North)

Site 405S-2 is located in the on-ramp loop from Wilshire Boulevard westbound to I-405 southbound and is shown on Figure 24. The maximum available surface area for an IFB is 29,305 square feet (2,723 m^2). The maximum water quality volume available is 58,610 cubic feet (1660 m^3) at the assumed 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 405S-1 (Wilshire Boulevard North)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
A	28,650 (2,662)	1,791 (51)	1,791 (51)	None required.
B	23,370 (2,171)	1,461 (41)	3,251 (92)	None required.
C	16,350 (1,519)	1,022 (29)	4,273 (121)	Construct new inlet. (minor)
D	6,750 (627)	422 (12)	4,695 (133)	Construct new inlet. (minor)
E	9,445 (877)	590 (17)	5,285 (150)	Construct new inlet. (minor)
F	15,320 (1,423)	958 (27)	6,243 (177)	Jack new pipe under freeway. (major)
G	13,230 (1,229)	827 (23)	7,070 (200)	Construct new inlet. (minor)
H	6,540 (608)	409 (12)	7,478 (212)	None required.
I	7,740 (719)	484 (14)	7,962 (225)	None required.
J	10,330 (960)	646 (18)	8,608 (244)	Construct new inlet. (minor)
V	52,900 (4,915)	3,306 (94)	11,914 (337)	Construct new inlet and berm. (minor)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 58,610 ft^3 (1,660 m^3). The total cumulative water quality volume requiring treatment is 11,914-ft^3 (337 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume.

9.4.2 Site 405S-2 (Wilshire Boulevard South)

Site 405S-2 is located in the off-ramp area from I-405 southbound to Wilshire Boulevard eastbound and is shown on Figure 25. The maximum available surface area for an IFB is 28,715 square feet (2,668 m^2). The maximum water quality volume available is 57,430 cubic feet (1,626 m^3) at the assumed 1.0 inch (2.5 cm) per hour infiltration rate. Runoff quantities for a 0.75 inch (1.9 cm) storm and drainage modifications are summarized in the following table.

Catchment Areas and Drainage Modifications for IFB 405S-2 (Wilshire Boulevard South)

Catchment Area	Area ft^2 (m^2)	Water Quality Volume ft^3 (m^3)	Cumulative Volume ft^3 (m^3)	Drainage Modifications
K	4,305 (400)	269 (8)	269 (8)	Construct new inlet. (minor)
L	7,725 (718)	483 (14)	752 (21)	Construct new inlet. (minor)
M	8,115 (754)	507 (14)	1,259 (36)	Construct new inlet. (minor)
N	4,095 (380)	256 (7)	1,515 (43)	Construct new inlet. (minor)
O	4,140 (385)	259 (7)	1,774 (50)	Construct new inlet. (minor)
P	4,335 (403)	271 (8)	2,045 (58)	Construct new inlet. (minor)
Q	1,835 (170)	115 (3)	2,159 (61)	Construct new inlet. (minor)
R	15,690 (1,458)	981 (28)	3,140 (89)	Construct new inlet. (minor)
S	10,440 (970)	653 (18)	3,793 (107)	Construct new inlet. (minor)
T	11,950 (1,110)	747 (21)	4,539 (129)	Construct new inlet. (minor)
U	12,570 (1,168)	786 (22)	5,325 (151)	Jack new pipe under freeway. (major)
W	33,470 3,109	2,092 (59)	7,417 (210)	Jack new pipe under freeway. (major)

The calculated maximum available water quality volume that can be treated by the potential IFB is approximately 57,430ft^3 (1,626 m^3). The total cumulative water quality volume requiring treatment is 7,417-ft^3 (210 m^3). Therefore, it is concluded that the basin has sufficient capacity to handle the required water quality volume.

10.0 PRIORITIES 6 AND 7 PRELIMINARY SITE SELECTION

10.1 DISCUSSION OF PRIORITIES 6 AND 7 (I-5) SITE SELECTION STUDIES

The infiltration site selection process was modified for the Phase II - Priorities 6 (Orange/Los Angeles County border to I-605) and 7 (I-605 to I-710) along the I-5. These corridors were the lowest ranked priorities, and the last to be funded for investigation. The key factors involved with modifying the selection process included the following.

- Land availability associated with the proposed widening project along I-5
- Available time for investigation regarding the time frame of the Stipulation.

With the planned widening of I-5, future land availability for potential IFB sites was unknown. Land could be acquired by Department that is not currently available for investigation and land that is presently available may be required for freeway design. In addition to the land issue, there were just over two months remaining to complete the study by the Stipulation deadline of April 27, 2003.

Given these conditions, it was mutually agreed upon by the Department and the Plaintiff's consultant to evaluate the infiltration potential along the corridors by reaches, with the intent of defining potential areas where future-siting studies could focus. In essence, this is the same evaluation as applied to all the previous corridors during the preliminary site selection process. However, instead of conducting secondary and detailed investigations to characterize a specific site, the information from the secondary and detailed investigations would be used to characterize reaches. Completion of preliminary studies was to be concurrent with a combined secondary and detailed investigations. Environmental Site Assessment reports, drainage modifications, and evaluation of catchment areas were excluded from the preliminary portion of the study. Environmental screening of soils was excluded from the secondary portion of the study.

In order to evaluate the corridors in reaches, investigations were to be spaced along the length of the corridors, and not concentrated at a particular interchange with numerous sub-sites. Sites that were identified from a drive-by reconnaissance were compared to the Department's design drawings to see if there was any change between present and future land availability. Areas identified where land availability remained unchanged and currently meet setback criteria were preferentially investigated. However, no areas were to be excluded from the investigation based on future design plan usage. There were 22 sites, including sub-sites, which were identified along Priority 6 (Table 4) and 15 sites along Priority 7 (Table 5) that meet present day setback criteria, as defined in Exhibit A of the Stipulation. The majority of these sites would still be available or partially available when compared to current design plans. A screening of typical preliminary siting procedures, including review of soil and geologic maps and CDMG contour maps of depth to highest historical groundwater, were completed in order to rank the sites. Fourteen sites were originally selected for secondary investigations. All the sites were evaluated as a potential IFB sites.

Surface soils along Priority 6 consisted primarily of the Hanford Association and minor amounts of the Yolo Association at the Orange County Los Angeles County border, and the Chino Association near Imperial Highway (Figure 26B). Surface soils along Priority 7 consisted of the Hanford Association, Romona Association, Tujunga-Soboba Association, and the Chino Association. The Hanford Association is mapped between I-605 and the Rio Hondo River, and the Tujunga-Soboba is mapped along and immediately adjacent to the Rio Hondo River. North of the river is predominately the Romona-Placentia Association, with minor amounts of the Chino Association in the vicinity between Eastern Avenue and I-710 (Figure 27B).

Characteristics of the soil associations are presented in the following table:

Soil Association	Soil Type(s)	Soil Hydrologic Group	Rate of Infiltration	Rate of Transmission
Hanford	Sandy loam soils	B	Moderate	Moderate
Tujunga-Soboba	Sand	A	High	High
Romona	Loam, clay loam and clay	C	Slow	Very Slow
Chino	Loam and silt loam to clay loam	C	Slow	Very Slow
Yolo	Loam Silt Loam	B	Moderate	Moderate

As shown on the geologic maps for Priorities 6 and 7, Figures 26A and 27A, respectively, Quaternary alluvium consisting of unconsolidated floodplain deposits of silt, sand, and gravel are mapped along the entire length of Priority 6 and most of Priority 7. Older, alluvial deposits consisting of weakly consolidated silt, sand, and gravel are mapped north of the Rio Hondo River to the Washington Street undercrossing. These older alluvial deposits directly correlate with mapped distribution of the Romona soil association.

Depth to historic highest groundwater along Priority 6 (Figure 26C) shows historic groundwater highs ranged between 8 and 10 feet (2.4 and 3.0 meters) bgs along the corridor. Depth to historic highest groundwater along Priority 7 (Figure 27C) ranges between 10 and 70 feet (3.0 and 21.3 meters) bgs. In general, reported historic groundwater levels are progressively deeper from south to north along the Priority 7 corridor. The shallower areas with historic groundwater levels ranging between 10 and 20 feet (3.0 and 6.0 meters) are recorded along the San Gabriel and Rio Hondo Rivers and an area between the Garfield and Washington undercrossings. The deeper historic groundwater levels roughly coincide with the mapped distribution of Older alluvial deposits, reflecting the higher topographic elevations of the Older alluvial deposits as compared to the younger Quaternary floodplain deposits in the area.

Depth to groundwater observed during drilling from previous geotechnical investigations along both Priorities 6 and 7 are consistent with or slightly deeper than the CDMG depth to historic highest groundwater contours (Figures 26C and 27C).

Rating of conditions observed during geotechnical investigations previously completed along Priorities 6 and 7 indicate that areas with the highest potential for IFB sites along Priority 6 are north of the Alondra

Overcrossing to the Silver Bow Overcrossing, and from Orr and Day Overcrossing to the San Gabriel River (Figure 26C). The highest rated areas along Priority 7 are between the San Gabriel River and the Rio Hondo River (Figure 27C).

Based on the Preliminary Site Screening, the areas of highest potential for IFBs along Priority 6 would be within areas where the Hanford Association Type B soils are mapped. This is approximately from North Coyote Creek to Silver Bow Overcrossing, and from just south of Orr and Day Overcrossing to the San Gabriel River (Figure 26c,d). The area with the highest potential along Priority 7 is between the I-605 and the Rio Hondo River. This area is also within the Hanford Association with Type B soils. These are the same areas where sites with the highest potential were indicated from the previous geotechnical investigation site ratings. This combined area is within the Montebello Forebay. The Montebello Forebay has long been an important area for recharge to the Central Groundwater Basin in Los Angeles County.

