Converse Consultants
Geotechnical Engineering
Environmental & Groundwater Science
Inspection & Testing Services

GEOTECHNICAL AND PERCOLATION TEST RESULTS REPORT FOR THE FEASIBILITY OF ONSITE SEWAGE DISPOSAL USING SEPTIC TANK AND LEACH LINES

Sunburst Site – Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California

CONVERSE PROJECT NO. 22-81-308-01

Prepared For:
ADM LLC
1329 Sierra Alta Way
Los Angeles, CA 90065

UPDATED AUGUST 2025

Presented By:
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March 27, 2023

Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

August 18, 2025

Ms. Mirtilla Alliata de Montereale
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ADM LLC
1329 Sierra Alta Way
Los Angeles, California 90065

Subject: **GEOTECHNICAL AND PERCOLATION TEST RESULTS REPORT FOR THE FEASIBILITY OF ONSITE SEWAGE DISPOSAL USING SEPTIC TANK AND LEACH LINES**
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City of Joshua Tree, San Bernardino County, California
Converse Project No. 22-81-308-01

Dear Ms. Montereale:

Converse Consultants (Converse) is pleased to submit this Geotechnical and Percolation Test Results Report for Feasibility Of Onsite Sewage Disposal Using Septic Tank Leach Lines for the proposed 8 lot residential development, located at 4252 Sunburst Street in the City of Joshua Tree, San Bernardino County, California. This report was prepared in accordance with our proposal dated November 4, 2022, and your signed acceptance agreement and authorization to proceed dated November 11, 2022.

Based upon our field investigation, percolation testing and analyses, the project site is considered feasible from a geotechnical standpoint provided the recommendations presented in this report are incorporated into the design and development of the project.

We appreciate the opportunity to be of service to ADM LLC. Should you have any questions, please do not hesitate to contact us at 909-474-2847.

CONVERSE CONSULTANTS

Hashmi S. E. Quazi, PhD, GE, PE
Principal Engineer

Dist.: 1/Addressee
HSQ/RLG/MS/CN/kvg

PROFESSIONAL CERTIFICATION

This report has been prepared by the individuals whose seals and signatures appear herein.

The findings, recommendations, specifications, or professional opinions contained in this report were prepared in accordance with generally accepted professional engineering, engineering geologic principles, and practice in this area of Southern California. There is no warranty, either expressed or implied.

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1.0 INTRODUCTION

This geotechnical investigation and percolation report was prepared by Converse for the proposed 8 lot residential development, located at 4252 Sunburst Street, in the City of Joshua Tree, San Bernardino County, California. The approximate location of the proposed project is shown in Figure No. 1, *Approximate Project Location Map.*

The purpose of this investigation was to evaluate the current nature and engineering properties of the subsurface soils and groundwater conditions, as well as review the referenced conceptual grading exhibit, and to provide geotechnical recommendations for the proposed residential development.

This report was prepared for the project described herein and is intended for use solely by ADM LLC, and their authorized agents. This report may be made available to the prospective bidders for bidding purposes. However, the bidders are responsible for their own interpretation of the site conditions between and beyond the boring locations, based on factual data contained in this report. This report may not contain sufficient information for use by others and/or other purposes.

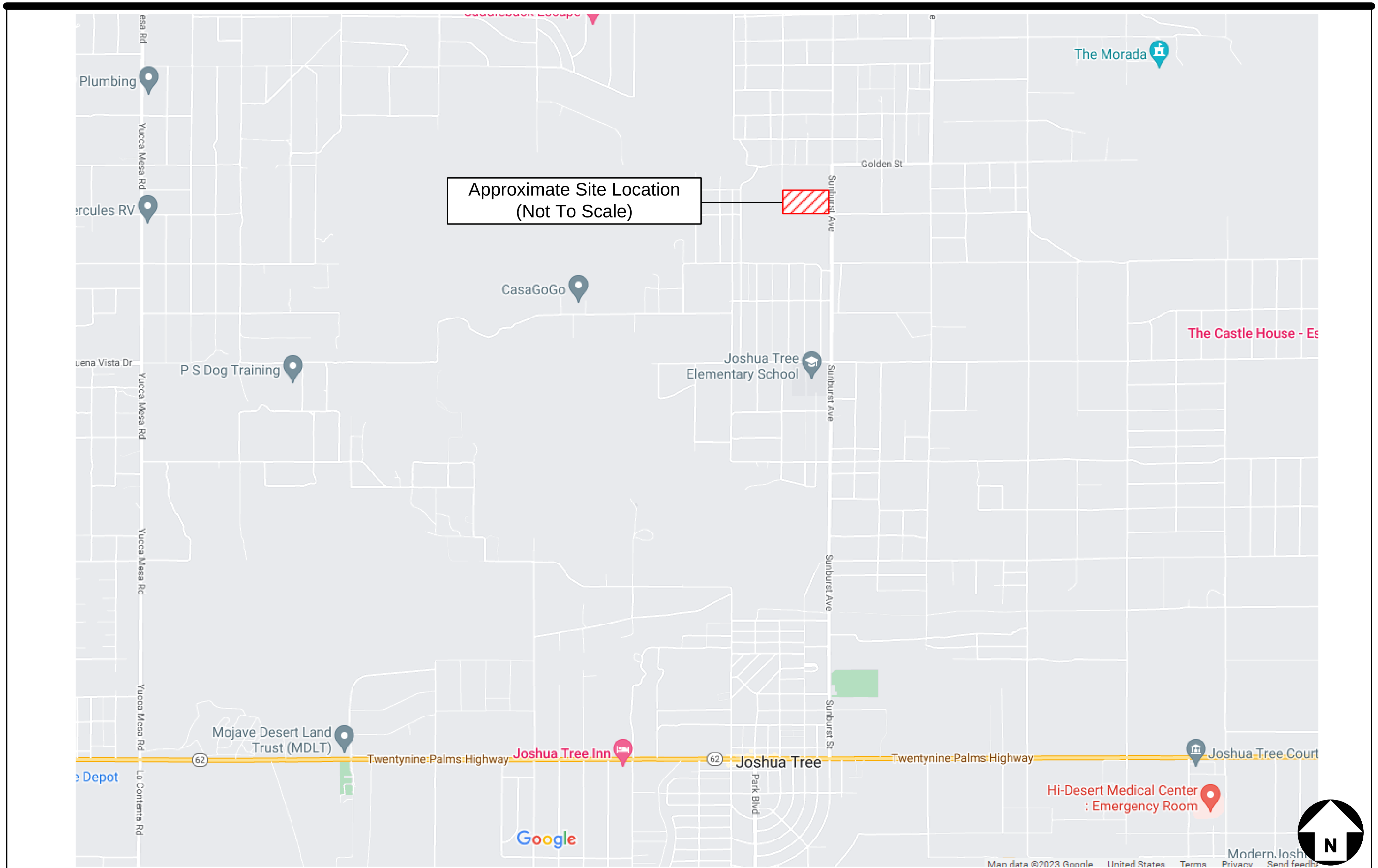
2.0 SITE DESCRIPTION AND BACKGROUND

The approximately 20-acre rectangular shaped site is located at 4252 Sunburst Street, in the City of Joshua Tree, San Bernardino County, California. The site is bounded on the north, west, and south by undeveloped land, on the east by Sunburst Street. An access road has been graded along the southern boundary of the site. Currently the site is undeveloped land with a medium to dense cover of native vegetation consisting of joshua trees, yucca plants, creosote bushes, cactus, and various desert grasses.

The site is relatively flat and slopes gently from the northwest to the southeast and south. Drainage appears to flow south and southwest. Site elevations range from approximately 2,824 feet above mean sea level (msl) in the northeast portion of the site to approximately 2,779 feet above msl in the southwest portion of the site.

3.0 PROJECT DESCRIPTION

Based on conversations with you and representatives with West Coast Civil as well as a review of the schematic site plan, we understand the property will be developed for 8 detached single-family residential structures. The structures will likely be one-story to two-story steel-framed homes with a raised floor, permanently attached to a reinforced concrete system of stem walls, grade beams and shallow strip footing. The strip footing depth is 4’-2.25” below the first level final floor grade. Each residence will be supported by onsite sewage disposal system of either septic tank and seepage pit or septic tank



Project: Sunburst Site Approximately 20-Acres (APN-0605-051-01)

Location: 4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California

For: ADM LLC

Approximate Site Location Map

Project No.
22-81-308-01

Converse Consultants

Figure No.
1

and leach lines. Associated with the development will be underground and above ground utilities, access road, interior streets and landscaping.

4.0 SCOPE OF WORK

Our scope of work included the following tasks.

4.1 Project Set-up

The project set-up consisted of the following tasks.

- Review of existing plans and data relevant to the project.
- Conducted a site reconnaissance to mark the site for boring and test pit locations and to verify that drill rig and excavator access to the proposed locations was available.
- Notified Underground Service Alert (USA) at least 48 hours prior to conducting field work to clear the boring and test pit locations of any conflict with existing underground utilities.
- Engaged a California licensed drilling company to drill the borings.
- Engaged a California licensed excavator company to dig the test pits.

4.2 Subsurface Exploration

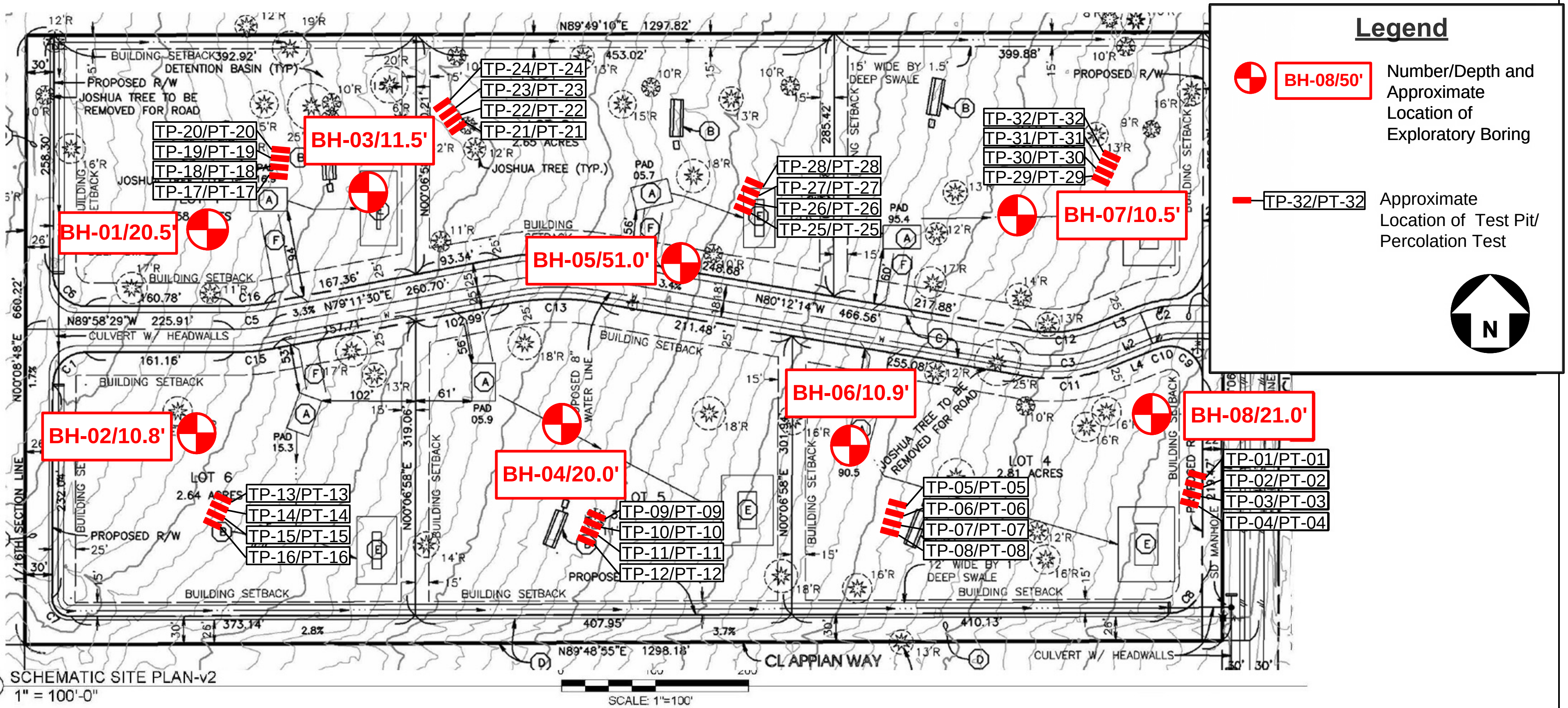
Eight exploratory borings (BH-01 through BH-08) were drilled using a truck-mounted CME 75 drill rig equipped with 8-inch diameter hollow-stem augers to investigate the subsurface conditions on December 21, 2022. The borings were drilled to depths between approximately 10.5 feet and 51.0 feet, below existing ground surface (bgs).

Thirty-two exploratory test pits (Four per proposed residential lot, TP-01 through TP-32) were excavated using two rubber-tracked mini-excavators equipped with 24-inch-wide buckets to investigate the subsurface conditions on December 23, 2022. The test pits were excavated to depths of approximately 4.0 feet bgs.

The approximate locations of the exploratory borings and test pits are shown on Figure No. 2, *Approximate Boring, Test Pit, and Percolation Test Locations Map*.

4.3 Percolation Testing

Four test pits were excavated at each lot on December 23, 2022, for a total of 32 exploratory test pits (TP-01/PT-01 through TP-32/PT-32), which were tested from January 11, 2023, to February 8, 2023. The percolation test pits were located by measurement from property boundaries utilizing the referenced schematic site plan. The test method employed was the continuous pre-soak test in conformance with the county



1 SCHEMATIC SITE PLAN-v2
1" = 100'-0"

LEGEND
(E) DETENTION BASIN
(A) BUILDING
(B) SEPTIC TANK + LEACH FIELD

SUNBURST SCHEMATIC SITE PLAN

This floor plan is shown for reference purposes only. Connect Homes reserves the right to make changes and substitutions to this standard floor plan at any time. "NIC - Not In Contract

Project: Sunburst Site Approximately 20-Acres (APN-0605-051-01)

Location: 4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California

For: ADM LLC

Approximate Boring, Test Pit, and Percolation Test Locations Map

Project No.
22-81-308-02

Converse Consultants

Figure No.
2

standards for percolation testing for leach lines, presented in the referenced SBCPHEHS standards.

The percolation tests were conducted in 6-inch diameter by 13-inch-deep percolation test holes which were hand augured at the bottom of the approximately 4 feet deep test pits. Prior to initiating the percolation tests, each test hole was first cleared of loose soils and a plastic liner, perforated in the bottom and sides, was then placed in the bottoms of the hand augured test holes.

For the pre-soak, if all of the water percolated in 2 consecutive readings within 10 minutes or less, the percolation test was conducted on the same day, if not the percolation test was conducted on the next day. After the pre-soak, the test was conducted by adjusting the water level to 6 inches above the bottom of the percolation test hole. The reading was conducted when the water level was 3 inches over the bottom of the percolation test hole so that each test represented no more than a 3-inch drop in water level. Measurements were made with a precision of ⅛-inch and after each reading, the water was refilled to the original level within the test hole. Percolation test data recorded in the field are presented in Appendix C *Percolation Testing*, and a summary of the percolation rates are presented below in Table No. 5 in Section 9.0, *Percolation Test Results.*

4.4 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in soil classification, and to evaluate relevant engineering properties. These tests included the following.

- *In-situ* moisture contents and dry densities (ASTM D2216 and D2937)
- Expansion Index (ASTM D4829)
- R-value (California Test 301)
- Corrosivity (CTM 643, 422, 417)
- Collapse (ASTM D4546)
- Grain size analysis (ASTM D6913)
- Maximum dry density and optimum-moisture content (ASTM D1557)
- Direct shear (ASTM D3080)

For *in-situ* moisture and dry density data, see the logs of borings in Appendix A, *Field Exploration*. For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*.

4.5 Analysis and Report Preparation

Data obtained from the field exploration, percolation testing results, and laboratory testing program was assembled and evaluated. Geotechnical analyses of the compiled data were performed, followed by the preparation of this report to present our findings, conclusions, and recommendations for the project.

5.0 SITE CONDITIONS

A general description of the subsurface conditions, various materials and groundwater conditions encountered at the site during our field exploration is discussed below.

5.1 Subsurface Profile

Based on our field exploration and laboratory test results, the subsurface soil at the project site consisted entirely of old alluvial deposits. This soil unit is characterized by poorly bedded to non-bedded granitic cobble-pebble gravel and sand from the nearby mountains to the west and south, with some fragments of metamorphic and volcanic rock. These materials were fine to coarse-grained silty sand with some gravel ranging up 2 inches maximum dimension, trace to some clay, trace to some caliche, was medium dense to very dense, dry to moist, and various shades of brown, red, and gray.

For a detailed description of the subsurface materials encountered in the exploratory borings, see the logs, Drawings No. A-2 through A-9, in Appendix A, *Field Exploration.*

5.2 Groundwater

Groundwater was not encountered during the investigation. For comparison, several regional and national databases were accessed to identify potential groundwater scenarios at the project site.

The GeoTracker database (SWRCB, 2023) was reviewed for historical groundwater data from sites within a 1.0-mile radius of the project site, but no data was found.

The National Water Information System (USGS, 2023) was reviewed for historical groundwater data from sites within a 1.0-mile radius of the project site. Three sites with historical well measurements were located within a 1.0-mile radius of the generalized center of the project area. Data from that search is listed in the table below.

