Appendix I

Low Impact Development Report

Low Impact Development Report (LID)

For

Morningside High School

PREPARED FOR:

Inglewood Unified School District
401 S. Inglewood Ave
Inglewood, CA 90301

PREPARED BY:

BKF Engineers
4675 MacArthur Court, Suite 400
Newport Beach, CA 92660

Prepared: July 1, 2022

REGISTERED PROFESSIONAL ENGINEER
BRUCE W. KIRBY
No. C 42393
CIVIL
STATE OF CALIFORNIA

Bruce Kirby, PE
R.C.E. No. 42393
Expires: 03/31/24

BKF Engineers

4675 MacArthur Court Suite 400 | Newport Beach, California 92660

Engineers | Surveyors | Planners

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PROJECT OWNER'S CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for the gathered information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner's Name:			
Owner's Title:			
Company:			
Address:			
Email:			
Telephone No:			
Signature:		Date:	

PREPARER (ENGINEER) CERTIFICATION

<table>
<tr><td>Engineer's Name:</td><td colspan="3">Bruce W. Kirby, P.E.</td></tr>
<tr><td>Engineer's Title:</td><td colspan="3">Project Manager</td></tr>
<tr><td>Company:</td><td colspan="3">BKF Engineers</td></tr>
<tr><td>Address:</td><td colspan="3">4675 MacArthur Ct, Suite 400, Newport Beach, CA 92660</td></tr>
<tr><td>Email:</td><td colspan="3">bkirby@bkf.com</td></tr>
<tr><td>Telephone No:</td><td colspan="3">(949) 526-8465</td></tr>
<tr><td colspan="4">I hereby certify that this Low Impact Development Plan is in compliance with, and meets the requirements set forth in, Order WQ 2015-0075, of the Los Angeles Regional Water Quality Control Board.</td></tr>
<tr><td>Engineer's Signature</td><td></td><td>Date</td><td>07/01/2022</td></tr>
<tr><td>Place
Stamp
Here</td><td colspan="3">REGISTERED PROFESSIONAL ENGINEER
BRUCE W. KIRBY
No. C 42393
CIVIL
STATE OF CALIFORNIA</td></tr>
</table>

1.0 INTRODUCTION

This Low Impact Development Report (LID) summarizes storm water protection requirements for the Morningside High School site upgrades (herein referred to as "the project").

This LID Report describes the permanent storm water Best Management Practices (BMPs) that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project. For the purposes of post-construction storm water quality management, the project will follow the guidelines and requirements set forth in the County of Los Angeles "Low Impact Development Standards Manual" dated February 2014 (herein "LID Manual").

Project Applicant: IUSD (Inglewood Unified High School)
401 S. Inglewood Ave
Inglewood, CA 90301

1.1 SITE AND PROJECT DESCRIPTION

The subject site is located in the City of Inglewood, Los Angeles County, California. The proposed campus upgrades will be located around the perimeter of the campus, primarily adjacent to the north, east, and south property lines. The campus upgrades will include a baseball field, softball field, tennis courts, basketball courts, track and football field, bathroom buildings, retaining walls, sidewalk, and landscaping.

The existing project area has an average slope of 2.0% draining in the southwesterly direction. Existing drainage is captured within landscape and hardscape area drains and piped into an underground storm drain system. The existing parking lots along the northerly and westerly property lines, surface flow and discharge to the public street, and eventually into an underground storm drain system.

Drainage for the proposed campus upgrades are designed so that runoff drains away from the new structures and sports fields, and is captured into a network of area drains in the surrounding landscape and hardscape along the perimeter of the buildings and sports fields. Roof drainage will be conveyed through downspouts which tie into the proposed storm drain system. The stormwater for this site will be routed into underground infiltration vaults to retain runoff for the 85th percentile treatment storm.

2.0 DESIGNATED PROJECT REQUIREMENT

Requirements for permanent BMPs are determine based on the criteria set forth in the LID Manual. Projects are identified by four categories:

- Designated Project
- Non-Designated Project
- Small-Scale Non-Designated Project
- Large-Scale Non-Designated Project

2.1 DETERMINATION FOR PERMANENT BMP REQUIREMENT

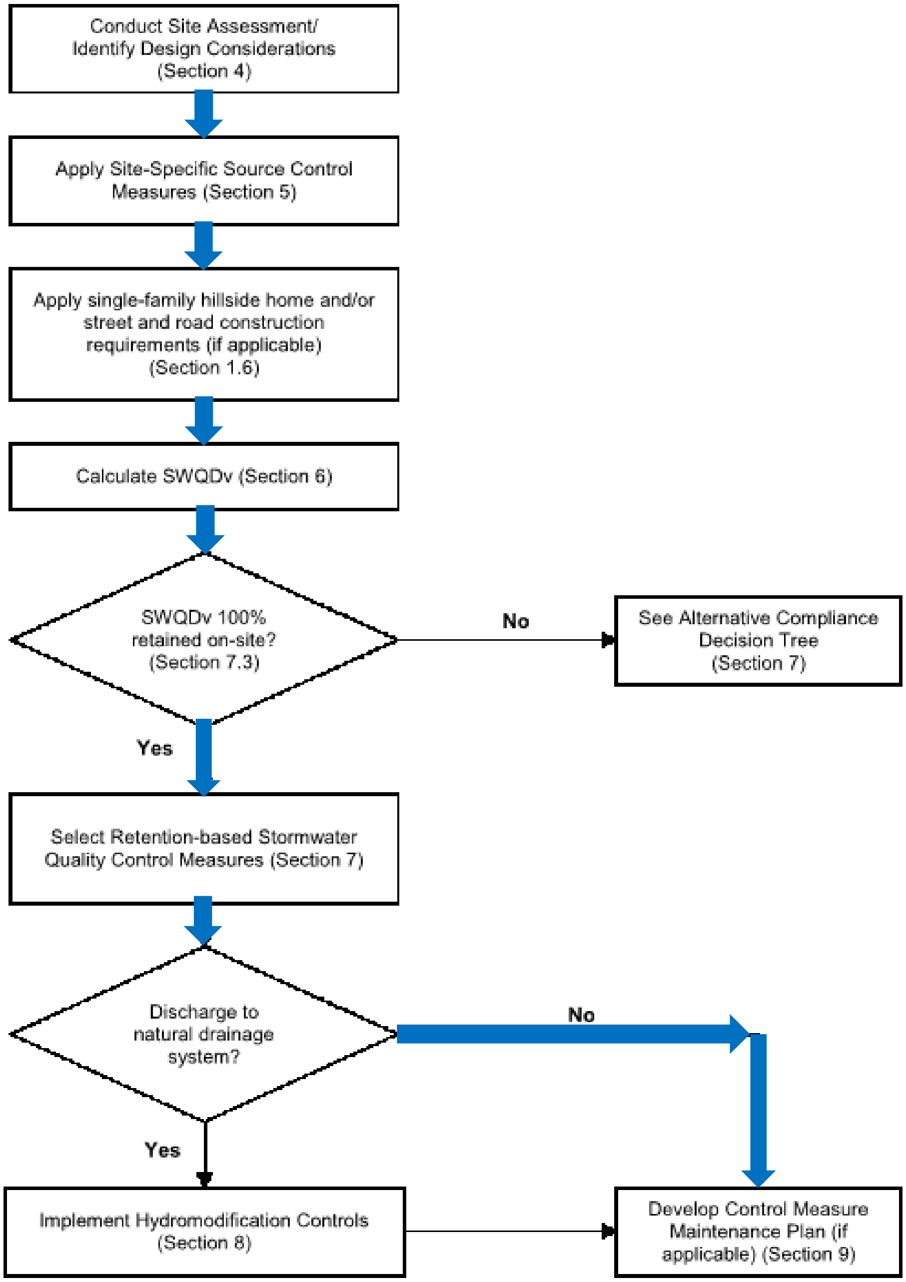
The project is considered a **"Designated Project,"** based on the LID Manual. The project meets the following requirements to be a Designated Project:

1. All development projects equal to one acre or greater of disturbed area and adding more than 10,000 square feet of impervious surface area

All "Designated Projects" must retain 100 percent of the Storm Water Quality Design Volume (SWQDv) on-site through infiltration, evapotranspiration, stormwater runoff harvest and use, or a combination thereof unless it is demonstrated that it is technical infeasible to do so.

The project will retain the SWQDv for the site as outlined in the Design Process Chart Breakdown in Section 2.2. For this project site, an underground infiltration system will be utilized to treat the 65,233 cf of SWQDv. See Section 5.0, Section 6.0 and **Appendix E** for more information and calculations.

2.2 DESIGN PROCESS CHART BREAKDOWN



3.0 SITE ASSESSMENT AND DESIGN CONSIDERATIONS

This section discusses the steps taken for assessing the project site conditions and identifying design considerations to determine appropriate stormwater quality control measures for the project.

3.1 VICINITY MAP

3.2 PROJECT SUMMARY INFORMATION

Pre-Project

The existing site is currently occupied by an existing high school campus, that includes: an on-site parking lot at the northwest corner and along Yukon Ave, a bus parking lot along 104th street, instructional and administrative buildings, baseball field, tennis courts, softball field, basketball courts, football field with metal bleachers, track & field, and paved walkways and landscaping throughout the campus grounds.

The existing project area has an average slope of 2.0% draining in the southwesterly direction. Majority of the existing drainage is captured within landscape and hardscape area drains and piped into an underground storm drain system. The northwest corner, that includes a parking lot and bus parking lot, surface drains off-site to Yukon Ave, and then south to an underground storm drain system

Post-Project

In the post-project conditions, proposed campus upgrades include new athletic fields, parking lots, and walkways. Storm water runoff will mimic the existing drainage conditions. Storm drain inlets throughout the site and new athletic fields will capture surface flow into an underground storm drain pipe network.

The runoff is then routed into underground stormcapture infiltration vaults to the south and southwest where the SWQDv will be retained on site while additional overflow is discharged through an emergency outlet that discharges into the existing storm drain system to the southwest of the project area.

Percent Area Impervious Created or Replaced

The “Percent Area Impervious Created or Replaced” found was 100%. Since the impervious area created or replaced for the new development is greater than 50% of the impervious area of the previously existing development, the proposed development is required to retain 100% the SWQDv.

3.3 WATERSHED

The proposed development is located within the Dominguez Channel and Los Angeles/Long Beach Harbors Watershed and is part of the Dominguez Channel and Los Angeles/Long Beach Harbors Watershed Management Area. Surface flow from the project enters the municipal storm drain system which outlets into the Dominguez Channel and ultimately discharges into the Pacific Ocean.

Region:	Los Angeles Regional Water Quality Control Board (LARWQCB)
Receiving Water:	Dominguez Channel
Watershed:	Dominguez Channel and Los Angeles/Long Beach Harbors Watershed
303(d) Listing:	Ammonia, Copper, Dieldrin, Indicator bacteria, Lead, Sediment, Toxicity, Zinc

3.4 GEOTECHNICAL CONDITIONS

Geotechnical information outlined below was taken from the Geotechnical Report prepared by Koury Engineering & Testing, Inc., dated January 22, 2020.

Geologic Setting: The subsurface soil profile consists of fill underlain by alluvial deposits. The fill depth was found to range between about 2 and 5 feet at the boring locations. Deeper fill may be encountered at utility locations, or at other locations between and beyond the borings. Except for Boring B-5 where 6 inches of asphalt was encountered, the asphalt pavement thickness at the boring locations consisted of about 3½ to 5 inches of asphalt concrete. The asphalt was found to be underlain by 2 to 3 inches of aggregate base except for Boring B-4 that indicated 6 inches of base. Except for Boring B-2 drilled in the southwest portion of the campus in relatively close vicinity of Yukon Avenue South where clayey sand was encountered, the fill materials encountered in the borings consisted generally of firm to stiff sandy lean clay. The fill encountered were generally moist to very moist. With a few exceptions, the underlying alluvium consists predominantly of interbedded sandy lean clay with clayey sand and silty sand. Interbeds of poorly graded sand were encountered in Borings B-6 and B-9 at depths exceeding 13 feet below the ground surface. The sandy clay alluvial soils are generally stiff to very stiff, and the sand are medium dense to dense.

Groundwater: The site lies at approximately elevations 88 to 112 feet (NAVD88). Groundwater was not encountered in the borings drilled for this study. The Seismic Hazard Zone Report for the Inglewood 7.5-Minute Quadrangle, Los Angeles County CA, Seismic Hazard Zone Report 029, Department of Conservation, Division of Mines and Geology indicates that the historic high groundwater is at least 50 feet below ground surface (see Figure A-5 for the Historic High Groundwater Map).

3.5 GEOTECHNICAL HAZARDS

Geotechnical information outlined below was taken from the Geotechnical Report prepared by Koury Engineering & Testing, Inc., dated January 22, 2020.

The subject site is not located within an Alquist-Priolo Earthquake Fault Zone.

The site is not located in a Landslide Hazard Zone on the State of California Seismic Hazard Zones Map (Figure A-4 in Appendix A). No evidence for land sliding was observed on or in the immediate vicinity of the site at the time of our field exploration. Based on topographic conditions, land sliding is not considered a potential hazard at the site.

The Liquefaction Hazards zone on the State of California Seismic Hazards Zones Map (Figure A-4 in Appendix A) indicates that the site is not located in a liquefaction susceptibility zone. Due to the absence of shallow groundwater, the presence of clayey soils and some medium dense to dense sands, it is our opinion that the potential for liquefaction is remote.

Flooding is not considered a high potential hazard to the site.

The onsite soils have been mapped as older alluvium and the soils at shallow depth have moisture contents that are near or above optimum, which aid in mitigating collapse potential. Our laboratory tests did not indicate significant collapse. Therefore, the potential for collapse is considered low. Over-excavation and re-compaction, and appropriate drainage are recommended to mitigate the potential for hydrocollapse.

3.6 SITE DESIGN PRINCIPLES

Site design can protect sensitive environmental features. The intention of site design principles is to reduce stormwater peak flows and volumes and other impacts associated with land development. The following text discusses the low impact development BMPs outlined in the LID Manual with respect to the project. Italicized text is taken directly from the LID Manual and reproduced for this report. Portions of the italicized text are condensed from the LID Manual. Immediately following and written in regular text, will be the response as it applies to the project.

Site Planning

- *Project applicants must implement a holistic approach to site design in order to develop a more hydraulically-functional site, help to maximize the effectiveness of on-site retention, and integrate stormwater management throughout the project site. Early project site planning can identify physical site constraints, reduce costs of downstream stormwater quality control measures, and prevent potential project site re-design.*
  Response:
  The project site layout conforms to natural landforms.

Protect and Restore Natural Areas

- *Conservation of natural areas, soils, and vegetation helps to retain numerous functions of pre-development hydrology, including rainfall interception, infiltration, and evapotranspiration. Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Sensitive areas, such as streams and their buffers, floodplains, wetlands, steep slopes, and highly-permeable soils, should be protected and/or restored. Slopes can be a major source of sediment and should be properly protected and stabilized. Locating development in less sensitive areas of a project site and conserving naturally vegetated areas can minimize environmental impacts from stormwater runoff.*

  Response:
  The site is currently developed, and therefore there is no opportunity to preserve existing natural vegetation. The proposed site will include new landscaping and new trees.

Minimize Impervious Area

- *The potential for discharge of pollutants in stormwater runoff from a project site increases as the percentage of impervious area within the project site increases because impervious areas increase the volume and rate of stormwater runoff. Pollutants deposited on impervious areas are easily mobilized and transported by stormwater runoff. Minimizing impervious area through site design is an important method to reducing the pollutant load in stormwater runoff. In addition to the environmental and aesthetic benefits, a highly pervious site may allow reduction of potential downstream conveyance and stormwater quality control measures, yielding savings in development costs. Minimizing impervious area will also reduce the stormwater runoff coefficient, which is directly proportional to the volume of stormwater runoff that must be retained on-site.*

  Response:
  The project incorporates landscaping/vegetated areas onsite to minimize the impervious footprint.

4.0 SOURCE CONTROL MEASURES

Source control measures are designed to prevent pollutants from contacting stormwater runoff or prevent discharge of contaminated stormwater runoff to the storm drain system and/or receiving water. This section describes structural type, source control measures that will be considered for implementation in conjunction with appropriate non-structural source control measures. The following text discusses the source control measures BMPs from the LID Manual with respect to the project. Italicized text is taken directly from the LID Manual, and reproduced for this report. Portions of the italicized text are condensed from the LID Manual. Immediately following and written in regular text, will be the response as it applies to the project. For more information regarding the Source Control Measures outlined below, see Appendix D from the LID Manual.

S-1: Storm Drain Message and Signage

- *Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.*

- *Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., "No Dumping – Drains to the Ocean") are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.*

Response:
All catch basins with open grates within the project site will be stenciled.

S-2: Outdoor Material Storage

- *Design specifications for material storage areas are regulated by local building and fire codes, ordinances, and zoning requirements. Source control measures presented in the LID Manual are intended to enhance and be consistent with local code and ordinance requirements while addressing stormwater runoff concerns. The design specifications, presented in Table D-2 in the LID Manual, must be incorporated into the design of outdoor material storage areas when stored materials could contribute pollutants to the storm drain system. The level of controls required varies relative to the risk category of the material stored.*

  Response:
  The project does not propose any outdoor material storage areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-3: Outdoor Trash Storage and Waste Handling Area

- *Wastes from commercial and industrial sites are typically hauled away for disposal by either public or commercial carriers that may have design or access requirements for waste storage areas. Design specifications for waste handling areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. The design specifications, listed below in Table D-3, are recommendations and are not intended to conflict with requirements established by the waste hauler. The design specifications are intended to enhance local codes and ordinances while addressing stormwater runoff concerns. The waste hauler should be contacted prior to the design of trash storage and collection areas to determine established and accepted guidelines for designing trash collection areas. All hazardous waste must be handled in accordance with the legal requirements established in Title 22 of the California Code of Regulations. Conflicts or issues should be discussed with LACDPW staff.*

  Response:
  The project site does not propose storage areas for trash storage areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor trash storage area will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-4: Outdoor Loading/Unloading Dock Area

- *Design specifications for outdoor loading/unloading dock areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. Additionally, individual businesses may have their own design or access requirements for* *loading docks. Design specifications presented in this fact sheet are intended to enhance and be consistent with these code and ordinance requirements while addressing stormwater runoff concerns. The design specifications presented in Table D-4 are not intended to conflict with requirements established by individual businesses, but should be followed to the maximum extent practicable.*

Response:
The project does not propose any outdoor loading and unloading dock areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-5: Outdoor Vehicle/Equipment Repair/Maintenance Area

- *Design specifications for vehicle and equipment repair/maintenance areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. The design specifications presented in this fact sheet are intended to enhance and be consistent with these code and ordinance requirements while addressing stormwater runoff concerns. The design specifications required for vehicle and equipment repair/maintenance areas are presented in Table D-5. All wash water and hazardous and toxic wastes must be prevented from entering the storm drain system.*

  Response:
  The project does not propose any outdoor vehicle equipment repair areas, or outdoor vehicle maintenance areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-6: Outdoor Vehicle/Equipment/Accessory Washing Area

- *Design specifications for vehicle/equipment/accessory washing areas are regulated by local building and fire codes and current County ordinances and zoning requirements. The design specifications presented in Table D-6 are intended to enhance and be consistent with these requirements while addressing stormwater runoff concerns. All wash water and hazardous and toxic wastes must be prevented from entering the storm drain system.*

  Response:
  The project does not propose any outdoor vehicle equipment areas or outdoor vehicle accessory washing areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-7: Fuel and Maintenance Area

- *Design specifications for fuel and maintenance areas are regulated by local building and fire codes and current County ordinances and zoning requirements. The design* *specifications presented in Table D-7 are intended to enhance and be consistent with these code and ordinance requirements while addressing stormwater runoff concerns.*

Response:

The project does not propose any fuel and maintenance areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-8: Landscape Irrigation Practices

- *Choose plants that minimize the need for fertilizer and pesticides.*
- *Group plants with similar water requirements and water accordingly.*
- *Use mulch to minimize evaporation and erosion.*
- *Include a vegetative boundary around project site to act as a filter.*
- *Design the irrigation system to only water areas that need it.*
- *Install an approved subsurface drip, pop-up, or other irrigation system. The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.*
- *Install rain sensors to shut off the irrigation system during and after storm events.*
- *Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.*
- *If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).*
- *For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.*
- *Implement Integrated Pest Management practices*
- *For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.*

Response:

Irrigation practices and systems for the project will be designed pursuant to the guidelines shown above and in the LID Manual.

S-9: Building Material Selection

Lumber

- *Decks and other house components constructed using pressure-treated wood that is typically treated using arsenate, copper, and chromium compounds are hazardous to the environment. Pressure-treated wood may be replaced with cement-fiber or vinyl.*

Roofs, Fencing, and Metals

- *Minimizing the use of copper and galvanized (zinc-coated) metals on buildings and fencing can reduce leaching of these pollutants into stormwater runoff. The following building materials are conventionally made of galvanized metals:*
    - *Metal roofs*
    - *Chain-link fencing and siding*
    - *Metal downspouts, vents, flashing, and trim on roofs.*

  Architectural use of copper for roofs and gutters should be avoided. As an alternative to copper and galvanized materials, coated metal products are available for both roofing and gutter application. Vinyl-coated fencing is an alternative to traditional galvanized chain-link fences. These products eliminate contact of bare metal with precipitation or stormwater runoff, and reduce the potential for stormwater runoff contamination. Roofing materials are also made of recycled rubber and plastic. Green roofs may be an option. Green roofs use vegetation such as grasses and other plants as an exterior surface. The plants reduce the velocity of stormwater runoff and absorb water to reduce the volume of stormwater runoff. One potential problem with using green roofs in the Los Angeles County area is the long, hot and dry summers, which may kill the plants if they are not watered. See the Green Roof Fact Sheet (RET- 7) in Appendix E of the LID Manual.

  Response:
  Building material selection will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-10: Animal Care and Handling Facilities

- *Site barns, corrals, and pastures on property that drains away from the storm drain system and receiving waters.*
- *Locate animal washing areas, pastures, horse riding areas, stalls, or cages at least 50 feet away from storm drains, domestic wells, septic tank or leach field sites, and receiving waters.*
- *Design berms, gutters, or grassed ditches to divert stormwater runoff away from animal area, storm drain system, and receiving waters.*
- *Cover animal enclosures (i.e., stables) to protect them from precipitation.*
- *Prevent animals from entering sensitive environmental areas.*
- *Regularly sweep or shovel animal holding areas.*

  Response:
  The project does not propose any animal care or handling facilities. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

S-11: Outdoor Horticulture Areas

- *Do not allow wash water from the horticulture area to drain directly to the storm drain system or receiving waters*

Response:
The project does not propose outdoor horticulture areas. If these conditions change, it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines outlined above and in the LID Manual.

5.0 STORMWATER QUALITY DESIGN VOLUME CALCULATIONS

Current water quality requirements are based on treating a specific volume of stormwater runoff from the project site (stormwater quality design volume [SWQDv]). By treating the SWQDv, it is expected that pollutant loads, which are typically higher during the beginning of storm events, will be reduced or prevented from reaching the receiving waters.

5.1 DESIGN STORM EVENT

The design storm, for which the SWQDv is calculated, is defined as the greater of:

- *The 0.75-inch, 24-hour rain-event; or*
- *The 85th percentile, 24-hour rain event as determined from the Los Angeles County 85th percentile precipitation isoheytal map.*

It was determined that the 85th percentile, 24-hour rain event will be the design storm for which the SWQDv will be calculated for this project site as shown below.

The 85th percentile, 24-hour rain = 1.0-inch > 0.75-inches **[Use the 85th percentile]**

Note:
The 85th percentile, 24-hour rain event precipitation was found using the Los Angeles County Hydrology Map GIS Viewer, see **Appendix C**.

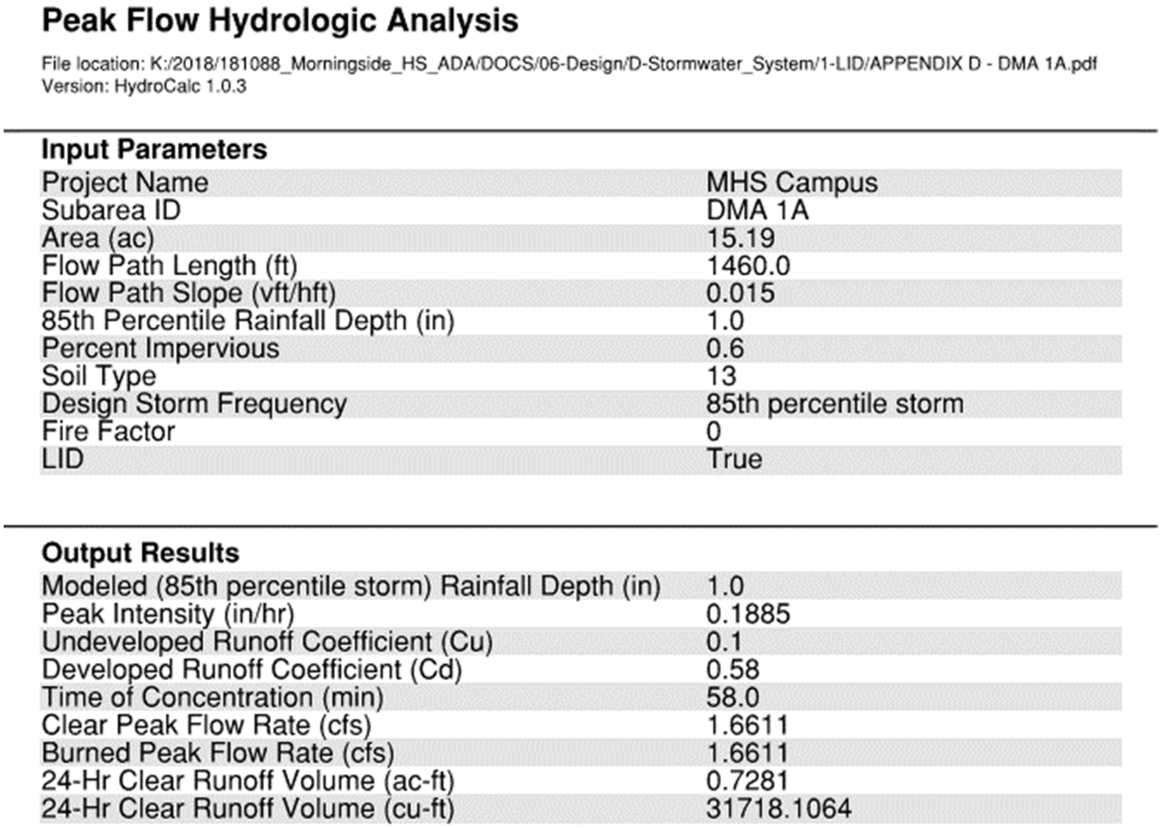
5.2 STORMWATER QUALITY DESIGN VOLUME (SWQDV)

The project site was determined to be a Designated Project, therefore the project site is required to retain 100% of the SWQDv on-site or provide biotreatment for 1.5 times the SWQDv. The SWQDv for the site was calculated using the HydroCalc software developed by Los Angeles County Department of Public Works (LACDPW). The software completes the full MODRAT calculation process and produces the peak stormwater runoff flow rates and volumes for single subareas. HydroCalc is limited to watersheds and project areas up to 40 acres.

The SWQDv required to be treated is summarized below.

HydroCalc Analysis – 85TH Percentile Storm

DMA 1A & 1B:



Peak Flow Hydrologic Analysis

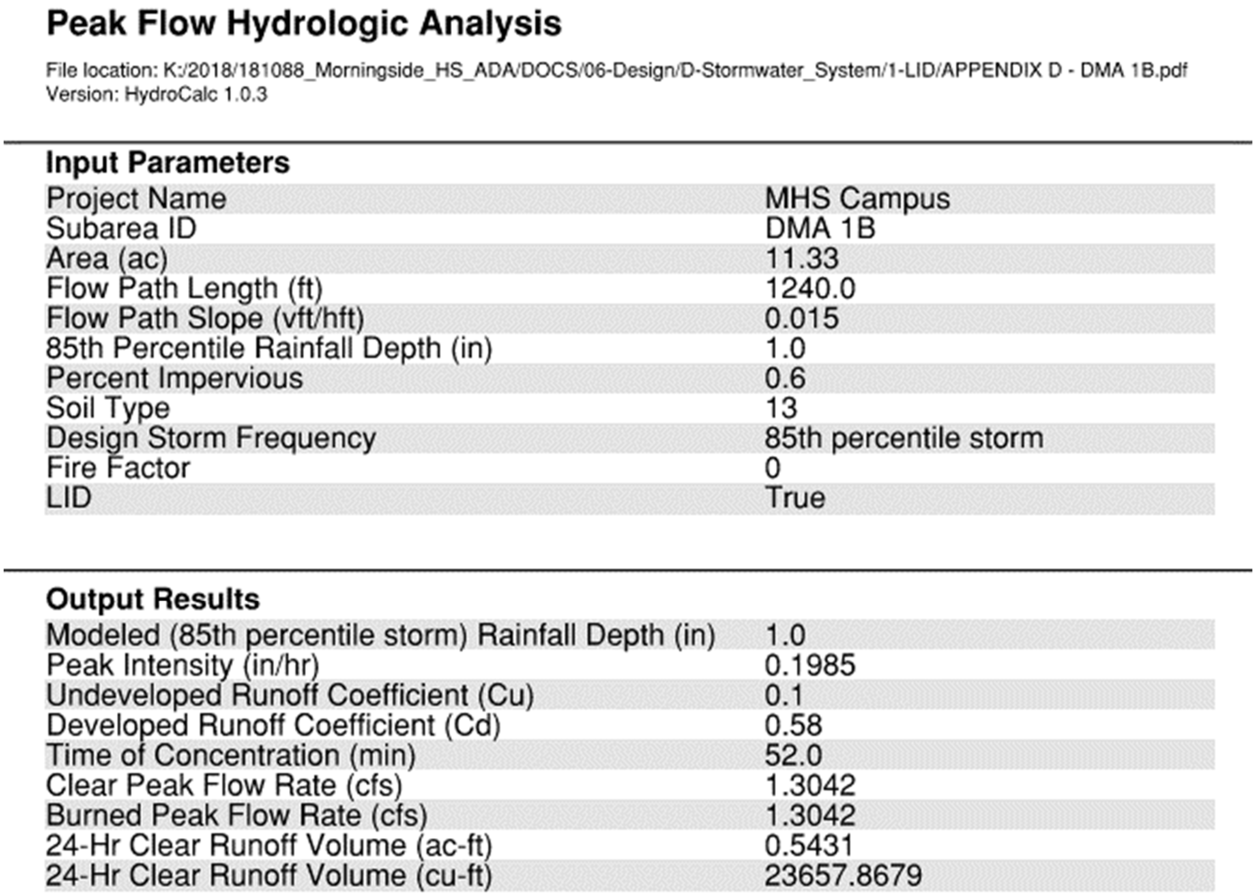
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 1A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 1A
Area (ac)	15.19
Flow Path Length (ft)	1460.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1885
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	58.0
Clear Peak Flow Rate (cfs)	1.6611
Burned Peak Flow Rate (cfs)	1.6611
24-Hr Clear Runoff Volume (ac-ft)	0.7281
24-Hr Clear Runoff Volume (cu-ft)	31718.1064



Peak Flow Hydrologic Analysis

File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 1B.pdf
Version: HydroCalc 1.0.3

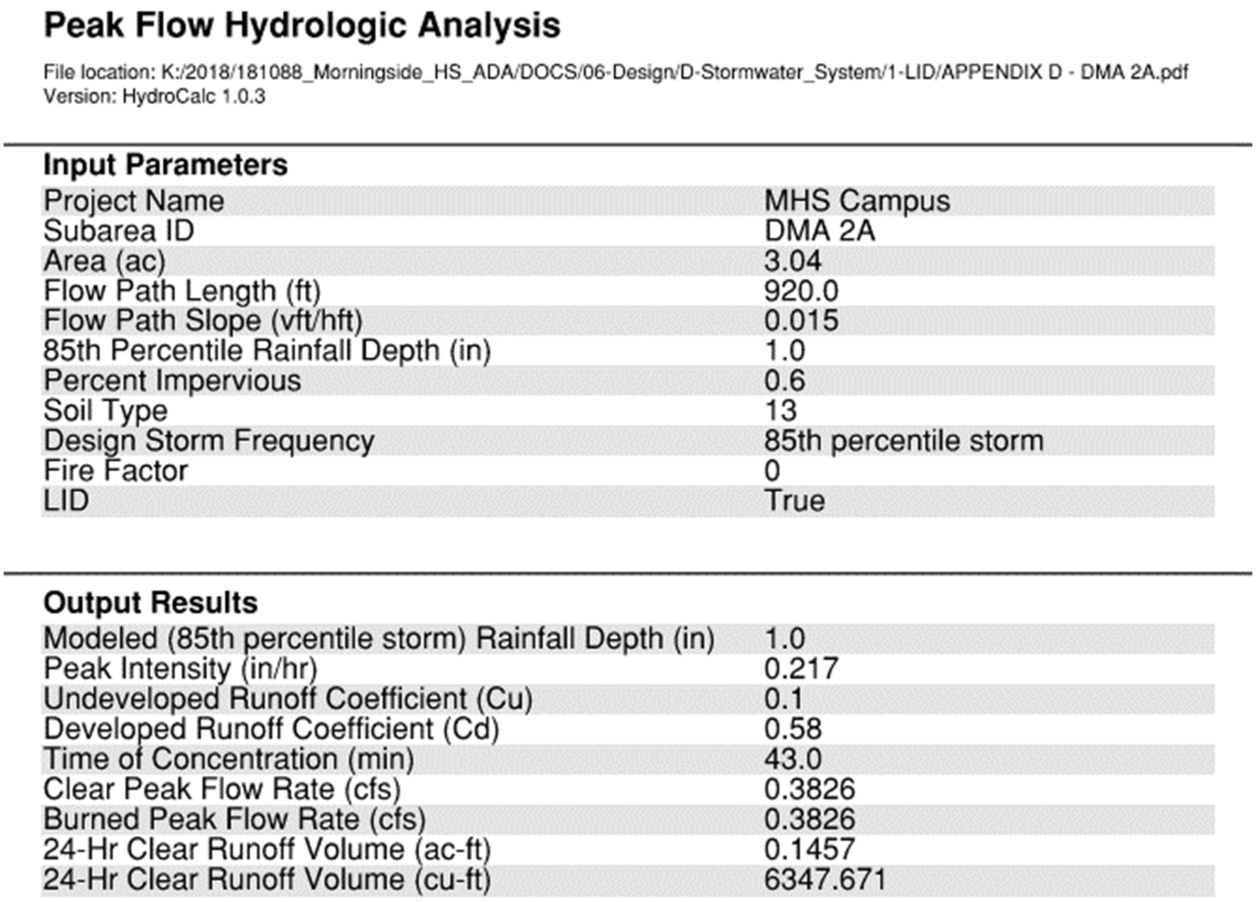
Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 1B
Area (ac)	11.33
Flow Path Length (ft)	1240.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1985
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	52.0
Clear Peak Flow Rate (cfs)	1.3042
Burned Peak Flow Rate (cfs)	1.3042
24-Hr Clear Runoff Volume (ac-ft)	0.5431
24-Hr Clear Runoff Volume (cu-ft)	23657.8679

DMA 2A & 2B:



Peak Flow Hydrologic Analysis

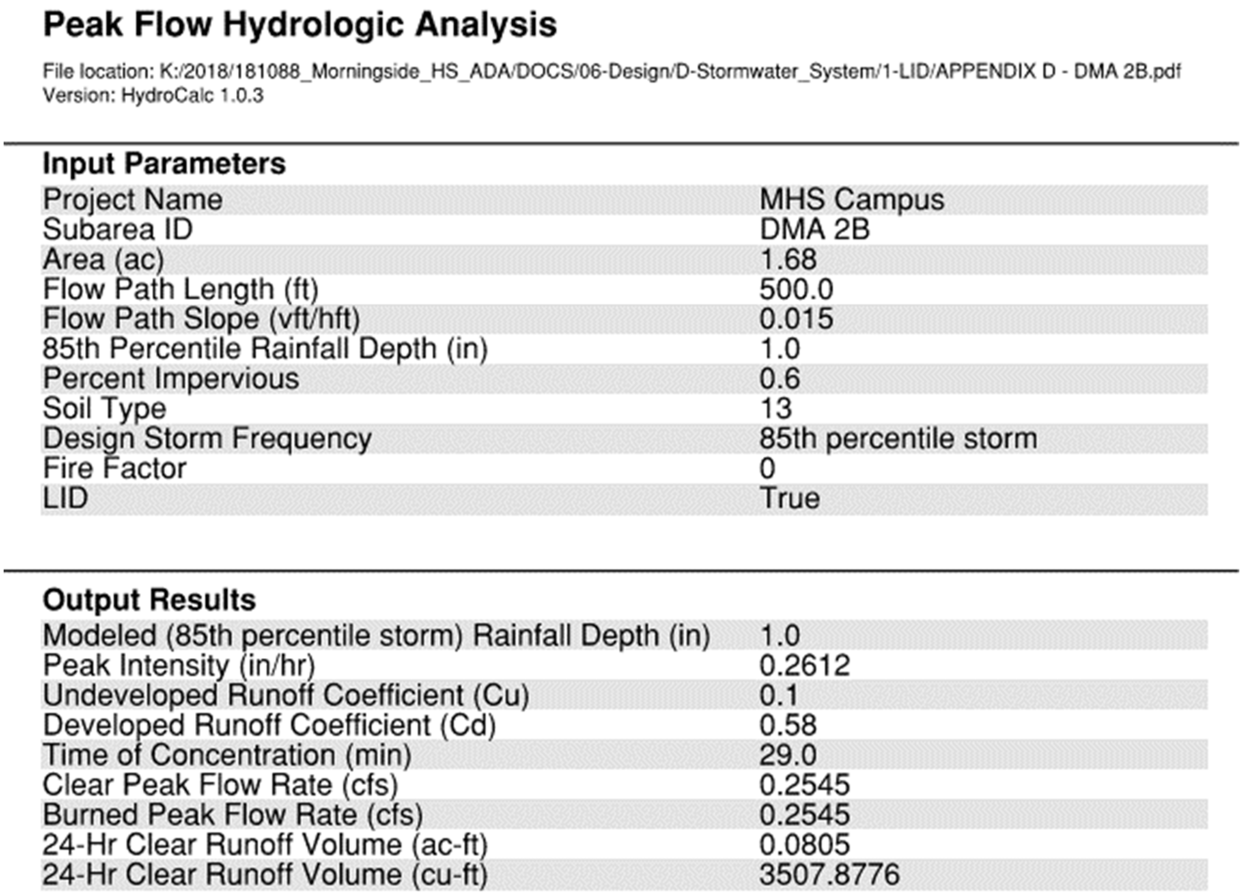
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 2A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 2A
Area (ac)	3.04
Flow Path Length (ft)	920.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.217
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	43.0
Clear Peak Flow Rate (cfs)	0.3826
Burned Peak Flow Rate (cfs)	0.3826
24-Hr Clear Runoff Volume (ac-ft)	0.1457
24-Hr Clear Runoff Volume (cu-ft)	6347.671



Peak Flow Hydrologic Analysis

File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 2B.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 2B
Area (ac)	1.68
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2612
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	29.0
Clear Peak Flow Rate (cfs)	0.2545
Burned Peak Flow Rate (cfs)	0.2545
24-Hr Clear Runoff Volume (ac-ft)	0.0805
24-Hr Clear Runoff Volume (cu-ft)	3507.8776

6.0 STORMWATER QUALITY CONTROL MEASURES

Stormwater quality control measures are required to augment site design principles and source control measures to reduce the volume of stormwater runoff and potential pollution loads in stormwater runoff to the maximum extent practicable. Stormwater quality control measures are designed to handle the frequent, smaller storm events, or the initial volume of stormwater runoff from larger storm events (typically referred to as first flush events). The first flush of larger storm events is the initial period of the storm where stormwater runoff typically carries the highest concentration and loads of pollutants. Small, frequent storm events represent most of the total annual average precipitation in the County. The LID Ordinance requires that all Designated Projects retain the SWQDv on-site using retention-based stormwater quality control measures (infiltration and/or stormwater runoff harvest and use) or biofiltrate 1.5 times the SWQDv if infiltration is not feasible.