North of the Rio Hondo River, surface soils consist of the Romona and Chino Associations. Both of these associations have Type C soils. The Romona Association is coincident with older alluvial deposits that are weakly consolidated. Type C soils and Older alluvium deposits have been found to have a low potential for IFB sites based on findings from preliminary, secondary, and detailed investigations completed on Priorities 1 through 5.

Overall, the area with the highest potential would be the northern portion of Priority 6, north of the area mapped as the Chino Association shown on Figure 26B, and the southern portion of Priority 7, south of the Rio Hondo River (Figure 27). This area is largely coincident with the San Gabriel and Rio Hondo Spreading Grounds.

11.0 SUMMARY OF PRELIMINARY SITE SELECTION STUDIES

A combined total of 84 potential IFB site locations were identified during the preliminary site selection studies for Phase I - Priorities 1, 2, and 3; and Phase II - Priorities 4, 5, 6, and 7. Of these, 26 sites were recommended for secondary site screening and 4 sites were recommended for partial secondary site screening. Two of the four sites recommended for partial secondary investigations were eventually recommended for full secondary site screening investigations, bringing the total number of sites recommended for secondary site screening to 28. One additional site was identified late in the study during a reevaluation of the Priority 5 corridor. As a result, this site (405S-4) only had partial preliminary investigations completed. At present it is considered as a potential IFB location pending additional preliminary and possibly secondary investigations. The site is only included in the tally of potential IFB sites identified, and was not counted as a site recommended for secondary investigation or as a site eliminated from further consideration.

There were 27 sites from the combined total of 84 sites, including 15 sites along Priority 6, and 12 sites along Priority 7 that were not recommended for secondary site screening. These sites were not recommended partially due to time constraints, but primarily because the original plan to characterize the infiltration potential along Priorities 6 and 7 was to identify segments or reaches of the corridors that had soils with infiltration potential versus evaluating all the individual sites recognized. It is estimated that 9 of these sites could be candidates for future secondary site investigations given present land availability. The remaining 18 sites, given present size and conditions, are not considered as potential IFB sites. The table below summarizes the preliminary site selection studies by priority and lists the number of sites identified, sites eliminated from further consideration, and sites recommended for secondary site screening. Details of the individual sites are summarized in Table 1 (Priority 3 sites), Table 2 (Priority 4 sites), Table 3 (Priority 5 sites), Table 4 (Priority 6 sites), and Table 5 (Priority 7 sites).

Summary Table of Preliminary Site Selection Study For Phase I and Phase II Priorities

Phase	Priority	Number of Potential IFB Sites Identified (1)	Potential IFB Sites Recommended for Partial Secondary Site Screening (1)	Potential IFB Sites Recommended for Secondary Site Screening (1)	Potential IFB Sites Eliminated From Further Consideration (2)
I	1	0	0	0	0
	2	0	0	0	0
	3	9	0	5	4
II	4	33	3	9	21
	5	5 (3)	0	2	2
	6	22	0	8	14
	7	15 (4)	1 (4)	2	12
Total		**84**	**4 (5)**	**26 (5)**	**53**

(1) Includes individual sites and sub-sites.

(2) Includes sites from Priorities 6 and 7 that were not recommended for secondary site screening, but are not necessarily eliminated as potential IFB sites.

(3) Site 405S-4 was identified during reevaluation of Priority 5. Only partial preliminary site selection studies were completed. Site is considered a potential IFB location pending additional studies. This site is included in potential IFB sites identified count totals only.

(4) A partial secondary site screening was conducted along Priority 7 at the Paramount Blvd/I-5 interchange for the purpose of collecting lithologic information along that reach of the corridor. The area drilled was not considered a potential IFB site and is not included in the site summary count.

(5) Secondary site screenings were subsequently completed on two Priority 4 sites that were originally recommended for partial secondary screening, bringing the total number secondary site screenings to 28 sites.

12.0 SECONDARY SITE SCREENING

A total of 26 sites were recommended for secondary site screening and four sites were recommended for partial secondary site screening based on the findings from the Preliminary Site Selection studies. Two of the sites on Priority 4, 710-3 (Florence Ave), and 710-5 (Imperial Hwy), that were originally recommended for partial secondary screening were subsequently recommended for full secondary screening, bringing the total number of sites that had full secondary investigations completed to 28 sites.

12.1 RESULTS OF SUBSURFACE CHARACTERIZATION

Secondary screening investigations were completed for Phase I - Priority 3 (SR-71), and Phase II - Priority 4 (I-710), Priority 5 (I-405), and Priorities 6 (I-5) and 7 (I-5).

The potential IFB sites were evaluated for soil types, soil stratigraphy, and depth to groundwater. In addition, Environmental Site Assessment reports were reviewed or generated (Appendices I through M), and environmental soil screening for soil contamination was conducted on Priority 4 (I-710) and Priority 5 (I-405) potential IFB sites (Appendix N).

In general, the soil types were predominantly fine-grained along each of the Priority corridors and consisted of a heterogeneous sequence of clays, silts, silty sands, clayey sands, and fine - to medium-grained poorly graded sands. Coarse-grained sands were rarely encountered and gravel deposits were identified only at Priority 5 Site 405S-1. The soil deposits were typically gradational resulting in a lateral and vertical varying stratigraphy. Restrictive layers consisting of silt, clay, and silty sands with greater than 40% fine content were developed to varying degrees at every site investigated. Sites that were recommended for detailed investigations had relatively continuous sand layers consisting of silty sands with fine contents typically less than 40% to poorly graded sands with less than 5% fines interlayered above and below the restrictive layers.

The information obtained from the secondary site screening investigations, including site location maps with boring and geologic cross-section locations, geologic cross-sections, boring logs, monitoring well construction diagrams, and geotechnical laboratory results are presented for each site and grouped by Priority in the following Appendices: Appendix D (Priority 3); Appendix E (Priority 4); Appendix F (Priority 5), Appendix G (Priority 6), and Appendix H (Priority 7).

12.1.1 Groundwater Monitoring

Groundwater levels were monitored at the potential IFB sites on a monthly basis and compared to historic groundwater levels in order to get an indication of seasonal high groundwater at the potential IFB sites. Groundwater monitoring was conducted from April 2002 to April 2003 for Priority 3 (SR-71), Priority 4 (I-710), and Priority 5 (I-405). The reported annual rainfall for the 2001/2002 wet season, October 2001 to April 2002, was one of the driest years on record and was well below 80% of the average annual rainfall according to the National Oceanic Atmospheric Administration (NOAA) database. However, the reported rainfall during the 2002/2003 wet season, October 2002 to April 2003 was approximately 82

percent of the average annual rainfall. Monthly groundwater levels are presented in Table 6. The following paragraphs describe the observed groundwater levels for each Priority.

Priority 3 (SR-71). As shown in Table 6, groundwater has not been observed in any of the Priority 3 (SR-71) wells to depths of 30 feet (9.1 meters) bgs since April 2002. This is consistent with the findings from the preliminary site selection study that showed that depth to historically high groundwater for potential IFB sites ranged between 30 and 40 feet (9.1 and 12.2 meters) bgs. Review of the LACDPW well data over the last 20 years indicates that regional groundwater ranges between 80 and 100 feet (24.4 and 30.4 meters) bgs in the area of the SR-71 sites. This information is considered a reliable indication that groundwater levels should not restrict infiltration at the identified potential IFB sites on Priority 3.

Priority 4 (I–710 sites). Groundwater or perched groundwater has been observed at three sites along Priority 4, 710-3d (Florence Ave), 710-5 (Imperial Hwy), and 710-6b (710/105 interchange). Groundwater was not observed in the monitoring well installed at potential IFB sites north of Florence on I-710 within depths ranging between 20 and 50 feet (6 to 15.2 meters) bgs.

Depth to historic groundwater in the vicinity of site 710-2 (Atlantic/Bandini) is reported to range between approximately 20 and 30 feet (6.1 and 9.1 meters) bgs. Groundwater has not been observed in wells completed at depths ranging between 15 and 50 feet (4.6 and 15.2 meters) bgs at this site. Regional groundwater depths based on the five closest wells in the USGS database located within a 1-mile radius of the site range from approximately 100 to 180 feet (30.4 to 54.9 meters) bgs over the last 20 years.

Depth to historic groundwater in the vicinity of site 710-3 (Florence Ave) has been reported to be approximately 8 feet (2.4 meters) bgs. Three wells have been completed to depths of 25, 50, and 90 feet (7.6, 15.2, 27.4 meters) bgs during the secondary screening. Perched groundwater has been observed at approximately 18 feet (5.2 meters) bgs in the southwest clover loop and the regional groundwater was measured at approximately 78 feet (23.8 meters) bgs. Groundwater has not been observed in the well completed to 50 feet (15.2 meters) bgs in the southeast clover loop. Similar depths to perched groundwater have been recorded at sites within ¼ mile (0.4 km) of site 710-3 as shown in Table 7. Regional groundwater depths based on the five closest wells in the USGS database located within a 1-mile (1.62 km) radius of the site range from approximately 60 to 120 feet (18.3 to 36.6 meters) bgs over the last 20 years.