Table No. 1, Summary of USGS Groundwater Depth Data

Site No.	Location	Groundwater Depth Range (ft. bgs)	Date Range
34101111618901	1,600 feet south of the project site	540	1968
340953116175801	4,800 feet southeast of the project site	440.45-444.40	1968-1996
341044116173901	4,326 feet east of the project site	434.04-439.36	1958-1983

The California Department of Water Resources database (DWR, 2023) was reviewed for historical groundwater data from sites within a 1.0-mile radius of the project site, but no data was found.

Based on available data, the historical high groundwater level near the site is estimated to be approximately 434.0 feet bgs, and the current groundwater level is estimated to be deeper than 51.0 feet bgs. Groundwater is not expected to be encountered during construction of the proposed project. Perched water layers at depth may be present locally, particularly following high precipitation or irrigation events.

5.3 Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. Depending on the extent and location below finish subgrade, expansive soils can have a detrimental effect on structures.

Based on the one laboratory test conducted, the expansion index representative of the site soils was 0, corresponding to very low expansion potentials.

5.4 Collapse Potential

Soil deposits subjected to collapse/hydro-consolidation generally exist in regions of moisture deficiency. Collapsible soils are generally defined as soils that have potential to suddenly decrease in volume upon increase in moisture content even without an increase in external loads. Moreover, some soils may have a different degree of collapse/hydro-consolidation based on the amount of proposed fill or structure loads. Soils susceptible to collapse/ hydro-consolidation include wind-blown silt, weakly cemented sand, and silt where the cementing agent is soluble (e.g., soluble gypsum, halite), alluvial or colluvial deposits within semi-arid to arid climate, and certain weathered bedrock above the groundwater table.

Granular soils may have a potential to collapse upon wetting in arid climate regions. Collapse/hydro-consolidation may occur when the soluble cements (carbonates) in the soil matrix dissolve, causing the soil to densify from its loose/low density configuration from deposition.

The degree of collapse of a soil can be defined by the collapse potential value, which is expressed as a percent of collapse of the total sample using the Collapse Potential Test (ASTM D4546). According to the ASTM guideline, the severity of collapse potential is commonly evaluated by the following Table No. 2, *Collapse Potential Values*.

Table No. 2, Collapse Potential Values

Collapse Potential Value (%)	Severity of Problem
0	None
0.1 to 2	Slight
2.1 to 6.0	Moderate
6.0 to 10.0	Moderately Severe
>10	Severe

Four collapse tests were conducted for this project. Based on the laboratory test results, the measured collapse potential within the upper 8.5 feet, ranged from 0.5 percent to 6.0 percent. This indicates a slight to moderate problem at the site. Collapse potential distress is typically considered a concern when collapse potential is over 2% (LA County, 2013).

5.5 Excavatability

The subsurface materials of the project are expected to be excavatable by conventional heavy-duty earth moving equipment. However, difficult excavation may be encountered at depths below approximately 5.0 feet to 7.5 feet due to very dense soil conditions.

The phrase “conventional heavy-duty excavation equipment” is intended to include commonly used equipment such as excavators, scrapers, and trenching machines. It does not include hydraulic hammers (“breakers”), jackhammers, blasting, or other specialized equipment and techniques used to excavate hard earth materials. Selection of an appropriate excavation equipment models should be done by an experienced earthwork contractor.

5.6 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface soil conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations.

5.7 Caving

Caving was not encountered in any of the exploratory borings, however minor caving was encountered in test pit excavations when the side walls were disturbed. Localized caving will occur in excavations that extend into granular units of the on-site soils.

6.0 ENGINEERING GEOLOGY

The regional and local geology within the proposed project area are discussed below.

6.1 Regional Geology

The project site is located in the Mojave Desert Geomorphic Province of Southern California. The Mojave Desert is a broad interior region of isolated mountain ranges separated by wide desert plains. The area is roughly triangular shaped and bounded by the Garlock Fault on the north, the San Andreas Fault on the southwest, and the Colorado River on the east. The drainages are primarily closed and terminate in playas within the valley floors.

The province is a seismically active region primarily characterized by a series of northwest-southeast-trending strike-slip faults and east-west trending secondary faults. The most prominent of the nearby fault zones include the Helendale, Lenwood, Landers, and San Andreas Fault Zones, all of which have been known to be active during Quaternary time.

Extension of the region has resulted in exposure of basement rocks dating to the Precambrian age, deposition of young Holocene-aged sedimentary basins, and eruptions of volcanic units.

6.2 Local Geology

The project site is located in the Hidden River Valley Area between Bartlett Mountain and Bunker Mountain, approximately 6.5 miles north of the Joshua Tree National Park. Regional mapping (Dibblee and Minch, 2008) indicates that the site is generally underlain by young (Holocene-aged) alluvial deposits. These deposits primarily consist of unconsolidated to weakly consolidated gravel, sand, and silt.

7.0 FAULTING AND SEISMICITY

The approximate distance and seismic characteristics of nearby faults are discussed in the following subsections.

7.1 Faulting

The project site is not located within a currently designated San Bernardino County (SBCa, 2010) or State of California Earthquake Fault Zone (CGS, 2007). There are no known active faults projecting toward or extending across the project site. The potential for surface rupture resulting from the movement of nearby major faults is not known with certainty but is considered low.

The proposed site is situated in a seismically active region. As is the case for most areas of Southern California, ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site.

Table No. 3, *Summary of Regional Faults,* summarizes selected data of known faults capable of seismic activity within 100 kilometers of the site. The data presented below was calculated based on the centralized project site coordinate 34.1759N, 116.3105W using the National Seismic Hazard Maps Database (USGS, 2008) and other published geologic data.

Table No. 3, Summary of Regional Faults

Fault Name and Section	Closest Distance (km)	Slip Sense	Length (km)	Slip Rate (mm/year)	Maximum Magnitude
Pinto Mtn	3.75	strike slip	74	2.5	7.30
So Emerson-Copper Mtn	7.34	strike slip	54	0.6	7.10
Eureka Peak	9.81	strike slip	19	0.6	6.70
Landers	10.29	strike slip	95	0.6	7.40
Burnt Mtn	11.16	strike slip	21	0.6	6.80
Calico-Hidalgo	12.76	strike slip	117	1.8	7.40
Johnson Valley (No)	20.48	strike slip	35	0.6	6.90
Pisgah-Bullion Mtn-Mesquite Lk	21.33	strike slip	88	0.8	7.30
North Frontal (East)	24.83	thrust	27	0.5	7.00
Lenwood-Lockhart-Old Woman Springs	36.26	strike slip	145	0.9	7.50
S. San Andreas	36.94	strike slip	548	n/a	8.18
Helendale-So Lockhart	49.39	strike slip	114	0.6	7.40

Fault Name and Section	Closest Distance (km)	Slip Sense	Length (km)	Slip Rate (mm/year)	Maximum Magnitude
North Frontal (West)	54.25	reverse	50	1	7.20
San Jacinto	72.2	strike slip	241	n/a	7.88
Cleghorn	83.25	strike slip	25	3	6.80
Gravel Hills-Harper Lk	95.37	strike slip	65	0.7	7.10

(Source: https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/)

7.2 CBC Seismic Design Parameters

Seismic parameters based on the 2022 California Building Code (CBSC, 2022) and ASCE 7-16 are provided in the following table. These parameters were determined using the generalized coordinates (34.1759N, 116.3105W) and the Seismic Design Maps ATC online tool.

Table No. 4, CBC 2022 Seismic Design Parameters

Seismic Parameters	
Site Coordinates	34.175907N, 116.310592W
Site Class	D*
Risk Category	II
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_s	1.968g
Mapped 1-second Spectral Response Acceleration, S_1	0.704g
Site Coefficient (from Table 11.4-1), F_a	1.0
Site Coefficient (from Table 11.4-2), F_v	2.5
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	1.968g
MCE 1-second period Spectral Response Acceleration, SM_1	1.760g
Design Spectral Response Acceleration for short period S_{DS}	1.312g
Design Spectral Response Acceleration for 1-second period, S_{D1}	1.173g
Site Modified Maximum Peak Ground Acceleration, PGA_M	0.925g

* *Stiff Soil Classification*

7.3 Secondary Effects of Seismic Activity

In general, secondary effects of seismic activity include surface fault rupture, soil liquefaction, landslides, lateral spreading, tsunamis, seiches, and earthquake-induced flooding. The site-specific potential for each of these seismic hazards is discussed in the following sections.

Surface Fault Rupture: The site is not located within a currently designated State of California (CGS, 2007) or San Bernardino County (SBC, 2007) earthquake fault zone. There are no known active faults projecting toward or extending across the project site. The potential for surface rupture resulting from the movement of nearby major faults is not known with certainty but is considered low.

Liquefaction: Liquefaction is defined as the phenomenon in which a cohesionless soil mass within the upper 50 feet of the ground surface suffers a substantial reduction in its shear strength, due the development of excess pore pressures. During earthquakes, excess pore pressures in saturated soil deposits may develop as a result of induced cyclic shear stresses, resulting in liquefaction.

Soil liquefaction generally occurs in submerged granular soils and non-plastic silts during or after strong ground shaking. There are several general requirements for liquefaction to occur. They are as follows.

- Soils must be submerged.
- Soils must be loose to medium-dense.
- Ground motion must be intense.
- Duration of shaking must be sufficient for the soils to lose shear resistance.

Based on a site-specific settlement analysis presented in Appendix D, *Liquefaction and Settlement Analysis*, we estimate that the potential for liquefaction induced settlement is negligible.

Seismic Settlement: Dynamic dry settlement may occur in loose, granular, unsaturated soils during a large seismic event. Based on a site-specific settlement analysis presented in Appendix C, *Liquefaction and Settlement Analysis*, we estimate 0.13 inches of total dry seismic settlement.

Landslides: Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. Due to the relatively flat nature of the proposed configuration of the project site, the risk of landsliding is considered negligible.

Lateral Spreading: Seismically induced lateral spreading involves primarily lateral movement of earth materials over underlying materials which are liquefied due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. Due to the relatively flat nature of the project site and the recommended remedial grading, the risk of lateral spreading is considered low.

Tsunamis: Tsunamis are large waves generated in open bodies of water by fault displacement or major ground movement. Due to the inland location and elevation of the site, tsunamis are not considered to be a risk.

Seiches: Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Due to the distance to large bodies of water from the site, seiching is not considered to be a risk

Earthquake-Induced Flooding: Dams or other water-retaining structures may fail as a result of large earthquakes. The project site is not located within a designated dam inundation area (DSOD, 2023).

8.0 LABORATORY TEST RESULTS

Laboratory testing was performed to determine the physical and chemical characteristics and engineering properties of the subsurface soils. Current physical test results are included in Appendix A, *Field Exploration* and Appendix B, *Laboratory Testing Program*. Discussions of the various test results are presented below.

8.1 Physical Testing

- *In-situ* Moisture and Dry Density – *In-situ* dry densities and moisture contents of the site soils were determined in accordance with ASTM Standard D2216 and D2937. Dry densities of the soils ranged from 96 to 140 pounds per cubic foot (pcf) with moisture contents of 1 to 8 percent. Results are presented on the Log of Borings in Appendix A, *Field Exploration.*
- Expansion Index - One representative bulk soil was tested to evaluate the expansion potential in accordance with ASTM Standard D4829. The test result indicated expansion index is 0, corresponding to very low expansion potential.
- R-Value – Two representative bulk samples were tested in accordance with Caltrans Test Method 301. The results of the R-value tests were both 77.
- Collapse Potential – Four representative samples were tested to determine the collapse potential in accordance with the ASTM Standard D4596. The test results indicated collapse potentials of 0.5, 1.5, 4.0, and 6.0 percent, indicating a slight to moderate collapse potential.
- Grain Size Analysis – Four representative samples were tested to determine the relative grain size distribution in accordance with the ASTM Standard D6913. The test results are graphically presented in Drawing No. B-1, *Grain Size Distribution Results.*

- Maximum Dry Density and Optimum Moisture Content – Typical moisture-density relationship tests were performed on three representative soil samples in accordance with ASTM Standard D1557. The results are presented in Drawing No. B-2, *Moisture-Density Relationship Results*, in Appendix B, *Laboratory Testing Program*. The laboratory maximum dry densities of the samples tested were 129.8 (with rock correction 131.2) pcf, 125.8 (with rock correction 127.5) pcf, and 134.0 (with no rock correction) pcf and had moisture contents of 9.3 (with rock correction 8.5) percent, 9.0 (with rock correction 5.5) percent, and 6.5 (with no rock correction) percent, respectively.
- Direct Shear – Two direct shear tests were performed on undisturbed samples under soaked moisture conditions in accordance with ASTM Standard D3080. The test results are presented in Drawing Nos. B-3 and B-4, *Direct Shear Test Result* in Appendix B, *Laboratory Testing Program*.

8.2 Chemical Testing - Corrosivity Evaluation

One representative soil sample was tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of these tests was to determine the corrosion potential of site soils when placed in contact with common pipe materials. The tests were performed by AP Engineering and Testing, Inc. (Pomona, CA) in accordance with California Test Methods 643, 422, and 417. The test results are presented in Appendix B, *Laboratory Testing Program and* are summarized below.

- The pH measurement of the sample tested was 8.8.
- The sulfate content of the sample tested was 29 ppm (0.0029 percent by weight).
- The chloride concentration of the sample tested was 19 ppm.
- The minimum electrical resistivities when saturated were 8,808 ohm-cm.

9.0 PERCOLATION TEST RESULTS

Thirty-two percolation tests (PT-01 through PT-32) were performed between January 11, 2023, and February 8, 2023, to evaluate the water percolation rate. The measured percolation test data and calculations are represented in Appendix C, *Percolation Testing*. The estimated percolation rates at each test hole are presented in the following table.

Table No. 5, Estimated Field Percolation Rates

Percolation Test	Lot Number	Percolation Test Hole Depth (in)	Trench Depth (ft) of Percolation Test	Soil Types	Percolation Rate (MPI)
PT-01	5	13.0	4.0	Silty Sand (SM)	2.17

Percolation Test	Lot Number	Percolation Test Hole Depth (in)	Trench Depth (ft) of Percolation Test	Soil Types	Percolation Rate (MPI)
PT-02	5	13.0	4.0	Silty Sand (SM)	1.83
PT-03	5	13.0	4.0	Silty Sand (SM)	0.33
PT-04	5	13.0	4.0	Silty Sand (SM)	2.33
PT-05	4	13.0	4.0	Silty Sand (SM)	0.17
PT-06	4	13.0	4.0	Silty Sand (SM)	0.33
PT-07	4	13.0	4.0	Silty Sand (SM)	2.67
PT-08	4	13.0	4.0	Silty Sand (SM)	0.17
PT-09	3	13.0	4.0	Silty Sand (SM)	0.83
PT-10	3	13.0	4.0	Silty Sand (SM)	1.67
PT-11	3	13.0	4.0	Silty Sand (SM)	0.83
PT-12	3	13.0	4.0	Silty Sand (SM)	1.33
PT-13	2	13.0	4.0	Silty Sand (SM)	0.67
PT-14	2	13.0	4.0	Silty Sand (SM)	0.50
PT-15	2	13.0	4.0	Silty Sand (SM)	0.33
PT-16	2	13.0	4.0	Silty Sand (SM)	1.00
PT-17	1	13.0	4.0	Silty Sand (SM)	0.33
PT-18	1	13.0	4.0	Silty Sand (SM)	0.50
PT-19	1	13.0	4.0	Silty Sand (SM)	0.67
PT-20	1	13.0	4.0	Silty Sand (SM)	1.67
PT-21	8	13.0	4.0	Silty Sand (SM)	0.83
PT-22	8	13.0	4.0	Silty Sand (SM)	0.33
PT-23	8	13.0	4.0	Silty Sand (SM)	0.50
PT-24	8	13.0	4.0	Silty Sand (SM)	0.50
PT-25	7	13.0	4.0	Silty Sand (SM)	2.50
PT-26	7	13.0	4.0	Silty Sand (SM)	3.00
PT-27	7	13.0	4.0	Silty Sand (SM)	0.17
PT-28	7	13.0	4.0	Silty Sand (SM)	0.67
PT-29	6	13.0	4.0	Silty Sand (SM)	0.83
PT-30	6	13.0	4.0	Silty Sand (SM)	0.17
PT-31	6	13.0	4.0	Silty Sand (SM)	0.17
PT-32	6	13.0	4.0	Silty Sand (SM)	0.17

The measured field percolation test rates ranged from 0.17 to 3.00 minutes per inch (MPI), for a mean average of 0.94 MPI with ¼ of the mean average being 0.24 MPI. According to SBCDPHEHS since all of the test results do not fall within ¼ of the mean average MPI or 0.70 MPI to 1.18 MPI the percolation rate of 3.00 MPI should be used for leach line system design.

9.1 Parameters and Calculations

The following calculations are based on a typical septic tank capacity and are for general reference only. For alternate tank size capacity design percolation rates, please refer to the SBDPHEHS standards to calculate the correct rate.

1 residence per lot
1,000 gallons of septic tank capacity per residence

Most Conservative Leach Line Field Percolation MPI = 3.00 min/inch
Design Percolation Rate = 3.00 min/inch = 20.00 inches/hour

10.0 EARTHWORK AND SITE GRADING RECOMMENDATIONS

Earthwork for the project will include grading, trench excavation, pipe subgrade preparation, pipeline bedding placement and trench backfill, as well as roadway pavement construction. Recommendations for earthwork are presented in the following subsections. General Earthwork Specifications are presented in Appendix D*, Liquefaction and Seismic Settlement.*

10.1 General

This section contains our general recommendations regarding earthwork for the proposed 8-lot residential development. These recommendations are based on the results of our field exploration and laboratory testing as well as our experience with similar projects, and data evaluation as presented in the preceding sections. These recommendations may require modification by the geotechnical consultant based on observation of the actual field conditions during remedial grading.

Prior to the start of construction, all underground existing utilities and appurtenances should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications. All excavations should be conducted in such a manner as not to cause loss of bearing and/or lateral support of existing structures or utilities.