Based on the percolation test performed by Koury Engineering & testing, Inc., on June 29, 2021, the minimum design percolation rate was 3.2 in/hr. Based on these percolation rate results, it is feasible to infiltrate the full SWQDv for the site. See Appendix E for calculations.

All the stormwater quality control measures outlined in the LID Manual were evaluated. It was determined that the most practicable treatment BMP for the project will be the following:

- (4) Underground Infiltration Vaults

6.1 UNDERGROUND INFILTRATION SIZING

Stormwater runoff is intercepted by a series of inlet drains within the surrounding landscaping as well as the roof downspouts and is conveyed through underground storm drain pipe into the underground infiltration vaults. The underground infiltration vaults are designed to infiltrate the SWQDv of 65,233 cf for the project site. Overflow for excess stormwater will be conveyed through an emergency outlet device in the underground infiltration system and into the existing storm drain to the south. Calculations for the infiltration vaults are available in **Appendix E**.

7.0 HYDROMODIFICATION

All Designated projects located within natural drainage systems that have not been improved or drainage systems that are tributary to a natural drainage system are required to implement hydromodification controls.

Projects may be exempt from implementation of hydromodification control measures where assessments of downstream channel conditions and proposed discharge hydrology indicate adverse hydromodification effects to beneficial uses of natural drainage systems are unlikely.

The proposed project has been determined to be **EXEMPT** from hydromodification requirements since it is discharges to concrete-lined channels. Therefore, the site does not have any adverse hydromodification impacts to natural drainage systems.

8.0 STORMWATER QUALITY CONTROL MEASURE MAINTENANCE

Continued effectiveness of stormwater quality control measures specified in the LID Standards Manual depends on on-going inspection and maintenance. All publicly maintained stormwater quality control measures must have easements for access and maintenance or be in lots dedicated to the County in fee title. To ensure that such maintenance is provided, LACDPW may require the submittal of a Maintenance Plan and execution of a Maintenance Agreement with the owner/operator of stormwater quality control measures. The property owner or his/her designee is responsible for complying with the Maintenance Agreement outlined in the LID Manual. A copy of the Maintenance Agreement is provided in **Appendix H.**

8.1 MAINTENANCE RESPONSIBILITY

The Owner of the project site is the site operator and will be the party responsible to ensure implementation and funding of maintenance of permanent BMPs.

It is anticipated that the owner of the project will manage multiple separate maintenance contracts for different types of maintenance (e.g., landscape maintenance vs. maintenance of the BMPs). Throughout this section, the owner of the project is the "party responsible to ensure implementation and funding of maintenance of permanent BMPs." The party who actually performs the activities is the "inspector," "maintenance contractor," or "maintenance operator."

8.2 INSPECTION AND MAINTENANCE FOR SOURCE CONTROL MEASURES

The following source control measures for the project requires permanent maintenance:

- Storm Drain Message and Signage
- Outdoor Trash Storage and Waste Handling
- Landscape Irrigation Practices

The discussions below provide inspection criteria, maintenance indicators, and maintenance activities for the above listed source control measures that require permanent maintenance.

S-1 Storm Drain Message and Signage

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaces as necessary). If required by the City, the owner/operator or homeowner's association shall enter into a maintenance agreement with the agency or record deed restriction upon the property title to maintain the legibility of placards and signs.

S-3 Outdoor Trash Storage and Waste Handling Area

The integrity of structural elements that are subject to damage (e.g., screens, covers, signs) must be maintained by the owner/operator as required by local codes and ordinances. Outdoor trash storage and waste handling areas must be checked periodically to ensure containment of accumulated water and prevention of stormwater run-on. Maintenance agreements between the City and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

S-8 Landscape Irrigation Practices

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Failure to properly maintain building and property may subject the property owner to citation.

8.3 INSPECTION AND MAINTENANCE FOR STORM QUALITY MEASURES

The following storm quality measure for the project requires permanent maintenance:

- Underground Infiltration System

The discussions below provide inspection criteria, maintenance indicators, and maintenance activities for the above listed storm quality measure that require permanent maintenance according to manufacturer recommendations. These proprietary systems shall be inspected and maintained per manufacturer specifications and recommendations. See **Appendix G** for the Operations and Maintenance of each BMP listed above.

8.4 INSPECTION AND MAINTENANCE FREQUENCY

The Table below lists the BMPs to be inspected and maintained and the minimum frequency of inspection and maintenance activities.

BMP	Inspection Frequency	Maintenance Frequency
Storm Drain Message and Signage	Monthly	Routine maintenance of marker and sign legibility and visibility. See Section 8.2.
Outdoor Trash Storage and Waste Handling	Monthly	Routine maintenance of structure and waste water within the trash area. See Section 8.2.
Landscape Irrigation Practices	Monthly	Routine trimming and trash removal; monthly non-routine maintenance as-needed based on maintenance indicators in Section 8.2.
Underground Infiltration System	Annual and after major storm events	Routine maintenance to clean the underground infiltration system of sediments, trash, and debris. As-needed maintenance based on maintenance indicators as outlined in **Appendix G**.

The frequencies given in the Summary Table of Inspection and Maintenance Frequency are minimum recommended frequencies for inspection and maintenance activities for the project. Typically, the frequency of maintenance required for permanent BMPs is site and drainage area specific. If it is determined during the regularly scheduled inspection and/or routine maintenance that a BMP requires more frequent maintenance (e.g., to remove accumulated trash) it may be necessary to increase the frequency of inspection and/or routine maintenance. If it is determined during the regularly scheduled inspection that the maintenance thresholds are consistently met or exceeded, it may be necessary to increase the frequency of inspection and routine maintenance.

8.5 RECORD KEEPING REQUIREMENTS

The party responsible to ensure implementation and funding of maintenance of permanent BMPs shall maintain records documenting the inspection and maintenance activities. The records must be kept a minimum of 5 years and shall be made available to the City of Inglewood for inspection upon request at any time.

9.0 SUMMARY

This Low Impact Development Report (LID) summarizes the permanent storm water management features proposed for the project site that will collectively meet the requirements set forth in the LID Manual. The project meets the hydromodification exemption criteria and is not required to implement hydromodification management facilities as discussed in Section 7.0 of this report.

The project is a "Designated Project," based on the LID Manual as discussed in Section 2.1.

Based on the "anticipated" pollutants of concern that may be generated on-site and identification of receiving waters that are listed as impaired on the 2010 CWA Section 303(d) List of Water Quality Limited Segments, the following are the project pollutants of concern: Ammonia, Copper, Dieldrin, Indicator bacteria, Lead, Sediment, Toxicity, and Zinc as outlined in Section 3.3 of this report.

In addition to treatment control BMPs, the project will incorporate source control BMPs which are described in Section 4.0 and Section 6.0.

The project includes a proposed network of storm water management features that will utilize source control measures to meet the requirements for stormwater quality design measure. The following list provides a summary of stormwater quality design measures selected for the project site:

- (4) underground infiltration vaults

The above stormwater quality design measure was selected for the project and provide "High" removal efficiency for the targeted pollutants of concern as discussed in Section 3.3 and Section 6.1.

The stormwater quality design measure maintenance in Section 8.0 of this report provides inspection criteria, maintenance indicators, and maintenance activities for the above-listed BMPs that require permanent maintenance.

This report accompanies a set of construction drawings and specifications which detail the construction, operation, and maintenance of the proposed Low Impact Development (LID) design elements for this site.

APPENDIX A

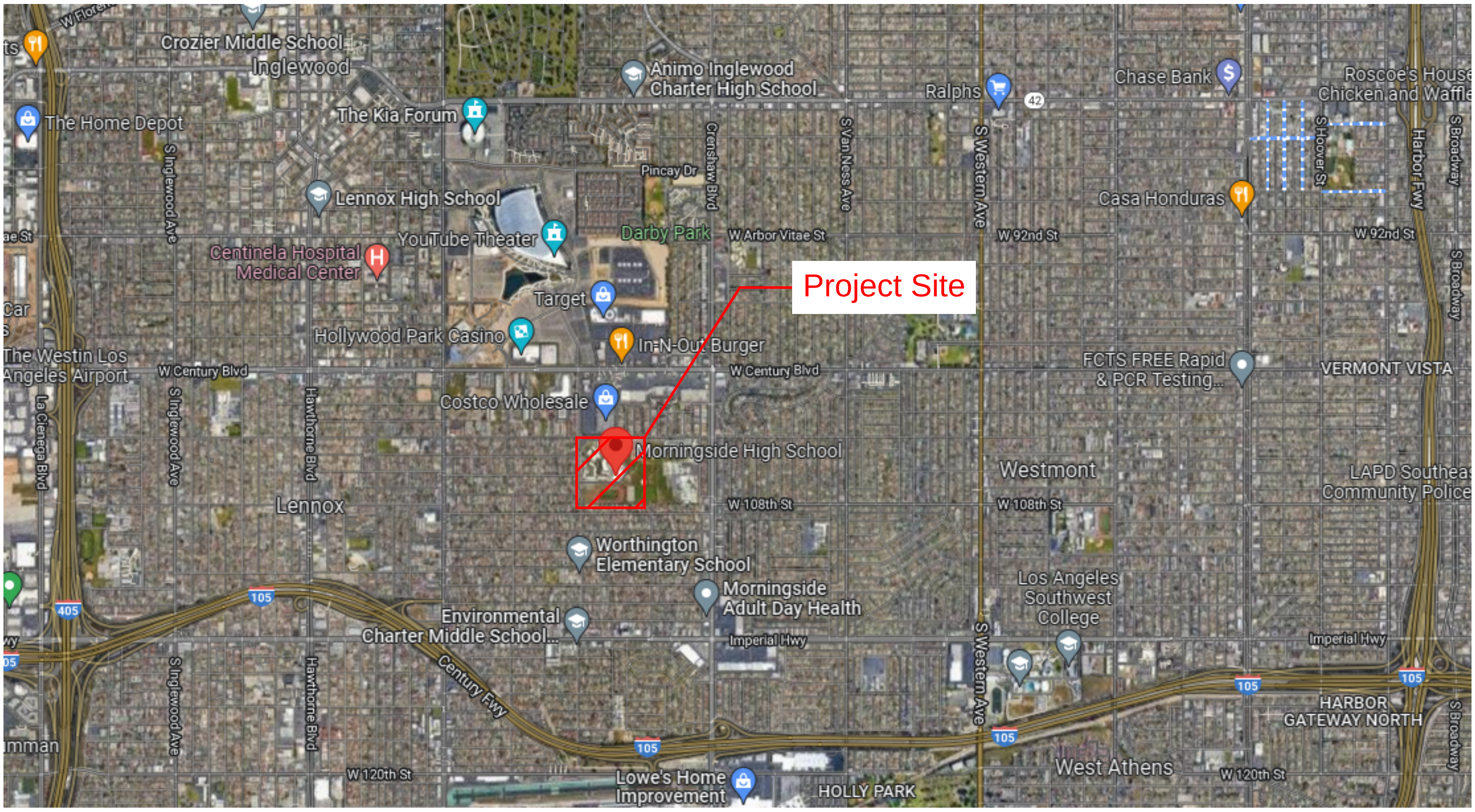
VICINITY MAP

Vicinity Map

For

Morningside High School

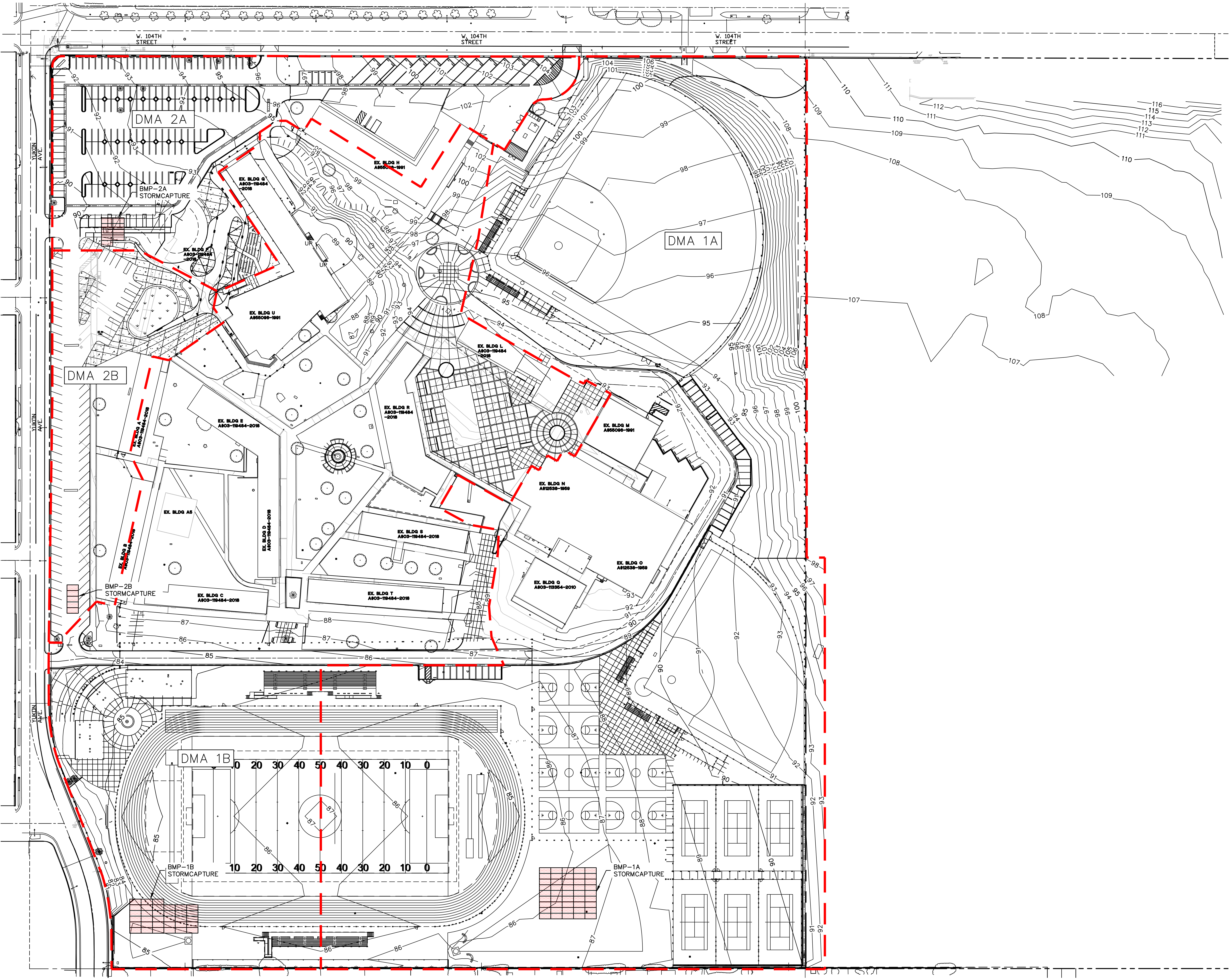
10500 Yukon Avenue
Inglewood, CA 90303



APPENDIX B

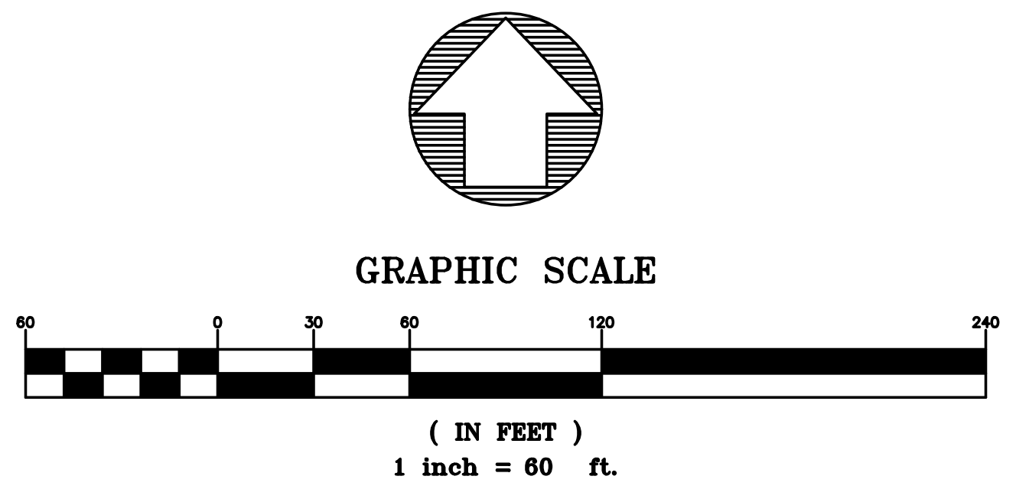
BMP SITE PLAN

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY



TREATMENT SUMMARY

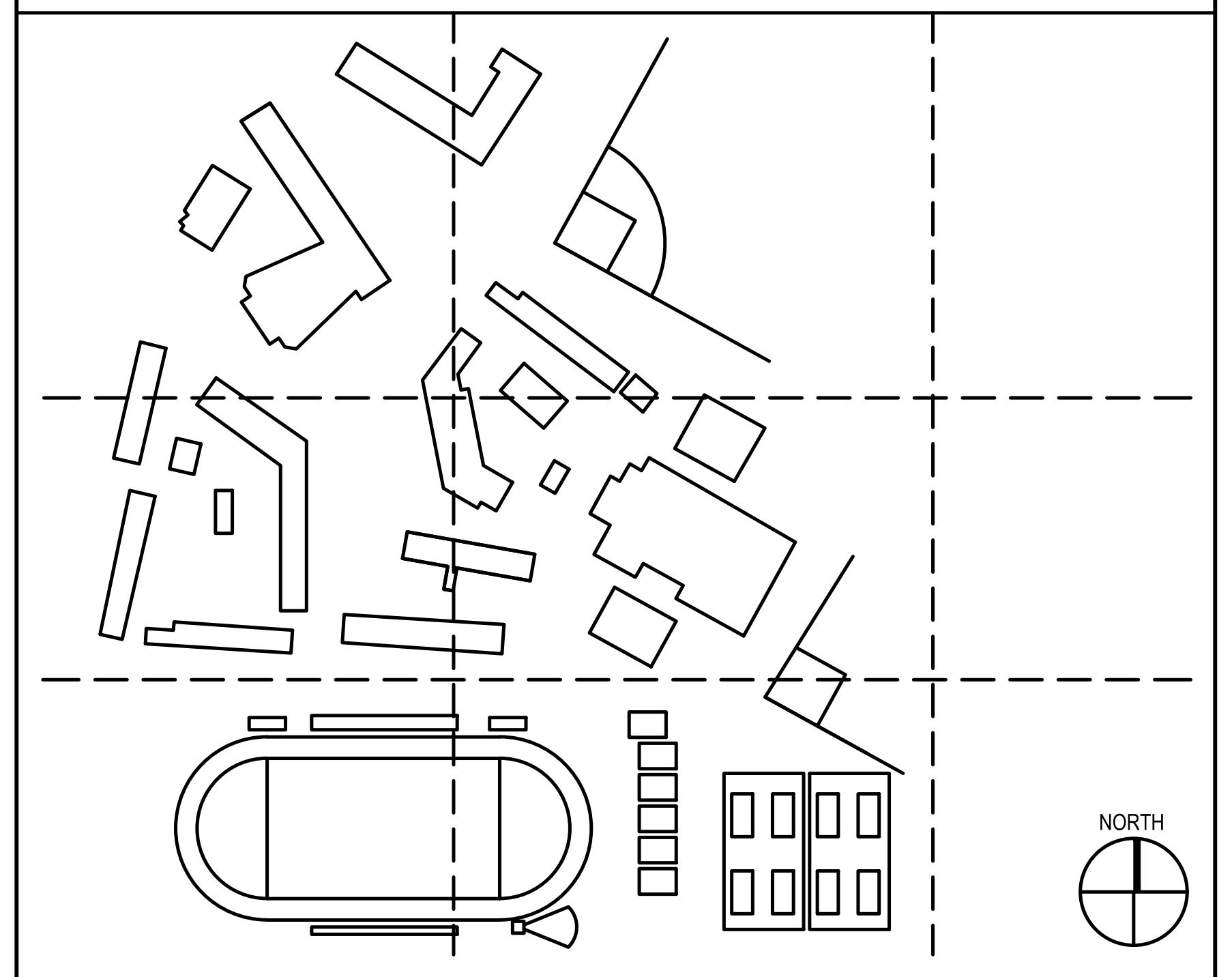
DRAINAGE MANAGEMENT AREA	AREA (ACRES)	LID BMP USED	V_M (CU-FT)	VOL PROVIDED (CU-FT)
DMA 1A	15.19	UNDERGROUND INFILTRATION VAULT (BMP-1A)	31,719	32,340
DMA 1B	11.33	UNDERGROUND INFILTRATION VAULT (BMP-1B)	23,658	24,255
DMA 2A	3.04	UNDERGROUND INFILTRATION VAULT (BMP-2A)	6,348	6,615
DMA 2B	1.68	UNDERGROUND INFILTRATION VAULT (BMP-2B)	3,508	3,675
TOTAL	31.24		65,233	66,885



LEGEND

- PROPERTY LINE
- CENTER LINE
- XX PROPOSED CONTOUR
- XX EXISTING CONTOUR
- DMA BOUNDARY
- FLOW LINE

KEY PLAN



4000 MacArthur Blvd., Suite 101
Newport Beach CA 92660
P 949.955.1919 F 949.955.9175
www.lionakis.com

CONSULTANT

ENGINEERS . SURVEYORS . PLANNERS

4675 MacArthur Court, Suite 400
Newport Beach, CA 92660
P 949.526.8460 F 949.526.8499
www.bkf.com

SEAL

PROJECT

MORNINGSIDE HIGH
SCHOOL SITE UPGRADE

10500 YUKON AVE S
INGLEWOOD, CA 90303

CLIENT

INGLEWOOD UNIFIED SCHOOL DISTRICT

401 S. INGLEWOOD AVE
INGLEWOOD, CA 90301

ISSUED

MARK	DATE	DESCRIPTION
	02/28/2020	DSA SUBMITTAL
	10/23/2020	DSA BACKCHECK

MANAGEMENT

LIONAKIS PROJECT NO:	018083
CLIENT PROJECT NO:	20181088
COPYRIGHT:	LIONAKIS 2015

TITLE

APPENDIX B
LID EXHIBIT

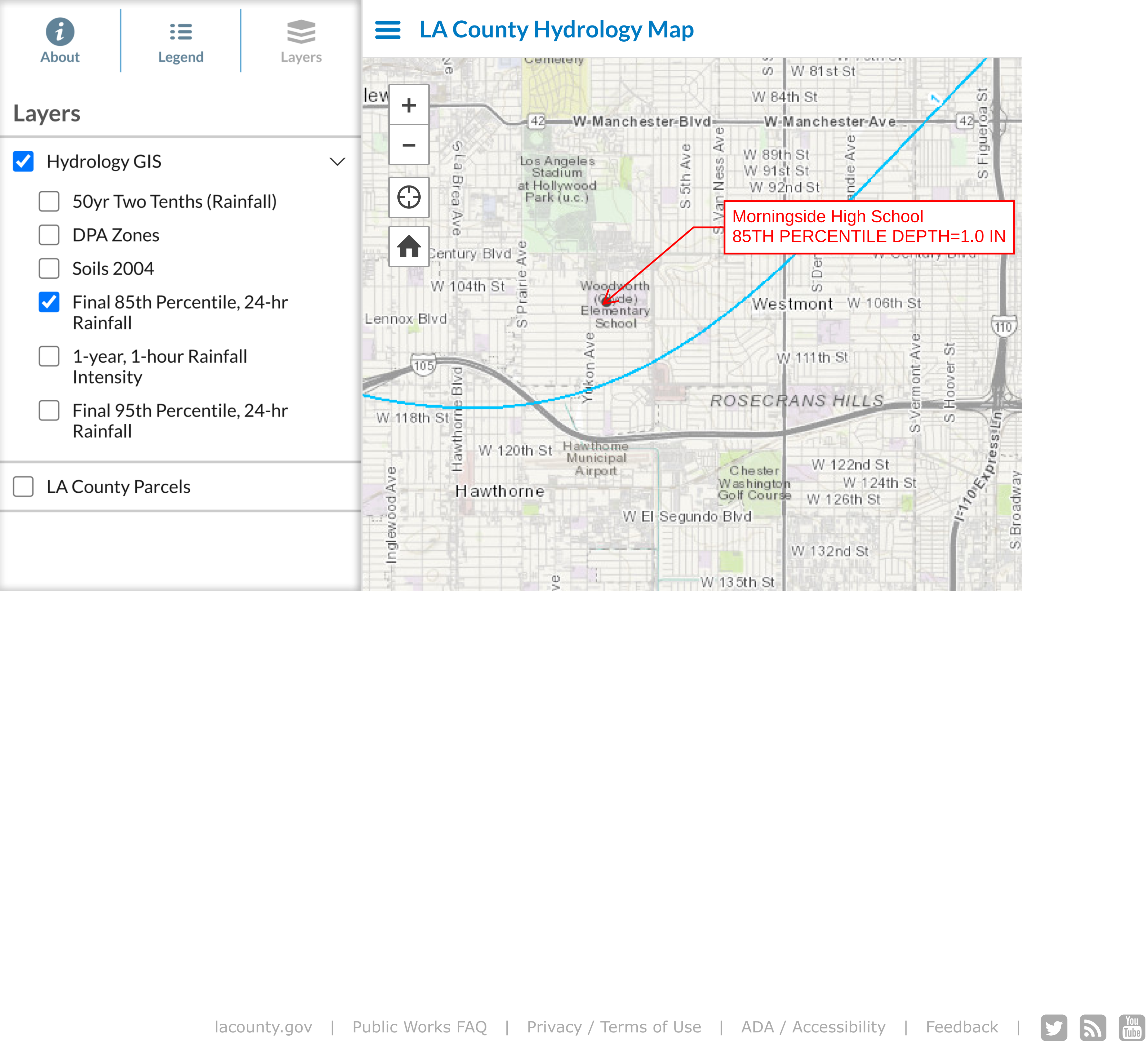
SHEET

C:\Users\Jason.Mackin\Documents_RevitLocalFiles\018083_BIM_A-MASTER_R18_CENTRAL_Jason.Mackin.rvt

11/30/2018 2:25:05 PM

APPENDIX C

COUNTY OF LOS ANGELES HYDROLOGY MAPS



LA County Hydrology Map

Layers

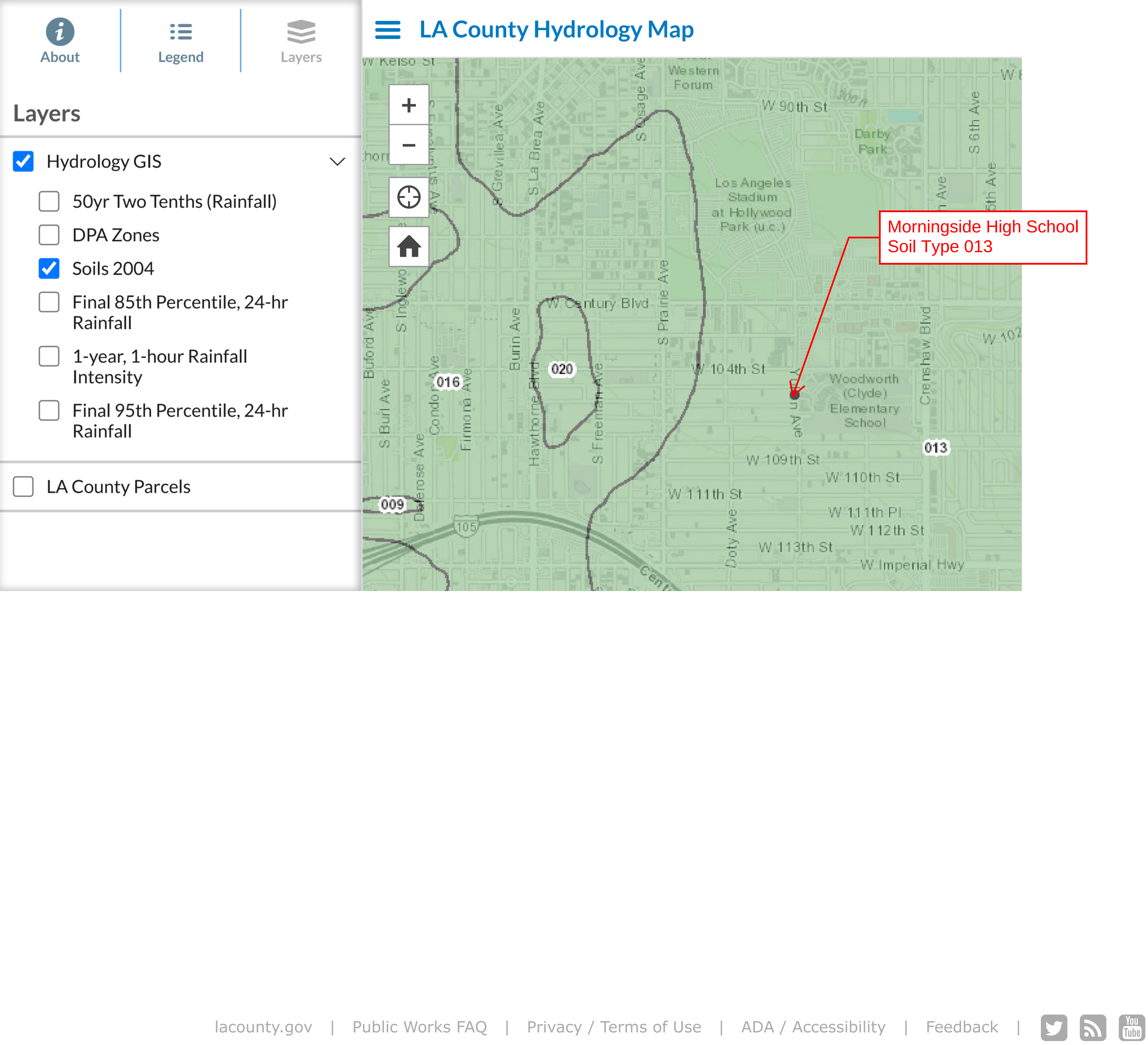
☑ Hydrology GIS

- ☐ 50yr Two Tenths (Rainfall)
- ☐ DPA Zones
- ☐ Soils 2004
- ☑ Final 85th Percentile, 24-hr Rainfall
- ☐ 1-year, 1-hour Rainfall Intensity
- ☐ Final 95th Percentile, 24-hr Rainfall

☐ LA County Parcels

Morningside High School
85TH PERCENTILE DEPTH=1.0 IN

lacounty.gov | Public Works FAQ | Privacy / Terms of Use | ADA / Accessibility | Feedback |



Layers

☑ Hydrology GIS

- ☐ 50yr Two Tenths (Rainfall)
- ☐ DPA Zones
- ☑ Soils 2004
- ☐ Final 85th Percentile, 24-hr Rainfall
- ☐ 1-year, 1-hour Rainfall Intensity
- ☐ Final 95th Percentile, 24-hr Rainfall

☐ LA County Parcels

Morningside High School
Soil Type 013

APPENDIX D

HYDROCALC OUTPUT - 85TH PERCENTILE STORM

Peak Flow Hydrologic Analysis

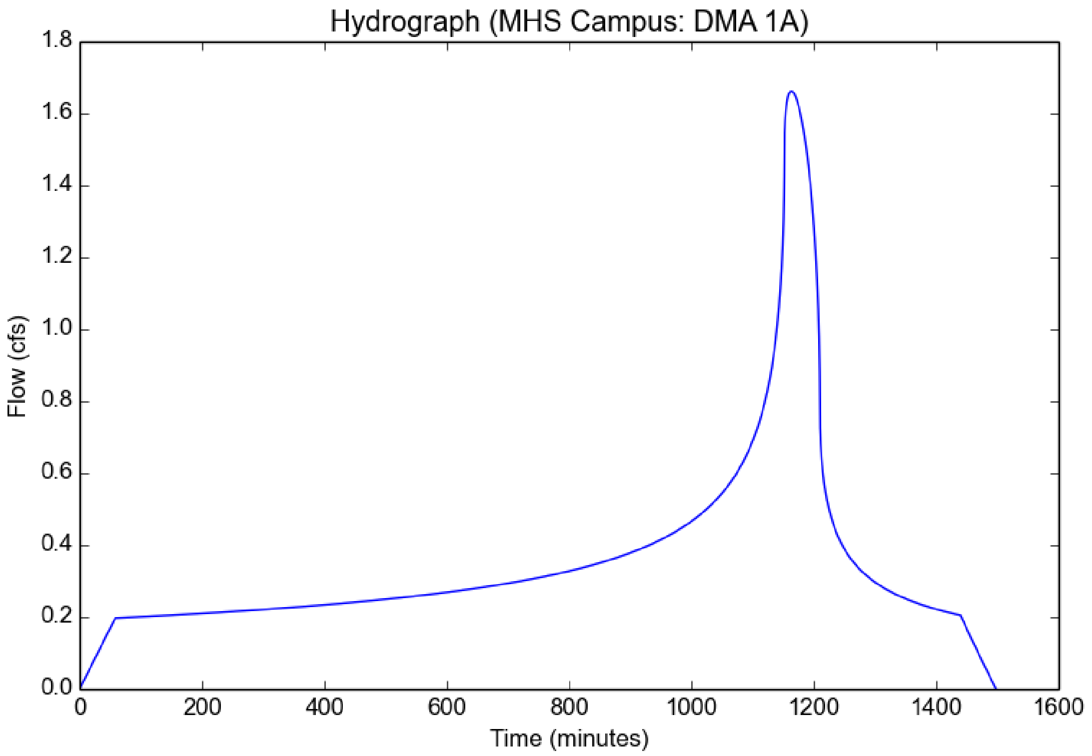
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 1A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 1A
Area (ac)	15.19
Flow Path Length (ft)	1460.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1885
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	58.0
Clear Peak Flow Rate (cfs)	1.6611
Burned Peak Flow Rate (cfs)	1.6611
24-Hr Clear Runoff Volume (ac-ft)	0.7281
24-Hr Clear Runoff Volume (cu-ft)	31718.1064



Peak Flow Hydrologic Analysis

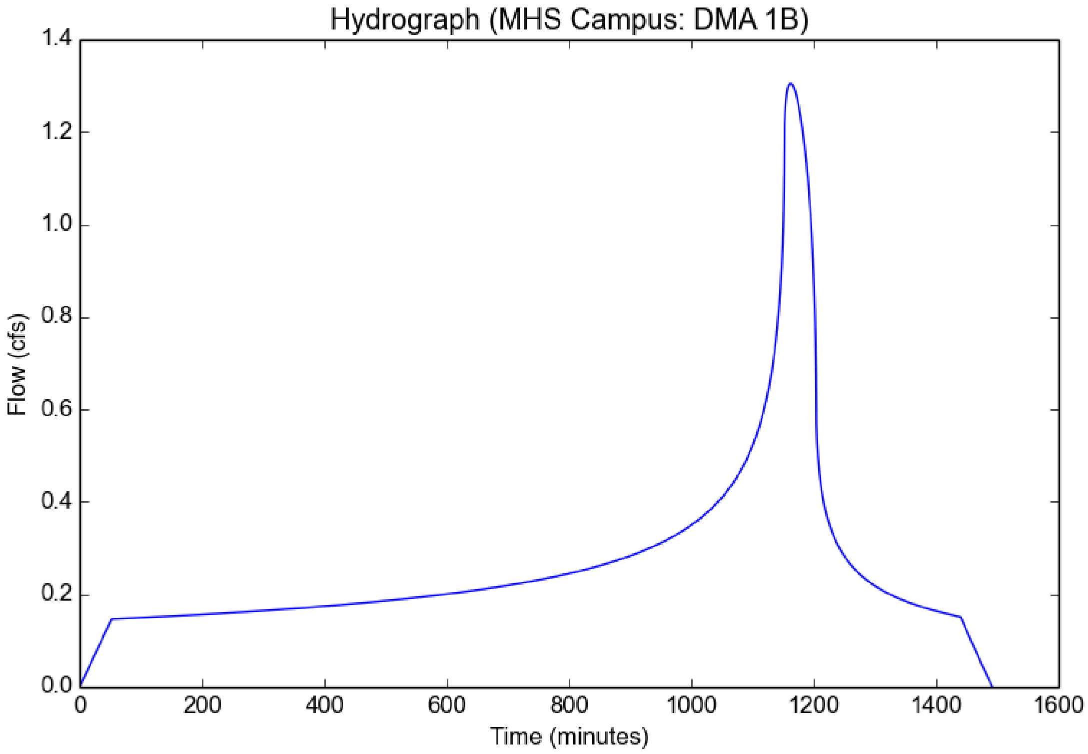
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 1B.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 1B
Area (ac)	11.33
Flow Path Length (ft)	1240.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1985
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	52.0
Clear Peak Flow Rate (cfs)	1.3042
Burned Peak Flow Rate (cfs)	1.3042
24-Hr Clear Runoff Volume (ac-ft)	0.5431
24-Hr Clear Runoff Volume (cu-ft)	23657.8679



Peak Flow Hydrologic Analysis

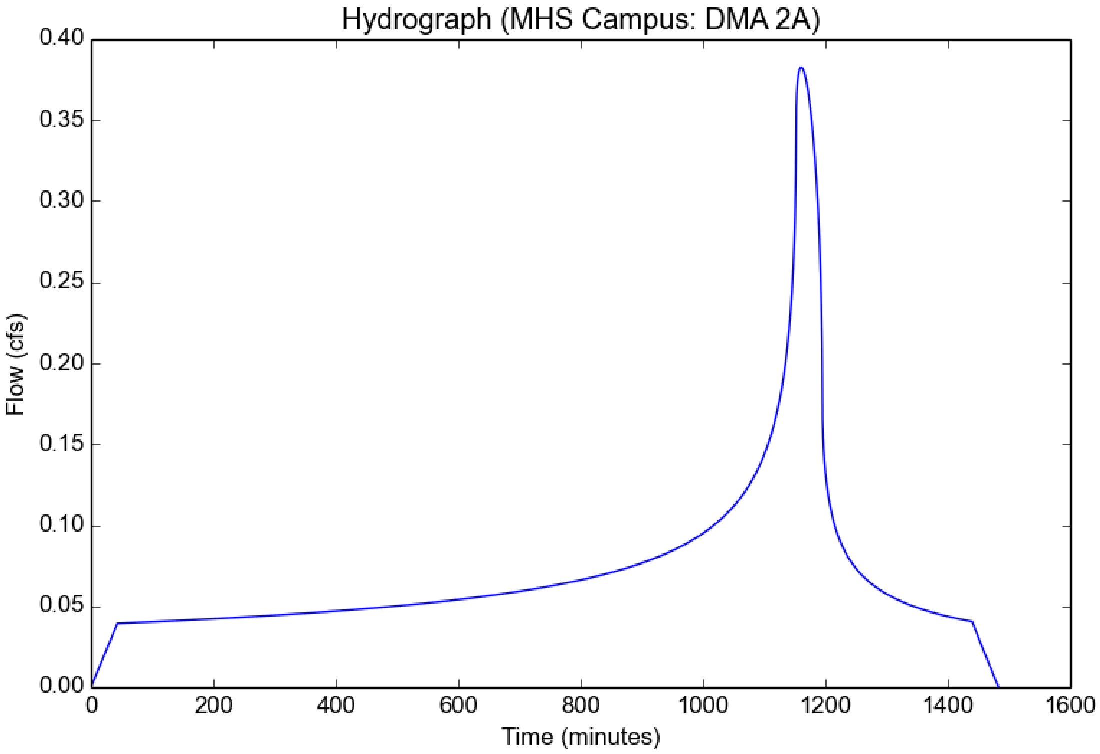
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 2A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 2A
Area (ac)	3.04
Flow Path Length (ft)	920.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.217
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	43.0
Clear Peak Flow Rate (cfs)	0.3826
Burned Peak Flow Rate (cfs)	0.3826
24-Hr Clear Runoff Volume (ac-ft)	0.1457
24-Hr Clear Runoff Volume (cu-ft)	6347.671