The depth to historic groundwater in the vicinity of site 710-5 (Imperial Hwy) has been reported to be approximately 8 feet (2.4 meters) bgs. One well has been completed in the northeast clover loop (710-5f), as part of a partial secondary investigation, to an approximate depth of 39 feet (11.9 meters) bgs. Groundwater levels in this well have been recorded at approximately 23 to 25 feet (7 to 7.6 meters) bgs. A second well was completed in the southeast clover loop (710-5e) at 30 feet (9.1 meters) bgs. Groundwater levels in this well have been recorded at approximately 11 to 15 feet (3.4 to 4.6 meters) bgs. Depths to perched groundwater at nearby sites have been reported in the range of 20 to 30 feet (6.1 to 9.1 meters) bgs, and regional groundwater has been reported between 80 and 90 feet (24.4 and 27.4 meters) bgs. This suggests the groundwater levels observed in the well located in the northeast and southeast clover loops are probably perched. Regional groundwater depths based on the five closest wells in the

USGS data base located within a 1-mile (1.62 km) radius of the site range from approximately 65 to 115 feet (19.8 to 35.1 meters) bgs over the last 20 years.

Depth to historic groundwater in the vicinity of site 710-6 (710/105 interchange) is approximately 8 feet (2.4 meters) bgs. A well was not installed at this site, but water was encountered during drilling of a geotechnical boring at 22 feet bgs (6.7 meters) directly below a fill consisting of clay.

There is not a reliable indication that groundwater will be greater than 10 feet (3.0 meters) below a proposed invert in the area of 710-5 (Imperial Hwy) based on the presence of shallow perched groundwater. However, there is a reasonable indication that groundwater levels in the vicinity of 710-2 (Atlantic/Bandini) are sufficiently deep for a potential IFB site.

Priority 5 (I-405). The reported depth to historic groundwater in the vicinity of Sites 405S-1 and 405S-2 (Wilshire Blvd) has been reported to be approximately 30 to 40 feet (9.1 to 12.2 meters) bgs. Monitoring wells installed at these sites have been completed to depths of approximately 50 feet (15.2 meters) bgs and groundwater has not been observed to date in these wells. This information is considered a reliable indication that groundwater levels should not restrict infiltration at the identified potential IFB sites on Priority 5 (I-405).

Priority 6 (I-5). The reported depth to historic groundwater along Priority 6 ranges from 8 to 10 feet (2.4 to 3.0 meters) bgs. Groundwater has been measured in monitoring wells installed for this study at approximately 17 feet (5.2 meters) bgs at Site 5-2 (Alondra Blvd) located towards the southern end of Priority 6. Groundwater has not been measured in wells up to 30 feet (9.1 meters) depth installed at sites north of Alondra Blvd. However, these wells were just recently installed in late February and early March 2003. Additional monitoring is warranted along this corridor.

Priority 7 (I-5). The reported depth to historic groundwater along Priority 7 ranges from 10 to 20 feet (3.0 to 6.1 meters) bgs between I-605 and the Rio Hondo River. North of the Rio Hondo River to I-710 historic groundwater depths range between 20 and 70 feet (6.1 and 21.3 meters) bgs. Two wells were installed to 30 feet (9.1 meters) depth along this corridor in late February 2003, and groundwater has not been observed to date. Additional monitoring is warranted along this corridor.

12.1.2 Environmental Soil Analytical Results

Priority 4 (I-710) and Priority 5 (I-405) potential IFB sites were the only sites screened for potential soil contamination. The environmental soil samples collected from the I-710 and I-405 sites were analyzed for Title 22 metals (U.S. Environmental Protection Agency [EPA] Method 6010B), VOCs (EPA Method 8260B), and Total Petroleum Hydrocarbons (TPH) (EPA Method 8015M). The analytical results are summarized in Table 8 and analytical reports are included in Appendix N. The analytical results presented in Table 8 for levels of inorganic and organic constituents detected were presented to LARWQCB for their review. Constituents analyzed were below laboratory detection limits or below regulatory action levels.

12.2 COMPLIANCE WITH LARWQCB

As part of the secondary site screening and prior to conducting any detailed investigations, the Department requested that the LARWQCB review information and identify any concerns or conditions of approval regarding potential IFB site locations that were recommended for detailed site investigations from Phase I - Priority 3, and Phase II - Priority 4 (I-710) and Priority 5 (I-405). Twelve potential IFB site locations were presented to the LARWQCB for their review. As stated in Section 4.1.2, the LARWQCB review of site locations was focused on sites known to be contaminated, particularly LUST sites in the vicinity of the potential IFB sites, and the location of the potential basin sites with regard to vulnerable aquifer areas. Based on these criteria the LARWQCB either approved or conditionally approved 11 of the 12 potential IFB sites. Of the 12 IFB sites identified, none of the subject sites are listed on the most recent federal, state, and local lists of registered and contaminated sites, or as sites using hazardous substances. However, several LUST sites had been identified in the vicinity of the potential IFB sites located along the I-710 corridor. In particular, the LARWQCB was concerned with Sites 710-2a, b, c, d, e (710/Atlantic-Bandini), and Site 710-3 (710/Florence Ave). The LARWQCB had no comments or concerns regarding Site 710-5 (710/Imperial Highway Interchange). However, several sites were identified as potential groundwater contamination sources in the ISA report for Site 710-5 (710/Imperial Highway Interchange). This site was subsequently included as conditionally approved. The original approval status of the 12 sites are presented below.

Site Identification	Location Description	LARWQCB July 2002 Approval Status
71S-2	71/Ridgway and Campus	Conditionally Approved
71S-3	71/Valley Blvd	Conditionally Approved
71S-4	71/Pomona Blvd	Conditionally Approved
710-2a	710/Atlantic-Bandini Interchange	Conditionally Approved
710-2b	710/Atlantic-Bandini Interchange	Conditionally Approved
710-2c	710/Atlantic-Bandini Interchange	Conditionally Approved
710-2d	710/Atlantic-Bandini Interchange	Conditionally Approved
710-2e	710/Atlantic-Bandini Interchange	Conditionally Approved
710-3	710/Florence Interchange	Conditionally Approved
710-5	710/Imperial Hwy Interchange	Conditionally Approved
405S-1	405/Wilshire Interchange	Approved
405S-2 (1)	405/Wilshire Interchange	Approved

(1) Upon re-evaluation of soil stratigraphy, Site 405S-2 was eliminated as a potential IFB site for detailed investigation.

Based on conversations with the LARWQCB, it was the understanding of the Department that because this is a site selection study, the Department could proceed with detailed investigations at their discretion for the above-listed sites. However, the LARWQCB requested that the Department review available databases and local lead agencies in order to evaluate potential off-site groundwater contamination sources for the conditionally approved sites. The following paragraphs summarize the LARWQCB comments.

I-405 Sites: The LARWQCB had no concerns or conditions of approval for the potential IFB sites located at the I-405/ Wilshire Interchange, Sites 405S-1 and 405S-2.

SR-71 Sites: The three sites identified along the SR-71, Sites 71S-2 (Ridgeway Street), 71S-3 (Valley Blvd), and 71S-4 (Pomona Blvd), are all located above a vulnerable aquifer. The LARWQCB condition of approval for sites located above a vulnerable aquifer is that at least 10 feet (3.0 meters) of separation should exist between the invert of the potential IFB and depth to historically highest groundwater. There were no conditions of approval stated by the LARWQCB concerning known contamination sites in the vicinity of the SR-71 potential basin sites. As stated in Section 12.2.1, groundwater levels have been historically greater than 30 bgs in the area of the sites. Upon further review, the LARWQCB approved all three of the Priority 3 (SR-71) sites.

710-2 (710/Atlantic-Bandini). The LARWQCB identified four LUST sites from their Geotracker database in the vicinity of Sites 710-2a, b, c, d, e (710/Atlantic-Bandini) that were of potential concern. These sites were also identified in the ISA report completed by URS, and include the United States Government (U.S. Postal Service Transfer Station), DeWitt Trans Storage, U.S. Army Reserve Center (Gen. Geo. S, Patton Jr.), and Watkins Motor Lines. According to the federal and state databases that were checked, including the LARWQCB Geotracker database, the contamination at all four of these sites was restricted to the soil and the source tanks have been removed. However, the U.S. Postal Service Transfer Station and Watkins Motor Lines still have non-leaking tanks in operation and are under regulatory review. The results of the agency reviews for Site 710-2 (710/Atlantic-Bandini) are presented in Table 9. The locations of LUST sites in relation to Site 710-2 are shown on Figure 28.

710-3 (710/Florence Ave). The LARWQCB expressed concern about two LUST sites, Circle K #7900 and the City of Bell Gardens, identified within a ¼ mile (0.4 km) of the 710-3 (710/Florence Ave.) site in the Geotracker database. These sites were also identified in the ISA report for Site 710-3. The results of the agency reviews for Site 710-3 are presented in Table 7. Site locations in relation to Site 710-3 are shown on Figure 29.

710-5 (710/Imperial Highway Interchange). At the time of their initial review the LARWQCB did not express any concern about LUST sites in the vicinity of Site 710-5 (710/Imperial Highway Interchange). However, during review of local agencies several sites have been identified within a ¼ mile (0.4 km) of the 710-5 site. The results of the agency reviews for Site 710-5 are presented in Table 10. LUST site locations in relation to Site 710-5 are shown on Figure 30.

Upon further review, the LARWQCB approved all the Priority 4 potential IFB sites.

13.0 SUMMARY OF SECONDARY SITE SCREENING INVESTIGATIONS

Twenty-eight potential IFB sites from Phase I - Priority 3, and Phase II - Priorities 4, 5, 6, and 7 were recommended for secondary screening. Of these, 25 were investigated. Three sites, 710-2d, 710-2e (Atlantic/Bandini) and 5-4a (Rosecrans), were not investigated. Two of the sites, 710-2d, and 710-2e, were still recommended for detailed investigations based on their close proximity to other 710-2 (Atlantic/Bandini) sub-sites that meet secondary screening criteria. It was agreed between the Department and the Plaintiff's consultant that the secondary and detailed investigations for these two sites could be conducted concurrently. The third site, 5-4a (Rosecrans), is located along Priority 6 (I-5). The site selection process along this corridor was modified from identifying individual potential IFB sites to rating infiltration potential along reaches of the corridor, as agreed between the Department and the Plaintiff. Site 5-4a had access constraints and information from adjacent 5-4 sub-sites was deemed sufficient for characterization of the infiltration potential along that reach of the corridor.