All existing structures, debris, deleterious material and surficial soils containing roots and perishable materials should be stripped and removed from the project site.

Deleterious material, including manure, organics, organic disturbed soils, concrete, and debris generated during excavation, should not be placed as fill.

10.2 Private Sewage System Abandonment

From a geotechnical standpoint, any seepage pits, other private sewage systems, and/or other subsurface structures that may be encountered should be located, mapped on the grading plans, removed and/or properly abandoned. Abandonment and/or removal of septic systems that may exist should be in accordance with local codes and recommendations by Converse. Seepage pits, if abandoned in-place, should be pumped clean, backfilled with gravel or clean sand jetted into place, and then capped with a minimum of 2 feet of a 2-sack or greater slurry or concrete for a minimum distance of 2 feet outside the edge of the seepage pit. The top of the slurry or concrete cap should be at a minimum 10 feet below proposed grade.

10.3 Overexcavation

The site is generally underlain by approximately 2.5 feet to 8.0 feet of potentially compressible soils (low density portions of the alluvial deposits), which may be prone to future adverse settlement under the surcharge of foundation, improvements and/or fill loads. In addition, portions of the alluvial soils also have an in-place swell potential that may be prone to future heave when they become wet, Therefore, these materials should be over-excavated to competent alluvial deposits, within all areas of proposed structures, walls and other improvements, and replaced with compacted fill soils.

Building Pad Areas: Within the entire level portions of the building pad areas overexcavations should be at least approximately 6.0 feet to 8.0 feet below existing grade or at least 4.0 feet below footings, whichever is deeper. All over-excavations should extend laterally at least 5.0 feet or equal to the depth of over-excavation, whichever is greater, outside the entire level portions of the building pad area.

Improvements Outside of the Building Pad Areas*:* For areas of proposed roadways, parking, flatwork, walls and other improvements, overexcavations should be at least 4.0 to 5.0 feet below existing grade. Within wall areas overexcavations should also be a minimum of 4.0 feet below the proposed wall footings, all over-excavations should extend laterally at least 3.0 feet or equal to the depth of over-excavation, whichever is greater.

The final bottom surfaces of all excavations should be observed and approved by the project geotechnical consultant prior to placing any fill or structures. However, localized deeper over-excavation could be encountered, based on observations and density testing by the geotechnical consultant during grading of the final bottom surfaces of all excavations.

The estimated locations and approximate depths of over-excavation of unsuitable, compressible soil materials are indicated on Figure No. 2, *Approximate Boring, Test Pit, and Percolation Testing Locations Map*.

If isolated pockets of very soft, loose, eroded, or pumping soil are encountered, the unstable soil should be excavated as needed to expose undisturbed, firm, and unyielding soils.

The contractor should determine the best manner to conduct the excavations, such that there are no losses of bearing and/or lateral support to the existing structures or utilities (if any).

Areas to receive fill and/or other surface improvements should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition, and recompacted to at least 90 percent relative compaction (based on ASTM Test Method D1557).

10.4 Cut/Fill Transition and Fill Differentials

To mitigate distress to structures related to the potential adverse effects of excessive differential settlement, cut/fill transitions should be eliminated from all level portions of the building pad areas. This should be accomplished by overexcavating the entire "cut" portion of the entire building pad area by at least 8.0 feet below proposed grade and replacing the excavated materials as properly compacted fill, so that all footings for structures and walls are founded into engineered fill with a minimum of 4.0 feet of fill below footings for proposed structures and 4.0 feet below footings for proposed walls. Recommended depths of over-excavation are provided in the following table.

Table No. 6, Overexcavation Depth for Cut/Fill Transitions

Depth of Fill ("Fill" Portion)	Depth of Overexcavation ("Cut" Portion)
Up to 12.0 feet	4.0 feet
Greater than 12.0 feet	One-third the maximum thickness of fill placed on the "fill" portion (15 feet maximum)

10.5 Engineered Fill

No fill should be placed until excavations and/or natural ground preparation have been observed by the geotechnical consultant. The native soils encountered within the project sites are generally considered suitable for re-use as compacted fill. Excavated soils should be processed, including removal of roots and debris, removal of oversized particles, mixing, and moisture conditioning, before placing as compacted fill. On-sites soils used as fill should meet the following criteria.

- No particles larger than 8 inches in largest dimension.
- Rocks larger than 4 inches should not be placed within the upper 12 inches of subgrade soils.
- Free of all organic matter, debris, or other deleterious material.
- Expansion index of 20 or less.
- Sand Equivalent greater than 15 (greater than 30 for pipe bedding).
- Contain less than 30 percent by weight retained in 3/4-inch sieve.
- Contain less than 40 percent fines (passing #200 sieve).

Based on field investigation and laboratory testing results, on-site soils are suitable as fill materials.

Imported materials, if required, should meet the above criteria prior to being used as compacted fill. Any imported fills should be tested and approved by geotechnical representative prior to delivery to the site.

10.6 Compacted Fill Placement

All surfaces to receive structural fills should be scarified to a depth of 12 inches. The soil should be moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. The scarified soils should be recompacted to at least 90 percent of the laboratory maximum dry density.

Fill soils should be thoroughly mixed, and moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. Fill soils should be evenly spread in horizontal lifts not exceeding 8 inches in uncompacted thickness.

All fill placed at the site should be compacted to at least 90 percent of the laboratory maximum dry density as determined by ASTM Standard D1557 test method unless a higher compaction is specified herein. The upper 12 inches of subgrade soils underneath pavements intended to support vehicle loads should be scarified, moisture conditioned, and compacted to at least 95 percent of the laboratory maximum dry density.

Fill materials should not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations should not resume until the geotechnical consultant approves the moisture and density conditions of the previously placed fill.

10.7 Backfill Recommendations Behind Walls

Compaction of backfill adjacent to perimeter wall or any retaining walls, that may be proposed in the future, can produce excessive lateral pressures. Improper types and locations of compaction equipment and/or compaction techniques may damage the walls. The use of heavy compaction equipment should not be permitted within a horizontal distance of 5 feet from the wall. Backfill behind any structural walls within the recommended 5-foot zone should be compacted using lightweight construction equipment such as handheld compactors to avoid overstressing the walls.

10.8 Shrinkage and Subsidence

The volume of excavated and recompacted soils will decrease as a result of grading. The shrinkage would depend on, among other factors, the depth of cut and/or fill, and the grading method and equipment utilized. Based on our exploration, laboratory test results, as well as our experience with other projects in close vicinity of this site, for the preliminary estimation, shrinkage factors for various units of earth material at the site may be taken as presented below.

- The shrinkage factor (defined as a percentage of soil volume reduction when moisture conditioned and compacted to the average of 92 percent relative compaction) for the upper 10 feet of soils is estimated to range from approximately 7 to 20 percent. An average value of 12 percent may be used for preliminary earthwork planning.
- Subsidence (defined as the settlement of native materials from the equipment load applied during grading and proposed fill loads) would depend on the construction methods including type of equipment utilized. Ground subsidence is estimated to be approximately 0.10 foot to 0.15 foot.

Although these values are only approximate, they represent our best estimates of the factors to be used to calculate lost volume that may occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field-testing using the actual equipment and grading techniques be conducted.

10.9 Site Drainage

Adequate positive drainage should be provided away from the structures and excavation areas to prevent ponding and to reduce percolation of water into the foundation soils. A desirable drainage gradient is 1 percent for paved areas and 2 percent in landscaped areas. Surface drainage should be directed to suitable non-erosive devices.

10.10 Utility Trench Backfill

The following sections present earthwork recommendations for utility trench backfill, including subgrade preparation and trench zone backfill.

Open cuts adjacent to existing roadways or structures are not recommended within a 1:1 (horizontal: vertical) plane extending down and away from the roadway or structure perimeter (if any).

Soils from the trench excavation should not be stockpiled more than 6 feet in height or within a horizontal distance from the trench edge equal to the depth of the trench. Soils should not be stockpiled behind the shoring, if any, within a horizontal distance equal to the depth of the trench, unless the shoring has been designed for such loads.

10.10.1 Pipeline Subgrade Preparation

The final subgrade surface should be level, firm, uniform, and free of loose materials and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. Protruding oversize particles larger than 2 inches in dimension, if any, should be removed from the trench bottom and replaced with compacted on-site materials.

Any loose, soft and/or unsuitable materials encountered at the pipe subgrade should be removed and replaced with an adequate bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

10.10.2 Pipe Bedding

Bedding is defined as the material supporting and surrounding the pipe to 1 foot above the pipe. Recommendations for pipe bedding are provided below.

To provide uniform and firm support for the pipe, compacted granular materials such as clean sand, gravel or ¾-inch crushed aggregate, or crushed rock may be used as pipe bedding material. Typically, soils with sand equivalent value of 30 or more are used as pipe bedding material. The pipe designer should determine if the soils are suitable as pipe bedding material.

The type and thickness of the granular bedding placed underneath and around the pipe, if any, should be selected by the pipe designer. The load on the rigid pipes and deflection of flexible pipes and, hence, the pipe design, depends on the type and the amount of bedding placed underneath and around the pipe.

Bedding materials should be vibrated in-place to achieve compaction. Care should be taken to densify the bedding material below the spring line of the pipe. Prior to placing the pipe bedding material, the pipe subgrade should be uniform and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom, for as near its full length as is practicable.

10.10.3 Trench Zone Backfill

The trench zone is defined as the portion of the trench above the pipe bedding extending up to the final grade level of the trench surface. Excavated sites soil free of oversize particles and deleterious matter may be used to backfill the trench zone. Detailed trench backfill recommendations are provided below.

- Trench excavations to receive backfill should be free of trash, debris or other unsatisfactory materials at the time of backfill placement.
- Trench zone backfill should be compacted to at least 90 percent of the laboratory maximum dry density as per ASTM D1557 test method. At least the upper 1 foot of trench backfill underlying pavement should be compacted to at least 95 percent of the laboratory maximum dry density as per ASTM D1557 test method.
- Particles larger than 1 inch should not be placed within 12 inches of the pavement subgrade. No more than 30 percent of the backfill volume should be larger than ¾-inch in the largest dimension. Gravel should be well mixed with finer soil. Rocks larger than 3 inches in the largest dimension should not be placed as trench backfill.
- Trench backfill should be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers or mechanical tampers to achieve the density specified herein. The backfill materials should be brought to within ± 3 percent of optimum moisture content for coarse-grained soil, and between optimum and 2 percent above optimum for fine-grained soil, then placed in horizontal layers. The thickness of uncompacted layers should not exceed 8 inches. Each layer should be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.
- The contractor should select the equipment and processes to be used to achieve the specified density without damage to adjacent ground, structures, utilities and completed work.
- The field density of the compacted soil should be measured by the ASTM D1556 (Sand Cone) or ASTM D6938 (Nuclear Gauge) or equivalent.
- It should be the responsibility of the contractor to maintain safe working conditions during all phases of construction.
- Trench backfill should not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations should not resume until field tests by the project’s geotechnical consultant indicate that the

moisture content and density of the fill are in compliance with project specifications.

11.0 DESIGN RECOMMENDATIONS

The various design recommendations provided in this section are based on the laboratory testing as well as the assumption that in preparing the site, the earthwork recommendations provided in this report will be implemented. Design recommendations for the structures are provided in the following section.

11.1 Preliminary Shallow Foundation Design Parameters

The proposed one- and two-story buildings, perimeter walls and possible retaining walls may be supported on continuous or isolated spread footings founded completely within in competent compacted fill. The design of the shallow foundations should be based on the recommended parameters presented in the table below.

Table No. 7, Recommended Foundation Design Parameters

Parameter	1-Story Value	2-Story Value
Minimum continuous footing width (interior and exterior)	12 inches	15 inches
Minimum continuous or isolated footing depth of embedment below lowest adjacent grade (interior and exterior)	15 inches	18 inches
Allowable net bearing capacity	2,500 psf	3,000 psf

Isolated interior footings should be at least 24 inches wide. The footing dimensions and reinforcement should be based on structural design. The allowable bearing capacity can be increased by 500 pounds per square foot (psf) with each foot of additional embedment and 100 psf with each foot of additional width up to a maximum of 4,000 psf.

The net allowable bearing values indicated above are for the dead loads and frequently applied live loads and are obtained by applying a factor of safety of 3.0 to the net ultimate bearing capacity. If normal code requirements are applied for design, the above vertical bearing value may be increased by 33 percent for short duration loadings, which will include loadings induced by wind or seismic forces.

11.2 Lateral Earth Pressures and Resistance to Lateral Loads

In the following subsections, the lateral earth pressures and resistance to lateral loads are estimated by using on-site native soils strength parameters obtained from laboratory testing.

11.2.1 Active Earth Pressures

The active earth pressure behind any buried walls or foundation depends primarily on the allowable wall movement, type of backfill materials, backfill slopes, wall or foundation inclination, surcharges, and any hydrostatic pressures. The lateral earth pressures for the project site are presented in the following table.

Table No. 8, Active and At-Rest Earth Pressures

Loading Conditions	Lateral Earth Pressure[1] (psf)	Lateral Earth Pressure[2] (psf)
	Level backfill	2:1 backfill
Active earth conditions (wall is free to deflect at least 0.001 radian)	36	50
At-rest (wall is restrained)	56	101

These pressures assume no surcharge and no hydrostatic pressure. If water pressure is allowed to build up behind the structure, the active pressures should be reduced by 50 percent and added to a full hydrostatic pressure to compute the design pressures against the structure.

11.2.2 Passive Earth Pressure

Resistance to lateral loads can be assumed to be provided by a combination of friction acting at the base of foundations and by passive earth pressure. A coefficient of friction of 0.35 between formed concrete and soil may be used with the dead load forces. An allowable passive earth pressure of 300, psf per foot of depth may be used for the sides of footings poured against recompacted soils. A factor of safety of 1.5 was applied in calculating passive earth pressure. The maximum value of the passive earth pressure should be limited to 2,500 psf for compacted fill.

Vertical and lateral bearing values indicated above are for the total dead loads and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing and lateral resistance values may be increased by 33 percent for short duration loading, which will include the effect of wind or seismic forces.

Due to the low overburden stress of the soil at shallow depth, the upper 1 foot of passive resistance should be neglected unless the soil is confined by pavement or slab.

11.3 Retaining Walls Drainage

The recommended lateral earth pressure values, for any future retaining walls, do not include lateral pressures due to hydrostatic forces. Therefore, wall backfill should be free draining and provisions should be made to collect and dispose of excess water that may accumulate behind earth retaining structures. Behind wall drainage may be provided by free-draining gravel surrounded by synthetic filter fabric or by prefabricated, synthetic drain panels or weep holes. In either case, drainage should be collected by perforated pipes and directed to a sump, storm drain, or other suitable location for disposal. We recommend drain rock should consist of durable stone having 100 percent passing the 1-inch sieve and less than 5 percent passing the No. 4 sieve. Synthetic filter fabric should have an equivalent opening size (EOS), U.S. Standard Sieve, of between 40 and 70, a minimum flow rate of 110 gallons per minute per square foot of fabric, and a minimum puncture strength of 110 pounds.

11.4 Slabs-on-Grade

Slabs-on-grade should be supported on properly compacted fill. Compacted fill used to support slabs-on-grade should be placed and compacted in accordance with Section 10.6, Compacted Fill Placement.

Structural design elements of slabs-on-grade, including but not limited to thickness, reinforcement, joint spacing of more heavily loaded slabs will be dependent upon the anticipated loading conditions and the modulus of subgrade reaction (200 kcf) of the supporting materials and should be designed by a structural engineer.

Slabs should be designed and constructed as promulgated by the American Concrete Institute (ACI) and the Portland Cement Association (PCA). Care should be taken during concrete placement to avoid slab curling. Prior to the slab pour, all utility trenches should be properly backfilled and compacted.

Subgrade for slabs-on-grade should be firm and uniform. All loose or disturbed soils including under-slab utility trench backfill should be recompacted.

If moisture-sensitive flooring or environments are planned, slabs-on-grade should be protected by 10-mil-thick polyethylene vapor barriers. The sub-grade surface should be free of all exposed rocks or other sharp objects prior to placement of the barrier. The barrier should be overlain by 2 inches of sand, to minimize punctures and to aid in the concrete curing. At discretion of the structure engineer, the sand layer may be eliminated.

In hot weather, the contractor should take appropriate curing precautions after placement of concrete to minimize cracking or curling of the slabs. Temperatures throughout the day should be considered when planning a concrete pour. The potential for slab cracking may be lessened by the addition of fiber mesh to the concrete and/or control of the water/cement ratio.

Concrete should be cured by protecting it against loss of moisture and rapid temperature change for at least seven days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used after finishing operations have been completed. The edges of concrete slabs exposed after removal of forms should be immediately protected to provide continuous curing.

11.5 Seismic Settlement

The total settlement of shallow footings, designed as recommended above, from static structural loads and short-term settlement of properly compacted fill is anticipated to be 0.5 inch or less. The static differential settlement can be taken as equal to one-half of the static total settlement over a lateral distance of 40 feet.

11.6 Expansion Potential

Based on the results of the expansion testing of representative site soils, on-site soils have expansion index of 0.

The expansion indices of the final finish-grade soils will vary from the results obtained during our investigation. The expansion potential of the finish-grade soils should be confirmed by additional testing at the completion of grading and revise the foundation design parameters if necessary. During construction, the contractor should determine effective methods to minimize moisture variations.

11.7 Pipe Design for Underground Utilities

Structural design of pipes requires proper evaluation of all possible loads acting on pipes. The stresses and strains induced on buried pipes depend on many factors, including the type of soil, density, bearing pressure, angle of internal friction, coefficient of passive earth pressure, and coefficient of friction at the interface between the backfill and native soils. The recommended values of the various soil parameters for the pipe design are provided in Table No. 9, *Soil Parameters for Pipe Design*.