Peak Flow Hydrologic Analysis

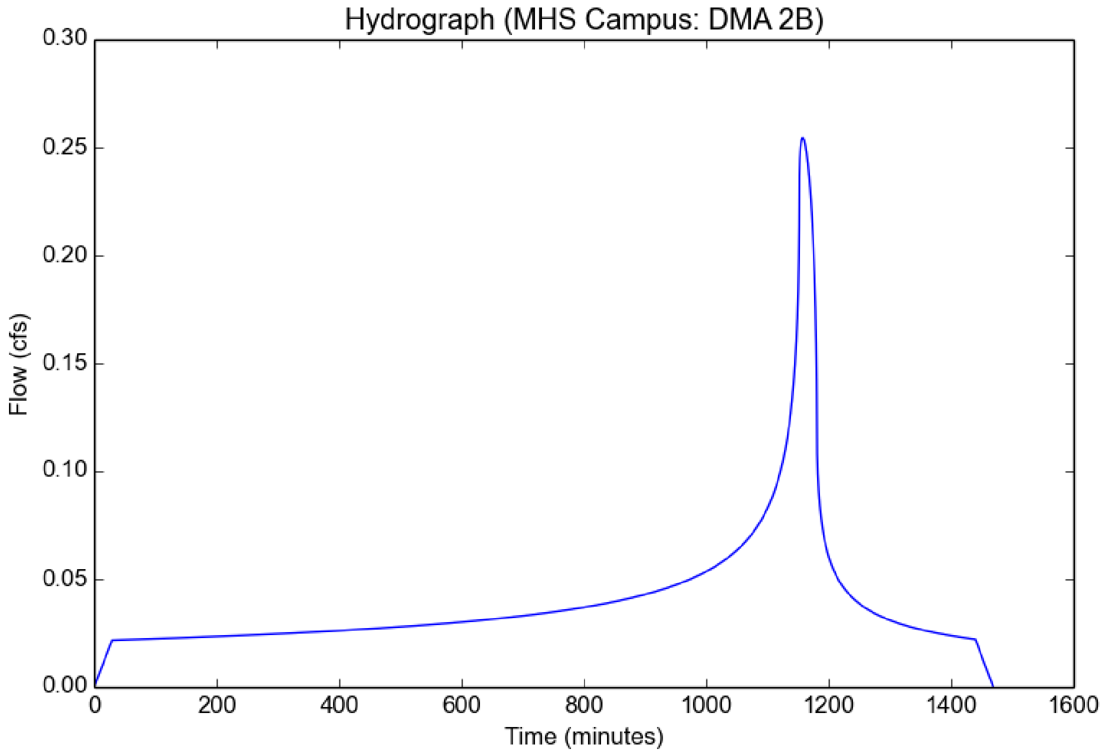
File location: K:/2018/181088_Morningside_HS_ADA/DOCS/06-Design/D-Stormwater_System/1-LID/APPENDIX D - DMA 2B.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MHS Campus
Subarea ID	DMA 2B
Area (ac)	1.68
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.015
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2612
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.58
Time of Concentration (min)	29.0
Clear Peak Flow Rate (cfs)	0.2545
Burned Peak Flow Rate (cfs)	0.2545
24-Hr Clear Runoff Volume (ac-ft)	0.0805
24-Hr Clear Runoff Volume (cu-ft)	3507.8776



APPENDIX E

STORMWATER QUALITY DESIGN MEASURE CALCULATIONS

Stormwater Quality Design Measure Calculations

Date: 6/29/2022
Job No.: 181088
Project: MHS CAMPUS UPGRADES

Description and Assumptions:

** Based on County of Los Angeles Low Impact Development Standard Manual*

Design Frequency = 85th Percentile, 24-Hour Rain Event = 1.0 in

STORMWATER QUALITY DESIGN CALCS FOR BMP# 1 & 2

Area Summary

Surface Type	Area (sf)	Area (acres)
Impervious	809,941	18.59
Pervious	550,941	12.65
TOTAL	**1,360,881**	**31.24**

Step 1: Determine the Stormwater Quality Design Volume (SWQDv)

85th Percentile SWQDv per HydroCalc Output in Appendix D= 65,233 ft^3

HydroCalc Design Volume (SWQDv) output is an accepted value per section 6.3 in the LA County Low Impact Development Standards Manual
(See Appendix D for Hydrocalc Analysis)

Step 2: Determine the design infiltration rate

$f_{design} = f_{measured}/FS$

$f_{measured}$ = 3.2 in/hr

FS = 2

f_{design} = 1.60 **in/hr**

Step 3: Determine the bioretention surface area

$d_{max} = f_{design}/12 \times t$

Where:

d_{max}= Maximum depth of water that can be infiltrated within the max detention time [ft]
f_{design} = Design infiltration rate [in/hr]
t = Maximum retention time (max 96 hrs) [hr]

d_{max}= 12.8 ft

Select a ponding depth less than the maximum ponding depth

$d_{max} \geq d_p$

Where:

d_{max} = Maximum depth of water that can be infiltrated within the maximum detention time [ft]

d_p = Ponding depth [ft]

d_p = 7 ft

Calculate the infiltrating surface area (bottom of the bioretention area) required

$A = SWQDv / d_p$

A= 9,319 sf

APPENDIX F

BMP FACT SHEETS

BKF Engineers
4675 MacArthur Court, Suite 400
Newport Beach, California 92660
P 949.526.8460

GENERAL NOTES:

THE STORM CAPTURE™ SYSTEM BY OLDCASTLE PRECAST IS PART OF THE STORMWATER MANAGEMENT SYSTEM FOR THE RESPECTIVE SITE, AS PREPARED BY THE PROJECT DESIGN ENGINEER. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO DETERMINE DESIGN FLOW RATES, PRE-TREATMENT AND POST-TREATMENT REQUIREMENTS, STORAGE VOLUME, AND ENSURE THE FINAL DESIGN MEETS ALL CONVEYANCE AND STORAGE REQUIREMENTS. SYSTEM DESIGN AND TYPE, SOIL ANALYSIS, LOADING REQUIREMENTS, COVER HEIGHT AND MODULE SIZE DETERMINE THE FOUNDATION TYPE AND REQUIREMENTS AS STATED HEREIN. ANY VARIATIONS FOUND DURING CONSTRUCTION FROM THE SITE AND SYSTEM ANALYSIS MUST BE REPORTED TO THE PROJECT DESIGN ENGINEER. THE PROJECT DESIGN ENGINEER IS RESPONSIBLE FOR OBTAINING A GEOTECHNICAL ENGINEERING REPORT VERIFYING THE BEARING CAPACITY STATED IN DESIGN NOTES.

DESIGN NOTES:

1. DESIGN LOADINGS:
   A. AASHTO HS20-44 W/ IMPACT.
   B. DEPTH OF COVER = 6" - 5'-0".
   C. ASSUMED WATER TABLE = BELOW BOTTOM.
   D. EQUIVALENT FLUID PRESSURE = 45 PCF.
   E. LATERAL LIVE LOAD SURCHARGE = 80 PSF.
   F. NO LATERAL SURCHARGE FROM ADJACENT STRUCTURES.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH SHALL BE 6,000 PSI.
3. STEEL REINFORCEMENT: REBAR, ASTM A-615, GRADE 60.
4. CEMENT: ASTM C-150 SPECIFICATION.
5. STORM CAPTURE MODULE TYPE = INFILTRATION.
6. DEPTH OF AGGREGATE BEARING LAYER TO BE DETERMINED IN ACCORDANCE WITH OLDCASTLE TECH NOTE SC-01.
7. ALLOWABLE SOIL BEARING PRESSURE ADDRESSED IN OLDCASTLE TECH NOTE SC-01.
8. REFERENCE STANDARDS:
   A. ASTM C 890
   B. ASTM C 891
   C. ASTM C 913
9. LESS THAN 6" OR GREATER THAN 5' OF COVER REQUIRES CUSTOM STRUCTURAL DESIGN AND MAY REQUIRE THICKER AGGREGATE BEARING LAYER.

INSTALLATION NOTES:

THE STORM CAPTURE™ MODULE SYSTEM IS TO BE INSTALLED IN ACCORDANCE WITH ASTM C891, INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES. PROJECT PLAN AND SPECIFICATIONS MUST BE FOLLOWED ALONG WITH ANY APPLICABLE REGULATIONS.

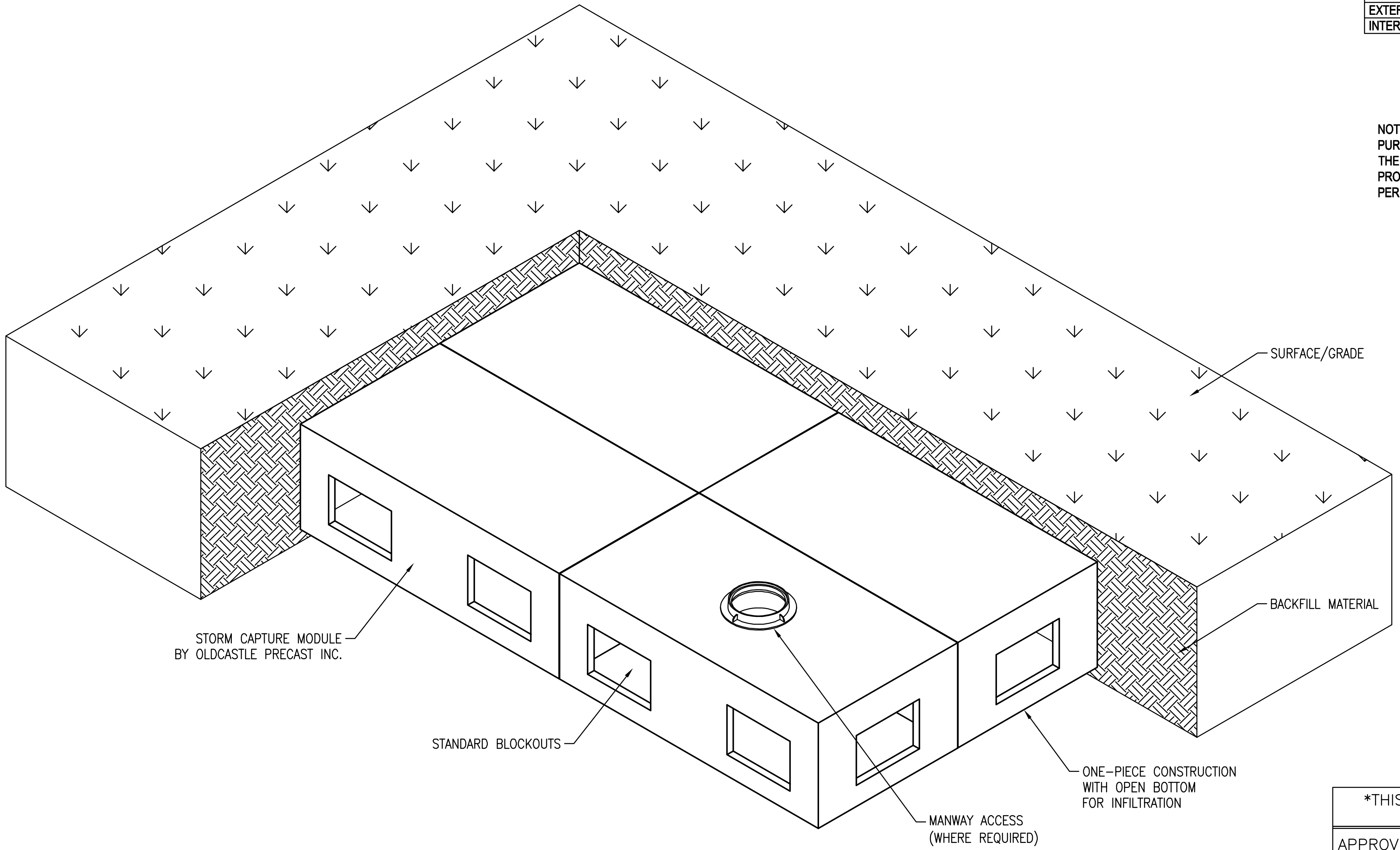
1. PLAN LINE, GRADE AND ELEVATIONS MUST BE FOLLOWED.
2. A. WHERE SPECIFIED, AN 8 OZ. NON-WOVEN GEOTEXTILE FABRIC MUST BE USED AS A SEPARATION LAYER AROUND THE STORM CAPTURE SYSTEM.
3. PENETRATIONS IN THE GEOTEXTILE MAY ONLY BE MADE WITH SMOOTH WALL PIPES. MAKE PENETRATIONS FOR ALL OUTLETS BEFORE MAKING PENETRATIONS FOR ANY INLETS.
4. THE AGGREGATE BEARING LAYER SHOULD CONSIST OF CLEAN, DURABLE CRUSHED AGGREGATE COMPACTED AS DIRECTED BY THE ENGINEER. OLDCASTLE RECOMMENDS MATERIALS SUCH AS NO. 56 OR NO. 57 STONE PER ASTM C33.
5. DESIGNATED EMBEDDED LIFTERS MUST BE USED. USE PROPER RIGGING TO ASSURE ALL LIFTERS ARE EQUALLY ENGAGED WITH A MINIMUM 60 DEGREE ANGLE ON SLINGS AS NOTED AND IN ACCORDANCE WITH OLDCASTLE LIFTING PROCEDURES.
6. MODULES MUST BE PLACED AS CLOSE TOGETHER AS POSSIBLE, AND GAPS SHALL NOT BE GREATER THAN 3/4". ALL EXTERIOR SYSTEM JOINTS SHALL BE COVERED WITH A MIN. 8" JOINT WRAP ON SIDES AND TOP (CS-212 CONSEAL OR EQUIVALENT). INSTALL ONE ROW CS-102 CONSEAL (OR EQUIVALENT) BETWEEN PRECAST PIECES.
7. AUTHORIZATION SHOULD BE GIVEN BY THE PROJECT ENGINEER OR DESIGNATED PERSON PRIOR TO PLACEMENT ON BACKFILL FOR THE SYSTEM. CARE SHOULD BE TAKEN DURING PLACEMENT OF BACKFILL NOT TO DISPLACE MODULES OR JOINT WRAP. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY OR AS SPECIFIED, AND SHOULD NOT BE COMPACTED WITHIN 6" OF MODULE.
8. CONSTRUCTION EQUIPMENT EXCEEDING DESIGN LOADING SHALL NOT BE ALLOWED ON STRUCTURE.

SPLASH PADS, INLETS AND RISERS:

PLACE SPLASH PADS AS DESIGNATED TO PREVENT SCOUR FROM INLETS AND INLET PIPES. ALL PIPE INLETS SHALL EXTEND INSIDE MODULE A MINIMUM OF 4". PLACE A NON-SHRINK, NON-METALIC GROUT, MIN. 3,000 PSI IN ANNULAR SPACE TO ELIMINATE ALL VOIDS.

REVISIONS

REVISION	DATE	SHEETS	DESCRIPTION OF REVISION



INFILTRATION MODULE ISO VIEW

N.T.S.

STORMCAPTURE®

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TYPICAL ELEVATION	2
EXTERIOR DETAILS	3
INTERIOR DETAILS	4

NOTE: THIS VIEW IS FOR ILLUSTRATION PURPOSES ONLY TO SHOW FEATURES OF THE SYSTEM. ACTUAL LAYOUT VARIES BY PROJECT, SEE SITE PLAN LAYOUT. ALL PERIMETER WALLS ARE SOLID.

THIS MUST BE FILLED OUT BEFORE MANUFACTURING BEGINS

APPROVED W/ NO EXCEPTIONS TAKEN: ☐

APPROVED AS NOTED: ☐

REVISE AND RESUBMIT: ☐

- PRELIMINARY -
NOT FOR CONSTRUCTION

SIGNATURE DATE

Oldcastle®
Stormwater Solutions
7921 SOUTHPARK PLAZA, SUITE 200, LITTLETON, CO 80120
PHONE: 1-888-965-3227 FAX: 303-794-7497

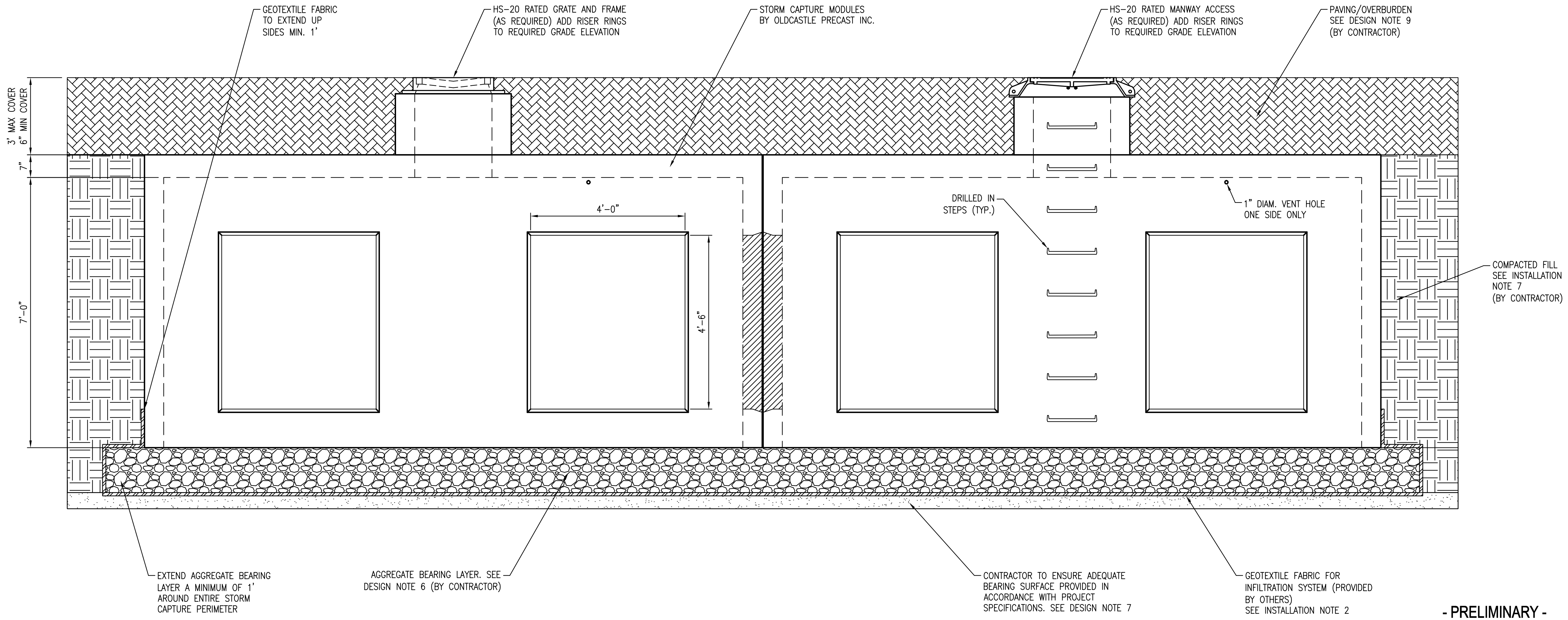
STORMCAPTURE
NOTES & GENERAL ISO

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 7 ft top-only	REV DATE	1 OF 4

STORMCAPTURE®



TYPICAL ELEVATION

SCALE: 3/8" = 1'-0"

- PRELIMINARY -
NOT FOR CONSTRUCTION

NOTE:
FOR INFILTRATION - EXFILTRATION SYSTEMS, THE AGGREGATE SUBGRADE MUST BE WASHED AND CLEAN.

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PHONE: 1-888-965-3227 FAX: 303-794-7497

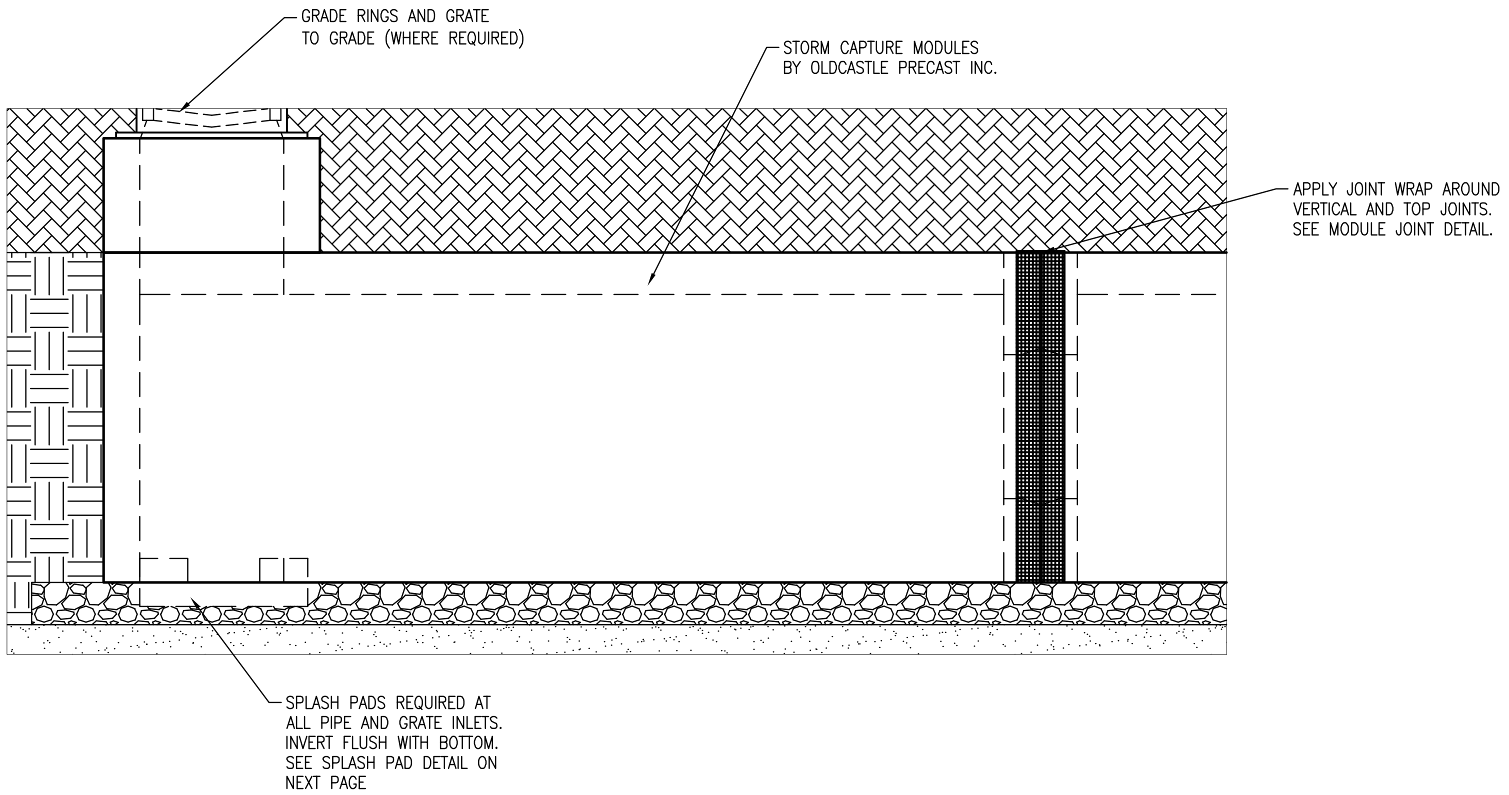
STORMCAPTURE
TYPICAL ELEVATION

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 7 ft top-only	REV DATE	2 OF 4

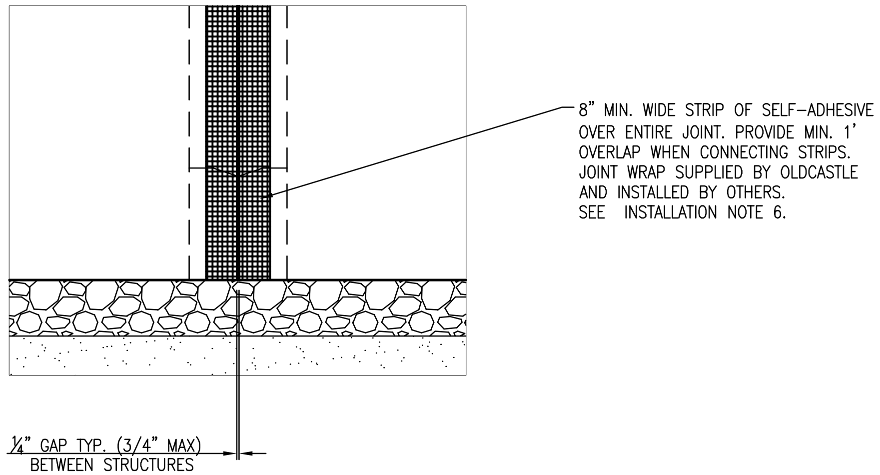
STORMCAPTURE®



GRATE INLET DETAIL

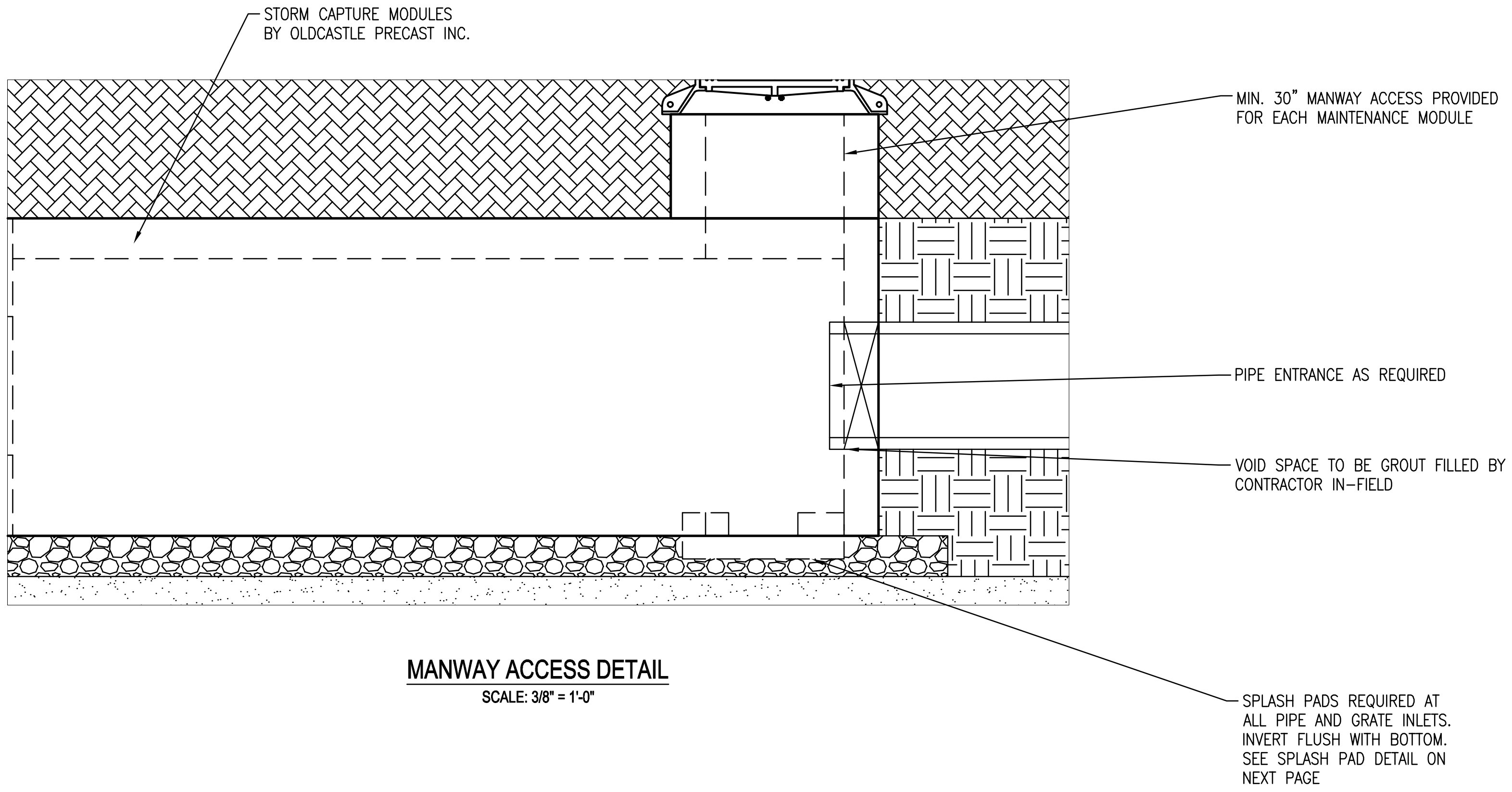
SCALE: 3/8" = 1'-0"

NOTE: WEIR PLATES, IF REQUIRED, MAY BE INSTALLED WITH RED-HEAD ANCHORS (BY OTHERS). ELEVATIONS TO BE DETERMINED BY PROJECT DESIGN ENGINEER



MODULE JOINT DETAIL

SCALE: 1/2" = 1'-0"



MANWAY ACCESS DETAIL

SCALE: 3/8" = 1'-0"

- PRELIMINARY -
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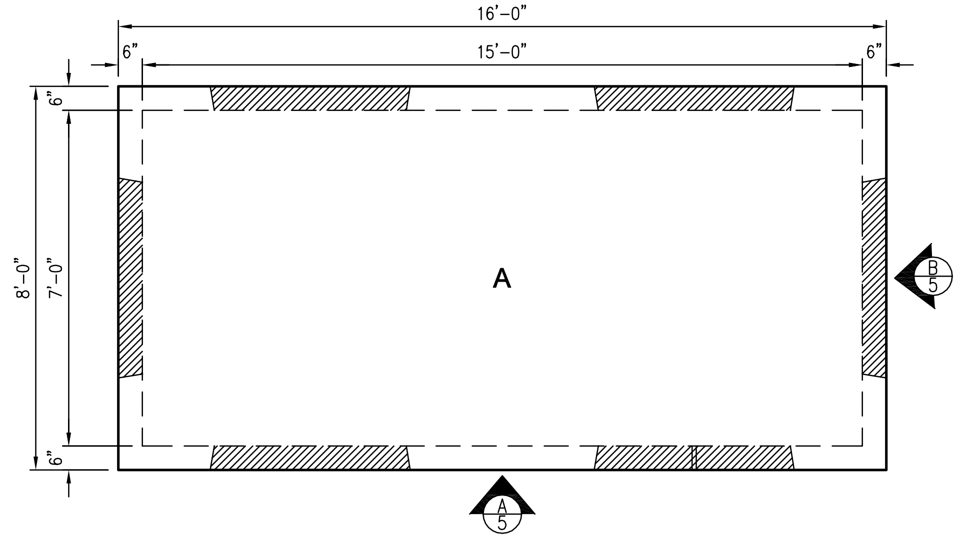
STORMCAPTURE
EXTERIOR DETAILS

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

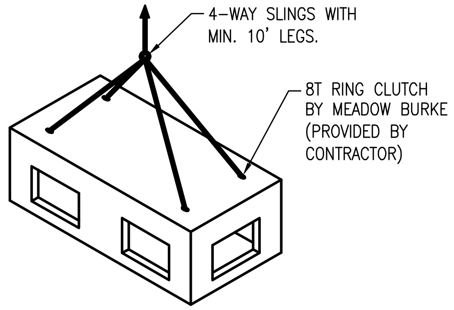
DRAWING NUMBER	REVISION	SHEET
SC - 7 ft top-only	REV DATE	3 OF 4

STORMCAPTURE®



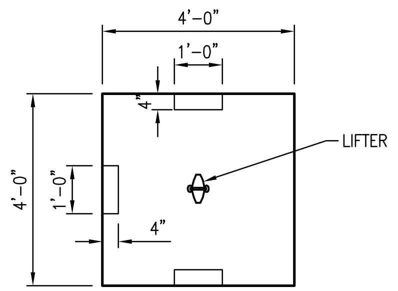
STORM CAPTURE PLAN VIEW

SCALE: 1/4" = 1'-0"



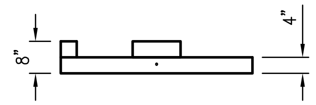
MODULE LIFTING DETAIL

N.T.S.



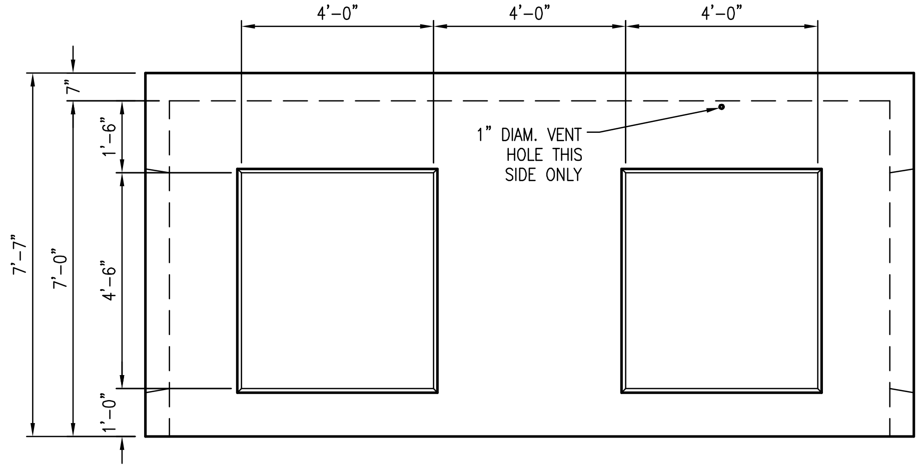
SPLASH PAD - PLAN

SCALE: 1/4" = 1'-0"



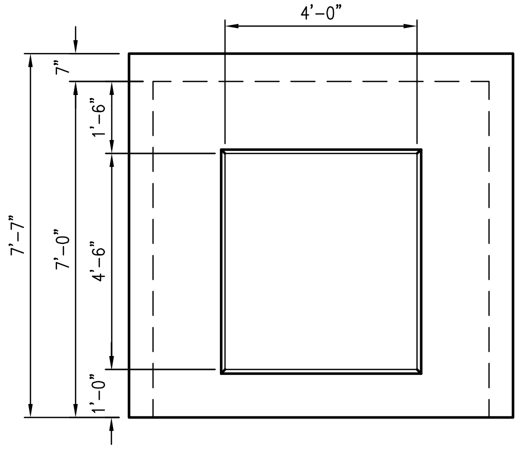
SPLASH PAD - PROFILE

SCALE: 1/4" = 1'-0"



VIEW A

SCALE: 1/4" = 1'-0"



VIEW B

SCALE: 1/4" = 1'-0"

- PRELIMINARY -
NOT FOR CONSTRUCTION

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Stormwater Solutions
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PHONE: 1-888-965-3227 FAX: 303-794-7497

STORMCAPTURE
INTERIOR DETAILS

CUSTOMER

DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
	STS	STS	JH		

DRAWING NUMBER	REVISION	SHEET
SC - 7 ft top-only	REV DATE	4 OF 4

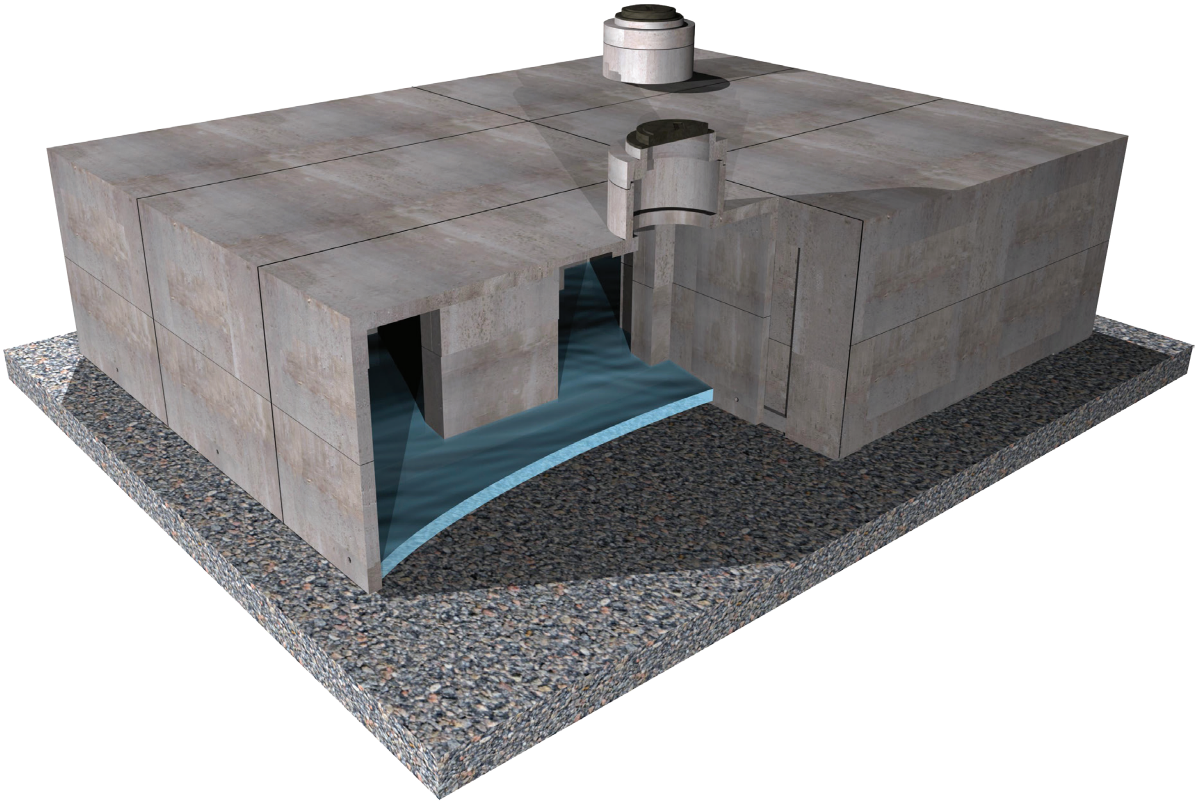
APPENDIX G

BMP OPERATIONS & MAINTENANCE MANUAL

BKF Engineers
4675 MacArthur Court, Suite 400
Newport Beach, California 92660
P 949.526.8460

STORMCAPTURE®

Inspection and Maintenance Guide



Stormwater

Description

The StormCapture® system is an underground, modular, structural precast concrete storage system for stormwater detention, retention, infiltration, harvesting and reuse, and water quality volume storage. The system's modular design utilizes multiple standard precast concrete units with inside dimensions of 7 feet by 15 feet (outside dimensions of 8 feet by 16 feet) to form a larger storage system. The inside height of the StormCapture system can range from 2 feet to 14 feet. This modular design provides limitless configuration options for site-specific layouts.

StormCapture components can be provided as either open-bottom modules to promote infiltration or closed-bottom modules for detention. In some cases, StormCapture modules can be placed in a checkerboard configuration for an even more efficient design. A Link Slab, with a footprint of 9 feet by 17 feet, is then used to bridge each space without a module.

The standard StormCapture design incorporates lateral and longitudinal passageways between modules to accommodate internal stormwater conveyance throughout the system. These passageways may be classified as either a "window configuration" with standard 12-inch tall sediment baffles extending up from the floor of the module to the bottom of the window, or a "doorway configuration" without the sediment baffles. The function and drainage rate of a StormCapture system depends on site-specific conditions and requirements.

Stormwater typically enters the StormCapture system through an inlet pipe. Grated inlets can also be used for direct discharge into the system. The StormCapture system is rated for H-20 traffic loading with limited cover. Higher load requirements can also be accommodated. In addition, StormCapture systems are typically equipped with a limited number of maintenance modules that provide access to the system for ongoing inspection and maintenance.

Function

The StormCapture system is primarily used to manage water quantity by temporarily storing stormwater runoff from impervious surfaces to prevent flooding, slow down the rate at which stormwater leaves the site, and reduce receiving stream erosion. In addition, the StormCapture system can be used to capture stormwater runoff for water quality treatment. Regardless of how the StormCapture system is used, some sedimentation may occur in the modules during the time water is stored.