Eighteen of the 25 sites investigated, approximately 72%, met the criteria stated in Exhibit A of the Stipulation, and were recommended for further detailed investigations. The remaining seven sites were eliminated due to soil types and soil stratigraphy characteristics that are restrictive to infiltration. No sites were eliminated due to environmental or depth to groundwater issues; however, two sites from Priority 4, 710-5e and 710-5f (Imperial Hwy), warrant additional groundwater monitoring. Altogether, with the 18 sites that met criteria for secondary screening plus the two sites from Priority 4 (710-2d and 710-2e), a total of 20 sites were recommended for detailed site investigations.

The table provided below summarizes the secondary site screening investigations by Priority and lists the number of sites identified, sites eliminated from further consideration, and sites recommended for detailed investigation. A summary of the sites eliminated from further consideration as an IFB and a description of the unfavorable characteristics of the site are presented in Table 11. Details of the individual sites are summarized in Table 1 (Priority 3 sites), Table 2 (Priority 4 sites), Table 3 (Priority 5 sites), Table 4 (Priority 6 sites), and Table 5 (Priority 7 sites).

Summary Table of Secondary Site Screening for Phase I and Phase II Priorities

Phase	Priority	Potential IFB Sites Recommended for Secondary Site Screening (1)	Potential IFB Sites Recommended for Detailed Investigation (1)	Potential IFB Sites Eliminated From Further Consideration
I	3	5	3	2
II	4	11	8	3
	5	2	1	1 (2)
	6 (3)	8	6	2
	7 (3)	2	2	0
Total (3)		28	20 (4)	8

(1) Includes individual sites and sub-sites.

(2) Site 405S-2 was originally recommended for detailed investigation, but upon re-evaluation of soil stratigraphy was eliminated from further consideration as a potential IFB site.

(3) Includes sites from Priorities 6 and 7 that were investigated in order to characterize potential infiltration along reaches of these corridors and represents present day land availability.

(4) Includes two sites from Priority 4 (710-2d, and 710-2e) that received secondary screening. Secondary screening was planned to be conducted concurrently with detailed investigation.

14.0 SITES RECOMMENDED FOR DETAILED INVESTIGATION

Eighteen potential IFB sites meet the criteria for preliminary site selection and secondary site screening and were recommended for detailed investigations. Two additional sites, 710-2d and 710-2e (Atlantic/Bandini), were recommended to have secondary and detailed investigations completed together. Altogether, 20 sites were recommended for detailed investigation.

The priority for completing detailed investigations was to complete all Phase I potential IFB sites first. If available funds and schedule permitted, then Phase II potential IFB sites would be tested in order of priority. Early in the project history it became evident that since no sites were identified along Priorities 1 and 2 (I-405), and only five potential IFB sites were recommended for secondary investigation on Priority 3 (SR-71), funds would be available to complete some Phase II studies. Therefore, it was agreed between the Department and the Plaintiff that Priority 4 (I-710) and Priority 5 (I-405) could be studied through completion of secondary site screening. At the completion of these studies, a total of 12 sites were recommended for detailed investigations. Three of the sites are located along Priority 3 SR-71, seven along Priority 4 (I-710), and two along Priority 5 (I-405).

The 12 potential sites were presented to the LARWQCB for their review and conditions of approval concerning site locations, as discussed in Section 12.2. All 12 sites were approved by the LARWQCB. However, at this time in the study, funding was approved to complete detailed investigations on only nine potential IFB sites. Therefore, the 12 potential IFB sites were compared against each other and rated and ranked according to the following criteria:

- Catchment Volume
- Available Area
- Geology
- Hydrogeology
- Constructability
- Environmental Concerns.

Each of the above categories contains sub-categories. As an example, sub-categories under the category of Geology included presence and depth of fill, percentage of fines in the soil, and the presence and depth to restrictive layers. A weighted point system was used to rate each site by category, and the sites were ranked according to the sum of the category point totals. The 12 sites are presented below in their proposed ranked order for detailed investigation.

Ranking Order	Site Identification	Location Description
1	710-2c	710/Atlantic-Bandini Interchange
2	405S-1	405/Wilshire Interchange
3	71S-4	71/Pomona Blvd
4	71S-3	71/Valley Blvd
5	710-2b	710/Atlantic-Bandini Interchange
6	71S-2	71/Ridgway and Campus
7	710-2e	710/Atlantic-Bandini Interchange
8	710-2a	710/Atlantic-Bandini Interchange
9	710-5	710/Imperial Hwy Interchange
10	710-2d	710/Atlantic-Bandini Interchange
11	405S-2	405/Wilshire Interchange
12	710-3	710/Florence Interchange

Detailed investigations proceeded with the top nine ranked potential IFB sites. Upon completion of the top nine sites, funding was still available to complete the remaining sites. In addition, funding was available to complete secondary and detailed investigations concurrently for Phase II - Priorities 6 and 7. Eight additional sites were completed through detailed investigation, with six sites along Priority 6 and two sites along Priority 7. The total number of sites for which detailed investigations were performed was 18.

14.1 DISCUSSION OF DETAILED INVESTIGATIONS

Eighteen of the 20 sites recommended for detailed investigations were completed. Two sites on Priority 4 (710-2d and 710-2e) were eventually eliminated. Site 710-2d was eliminated from further consideration because of the limited catchment area it could treat, and because the adjacent Site (710-2a) failed to meet infiltration rate criterion, as cited in Exhibit A of the Stipulation. The property that Site 710-2e was located on was in the process of a property transaction, and was not available for investigation. Table 12 lists the sites tested, depth of test section, soil types tested, and hydraulic conductivity values that were calculated for each test at a given site.

14.2 RESULTS OF IN-HOLE CONDUCTIVITY TESTS

Hydraulic conductivity values were calculated from in-hole tests using Equations 1, 2 and 3 below. Selection of the proper equation was based on field conditions, as shown on Figure 31. Equation 1 corresponds to a low water table or depth to impervious layer, where the distance from the water level in the test well during the test to the water table or impervious layer is greater than three times the depth of the water in the test well, as shown under Condition I of Figure 31. Equations 2 or 3 correspond to a relatively high water table or impervious layer. These equations are used when the distance from the water surface in the test well during the test to the groundwater table, or to an impervious layer, is less than three times the depth of water in the test well. Condition II, Figure 31 shows a high water table or depth to impervious layer that is below the bottom of the test well. Equation 2 is used for these

conditions. Condition III shows a high water table with the depth to water or impervious layer located above the bottom of the test well. Equation 3 is used under these conditions.

Condition I:

$$k_{20} = \frac{qV}{2\pi h^2}\left\{\ln\left[\frac{h}{r}+\sqrt{\left(\frac{h}{r}\right)^2+1}\right]-\frac{\sqrt{1+\left(\frac{h}{r}\right)^2}}{\frac{h}{r}}+\frac{1}{\frac{h}{r}}\right\}$$

Condition II:

$$k_{20} = \frac{qV}{2\pi h^2}\left[\frac{\ln\left(\frac{h}{r}\right)}{\frac{1}{6}+\frac{1}{3}\left(\frac{h}{T_u}\right)^{-1}}\right]$$

Condition III:

$$k_{20} = \frac{qV}{2\pi h^2}\left[\frac{\ln\left(\frac{h}{r}\right)}{\left(\frac{h}{T_u}\right)^{-1}+\frac{1}{2}\left(\frac{h}{T_u}\right)^{-2}}\right]$$

Where:

k_{20} = Coefficient of permeability at 20°C

h = height of water in the well

r = radius of well

q = discharge rate of water from the well for steady-state condition (determined experimentally)

V = $\frac{\mu T, \text{ viscosity of water at temp. T}}{\mu_{20}, \text{ viscosity of water at 20°C}}$

T_u = unsaturated distance between the water surface in the well and the water table

Table 12 lists the sites where in-hole hydraulic conductivity tests were completed. In-hole hydraulic conductivity test data for the individual test holes are included with respective site data that are grouped by Priority and presented in the following appendices: Appendix D (Priority 3), Appendix E (Priority 4), Appendix F (Priority 5), Appendix G (Priority 6), and Appendix H (Priority 7).

According to the criterion in Exhibit A of the Stipulation, if the lowest hydraulic conductivity value is less than 0.5 inches per hour, the site should be eliminated from further consideration as a potential IFB site. If this criterion was applied in the strictest sense, then all but two of these sites tested would be eliminated from further consideration. However, the tests were conducted in various soil layers at different depths over a wide area at each site in an attempt to characterize the infiltration potential of the site. Several sites had areas that contained soil types that failed the infiltration rate criterion; however, by re-sizing the area of the proposed basin these soils could be avoided or eliminated during excavation of the actual basin. Final basin design would have to account for the distribution of these relatively impervious soils. Eleven potential IFB sites were identified when the hydraulic conductivity test results alone with the lateral and vertical variations in soil layering were taken into account. The remaining seven sites were eliminated because the majority or all of the hydraulic conductivity tests that were conducted failed to meet the 0.5 inches per hour criterion. The table below summarizes the detailed investigations by Priority and lists the number of sites identified for detailed testing, sites eliminated from further consideration, and sites considered as potential IFB sites.