Where pipes are connecting to rigid structures near, or at its lower levels, and then are subjected to significant loads as the backfill is placed to finish grade, we recommend that provisions be incorporated in the design to provide support of these pipes where they exit the structure. Consideration can be given to flexible connections, concrete slurry support beneath the pipes where they exit the structures, overlaying and supporting the pipes with a few inches of compressible material, (i.e., Styrofoam, or other materials), or other techniques. Automatic shutoffs should be installed to limit the potential leakage from seismic event related damage.

Table No. 9, Soil Parameters for Pipe Design

Soil Parameters	Parameters
Total unit weight of compacted backfill (assuming 92% average relative compaction), γ	131.5 pcf
Angle of internal friction of soils, ϕ	35º
Soil cohesion, c	0 psf
Coefficient of friction between concrete and native soils, fs	0.35
Coefficient of friction between pipe and compacted fill or native soils, fs	0.25 for metal or HDPE pipe 0.30 for CML&C pipe
Bearing pressure against compacted fill or natural soils	2,500 psf
Coefficient of passive earth pressure, Kp	3.69
Coefficient of active earth pressure, Ka	0.27
Modulus of Soil Reaction, E'	1,500 psi

11.8 Soil Corrosivity

The results of chemical testing of representative site soils are presented in Appendix B, *Laboratory Testing Program*, and a general discussion are presented below.

The sulfate contents of the sampled soils correspond to American Concrete Institute (ACI) exposure category S0 for these sulfate concentrations (ACI 318-14, Table 19.3.1.1). No concrete type restrictions are specified for exposure category S0 (ACI 318-14, Table 19.3.2.1). A minimum compressive strength of 2,500 psi is recommended.

We anticipate that concrete structures such as footings, slab, and concrete pad will be exposed to moisture from precipitation and irrigation. Based on the site locations and the results of chloride testing of the sites soils, we anticipate that concrete structures will be exposed to external sources of chlorides, such as deicing chemicals, salt, brackish water, or seawater. ACI specifies exposure category C1 where concrete is exposed to moisture, but not to external sources of chlorides (ACI 318-14, Table 19.3.1.1). ACI provides concrete design recommendations in ACI 318-14, Table 19.3.2.1, including a compressive strength of at least 2,500 psi and a maximum chloride content of 0.3 percent.

According to Romanoff, 1957, the following table provides general guideline of soil corrosion based on electrical resistivity.

Table No. 10, Correlation Between Resistivity and Corrosion

Soil Resistivity (ohm-cm) per Caltrans CT 643	Corrosivity Category
Over 10,000	Mildly corrosive
2,000 – 10,000	Moderately corrosive
1,000 – 2,000	corrosive
Less than 1,000	Severe corrosive

The measured value of the minimum electrical resistivities of the sample when saturated was 8,808 ohm-cm. This indicates that the soil tested is moderately corrosive to ferrous metals in contact with the soil. Converse does not practice in the area of corrosion consulting. If needed, qualified corrosion consultant should provide appropriate corrosion mitigation measures for any ferrous metals in contact with the site soils.

The corrosion potential of the finish-grade soils should be confirmed by additional testing at the completion of grading and revise the design parameters if necessary.

11.9 Asphalt Concrete pavement

Two soil samples were tested by Converse to determine the R-value of the subgrade soils. Based on laboratory testing, the R-value were 77. For pavement design, we have utilized a design R-value of 50 and on Traffic Indices (TIs) ranging from 5.0 to 8.0.

Based on the above information, asphalt concrete and aggregate base thickness results are presented using the Caltrans Highway Design Manual (Caltrans, 2022), Chapter 630 with a safety factor of 0.2 for asphalt concrete/aggregate base section and 0.1 for full depth asphalt concrete section. Preliminary asphalt concrete pavement sections are presented in the following table below.

Table No. 11, Recommended Preliminary Pavement Sections

R-value	Traffic Index (TI)	Pavement Section		
		Option 1		Option 2
		Asphalt Concrete (inches)	Aggregate Base (inches)	Full AC Section (inches)
50	5.0	4.0	0.0	4.0
	6.0	4.0	3.0	6.0
	7.0	4.5	4.0	7.0
	8.0	5.0	5.0	8.0

At or near the completion of grading, subsurface samples should be tested to evaluate the actual subgrade R-value for final pavement design.

Prior to placement of aggregate base, at least the upper 12 inches of finish grade should be scarified, moisture-conditioned if necessary, and recompacted to at least 95 percent of the laboratory maximum dry density as defined by ASTM Standard D1557 test method.

Base materials should conform with Section 200-2.2,"*Crushed Aggregate Base*," of the current Standard Specifications for Public Works Construction (SSPWC; Public Works Standards, 2018) and should be placed in accordance with Section 301.2 of the SSPWC.

Asphaltic concrete materials should conform to Section 203 of the SSPWC and should be placed in accordance with Section 302-5 of the SSPWC.

11.10 Concrete Flatwork

Except as modified herein, concrete walks, driveways, access ramps, curb and gutters should be constructed in accordance with Section 303-5, *Concrete Curbs, Walks, Gutters, Cross-Gutters, Alley Intersections, Access Ramps, and Driveways*, of the Standard Specifications for Public Works Construction (Public Works Standards, 2018).

The subgrade soils under the above-mentioned improvements should consist of compacted fill placed as described in section 10.6 of this report. Prior to placement of concrete, the upper 12 inches of finish grade should be moisture conditioned to within 3 percent of optimum moisture content for coarse-grained soils and 0 and 2 percent above optimum for fine-grained soils.

The thickness of driveways for passenger vehicles should be at least 4 inches, or as required by the civil or structural engineer. Transverse control joints for driveways should be spaced not more than 10 feet apart. Driveways wider than 12 feet should be provided with a longitudinal control joint.

Concrete walks subjected to pedestrian and bicycle loading should be at least 4 inches thick, or as required by the civil or structural engineer. Transverse joints should be spaced 15 feet or less and should be cut to a depth of one-fourth the slab thickness.

Positive drainage should be provided away from all driveways and sidewalks to prevent seepage of surface and/or subsurface water into the concrete base and/or subgrade.

12.0 CONSTRUCTION RECOMMENDATIONS

Temporary sloped excavation recommendations are presented in the following sections.

12.1 General

Prior to the start of construction, all existing underground utilities should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications.

Sloped excavations may not be feasible in locations adjacent to existing utilities, pavement, or structure (if any). Recommendations pertaining to temporary excavations are presented in this section.

Excavations near existing structures and utilities may require vertical side wall excavation. Where the side of the excavation is a vertical cut, it should be adequately supported by temporary shoring to protect workers and any adjacent structures.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met. The soils exposed in cuts should be observed during excavation by the geotechnical consultant and the competent person designated by the contractor. If potentially unstable soil conditions are encountered, modifications of slope ratios for temporary cuts may be required.

12.2 Temporary Sloped Excavations

Temporary open-cut trenches may be constructed with side slopes as recommended in the following table*.* Temporary cuts encountering soft and wet fine-grained soils; dry loose, cohesionless soils or loose fill from trench backfill may have to be constructed at a flatter gradient than presented below.

Table No. 12, Slope Ratios for Temporary Excavations

Soil Type	OSHA Soil Type	Depth of Cut (feet)	Recommended Maximum Slope (Horizontal:Vertical)[1]
Silty Sand (SM)	C	0-10	1.5:1

[1] Slope ratio assumed to be uniform from top to toe of slope.

For shallow excavations up to 4 feet bgs, slope ratio of 1:1 can be used. For steeper temporary construction slopes or deeper excavations, or unstable soil encountered during the excavation, shoring or trench shields should be provided by the contractor to protect the workers in the excavation. Design recommendations for temporary shoring are provided in the following section.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction materials, should not be placed within 5 feet of the unsupported slope edge. Stockpiled soils with a height higher than 6 feet will require greater distance from trench edges.

13.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

The project geotechnical consultant should review plans and specifications as the project design progresses. Such review is necessary to identify design elements, assumptions, or new conditions which require revisions or additions to our geotechnical recommendations.

The project geotechnical consultant should be present to observe conditions during construction. Geotechnical observation and testing should be performed as needed to verify compliance with project specifications. Additional geotechnical recommendations may be required based on subsurface conditions encountered during construction.

14.0 CLOSURE

This report is prepared for the project described herein and is intended for use solely by ADM LLC and their authorized agents, to assist in the development of the proposed project. Our findings and recommendations were obtained in accordance with generally accepted professional principles practiced in geotechnical engineering. We make no other warranty, either expressed or implied.

Converse Consultants is not responsible or liable for any claims or damages associated with interpretation of available information provided to others. Site exploration identifies actual soil conditions only at those points where samples are taken, when they are taken. Data derived through sampling and laboratory testing is extrapolated by Converse employees who render an opinion about the overall soil conditions. Actual conditions in areas not sampled may differ. In the event that changes to the project occur, or additional, relevant information about the project is brought to our attention, the recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed, and the recommendations of this report are modified or verified in writing. In addition, the recommendations can only be finalized by observing actual subsurface conditions revealed during construction. Converse cannot be held responsible for misinterpretation or changes to our recommendations made by others during construction.

As the project evolves, a continued consultation and construction monitoring by a qualified geotechnical consultant should be considered an extension of geotechnical investigation services performed to date. The geotechnical consultant should review plans and specifications to verify that the recommendations presented herein have been appropriately interpreted, and that the design assumptions used in this report are valid.

Where significant design changes occur, Converse may be required to augment or modify the recommendations presented herein. Subsurface conditions may differ in some locations from those encountered in the explorations, and may require additional analyses and, possibly, modified recommendations.

Design recommendations given in this report are based on the assumption that the recommendations contained in this report are implemented. Additional consultation may be prudent to interpret Converse's findings for contractors, or to possibly refine these recommendations based upon the review of the actual site conditions encountered during construction. If the scope of the project changes, if project completion is to be delayed, or if the report is to be used for another purpose, this office should be consulted.

15.0 REFERENCES

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Appendix A

Field Exploration

APPENDIX A

FIELD EXPLORATION

Our field investigation included a site reconnaissance and a subsurface exploration program consisting of drilling borings and digging test pits. During the site reconnaissance, the surface conditions were noted, and the boring and test pit locations were established in the field using approximate distances from local streets and property boundaries as a guide and should be considered accurate only to the degree implied by the method used to locate them. Descriptions of the field investigation methods are presented below.

Borings

Eight exploratory borings (BH-01 through BH-08) were drilled on December 21, 2022, to investigate subsurface conditions within the proposed residential building footprint. The borings were drilled to depths ranging from 10.5 feet to 51.0 feet below existing ground surface (bgs).

The borings were advanced using a truck-mounted CME 75 drill rig equipped with 8-inch diameter hollow-stem augers for soils sampling. Encountered materials were continuously logged by a Converse geologist and classified in the field by visual classification in accordance with the Unified Soil Classification System. Where appropriate, the field descriptions and classifications have been modified to reflect laboratory test results.

Relatively undisturbed samples were obtained using California Modified Samplers (2.4 inches inside diameter and 3.0 inches outside diameter) lined with thin sample rings. The steel ring sampler was driven into the bottom of the borehole with successive drops of a 140-pound driving weight falling 30 inches. Blow counts at each sample interval are presented on the boring logs. Samples were retained in brass rings (2.4 inches inside diameter and 1.0 inch in height) and carefully sealed in waterproof plastic containers for shipment to the Converse laboratory. Bulk samples of typical soil types were also obtained. Some ring samples collected from each borehole were disturbed or contained no soil recovery because of the poor consolidation and large grain sizes.

Standard Penetration Testing (SPT) was also performed in one boring (BH-05) in accordance with the ASTM Standard D1586 test method beginning at 20 feet to 50 feet bgs using a standard (1.4 inches inside diameter and 2.0 inches outside diameter) split-barrel sampler. The mechanically driven hammer for the SPT sampler was 140 pounds, falling 30 inches for each blow. The recorded blow counts for every 6 inches for a total of 1.5 feet of sampler penetration are shown on the Logs of Borings.

Representative bulk samples were collected from selected depths and placed in large plastic bags for delivery to our laboratory.

The exact depths at which material changes occur cannot always be established accurately. Unless a more precise depth can be established by other means, changes in material conditions that occur between drive samples are generally indicated on the logs at the top of the next drive sample, unless the change is encountered within the sample.

For a key to soil symbols and terminology used in the boring logs, refer to Drawing Nos. A-1a and A-1b, *Unified Soil Classification and Key to Log Boring Symbols*. For logs of borings, see Drawings No. A-2 through A-9, *Logs of Borings*.

Test Pits

Thirty-two percolation test pits (TP-01 through TP-32) were excavated within the proposed leach line field area using a mini-excavator equipped with 36-inch-wide bucket to investigate the subsurface conditions on December 23, 2022. The percolation test pits were excavated to approximately 4.0 feet below the existing ground surface (bgs).

At the bottom of each test pit, a 6-inch diameter and 13-inch-deep hole was hand augured for percolation testing. Details of setting up the test holes and percolation testing procedure are discussed in Appendix C, *Percolation Testing*.

Following percolation testing, test pits were backfilled in lifts with excavated soil, tamped, and then wheel rolled at the surface using the bucket under the weight of the mini-excavator. If construction is delayed the ground surface at the test pit locations may settle over time. We recommend the owner monitor the test pit locations and backfill any depressions that occur or provide protection around the test pit locations to prevent trip and fall injuries from occurring.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO 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 (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT 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 GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 4546)
CP	Compaction Curve (ASTM D 1557)
CR	Corrosion, Sulfates, Chlorides (CTM 643-99; 417; 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeablility (ASTM D 2434)
PA	Particle Size Analysis (ASTM D 6913 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (ASTM D 4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301)
SE	Sand Equivalent (ASTM D 2419)
SG	Specific Gravity (ASTM D 854)
SW	Swell Potential (ASTM D 4546)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 2937)
WA	Passing No. 200 Sieve

BORING LOG SYMBOLS

SAMPLE TYPE

- STANDARD PENETRATION TEST — Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method
- DRIVE SAMPLE — 2.42" I.D. sampler (CMS).
- DRIVE SAMPLE — No recovery
- BULK SAMPLE
- GROUNDWATER WHILE DRILLING
- GROUNDWATER AFTER DRILLING

DRILLING METHOD SYMBOLS

Auger Drilling | Mud Rotary Drilling | Dynamic Cone or Hand Driven | Diamond Core

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. 22-81-308-01

Drawing No. A-1a

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	SPT Blow Counts	Pocket Penetrometer (tsf)	CA Sampler	Torvane (tsf)	Field Approximation
Very Soft	<0.25	< 2	<0.25	<3	<0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	2 - 4	0.25 - 0.50	3 - 6	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	5 - 8	0.50 - 1.0	7 - 12	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	9 - 15	1.0 - 2.0	13 - 25	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	16 - 30	2.0 - 4.0	26 - 50	1.0 - 2.0	Readily indented by thumbnail
Hard	>4.0	>30	>4.0	>50	>2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60}- Value (blows / foot)	CA Sampler
Very Loose	<4	<5
Loose	4- 10	5 - 12
Medium Dense	11 - 30	13 - 35
Dense	31 - 50	36 - 60
Very Dense	>50	>60

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OF PROPORTION OF SOILS

Descriptor	Criteria
Trace (fine)/ Scattered (coarse)	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION/ Induration

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptions and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. 22-81-308-01 Drawing No. A-1b

Log of Boring No. BH-01

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2818 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
0		**ALLUVIUM** **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 1 inch maximum dimension, slightly desiccated, loose to slightly indurated, dry to moist, light reddish brown.		X				
2.5		- @2.5': medium dense.	X	X	4/9/12	1	107	
5		- @5.0': very dense.	X		18/30/35	2	113	
7.5		- @7.5': increased coarse grains, trace silt, trace caliche, loose, reddish brown.	X		24/50-6"	2	111	CL
10		- @10.0': slightly indurated, light reddish brown.	X	X	22/35/36	2	116	CP, DS
15			X		15/27/35	1	105	
20		- @20.0': mostly coarse grains, loose.	X		50-6"			*no recovery*

End of boring at 20.5 feet bgs.
No groundwater encountered.
Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.

Log of Boring No. BH-02

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2816 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 2 inches maximum dimension, trace caliche, slightly indurated, dry to moist, light reddish brown. - @ 2.5': dense.	■		7/15/20	1	111	
5		- @5.0': increased finer grains, heavy caliche, friable, very dense, reddish brown.	■	▨	50-6"	4	102	PA
		- @7.5': increased coarse grains, loose.	■	▨	50-6"	3	96	
10		- @10.0': light reddish brown.	■		36/50-4"	2	107	
		End of boring at 10.8 feet bgs. No groundwater encountered. Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/27/2022.						

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **A-3**

Log of Boring No. BH-03

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2812 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 2 inches maximum dimension, slightly indurated, dry to moist, light brown.						
		- @2.5': medium dense,	■		4/5/10	2	110	
5		- @5.0': moderately indurated, very dense, brownish red.	■	▩	27/32/50-5"	4	102	CL CP
		- @7.5': increased finer grains, orangish brown.	■	▩	21/30/34	3	96	
10		- @10.0': increased coarse grains, trace caliche, dense, light reddish brown.	■		20/24/27	1	113	

End of boring at 11.5 feet bgs.
No groundwater encountered.
Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.