Configurations

The configuration of the StormCapture systems may vary, depending on the water quality and/or quantity requirements of the site. StormCapture configurations for detention, retention/infiltration, and retention/harvesting are described below.

Detention

StormCapture Detention systems are designed with a closed bottom to detain stormwater runoff for controlled discharge from the site. This design may incorporate a dead storage sump and a permanent pool of water if the outlet pipe is higher than the floor elevation. Discharge from the system is typically controlled by an outlet orifice and/or outlet weir to regulate the rate of stormwater leaving the system. StormCapture Detention systems are typically designed with silt-tight joints, however when conditions exist that require a StormCapture system to be watertight, the system may be wrapped in a continuous, impermeable geomembrane liner. If the StormCapture Detention system includes Link Slabs, a liner must be used to detain water since the chambers under each Link Slab have no floor slab. In this case, care must be taken by maintenance personnel not to damage the exposed liner beneath each Link Slab.

Retention/Infiltration

StormCapture Retention/Infiltration systems are designed with an open bottom to allow for the retention of stormwater onsite through infiltration into the base rock and surrounding soils. For infiltration systems, the configuration of the base of the StormCapture system may vary, depending on the needs of the site and the height of the system. Some systems may use modules that have fully open bottoms with no concrete floor, while other systems may use modules that incorporate floor openings in the base of each module. These are typically 24-inch by 24-inch openings. For open-bottom systems, concrete splash pads may be installed below inlet grate openings and pipe inlets to prevent erosion of base rock. A StormCapture Infiltration system may have an elevated discharge pipe for peak overflow.

Retention/Harvesting

StormCapture Retention/Harvesting systems are similar to detention systems using closed-bottom modules, but stormwater is typically retained onsite for an extended period of time and later reused for non-potable applications or irrigation. For rainwater harvesting systems, an impermeable geomembrane liner is typically installed around the modules to provide a water-tight system.

Inspection and Maintenance Overview

State and local regulations typically require all stormwater management systems to be inspected on a regular basis and maintained as necessary to ensure performance and protect downstream receiving waters. Inspections should be used to evaluate the conditions of the system. Based on these inspections, maintenance needs can be determined. Maintenance needs vary by site and system. Using this Inspection & Maintenance Guide, qualified maintenance personnel should be able to provide a recommendation for maintenance needs. Requirements may range from minor activities such as removing trash, debris or pipe blockages to more substantial activities such as vacuuming and removal of sediment and/or non-draining water. Long-term maintenance is important to the operation of the system since it prevents excessive pollutant buildup that may limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Only authorized personnel shall inspect and/or enter a StormCapture system. Personnel must be properly trained and equipped before entering any underground or confined space structure. Training includes familiarity with and adherence to any and all local, state and federal regulations governing confined space access and the operation, inspection, and maintenance of underground structures.

Inspection and Maintenance Frequency

The StormCapture system should be inspected on a regular basis, typically twice per year, and maintained as required. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. Local jurisdictions may also dictate inspection and maintenance frequencies.

Inspection Equipment

The following equipment is helpful when conducting StormCapture inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

A typical StormCapture system provides strategically placed access points that may be used for inspection. StormCapture inspections are usually conducted visually from the ground surface, without entering the unit. This typically limits inspection to the assessment of sediment depth, water drain down, and general condition of the modules and components, but a more detailed assessment of structural condition may be conducted during a maintenance event.

To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be inspected and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Observe inlet and outlet pipe penetrations for blockage or obstruction.
- If possible, observe internal components like baffles, flow control weirs or orifices, and steps or ladders to determine whether they are broken, missing, or possibly obstructed.
- Observe, quantify, and record the sediment depths within the modules.
- Retrieve as much floating trash as possible with a long-handled net. If a significant amount of trash remains, make a note in the Inspection & Maintenance Log.
- For infiltration systems, local regulations may require monitoring of the system to ensure drain down is occurring within the required permit time period (typically 24 to 72 hours). If this is the case, refer to local regulations for proper inspection procedure.

Maintenance Indicators

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Inlet or outlet piping is blocked or obstructed.
- Internal components are broken, missing, or obstructed.
- Accumulation of more than six inches of sediment on the system floor or in the sump, if applicable.
- Significant accumulation of floating trash and debris that cannot be retrieved with a net.
- The system has not drained completely after it hasn't rained for one to three days, or the drain down does not meet permit requirements.
- Any hazardous material is observed or reported.

Maintenance Equipment

The following equipment is helpful when conducting StormCapture maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Vacuum truck

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is usually required to maintain the StormCapture. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Once safety measures such as traffic control have been deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove trash and debris using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely remove accumulated sediment. Some jetting may be necessary to fully evacuate sediment from the system floor or sump. Jetting is acceptable in systems with solid concrete floors or base slabs (referred to as closed-bottom systems). However, jetting is not recommended for open-bottom systems with a gravel foundation since it may cause bedding displacement, undermining of the foundation, or internal disturbance.
- All material removed from the system during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Inspect inlet and outlet pipe penetrations for cracking and other signs of movement that may cause leakage.
- Inspect the concrete splash pads (applicable for open-bottom systems only) for proper function and placement.
- Inspect the system for movement of modules. There should be less than 3/4-inch spacing between modules.
- Inspect the general interior condition of modules for concrete cracking or deterioration. If the system consists of horizontal joints as part of the modules, inspect those joints for leakage, displacement or deterioration.

Be sure to securely replace all access covers, as appropriate, following inspection and/or maintenance. If the StormCapture modules or any of the system components show significant signs of cracking, spalling, or deterioration or if there is evidence of excessive differential settlement between modules, contact Oldcastle Stormwater at **800-579-8819.**

StormCapture
Inspection & Maintenance Log

Refer to as-built records for details about system size and location onsite

Location ____

System Configuration:

Inspection Date ______________

☐ Detention ☐ Infiltration ☐ Retention/Harvesting

Inlet or Outlet Blockage or Obstruction

Notes:

☐ Yes ☐ No

Condition of Internal Components

Notes:

☐ Good ☐ Damaged ☐ Missing

Sediment Depth Observed

Notes:

☐ Inches of Sediment:____________

Trash and Debris Accumulation

Notes:

☐ Significant ☐ Not Significant

Drain Down Observations

Notes:

☐ Appropriate Time Frame ☐ Inappropriate Time Frame

Maintenance Required

☐ **Yes - Schedule Maintenance** ☐ **No - Inspect Again in _______ Months**

STORMCAPTURE®

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BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Oldcastle Precast®

www.oldcastlestormwater.com
800-579-8819

Stormwater

APPENDIX H

COVENANT AND AGREEMENT

RECORDING REQUESTED BY
AND MAIL TO:

CITY OF WALNUT
ENGINEERING DEPARTMENT
21201 LA PUENTE RD
WALNUTE, CA 91789

Space above this line is for Recorder's use

COVENANT AND AGREEMENT
REGARDING THE MAINTENANCE OF LOW IMPACT DEVELOPMENT (LID) & NATIONAL POLLUTANTS DISCHARGE ELIMINATION SYSTEM (NPDES) BMPs

The undersigned, ____ ("Owner"), hereby certifies that it owns the real property described as follows ("Subject Property"), located in the City of Walnut, State of California:

LEGAL DESCRIPTION

ASSESSOR'S ID #___________________TRACT NO.___________________LOT NO.__________________________

ADDRESS: ____

____

Owner is aware of the requirements of the County of Los Angeles' Green Building Standards Code, Title 31, Section 4.106.4 (LID), and National Pollutant Discharge Elimination System (NPDES) permit. The following post-construction BMP features have been installed on the Subject Property:

☐ Porous pavement
☐ Cistern/rain barrel
☐ Infiltration trench/pit
☐ Bioretention or biofiltration
☐ Rain garden/planter box
☐ Disconnect impervious surfaces
☐ Dry Well
☐ Storage containers
☐ Landscaping and landscape irrigation
☐ Green roof
☒ Other Storm Capture Infiltration Vault

____

The location, including GPS x-y coordinates, and type of each post-construction BMP feature installed on the Subject Property is identified on the site diagram attached hereto as Exhibit 1.

Owner hereby covenants and agrees to maintain the above-described post-construction BMP features in a good and operable condition at all times, and in accordance with the LID/NPDES Maintenance Guidelines, attached hereto as Exhibit 2.

Owner further covenants and agrees that the above-described post-construction BMP features shall not be removed from the Subject Property unless and until they have been replaced with other post-construction BMP features in accordance with County of Los Angeles' Green Building Standards Code, Title 31 and NPDES permit.

Owner further covenants and agrees that if Owner hereafter sells the Subject Property, Owner shall provide printed educational materials to the buyer regarding the post-construction BMP features that are located on the Subject Property, including the type(s) and location(s) of all such features, and instructions for properly maintaining all such features.

Owner makes this Covenant and Agreement on behalf of itself and its successors and assigns. This Covenant and Agreement shall run with the Subject Property and shall be binding upon owner, future owners, and their heirs, successors and assignees, and shall continue in effect until the release of this Covenant and Agreement by the County of Los Angeles, in its sole discretion.

Owner(s):

By:__________________________________ Date:__________________________________

By:__________________________________ Date:__________________________________

(PLEASE ATTACH NOTARY)

REFERENCE

PLAN CHECK NO.: ____________________________________ DISTRICT OFFICE NO.:________________________

ATTACHMENTS

RECORDING REQUEST BY AND MAIL TO:

City of Walnut
Department of Public Works

Building and Safety – Drainage and Grading Section
Land Development – Drainage and Grading Section

21201 La Puente Rd.
Walnut, CA 91789

Space above this line is for Recorder's use

COVENANT FOR MAINTENANCE OF WATER QUALITY (WQ) DEVICES

I (we) ____________________________________, hereby certify that I (we) am (are) the legal owner(s) of APN# 8710-002-905, and as such owners for the mutual benefit of future purchasers, their heirs, successors, and assigns, do hereby fix the following protective conditions to which their property, or portions thereof, shall be held, sold and/or conveyed.

That owner(s) shall maintain the WQ system shown on attached Exhibit A map and on Grading Plan GPC # ____________, on file in the office of the Director of Public Works, in a good and functional condition at least once a year and retain proof of the inspection. The owner(s) shall perform this responsibility, unless the City discharges this obligation through a subsequently recorded written instrument.

The undersigned also covenants and agrees for himself, his heirs, successors, and assigns, to indemnify, defend, and save harmless the County, its agents, officers and employees from and against any and all liability, expenses, including defense costs and legal fees, and claims for damages of any nature whatsoever, including, but not limited to, bodily injury, death, personal injury, or property damage arising from or connected with the construction or maintenance of said work.

Owner(s):

By: ____ Date: _______________________

By: ____ Date: _______________________

APPENDIX I

GEOTECHNICAL REPORT (FOR REFERENCE ONLY)

KOURY

PASSION INTEGRITY QUALITY

KOURYENGINEERING.COM

LIMITED GEOTECHNICAL INVESTIGATION REPORT

VARIOUS CAMPUS UPGRADES
MORNINGSIDE HIGH SCHOOL
10500 YUKON AVENUE SOUTH
INGLEWOOD, CALIFORNIA 90303

PREPARED FOR:
INGLEWOOD UNIFIED SCHOOL DISTRICT
401 SOUTH INGLEWOOD AVENUE
INGLEWOOD, CA 90303

PREPARED BY:
KOURY ENGINEERING & TESTING, INC.
14280 EUCLID AVENUE
CHINO, CALIFORNIA 91710

PROJECT NO. 19-1110

JANUARY 22, 2020

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January 22, 2020
Project No. 19-1110

Inglewood Unified School District
401 S. Inglewood Avenue
Inglewood, CA 90303

Attention: Ms. Kimberly Munoz

SUBJECT: Limited Geotechnical Investigation Report
Morningside High School Site Upgrades
10500 Yukon Avenue South
Inglewood, CA 90303

1. INTRODUCTION

This report presents the results of a Limited Geotechnical Investigation performed by Koury Engineering & Testing, Inc. (Koury) for the proposed Morningside High School improvements located at 10500 Yukon Avenue South, Inglewood, California. The study was performed to evaluate the subsurface soil conditions in the area of the proposed improvements in order to provide geotechnical recommendations for design and construction. This report includes our findings and recommendations for the design and construction of the proposed buildings, bleachers and associated improvements.

The recommendations provided within this submittal are based on the results of our field exploration, laboratory testing and engineering analyses. Our services were performed in general accordance with our Proposal No. 19-1110, dated November 4, 2019.

Our professional services have been performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared exclusively for the Inglewood Unified School District and their consultants for the subject project. The report has not been prepared for use by other parties and may not contain sufficient information for the purposes of other parties or other uses.

2. SITE CONDITIONS

The Morningside High School is bounded by W 104th Street on the north, Yukon Avenue South on the west, W 108th Street and residential homes on the south and Monroe Middle School and commercial facilities on the east. The main access to the site is from Yukon Avenue South near the southwest corner of the campus. The proposed small one-story buildings are located in the southwest portion of the campus, south and northwest of the existing football field. The existing football field will be shifted west and the bleachers will be constructed north and south of the track that will surround the new football field.

The south portion of the campus is presently occupied by an existing football field, basketball courts and portable trailers. Most of the area is landscape except for the track, the basketball court, and the portable trailer area. The proposed expanded parking lot is presently occupied partially by an existing parking lot and landscape and walkway strips. The proposed electrical yard within the northern portion of the site is covered with grass landscape. Immediately east of the future electrical yard, a new baseball field will be constructed following the removal of some portable buildings and tennis courts. There will be a new softball field located northeast of the existing basketball courts and at the east end of the existing football field.

The site slopes gently to the south and southwest, and the ground surface lies at elevations between about 88 and 112 feet (NAVD88). Drainage of the site is generally by sheet flow toward the south.

3. PROPOSED IMPROVEMENTS

Koury understands that the Inglewood Unified School District is planning to add facilities to the Morningside High School consisting of several small one-story buildings, a football field with two sets of bleachers, running track, parking lot, tennis courts, and baseball and softball fields. Based on the site plan provided to us, there will be a new student visitor parking lot at the northwest corner of the campus supporting approximately 154 parking spaces. The proposed electrical yard to be located within the northern portion of the site east Building H and west of the new baseball field will measure about 30 by 65 feet in plan and may have masonry walls with metal deck roofing.

Within the southwest corner of the campus, it is proposed to construct a new football field and an 8-lane track and new bleachers will be located on the north and south sides of the running track. The site plan shows also three small one-story buildings on the northwest side of the playfield area; these buildings are likely to contain bathrooms, locker rooms, storage rooms or concessions. The smallest building covers an area of about 700 square feet and the largest building covers an area of about 3,600 square feet. The third building appears to cover an area of about 1,900 square feet. The site plan also indicates that two rows of 3 side-by-side tennis courts are planned east of the football field and south of the future softball field. The basketball courts will be relocated west partially between the basketball courts and the east end of the new track.

The associated improvements at the site may consist of low walls, fire access road, new utility lines, sidewalks, fencing, light poles, scoreboard and various hardscape areas. Architectural and structural design details for the new buildings were not provided. Koury assumed maximum building column load of about 25 kips and maximum wall loads not exceeding 2 kips per lineal foot.

4. FIELD EXPLORATION

The field exploration program consisted of drilling ten soil test borings (B-1 through B-10) on January 2, 2020 using truck-mounted hollow-stem auger drilling equipment. The borings were drilled to depths ranging between about 6½ and 41½ below the existing ground surface.

The locations of the borings are shown on the Boring Location Map, Figure A-2, presented in Appendix A. Standard penetration test samples, California ring samples and bulk samples were obtained from the borings for laboratory testing. The depths, blow counts, and description of the samples are shown on the attached boring logs presented in Appendix B of this report. The contractor used a 140-lbs automatic hammer to drive the samplers a maximum of 18 inches into the soils.

5. LABORATORY TESTING

Laboratory tests, including moisture content, dry unit weight, #200 sieve wash, direct shear, pocket penetrometer, consolidation and expansion index were performed to aid in the classification of the materials encountered and to evaluate their engineering properties. Sulfates, chlorides, resistivity, and pH tests (corrosivity tests) were also performed on one sample. The results of pertinent laboratory tests are presented on the boring logs in Appendix B, and/or in Appendix C.

6. SOIL CONDITIONS

The subsurface soil profile consists of fill underlain by alluvial deposits. The fill depth was found to range between about 2 and 5 feet at the boring locations. Deeper fill may be encountered at utility locations, or at other locations between and beyond the borings. Except for Boring B-5 where 6 inches of asphalt was encountered, the asphalt pavement thickness at the boring locations consisted of about 3½ to 5 inches of asphalt concrete. The asphalt was found to be underlain by 2 to 3 inches of aggregate base except for Boring B-4 that indicated 6 inches of base.

Except for Boring B-2 drilled in the southwest portion of the campus in relatively close vicinity of Yukon Avenue South where clayey sand was encountered, the fill materials encountered in the borings consisted generally of firm to stiff sandy lean clay. The fill encountered were generally moist to very moist.

With a few exceptions, the underlying alluvium consists predominantly of interbedded sandy lean clay with clayey sand and silty sand. Interbeds of poorly graded sand were encountered in Borings B-6 and B-9 at depths exceeding 13 feet below the ground surface. The sandy clay alluvial soils are generally stiff to very stiff, and the sand are medium dense to dense.

With a few exceptions, the alluvial soils encountered are generally moist to very moist. Except for one sample of Boring B-9 at a depth of 21 feet where a moisture content of 31 percent was measured, the moisture contents of the sandy clay range from about 12½ to 21 percent with an average of about 14 percent, and the moisture contents of the sand range from about 2 to 14½ percent with an average of about 10 percent. The degree of saturation of the clay is generally high (about 90 to nearly 100 percent).

Our #200 sieve wash tests indicated that the fines contents of sand generally range from about 4 to 48 percent with an average of about 31½ percent. The fines contents of the clay vary from about 50 to 90 percent with an average of about 64½ percent. The dry unit weights of the clay tested range from about 100 to 127 pcf with an average of about 119½ pcf. The dry unit weights of sand range from about 108 to 127 pcf with an average of about 119 pcf.

The consolidation tests did not indicate significant collapse upon addition of water. Despite the high degree of saturation, however, the consolidation test from a depth of 9 feet indicated about 0.3% swell strain upon addition of water under a pressure of 3200 psf. The clay soils are generally overconsolidated and are considered moderately compressible. The rebound (unloading) curve of the consolidation tests indicate that some of the clay tested have potential for expansion. The direct shear test performed on a clayey sand sample indicated peak and ultimate friction angles of about 32 and 31 degrees and peak and ultimate cohesion of about 472 and 52 psf, respectively.

Pocket penetrometer test results indicate unconfined compression strengths of the tested soils ranging between about 1.5 and 4.5 tsf with an average of about 4.4 tsf. An expansion index test on a sandy lean clay of Boring B-1 at 0 to 2 feet yielded a value of 14 while a test on Boring B-4 on a sample near the surface yielded a value of 22.

Variations in the soil conditions as well as detailed descriptions are indicated on the attached boring logs in Appendix B. The soil conditions described in this report are based on the soils observed in the test borings drilled for this investigation and the laboratory test results. Variations between and beyond the borings should be anticipated.

7. GROUNDWATER

The site lies at approximately elevations 88 to 112 feet (NAVD88). Groundwater was not encountered in the borings drilled for this study. The Seismic Hazard Zone Report for the Inglewood 7.5-Minute Quadrangle, Los Angeles County CA, Seismic Hazard Zone Report 029, Department of Conservation, Division of Mines and Geology indicates that the historic high groundwater is at least 50 feet below ground surface (see Figure A-5 for the Historic High Groundwater Map).

8. SITE GEOLOGY

The site is located within the Los Angeles physiographic basin. The Los Angeles basin is bounded on the north by the Santa Monica and San Gabriel Mountains, on the east and southeast by the Santa Ana Mountains and the San Joaquin Hills, and on the west and south by the Pacific Ocean. The Los Angeles basin represents a down-warped block of basement rock overlain by approximately 31,000 feet of sediment.

The Los Angeles physiographic basin is part of the Peninsular Ranges Geomorphic Province. The Peninsular Ranges extend north to the San Gabriel Mountains and south into Mexico to the tip of Baja California. The Peninsular Ranges Province is characterized by alluviated basins, elevated erosion surfaces, and northwest-trending mountain ranges bounded by northwest trending faults.

The Geology Map of the Long Beach Quadrangle indicates that the subsurface conditions at the site consist of old alluvial floodplain deposits consisting of sand, silt and clay (see Figure A-3 for the Geology Map). The subsurface soil profile encountered in the borings consists of fill underlain by alluvial deposits.

9. OIL WELL

The State of California Department of Conservation, Division of Oil, Gas and Geothermal Resources indicates that Morningside High School is located about ½ mile south of the Potrero Oil/Gas Field and ½ mile west of the Howard Townsite Oil/Gas Field. The nearest dry hole is located about 1,000 feet north of the site and the nearest idle hole is about ½ mile northwest of the site. The nearest active well is located about 1½ miles southeast of the site (See Figure A-9, in Appendix A).

During our subsurface exploration, we did not observe oil-field derived hazardous or toxic materials within the borings drilled to the maximum depth of 41½ feet. No hazardous materials associated with oil fields are anticipated at the building sites.

10. SEISMIC CONSIDERATIONS

10.1. General

Morningside High School, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto, Newport-Inglewood and Whittier-Elsinore fault zones.

By definition of the California Geological Survey (CGS), an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The CGS has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 2,000,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1997 as the Alquist-Priolo Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zone to preclude new construction of certain inhabited structures across the trace of active faults.

The subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Probably the most important fault line to the site from a seismic shaking standpoint is the northwest trending Alquist-Priolo Newport-Inglewood Fault, located approximately 1,000 feet northeast of the site. The nearest Alquist-Priolo active segment of the Palos Verdes Fault is located approximately 13 miles south of the site and the Whittier Fault Zone nearest active segment is located about 19 miles east of the site. The Redondo Canyon Fault is located about 9½ miles southwest of the site, the Santa Monica Fault Zone is located about 10 miles northwest of the site and the Hollywood Fault Zone is located about 11 miles north of the site (see Figure A-6, Appendix A). The Puente Hills (LA) Fault is located about 5 miles to the northeast, the Puente Hills (Santa Fe Springs) Fault is about 11 miles to the southeast, and the Compton Fault is about 8¼ miles to the southwest.

Based on the information available at this time, it is our opinion that a Mw7.3 earthquake may occur on the Palos Verdes Fault, a Mw6.9 earthquake may occur on the Whittier Fault, a Mw7.2 earthquake may occur on the Newport-Inglewood Fault, a Mw6.2 earthquake may occur on the Redondo Canyon

Fault, a Mw7.0 earthquake may occur on the Santa Monica Fault, a Mw6.6 earthquake may occur on the Hollywood Fault, a Mw6.9 earthquake may occur on the Puente Hills (LA) Fault segment, a Mw6.6 earthquake may occur on the Puente Hills (Santa Fe Springs) segment, and a Mw6.9 earthquake may occur on the Compton Fault. Large earthquakes could occur on other faults in the general area, but because of their greater distance and/or lower probability of occurrence, they may be less important to the site from a seismic shaking standpoint.

Due to the proximity of the site to the Newport-Inglewood Fault, near field effects from strong ground motion associated with a large earthquake along this fault may occur at the site. These near field effects, including "fling" and directivity of strong ground motion, may result in significantly higher accelerations at the site.

According to the EQSEARCH program, within a search radius of 60 miles, about 63 earthquakes of magnitude 5 or greater have been recorded up to the year 2000. Within that same period, there are records of 11 earthquakes of magnitude 6 or greater, 5 earthquakes of magnitude 6.5 or greater and 3 earthquakes of magnitude 7 or greater within the same search area. The largest earthquake from the site was reported to have occurred in 1827 at a location about 38 miles from the site. Using the attenuation relationship of Campbell and Bozorgnia for alluvium (1997), the highest acceleration at the site could have been on the order of 0.22g. A summary of the earthquakes with magnitudes 5 and greater is attached in Appendix D.

10.2. Landsliding

The site is not located in a Landslide Hazard Zone on the State of California Seismic Hazard Zones Map (Figure A-4 in Appendix A). No evidence for landsliding was observed on or in the immediate vicinity of the site at the time of our field exploration. Based on topographic conditions, landsliding is not considered a potential hazard at the site.

10.3. Liquefaction

Liquefaction may occur when saturated, loose to medium dense, cohesionless soils are densified by ground shaking or vibrations. The densification results in increased pore water pressures if the soils are not sufficiently permeable to dissipate these pressures during and immediately following an earthquake. When the pore water pressure is equal to or exceeds the overburden pressure, liquefaction of the affected soil layers occurs. For liquefaction to occur, three conditions are required:

- Ground shaking of sufficient magnitude and duration;
- Groundwater level at or above the level of the susceptible soils during the ground shaking; and
- Soils that are susceptible to liquefaction.

The Liquefaction Hazards zone on the State of California Seismic Hazards Zones Map (Figure A-4 in Appendix A) indicates that the site is not located in a liquefaction susceptibility zone. Due to the absence of shallow groundwater, the presence of clayey soils and some medium dense to dense sands, it is our opinion that the potential for liquefaction is remote. However; the potential for dry seismic settlement was evaluated.

For seismic dry settlement evaluation, we obtained an earthquake magnitude of Mw6.35 from a seismic-hazard deaggregation using the USGS Unified Hazard Tool. Our analysis also utilized a site acceleration of 0.898g (PGA_M) obtained from ASCE 7-16 Seismic Design Ground Motion Analysis. The seismic settlement calculations were performed for the deepest borings (B-6 and B-7) using the SPT and equivalent California sampler blow count data. The SPT tests were performed with an automatic hammer and unlined SPT samplers. The California sampler blow counts were multiplied by a factor of 0.65 to obtain the equivalent SPT blow counts.

Using the LiquifyPro software, we calculated seismic settlements on the order of ½ to ¾ inch (see result of calculations in Appendix C). Considering the recommendations in Section 7.66 of the SCEC Guidelines for Implementation of SP 117 and our total seismic settlement calculations, it is our opinion that a differential settlement on the order of ¼ inch in 40 feet may be considered for the design seismic event.

10.4. Tsunamis and Seiches

The site is located at an average elevation ranging from approximately 88 to 112 feet and 5½ miles away from the coastline. There is no mapped major reservoir in the immediate vicinity and upslope of the site. Therefore, tsunamis and seiches are not considered potential hazards.

11. FLOODING

The project site lies within an area of minimal flood hazard as shown on the FEMA Flood Map #06037C1780G, effective date December 21, 2018 (Figure A-7, Appendix A). Based on the County of Los Angeles GIS, the site is located within a 500-year flood zone; however, the site is not reported as being located in a dam inundation zone. Flooding is not considered a high potential hazard to the site.

12. COLLAPSIBLE SOILS

Soils prone to collapse are generally young and deposited by flash floods and wind. The onsite soils have been mapped as older alluvium and the soils at shallow depth have moisture contents that are near or above optimum, which aid in mitigating collapse potential. Our laboratory tests did not indicate significant collapse. Therefore, the potential for collapse is considered low. Overerexcavation and recompaction, and appropriate drainage are recommended to mitigate the potential for hydrocollapse.

13. CONCLUSIONS AND RECOMMENDATIONS

13.1. General

In our opinion, the planned improvements are feasible from a geotechnical engineering point of view provided the geotechnical recommendations presented in this report are followed. The main concerns from a geotechnical standpoint are the presence of clay soils and high moisture content soils.

The following sections contain preliminary geotechnical recommendations for the design and construction of the proposed improvements and include our recommendations and discussions about grading, bearing capacity, settlement, flatwork, slabs-on-grade, temporary excavations, and utility trenches.

13.2. Grading

13.2.1. Building Pads

The thickness of undocumented fill encountered at the boring locations range from about 2 to 5 feet. We recommend removing all undocumented fill within the proposed building pads and structure areas. The exact thickness of undocumented fill should be verified at the time of grading.

Any existing pavement, foundation, vegetation, organic material, abandoned underground utilities and other debris should be removed from the proposed building pad and structure areas. Additional recommendations for overexcavation are presented below.

Within building pad areas, we recommend complete overexcavation of the existing fill and the subgrade to at least 3½ feet below existing grades and 2 feet below footings, whichever is deeper. Where feasible, the overexcavation should extend laterally at least 5 feet beyond the building perimeter.

Following subgrade approval by the Geotechnical Engineer, the bottom of the removal excavation should be scarified to a depth of 8 inches, moisture conditioned to at least 125 percent of optimum and recompacted to 90% relative compaction for clay soils and moisture conditioned within 2½ percent of optimum and recompacted to 92% relative compaction for sand as determined by ASTM D1557. However, if the subgrade is firm and consists of undisturbed clay alluvium and the moisture content is at least 125 percent of optimum, the scarification should not be performed, and measures should be taken to prevent subgrade disturbance. The subgrade should be proof rolled with heavy construction equipment to determine its firmness, as needed.

All fill placed within the building pads should be compacted to at least 95% relative compaction at a moisture content within 2½ percent of optimum for sand/granular soils and to at least 90% relative compaction at a moisture content of at least 125 percent of optimum for sandy clay soils unless approved otherwise by the Geotechnical Consultant at the time of construction. The shallow on site sandy clay soils can generally be used as backfill; however, if encountered, any medium to high plastic onsite clay soils should not be used within 2 feet of footings or building slabs. All fill should be deemed as “failing” and unsuitable if the moisture content is less than the recommended value unless determined otherwise by the Geotechnical Engineer at the time of construction.

13.2.2. Exterior Flatwork, Sidewalk and Pavement Areas

Similarly to the building footprint areas, all abandoned utilities should be removed, and the excavations should be backfilled with engineered fill. We recommend overexcavating 18 inches of subgrade material and placing at least 18 inches of new engineered fill for the subgrade of all new non-structural flatwork and pavement. Prior to backfill placement, the subgrade should be scarified to a depth of 8 inches, moisture conditioned and recompacted to 90% relative compaction.

We further recommend the placement of at least 12 inches of non-expansive granular material below all new pedestrian concrete flatwork. It is critical that the upper 12 inches of clay soils below the non-expansive soils be thoroughly moisture conditioned to 125 percent of optimum except for asphalt pavement where it should be at least 115 percent of optimum.

Except for pavement areas, all fill outside the structure areas should be compacted to at least 90% relative compaction at moisture content within 2½ percent of optimum for sand and other granular material and at least 125 percent of optimum for clay soils except as indicated otherwise by the Geotechnical Engineer. Below pavement areas, all clay soils should be compacted to at least 90 percent relative compaction and all granular material to 95 percent relative compaction.

13.2.3. General Grading Requirements

1. All fill, unless otherwise specifically stated in the report, should be compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557 Method of Soil Compaction for clay soils and 95 percent relative compaction for sand and other granular soils, unless specified otherwise.

2. No fill should be placed until the area to receive the fill has been adequately prepared and approved by the Geotechnical Consultant or his representative.

3. Fill soils should be kept free of debris and organic material.

4. Rocks or hard fragments larger than 3 inches may not be placed in the fill without approval of the Geotechnical Consultant or his representative, and in a manner specified for each occurrence. There should not be any concentrations of particle sizes of 2 inches or greater; proper mixing should be performed. If encountered, oversize materials should be disposed outside the structural fill and flatwork areas at the locations designated by the District representative.

5. The fill material should be placed in lifts which, when loose, should not exceed 8 inches per lift. Each lift should be spread evenly and should be thoroughly mixed during the spreading operation to obtain uniformity of material and moisture.

6. When the moisture content of the fill material is lower than the specified value or is too low to obtain adequate compaction, water should be added and thoroughly dispersed until the soil has a moisture within 2½ percent of optimum moisture content for sand material and 125 percent of optimum for clayey soils unless indicated otherwise in this report and/or by the Geotechnical Engineer at the time of construction.

7. When the moisture content of the fill material is too high to obtain adequate compaction, the fill material should be aerated by blading or other satisfactory methods until the soil has a moisture content as specified herein.

8. Permanent fill and cut slopes should not be constructed at gradients steeper than 2:1(H: V).

It should be noted that some of the clay soils have a high in-situ degree of saturation and moisture contents above optimum and outside the compactable moisture range. These soils are subject to disturbance and “pumping”, specially under heavy rubber tire equipment. The contractor will have to select appropriate excavation and compaction equipment to avoid disturbing the high moisture content subgrade soils or soils with high degree of saturation and to be able to compact the fill to the project specifications above relatively soft subgrade. Any scarified clay soils must be compacted to at least 90 percent relative compaction as determined by ASTM D1557.

We recommend that all excavated clay soils be pre-mixed and moisture conditioned outside the fill area prior to reuse as fill. Where the soil consists of sandy clay (50 to 70% fines) and severe “pumping” conditions develop during compaction, the moisture conditioning requirement may be revised at the discretion of the Geotechnical Engineer. Pre-soaking or aeration will be required if the compaction moisture does not meet the above requirements.

13.3. Fill Materials

13.3.1. Onsite Materials

The onsite shallow clayey sand and sandy clay with low expansion potential are deemed suitable to be re-used as engineered fill, provided they are properly processed, moisture conditioned, and free from deleterious material prior to fill placement except as indicated. Some import non-expansive material should also be anticipated for backfilling purpose. The imported materials being used for backfilling should have a low expansion potential (EI less than 20) and should comply with the specifications of this report.

The onsite sandy clay soils may be used under asphalt pavement and concrete roadway areas provided they are properly moisture conditioned; however, they should not be used as backfill within the upper one foot below concrete pedestrian flatwork areas unless further testing at the time of construction indicates an expansion index less than about 20. Unless indicated otherwise, the shallow sandy clay soils are considered suitable for backfilling purpose where no concrete flatwork is anticipated provided, they are free of deleterious and oversize materials and are properly processed and moisture conditioned.

Overexcavation and re-compaction will induce fill shrinkage. Many factors such as mixing, relative compaction of the fill, and topographic approximations will affect shrinkage. We cannot estimate the exact amount of shrinkage; however, in our opinion, the shrinkage may be on the order of 10 to 15 percent for existing soils excavated and recompacted to 90 percent relative compaction. This estimate does not include the material that will be required to fill in the excavations after the removal of any subsurface structures from the prior use of the site and removal of topsoil.

13.3.2. Import

Import materials should contain sufficient fines (binder material) to be relatively impermeable and result in a stable subgrade when compacted. The imported materials should have an expansion index (EI) less than 20 and should be free of organic materials, debris, and cobbles larger than 2½ inches with no more than 40% passing the # 200 sieve. A bulk sample of potential import material, weighing at least 35 pounds, should be submitted to the Geotechnical Consultant at least 48 hours before fill operations. Other than aggregate base and bedding sand, all proposed import materials should be tested for corrosivity, should be environmentally cleared from contamination and should be approved by the Geotechnical Consultant prior to being imported onsite.

13.4. Temporary Excavations

Temporary excavations adjacent to un-surcharged areas are anticipated to be stable vertically to a depth up to 5 feet in fill and alluvium. For deeper excavations up to a depth of 8 feet, we recommend a gradient no steeper than ¾:1 (H:V) for unsurcharged excavations unless shoring is used.

The tops of slopes should be barricaded to prevent vehicles and storage loads within 6 feet of the tops of the slopes, or within a distance equal to at least the height of the slope, whichever is greater. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes; we should be advised of such heavy vehicle loadings so that specific setback requirements can be established. When excavating adjacent to existing footings or building supports, proper means should be employed to prevent any possible damage to the existing structures. Un-shored excavations should not extend below a 1½:1 (H:V) plane extending downward from the lower edge of adjacent footings and should start at least 2 feet away from the footing edge. Where there is insufficient space to slope back an excavation, shoring may be required. All regulations of State and Federal OSHA should be followed.

Temporary excavations are assumed to be those that will remain un-shored for a period of time not exceeding one week. In dry weather, the excavation slopes should be kept moist, but not soaked. If excavations are made during the rainy season (normally from November through April), particular care should be taken to protect slopes against erosion. Mitigative measures, such as installation of berms, plastic sheeting, or other devices, may be warranted to prevent surface water from flowing over or ponding at the top of excavations.

13.5. Floor Slabs

13.5.1. General

The grading recommendations for the new building pads are provided in Section 13.2.1. The building floor slabs-on-grade, as a minimum, should have a thickness of 5 inches and should contain as a minimum No. 4 bars spaced a maximum of 16 inches on centers, in both directions or as recommended otherwise by the Structural Engineer. The Structural Engineer should ultimately determine the size and spacing of the reinforcement to be used. We recommend a concrete strength of at least 4000 psi unless determined otherwise by the Structural Engineer.

13.6.2 Moisture Sensitive Floor Covering

Water vapor transmitted through floor slabs is a common cause of floor covering problems. In areas where moisture-sensitive floor coverings (such as tile, hardwood floors, linoleum or carpeting) are planned, a vapor retarder should be installed below the concrete slab to reduce excess vapor transmission through the slab.

The function of the recommended impermeable membrane (vapor retarder) is to reduce the amount of soil moisture or water vapor that is transmitted through the floor slab. The membrane should be at least 15-mil thick, Class A, and care should be taken to preserve the continuity and integrity of the membrane beneath the floor slab. The vapor retarder should conform to ASTM E1745.

A capillary break below the slab may be used at the discretion of the Project Architect. If used, the capillary break should consist of at least 4 inches of free draining gravel or coarse sand, with no more than 2 percent passing the ASTM No. 200 sieve, and should be placed below the vapor retarder. The gradation for the free draining material should conform to the requirements for No. 4 Concrete Aggregates as specified in Section 200-1.4 of the Standard Specifications for Public Works Construction (Greenbook).

Another factor affecting vapor transmission through floor slabs is the water to cement ratio in the concrete used for the floor slab. A high water to cement ratio increases the porosity of the concrete, thereby facilitating the transmission of water vapor through the slab. The project Structural Engineer should provide recommendations for design of the building slab in accordance with the latest version of the applicable codes. The placement of sand above the vapor retarder is the purview of the Structural Engineer.

13.6. Seismic Coefficients

Under the Earthquake Design Regulations of Chapter 16A, Section 1613A of the 2019 CBC, and based on the mapped values, the coefficients and factors presented in Table 1 were calculated using ASCE 7-16 and the USGS map parameters (Figure A-8, Response Spectrum).

Table 1 – Seismic Coefficients and Factors

Site Class (CBC 2019 – 1613A.3.2)	D
Seismic Design Category based on Occupancy Category III (CBC 2019-1604A.5 &1613A.3.5)	*D
Mapped Acceleration Parameter for Short Period (0.2 Second), S_S	1.895
Mapped Acceleration Parameter for 1.0 Second, S_1	0.667
Adjusted Maximum Spectral Response Parameter for Short Period (0.2 Second), S_{MS}	1.895
Adjusted Maximum Spectral Response Parameter for 1.0 Second Period, S_{M1}	*1.134
Design Spectral Response Acceleration Parameter, S_{DS}	1.263
Design Spectral Response Acceleration Parameter, S_{D1}	*0.756
Peak Ground Acceleration (PGA_M)	0.898

Project Site Coordinates: Longitude: W118.333090º Latitude: N33.929175º (WGS84)
*Based on F_v of 1.7. See Section 11.4.8 of ASCE 7-16 for calculation requirements

The site class is determined in accordance with ASCE 7 Chapter 20 using either shear wave velocity, SPT blow count or undrained shear strength. For a site to be classified as Site Class D the weighted average SPT blow count should be between 15 and 50 and the average weighted undrained shear strength should be between 1,000 and 2,000 psf within the upper 100 feet of soil. The SPT blow count test results presented on the boring logs indicate that the requirements for Class D are met.

13.7. Shallow Foundations

General: For the purpose of preparing this report, we assumed that the proposed building structures will impose maximum column loads of about 25 kips and wall loads less than 2 kips per lineal foot. The recommendations for preparation of the subgrade underlying the footings are provided in the “Earthwork” Section of this report. The Structural Engineer should design foundations in accordance with the requirements of the applicable building code.