Summary Table of Detailed Investigations for Phase I and Phase II Priorities

Phase	Priority	Potential IFB Sites Recommended for Detailed Site Investigations (1)	Sites Considered as Potential IFB Sites (1)	Potential IFB Sites Eliminated From Further Consideration (1)
I	3	3	1	2
II	4	8 (2)	4	4 (2)
	5	1	0	2
	6 (3)	6	4	1
	7 (3)	2	2	0
Total (3)		**20 (2)**	**11**	**9 (2)**

(1) Includes individual sites and sub-sites.

(2) Includes two sites from Priority 4 (710-2d, and 710-2e) that did not received detailed investigations, but were eliminated base on findings from adjacent sites (710-2d), and could not be tested due to property transactions (710-2e).

(3) Includes sites from Priority 6 and Priority 7 that were investigated in order to characterize potential infiltration along reaches of these corridors and represents present day land availability

14.3 DISCUSSION OF SITES IDENTIFIED AS POTENTIAL INFILTRATION BASINS

Six of the 11 sites identified as potential IFBs are located along Priorities 6 and 7 (I-5) corridors. The Priority 6 sites are listed below and their locations are shown on Figure 26D. The Priority 6 sites include:

- Site 5-2 (Alondra Blvd)
- Site 5-4d (Rosecrans/Firestone Ave)
- Site 5-5b (San Antonio Ave)
- Site 5-8b (5/605 Interchange).

The Priority 7 sites are listed below and their locations are shown on Figure 27D. The Priority 7 sites include:

- Site 5-10b (5/605 Interchange)
- Site 5-11b (Lakewood/Rosemead Blvd).

The location of these sites is consistent with the areas identified in the preliminary investigation, as having the highest potential for IFB sites. The areas are discussed in further detail in Section 10.1 of this report.

A summary of the subsurface characteristics for Priorities 6 and 7 potential IFB sites including range of hydraulic conductivity values, thickness of pervious zone, depth and thickness of impervious zone, observed depths to groundwater, and typical soil types of both the impervious and pervious zones is presented in Table 14. As can be seen in Table 14, the pervious zone is typically within 2 meters of the surface at all of the above-listed sites, and is typically about 4.5 meters thick. The thickness of the impervious zone ranges from approximately 0.6 meters to greater than 5.5 meters. Most of the sites would not require any overexcavation; however, several would probably require from 1 to 2.5 meters of soil being excavated, allowing the basin invert to be situated directly above the more permeable soils.

Four out of the five remaining potential IFB sites are located along Priority 4 (I-710), and the fifth site is located along Priority 3. The sites are listed below and their locations are shown on Figures 11 and 7, respectively. General characteristics of the sites are presented in Table 14. The sites include:

- Priority 4 - Site 710-2, sub-sites b and c (Atlantic/Bandini Interchange)
- Priority 4 - Site 710-5, sub-sites e and f (710/Imperial Hwy Interchange)
- Priority 3 - Site 71S-3, (Valley/Holt Blvd).

The sites identified along Priorities 3 and 4 have been fully investigated and the properties are presently available for use as potential IFB locations; therefore, a brief discussion on each individual site is warranted.

- Priority 3 – Site 71S-3 (Valley/Holt Blvd)

The subsurface soils identified at this site are predominantly fine-grained deposits consisting of silt and silty sand and clayey sand, within the upper 7 feet (2 meters). These near-surface sands have a fines content ranging from 38 to 50%. A continuous silt layer is present from approximately 5 to 7 feet (1.5 to 2.0 meters) depth across the site and becomes thicker along the northern portion of the site, parallel to SR-71. Below these predominantly fine-grained deposits is a sand layer consisting of silty sand, with a fines content ranging from 20 to 28%, and sands with less than 8% fines. This sand layer is apparently continuous across the site with the top of the layer ranging between 7 (2.0 meters) feet bgs in the south to 18 feet (5.5 meters) bgs in the north. Of the seven in-hole hydraulic conductivity tests performed at the site, only four tests had hydraulic conductivity values that meet the 0.5 inches per hour criterion stated in Exhibit A of the Stipulation. However, the three tests that failed were located along the northern and

northeastern portions of the investigated area in the near surface sand layer with the 38 to 50% fines content. The four passing tests were located within the lower silty sand to sand layer.

The site area, as originally defined based on the setback criteria, was approximately 21,075 ft^2 (1958m^2), and the cumulative water quality volume from available catchment areas based on the 0.75 inch (1.9 cm) storm, was 12,104 ft^3 (343 m^3). By rearranging Equation 1 from Exhibit A of the Stipulation (V=Akt), a minimum area needed to accommodate the cumulative water quality volume for Site 71S-3 can be calculated. Using the lowest "passing" hydraulic conductivity value of 0.66 inches per hour obtained from in-hole hydraulic conductivity tests conducted at Site 71S-3 (Table 12), the area needed is calculated as follows:

$$A=V/kt$$

$$A = 12{,}104\ ft^3 / (0.66\ \text{inches/hour} \times 0.5\ \text{safety factor} \times 48\ \text{hours}) \times 12\ \text{inches/foot}$$

$$A = 9{,}169\ ft^2\ (852\ m^2)$$

The present area at Site 71S-3 that is underlain by the lower silty sand to sand layer (fines content 8 to 28%) is approximately 12,236 ft^2 (1137 m^2). The existing ground surface over this area is covered with ice plants and low shrubs, and is outside or away from the northern portion of the site that is vegetated with mature trees. Therefore, it appears feasible that an IFB could be constructed at the 71S-3 site by excavating a basin to approximately 7 feet (2.1 meters) bgs (top of lower sand) in the southern half of the site. It is anticipated that the excavation would require backfilling with a permeable material to a design grade that allows gravity drainage of the basin. The geometric mean hydraulic conductivity of the passing hydraulic conductivity tests is recommended for design purposes. The geometric mean hydraulic conductivity value for 71S-3 is 0.8 inches per hour.

- Priority 4 – Site 710-2b (Atlantic/Bandini Interchange)

The soil deposits at Site 710-2b predominantly consist of sand, sand with silt, and silty sand from the surface to approximately 11.5 feet (3.5 meters) bgs. However, along the southern and eastern margins of the site, a silt layer extends from the surface to depths ranging between 2 and 8 feet (0.6 and 2.4 meters). Below the upper sand layer, an approximately 18-foot (5.5meter) thick clay layer extends across the site. As shown on Figure 14, a 12-foot wide x 6-foot deep box culvert bisects the site into two halves, 710-2b-1(west side) and 710-2b-2 (east side). Interpretation of the geologic cross-sections suggests the western portion of the site (710-2-1) would be suitable for an IFB. The area of the eastern portion of the site (710-2b-2) could be significantly reduced due to the silt layer that was identified in that area. The maximum water quality volume available for 710-2b-1is recalculated to be 18,971 ft^3 (537 m^3) per Equation 1 of Exhibit A of the Stipulation (V=Akt). The parameters used for the recalculation were the lowest "passing" hydraulic conductivity of 0.52 inches/hour from in-hole hydraulic conductivity tests conducted in the western portion of the site (Table 12), and the maximum available surface area for 710-2b-1 of 18,242 ft^2 (1,695 m^2) (Section 8.4.1.2). The total cumulative volume for the available catchment areas from Section 8.4.1.2 was 7,874 ft^3 (223 m^3). Site 710-2b-1, therefore, has sufficient capacity (18,971>>7,874) to accommodate the water quality volume. The western portion of Site 710-2b appears to be feasible for an IFB based on the comparison of the water quality volume and the cumulative

catchment volume. The geometric mean hydraulic conductivity of the passing hydraulic conductivity tests is recommended for design purposes. The geometric mean hydraulic conductivity value for 710-2b is 0.55 inches per hour.

- Priority 4 – Site 710-2c (Atlantic/Bandini Interchange)

The subsurface soils identified at Site 710-2c are relatively fine-grained consisting of predominantly clay, silt, and silty sand from the surface to approximate depths of 5 to 7 feet (1.5 to 2 meters). Below the fine-grained surface deposits is a sand layer that ranges in thickness between 3 and 10 feet (1 and 3 meters). Beneath this sand layer the soils consists of a thick sequence of silt and clay that is at least 20 to 40 feet (6 to 12 meters) thick. Of the seven in-hole hydraulic conductivity tests performed at the site, only four tests had hydraulic conductivity values that meet the 0.5 inches per hour criterion stated in Exhibit A of the Stipulation. However, all four of the test holes that tested successfully are located on the eastern portion of the site and the tested portions were within the 3 to 10 foot (1 to 3 meter) thick sand layer. This zone is restricted vertically and infiltration and subsurface flow would be dependent on the lateral extent of the sand layer.

The site area, as originally defined based on the setback criteria, was approximately 62,248 ft^2 (5783 m^2), and the cumulative water quality volume from available catchment areas based on 0.75-inch (1.9 cm) storm was 11,769 ft^3 (333 m^3). Using the lowest "passing" hydraulic conductivity value of 0.86 inches per hour obtained from in-hole tests conducted at Site 710-2c (Table 12) and a safety factor of 0.5, the surface area required to accommodate the cumulative water quality volume is 6,867 ft^2 (638 m^2). An estimate of the area of the sand layer based on the geologic cross-sections constructed at Site 710-2c is 29,187-ft^2 (2712 m^2). Therefore, it appears feasible that an IFB could be constructed at the 710-2c site by excavating a basin to approximately 7 feet (2.1 meters) depth in the eastern portion of the site. However, due to the limited vertical extent of the sand layer, a long-term infiltration test should be performed at this site. It is anticipated that the excavation would require backfilling with a permeable material to a design grade that allows gravity drainage of the basin. The geometric mean hydraulic conductivity of the passing hydraulic conductivity tests is recommended for design purposes. The geometric mean hydraulic conductivity value for 710-2c is 1.67 inches per hour.