Log of Boring No. BH-04

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2804 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
0		**ALLUVIUM** **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 1 inch maximum dimension, slightly desiccated, trace caliche, slightly indurated, medium dense, dry to moist, reddish brown.						
			■		6/8/10	1	106	
5		- @5.0': heavy caliche, moderately indurated, brownish red.	■	▩	8/12/16	5	98	
		- @7.5': mostly coarse grains, large caliche pockets, loose, very dense.	■	▩	30/50-4"	3	108	
10			■		50-5"	4	123	
15			■		50-4"			*no recovery*
20		End of boring at 20.0 feet bgs. No groundwater encountered. Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.			50-0"			*no recovery*

Log of Boring No. BH-05

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2801 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 1 inch maximum dimension, slightly indurated, medium dense, dry to moist, light reddish brown.			9/14/14	3	102	CP, EI, PA
5		- @5.0': trace caliche, brownish red.			8/15/18	2	106	DS
								PA
		- @7.5': mostly caliche, very dense, light reddish brown.			22/50-6"	3	108	CL
10		- @10.0': mostly coarse grains and rock fragments.			50-6"	8	112	
								PA
15		- @ 15.0': moderately indurated.			50-6"	5	105	
20					10/20/30	4		
25		- @25.0': light brown.			35/50-6"	2	111	
30					12/22/26	2		

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. 22-81-308-01

Drawing No. A-6a

Project ID: 22-81-308-01.GPJ; Template: LOG

Log of Boring No. BH-05

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2801 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		OLDER ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, few gravel up to 1 inch maximum dimension, moderately indurated, very dense, dry to moist, light grayish brown.	■		30/50-6"	2	101	
40			☒		10/16/21			*no recovery*
45			☐		40/50-6"			*no recovery*
50			☒		41/50-6"			*no recovery*
		End of boring at 51.0 feet bgs. No groundwater encountered. Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.						

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **A-6b**

Log of Boring No. BH-06

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2795 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 1 inch maximum dimension, slightly desiccated, trace caliche, slightly indurated, medium dense, dry to moist, light brownish red.	X	X	9/16/18	2	108	CR
5		- @ 5.0': increased coarse grains, increased caliche, dense, reddish brown.	X		12/22/33	2	109	
		- @ 7.5': mostly coarse grains, trace silt, loose, dark brownish red.	X		50-6"	3	108	
10		- @ 10.0': light grayish brown.	X		34/50-5"	4	109	

End of boring at 10.9 feet bgs.
No groundwater encountered.
Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.

Log of Boring No. BH-07

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2790 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 2 inches maxiumum dimension, trace caliche, slightly indurated, medium dense, dry to moist, light grayish reddish brown.	■	▨	9/11/16	1	108	
5		- @5.0': dense, reddish brown.	■		12/24/20	1	119	CL
		- @7.5': loose, very dense.	■		50-6"	2	140	
10			■		50-6"	4	112	

End of boring at 10.5 feet bgs.
No groundwater encountered.
Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.

Log of Boring No. BH-08

Date Drilled: 12/21/2022 Logged by: Catherine Nelson Checked By: Robert L Gregorek II

Equipment: 8" DIAMETER HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 2782 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, some gravel up to 1 inch maximum dimension, slightly desiccated, trace caliche, slightly indurated, medium dense, dry to moist, light brownish red.						
					8/14/14	2	111	R
5		- @5.0': increased coarse grains, dense.			7/12/25	2	105	
		- @7.5': increased finer grains, very dense.			25/50-6"	4	113	
10		- @10.0': increased caliche.			30-50-6"	3	112	
15		- @15.0': bluish gray pockets, light brown.			20/33/43	2	118	
20		- @20.0': brownish red.			25/50-6"	3	108	
		End of boring at 21.0 feet bgs. No groundwater encountered. Borehole was filled with soil cuttings and compacted with an auger using the weight of the drill rig on 12/21/2022.						

Appendix B

Laboratory Testing Program

APPENDIX B

LABORATORY TESTING PROGRAM

Tests were conducted in our laboratory on representative soil samples for the purpose of classification and evaluation of their physical properties and engineering characteristics. The amount and selection of tests were based on the geotechnical parameters required for this project. Test results are presented herein and on the Logs of Borings, in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

In-Situ Moisture Content and Dry Density

In-situ dry density and moisture content tests were performed on relatively undisturbed ring samples, in accordance with ASTM Standard D2216 and D2937 to aid in soils classification and to provide qualitative information on strength and compressibility characteristics of the site soils. For test results, see the Logs of Borings in Appendix A, *Field Exploration*.

Expansion Index

One representative bulk sample was tested to evaluate the expansion potential of materials encountered at the site in accordance with ASTM D4829 Standard. The test result is presented in the following table.

Table No. B-1, Expansion Index Test Result

Boring No.	Depth feet)	Soil Description	Expansion Index	Expansion Potential
BH-06	0-5	Silty Sand (SM)	0	Very Low

R-value

Two representative bulk soil samples were tested for resistance value (R-value) in accordance with California Test Method CT301. This test is designed to provide a relative measure of soil strength for use in pavement design. The test results are presented in the table below.

Table No. B-2, R-Value Test Result

Boring No.	Depth (feet)	Soil Classification	Measured R-value
BH-01	0-5	Silty Sand (SM)	77
BH-08	0-5	Silty Sand (SM)	77

Soil Corrosivity

One representative soil sample was tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of the test was to determine the corrosion potential of site soils when placed in contact with common construction materials. The test was performed by AP Engineering and Testing, Inc. (Pomona, CA) in accordance with Caltrans Test Methods 643, 422 and 417. Test result is presented in the following table.

Table No. B-3, Summary of Soil Corrosivity Test Results

Boring No.	Depth (feet)	pH	Soluble Sulfates (CA 417) (ppm)	Soluble Chlorides (CA 422) (ppm)	Min. Resistivity (CA 643) (Ohm-cm)
BH-06	0-5	8.8	29	19	8,808

Collapse Potential

To evaluate the moisture sensitivity (collapse/swell potential) of the encountered soils, four collapse tests were performed in accordance with the ASTM Standard D4546 laboratory procedure. Each sample was loaded to approximately 2 kips per square foot (ksf), allowed to stabilize under load, and then submerged. The test results are presented in the following table.

Table No. B-4, Collapse Test Result

Boring No.	Depth (feet)	Soil Classification	Percent Swell (+) Percent Collapse (-)	Collapse Potential
BH-01	7.5-8.5	Silty Sand (SM)	-1.5	Slight
BH-03	5.0-6.4	Silty Sand (SM)	-6.0	Moderate
BH-05	7.5-8.5	Silty Sand (SM)	-4.0	Slight
BH-07	5.0-6.5	Silty Sand (SM)	-0.5	Slight

Grain-Size Analyses

To assist in classification of soils, mechanical grain-size analyses were performed on two select samples in accordance with the ASTM Standard D6913 test method. Grain-size curves are shown in Drawing No. B-1, *Grain Size Distribution Results*.

Table No. B-5, Grain Size Distribution Test Results

Boring No.	Depth (ft)	Soil Classification	% Gravel	% Sand	%Silt	%Clay
BH-02	5-10	Silty Sand (SM)	2.0	83.2	14.8	
BH-05	0-5	Silty Sand (SM)	6.0	78.4	15.6	
BH-05	5-10	Silty Sand (SM)	10.0	80.1	9.9	
BH-05	10-15	Silty Sand (SM)	9.0	78.9	12.1	

Maximum Dry Density and Optimum Moisture Content

Laboratory maximum dry density-optimum moisture content relationship tests were performed on three representative bulk soil samples. These tests were conducted in accordance with the ASTM Standard D1557 test method. The test results are presented in Drawing No. B-2, *Moisture-Density Relationship Results,* and are summarized in the following table.

Table No B-6, Summary of Moisture-Density Relationship Results

Boring No.	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Density (lb./cft)
BH-01	10-15	Silty Sand (SM), Reddish Brown	9.2 (8.3*)	129.8 (131.2*)
BH-03	5-10	Silty Sand (SM), Reddish Brown	9.0 (8.5*)	125.8 (127.5*)
BH-05	0-5	Silty Sand (SM), Reddish Brown	6.5	134

(*Rock correction: BH-01=7.67%, BH-03=5.51%)

Direct Shear

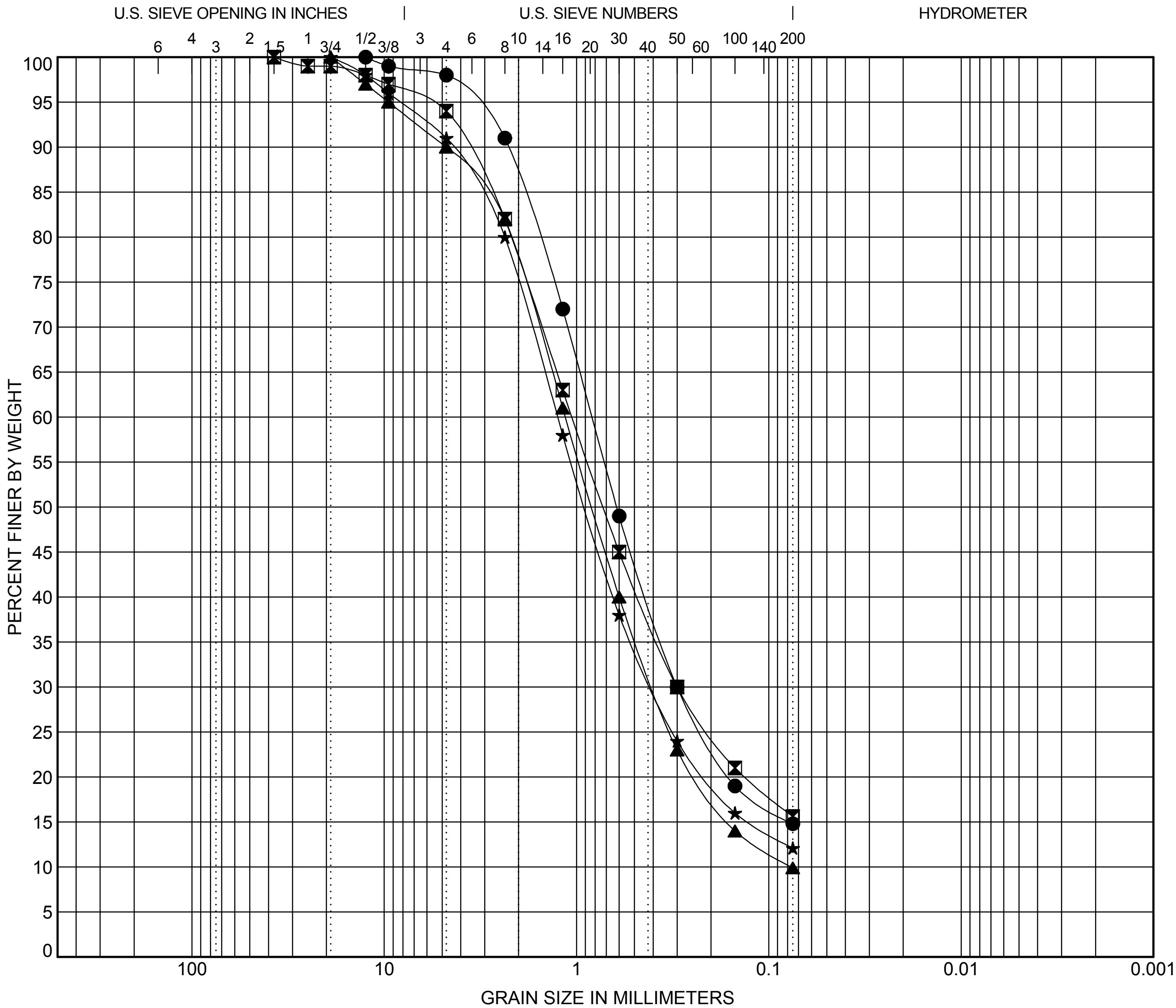
Two direct shear tests were performed on an undisturbed sample under soaked moisture condition in accordance with ASTM D3080. For each test, three samples contained in brass sampler rings were placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. The sampler rings were then sheared at a constant strain rate of 0.02 inch/minute. Shear deformation was recorded until a maximum of about 0.25-inch shear displacement was achieved. Ultimate strength was selected from the shear-stress deformation data and plotted to determine the shear strength parameters. For test data, including sample density and moisture content, see Drawing Nos. B-3 and B-4, *Direct Shear Test Results,* and the following table.

Table No. B-7, Summary of Direct Shear Test Results

Boring No.	Depth (feet)	Soil Description	Peak Strength Parameters	
			Friction Angle (degrees)	Cohesion (psf)
BH-01	10.0-11.5	Silty Sand (SM)	29	170
BH-05	5.0-6.5	Silty Sand (SM)	35	10

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**BH-02**	**5-10**	**SILTY SAND (SM)**					
⊠	**BH-05**	**0-5**	**SILTY SAND (SM)**					
▲	**BH-05**	**5-10**	**SILTY SAND (SM)**				**1.83**	**14.98**
★	**BH-05**	**10-15**	**SILTY SAND (SM)**				**2.51**	**24.34**

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-02**	**5-10**	**12.5**	**0.829**	**0.3**		**2.0**	**83.2**	**14.8**	
⊠	**BH-05**	**0-5**	**37.5**	**1.054**	**0.3**		**6.0**	**78.4**	**15.6**	
▲	**BH-05**	**5-10**	**19**	**1.143**	**0.399**	**0.076**	**10.0**	**80.1**	**9.9**	
★	**BH-05**	**10-15**	**19**	**1.257**	**0.404**		**9.0**	**78.9**	**12.1**	

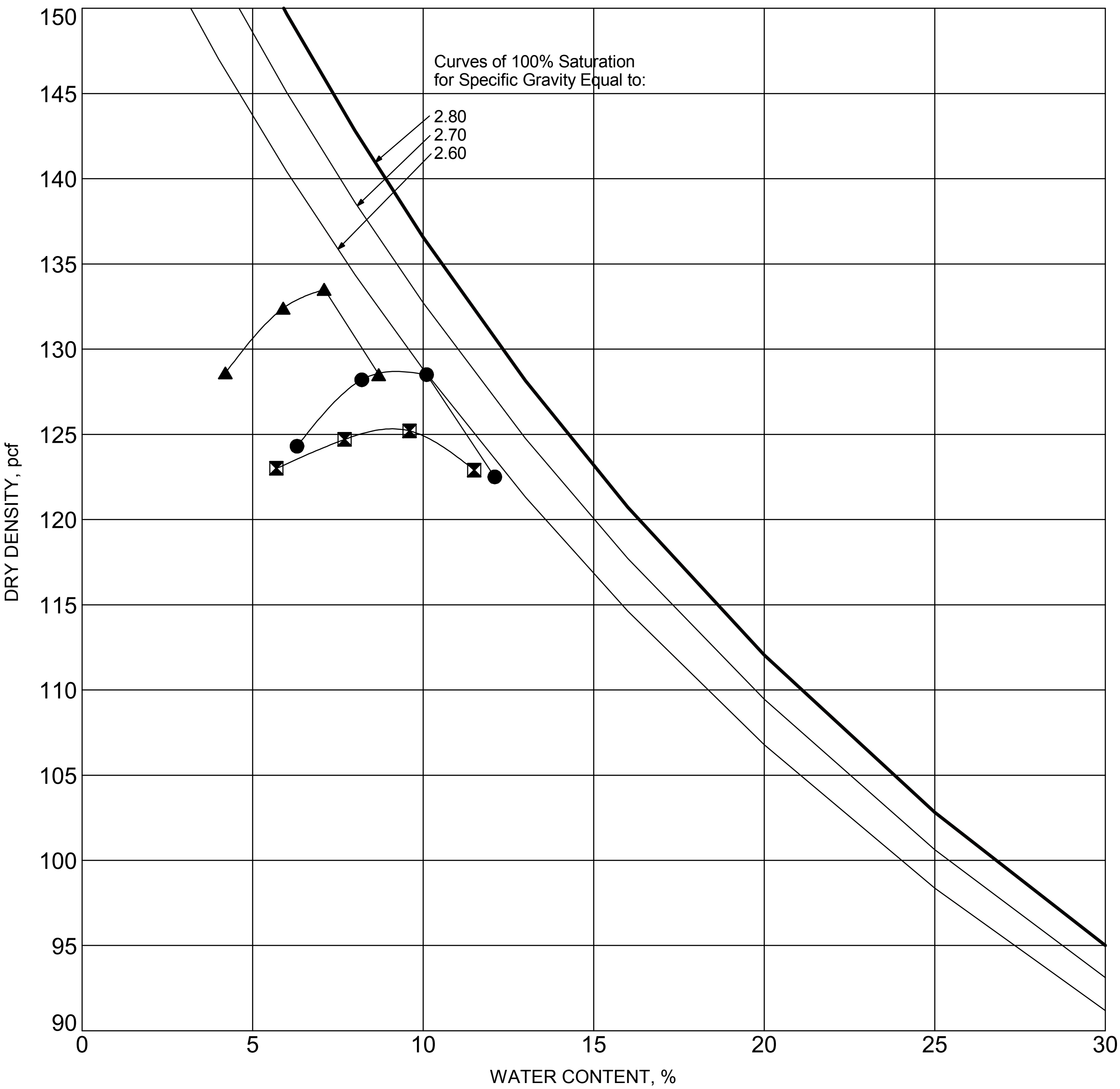
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **B-1**



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	BH-01	10-15	SILTY SAND (SM), Reddish Brown	D1557 - A	9.3 (8.3*)	129.8 (131.2*)
⧗	BH-03	5-10	SILTY SAND (SM), Reddish Brown	D1557 - A	9.0 (8.5*)	125.8 (127.5*)
▲	BH-05	0-5	SILTY SAND (SM), Reddish Brown	D1557 - A	6.5	134