Footings should have a minimum width of 2 feet for isolated footings and 18 inches for continuous footings. The bottom of building footings should be located at least 24 inches below the lowest adjacent finish grade, and reinforcement should consist of a minimum of two No. 5 bars, top and bottom or equivalent as determined by the Structural Engineer.

The proposed building structures may be supported on isolated and/or strip footings designed using a net allowable bearing pressure of 2,000 pounds per square foot (psf) for footings supported on at least 2 feet of engineered fill as indicated in the grading section of this report and embedded at least 24 inches below the lowest adjacent grade. This bearing pressure may be increased by 250 psf for each additional foot of depth and 200 psf for each additional foot of width to a maximum of 3,200 psf. A one-third increase in the bearing value may be used when considering wind or seismic loads. In the event of new footings located within one footing width of an existing footing, we recommend reducing the bearing pressure of the new footing by 30 percent.

Minor footings may be required for low height exterior landscape walls (4 feet or less in height), or other small ancillary structures. These footings should be supported on at least 2 feet of new engineered fill and should be embedded at least 18 inches. A vertical bearing pressure of 1,500 psf may be used for these footings.

Lateral Resistance of Footings: Lateral load resistance may be derived from passive resistance along the vertical sides of the foundations, friction acting at the base of the foundations, or a combination of the two. A coefficient of friction of 0.30 may be used between the footings, floor slabs, and the supporting soils comprised of engineered fill. Where visqueen is used below floor slabs, the friction coefficient should not exceed 0.1. The passive resistance of level properly compacted fill soils in direct contact with the footings may be assumed to be equal to the pressure developed by a fluid with a density of 250 pcf, to a maximum pressure of 2,500 psf. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined provided that the passive resistance is reduced by one third. We recommend that the first foot of soil cover be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

Estimated Settlement of Footings: Based on the results of our analyses and provided that our recommendations in preceding sections of this report are followed, we estimate that the total static settlement of isolated and/or strip footings under sustained loads will be on the order of ¾ inch for the anticipated maximum structural load. The maximum static differential settlement, over a horizontal distance of 40 feet, is anticipated to be on the order of ½ inch for similarly loaded footings. The differential settlement during the design seismic event is anticipated to be on the order of ¼ inch in 40 feet.

13.8. Retaining Walls

We have assumed that retaining walls, if needed, will have heights in the range of 1½ to 6 feet. Design earth pressures for retaining walls depend primarily on the allowable wall movement, wall inclination, type of backfill materials, backfill slopes, surcharges, and drainage. The earth pressures provided assume that non-expansive soil backfill will be used and a drainage system will be installed behind the walls so that external water pressure will not develop. A drainage system should be provided behind the walls to reduce the potential for development of hydrostatic pressure. If a drainage system is not installed, the cantilever level-backfilled walls, under static conditions, should be designed to resist a hydrostatic pressure equal to that developed by a fluid with a density of 95 pcf for the full height of the wall.

Determination of whether the active or at-rest condition is appropriate for design will depend on the flexibility of the wall. Walls that are free to rotate at least 0.002 radians (deflection at the top of the wall of at least 0.002 x H, where H is the unbalanced wall height) may be designed for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for at-rest conditions. The recommended static active and at-rest earth pressures are provided in the following table.

Table 2 - Earth Pressures for Retaining Walls, Import Sand Backfill

Wall Movement	Backfill Condition	Equivalent Fluid Pressure
Free to Deflect	Level	40
Restrained	Level	65

The above lateral earth pressures do not include the effects of surcharge (e.g., traffic, footings, sloping ground) or compaction-induced wall pressures. Any surcharge (live, including traffic, dead load, or slope) located within a 1:1 plane drawn upward from the base of the excavation should be added to the lateral earth pressures. The lateral contribution of a uniform surcharge load located immediately behind walls may be calculated by multiplying the surcharge by 0.33 for cantilevered walls and 0.5 for restrained walls. For vehicular surcharge adjacent to driveways or parking areas a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot traffic surcharge, should be used. The onsite clay soils should not be used as backfill for the walls unless the soil expansion is considered in the design due to an increase of lateral pressure.

Walls should be waterproofed using appropriate membranes, and properly drained or designed to resist hydrostatic pressures. The waterproofing membrane should be covered with a protection board or equivalent to prevent perforation during backfilling.

Except for the upper 2 feet, the backfill immediately behind retaining walls (minimum horizontal distance of 12 inches measured perpendicular to the wall) should consist of free-draining ¾-inch crushed rock wrapped with filter fabric. The upper 1½ feet of cover backfill should consist of relatively impervious onsite material. A 4-inch diameter perforated PVC pipe, placed perforations down at the bottom of the crushed rock layer, leading to a suitable gravity outlet, should be installed at the base of the walls. As an alternative to extending the crushed rock to within 1½ feet of the ground surface for the wall drain, geocomposite panel drains may be used. With wall drain panels, the 4-inch diameter perforated pipe located at the heel of the wall/footing should be surrounded with one cubic foot of ¾-inch crushed rock wrapped with filter fabric; the pipe invert should be supported on about 1½ inches of crushed rock. All drainage should be directed to the street in non-erosive devices.

In the event of a large earthquake, the lateral earth pressure on walls may be significant. When combining both static and seismic lateral earth pressures, a decreased factor of safety may be used in the design of retaining walls when checking for sliding and overturning stability. For cantilever walls, we have calculated the seismic increment of lateral pressure using the Mononobe-Okabe equation assuming the seismic coefficient to be 0.42 of the peak acceleration (PGA_M). We suggest using a dynamic earth pressure increment of 38 psf/ft for cantilever yielding walls with level backfill assuming the walls will not exceed 8 feet in height. The seismic pressure should be taken as a regular triangular distribution (not inverted). The point of application of the dynamic thrust may be taken at 0.37H above the toe of the wall, where H is the retained height. The Structural

Engineer should determine if a seismic increment of lateral earth pressure is applicable based on wall heights and allowable wall movements.

13.9. Utility Trench Backfill

Bedding material surrounding utility lines and extending to a point 12 inches above the lines should consist of either sand, fine-grained gravel, or sand-cement slurry to support and/or to protect the lines. A minimum of 4-inch thick bedding material should be placed below the bottom of the utility lines, on a firm and unyielding subgrade. The bedding material should meet the specifications provided in the latest edition of the "Standard Specifications for Public Works Construction" (Greenbook). Sand or gravel should be compacted in accordance with Greenbook specifications.

Above the bedding, up to finished subgrade in areas other than landscape and up to one foot below flatworks and pavements, utility trenches should be backfilled with onsite materials or imported granular materials and mechanically compacted to at least 90% of the maximum dry density of the soils.

For utility trenches within the building areas, the backfill should be compacted to the minimum required relative compaction indicated under the "Grading" section of this report. The backfill material should be observed, tested and approved by the Geotechnical Consultant. The trench bedding materials should be placed in accordance with Section 306-6 of the "Standard Specifications for Public Works Construction" (Greenbook).

When adjacent to any footings, utility trenches and pipes should be laid above an imaginary line measured at a gradient of 1½ (H:V) projected down from the bottom edges of any footings. Otherwise, the pipe should be designed to accept the lateral effect from the footing load, or the footing bottom should be deepened as needed to comply with this requirement. Backfill consisting of 2-sack sand cement slurry may also be used.

13.10. Drainage

Foundation, slab, flatwork, and pavement performance depend greatly on proper drainage within and along the boundary of the development. Perimeter grades around the buildings should be sloped in a manner allowing water to drain away from the structures and not pond next to the foundations. Roof downdrains should be connected to underground pipes carrying water away from the structure areas or have extenders so water does not drain and pond next to the structures. Per the 2019 CBC, landscape areas within 10 feet of structures should slope away at gradients of at least 5 percent. Paved areas within 10 feet of structures should slope away at gradients of at least 2 percent. Proper drainage is recommended for all surfaces to reduce the risk of settlement due to hydroconsolidation and heave due to soil expansion.

We recommend minimizing the size and number of planters adjacent to the building and using drought resistant planting. Any planter located within 8 feet of the building should have a solid bottom and a drain outlet to the storm drain. To reduce the potential for overwatering, irrigation should be performed under the management of experienced landscape architects, and not under the control of a landscape contractor.

13.11. Asphalt Concrete (AC) Pavement

The required pavement structural sections depend on the expected wheel loads, volume of traffic, and subgrade soils. Based on soil classification and our experience with R-value correlations with fines contents and plasticity index, an R-value of 10 may be used for pavement design for the clayey subgrade soils. The R-value should be confirmed with additional tests, if necessary, at the time of construction. The following pavement sections are recommended based on assumed traffic indices of 4, 5, 5.5 and 6. We recommend a traffic index of at least 6 for driveways where trucks, including trash trucks and fire trucks will have access. The project Civil Engineer should determine the traffic index to be used for different areas of the site.

Table 3 – Alternative Pavement Sections for Vehicular Traffic

Traffic Index	Asphalt Thickness (Inches)	Base Course (CAB) Thickness (Inches)
4	3.0	6.5
5	3.0	9.5
5.5	3.5	10.5
6	4.0	11.0

Base course material should consist of Crushed Aggregate Base (CAB) as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction ("Greenbook"). Base course and asphalt concrete should be compacted to at least 95 percent of the maximum dry density of that material. Crushed Miscellaneous Base (CMB) may be used only if the supplier can demonstrate that the aggregate does not contain contaminated material and provide documentation to that effect.

The subgrade underlying the pavement areas should be overexcavated 18 inches below the proposed base course layer. Prior to fill placement, the exposed surface should be scarified to a minimum depth of 8 inches, moisture conditioned within two percent of optimum moisture content for sand and to at least 115 percent of optimum moisture content for clay, and compacted to at least 90% of the maximum dry density obtained per ASTM D1557. The upper 12 inches of subgrade soils should be compacted to 95% relative compaction if sandy soils are present and to 90% for clayey soils. The subgrade should be in a "non-pumping" condition at the time of compaction.

Any onsite surficial organic soils within landscaped/turf areas should not be used as subgrade materials. Where feasible, the overexcavation should be laterally extended a minimum of 2 feet beyond the perimeters and edges of parking areas, roadways and curbs. Any abandoned footing and/or underground concrete structure within the work limit should be removed entirely and the excavation should be backfilled to grade.

In order to increase pavement performance and extend the pavement life, concrete curbs and gutters could be deepened to extend below the base course material and be seated in the compacted subgrade. Priority should be given to areas where heavier traffic is anticipated and where irrigation may be greater. The intent of deepening the curbs and gutters is to form a "cut-off" wall to reduce the amount of water flow through the base course material from adjacent landscaped areas. Subgrade soils, which become soaked as a result of water flowing through base course material, can reduce the life of the pavement and cause heaving of the pavement. Where feasible, the curbs should be deepened to an elevation at least 6 inches below the bottom level of the proposed base course section.

13.12. Portland Cement Concrete (PCC) Vehicular Pavement

The grading recommendations for vehicular PCC pavement are provided in Section 13.2.2 of this report. Base course material used in the pavement sections should consist of Crushed Aggregate Base (CAB) as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction (Greenbook 2012). The aggregate base course should be compacted to at least 95% of the maximum dry density of that material. Crushed Miscellaneous Base (CMB), as defined by Section 200-2.4 of the Greenbook, may be used only if the supplier can demonstrate that the aggregate does not contain contaminated material.

The recommendations presented herein should be used for design and construction of the slabs and pertaining grading work underlying vehicular pavement areas. A minimum modulus of rupture of 550 psi for concrete has been assumed in designing of the PCC pavement sections; this corresponds to a concrete compressive strength of approximately 4,000 psi at 28 days. A qualified design professional should specify where heavy duty and standard duty slabs are used based on the anticipated type and frequency of traffic. The recommended PCC pavement sections are provided in the following table.

Table 4 - PCC Pavement Sections

Pavement Type	Portland Cement Concrete Thickness (inches)	Base Course (CAB) Thickness (inches)
Light Duty	6.0	6.0
Heavy Duty	7.5	6.0

These concrete pavement sections should be increased for bus traffic where applicable. The following recommendations should also be incorporated into the design and construction of PCC pavement sections:

- The pavement sections should be reinforced with No. 3 rebars spaced at 18 inches on centers each way to reduce the potential for shrinkage cracking.
- Joint spacing in feet should not exceed twice the slab thickness in inches, e.g., 12 feet for a 6-inch thick slab. Regardless of slab thickness, joint spacing should not exceed 15 feet.
- Layout joints should form square panels. When this is not practical, rectangular panels can be used if the long dimension is no more than 1.5 times the short one.

- Control joints should have a depth of at least 1/4 the slab thickness, e.g., 1 inch for a 4-inch thick slab.
- Where the pavement does not abut against a curb or gutter, an 8-inch thickened edge should be constructed.
- Pavement section design assumes that proper maintenance such as sealing, and repair of localized distress will be performed on a periodic basis.

Exterior concrete slabs for pedestrian traffic or landscape should be at least four inches thick. Weakened plane joints should be located at intervals of no more than about 6 feet unless slabs thicker than 4 inches are used. The pavement sections should be reinforced with No. 3 rebars spaced no further than 18 inches on centers each way to reduce the potential for shrinkage cracking. A thickened edge is recommended at the exterior edge of the flatwork adjacent to landscape subject to irrigation. The thickened edges should be a minimum of 12 inches deep and 8 inches wide and reinforced with two No. 3 bars at the top and bottom. In addition to the thickened edges, the walkway should be underlain by at least 12 inches of non-expansive soils and the upper 12 inches of the clay subgrade below the non-expansive soils should have a moisture content of at least 125 percent of optimum prior to placement of the non-expansive soils. The concrete strength for pedestrian walkways should be at least 2,500 psi unless determined otherwise by the Structural Engineer.

If pedestrian pavers are used, they should be supported on one inch of sand underlain by 4 inches of crushed aggregate base (CAB). For light vehicle traffic, the pavers should be underlain by one inch of sand and at least 10 inches of aggregate base (CAB). For heavy duty traffic area, we recommend increasing the aggregate base thickness to 16 inches. A separation/reinforcing fabric should be placed on the prepared subgrade prior to placement of the aggregate base.

13.13. Hardscape Play Courts

The overexcavation and subgrade preparation for the play courts such as tennis courts and basketball courts should be as indicated for the for the pavement sections (minimum 18 inches of overexcavation and moisture conditioning to 125% of optimum). If conventional concrete slabs are used, we recommend 5-inch thick slab reinforced with #4 bars at 16 inches on center unless indicated otherwise by the slab designer. The concrete strength should be at least 3500 psi and the slabs should be underlain by at least 4 inches of aggregate base. Any portions of the slab adjacent to irrigated planter should have a reinforced thickened concrete edge extending 18 inches below the ground surface.

13.14. Grading of the Football Field

Any existing pavement, foundations, vegetation, abandoned underground utilities and other debris should be removed from the areas to be graded. All excavation should be backfilled with engineered fill. All topsoil should also be removed. Following removal of topsoil, we recommend overexcavating an additional 12 inches of material. Following geotechnical approval, the bottom of the removal excavations should be scarified to a depth of 10 inches, moisture conditioned within 2 percent of optimum for sand, above optimum for silt and to 125 percent of optimum for clay, and recompacted to at least 90% relative compaction as determined by ASTM D1557. All fill placed should be compacted to at least 90% relative compaction at moisture contents as indicated above.

Depending upon the time of the year the grading occurs and the irrigation of the lawn during the prior months, localized wet soils should be anticipated. These wet soils can induce “pumping conditions” and prevent compaction of the proposed backfill. It should be anticipated that the wet soils will require additional overexcavation and bridging with crushed rock, dryer soils, and with the use of geosynthetic. Landscape irrigation should be discontinued at least 4 weeks before grading to allow some drying at the surface.

It is recommended to slope the subgrade to at least one percent toward the internal drains. The thickness of the drain stone/rock above the subgrade can be adjusted as necessary to obtain the desired synthetic turf grade. The subgrade should be proof rolled using heavy rubber tire equipment or a loaded truck under the observation of the Geotechnical Engineer. Any unsuitable soft spots should be remediated as recommended by the Geotechnical Engineer.

Liner for Synthetic Turf Field

It should be noted that the upper soils within the football field area are relatively impervious and subject to develop “pumping” conditions once they become soaked, thus resulting in unstable subgrade. It is, therefore, recommended that an impervious liner overlain by a drainage system be installed for supporting the synthetic turf. Prior to installation of the membrane, it is recommended to finish rolling the subgrade with a large smooth drum roller (at least 4 by 4 drums). The polyethylene/HDPE impervious liner should be highly flexible, resisting to abrasion, to puncture, and to the anticipated heat of the field. The grab tensile strength (ASTM D7004) and the puncture resistance (ASTM D4833) should be at least 300 pounds and 150 pounds, respectively, unless indicated otherwise by the field designer.

Drainage System

The drainage system is anticipated to consist of aggregate stone, flat drain collectors and perforated piping as designed by the landscape architect and/or the civil engineer. The drainage pipes are normally designed so that the main drain (s) are placed along the side of the field and lateral piping is installed at an angle across the slope of the field. The lateral drains are normally 15 to 20 feet apart. Drainage pipes should maintain a consistent slope to the outlet of at least 0.5 percent. Geotextile fabric is recommended as a barrier between unstable subsoil and the gravel drainage blanket. At least one inch of drain gravel is normally placed below round perforated piping, which should be installed with the perforation holes facing down.

All permeable stone should consist of clean, virgin crushed stone free of shale, soft limestone and sandstone, clay and organic material and any other deleterious material. For field perimeter drain, the drain gravel protected with filter fabric may consist of ¾-inch crushed rock conforming to the Greenbook Specifications or other aggregate as selected by the landscape architect/civil engineer. The crushed rock should be protected by a geotextile such as Mirafi 140N or approved equivalent and the fill cap above the geotextile should be at least 12 inches thick.

The stone mix must have enough fines to be stable but not so much as to reduce drainage excessively. Some construction system calls for a simple structural stone (free draining finishing stone) layer laid directly over the free draining crushed base stone. The sand equivalent of the base stone should be at least 75 and the percentage of wear at 500 revolutions (ASTM C131) should not exceed 40 unless approved otherwise by the designer. The crushed base stone should be at least 6 inches thick and should consist of modified Caltrans Class 2 permeable aggregate with the recommended following grading or approved equivalent by the Field Designer.

Sieve Size	Percent Passing
1”	100
¾”	90-100
½”	50-90
3/8	35-70
No. 4	25-40
No. 8	18-30
#30	6-15
#50	0-7
#100	0-4
#200	0-1

The base stone may fragment at every stage of the construction process and result in higher fine content than determined at the plant due to loading, unloading, spreading and compacting. The stone should be spread in such a way that it is immediately level with the field design gradient. It is important to avoid modifying the grade once the stone is laid out. Stockpile stones tend to separate by size during handling (the finer stones tend to move to the bottom). Preferably, stones should not be mix on site to avoid separation and the optimum moisture should be maintained to provide better cohesion and reduce segregation.

It is recommended to compact the stone base between 92 and 95 percent relative compaction as determined by ASTM D1557 unless determined otherwise by the Field Designer. Over compaction should be avoided since it will cause additional breakdown of the stone particles and may reduce the hydraulic conductivity/permeability. The contractor should establish circulation pattern in the field to avoid concentration of traffic that may result in over compaction/breakdown of the stone in localized areas. The Synthetic Turf Council’s suggests a minimum flow rate through the permeable base of 28 inches per hour. At the discretion of the Field Designer, the flow rate of the base stone should be measured in the field at the time of construction.

Running Track

Within the track area, we recommend overexcavating 18 inches of subgrade material below the pavement section. The overexcavation should extend at least 2 feet outside the track, where feasible. Prior to backfilling, the subgrade should be scarified to a depth of 8 inches, moisture conditioned and recompacted to 90 percent relative compaction. The upper 12 inches of subgrade should be compacted to 92% relative compaction. The excavated material may be used as fill except for high plastic clay soils, if encountered.

The pavement section should consist of 4 inches of asphalt concrete underlain by 6 inches of Crushed Aggregate Base (CAB) as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction (“Greenbook”). A material with shock absorbing properties may be placed over the asphalt concrete. Proper drainage adjacent to the track is essential to prevent soil movement due to water penetration below the ground surface. The curbs should extend 16 inches below the finish grade to serve as a barrier for water migration below the track unless indicated otherwise by the track designer.

14. SOIL EXPANSIVITY

The subsurface soils encountered at shallow depths within the building pad area ranges range from sandy lean clay to clayey sand. These types of material generally have a moderate susceptibility to expansion when facing seasonal cycles of saturation/desiccation. Expansion index testing on shallow samples of Borings B-1 and B-4 indicated values of 14 and 22, respectively, indicating low expansion potential, however, medium expansion potential soils may be present within the proposed improvement areas. As such, the recommendations provided in this report regarding drainage, moisture content during compaction, presoaking, the use of sand blankets and other pertinent recommendations for site improvements should be incorporated into the design and construction.

15. SOIL CORROSIVITY

The corrosion potential of the onsite materials to steel and buried concrete was preliminarily evaluated. Laboratory testing was performed on one soil sample to evaluate pH, minimum resistivity, chloride and soluble sulfate content. The test results are presented in the following table.

Table 5 - Corrosion Test Results

Boring	Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
B-4	2 – 3	8060	6.8	60	15

These tests are only an indicator of soil corrosivity for the sample tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm that their corrosion potential is not significantly more severe than those noted. The concentrations of soluble sulfates indicate that the potential of sulfate attack on concrete in contact with the onsite soils is “negligible” based on ACI 318 Table 4.3.1. Cement Type II may be used in the concrete. Maximum water-cement ratios are not specified for the sulfate concentrations; however, the Structural Engineer should select a concrete with appropriate strength.

Further interpretation of the corrosivity test results, including the resistivity value, and providing corrosion design and construction recommendations are the purview of corrosion specialists/consultants.

16. OBSERVATION AND TESTING

This report has been prepared assuming that Koury Engineering & Testing, Inc. will perform all geotechnical-related field observations and testing. If the recommendations presented in this report are utilized, and observation of the geotechnical work is performed by others, the party performing the observations must review this report and assume responsibility for the recommendations contained herein. That party would then assume the title of “Geotechnical Consultant of Record”. A representative of the Geotechnical Consultant should be present to observe all grading operations as well as all footing excavations.

17. CLOSURE

The findings and recommendations presented in this report were based on the results of our field and laboratory investigations, combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either expressed or implied. Subsurface variations between borings should be anticipated. Koury should be notified if subsurface conditions are encountered, which differ from those described in this report since updated recommendations may be required. Samples obtained during this investigation will be retained in our laboratory for a period of 45 days from the date of this report and will be disposed after this period.

Should you have any questions concerning this submittal, or the recommendations contained herewith, please do not hesitate to call our office.

Respectfully submitted,

KOURY ENGINEERING & TESTING, INC.

Jacques Roy

Jacques B. Roy P.E. G.E.
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JACQUES B. ROY
NO. 2077
Ex. Date 9/30/21
Geotechnical
STATE OF CALIFORNIA

Eirik F. Haenschke
Engineering Geologist

PROFESSIONAL GEOLOGIST
EIRIK F. HAENSCHKE
No. 1597
CERTIFIED ENGINEERING GEOLOGIST
Exp 9-30-20
STATE OF CALIFORNIA

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APPENDICES

Appendix A: Maps and Plans

Vicinity Map – Figure A-1
Boring Location Map – Figure A-2
Geology Map – Figure A-3
Seismic Hazard Zones Map – Figure A-4
Historic High Groundwater Map – Figure A-5
Fault Map – Figure A-6
Flood Map – Figure A-7
Response Spectrum – Figure A-8
Oil and Gas Map – Figure A-9

Appendix B: Field Exploratory Boring Logs

Borings B-1 through B-10

Appendix C: Laboratory Test Results and Calculations

Appendix D: Historical Earthquake Data

EQSEARCH Results

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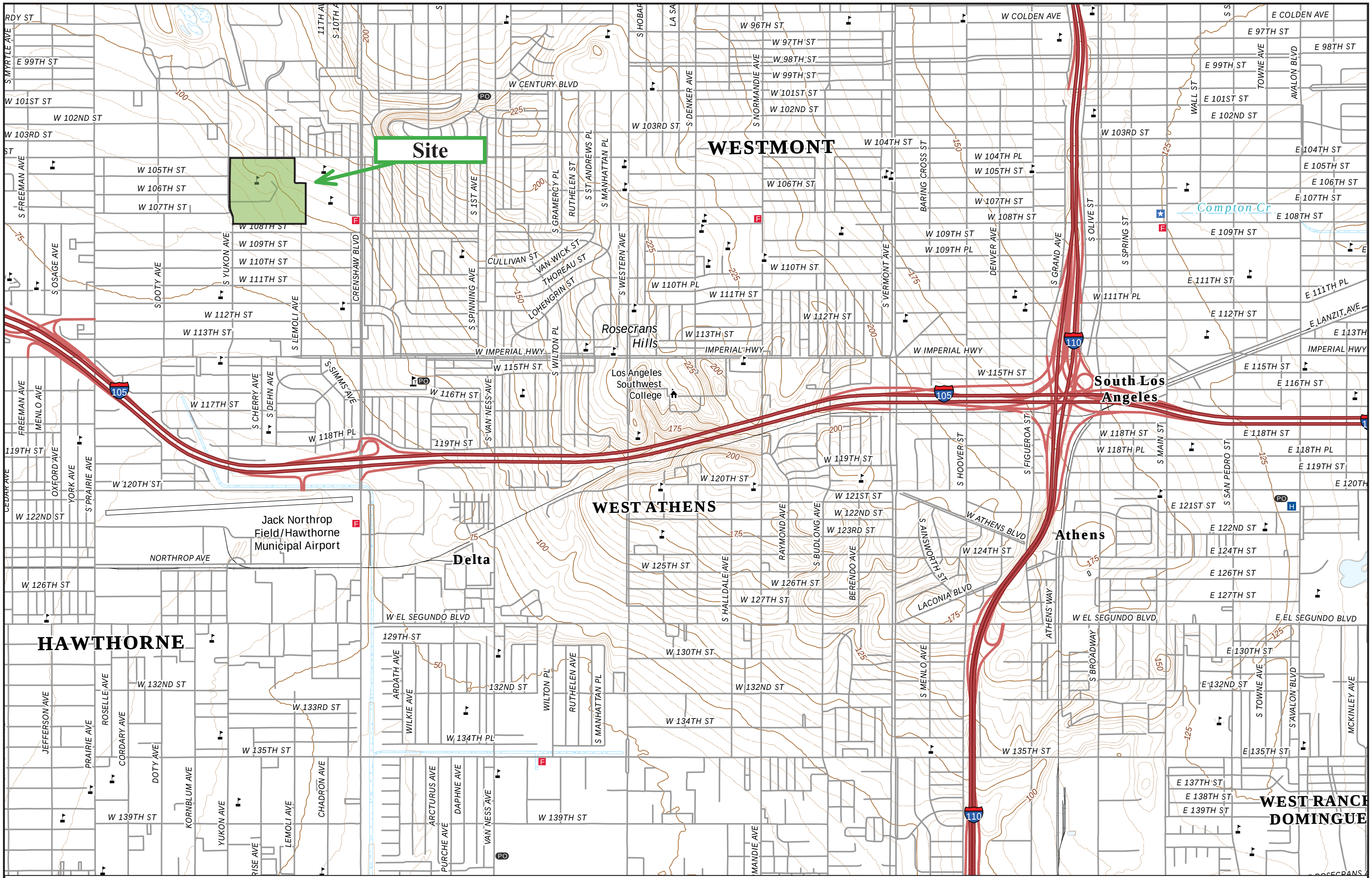
APPENDIX A

Maps and Plans



Reference: USGS Topographic Map, Inglewood Quadrangle, California-Los Angeles County, 7.5 Minutes Series, 2018 - Contour Interval 5 ft.

0 1/2 1 Mile N

KOURY
PASSION INTEGRITY QUALITY

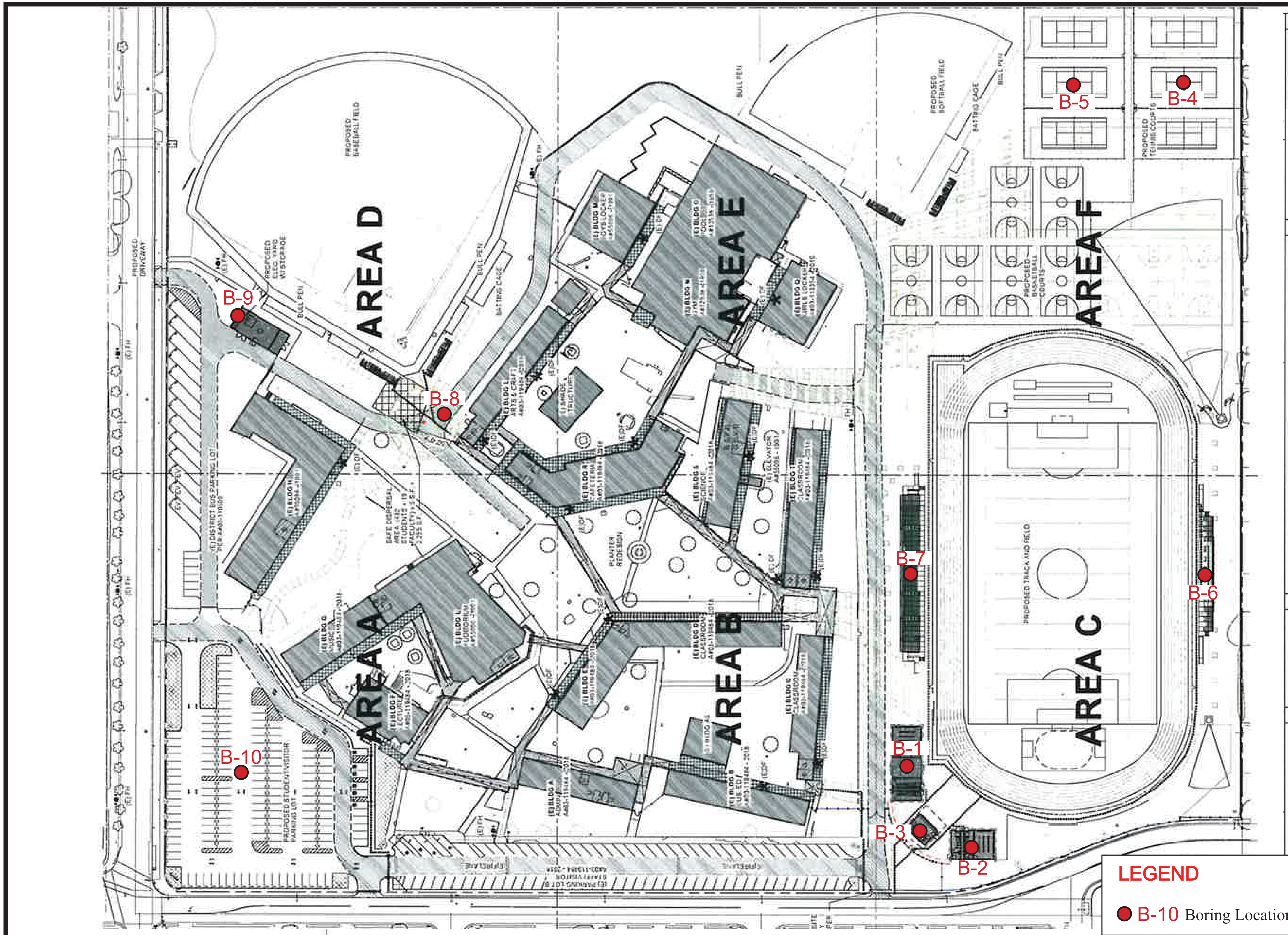
Project Name:
Morningside High School

Project No.: 19-1110

Date: January 2020

Drawing Title:
Vicinity Map

Figure:
A-1



GENERAL NOTES

1. SEE HORIZONTAL CONTROL PLAN CIVIL DRAWINGS FOR DIMENSIONS NOT OTHERWISE SHOWN ON THIS DRAWING
2. SEE LANDSCAPE PLANS FOR ALL PLANTING MATERIAL SPECIES QUANTITIES ALLOCATIONS
3. SEE CIVIL AND LANDSCAPE DRAWINGS FOR ASPHALTIC & PORTLAND CEMENT CONCRETE PAVING TYPE AND SECTIONS
4. SEE CIVIL DRAWINGS FOR LOCATION OF ALL UNDERGROUND UTILITIES
5. SEE PLUMBING SHEETS FOR ALL ROUTING OF ALL UNDERGROUND GAS LINES AND ROOF DRAINAGE CONNECTION POINTS TO STORM DRAINAGE SYSTEM WATER AND SEWER LINES SHOWN ON CIVIL DRAWINGS
6. SEE ELECTRICAL DRAWINGS FOR LOCATION AND TYPES OF VARIOUS POWER AND SIGNAL PULL BOXES AND LIGHT FIXTURES
7. SEE CIVIL DRAWINGS FOR TYPICAL PAVEMENT STRIPING SYMBOLS ETC UNO
8. SEE SHEET AS101 FOR ACCESSIBLE PATH OF TRAVEL
9. SEE SHEET G-101 FOR EMERGENCY VEHICLE ACCESS & HYDRANTS
10. SEE BLEACHER DRAWINGS FOR BLEACHER LAYOUT AND CONSTRUCTION
11. SEE LANDSCAPE DRAWINGS FOR SPORT FIELDS
12. SEE SHEET AS402 FOR GATE SCHEDULE

SITE PLAN LEGEND

PROPERTY LINE
ASSUMED IMAGINARY LINE
▨ PROPOSED BUILDING/ CONSTRUCTION
▨ (E) CLASSROOM BUILDING WITH NO SCOPE IN THIS PROJECT
▦ (E) BUILDING OVERHANG
CANOPY SEE CANOPY DETAILS SHEET AS503
▦ SAFE DISPERSAL AREA 5 SF/PERSON MIN 50'-0" FROM ANY BUILDING
FH FIRE HYDRANT
ORNAMENTAL FENCE
CHAIN LINK FENCE
* DF HI-LO DRINKING FOUNTAIN WITH BOTTLE FILLING STATION
(E) FIRE TRUCK ACCESS ROAD
FIRELANE 20' BARRIER-FREE FIRE TRUCK ACCESS ROAD

EMERGENCY FIRE TRUCK ACCESS PATH OF TRAVEL, ROUTE WITH A MINIMUM OF 20 WIDE BY 15'-6" VERTICAL CLEARANCE WITH 50' INSIDE TURNING RADIUS AND AN ADDITIONAL 2 OF WIDTH PROVIDED TO ALLOW FOR CLEARANCE OF APPARATUS BUMPER OVERHANG TYP VEHICLE BARRIERS SUCH AS GATES PROVIDED WITH A KNOX BOX AT CAMPUS ENTRY POINTS

●●●● (E) PATH OF TRAVEL (A#03-119484 - 2018)
●●●● PATH OF TRAVEL

"**DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE STATEMENT** THE POT IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICATBLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR **PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS** AS PART OF THE DESIGN OF THIS PROJECT THE POT WAS WAS EXAMINED AND ANY ELEMENTS COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO BE NONCOMPLIANT 1) HAS BEEN IDENTIFIED AND 2) THE DETAILS DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMENTS.
DURING CONSTRUCTION IF POT ITEMS WITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CODE COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND RESONABLE CONSTRUCTION TOLERANCES, TEHY SHALL BE BOUGHT INTO COMPLIANCE WITH THE CBC AS A PART OF THIS PROJECT BY MEANS OF OF CONSTRUCTION CHANGE DOCUMENT."