- Priority 4 – Sites 710-5e and 710-5f (Imperial Hwy Interchange)

The subsurface soils identified at these two sites consist predominantly of silty sand and sand from the surface to approximately 6 to 10 feet (1.8 to 3 meters). The sand layer is present at both sites; however, along the southern half of Site 710-5f, the sand was interpreted to be fill material to approximately 7 feet (2 meters) bgs. The sand layer is underlain by a restrictive layer consisting of clay that is apparently present beneath the entire area, and is at least 10 to 14 feet (3 to 4 meters) thick.

Eleven in-hole hydraulic conductivity tests were performed at the sites with six performed at Site 710-5e and five at Site 710-5f. Nine of the 11 hydraulic conductivity tests met the 0.5 inches per hour criterion stated in Exhibit A of the Stipulation, with hydraulic conductivity values ranging between 0.8 and 5.8 inches/hour.

Perched groundwater was recorded in monitoring well 710-5-MW-1 (Site 710-5f) at approximately 23.5 feet (7.2 meters) depth and at approximately 11 feet (3.51 meters) in 710-5-MW2 (Site 710-5e). The groundwater appears to be semi-confined by the clay layer. The difference in depth to groundwater appears to be a function of the depth to the base of the confining clay and top of the underlying sands (Appendix E, Site 710-5, Figure 2).

Given a minimum excavation of one to two feet for a potential IFB the distance between the invert of the basin and the observed groundwater would be approximately 10 to 21.5 feet (3 to 6.5 meters). Based on the shallow levels of the perched groundwater, and that the monitoring was conducted in a year that was well below 80% of normal rainfall, there is not a reliable indication that groundwater will be greater than 10 feet (3.0 meters) below a proposed invert.

There is approximately 7 feet of fill present at Site 710-5f, and in-hole hydraulic conductivity tests were not performed in this material. Given this circumstance and that the present drainage is directed towards Site 710-5e, it appears that 710-5e is a better site for an IFB. Groundwater monitoring should continue and long-term infiltration testing is warranted at Site 710-5e due to the presence of the lower restrictive layer.

The LARWQCB should be consulted concerning the depth to groundwater-basin invert separation distance. Several hydraulic conductivity values were calculated to be above 2.5 inches per hour at Site 710-5. This information should also be presented to LARWQCB for their review regarding possible effects to groundwater. The geometric mean hydraulic conductivity of all the hydraulic conductivity tests conducted at site 710-5e is recommended for design purposes. The geometric mean hydraulic conductivity value for 710-5e is 2.35 inches per hour.

14.4 POTENTIAL IFB BASINS OUTSIDE THE DEPARTMENT RIGHT-OF-WAY

Eleven sites were identified during the preliminary (Tasks 1 through 5) site selection process that were outside the Department's Right-of-way. These sites were not evaluated further during this study as agreed upon by the Department and the Plaintiff's consultant. However, the potential of these sites as future IFBs was qualitatively ranked as low, moderate, or high based on information gathered during the preliminary site selection investigation, and results from secondary and detailed information of nearby sites (Table 15). Of the 11 sites, three sites were considered to have moderate potential as IFBs:

Priority 3 (SR-71)	71N-2 and 71S-7
Priority 7 (I-5)	5-15c

Two sites are currently being utilized as part of the Rio Hondo Spreading Grounds:

Priority 7 (I-5)	5-15a and 5-15b

In addition, two of the sites just south of the Priority 6 southern boundary at Manchester Avenue and Artesia Avenue have recently been investigated for use as IFB sites for another study. The study concluded that the sites were not suitable for IFB locations based on lithology and shallow groundwater

conditions. The remaining four sites are considered to have low potential as future IFBs based on lithology and/or shallow groundwater conditions (Table 15).

15.0 OUTSIDE PEER REVIEW

In accordance with the Stipulation, the Department and the Plaintiff selected three local experts to perform an outside peer review of this study. The review was to take place at the completion of the study; however, it was agreed upon that the review be initiated prior to completion of the study in order to make sure that there were no basic flaws with the procedures and their application. Initial meetings with the peer review panel indicated that the approach and application of the study were satisfactory. Final comments from the panel will be addressed in an addendum to this report. Some of the initial verbal comments are presented below, along with the Department's responses.

Comment: Setback criteria stated in Exhibit A of the Stipulation may be too restrictive, and should be evaluated to see if there are acceptable alternatives.

- ***Response:*** *For the purpose of this study the setback criteria are required to be as stated in Exhibit A of the Stipulation. However, these criteria should be reevaluated in the near future to determine if they are necessary and appropriate for the protection of highway users, structures, and embankments. Until the reevaluation is complete, future infiltration facility siting studies should apply less restrictive setback criteria that would retain potential sites for further consideration. Recommended guidelines for applying the setback criteria that allow for variations in setback distances to be evaluated on a case-by-case basis are presented in Section 17.2.*

Comment: Cone Penetration Tests (CPTs) would be a fast and economical method of exploration.

- ***Response:*** *CPT was not utilized during this study. However, the technique is a useful means of investigation, especially for large sites where several locations need to be investigated to characterize the site. The CPT can provide an interpreted boring log of the stratigraphic column based on empirical data correlating CPT data and soil types. The method is fast and provides a continuous profile and is generally less expensive than drilling. However, sampling is limited and CPTs can not be converted into hydraulic conductivity test wells. In addition, CPT interrupted soil types should be confirmed with a boring on site.*

Comment: Correlation of USDA soil types to USCS would help future workers correlate soil descriptions from their studies to findings from this study.

- ***Response:*** *Correlations of USDA and USCS soil types were completed for the Hydrologic Group Soil Associations presented on the soil distribution maps for each Priority. A complete comparison of the soil classifications systems is beyond the scope of this study, however, it is agreed that such a correlation would be beneficial for future studies. Both systems should be included in future guidelines, and criteria should be stated in terms of the USCS classifications, as well as the USDA soil types.*

Comment: Large-scale infiltration tests could increase the understanding of the actual infiltration at a given site. A protocol for conducting tests should be developed. Several large-scale tests should be performed and the results correlated to the USBR in-hole hydraulic conductivity test results.

- ***Response:*** *Large-scale infiltration tests were not included as part of the Stipulation criteria. However, the Department and the Plaintiff agreed to conduct such tests, as long as there was enough budget remaining from the allocated funds. If budget is available, it is planned to conduct a large–scale infiltration test at site 710-2c (710/Atlantic/Bandini Interchange).*

Comment: Develop logic tree of selection process.

- ***Response:*** *A logic tree has been incorporated as Figure 32within this report.*

16.0 LESSONS LEARNED

The intent of this section is to present lessons learned from the application of the siting criteria stated in the Recommended Site Evaluation Procedures in Exhibit A of the Stipulation. The Stipulation and Exhibit A are presented in Appendix A of this report.

The procedures for the preliminary site selection, secondary site screening, and detailed site investigation have been presented in the preceding sections of this report. The original intent of the study was to complete the preliminary site selection process prior to any secondary or detailed investigations. As the project progressed, modifications of the original intent were incorporated allowing secondary and detailed work to progress simultaneously. The following discussion presents lessons learned from each level of the investigation.

16.1 PRELIMINARY SITE SELECTION

1) The level of detail applied during the preliminary site selection process can be modified to fit project needs, depending on scope, budget, and schedule of a particular project. For siting studies, such as this study, it proved beneficial to establish a baseline characterization of soil and groundwater conditions along a given corridor by reviewing published soil and geologic maps, groundwater databases, and previous geotechnical studies at bridge sites. Once these conditions were reasonably well understood, reaches or specific areas with a high potential for IFB locations could be identified and the study could focus on these areas. An additional benefit is that the areas interpreted to have a high potential for IFB locations can be identified independently from other preliminary site selection criteria, such as site area, setback criteria, drainage modifications, or environmental conditions. The baseline conditions could then be applied to siting IFB locations for future projects where conditions or criteria could be modified or eliminated. The information obtained from the baseline characterization could be applied in the siting of other BMPs, such as infiltration trenches or biofiltration swales or strips.

   However, if the scope of a particular study is limited to a specific site or small area with only a few sites, then the preliminary selection process could focus on existing conditions, such as site area, setback, and drainage modification criteria that could limit the use of the site as an IFB location. In certain circumstances, when investigators have a working knowledge of the area, it may be economical to limit the preliminary site selection process and conduct secondary or partial secondary investigations directly.

2) For the purposes of this study the setback criteria were required to be as stated in Exhibit A of the Stipulation. These criteria should be reevaluated in the near future to determine if they are necessary and appropriate for the protection of highway users, structures, and embankments. Until the reevaluation is complete, future infiltration facility siting studies should apply less restrictive setback criteria that would retain potential sites for further consideration. Recommended guidelines for applying the setback criteria are presented in Section 17.2.

3) The use of GIS was very beneficial in visualizing the geographical relationship of different databases such as soil and geologic maps, aerial photographs, groundwater contours, and site locations. Also, site areas could be quickly estimated from aerial photographs.

4) Review of environmental conditions should be completed in a multi-stage process. The first stage should be completed during the pre-screening (Stage 1-Corridor Selection) process, and should include meetings with the Regional Water Quality Control Board (RWQCB), and local Environmental Health Departments to identify any policy, legal restrictions, or other concerns that would preclude consideration of collecting storm water runoff for infiltration.