*** Rock Correction: BH-01=7.67% and BH-03=5.51%)**

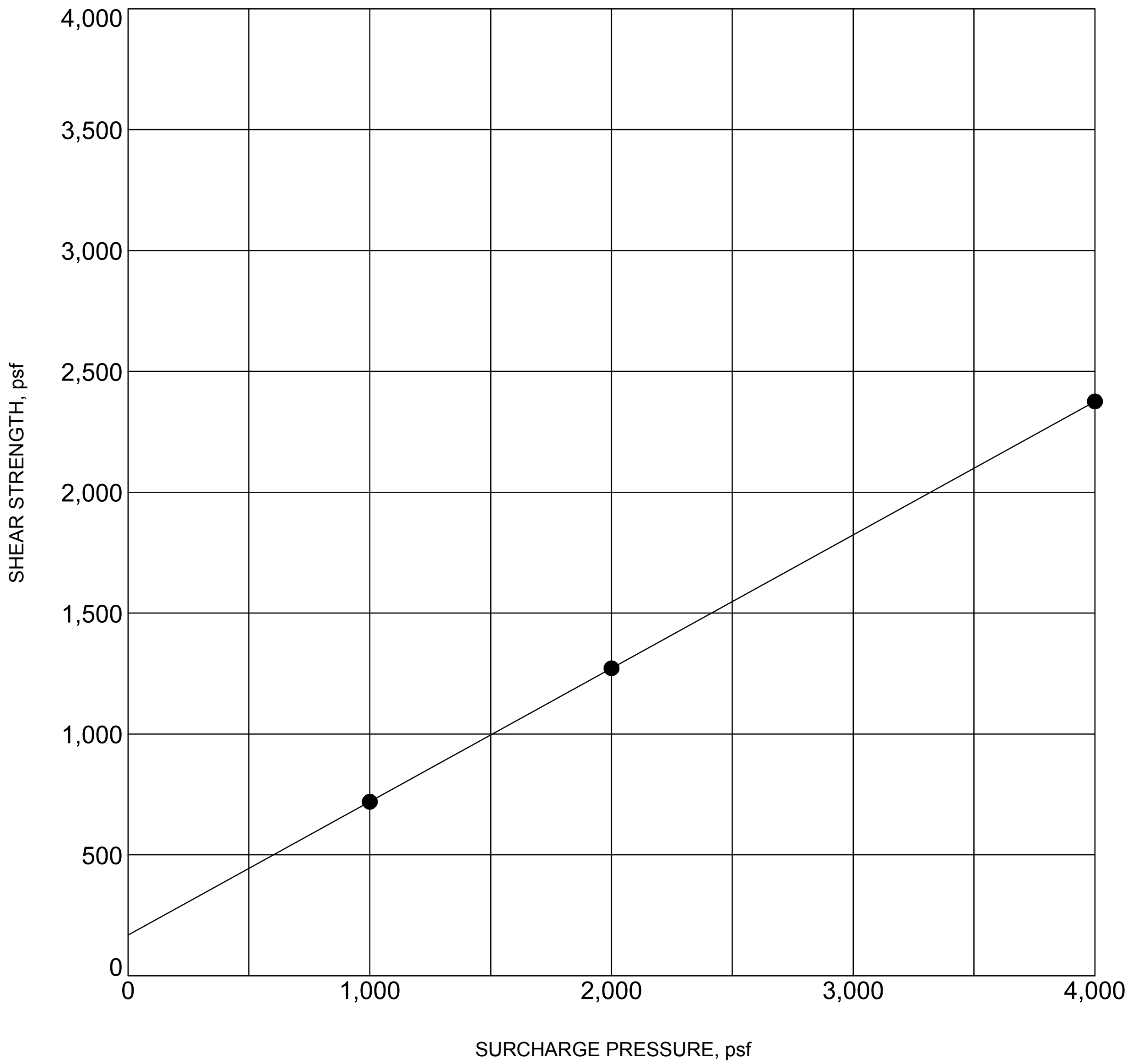
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **B-2**



BORING NO. :	**BH-01**	DEPTH (ft) :	**10.0-11.5**
DESCRIPTION :	**SILTY SAND (SM)**		
COHESION (psf) :	**170**	FRICTION ANGLE (degrees):	**29**
MOISTURE CONTENT (%) :	**2.0**	DRY DENSITY (pcf) :	**115.5**

NOTE: Ultimate Strength.

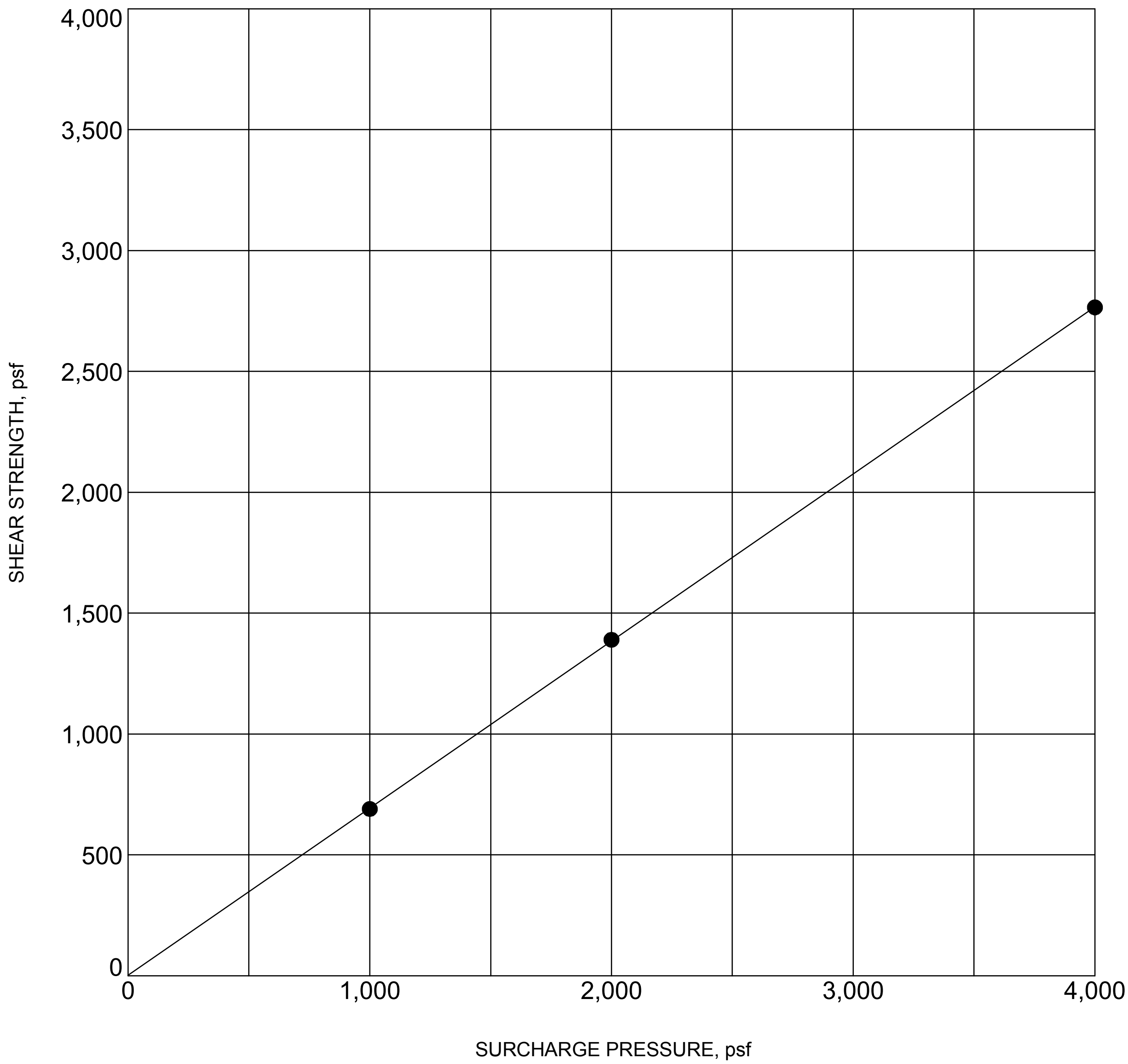
DIRECT SHEAR TEST RESULTS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **B-3**



BORING NO.	:	**BH-05**	DEPTH (ft)	:	**5.0-6.5**
DESCRIPTION	:	**SILTY SAND (SM)**			
COHESION (psf)	:	**10**	FRICTION ANGLE (degrees):		**35**
MOISTURE CONTENT (%)	:	**2.0**	DRY DENSITY (pcf)	:	**105.7**

NOTE: Ultimate Strength.

DIRECT SHEAR TEST RESULTS

Converse Consultants

Sunburst Site- Approximately 20-Acre Site (APN 0605-051-01)
4252 Sunburst Street
City of Joshua Tree, San Bernardino County, California
For: ADM LLC

Project No. **22-81-308-01**

Drawing No. **B-4**

Appendix C

Percolation Testing

APPENDIX C

PERCOLATION TESTING

Four (4) test pits were excavated at each lot on December 23, 2022, for a total of thirty-two (32) exploratory test pits (labeled as TP-01/PT-01 through TP-32/PT-32), which were tested from January 11, 2023, to February 8, 2023. These tests were conducted to evaluate the feasibility of utilizing leach fields for onsite disposal of sewage effluent. The percolation test pits were located by measurement from property boundaries utilizing the referenced schematic site plan. The test method employed was the continuous pre-soak test in conformance with the county standards for percolation testing for leach lines, presented in the referenced SBCPHEHS standards.

The percolation tests were conducted in 6-inch diameter by 13-inch-deep percolation test holes which were hand augured at the bottom of the approximately 4 feet deep test pits (TP-01 through TP-32). Prior to initiating the percolation tests, each test hole was first cleared of loose soils and a plastic liner, perforated in the bottom and sides, was then placed in the hand augured test holes.

For the pre-soak, if all of the water percolated in 2 consecutive readings within 10 minutes or less, the percolation test was conducted on the same day, if not the percolation test was conducted on the next day. After the pre-soak, the test was conducted by adjusting the water level to 6 inches over the bottom of the percolation test hole. The reading was taken when the water level was 3 inches over the bottom of the percolation test hole so that each test represented no more than a 3-inch drop in water level. Measurements were made with a precision of ⅛-inch and after each reading, the water level was refilled to the original level within the test hole, until completion of testing. Percolation test data recorded in the field are presented below in Table No. C-1. The measured percolation test data, calculations, and estimated percolation rates are shown on Plates Nos. C-1 through C-64.

Table No. C-1, Estimated Percolation Rates

Percolation Test	Percolation Test Hole Depth (in)	Trench Depth (ft) of Percolation Test	Soil Types	Percolation Rate (MPI)
PT-01	13.0	4.0	Silty Sand (SM)	2.17
PT-02	13.0	4.0	Silty Sand (SM)	1.83
PT-03	13.0	4.0	Silty Sand (SM)	0.33
PT-04	13.0	4.0	Silty Sand (SM)	2.33
PT-05	13.0	4.0	Silty Sand (SM)	0.17
PT-06	13.0	4.0	Silty Sand (SM)	0.33

Percolation Test	Percolation Test Hole Depth (in)	Trench Depth (ft) of Percolation Test	Soil Types	Percolation Rate (MPI)
PT-07	13.0	4.0	Silty Sand (SM)	2.67
PT-08	13.0	4.0	Silty Sand (SM)	0.17
PT-09	13.0	4.0	Silty Sand (SM)	0.83
PT-10	13.0	4.0	Silty Sand (SM)	1.67
PT-11	13.0	4.0	Silty Sand (SM)	0.83
PT-12	13.0	4.0	Silty Sand (SM)	1.33
PT-13	13.0	4.0	Silty Sand (SM)	0.67
PT-14	13.0	4.0	Silty Sand (SM)	0.50
PT-15	13.0	4.0	Silty Sand (SM)	0.33
PT-16	13.0	4.0	Silty Sand (SM)	1.00
PT-17	13.0	4.0	Silty Sand (SM)	0.33
PT-18	13.0	4.0	Silty Sand (SM)	0.50
PT-19	13.0	4.0	Silty Sand (SM)	0.67
PT-20	13.0	4.0	Silty Sand (SM)	1.67
PT-21	13.0	4.0	Silty Sand (SM)	0.83
PT-22	13.0	4.0	Silty Sand (SM)	0.33
PT-23	13.0	4.0	Silty Sand (SM)	0.50
PT-24	13.0	4.0	Silty Sand (SM)	0.50
PT-25	13.0	4.0	Silty Sand (SM)	2.50
PT-26	13.0	4.0	Silty Sand (SM)	3.00
PT-27	13.0	4.0	Silty Sand (SM)	0.17
PT-28	13.0	4.0	Silty Sand (SM)	0.67
PT-29	13.0	4.0	Silty Sand (SM)	0.83
PT-30	13.0	4.0	Silty Sand (SM)	0.17
PT-31	13.0	4.0	Silty Sand (SM)	0.17
PT-32	13.0	4.0	Silty Sand (SM)	0.17

The measured field percolation test rates ranged from 0.17 to 3.00 minutes per inch (MPI), for a mean average of 0.94 MPI with ¼ of the mean average being 0.235 MPI. According to SBCDPHEHS since all of the test results do not fall within ¼ of the mean average MPI or 1.53 MPI to 2.55 MPI the percolation rate of 3.00 MPI should be used for leach line system design.

Estimated Percolation Rate from Percolation Test Data, PT-01

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-01
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/25/2023
Test Date	1/25/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	8:51	8:57	6.00	3.00	13.00	6.00	10.00	0.00	10.00	0.60	100.00
Presoak 2	8:59	9:09	9.50	3.00	13.00	15.50	10.00	0.00	10.00	0.95	63.16
1	9:12	9:15	3.00	7.00	10.00	3.00	6.00	3.00	3.00	1.00	60.00
2	9:16	9:20	4.00	7.00	10.00	7.00	6.00	3.00	3.00	1.33	45.00
3	9:23	9:28	4.50	7.00	10.00	11.50	6.00	3.00	3.00	1.50	40.00
4	9:31	9:36	5.00	7.00	10.00	16.50	6.00	3.00	3.00	1.67	36.00
5	9:38	9:44	6.00	7.00	10.00	22.50	6.00	3.00	3.00	2.00	30.00
6	9:50	9:56	6.50	7.00	10.00	38.50	6.00	3.00	3.00	2.17	27.69
7	9:59	10:06	6.50	7.00	10.00	45.00	6.00	3.00	3.00	2.17	27.69
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**2.17**
Recommended Design Percolation Rate, (inches/hour)	**27.69**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Health, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
1

Percolation Rate versus Time, PT-01

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-01
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/25/2023
Test Date	1/25/2023

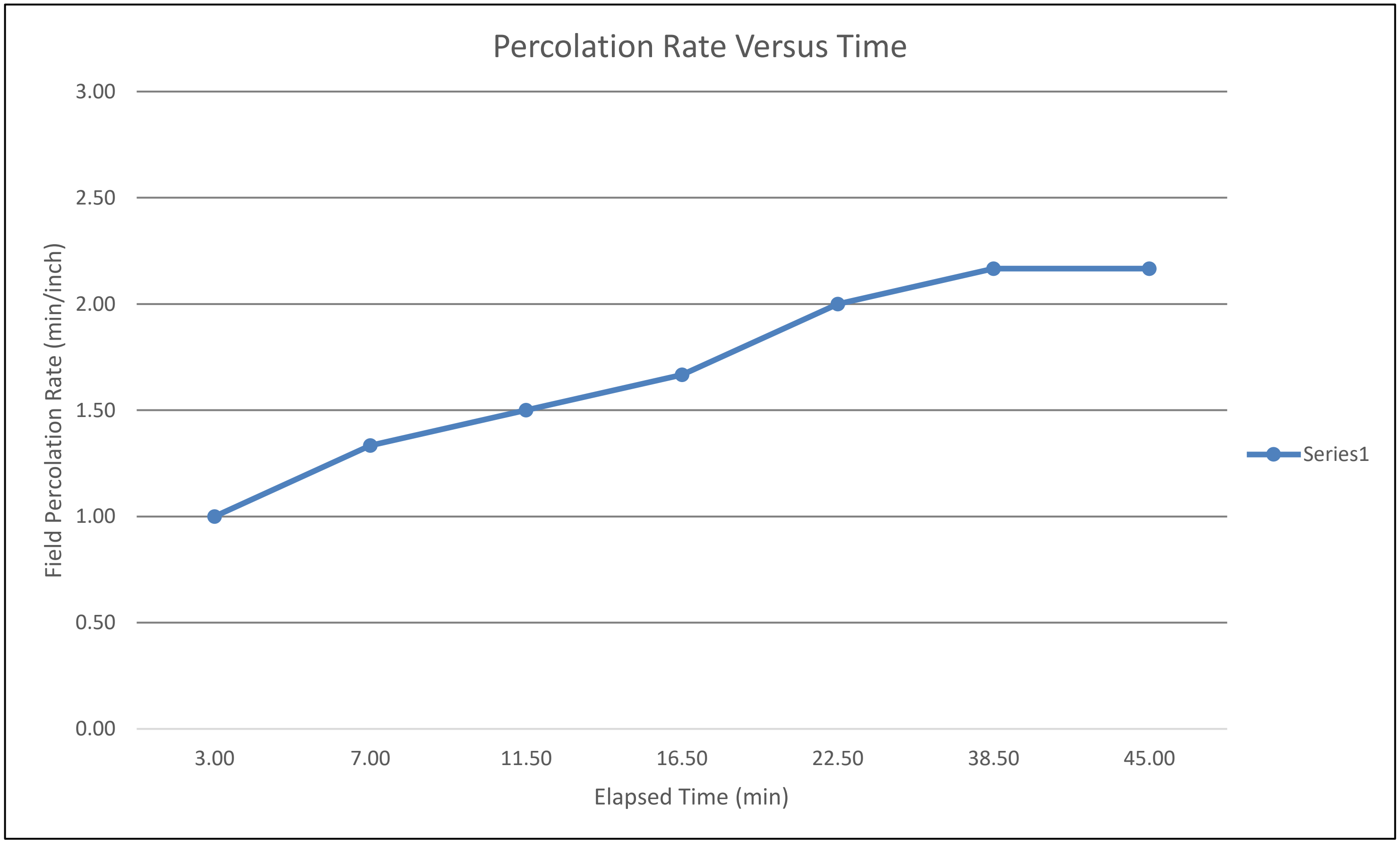


Plate No.
2

Estimated Percolation Rate from Percolation Test Data, PT-02

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-02
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	7:43	7:48	4.00	3.00	13.00	4.00	10.00	0.00	10.00	0.40	150.00
Presoak 2	7:51	8:01	10.00	3.00	13.00	14.00	10.00	0.00	10.00	1.00	60.00
1	8:04	8:07	3.00	7.00	10.00	17.00	6.00	3.00	3.00	1.00	60.00
2	8:09	8:13	4.00	7.00	10.00	21.00	6.00	3.00	3.00	1.33	45.00
3	8:15	8:19	4.00	7.00	10.00	25.00	6.00	3.00	3.00	1.33	45.00
4	8:22	8:26	4.50	7.00	10.00	29.50	6.00	3.00	3.00	1.50	40.00
5	8:30	8:35	5.00	7.00	10.00	34.50	6.00	3.00	3.00	1.67	36.00
6	8:38	8:44	5.50	7.00	10.00	40.00	6.00	3.00	3.00	1.83	32.73
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**1.83**
Recommended Design Percolation Rate, (inches/hour)	**32.73**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-02