PARKING COUNT

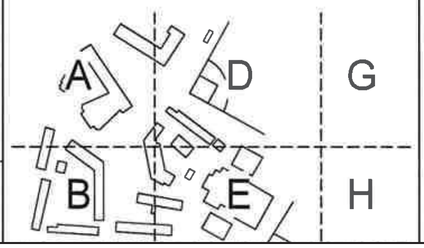
PARKING LOT A - STUDENT/VISITOR + DISTRICT BUS PARKING LOT SUMMARY

	NON ACCESSIBLE SPACES	ACCESSIBLE SPACES PROVIDED	ACCESSIBLE SPACES REQUIRED	VAN SPACES PROVIDED	VAN SPACES REQUIRED	TOTAL
OVERALL	~~189~~	6	6	1	1	197

(E) PARKING LOT B - STAFF/VISITOR SUMMARY (A#03-119484 - 2018)

	NON ACCESSIBLE SPACES	ACCESSIBLE SPACES PROVIDED	ACCESSIBLE SPACES REQUIRED	VAN SPACES PROVIDED	VAN SPACES REQUIRED	TOTAL
OVERALL	82	3	3	1	1	86

KEY PLAN



INGLEWOOD UNIFIED SCHOOL DISTRICT 1888

LIONAKIS
4000 MacArthur Blvd., Suite 101
Newport Beach CA 92660
P 949 955 1919 F 949 955 9175
www.lionakis.com

CONSULTANT

SEAL
C14099

PROJECT
MORNINGSIDE HIGH SCHOOL SITE UPGRADE

10500 YUKON AVE S
INGLEWOOD, CA 90303

CLIENT
INGLEWOOD UNIFIED SCHOOL DISTRICT

401 S. INGLEWOOD AVE.
INGLEWOOD, CA 90301

ISSUED

MARK	DATE	DESCRIPTION

MANAGEMENT

LIONAKIS PROJECT NO	019081
CLIENT PROJECT NO	
COPYRIGHT	LIONAKIS 2019

TITLE
OVERALL SITE PLAN

LEGEND

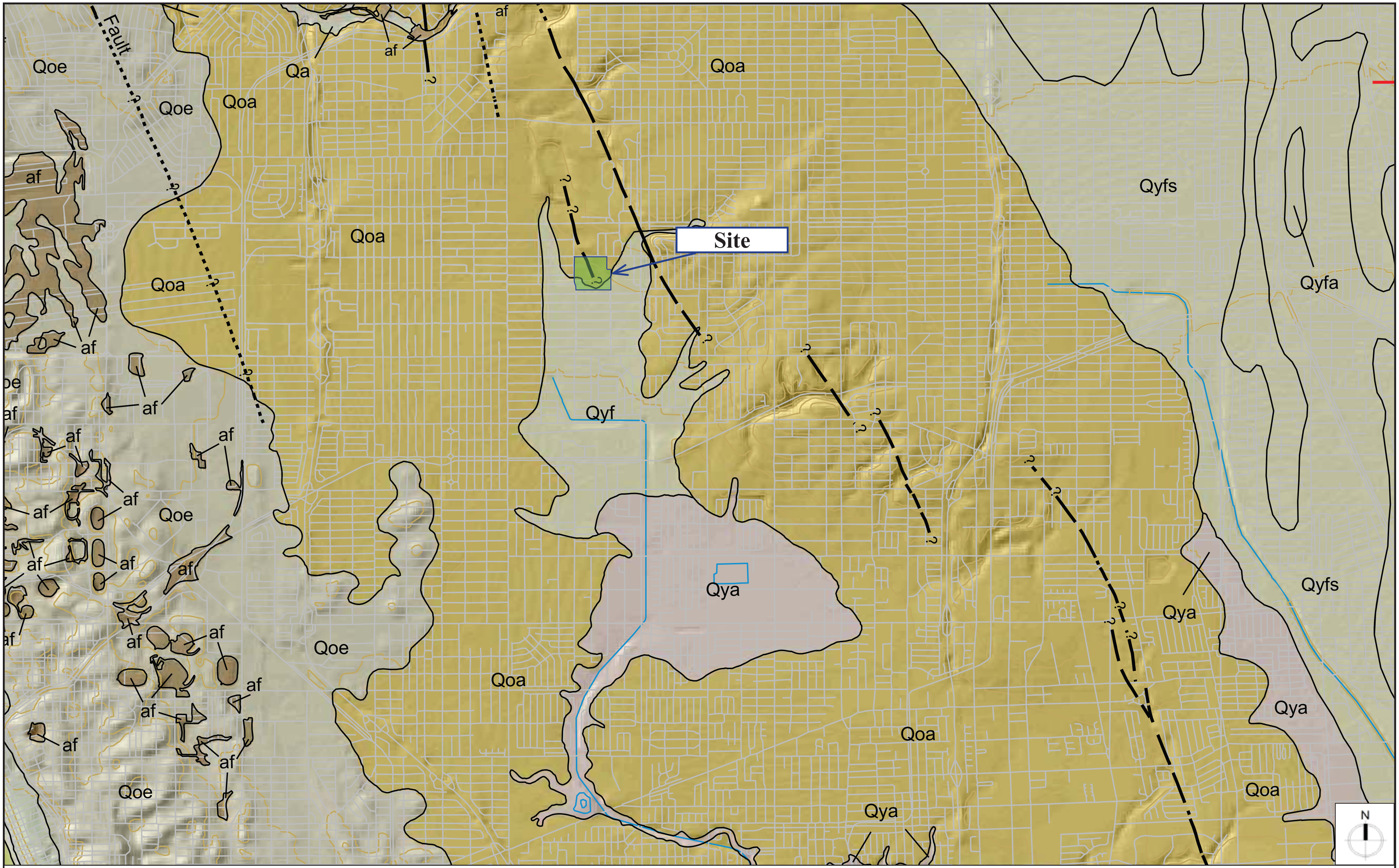
● B-10 Boring Location and Number

N

0 60 120'

KOURY PASSION INTEGRITY QUALITY

Project Name: Morningside High School	**Project No.:** 19-1110	**Date:** January 2020	**Drawing Title:** Boring Location Map	**Figure:** A-2



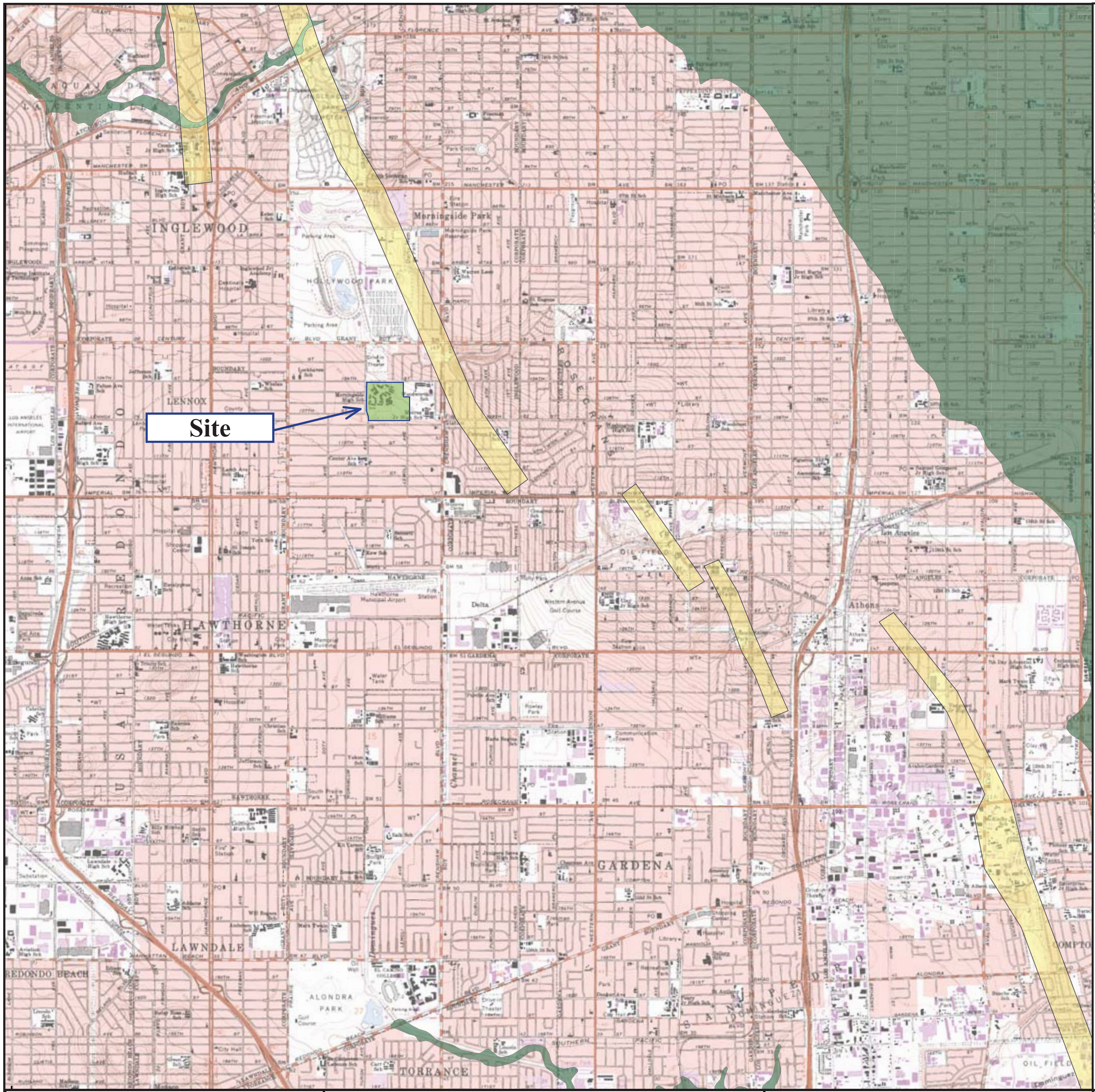
Legend

Qyf	Young Alluvial Fan & Valley Deposits
Qoa	Old Alluvial Flood Plain Deposits

0 1 2 Mile

Reference: Geologic Map of the Long Beach 30' x 60' Quadrangle, Southern California, Version 1.0 - 2003

KOURY PASSION INTEGRITY QUALITY	Project Name: **Morningside High School**	Project No.: **19-1110** Date: **January 2020**	Drawing Title: **Geology Map**	Figure: **A-3**



Earthquake Zones of Required Investigation Inglewood Quadrangle

California Geological Survey

This Map Shows Both Alquist-Priolo Earthquake Fault Zones And Seismic Hazard Zones Issued For The Inglewood Quadrangle

This map shows the location of Alquist-Priolo (AP) Earthquake Fault Zones and Seismic Hazard Zones, collectively referred to here as Earthquake Zones of Required Investigation. The Geographic Information System (GIS) digital files of these regulatory zones released by the California Geological Survey (CGS) are the "Official Maps." GIS files are available at the CGS website http://maps.conservation.ca.gov/cgs/informationwarehouse/. These zones will assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of surface fault rupture and earthquake-triggered ground failure as required by the AP Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630) and the Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6). For information regarding the general approach and recommended methods for preparing these zones, see CGS Special Publication 42, *Earthquake Fault Zones, a Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California*, Appendix C, and CGS Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*.

For information regarding the scope and recommended methods to be used in conducting required site investigations refer to CGS Special Publication 42, and CGS Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. For a general description of the AP and Seismic Hazards Mapping acts, the zonation programs, and related information, please refer to the website at www.conservation.ca.gov/cgs/.

MAP EXPLANATION

EARTHQUAKE FAULT ZONES

🟨 **Earthquake Fault Zones**
Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

Active Fault Traces
Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

SEISMIC HAZARD ZONES

Liquefaction Zones
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES

Overlap of Earthquake Fault Zone and Liquefaction Zone
Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.

Overlap of Earthquake Fault Zone and Earthquake-Induced Landslide Zone
Areas that are covered by both Earthquake Fault Zone and Earthquake-Induced Landslide Zone.

Note: Mitigation methods differ for each zone – AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.

ADDITIONAL INFORMATION

For additional information on the zones of required investigation presented on this map, the data and methodology used to prepare them, and additional references consulted, please refer to the following:

The Northern Newport-Inglewood Fault Zone, in the Long Beach, Inglewood, Hollywood, and Beverly Hills Quadrangles, Ventura County, California
California Geological Survey, Fault Evaluation Report FER-173,
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/FER/173/

For more information on the Alquist-Priolo Earthquake Fault Zoning Act please refer to:
http://www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx

Seismic Hazard Zone Report for the Inglewood 7.5-minute Quadrangle, Los Angeles County, California
California Geological Survey, Seismic Hazard Zone Report 027,
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/SHZR/SHZR_027_Inglewood.pdf

For more information on the Seismic Hazards Mapping Act please refer to:
http://www.conservation.ca.gov/cgs/shzp/Pages/SHMPpgminfo.aspx

Click the link below to learn how to take greater advantage of the GeoPDF format of this map after downloading.
http://gmw.conservation.ca.gov/SHP/EZRIM/Docs/TerragoUserGuide.pdf

INGLEWOOD QUADRANGLE

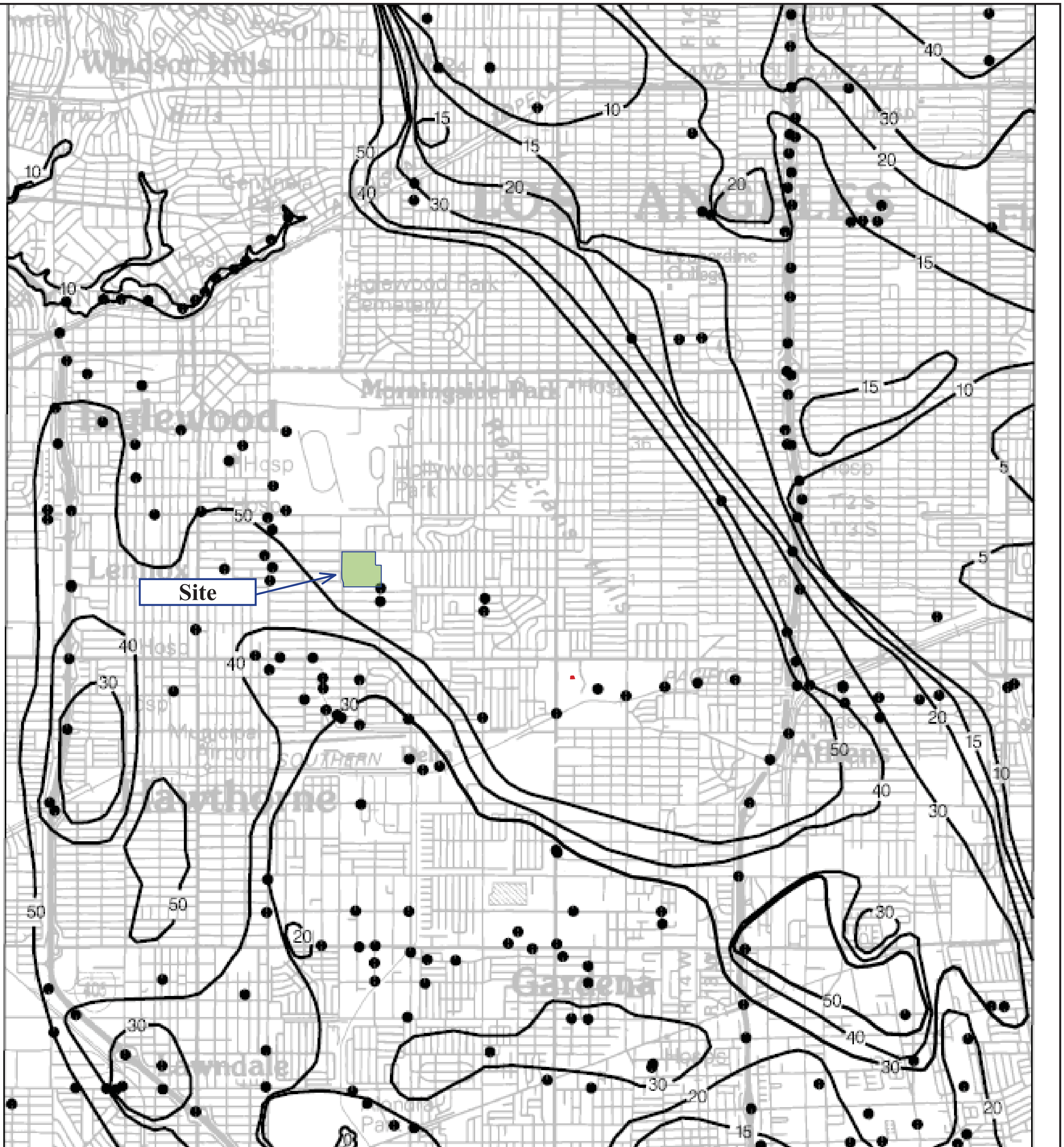
EARTHQUAKE FAULT ZONES	SEISMIC HAZARD ZONES
Delineated in compliance with Chapter 7.5 Division 2 of the California Public Resources Code *(Alquist-Priolo Earthquake Fault Zoning Act)*	Delineated in compliance with Chapter 7.8 Division 2 of the California Public Resources Code *(Seismic Hazards Mapping Act)*
REVISED OFFICIAL MAP	OFFICIAL MAP
Released: July 1, 1986	Released: March 25, 1999
James F. Davis STATE GEOLOGIST	James F. Davis STATE GEOLOGIST

0 0.5 1 Mile

N

KOURY
PASSION INTEGRITY QUALITY

Project Name:	Project No.: 19-1110	Drawing Title:	Figure:
Morningside High School	Date: January 2020	Seismic Hazard Zones Map	A-4



Base map enlarged from U.S.G.S. 30 x 60–minute series

Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Inglewood Quadrangle.

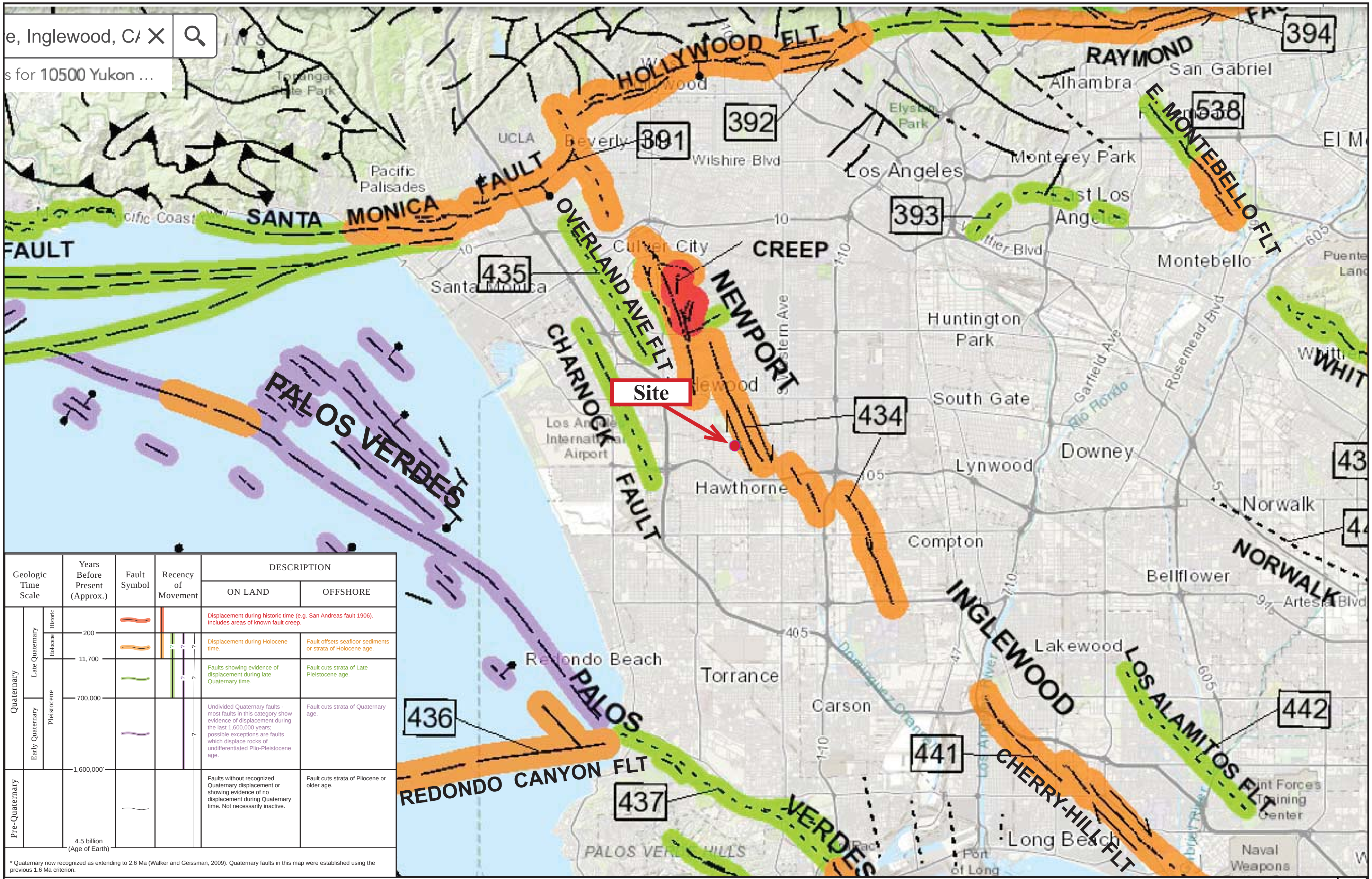
N

0 1 Mile

● Borehole Site

30 Depth to ground water in feet

Project Name:	Project No.: 19-1110	Drawing Title:	Figure:
Morningside High School	Date: January 2020	Historic High Groundwater Map	A-5



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic		🟥		Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200	🟧	? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700	🟩	? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000	🟪	?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000*	—		Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of Earth)				

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

Reference: Fault Activity Map of California (2010) - California Geological Survey
Department of Conservation Web Site @ http://maps.conservation.ca.gov/cgs/fam/ - See Figure A-6a, for explanation

0 4 Mile

N

KOURY
PASSION INTEGRITY QUALITY

Project Name: Morningside High School

Project No.: 19-1110

Date: January 2020

Drawing Title: Fault Map

Figure: A-6

National Flood Hazard Layer FIRMette

FEMA

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Ar of 1% annual chance flood with avera depth less than one foot or with drain areas of less than one square mile *Zo*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Z*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 / 17.5 Cross Sections with 1% Annual Chanc Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approxim point selected by the user and does not repre an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/21/2019 at 12:21:48 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 500'

KOURY
PASSION INTEGRITY QUALITY

Project Name: **Morningside High School**

Project No.: **19-1110**

Date: **January 2020**

Drawing Title: **Flood Map**

Figure: **A-7**

U.S. Seismic Design Maps

Morningside High School

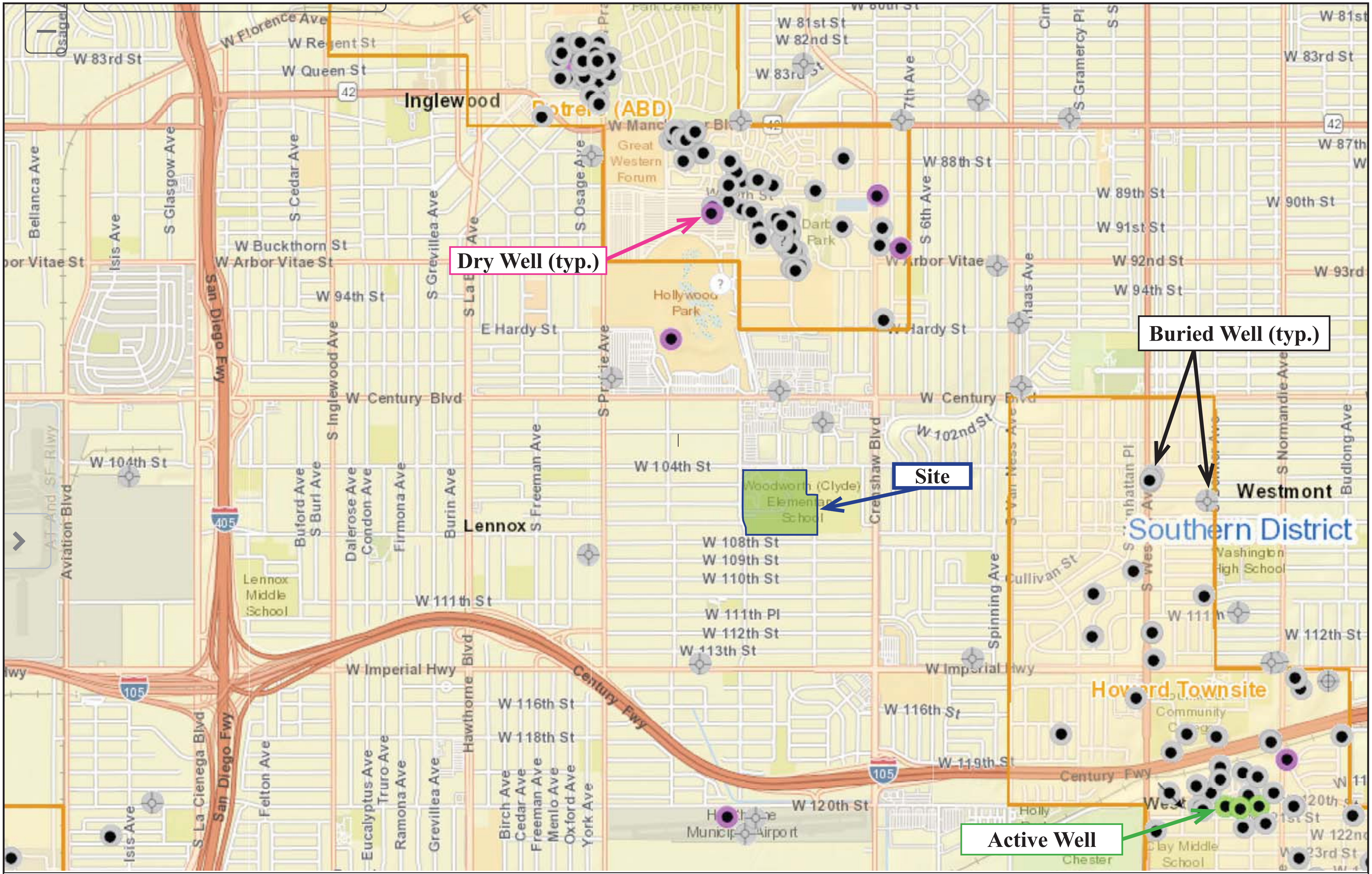
Latitude, Longitude: 33.941487, -118.333090

Date	10/28/2019, 4:04:21 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.895	MCE_R ground motion. (for 0.2 second period)
S_1	0.667	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.895	Site-modified spectral acceleration value
S_{M1}	null- See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.263	Numeric seismic design value at 0.2 second SA
S_{D1}	null - See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null - See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.819	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.898	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.895	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.1	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.461	Factored deterministic acceleration value. (0.2 second)
S1RT	0.667	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.74	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.832	Factored deterministic acceleration value. (1.0 second)
PGAd	0.996	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.902	Mapped value of the risk coefficient at short periods
C_{R1}	0.901	Mapped value of the risk coefficient at a period of 1 s

KOURY PASSION INTEGRITY QUALITY	Project Name: **Morningside High School**	Project No.: **19-1110** Date: **January 2020**	Drawing Title: **Response Spectrum**	Figure: **A-8**



Reference: California Department of Conservation, Division of Oil, Gas & Thermal Resources Well Finder (DOGGR)

KOURY PASSION INTEGRITY QUALITY	Project Name: Morningside High School	Project No.: 19-1110 Date: January 2020	Drawing Title: Oil & Gas Map	Figure: A-9

APPENDIX B

Field Exploratory Boring Logs

KEY TO LOGS

SOILS CLASSIFICATION

MAJOR DIVISIONS			GRAPHIC LOG	USCS SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN 50% OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	**CLEAN GRAVELS** LESS THAN 5% FINES	░	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			░	**GP**	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES MORE THAN 12% FINES	▥	**GM**	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			▤	**GC**	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS 50% OR MORE OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	**CLEAN SANDS** LESS THAN 5% FINES	▦	**SW**	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			░	**SP**	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES MORE THAN 12% FINES	▦	**SM**	SILTY SANDS, SAND-SILT MIXTURES
			▩	**SC**	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS 50% OR MORE OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		▥	**ML**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	**CL**	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▩	**OL**	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS 50 OR MORE		▧	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR GRAVELLY ELASTIC SILTS
			▨	**CH**	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			▩	**OH**	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			▤	**PT**	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	#200	#40	#10	#4	3/4"	3"	12"

SIEVE SIZES

KEY TO LOGS (continued)

SPT/CD BLOW COUNTS VS. CONSISTENCY/DENSITY					
FINE-GRAINED SOILS (SILTS, CLAYS, etc.)			GRANULAR SOILS (SANDS, GRAVELS, etc.)		
CONSISTENCY	*BLOWS/FOOT		RELATIVE DENSITY	*BLOWS/FOOT	
	SPT	CD		SPT	CD
SOFT	0-4	0-4	VERY LOOSE	0-4	0-8
FIRM	5-8	5-9	LOOSE	5-10	9-18
STIFF	9-15	10-18	MEDIUM DENSE	11-30	19-54
VERY STIFF	16-30	19-39	DENSE	31-50	55-90
HARD	over 30	over 39	VERY DENSE	over 50	over 90

* CONVERSION BETWEEN CALIFORNIA DRIVE SAMPLERS (CD) AND STANDARD PENETRATION TEST (SPT) BLOW COUNT HAS BEEN CALCULATED USING "FOUNDATION ENGINEERING HAND BOOK" BY H.Y. FANG. (**VALUES ARE FOR 140 Lbs HAMMER WEIGHT ONLY**)

DESCRIPTIVE ADJECTIVE VS. PERCENTAGE	
DESCRIPTIVE ADJECTIVE	PERCENTAGE REQUIREMENT
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

*THE FOLLOWING "DESCRIPTIVE TERMINOLOGY/ RANGES OF MOISTURE CONTENTS" HAVE BEEN USED FOR MOISTURE CLASSIFICATION IN THE LOGS.

APPROXIMATE MOISTURE CONTENT DEFINITION	
DEFINITION	DESCRIPTION
DRY	Dry to the touch; no observable moisture
SLIGHTLY MOIST	Some moisture but still a dry appearance
MOIST	Damp, but no visible water
VERY MOIST	Enough moisture to wet the hands
WET	Almost saturated; visible free water

Boring Log

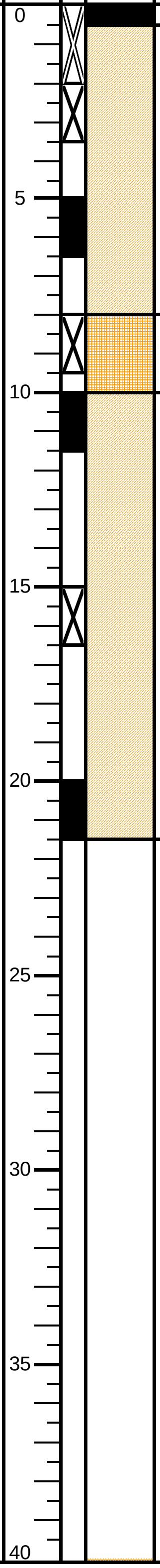
Project No. : 19-1110
Project Name : Morningside High School
Site Upgrades

Boring No. : B-1

Sheet : 1 **of :** 1

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Ground Elevation:
Drilling Co. : Cal Pac Drilling
Date Drilled : 1/02/20



Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Soil Type (USCS)	Description	Additional Tests
				AC/AB	5" asphalt concrete over 3" of aggregate base	
1	15.0			CL	**FILL: Sandy Lean CLAY;** trace of gravel, stiff, moist to very moist, dark brown	EI = 14
2	12.4		4 5 7		**ALLUVIUM:** **Sandy Lean CLAY;** stiff to very stiff, moist, yellowish brown	#200 Wash Fines = 54% PP = 3.5-4.5 tsf
3	12.4	124	4 7 11			PP = 4.5 tsf
4	14.0		4 8 10	SM	**Silty SAND;** fine to medium, medium dense, dark brown with grayish brown	#200 Wash Fines = 26% PP = 4.5 tsf
5	15.1	121	9 16 26	CL	**Sandy Lean CLAY;** very stiff, moist to very moist, dark brown with grayish brown inclusions	#200 Wash Fines = 70% PP = 4.5 tsf
6	13.6		5 8 15			#200 Wash Fines = 50% PP = 4.5 tsf
7	13.9	122	5 10 25		layers of clayey sand	
					End of Boring @ 21' 6" No groundwater encountered	

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Boring No. : B-2
Sheet : 1 **of :** 1
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Ground Elevation:
Hammer Weight : 140 lbs **Drop Height :** 30"
Drilling Co. : Cal Pac Drilling
Location : See Figure A-2
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0			**AC/AB**	5" of asphalt concrete over 3" of aggregate base	
1	11.7				☒		**SC**	**FILL:** **Clayey SAND;** fine to medium, medium dense, moist, dark brown	
2	11.0	119	2 2 3		■				#200 Wash Fines = 43% PP = 3.0-4.0 tsf
				5					
3	12.1		3 5 7		☒				PP = 4.5 tsf
4	14.9	123	7 13 21		■				#200 Wash Fines = 70% PP = 4.5 tsf
				10					
5	17.9		4 7 12		☒		**CL**	**ALLUVIUM:** **Sandy Lean CLAY;** lenses and layers of clayey sand, stiff, moist to very moist, dark brown	#200 Wash Fines = 74% PP = 4.5 tsf
				15					
6	18.6	116	4 15 29		■				PP = 4.5 tsf
				20					
7	15.7		4 8 14		☒				#200 Wash Fines = 74% PP = 4.0-4.5 tsf
								End of Boring @ 21' 6" No groundwater encountered	
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

Project No. : 19-1110
Project Name : Morningside High School
Site Upgrades

Boring No. : B-3

Sheet : 1 **of :** 1

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Ground Elevation:
Drilling Co. : Cal Pac Drilling
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0		■	AC/AB	5" of asphalt concrete over 2" of aggregate base	
1	13.1				⊠			**FILL:** **Sandy Lean CLAY;** firm to stiff, moist, dark brown	
2	12.6		4 7 9		☒				#200 Wash Fines = 62% PP = 4.0-4.5 tsf
								ALLUVIUM: **Sandy Lean CLAY;** stiff to very stiff, moist moist to very moist, dark brown	
3	15.4	120	7 10 14	5	■			lenses of clayey sand	#200 Wash Fines = 57% PP = 4.0-4.5 tsf Consolidation
4	13.2		4 7 12		☒				#200 Wash Fines = 73% PP = 4.5 tsf
5	15.8	118	5 12 23	10	■		CL		PP = 4.5 tsf Consolidation
6	14.3		5 10 16	15	☒				#200 Wash Fines = 59% PP = 4.5 tsf
7	21.0	110	6 12 25	20	■			lenses of clayey sand	#200 Wash Fines = 74% PP = 4.5 tsf
								End of Boring @ 21' 6" No groundwater encountered	
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ⊠ CD ■ SPT ☒

Boring Log

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Boring No. : B-4
Sheet : 1 of : 1
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Ground Elevation:
Hammer Weight : 140 lbs Drop Height : 30"
Drilling Co. : Cal Pac Drilling
Location : See Figure A-2
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0		■	**AC/AB**	3.5" of asphalt concrete over 6" of aggregate base	
1	16.2				☒	▨	**CL**	**FILL:** **Sandy Lean CLAY;** firm, moist to very moist, very dark brown	#200 Wash Fines = 70% EI = 22 Corrosivity
2	15.8		1 1 2		☒				
3	15.0	120	5 11 20	5	■			**ALLUVIUM:** **Sandy Lean CLAY;** firm to stiff, moist to very moist, dark brown	#200 Wash Fines = 70% PP = 4.5 tsf Direct Shear
								End of Boring @ 6' 6" No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Boring No. : B-5
Sheet : 1 of : 1
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Ground Elevation:
Hammer Weight : 140 lbs Drop Height : 30"
Drilling Co. : Cal Pac Drilling
Location : See Figure A-2
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0	☒	■	**AC**	6" of asphalt concrete	
1	15.4				☒	▨	**CL**	**FILL: Sandy Lean CLAY;** firm to stiff, moist to very moist, very dark brown	#200 Wash Fines = 63% PP = 1.5 tsf
2	13.7		3 6 10		☒	▨		**ALLUVIUM:** **Sandy Lean CLAY;** very stiff, moist, dark brown	
3	12.9	127	11 21 37	5	■	▨			#200 Wash Fines = 50% PP = 4.5 tsf
								End of Boring @ 6' 6" No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School
Site Upgrades

Boring No. : B-6
Sheet : 1 **of :** 1

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Cal Pac Drilling
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	6.3			0	☒		**CL**	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist, dark brown	#200 Wash Fines = 52%
2	4.2	116	10 12 16		■		**SC**	**Clayey SAND;** fine to medium, medium dense, moist, brown	#200 Wash Fines = 32% PP = 4.5 tsf
3	9.6		3 6 6	5	☒		**CL**		PP = 4.5 tsf
4	14.8	121	9 15 28		■			**ALLUVIUM:** **Sandy Lean CLAY;** stiff to very stiff, moist to very moist, dark brown	#200 Wash Fines = 72% PP = 4.5 tsf
5	12.7		5 13 15	10	☒			layers of clayey sand	#200 Wash Fines = 51% PP = 4.5 tsf
6	14.8	122	6 21 36	15	■				#200 Wash Fines = 53% PP = 4.5 tsf
7	13.0		5 9 14	20	☒		**SC**	**Clayey SAND;** fine to medium, medium dense, moist, dark brown	#200 Wash Fines = 35% PP = 4.5 tsf
8	4.4	108	5 12 24	25	■		**SP-SM**	**Poorly Graded SAND with SILT;** fine to medium, medium dense to dense, slightly moist, yellowish brown	
				30 35 40				End of Boring @ 26' 6" No groundwater encountered	

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110

Project Name : Morningside High School Site Upgrades

Boring No. : B-7

Sheet : 1 **of :** 1

Drilling Method : Hollow Stem 6" Auger

Sampling Method : Bulk - CD - SPT

Hammer Weight : 140 lbs **Drop Height :** 30"

Location : See Figure A-2

Ground Elevation:

Drilling Co. : Cal Pac Drilling

Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	8.9			0	⊠		CL	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist, brown	
2	8.6		13 17 17		☒			**ALLUVIUM:** **Sandy Lean CLAY;** very stiff to hard, moist, dark brown	#200 Wash Fines = 68% PP = 4.5 tsf
3	10.3	126	13 25 43	5	■				PP = 4.5 tsf
4	15.1		7 11 19		☒			**Lean CLAY with SAND;** very stiff to hard, moist to very moist, dark brown	#200 Wash Fines = 83% PP = 4.5 tsf
5	16.5	118	9 24 50	10	■				
6	15.2		8 13 22	15	☒			**Sandy Lean CLAY;** hard, moist to very moist, dark brown	#200 Wash Fines = 71% PP = 4.5 tsf
7	3.7	119	11 21 43	20	■		SM	**Silty SAND;** fine to medium, medium dense, slightly moist, brown	#200 Wash Fines = 14% PP = 4.5 tsf
8	8.9		7 9 15	25	☒				#200 Wash Fines = 35%
9	10.7	113	8 15 29	30	■			grayish brown	#200 Wash Fines = 43%
10	2.4		10 15 19	35	☒		SP-SM	**Poorly Graded SAND with SILT;** fine, dense, slightly moist, pale brown	#200 Wash Fines = 8%
				40			SC	**Clayey SAND**; layers of sandy clay, fine to medium, medium dense to dense, moist, grayish brown with dark brown	

Groundwater ▽ Bulk ⊠ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Boring No. : B-7
Sheet : 2 **of :** 2
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Ground Elevation:
Hammer Weight : 140 lbs **Drop Height :** 30"
Drilling Co. : Cal Pac Drilling
Location : See Figure A-2
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
11	11.5	124	9 22 36	40	■	▨	**SC**	**Clayey SAND;** layers of sandy clay, fine to medium, medium dense to dense, moist, grayish brown with dark brown	#200 Wash Fines = 48%
				45 50 55 60 65 70 75 80				End of Boring @ 41' 6" No groundwater encountered	

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School
Site Upgrades

Boring No. : B-8
Sheet : 1 of : 1

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs Drop Height : 30"
Location : See Figure A-2

Ground Elevation:
Drilling Co. : Cal Pac Drilling
Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0					
1	17.5				☒	▨	CL	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist to very moist, dark brown	#200 Wash Fines = 63%
2	9.8		2 3 8		☒	▨		**ALLUVIUM:** **Sandy Lean CLAY;** stiff to very stiff, moist, brown to dark brown	PP = 3.0-4.5 tsf
3	11.7	127	7 21 33	5	■	▨	SC	**Clayey SAND;** fine to medium, medium dense, moist, dark brown	#200 Wash Fines = 33% PP = 4.5 tsf
4	12.2		8 12 25		☒	▨			#200 Wash PP = 4.0-4.5 tsf
5	13.7	121	11 16 31	10	■	▨			#200 Wash Fines = 48% PP = 4.5 tsf
						▨	CL	**Sandy Lean CLAY;** stiff to very stiff, moist to very moist, dark brown	
6	15.4		6 10 16	15	☒	▨			PP = 4.5 tsf
								End of Boring @ 16' 6" No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

Project No. : 19-1110

Project Name : Morningside High School
Site Upgrades

Boring No. : B-9

Sheet : 1 **of :** 1

Drilling Method : Hollow Stem 6" Auger

Sampling Method : Bulk - CD - SPT

Ground Elevation:

Hammer Weight : 140 lbs **Drop Height :** 30"

Drilling Co. : Cal Pac Drilling

Location : See Figure A-2

Date Drilled : 1/02/20

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	15.5			0	☒		CL	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist to very moist, dark brown	#200 Wash Fines = 53%
2	13.5	121	2 6 11		■		SC	**ALLUVIUM:** **Clayey SAND;** layers of sandy clay, medium dense, moist to very moist, dark brown	PP = 4.0-4.5 tsf
3	14.5		6 9 13	5	☒				#200 Wash Fines = 46% PP = 4.5 tsf
4	11.4	124	6 11 18	10	■				#200 Wash Fines = 27%
5	6.0		7 9 12	15	☒		SP	**Poorly Graded SAND;** fine to medium, medium dense, moist, dark yellowish brown	#200 Wash Fines = 4%
6	31.0	100	7 11 21	20	■		CL	**Lean CLAY;** lenses of clayey sand, stiff to very stiff, moist to very moist, olive brown	#200 Wash Fines = 90% PP = 1.5-2.0 tsf
								End of Boring @ 21' 6" No groundwater encountered	
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs Drop Height : 30"
Location : See Figure A-2

Boring No. : B-10
Sheet : 1 of : 1
Ground Elevation:
Drilling Co. : Cal Pac Drilling
Date Drilled : 1/02/20

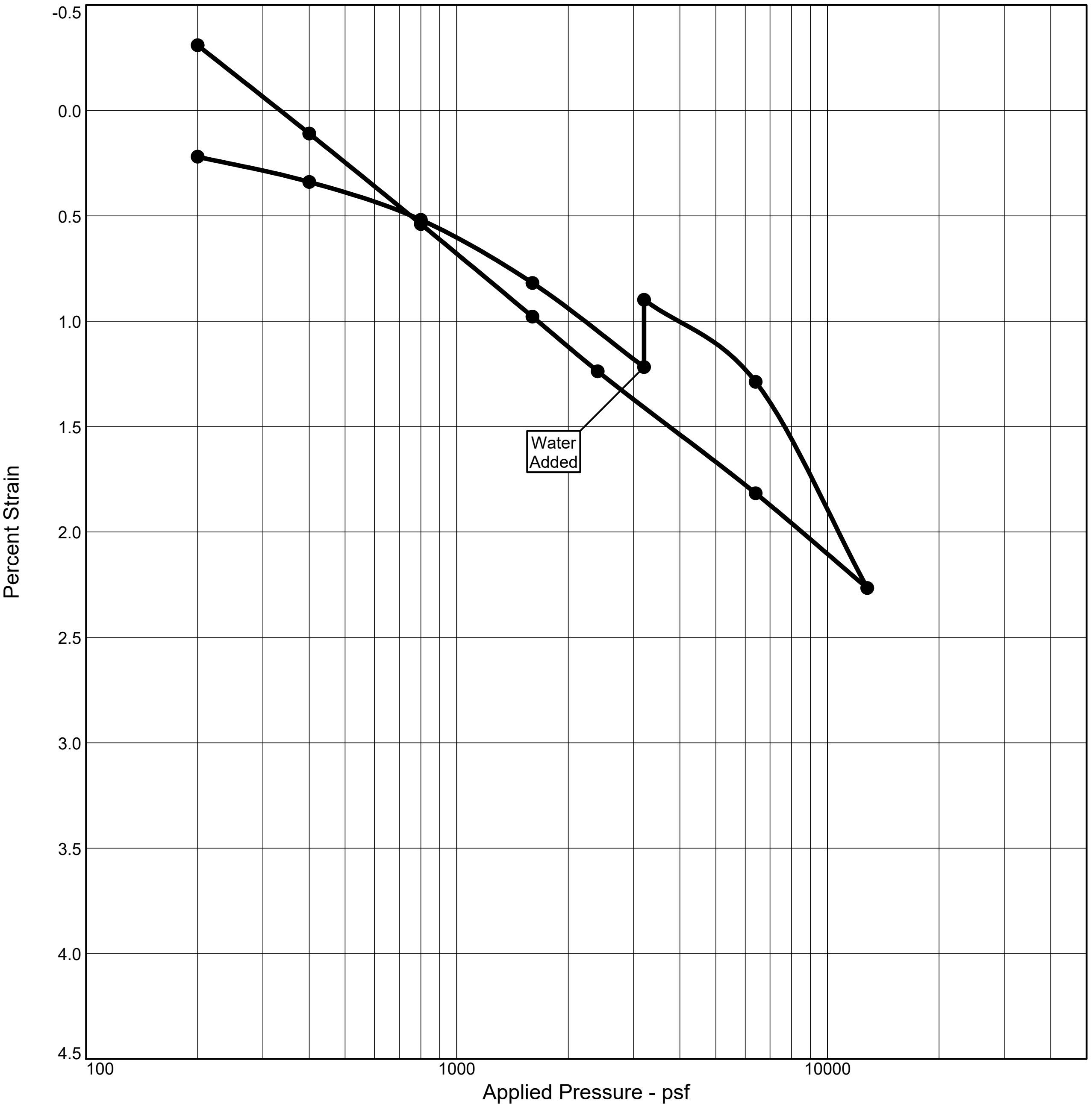
Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0		■	AC/AB	3.5" of asphalt concrete over 2" of aggregate base	
1					☒	▨		**FILL: Sandy Lean CLAY;** firm to stiff, moist to very moist, very dark brown	
2	12.0	127	3 6 15		■	▨	CL	**ALLUVIUM:** **Sandy Lean CLAY;** stiff, moist, lenses of clayey sand, dark brown	#200 Wash Fines = 55% PP = 4.5 tsf
3	11.9		4 7 8	5	☒	▨			#200 Wash Fines = 50% PP = 4.5 tsf
				10				End of Boring @ 6' 6" No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

APPENDIX C

Laboratory Test Results & Calculations

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.5 %	15.3 %	116.9			2.65		6197	0.05	0.02	0.415

MATERIAL DESCRIPTION	USCS	AASHTO
Observed as: Dark Yellowish Brown Sandy Clay	Observed as: CL	

Project No. 19-1110 **Client:**

Project: Morningside HS

Location: B3 @ 9' **Sample Number:** 2020-005 Series

Koury Engineering & Testing, Inc.