   The second-stage of environmental review would be site-specific. Again, the RWQCB and local Health Departments should be contacted and informed of potential IFB site locations. Completion of ISA reports for specific site locations or evaluations of potential off-site contamination from nearby sites should be completed at the request of the jurisdictional agencies. The timing of this stage of environmental review should be evaluated on a case-by-case basis. Typically the environmental review would be completed prior to initiating any secondary investigations. However, if the baseline soil and groundwater characterization studies indicate the site has only a marginal potential of meeting soil and groundwater criteria, then it may be economical to conduct the secondary investigation prior to completing the site-specific environmental studies. If the site meets secondary site criteria, then site-specific environmental studies should be completed. All required or due diligent environmental studies should be completed prior to the initiation of any detailed investigation infiltration testing.

   As an example, reviewing the environmental conditions and preparing ISA reports proved to be beneficial during the preliminary site selection process along Priority 4 (I-710). The identification of a groundwater contamination plume that was beneath the Firestone Avenue/I-710 Interchange area eliminated eight potential sites that would have otherwise been advanced to secondary levels of investigation. However, for site 710-10 (Olympic Blvd), the soil conditions were considered marginal based on the soil and groundwater characterization completed during the preliminary site selection. This site was later eliminated during the secondary screening when the subsurface soil conditions were verified. In this case, it would have been more economical to complete the secondary investigation at Site 710-10 prior to completing the environmental reviews.

5) Conditions identified during the preliminary screening that could eliminate a given site should be rated based on the most efficient methods of verifying the condition. Conditions that are easiest to establish, and have a greater potential of eliminating a site from further consideration, should be evaluated first. This could include completing portions of a secondary investigation in tandem with the preliminary site screening.

   The above concept of conducting differing levels of investigation was used when partial secondary screenings were approved for several Priority 4 (I-710) sites. In this case, shallow groundwater was anticipated and monitoring wells were installed prior to completing full secondary investigations. The logic was that groundwater levels could be monitored by installing one well, and if groundwater elevations were encountered that would prohibit the site for use as an IFB, then continuation of remaining preliminary investigations would stop. However, if groundwater levels were found to satisfy the Stipulation criterion, then preliminary and secondary studies could continue.

6) Identification of USDA hydrologic soil types proved to be a good indicator of the potential success of a given site. Hydrologic Group B soils were mapped at all potential IFB sites identified during this study. Hydrologic Group C soils were also acceptable according to the criteria, but sites with C type soils failed infiltration rate criterion. The distinction between Hydrologic Group B and Hydrologic Group C soils could be a criterion for ranking sites on future projects..

7) Although the hydrologic soil types proved to be a good indicator for potential sites, sites should not be eliminated on that criterion alone. Supplementary information, such as boring data from previous investigations and/or geologic maps, should be used in conjunction with the mapped soil types. The soil maps are general by design, and may not be a good indicator of lithology at depth.

8) Correlation of the USDA and USCS soil systems would be beneficial. This would allow investigators to easily compare soil data classified in one system to the other. Geotechnical soil borings are typically completed using the USCS, so most of the data used in establishing baseline conditions would use this system. Future criteria should be stated regarding both classifications systems.

16.2 SECONDARY SITE SCREENING

1) Continuous sampling and coring proved to be very effective. Having a continuous record of the subsurface stratigraphy allowed for the identification of soil layers that may have been missed with more conventional sampling intervals (i.e., 5-foot).

2) Hollow stem auger drilling techniques were used for the majority of this study. Hollow stem auger borings could be easily converted into monitoring wells or in-hole hydraulic conductivity test holes. Also, soil samples could be collected for both geotechnical and environmental testing.

3) Geoprobe, a direct push continuous drilling technique, was also useful, especially for shallower depths of investigation (i.e., 15 to 20 feet [4.5 to 6 meters]). At the shallow depths the Geoprobe was more efficient than the hollow stem drill rig. However, Geoprobe borings cannot be converted to wells.

4) The findings from this study substantiated the criterion for eliminating a site with greater than 40 percent fines (percent passing the No. 200 sieve). A wide range of variables hindered a statistical analysis of the data comparing the fine content from particle size analysis and hydraulic conductivity values from infiltration testing. However, a general trend indicated that soils in the range of 30 to 40 percent fines had approximately a 50 percent chance of meeting the 0.5 inches per hour hydraulic conductivity criterion. Soils with less than 30 percent fines met the criterion approximately 65 to 90 percent of the time. Only a few hydraulic conductivity tests conducted in soils with greater than 40 percent fines met the criterion.

   Soils with 30 percent fines or less could be correlated to hydraulic conductivity values that met the criterion of 0.5 inches per hour on geologic cross-sections with a high degree of confidence. Soils with 30 percent fines or less were correlated to estimate the lateral extent of pervious sand layers.

5) Secondary and detailed investigations were completed concurrently on some Priority 4 sites and all Priorities 6 and 7 sites. Field interpretations were relied upon to place in-hole hydraulic conductivity test holes, and this proved to be a cost and time efficient method of investigation.

6) Site-specific borings and the construction of geologic cross-sections were critical in evaluating the IFB potential of a site.

16.3 DETAILED INVESTIGATION

1) At least four in-hole hydraulic conductivity tests were performed at a given site. Test intervals varied and targeted different stratigraphic horizons. This allowed for specific layers or zones to be characterized, and provided information for design of invert elevations and the depth of excavation required.

2) As stated in Exhibit A, if one hydraulic conductivity test fails to meet the 0.5 inches per hour criterion, then the site is to be eliminated. However, by targeting different zones for testing it was possible to define areas within a site that could still accommodate the catchment volumes and that would satisfy the hydraulic conductivity criterion, although excavation of restrictive layers may be required.

3) The USBR in-hole hydraulic conductivity test method proved to be an efficient way to characterize the infiltration potential of a site. Entire soil zones or individual soil layers could be targeted, and information from the test well borings was used to refine secondary characterizations. Hydraulic conductivity values calculated from the tests were consistent with hydraulic conductivity values for respective soil types (Fetter, 1988).

16.4 LOGIC TREE

The logic tree, (Figure 32), outlines the process that was employed during this site selection study. The criteria listed under each stage of the process are based on the criteria presented in the Site Evaluation Procedures in Exhibit A with some modifications that were incorporated during the application of the criteria in this study, and from additional lessons learned at the completion of the study.

17.0 CONCLUSIONS AND RECOMMENDATIONS

17.1 CONCLUSIONS

All of the Phase I and Phase II Priorities were evaluated as part of the Infiltration Basin Site Selection Study. The following table summarizes the number of sites identified during the preliminary site selection, and the number of sites that were advanced to secondary and detailed investigations for Phase I - Priorities 1, 2, and 3; and Phase II - Priorities 4, 5, 6, and 7.

Phase	Priority	Sites Identified In Preliminary Investigation	Sites Advanced To Secondary Site Investigations	Sites Advanced To Detailed Investigation	Potential IFB Sites
I	1	0	0	0	0
	2	0	0	0	0
	3	9	5	3	1
II	4	33	11	8	4
	5	5 (1)	2	1	0
	6	22	8	6	4
	7	15	2	2	2
I & II	Total	84	28	20	11

1) Site (405S-4) was identified late in the study during a re-evaluation of the Priority 5 corridor. As a result, only partial preliminary investigations were completed. This site is considered as a potential IFB location pending additional preliminary and possibly secondary investigations. The site is included in the tally of potential IFB sites identified, and was not counted as a site recommended for secondary investigation or as a site eliminated from further consideration.

As shown in the above table, 11 sites were considered as potential IFB sites at the completion of the detailed investigations. Six of the 11 sites identified are located along the I-5 corridor, Priorities 6 and 7. As previously described, Priorities 6 and 7 were evaluated in terms of characterizing reaches, and not all potential sites listed were investigated, nor were drainage modifications evaluated for the sites investigated. However, comparison of the current design plans for the I-5 widening project and the area associated with the sites investigated during this study indicate that there would minimal conflict of land use. Therefore, these sites have been counted as potential IFB sites. The 11 potential sites are listed below:

Priority 3 (SR-71)	71S-3
Priority 4 (I-710)	710-2b, 710-2c, 710-5e, and 710-5f
Priority 6 (I-5)	5-2, 5-4d, 5-5b, and 5-8b
Priority 7 (I-5)	5-10b and 5-11b

The characteristics of these 11 sites are summarized in Tables 12, 13, and 14. Several observations can be made from comparing the potential sites:

- Six of the 11 sites identified are along the I-5 corridor with four sites along Priority 6 and two sites along Priority 7. These six sites are considered to have the highest potential for success as IFBs out of all the sites investigated in this study. This is based on the subsurface stratigraphy and in-hole hydraulic conductivity test results that were the most consistent in meeting the hydraulic conductivity criterion as cited in Exhibit A in the Stipulation of all the sites.
- All sites had at least one hydraulic conductivity test that failed to meet criterion, as seen by the minimum hydraulic conductivity values shown in Table 12, except for Sites 5-8b and 5-10b. Both of these sites are located on the west side of I-5 at the I-605 interchange. Site 5-10b is the present location of a lined detention basin.
- Rating of conditions observed during the preliminary site selection, (geotechnical investigations previously completed, mapping, and historic groundwater elevations) indicate that areas with the highest potential for IFB sites along Priority 6 are between the of Alondra Overcrossing and the Silver Bow Overcrossing, and from Orr and Day Overcrossing to the San Gabriel River (Figure 26c).
- Rating of conditions upon completion of secondary and detailed investigations along Priorities 6 substantiated the findings from the preliminary site screening. The area with the highest potential for IFB sites along Priority 6 are from Alondra Overcrossing to just north of San Antonio Ave, and from Orr and Day Overcrossing to the San Gabriel River (Figure 26d).
- Rating of conditions along Priority 7 at the completion of preliminary site selection investigations and the secondary and detailed investigations both indicated that the highest potential for IFB is between the San Gabriel River and the Rio Hondo River (Figure 27).
- Overall, the area with the highest potential would be the northern portion of Priority 6, just south of the Orr and Day Overcrossing near the Union Pacific Railroad Undercrossing (Figure 26d), and the southern portion of Priority 7, south of the Rio Hondo River (Figure 27d). This area is largely coincident with the San Gabriel and Rio Hondo Spreading Grounds, where the surface deposits consist of the semi-perched aquifer and Bellflower aquiclude, which in this area contains a large portion of sand and gravel and locally may not be an aquiclude. This combined area is within the Montebello Forebay. The Montebello Forebay has long been an important area for recharge to the Central Groundwater Basin in Los Angeles County (DWR, 1961).
- All potential IFB sites have soils of the Hanford Association (Hydrologic Soil Group B classification) mapped at the surface and no C type soils.
- Sites tested from each Priority had hydraulic conductivities that varied both horizontally and vertically, as seen by the range between the minimum and maximum hydraulic conductivity values in Table 12, and shown on individual site geologic cross-sections (Appendices D. F, G, and H).
- Priority 3 (SR-71) and Priority 4 (I-710) sites can handle larger volumes of storm water than the catchment area will provide. This allows for re-sizing a potential IFB to correlate with areas of the site with the highest infiltration rates.
- Two Priority 4 sites (710-5e and 710-5f) have water levels at approximately 11 and 23 feet (3.4 to 7.0 meters) depth below existing grade, respectively. Geologic cross-sections constructed for these sites indicate that 2 feet (0.6 meters) of material will be required to be excavated at site 710-5e and 7 feet (2.1 meters) to be excavated at site 710-5f to expose the soils with higher infiltration potential. This corresponds to a basin invert to groundwater separation of approximately 9 to 16 feet (2.7 to 4.9 meters).

- All four of the Priority 4 sites have well-developed restrictive layers that will inhibit downward flow. Pervious zones are within the sands above the restrictive layers, and the success of these sites will be dependent on the ability of the water to flow laterally. Long-term infiltration tests are warranted to evaluate this condition.
- Hydraulic conductivity values greater than 2.5 inches per hour were calculated for Sites 710-5e, 710-5f, and 5-2 (see Table 12).
- There is a reliable indication that groundwater levels are greater than 10 feet (3 meters) below anticipated basin inverts of 1 to 3 feet (0.3 to 0.9 meters) bgs at the potential IFB sites 71-S3 (Valley/Holt Blvd), 710-2b, and 710-2c (710/Atlantic/Bandini Interchange). There is not a reliable indication that the groundwater-invert separation distance is greater than 10 feet (3 meters) at sites 710-5e and 710-5f (710/Imperial Hwy). The sites identified along Priorities 6 and 7 have not been monitored long enough to estimate long-term groundwater levels.

In addition to the sites above, 11 sites were identified as potential IFB sites that were located outside of the Department's right-of-way. As agreed upon by the Department and the Plaintiff, these sites were noted as potential IFB sites, but were not evaluated past the preliminary site selection portion of this study. However, the potential of these sites was qualitatively estimated based on the preliminary site selection results and correlations with nearby sites where secondary and detailed investigations were completed. Of the 11 sites, three sites were considered to have moderate potential as IFBs:

Priority 3 (SR-71)	71N-2 and 71S-7
Priority 7 (I-5)	5-15c

Two sites are currently being utilized as part of the Rio Hondo Spreading Grounds:

Priority 7 (I-5)	5-15a and 5-15b

The remaining six sites are considered to have low to no potential as IFBs. Summaries of the 11 sites identified that are outside the Department's right-of-way are presented in Table 15.

17.2 RECOMMENDATIONS

The following recommendations are based on lessons learned from applying the Recommended Site Evaluation Procedures, completion of project tasks, and characteristics of the potential IFBs as they relate to future design issues. The Recommended Site Evaluation Procedures presented in Exhibit A were complete and focused the investigation to address critical issues concerning the siting of potential IFBs. However, after applying these procedures several slight modifications are recommended:

- The criteria stated in Exhibit A of the Stipulation should be reevaluated in the near future to determine if they are necessary and appropriate for the protection of highway users, structures, and embankments. Until the reevaluation is complete, future infiltration facility siting studies should apply less restrictive setback criteria that will retain more potential sites for further consideration. Suggested guidelines for applying a more flexible criterion are listed below.

1) Utilize the setback distances as stated in the present criteria to establish the maximum surface area available at the potential IFB site.

2) Estimate the minimum surface area of approximately 2,150 ft^2. The minimum surface area is calculated using Equation 1 of Exhibit A, and is based on estimating the total IFB water quality volume (WQV) available for the site assuming a minimum stormwater catchment runoff volume of 0.1acre feet, a 48 hour drawdown time, and an infiltration rate of 0.5 inches per hour (1.3 cm/per hour). The minimum surface area corresponds to a total IFB WQV capacity of 0.1 acre-foot. If the surface area is greater than 2,150 ft^2, then continue with the preliminary site selection characterization of the site. If the surface area is less than 2,150 ft^2, then the site is eliminated as a potential IFB location.

3) If the site is still considered a potential IFB after the preliminary soils and groundwater characterization, then conduct a more detailed evaluation of the available catchment areas and drainage modifications. Estimate the required basin surface area using the cumulative WQV for the stormwater catchment runoff, 48 hour drawdown time, and a minimum infiltration rate of 0.5 inches per hour (1.3 cm/per hour), or an infiltration rate that can be reasonably estimated from previous studies, soil survey tables, or soil type.

4) If the estimated basin area required is less than the maximum basin area available, then the basin remains a candidate as a potential IFB.

5) If the estimated basin area required is greater than the maximum basin area available then the potential modifications to the setback criteria should be evaluated and documented. The project engineer should propose reasonable modifications to the setback criteria necessary to achieve the acquired area.

6) Information pertaining to the type of structure or topographic feature potentially effected by modifications to the setback criteria should be documented. This information includes, but is not limited to, type of structure, structural foundation (footing, pile, etc.), and material used, orientation and steepness of slope, soil types, presence of restrictive layers, groundwater depth and groundwater gradient. Information can be collected during the preliminary, secondary and detailed stages of the siting study, or during the preliminary design phase.

7) Potential IFB sites that are recommend for preliminary design with adjusted setback distances will require engineering evaluations to validate the proposed setback modifications. Setback distances will need to be evaluated on a case by case basis during preliminary design. If the required setback modifications are considered to be unacceptable, then the site should be eliminated as a potential IFB site

- Complete a baseline characterization including characterization of soil and groundwater conditions along a given corridor by reviewing soil and geologic maps, groundwater databases, and previous geotechnical studies. Identify the locations with high potential for IFBs independently from other preliminary site selection criteria, such as area, setbacks, drainage modifications, or environmental conditions. Thus, the baseline conditions could be applied to siting IFB locations for future projects where conditions or criterion could be modified. The information obtained from the baseline characterization could be applied in the siting of other BMPs, such as infiltration trenches or biofiltration swales or strips.

- Apply USDA Hydrologic Group as a criterion to rate potential areas or specific sites. Type A and B soils should be considered as primary soil types, and Type C soils only considered with other supporting soil information, such as from boring logs or geologic maps.

- Sites should not be eliminated based solely on mapped USDA soil types.

- Preliminary Site Selection and Secondary Site Screening, or Secondary Site Screening and Detailed investigation activities can be conducted simultaneously. Application of the procedures should be decided on a case-by-case basis.

- Continuous sampling of soils should be completed within the upper 15 feet (4.6 meters) to characterize soil conditions.

- Hydraulic conductivity tests should try to characterize varying lithologic zones. Sites should not be eliminated based on one failed hydraulic conductivity test value, but evaluated to see if reconfiguring the basin size or excavation of surface soils would be feasible options.

- Twenty four (24) groundwater monitoring wells were installed during this study, with four wells installed along Priority 3, nine wells along Priority 4, two wells along Priority 5, seven wells along Priority 6, and two wells along Priority 7 (Table 6). It is recommended that all wells be abandoned in accordance with California well standards (1990). New wells should be installed for the potential IFBs identified when the respective corridor projects are approved.

- The LARWQCB should be informed of the shallow depths to groundwater measured at sites 710-5e and 710-5f (710/Imperial Hwy), and that the infiltration rates at these sites were estimated to be greater than 2.5 inches per hour. If these sites are to be considered for design, then further review is required by the LARWQCB to evaluate possible effects to waters of the State.

- It is recommended that 48-hour infiltration tests be completed for the sites identified along the Priority 4 corridor prior to these sites being considered for design. Success for these potential basins will depend on lateral flow, because vertical flow could be inhibited by continuous restrictive layers beneath each site. It is recommended that large-scale constant and falling head tests be conducted in test pits 10 by 10 feet (3 by 3 meters) in plan, and excavated to the elevation consistent with the invert of the basin.

- It is recommended that any over excavation required for the potential IFBs be back-filled with a permeable material that meets the infiltration criterion and other design specifications.

- At Site 710-2b (Atlantic/Bandini Interchange) the LACDPW has an easement for a 12 feet wide by 6 feet deep box culvert that bisects the site, 710-2b-1(west side) and 710-2b-2 (east side). Interpretation of the geologic cross-sections suggests the western portion of the site (710-2b-1) would be suitable for an IFB. The area of the eastern portion of the site (710-2b-2) could be significantly reduced due to the silt layer that was identified along the eastern margin of the site. Therefore, site 710-2b-1 is considered the best potential area for an IFB. The LACDPW will need to be contacted if a basin is considered further at this site.

18.0 REFERENCES

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