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-02
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

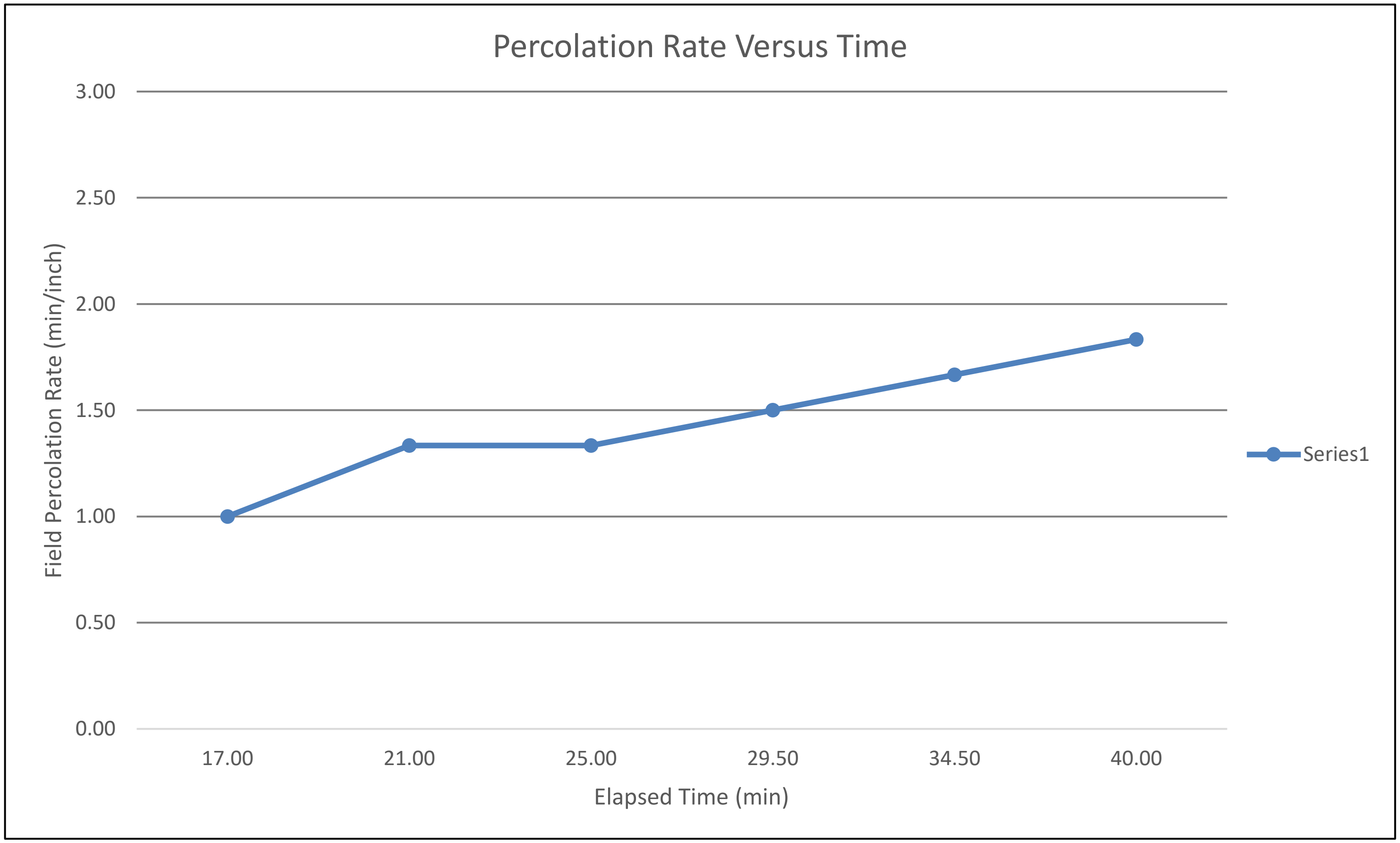


Plate No.
4

Estimated Percolation Rate from Percolation Test Data, PT-03

Shaded cells contain calculated values.

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-03
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	9:07	9:09	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	9:10	9:12	2.00	3.00	13.00	4.00	10.00	0.00	10.00	0.20	300.00
1	9:12	9:12	1.00	7.00	10.00	1.00	6.00	3.00	3.00	0.33	180.00
2	9:13	9:13	1.00	7.00	10.00	2.00	6.00	3.00	3.00	0.33	180.00
3	9:15	9:15	1.00	7.00	10.00	3.00	6.00	3.00	3.00	0.33	180.00
4	9:17	9:17	1.00	7.00	10.00	4.00	6.00	3.00	3.00	0.33	180.00
5	9:19	9:19	1.00	7.00	10.00	5.00	6.00	3.00	3.00	0.33	180.00
6	9:21	9:22	1.00	7.00	10.00	6.00	6.00	3.00	3.00	0.33	180.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.33**
Recommended Design Percolation Rate, (inches/hour)	**180.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
5

Percolation Rate versus Time, PT-03

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-03
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

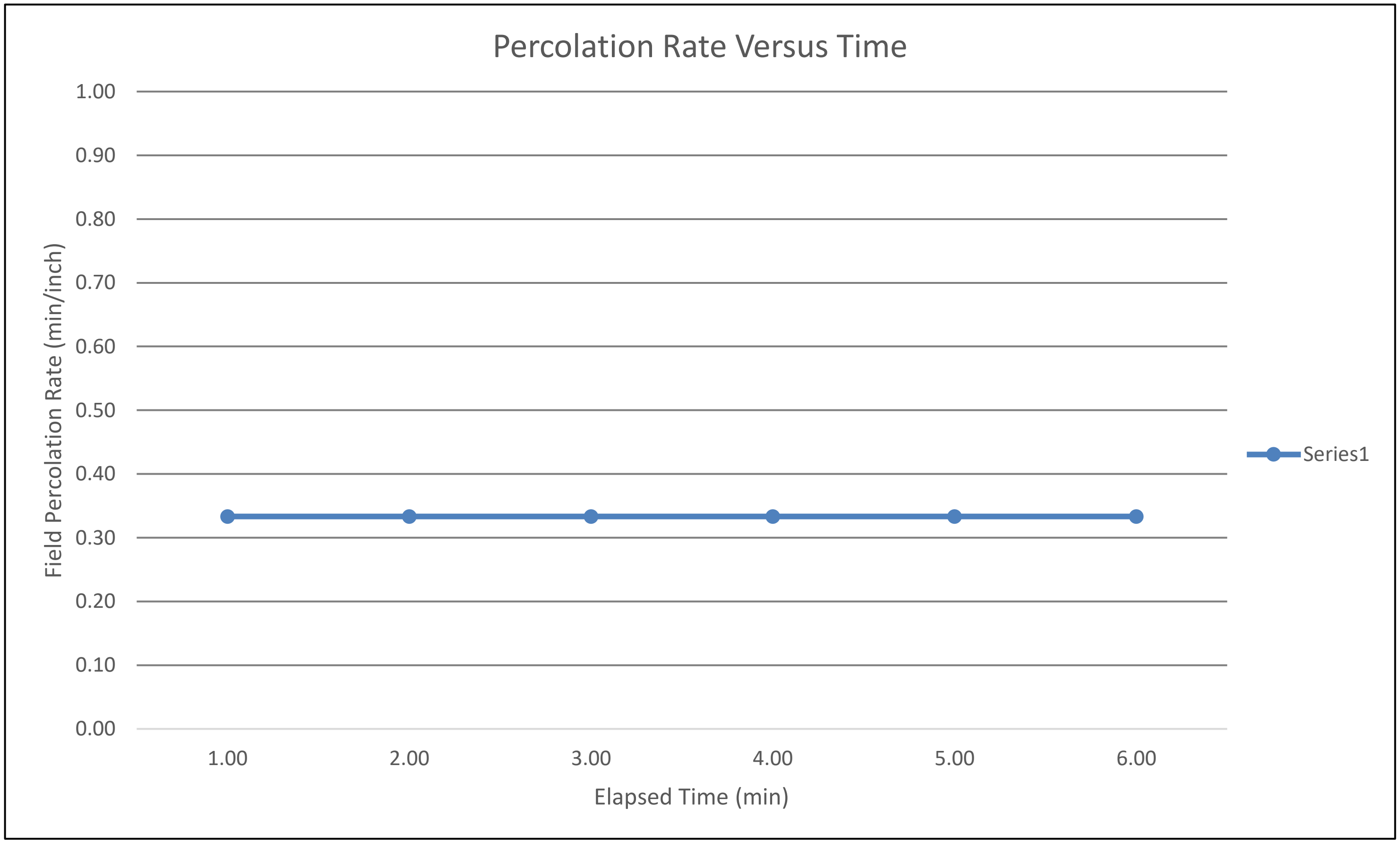


Plate No.
6

Estimated Percolation Rate from Percolation Test Data, PT-04

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-04
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	10:10	10:14	4.00	3.00	13.00	4.00	10.00	0.00	10.00	0.40	150.00
Presoak 2	10:22	10:28	6.50	3.00	13.00	10.50	10.00	0.00	10.00	0.65	92.31
1	10:30	10:32	2.50	7.00	10.00	2.50	6.00	3.00	3.00	0.83	72.00
2	10:34	10:37	3.00	7.00	10.00	5.50	6.00	3.00	3.00	1.00	60.00
3	10:39	10:42	3.00	7.00	10.00	8.50	6.00	3.00	3.00	1.00	60.00
4	10:46	10:50	4.00	7.00	10.00	12.50	6.00	3.00	3.00	1.33	45.00
5	10:53	10:57	4.50	7.00	10.00	17.00	6.00	3.00	3.00	1.50	40.00
6	11:01	11:08	7.00	7.00	10.00	23.00	6.00	3.00	3.00	2.33	25.71
7	11:09	11:16	7.00	7.00	10.00	30.00	6.00	3.00	3.00	2.33	25.71
8	11:17	11:24	7.00	7.00	10.00	37.00	6.00	3.00	3.00	2.33	25.71
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**2.33**
Recommended Design Percolation Rate, (inches/hour)	**25.71**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t/\Delta d$

Plate No.
7

Percolation Rate versus Time, PT-04

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-04
Test Location	Lot # 5
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

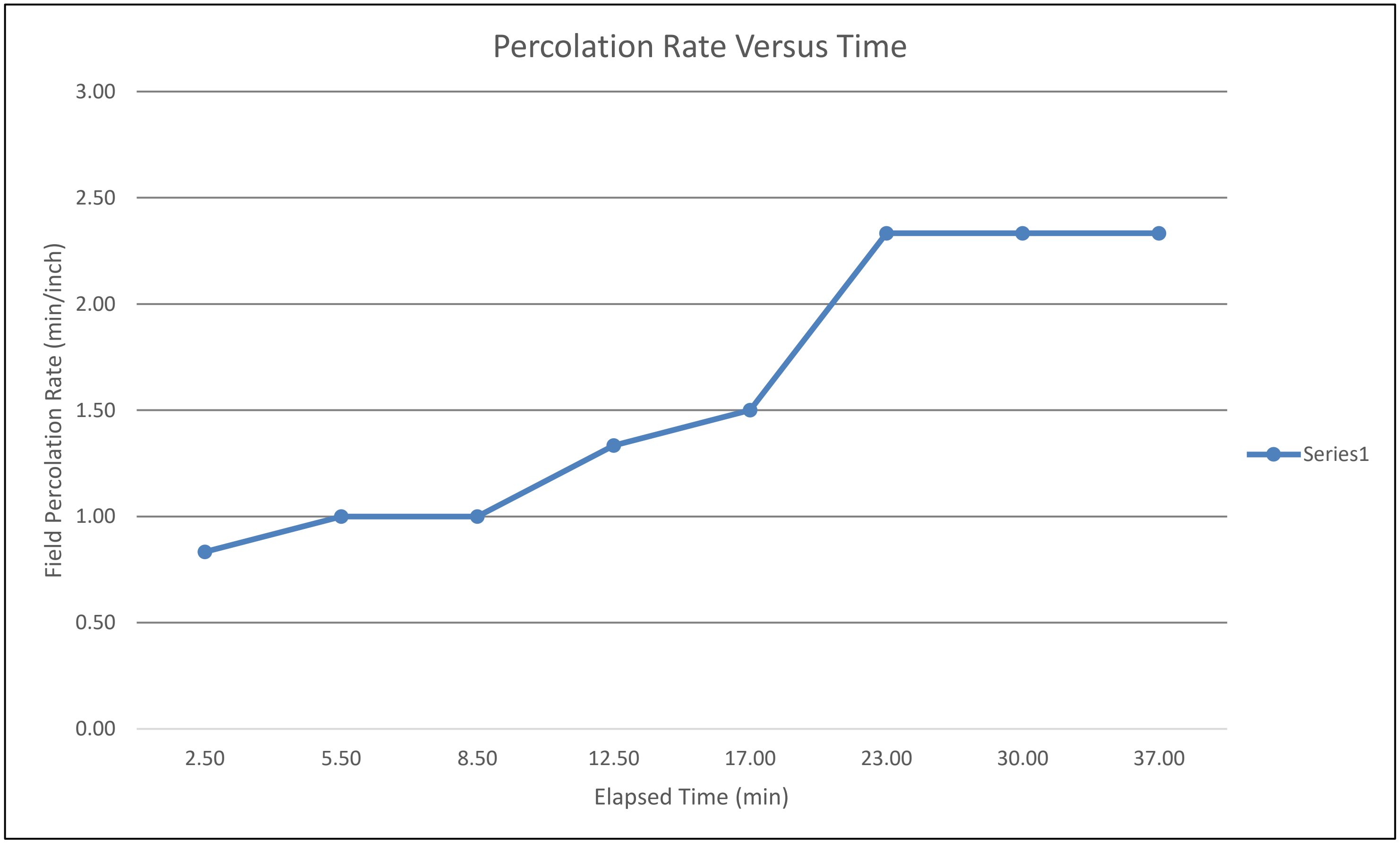


Plate No.
8

Estimated Percolation Rate from Percolation Test Data, PT-05

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-05
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	7:37	7:39	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	7:42	7:43	1.00	3.00	13.00	3.00	10.00	0.00	10.00	0.10	600.00
1	7:45	7:46	0.25	7.00	10.00	0.25	6.00	3.00	3.00	0.08	720.00
2	7:48	7:49	0.25	7.00	10.00	0.50	6.00	3.00	3.00	0.08	720.00
3	7:52	7:53	0.50	7.00	10.00	0.75	6.00	3.00	3.00	0.17	360.00
4	7:56	7:57	0.50	7.00	10.00	1.25	6.00	3.00	3.00	0.17	360.00
5	7:59	8:00	0.50	7.00	10.00	1.75	6.00	3.00	3.00	0.17	360.00
6	8:03	8:04	0.50	7.00	10.00	2.25	6.00	3.00	3.00	0.17	360.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
9

Percolation Rate versus Time, PT-05

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-05
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