Chino, CA

Remarks:
Lab #6349.

Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:**

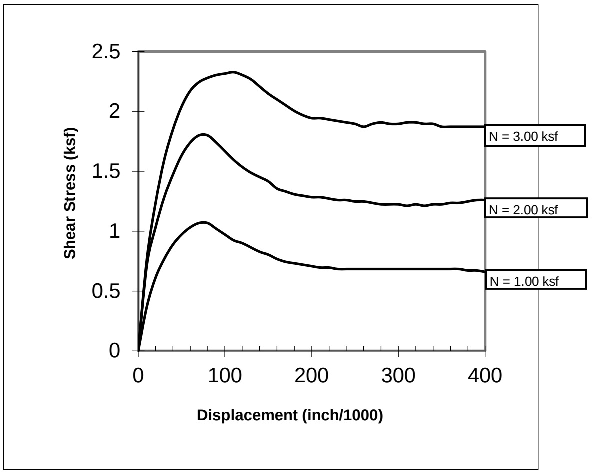
Direct Shear Test Report

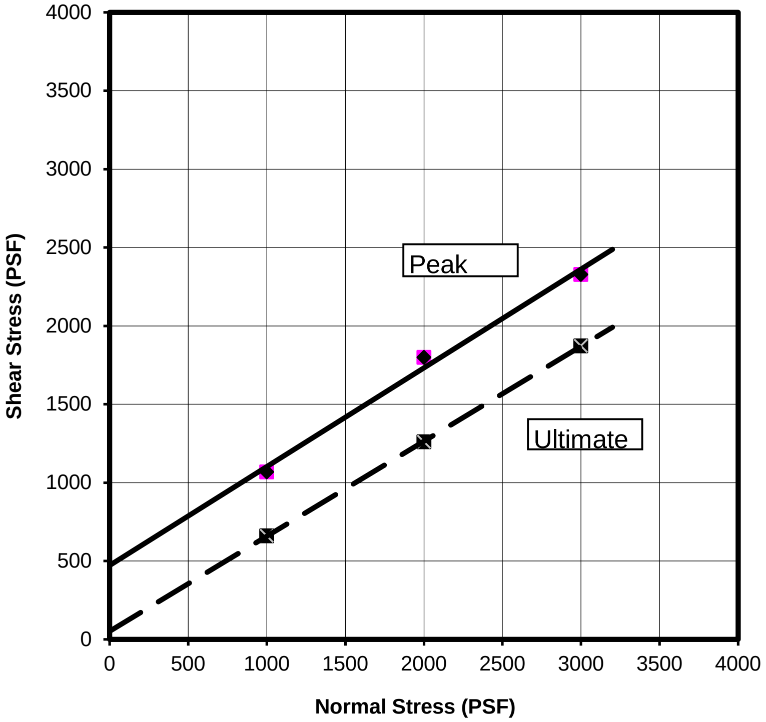
Sample Identification	Sample Description	Sample Test State
B1 @ 6'	Brown to Dark Yellowish Brown Clayey Sand	Saturated-Consolidated

Peak:	**Phi (Degrees)**	**32.2**	(Avg.Dry Dens. = 120.5 pcf) (Avg.Moist. = 13.6 %)
	Cohesion (PSF)	**472.0**	
Ultimate:	**Phi (Degrees)**	**31.2**	
	Cohesion (PSF)	**52.0**	

☑ **Relatively Undisturbed**

☐ **Remolded**





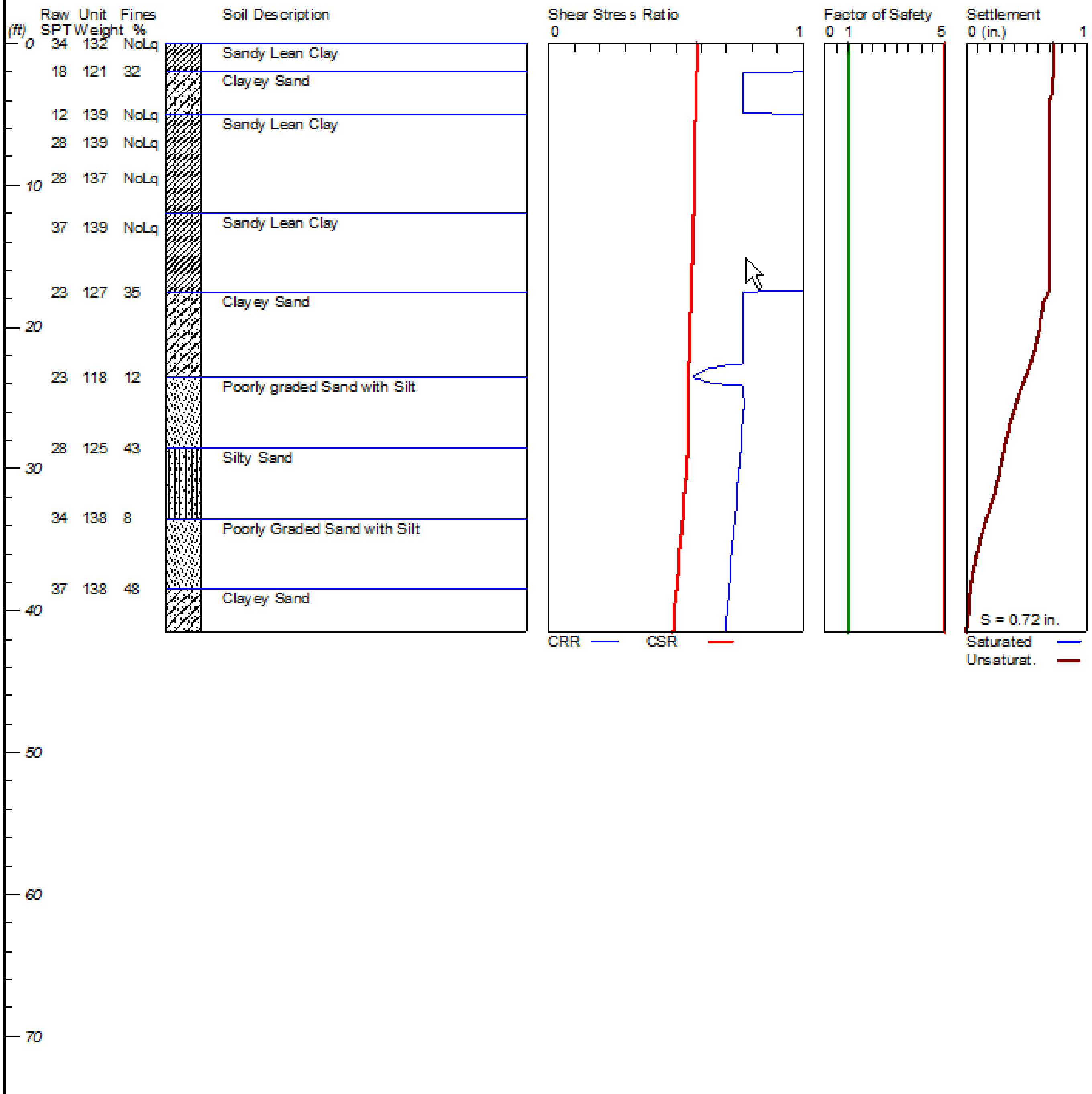
	Project Name: **Morningside HS**	**Project No.: 19-1110** **Date: 1/10/20**	**Lab #** **6337**

DRY SEISMIC SETTLEMENT

Morningside HS

Hole No.=B-6 ***Water Depth=60 ft***

Magnitude=6.35
Acceleration=0.898g

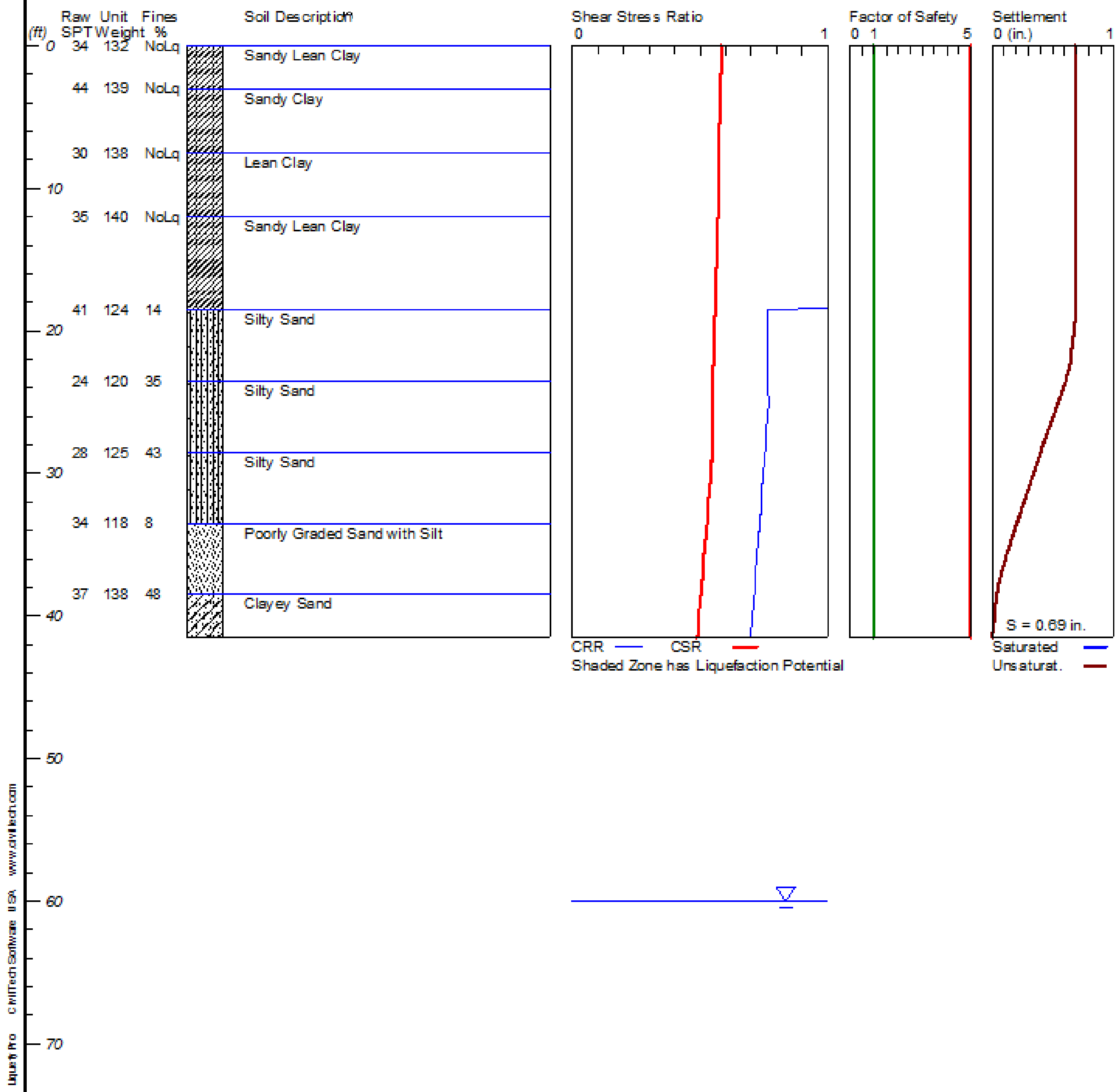


DRY SEISMIC SETTLEMENT

Morningside HS

Hole No.=B-7 Water Depth=60 ft

Magnitude=6.35
Acceleration=0.898g



APPENDIX D

Historical Earthquake Data

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                           *************************
                           *                       *
                           *    E Q S E A R C H    *
                           *                       *
                           *     Version 3.00      *
                           *                       *
                           *************************

                                 ESTIMATION OF
                            PEAK ACCELERATION FROM
                        CALIFORNIA EARTHQUAKE CATALOGS


JOB NUMBER: 19-1110
                                                     DATE: 01-21-2020

JOB NAME: Morningside HS

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT


MAGNITUDE RANGE:
   MINIMUM MAGNITUDE:  5.00
   MAXIMUM MAGNITUDE:  9.00

SITE COORDINATES:
   SITE LATITUDE:  33.9415
   SITE LONGITUDE:  118.3331

SEARCH DATES:
           START DATE:   1800
           END DATE:   2000

SEARCH RADIUS:
           60.0 mi
           96.6 km

ATTENUATION RELATION:  14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
   UNCERTAINTY (M=Median, S=Sigma): M       Number of Sigmas:  0.0
   ASSUMED SOURCE TYPE:  DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND:   0  Depth Source:  A
   Basement Depth:  5.00 km     Campbell SSR:  0     Campbell SHR:  0
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km):  3.0
```

```
                         -------------------------
                         EARTHQUAKE SEARCH RESULTS
                         -------------------------

Page  1
-------------------------------------------------------------------------------
    |       |        |          |  TIME  |     |     | SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC) |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec| (km)| MAG.|   g   |INT.|  mi  [km]
----+-------+--------+----------+--------+-----+-----+-------+----+-------------
MGI |34.0000|118.3000|09/03/1905| 540 0.0|  0.0| 5.30| 0.222 | IX |  4.5(  7.2)
T-A |34.0000|118.2500|09/23/1827| 0 0 0.0|  0.0| 5.00| 0.131 |VIII|  6.2( 10.0)
T-A |34.0000|118.2500|01/10/1856| 0 0 0.0|  0.0| 5.00| 0.131 |VIII|  6.2( 10.0)
T-A |34.0000|118.2500|03/26/1860| 0 0 0.0|  0.0| 5.00| 0.131 |VIII|  6.2( 10.0)
DMG |33.8500|118.2670|03/11/1933|1425 0.0|  0.0| 5.00| 0.113 | VII|  7.4( 11.8)
DMG |34.0000|118.5000|08/04/1927|1224 0.0|  0.0| 5.00| 0.078 | VII| 10.4( 16.7)
MGI |34.0000|118.5000|11/19/1918|2018 0.0|  0.0| 5.00| 0.078 | VII| 10.4( 16.7)
MGI |34.0800|118.2600|07/16/1920|18 8 0.0|  0.0| 5.00| 0.077 | VII| 10.4( 16.8)
DMG |33.7830|118.2500|11/14/1941| 84136.3|  0.0| 5.40| 0.092 | VII| 11.9( 19.2)
DMG |33.7830|118.1330|10/02/1933| 91017.6|  0.0| 5.40| 0.064 | VI | 15.9( 25.5)
PAS |34.0730|118.0980|10/04/1987|105938.2|  8.2| 5.30| 0.057 | VI | 16.2( 26.1)
PAS |34.0610|118.0790|10/01/1987|144220.0|  9.5| 5.90| 0.089 | VII| 16.7( 26.9)
PAS |33.9190|118.6270|01/19/1989| 65328.8| 11.9| 5.00| 0.042 | VI | 16.9( 27.2)
DMG |33.9500|118.6320|08/31/1930| 04036.0|  0.0| 5.20| 0.049 | VI | 17.1( 27.6)
MGI |34.1000|118.1000|07/11/1855| 415 0.0|  0.0| 6.30| 0.116 | VII| 17.2( 27.8)
MGI |34.0000|118.0000|12/25/1903|1745 0.0|  0.0| 5.00| 0.035 |  V | 19.5( 31.4)
DMG |33.7500|118.0830|03/11/1933| 2 9 0.0|  0.0| 5.00| 0.035 |  V | 19.5( 31.4)
```

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DMG |33.7500|118.0830|03/11/1933| 323 0.0|  0.0| 5.00| 0.035 |  V | 19.5( 31.4)
DMG |33.7500|118.0830|03/11/1933| 910 0.0|  0.0| 5.10| 0.038 |  V | 19.5( 31.4)
DMG |33.7500|118.0830|03/13/1933|131828.0|  0.0| 5.30| 0.045 | VI | 19.5( 31.4)
DMG |33.7500|118.0830|03/11/1933| 230 0.0|  0.0| 5.10| 0.038 |  V | 19.5( 31.4)
PAS |33.9440|118.6810|01/01/1979|231438.9| 11.3| 5.00| 0.034 |  V | 19.9( 32.1)
GSP |34.2310|118.4750|03/20/1994|212012.3| 13.0| 5.30| 0.039 |  V | 21.6( 34.7)
GSP |34.2130|118.5370|01/17/1994|123055.4| 18.0| 6.70| 0.113 | VII| 22.1( 35.5)
DMG |33.7000|118.0670|03/11/1933| 51022.0|  0.0| 5.10| 0.031 |  V | 22.6( 36.4)
DMG |33.7000|118.0670|03/11/1933| 85457.0|  0.0| 5.10| 0.031 |  V | 22.6( 36.4)
DMG |33.6830|118.0500|03/11/1933| 658 3.0|  0.0| 5.50| 0.039 |  V | 24.1( 38.8)
DMG |34.3080|118.4540|02/09/1971|144346.7|  6.2| 5.20| 0.027 |  V | 26.2( 42.2)
GSB |34.3010|118.5650|01/17/1994|204602.4|  9.0| 5.20| 0.025 |  V | 28.1( 45.3)
GSP |34.3050|118.5790|01/29/1994|112036.0|  1.0| 5.10| 0.022 | IV | 28.8( 46.3)
DMG |33.6170|118.0170|03/14/1933|19 150.0|  0.0| 5.10| 0.022 | IV | 28.8( 46.4)
DMG |34.3000|118.6000|04/04/1893|1940 0.0|  0.0| 6.00| 0.045 | VI | 29.1( 46.8)
GSP |34.2620|118.0020|06/28/1991|144354.5| 11.0| 5.40| 0.028 |  V | 29.1( 46.9)
DMG |34.2000|117.9000|08/28/1889| 215 0.0|  0.0| 5.50| 0.028 |  V | 30.5( 49.1)
DMG |33.6170|117.9670|03/11/1933| 154 7.8|  0.0| 6.30| 0.053 | VI | 30.7( 49.4)
DMG |33.5750|117.9830|03/11/1933| 518 4.0|  0.0| 5.20| 0.020 | IV | 32.3( 52.0)
DMG |34.4110|118.4010|02/09/1971|14 244.0|  8.0| 5.80| 0.033 |  V | 32.6( 52.5)
DMG |34.4110|118.4010|02/09/1971|141028.0|  8.0| 5.30| 0.022 | IV | 32.6( 52.5)
DMG |34.4110|118.4010|02/09/1971|14 1 8.0|  8.0| 5.80| 0.033 |  V | 32.6( 52.5)
DMG |34.4110|118.4010|02/09/1971|14 041.8|  8.4| 6.40| 0.053 | VI | 32.6( 52.5)
GSP |34.3260|118.6980|01/17/1994|233330.7|  9.0| 5.60| 0.027 |  V | 33.8( 54.3)
GSP |34.3780|118.6180|01/19/1994|211144.9| 11.0| 5.10| 0.017 | IV | 34.2( 55.1)
GSP |34.3690|118.6720|04/26/1997|103730.7| 16.0| 5.10| 0.017 | IV | 35.3( 56.8)
GSP |34.3770|118.6980|01/18/1994|004308.9| 11.0| 5.20| 0.017 | IV | 36.6( 58.9)
GSP |34.3940|118.6690|06/26/1995|084028.9| 13.0| 5.00| 0.015 | IV | 36.7( 59.0)
GSB |34.3790|118.7110|01/19/1994|210928.6| 14.0| 5.50| 0.021 | IV | 37.1( 59.7)
DMG |34.0000|119.0000|09/24/1827| 4 0 0.0|  0.0| 7.00| 0.067 | VI | 38.4( 61.8)
MGI |34.0000|119.0000|12/14/1912| 0 0 0.0|  0.0| 5.70| 0.024 |  V | 38.4( 61.8)
GSP |34.1400|117.7000|02/28/1990|234336.6|  5.0| 5.20| 0.016 | IV | 38.7( 62.3)
DMG |34.5190|118.1980|08/23/1952|10 9 7.1| 13.1| 5.00| 0.013 | III| 40.6( 65.3)
DMG |34.0650|119.0350|02/21/1973|144557.3|  8.0| 5.90| 0.026 |  V | 41.1( 66.1)
MGI |33.8000|117.6000|04/22/1918|2115 0.0|  0.0| 5.00| 0.012 | III| 43.1( 69.4)
MGI |34.0000|117.5000|12/16/1858|10 0 0.0|  0.0| 7.00| 0.049 | VI | 47.9( 77.0)



                            -------------------------
                            EARTHQUAKE SEARCH RESULTS
                            -------------------------

Page  2
-------------------------------------------------------------------------------
    |       |        |          |  TIME  |     |     | SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC) |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec| (km)| MAG.|   g   |INT.|  mi  [km]
----+-------+--------+----------+--------+-----+-----+-------+----+------------
```

```
PAS |33.6710|119.1110|09/04/1981|155050.3|  5.0| 5.30| 0.013 | III| 48.4( 77.8)
DMG |34.3000|117.6000|07/30/1894| 512 0.0|  0.0| 6.00| 0.022 | IV | 48.7( 78.3)
DMG |34.3700|117.6500|12/08/1812|15 0 0.0|  0.0| 7.00| 0.048 | VI | 49.0( 78.8)
DMG |33.6990|117.5110|05/31/1938| 83455.4| 10.0| 5.50| 0.014 | IV | 50.0( 80.5)
DMG |34.2700|117.5400|09/12/1970|143053.0|  8.0| 5.40| 0.013 | III| 50.7( 81.6)
DMG |34.3000|117.5000|07/22/1899|2032 0.0|  0.0| 6.50| 0.028 |  V | 53.7( 86.4)
DMG |33.7000|117.4000|05/15/1910|1547 0.0|  0.0| 6.00| 0.018 | IV | 56.1( 90.2)
DMG |33.7000|117.4000|04/11/1910| 757 0.0|  0.0| 5.00| 0.008 | III| 56.1( 90.2)
DMG |33.7000|117.4000|05/13/1910| 620 0.0|  0.0| 5.00| 0.008 | III| 56.1( 90.2)
DMG |34.2000|117.4000|07/22/1899| 046 0.0|  0.0| 5.50| 0.012 | III| 56.3( 90.6)

*******************************************************************************
-END OF SEARCH-   63 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH:   1800  TO  2000

LENGTH OF SEARCH TIME:   201  years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 4.5 MILES (7.2 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.222 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value=  1.226
  b-value=  0.395
  beta-value=  0.909


------------------------------------
TABLE OF MAGNITUDES AND EXCEEDANCES:
------------------------------------

  Earthquake | Number of Times | Cumulative
   Magnitude |    Exceeded     | No. / Year
  -----------+-----------------+------------
     4.0     |       63        |   0.31343
     4.5     |       63        |   0.31343
     5.0     |       63        |   0.31343
     5.5     |       22        |   0.10945
     6.0     |       11        |   0.05473
     6.5     |        5        |   0.02488
     7.0     |        3        |   0.01493
```

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We are a key member of the construction team while safeguarding the public. We improve operational logistics and provide superior quality control through the continuing development of our engineering staff and technical expertise, utilization of classroom training and field supervisors, thus defining the industry standard.

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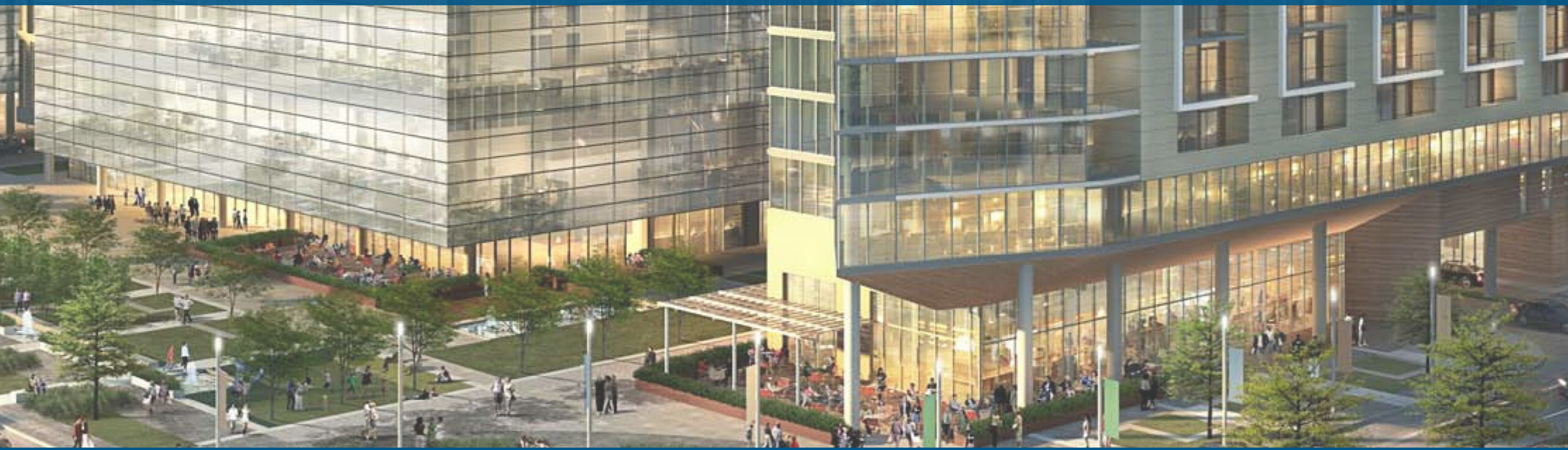
SUITE 302
GARDENA, CA 90248
PHONE 310-851-8685
FAX 310-851-8692



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June 29, 2021
Project No. 19-1110

Ms. Stephanie Pulcifer, Design & Construction Manager
Inglewood Unified School District
401 S. Inglewood Avenue
Inglewood, CA 90303

SUBJECT: Addendum Report - Percolation Testing
Morningside High School
10500 Yukon Avenue South, Inglewood, CA 90303
(CGS Application No. 04-CGS4351)

Reference: Limited Geotechnical Investigation Report, Morningside High School Upgrades, 10500 Yukon Avenue South, Inglewood, CA 90303, prepared by Koury Engineering & Testing, Inc., Project No. 19-1110, dated January 22, 2020.

Dear Ms. Pulcifer:

Presented herein are the results of percolation testing performed by Koury Engineering & Testing, Inc. (Koury) for the proposed storm water implementation project at the Morningside High School located at 10500 Yukon Avenue, City of Inglewood, California. (See Figure A-1 for Vicinity Map). This study was performed to provide information for BMP stormwater project planning from a geotechnical standpoint.

The recommendations provided within this addendum report are based on the results of our field exploration, laboratory testing, and engineering analysis. Our services were performed in general accordance with our proposal No. 19-1110 dated March 2, 2021.

Our professional services have been performed using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advise included in this report. This report has been prepared exclusively for the Inglewood Unified School District and their consultants for the subject project. The report has not been prepared for use by other parties and may not contain sufficient information for the purposes of other parties or other uses.

Site Conditions

Morningside High School is bounded by W 104th Street on the north, Yukon Avenue South on the west, W 108th Street and residential homes on the south and Monroe Middle School and commercial facilities on the east. The main access to the site is from Yukon Avenue South near the southwest corner of the campus. The percolation tests were performed on the west and south sides of the new location for the football field. The proposed new location of the football field is approximately 200 feet west of the old location.

The football field area slopes gently to the west, and the ground surface lies at elevations between about 82 and 87 feet (NAVD88). Drainage of the site is generally by sheet flow toward the west.

Proposed Infiltration System

We understand that it is proposed to construct two drywells south and west of the new football field and track complex located within the southern portion of the school campus. The drywells are anticipated to have a diameter of 4 to 5 feet and a depth on the order of about 35 feet. Infiltration will occur below a depth of 23 feet.

Percolation Borings

Percolation Borings P-1 and P-2 were drilled to a maximum depth of 46½ feet below ground surface on June 7, 2021. At these locations, the ground surface lies at elevations of about 85 and 82 feet, for P-1 and P-2, respectively. Truck-mounted hollow-stem auger drill rig equipment was used to drill the borings. The locations of the recent percolation borings and previous borings drilled by Koury are shown on the Percolation Boring Location Map, Figure A-2, presented in Appendix A.

Standard penetration test samples, California ring samples and bulk samples were obtained from the borings for laboratory testing. Sampling of Percolation Borings P-1 and P-2 were quasi continuous beyond a depth of 25 feet to characterize the subsurface conditions that may impede or promote water infiltration.

The depths, blow counts, and description of the samples are shown on the attached boring logs presented in Appendix B of this report. The contractor used 140-lbs automatic hammers to drive the samplers 18 inches into the soils or until practical refusal.

Laboratory Testing

Laboratory tests, including moisture content, dry unit weight, #200 wash, and gradation were performed on selected samples obtained from the borings to aid in the classification of the soils encountered and to evaluate their engineering properties. The results of laboratory tests are presented on the boring logs in Appendix A except for the Gradation/Particle Size Distribution Reports that are self-contained reports attached in Appendix B.

Soil Conditions

The Geology Map of the Long Beach Quadrangle indicates the subsurface conditions at the site consist of old alluvial floodplain deposits consisting of interbeds of sand, silt and clay (see Figure A-3 for the Geology Map).

The subsurface soil profile encountered consists of fill underlain by alluvial deposits. The fill depth was found to be about 3 feet at the boring locations. Also, at the boring locations, the ground surface exposes a mantle of grass over a thin cover of topsoil.

The alluvium underlying the fill generally consists of interbeds of sandy clay, clayey sand, poorly graded sand with silt, and silty sand. The alluvial sand is generally slightly moist to moist and medium dense to dense. The sand encountered in the recent borings has moisture contents in the range of about 3 to 10½ percent with an average of about 5½ percent. The silt and clay soils have moisture contents in the range of 6 to 17 percent with an average of about 12 percent.

Based on the laboratory test data, the clay and silt have 50 to 90 percent fines with an average of approximately 64 percent. The fine contents for sand soils range from about 6 to 47 percent with an average of about 16 percent. The pocket penetrometer test results show that the unconfined compression strength of the silt and clay tested is about 4½ tsf (tons per square foot). The particle size distribution reports for samples at depths of 35 and 27½ feet for Percolation Holes P-1 and P-2, respectively, indicate the presence of poorly graded sand (See Appendix C for test results).

Variations in the soil conditions as well as detailed descriptions are shown on the attached boring logs in Appendix A. The soil conditions described in this report are based on the soils observed in the recent test borings drilled for this study and the laboratory test results. Variations between and beyond the borings should be anticipated.

Groundwater

Groundwater was not encountered in any of the percolation borings drilled on campus to a maximum depth of 46½ feet. The Seismic Hazard Zone Report for the Inglewood 7.5-Minute Quadrangle, Los Angeles County CA, Seismic Hazard Zone Report 029, Department of Conservation, Division of Mines and Geology indicates the historic high groundwater is at least 50 feet below ground surface (see Figure A-4 in Appendix A).

Percolation Testing

Following soil sampling, the soil boreholes were used for percolation testing. The percolation testing was performed on a sunny day. The approximate locations of percolation tests were provided by the District design team as shown on the Percolation Boring Location Map, Figure A-2. The boring logs presented in Appendix A indicate the soil stratification encountered. The percolation holes extended to a depth of 46½ feet.

Koury performed the tests in substantial conformance with the boring percolation test procedure of the County of Los Angeles as defined in the Low Impact Development BMP Design Handbook dated 9/20/14, County Document GS200.2 dated 6/30/17. The test procedure consisted of drilling 9¼-inch diameter boreholes to the test depths and placing a 2- to 3-inch layer of filter gravel at the bottom of the holes. We also placed a 3-inch diameter perforated piping in the holes and filter rock within the annulus to prevent caving in the test zone.

The percolation holes were presoaked per the test method. Following pre-soaking, percolation testing began by filling the lower portion of the percolation holes with water and measuring the drop-in water level. The water column heights ranged predominantly from 17 to 26 feet for Percolation Hole P-1 and predominantly from 18 to 27 feet for Percolation Hole P-2. Based on the rate of water dissipation during presoaking, 10-minute measuring intervals were selected for the tests. Refilling with water was repeated several times until consistent results were noted.

The following Table-1 summarizes the results of the falling head percolation tests. The falling head percolation tests yielded short-term infiltration rates on the order of 3 and 7 inches per hour for Percolation Hole P-1 and P-2, respectively (See Appendix A for calculations).

Table 1 – Summary of Falling Head Percolation Testing

Test Number	Depth (ft)	Short Term Infiltration *(in/hour)	Adjusted Long Term Infiltration (in/hour)
P-1	46.5	3.2	0.8
P-2	46.5	7.4	1.8

*No correction factor applied

To determine the long-term infiltration rates presented in Table 1, we have applied a correction factor of 4. The correction factor was selected per the test method to account for the Boring Percolation Testing Method, the number of tests, the number of borings, subsurface soil variability and long-term maintenance. The correction factor calculations and assumptions are indicated on the Percolation Test Data Sheets in Appendix C. The design professional may re-adjust the factor, if deemed appropriate. However, reduction factors that are too low may affect the longevity of the drywells.

Subsurface Soil Considerations

The zones of percolation testing for Borings P-1 and P-2 start at depths of about 20 feet from the ground surface. The soils within the percolation test zones of P-1 and P-2 include sandy clay, clayey sand, silty sand and poorly graded sand with silt. However, percolation is likely to have occurred only in the silty sand and the poorly graded sand with silt. Most likely, the water dispersion/infiltration has occurred mainly laterally in the sand layers.

Conclusions and Recommendations

Based on the nature of the site alluvial deposits, the soils are stratified, and the horizontal hydraulic conductivity tends to be higher than the vertical hydraulic conductivity, which affect the vertical infiltration. Based on the fine contents of soils and the percolation test results within the percolation zones, infiltration within the silty sand and poorly graded sand with silt as indicated on the boring logs appears feasible. However, water mounting and a reduced infiltration rate should be expected when attempting to infiltrate a large volume of water.

The infiltration system is anticipated to consist of deep wells infiltrating below a depth of about 23 feet. Infiltration facilities should be kept at least 50 feet away or more from structures or foundations and 25 feet away from property lines due to greater hydraulic conductivity in the horizontal direction than in the vertical direction, which could detrimentally convey water laterally. Deep wells should be separated a distance of at least 100 feet or three times the depth of the deep wells, whichever is greater. Closer wells may be used; however, a reduction of infiltration rate may be required depending upon the soil stratigraphy present at the location selected.

The infiltration facilities should be designed to overflow to a storm conveyance in the event that the drainage capacity is exceeded or in case of future failure to infiltrate sufficiently. Because of the type of stratified soil deposits on site, changing the depth of infiltration or the location of the BMPs could have a significant impact on the rate of infiltration. The proposed infiltration design system should be reviewed by the Geotechnical Consultant prior to construction.

Closure

The findings and recommendations presented in this report are based on the results of our field and laboratory investigations, combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either expressed or implied. Subsurface variations between borings should be anticipated.

Koury should be notified if subsurface conditions are encountered, which differ from those described in this report since updated recommendations may be required. Samples obtained during this investigation will be retained in our laboratory for a period of 45 days from the date of this report and will be disposed after this period.

Should you have any questions concerning this submittal, or the recommendations contained herewith, please do not hesitate to call our office.

Respectfully submitted,

KOURY ENGINEERING & TESTING, INC.

Jacques Roy

REGISTERED PROFESSIONAL ENGINEER
JACQUES B. ROY
NO. 2077
Ex. Date 9/30/21
Geotechnical
STATE OF CALIFORNIA

Jacques B. Roy P.E. G.E
Principal Geotechnical Engineer

Distribution: 1. Addressee (a pdf copy via e-mail)
2. File (B)

APPENDICES

Appendix A: Maps and Plans

Vicinity Map – Figure A-1
Boring Location Map – Figure A-2
Geology Map – Figure A-3
Historic High Groundwater Map – Figure A-4

Appendix B: Field Exploratory Boring Logs

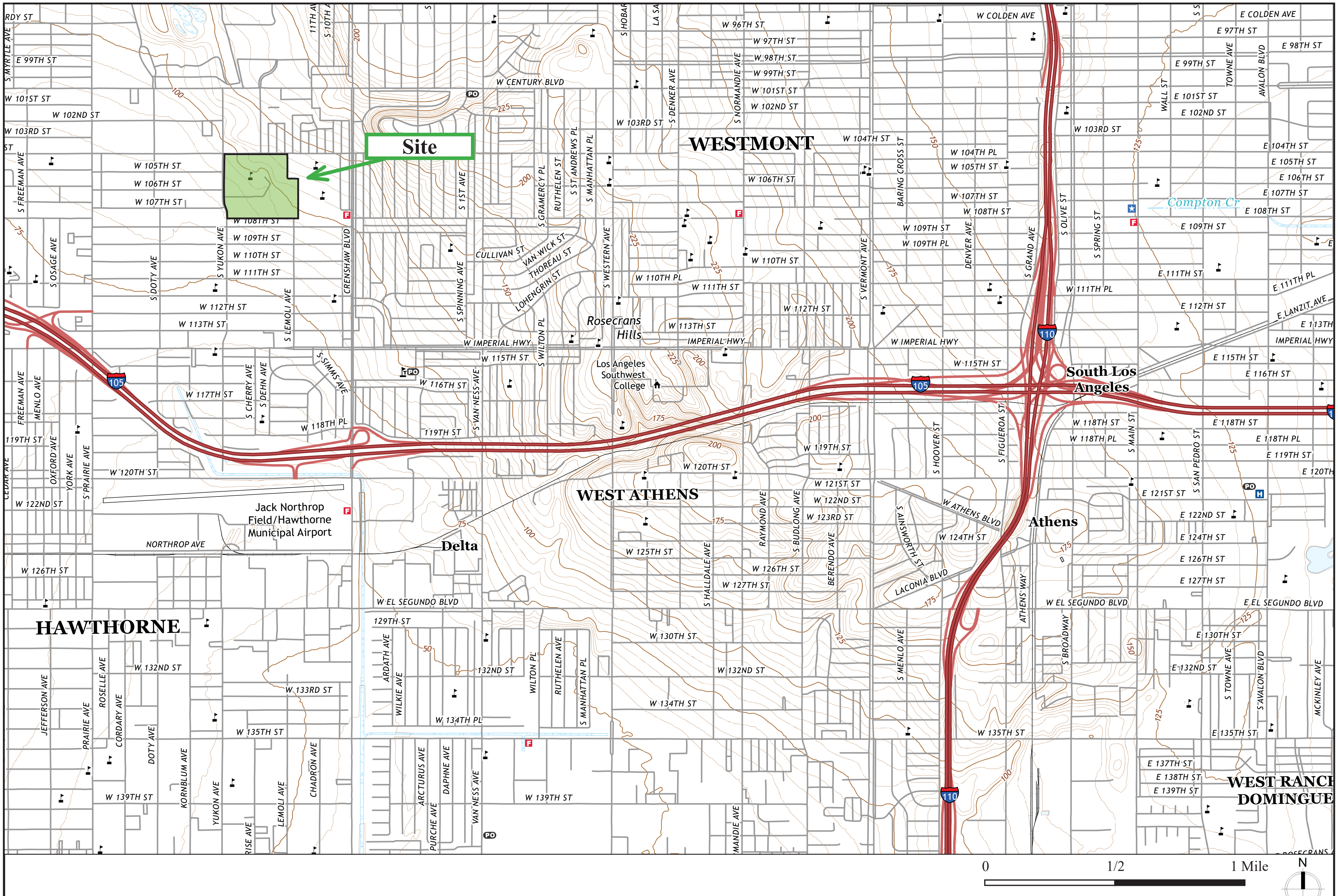
P-1 and P-2

Appendix C: Laboratory Test Results and Percolation Testing Calculations

Particle Size Distribution Reports (P-1 @ 32.5 ft and P-2 @ 27.5 ft)
Percolation Testing Data Sheet (P-1 and P-2)

APPENDIX A

Maps and Plans



Reference: USGS Topographic Map, Inglewood Quadrangle, California-Los Angeles County, 7.5 Minutes Series, 2018 - Contour Interval 5 ft, Bold Index Contour Lines Every Fifth Countour Line.

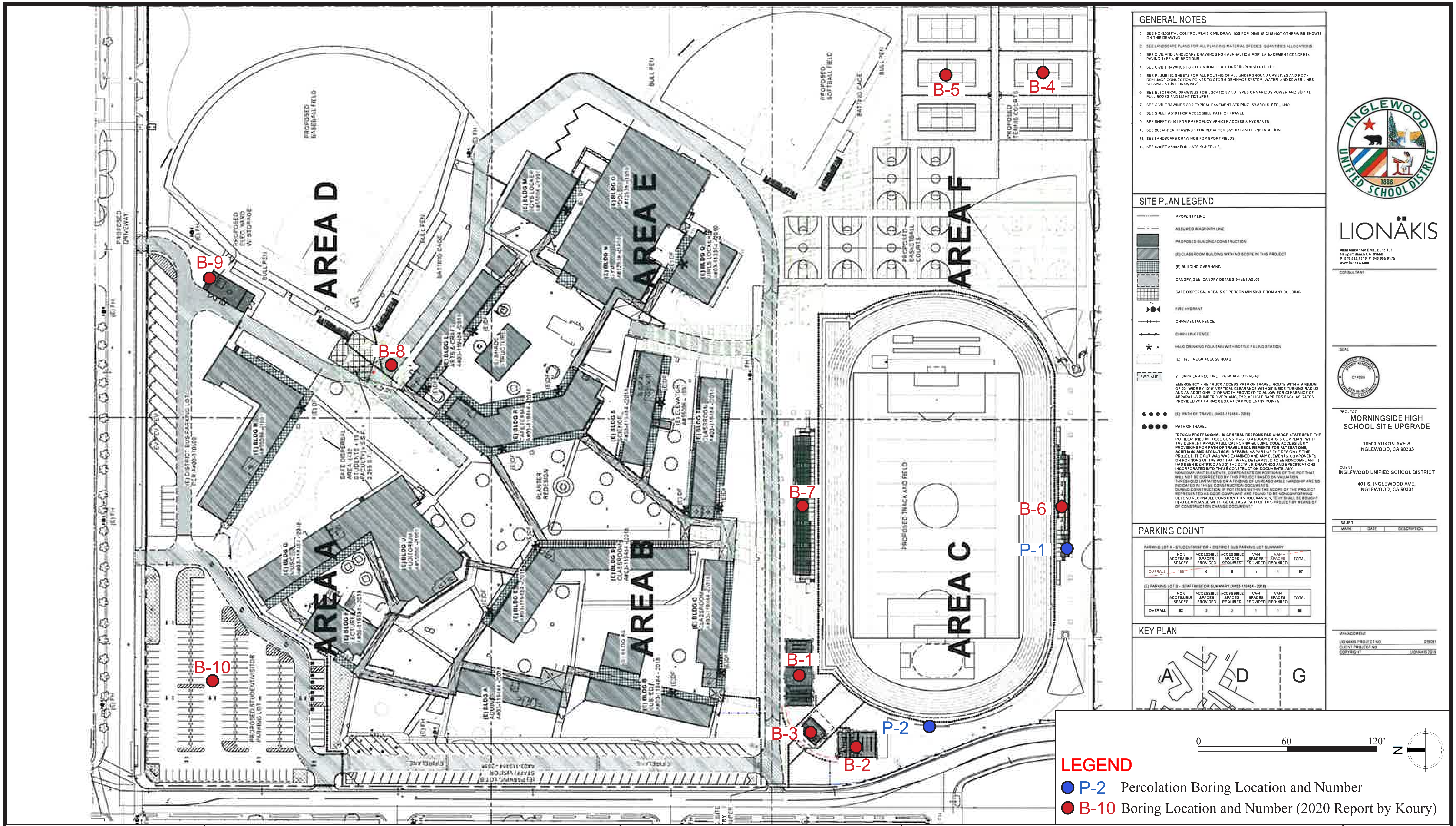
Project Name: Morningside High School

Project No.: 19-1110

Date: June 2021

Drawing Title: Vicinity Map

Figure: A-1



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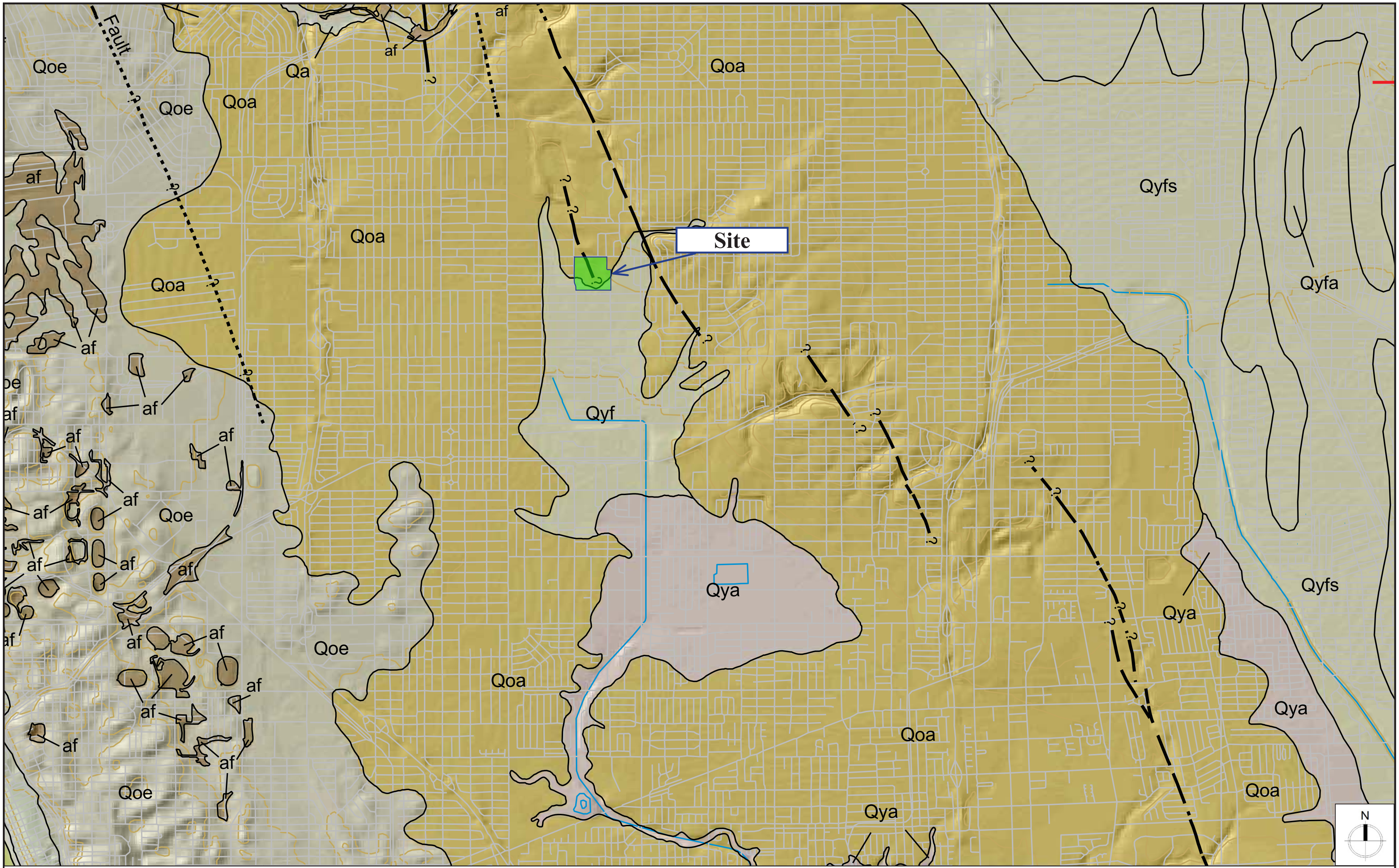
Project Name: Morningside High School

Project No.: 19-1110

Date: June 2021

Drawing Title: Percolation Boring Location Map

Figure: A-2



Legend

Qyf	**Young Alluvial Fan & Valley Deposits**
Qoa	**Old Alluvial Flood Plain Deposits**

0 1 2 Mile

Reference: Geologic Map of the Long Beach 30' x 60' Quadrangle, Southern California, Version 1.0 - 2003

KOURY
PASSION INTEGRITY QUALITY

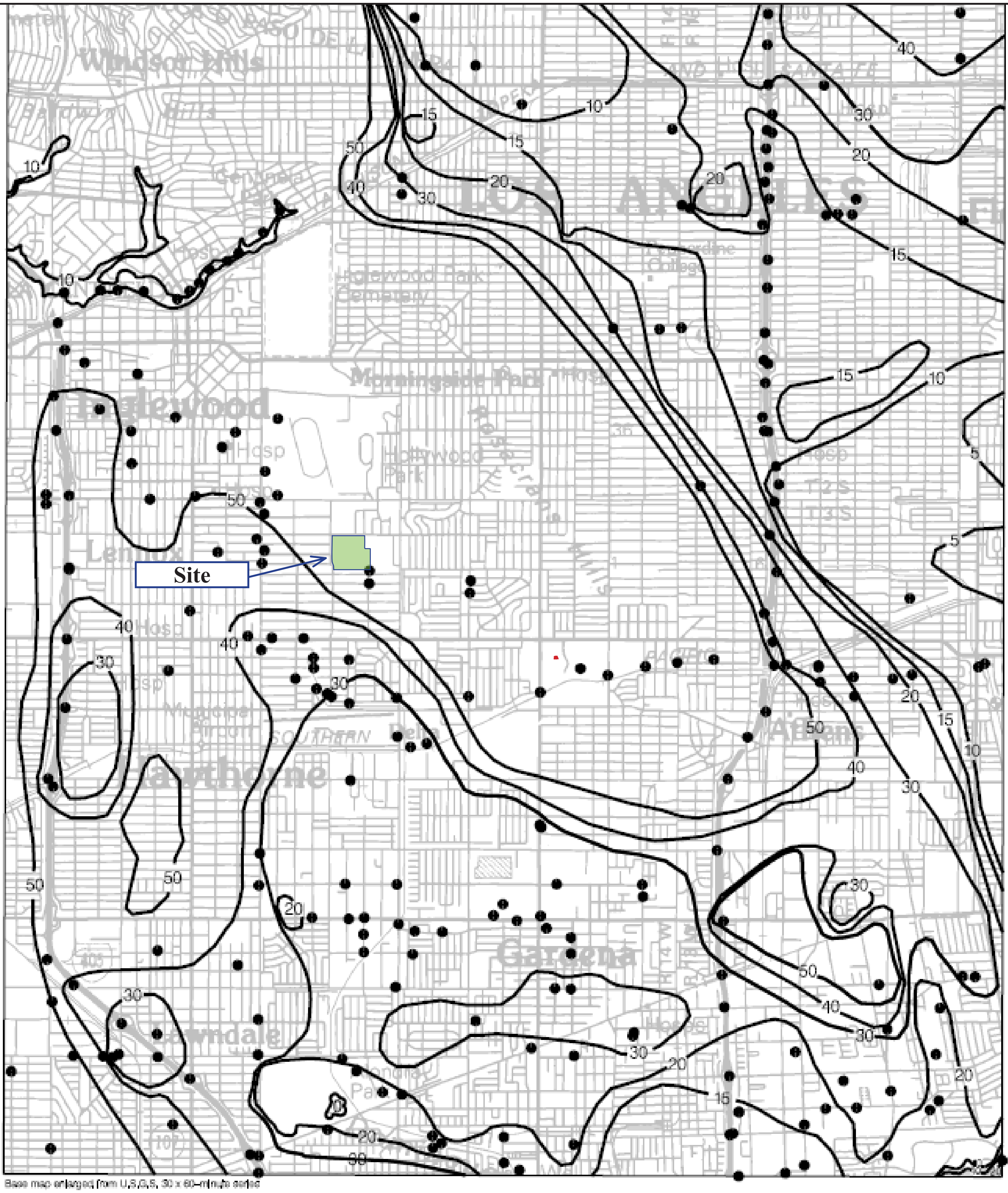
Project Name:
Morningside High School

Project No.: **19-1110**

Date: **June 2021**

Drawing Title:
Geology Map

Figure:
A-3



Base map enlarged from U.S.G.S. 30 x 60-minute series

Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Inglewood Quadrangle.

N

0 1 Mile

● Borehole Site

30 Depth to ground water in feet

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Project Name: **Morningside High School**

Project No.: **19-1110**

Date: **June 2021**

Drawing Title: **Historic High Groundwater Map**

Figure: **A-4**

APPENDIX B

Field Exploratory Boring Logs

KEY TO LOGS

SOILS CLASSIFICATION

MAJOR DIVISIONS			GRAPHIC LOG	USCS SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN 50% OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	**CLEAN GRAVELS** LESS THAN 5% FINES	░	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			░	**GP**	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES MORE THAN 12% FINES	▥	**GM**	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			▤	**GC**	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS 50% OR MORE OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	**CLEAN SANDS** LESS THAN 5% FINES	▩	**SW**	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			░	**SP**	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES MORE THAN 12% FINES	▦	**SM**	SILTY SANDS, SAND-SILT MIXTURES
			▩	**SC**	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS 50% OR MORE OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		▥	**ML**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	**CL**	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▩	**OL**	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS 50 OR MORE		▧	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR GRAVELLY ELASTIC SILTS
			▨	**CH**	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			▒	**OH**	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			▤	**PT**	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	#200	#40	#10	#4	3/4"	3"	12"

SIEVE SIZES

KEY TO LOGS (continued)

SPT/CD BLOW COUNTS VS. CONSISTENCY/DENSITY					
FINE-GRAINED SOILS (SILTS, CLAYS, etc.)			GRANULAR SOILS (SANDS, GRAVELS, etc.)		
CONSISTENCY	*BLOWS/FOOT		RELATIVE DENSITY	*BLOWS/FOOT	
	SPT	CD		SPT	CD
SOFT	0-4	0-4	VERY LOOSE	0-4	0-8
FIRM	5-8	5-9	LOOSE	5-10	9-18
STIFF	9-15	10-18	MEDIUM DENSE	11-30	19-54
VERY STIFF	16-30	19-39	DENSE	31-50	55-90
HARD	over 30	over 39	VERY DENSE	over 50	over 90

* CONVERSION BETWEEN CALIFORNIA DRIVE SAMPLERS (CD) AND STANDARD PENETRATION TEST (SPT) BLOW COUNT HAS BEEN CALCULATED USING "FOUNDATION ENGINEERING HAND BOOK" BY H.Y. FANG. (**VALUES ARE FOR 140 Lbs HAMMER WEIGHT ONLY**)

DESCRIPTIVE ADJECTIVE VS. PERCENTAGE	
DESCRIPTIVE ADJECTIVE	PERCENTAGE REQUIREMENT
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

*THE FOLLOWING "DESCRIPTIVE TERMINOLOGY/ RANGES OF MOISTURE CONTENTS" HAVE BEEN USED FOR MOISTURE CLASSIFICATION IN THE LOGS.

APPROXIMATE MOISTURE CONTENT DEFINITION	
DEFINITION	DESCRIPTION
DRY	Dry to the touch; no observable moisture
SLIGHTLY MOIST	Some moisture but still a dry appearance
MOIST	Damp, but no visible water
VERY MOIST	Enough moisture to wet the hands
WET	Almost saturated; visible free water

Boring Log

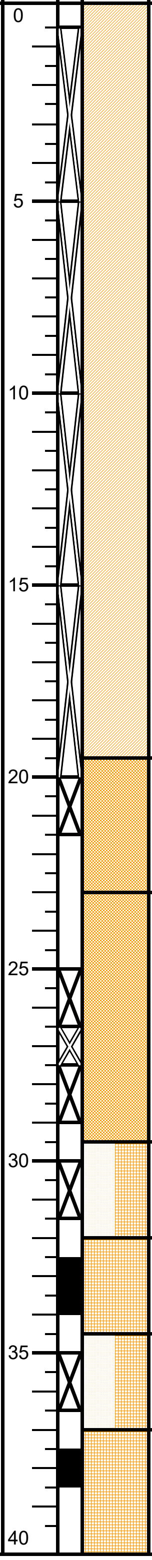
Project No. : 19-1110
Project Name : Morningside High School Site Upgrades

Boring No. : P-1

Sheet : 1 **of :** 2

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Ground Elevation:
Drilling Co. : One Way Drilling
Date Drilled : 6/07/21



Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Soil Type (USCS)	Description	Additional Tests
1	6.3			CL	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist, brown	#200 Wash Fines = 58%
					ALLUVIUM: **Sandy Lean CLAY;** very stiff, slightly moist, dark brown	
2	13.4				**Lean CLAY with SAND;** very stiff, moist, dark brown	#200 Wash Fines = 76%
3	11.0				**Sandy Lean CLAY;** hard, slightly moist, dark brown	#200 Wash Fines = 56%
4	13.4					#200 Wash Fines = 64%
5	10.2		8 12 15	SC	**Clayey SAND;** fine to medium, medium dense, slightly moist, brown	#200 Wash Fines = 30%
6	4.8		10 12 15	SM	**Silty SAND;** fine to medium, medium dense, slightly moist, brown	#200 Wash Fines = 14%
7	3.5					Fines = 18%
8	4.6		9 12 18			Fines = 13%
9	2.8		12 17 21	SP-SM	**Poorly Graded SAND with SILT;** fine to medium, dense, slightly moist, pale brown	#200 Wash Fines = 6%
10	8.5		13 24 44	SM	**Silty SAND;** fine to medium, medium dense, moist, brown	#200 Wash Fines = 31%
11	4.4		13 15 21	SP-SM	**Poorly Graded SAND with SILT;** fine to medium, dense, slightly moist, pale brown	#200 Wash Fines = 8% Gradation
12	4.8		27 50/6"	SM	**Silty SAND;** fine to medium, medium dense, slightly moist, light yellowish brown	#200 Wash Fines = 16%

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Boring No. : P-1
Sheet : 2 **of :** 2
Ground Elevation:
Drilling Co. : One Way Drilling
Date Drilled : 6/07/21

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
13	4.6		15 19 21	40	☒	▨	SP-SM	**Poorly Graded SAND with SILT;** fine to medium, dense, slightly moist, pale brown	#200 Wash Fines = 12%
						▨	SC	**Clayey SAND;** layers of sandy clay, fine to medium, medium dense to dense, moist, grayish brown with dark brown	
14	10.4		24 24 25	45	☒	▨			#200 Wash Fines = 47%
								End of Boring @ 46' 6" No groundwater encountered	
				50					
				55					
				60					
				65					
				70					
				75					
				80					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School Site Upgrades
Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Boring No. : P-2
Sheet : 1 **of :** 2
Ground Elevation:
Drilling Co. : One Way Drilling
Date Drilled : 6/07/21

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	7.4			0	☒		CL	Grass over topsoil **FILL: Sandy Lean CLAY;** stiff, moist, brown	#200 Wash Fines = 60%
2	13.0			5	☒			**ALLUVIUM:** **Sandy Lean CLAY;** very stiff, moist, dark brown	
3	17.2			10	☒			**Lean CLAY**; very stiff, moist, dark brown	#200 Wash Fines = 90%
4	12.8			15	☒			**Sandy Lean CLAY;** very stiff, moist, dark brown	#200 Wash Fines = 57%
5	8.1		15 17 24	20	☒		SC	**Clayey SAND;** fine to medium, layers of sandy lean clay, medium dense, moist, brown	#200 Wash Fines = 27%
6	5.5		16 19 27	25	☒		SM	**Silty SAND;** fine to medium, dense, slightly moist, brown	#200 Wash Fines = 13%
7	5.3	112	22 50/6"		■		SP-SM	**Poorly Graded SAND with SILT;** fine to medium, dense, slightly moist, brown	Fines = 11% Gradation
8	3.4		18 22 24	30	☒				#200 Wash Fines = 7%
9	3.8		16 19 27		☒				#200 Wash Fines = 8%
10	4.2		14 19 29	35	☒				#200 Wash Fines = 8%
				40			CL	**Sandy Lean CLAY**; very stiff to hard, moist, brown to dark brown	

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY
PASSION INTEGRITY QUALITY

Project No. : 19-1110
Project Name : Morningside High School
Site Upgrades

Boring No. : P-2

Sheet : 2 **of :** 2

Drilling Method : Hollow Stem 6" Auger
Sampling Method : Bulk - CD - SPT
Hammer Weight : 140 lbs **Drop Height :** 30"
Location : See Figure A-2

Ground Elevation:
Drilling Co. : One Way Drilling
Date Drilled : 6/07/21

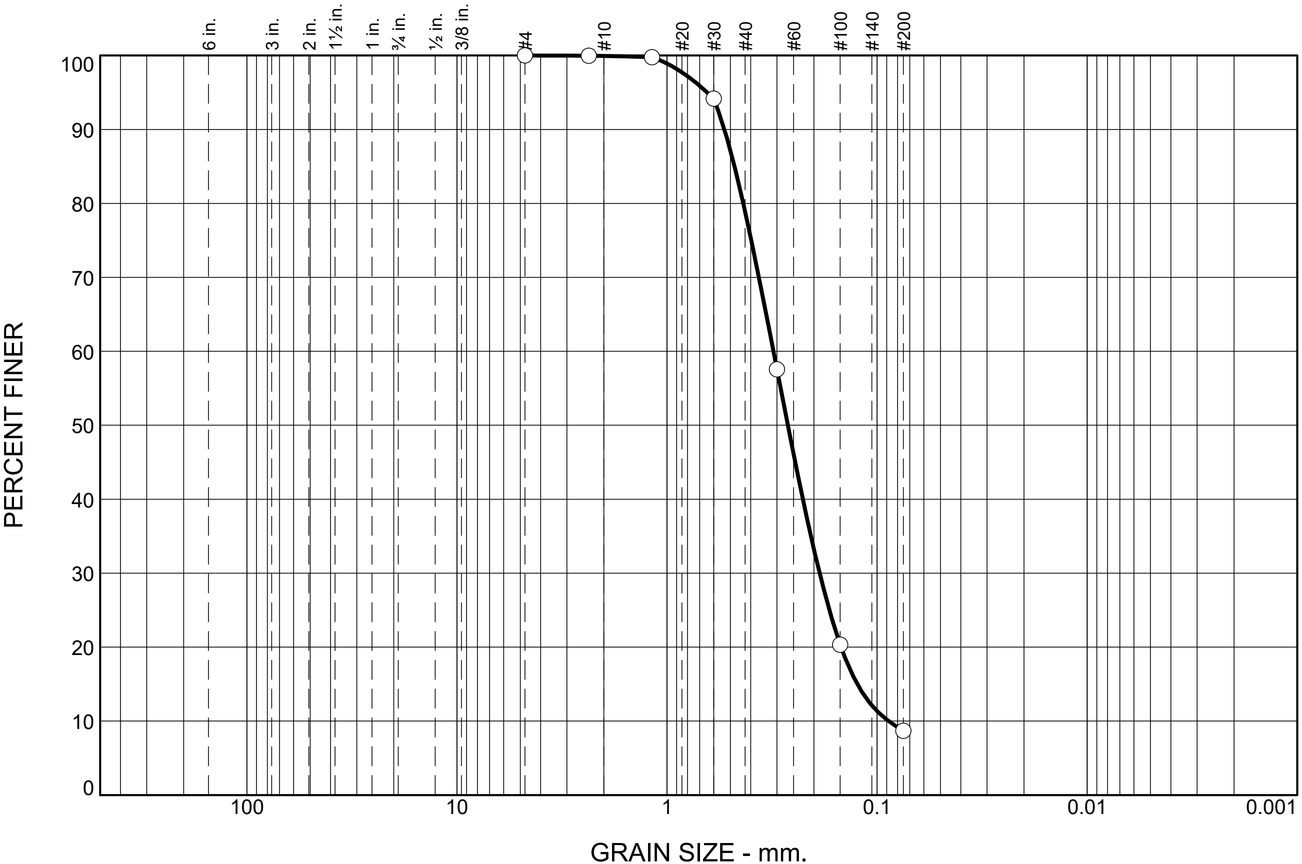
Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
11	16.5	116.0	17 32 42	40	■	▨	CL	**Sandy Lean CLAY;** very stiff to hard, moist, brown to dark brown	#200 Wash Fines = 61% PP = 4.5 tsf
12	11.6		21 27 32		☒	▨			#200 Wash Fines = 50% PP = 4.5 tsf
13	11.2		24 31 35	45	☒	▨			
								End of Boring @ 46' 6" No groundwater encountered	
				50					
				55					
				60					
				65					
				70					
				75					
				80					

Groundwater ▽ Bulk ☒ CD ■ SPT ☒

APPENDIX C

Laboratory Test Results and Percolation Testing Calculations

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	21.0	70.2	8.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	99.8		
#30	94.2		
#50	57.6		
#100	20.3		
#200	8.7		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5337 D_{85}= 0.4776 D_{60}= 0.3117
D_{50}= 0.2661 D_{30}= 0.1878 D_{15}= 0.1243
D_{10}= 0.0881 C_u= 3.54 C_c= 1.29

Classification

USCS= AASHTO=

Remarks

Lab #7284.

Location: P1 @ 35'
Sample Number: 2021-232 Series

Date: 6/17/21

Koury Engineering & Testing, Inc.

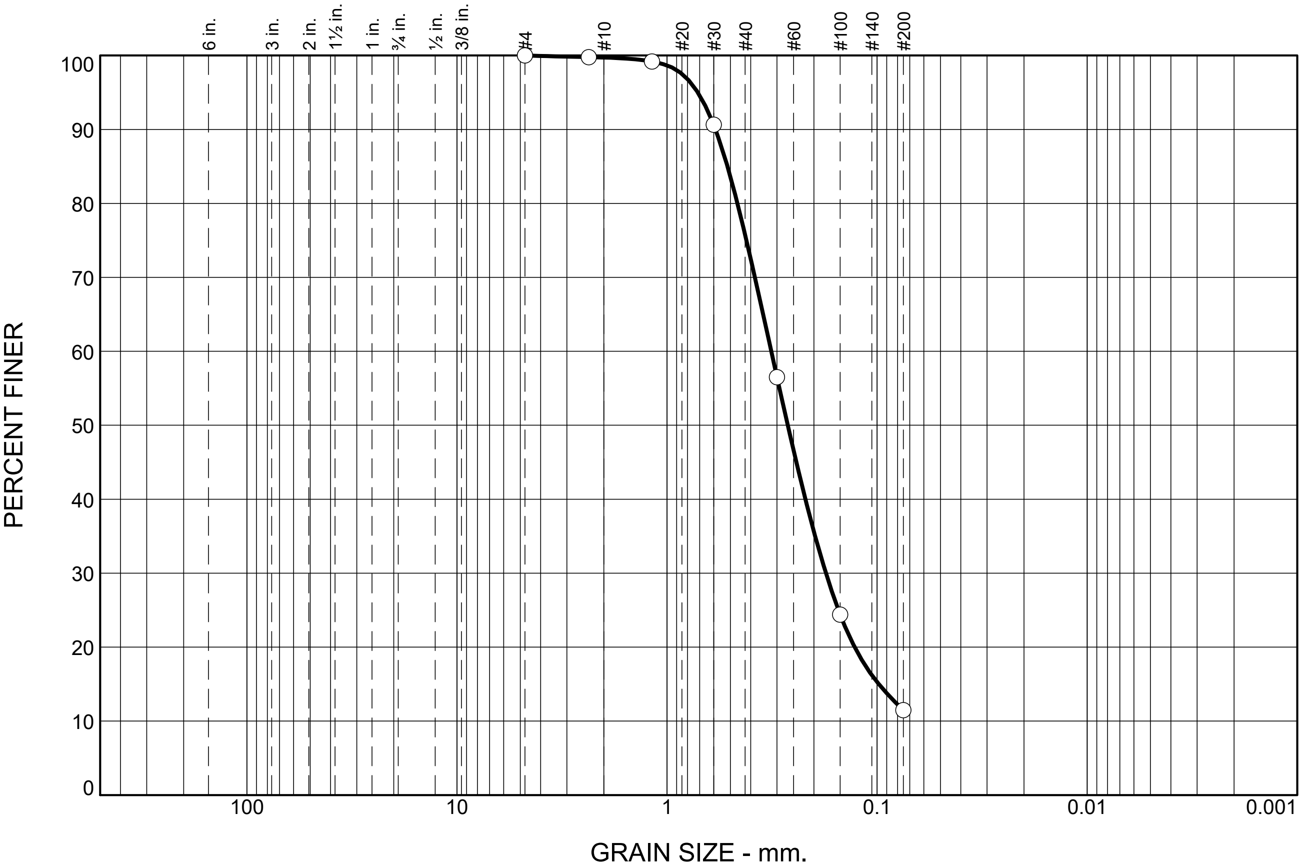
Chino, CA

Client:
Project: Morningside HS
Project No: 19-1110 **Figure**

Tested By: Mathew F. Perry **Checked By:**

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	23.9	64.3	11.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.2		
#30	90.6		
#50	56.5		
#100	24.4		
#200	11.5		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5883 D_{85}= 0.5160 D_{60}= 0.3192
D_{50}= 0.2665 D_{30}= 0.1754 D_{15}= 0.0982
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Lab #7284.

Location: P2 @ 27.5'
Sample Number: 2020-232 Series

Date: 6/17/21

Koury Engineering & Testing, Inc.

Chino, CA

Client:
Project: Morningside HS
Project No: 19-1110
Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:**

Percolation Testing

Job Name: Morningside High School

Job No.: 19-1110

Test No.: P-1

Test Location: About 265' E of Yukon Avenue S CL and 23' N of S school campus property fence line

Depth of Boring (d_b): 558 in

Water Table Depth (ft): > 50

Relatively Impervious Layer Depth (ft): 0-23 & 41-47

Diameter of Boring (D): 9.25 in

Test Date: 6/8/2021

Test Performer: ABB

	Time of Testing			**Water Level Measurement**		**Water Level Calculations**				**Percolation and Infiltration Calculations**		
Trial No.	Initial Time T_1 (min)	Final Time T_2 (min)	Time Interval $\Delta T = T_2 - T_1$ (min)	Initial Depth to Water d_1 (in)	Final Depth to Water d_2 (in)	Initial Height of Water Column $d_{H1} = d_b - d_1$ (in)	Final Height of Water Column $d_{H2} = d_b - d_2$ (in)	Drop in Height $\Delta d_H = d_{H1} - d_{H2}$ (in)	Average Height of Water Column $d_{avg} = (d_{H1}+d_{H2})/2$ (in)	Measured Percolation $K_i = \Delta d_H / \Delta T$ (in/hr)	Reduction Factor $R_f = ((2d_{H1} - \Delta d_H) / D) + 1$	Infiltration Rate $K = K_i / R_f$ (in/hr)
1	0	10	10.0	294	352 2/8	264	205 6/8	58 2/8	234 7/8	349.20	51.79	6.74
2	0	10	10.0	253 2/8	298 6/8	304 6/8	259 2/8	45 5/8	282	273.60	61.97	4.41
3	0	10	10.0	298 6/8	342 5/8	259 2/8	215 3/8	43 6/8	237 2/8	262.80	52.31	5.02
4	0	10	10.0	294	333	264	225	39	244 4/8	234.00	53.86	4.34
5	0	10	10.0	296 3/8	342 5/8	261 5/8	215 3/8	46 2/8	238 4/8	277.20	52.57	5.27
6	0	10	10.0	254 3/8	310 2/8	303 5/8	247 6/8	55 6/8	275 6/8	334.80	60.61	5.52
7	0	10	10.0	310 2/8	360 5/8	247 6/8	197 3/8	50 3/8	222 5/8	302.40	49.13	6.16
8	0	10	10.0	288	333	270	225	45	247 4/8	270.00	54.51	4.95
9	0	10	10.0	225 5/8	262 6/8	332 3/8	295 2/8	37 2/8	313 6/8	223.20	68.85	3.24
10	0	10	10.0	262 6/8	298 2/8	295 2/8	259 6/8	35 3/8	277 4/8	212.40	61.00	3.48
11	0	10	10.0	254 3/8	289 2/8	303 5/8	268 6/8	34 6/8	286 2/8	208.80	62.88	3.32

Notes:

1. Reduction Factor, $R_f = ((2d_{H1} - \Delta d_H) / D) + 1$
2. Long Term Infiltration Rate = Short Infiltration Rate / Reduction Factor

Short Term Infiltration Rate = **3.2** **in/hr**

Adjusted Long Term Infiltration Rate = **0.8** **in/hr**

Reduction Factor Range, used to account for Long Term Moderate Siltation, Site Variability, Number of Tests, Test Scale Limitations and other Factors= 3 to 12

Reduction Factor for Boring Percolation Testing RFt = 2 Site Variability, Number of Tests & Borings RF_v=2 Long Term Maintenance RF_S 1-3 **RF** = RFt x RFv x RFs = 2 x 2 x 1 = 4

Percolation Testing

KOURY ENGINEERING & TESTING, INC.

Job Name: Morningside High School

Job No.: 19-1110

Test No.: P-2

Test Location: About 85' E of Yukon Avenue S CL and 213' N of S school campus property fence line

Depth of Boring (d_b): 558 in

Water Table Depth (ft): > 50

Relatively Impervious Layer Depth (ft): 0-23 & 38-47

Diameter of Boring (D): 9.25 in

Test Date: 6/8/2021

Test Performer: ABB

Trial No.	**Time of Testing**			**Water Level Measurement**		**Water Level Calculations**				**Percolation and Infiltration Calculations**		
	Initial Time T_1 (min)	Final Time T_2 (min)	Time Interval $\Delta T = T_2 - T_1$ (min)	Initial Depth to Water d_1 (in)	Final Depth to Water d_2 (in)	Initial Height of Water Column $d_{H1} = d_b - d_1$ (in)	Final Height of Water Column $d_{H2} = d_b - d_2$ (in)	Drop in Height $\Delta d_H = d_{H1} - d_{H2}$ (in)	Average Height of Water Column $d_{avg} = (d_{H1}+d_{H2})/2$ (in)	Measured Percolation $K_i = \Delta d_H / \Delta T$ (in/hr)	Reduction Factor $R_f = ((2d_{H1} - \Delta d_H) / D) + 1$	Infiltration Rate $K = K_i / R_f$ (in/hr)
1	0.0	10.0	10.0	432	470 3/8	126	87 5/8	38 3/8	106 6/8	230.40	24.09	9.6
2	0.0	10.0	10.0	379 2/8	439 6/8	178 6/8	118 2/8	60 5/8	148 4/8	363.60	33.11	11.0
3	0.0	10.0	10.0	288	390 5/8	270	167 3/8	102 5/8	218 6/8	615.60	48.29	12.7
4	0.0	10.0	10.0	240	333	318	225	93	271 4/8	558.00	59.70	9.3
5	0.0	10.0	10.0	240	315 5/8	318	242 3/8	75 5/8	280 2/8	453.60	61.58	7.4
6	0.0	10.0	10.0	240	324	318	234	84	276	504.00	60.68	8.3
7	0.0	10.0	10.0	240	321	318	237	81	277 4/8	486.00	61.00	8.0
8	0.0	10.0	10.0	240	327 5/8	318	230 3/8	87 5/8	274 2/8	525.60	60.29	8.7
9	0.0	10.0	10.0	240	326 3/8	318	231 5/8	86 3/8	274 6/8	518.40	60.42	8.6
10	0.0	10.0	10.0	240	325 6/8	318	232 2/8	85 6/8	275 1/8	514.80	60.48	8.5
11	0.0	10.0	10.0	240	327 5/8	318	230 3/8	87 5/8	274 2/8	525.60	60.29	8.7
12	0.0	10.0	10.0	240	326 3/8	318	231 5/8	86 3/8	274 6/8	518.40	60.42	8.6

1. Reduction Factor, $R_f = ((2d_{H1} - \Delta d_H) / D) + 1$

2. Long Term Infiltration Rate = Short Infiltration Rate / Reduction Factor

Short Term Infiltration Rate = 7.4 **in/hr**

Adjusted Long Term Infiltration Rate = 1.8 **in/hr**

Reduction Factor Range, used to account for Long Term Moderate Siltation, Site Variability, Number of Tests, Test Scale Limitations and other Factors= 3 to 12

Reduction Factor for Boring Percolation Testing RFt = 2 Site Variability, Number of Tests & Borings RF_v=2 Long Term Maintenance RF_s 1-3 **RF** =RFt x RFv x RFs = 2 x 2 x 1 = 4

Reference: Los Angeles County Administrative Manual - Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration, GS200.2 dated 06/30/17

KOURY

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We are a key member of the construction team while safeguarding the public. We improve operational logistics and provide superior quality control through the continuing development of our engineering staff and technical expertise, utilization of classroom training and field supervisors, thus defining the industry standard.

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MAIN OFFICE

14280 EUCLID AVENUE
CHINO, CA 91710
PHONE 909-606-6111
FAX 909-606-6555

BRANCH OFFICE

17800 S.MAIN STREET
SUITE 302
GARDENA, CA 90248
PHONE 310-851-8685
FAX 310-851-8692

KOURYENGINEERING.COM