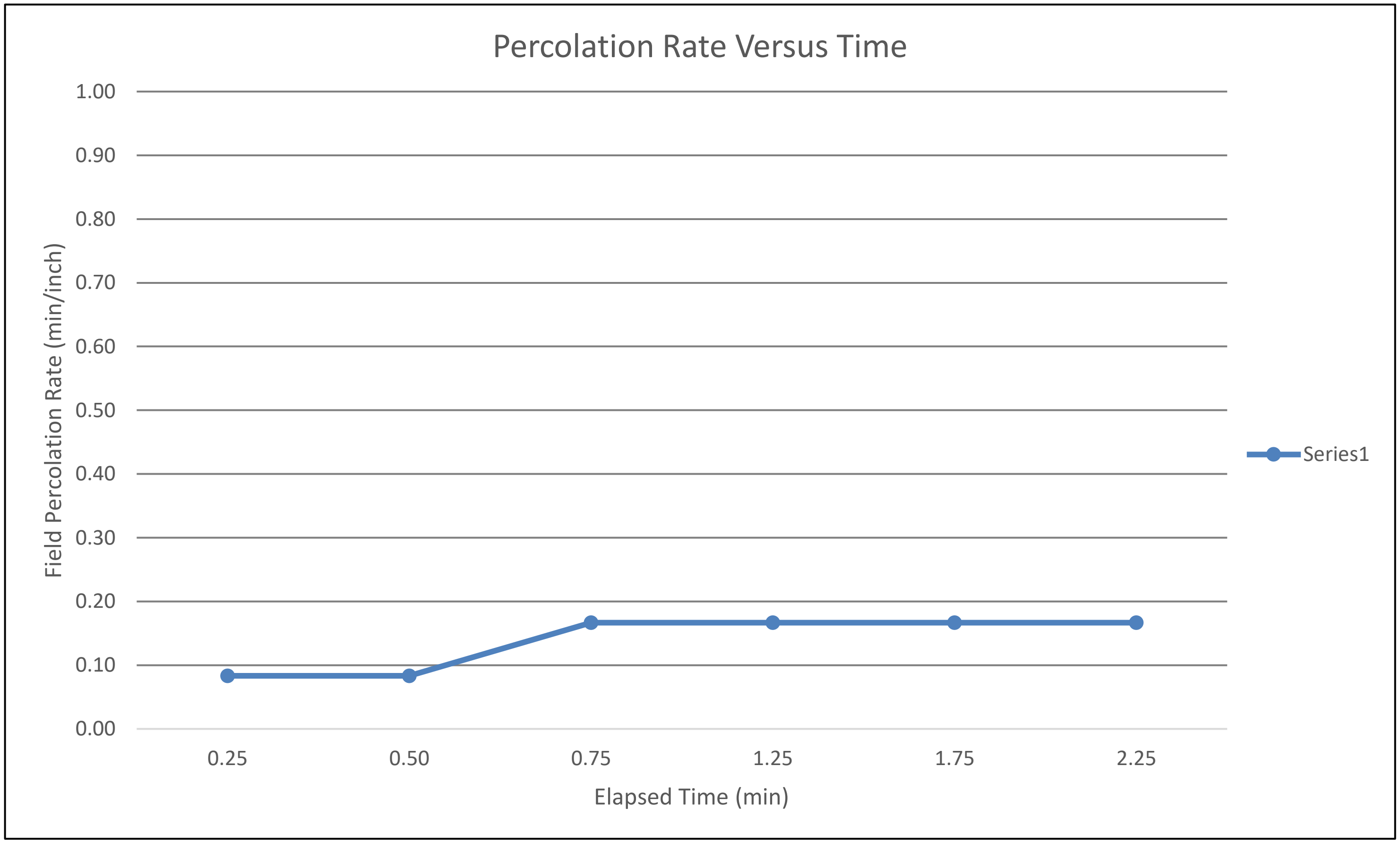


Plate No.
10

Estimated Percolation Rate from Percolation Test Data, PT-06

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-06
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	8:29	8:31	1.50	3.00	13.00	1.50	10.00	0.00	10.00	0.15	400.00
Presoak 2	8:34	8:36	1.50	3.00	13.00	3.00	10.00	0.00	10.00	0.15	400.00
1	8:40	8:41	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	8:43	8:44	1.00	7.00	10.00	1.50	6.00	3.00	3.00	0.33	180.00
3	8:47	8:48	1.00	7.00	10.00	2.50	6.00	3.00	3.00	0.33	180.00
4	8:51	8:52	1.00	7.00	10.00	3.50	6.00	3.00	3.00	0.33	180.00
5	8:55	8:56	1.00	7.00	10.00	4.50	6.00	3.00	3.00	0.33	180.00
6	8:59	9:00	1.00	7.00	10.00	5.50	6.00	3.00	3.00	0.33	180.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.33**
Recommended Design Percolation Rate, (inches/hour)	**180.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
11

Percolation Rate versus Time, PT-06

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-06
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

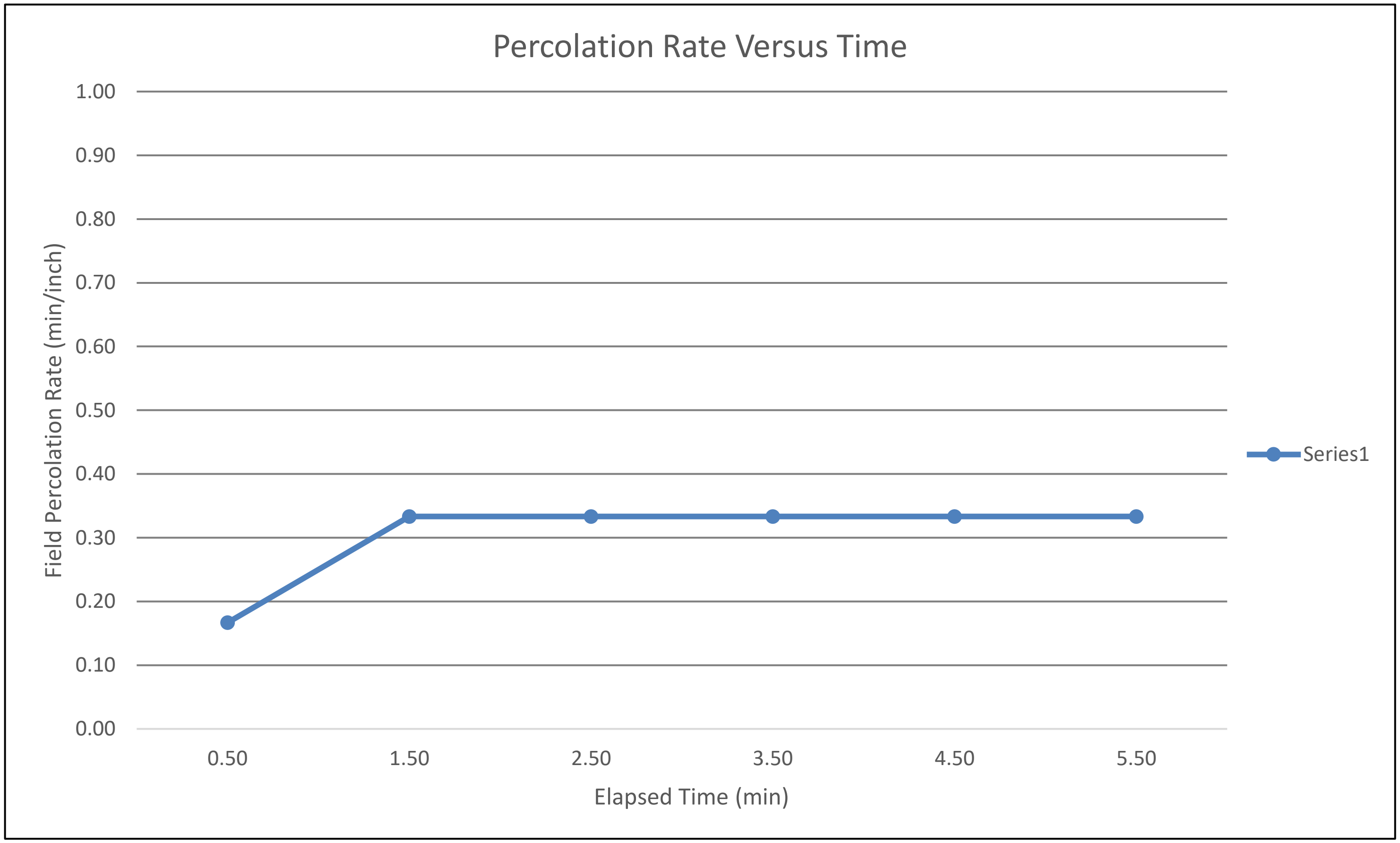


Plate No.
12

Estimated Percolation Rate from Percolation Test Data, PT-07

Shaded cells contain calculated values.

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-07
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	9:22	9:28	6.00	3.00	13.00	6.00	10.00	0.00	10.00	0.60	100.00
Presoak 2	9:30	9:36	6.00	3.00	13.00	12.00	10.00	0.00	10.00	0.60	100.00
1	9:39	9:41	2.50	7.00	10.00	2.50	6.00	3.00	3.00	0.83	72.00
2	9:44	9:47	2.50	7.00	10.00	5.00	6.00	3.00	3.00	0.83	72.00
3	9:51	9:55	3.50	7.00	10.00	8.50	6.00	3.00	3.00	1.17	51.43
4	9:58	10:04	5.50	7.00	10.00	14.00	6.00	3.00	3.00	1.83	32.73
5	10:07	10:15	7.50	7.00	10.00	21.50	6.00	3.00	3.00	2.50	24.00
6	10:19	10:28	8.00	7.00	10.00	29.50	6.00	3.00	3.00	2.67	22.50
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**2.67**
Recommended Design Percolation Rate, (inches/hour)	**22.50**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
13

Percolation Rate versus Time, PT-07

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-07
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

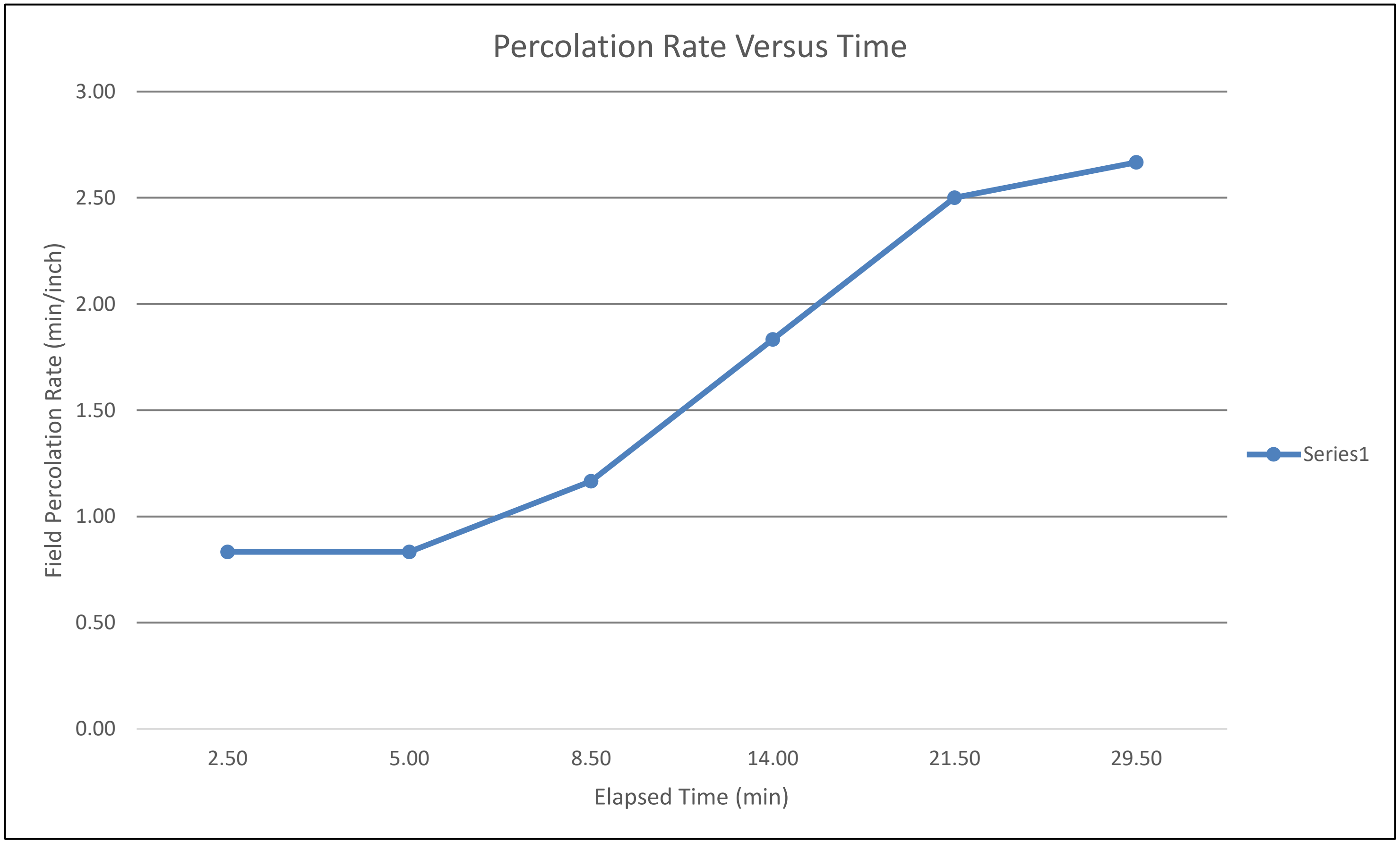


Plate No.
14

Estimated Percolation Rate from Percolation Test Data, PT-08

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-08
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	11:48	11:49	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	11:51	11:53	2.00	3.00	13.00	3.00	10.00	0.00	10.00	0.20	300.00
1	11:55	11:56	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	11:58	11:59	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	12:01	12:02	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	12:03	12:04	0.50	7.00	10.00	2.00	6.00	3.00	3.00	0.17	360.00
5	12:06	12:07	0.50	7.00	10.00	2.50	6.00	3.00	3.00	0.17	360.00
6	12:09	12:10	0.50	7.00	10.00	3.00	6.00	3.00	3.00	0.17	360.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t/\Delta d$

Plate No.
15

Percolation Rate versus Time, PT-08

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-08
Test Location	Lot # 4
Personnel	Catherine Nelson
Presoak Date	1/11/2023
Test Date	1/11/2023

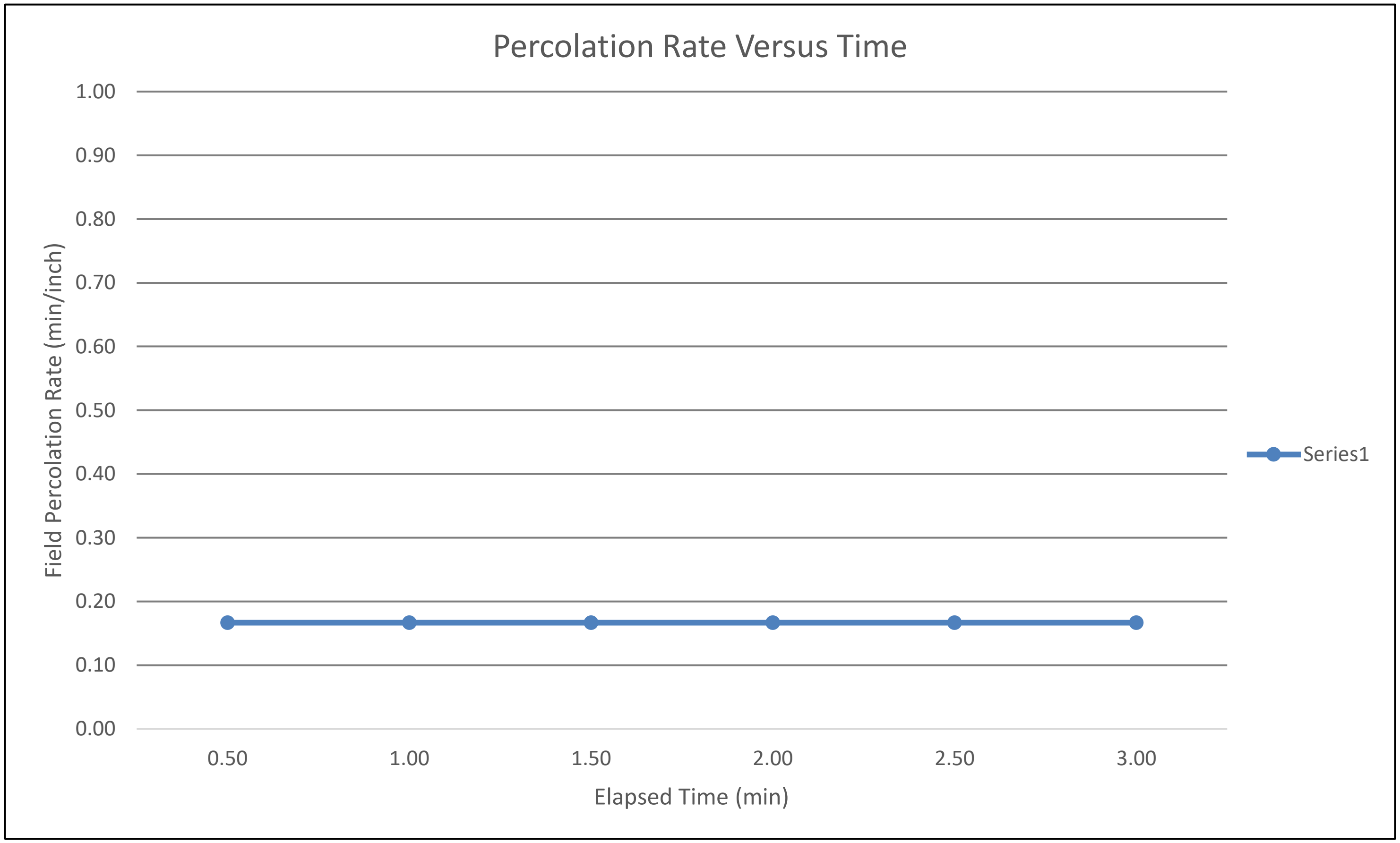


Plate No.
16

Estimated Percolation Rate from Percolation Test Data, PT-09

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-09
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	10:51	10:56	5.00	3.00	13.00	5.00	10.00	0.00	10.00	0.50	120.00
Presoak 2	10:59	11:08	9.00	3.00	13.00	14.00	10.00	0.00	10.00	0.90	66.67
1	11:11	11:13	2.00	7.00	10.00	2.00	6.00	3.00	3.00	0.67	90.00
2	11:16	11:19	3.00	7.00	10.00	5.00	6.00	3.00	3.00	1.00	60.00
3	11:21	11:24	3.00	7.00	10.00	8.00	6.00	3.00	3.00	1.00	60.00
4	11:27	11:29	2.50	7.00	10.00	10.50	6.00	3.00	3.00	0.83	72.00
5	11:32	11:34	2.50	7.00	10.00	13.00	6.00	3.00	3.00	0.83	72.00
6	11:38	11:40	2.50	7.00	10.00	15.50	6.00	3.00	3.00	0.83	72.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.83**
Recommended Design Percolation Rate, (inches/hour)	**72.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-09

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-09
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

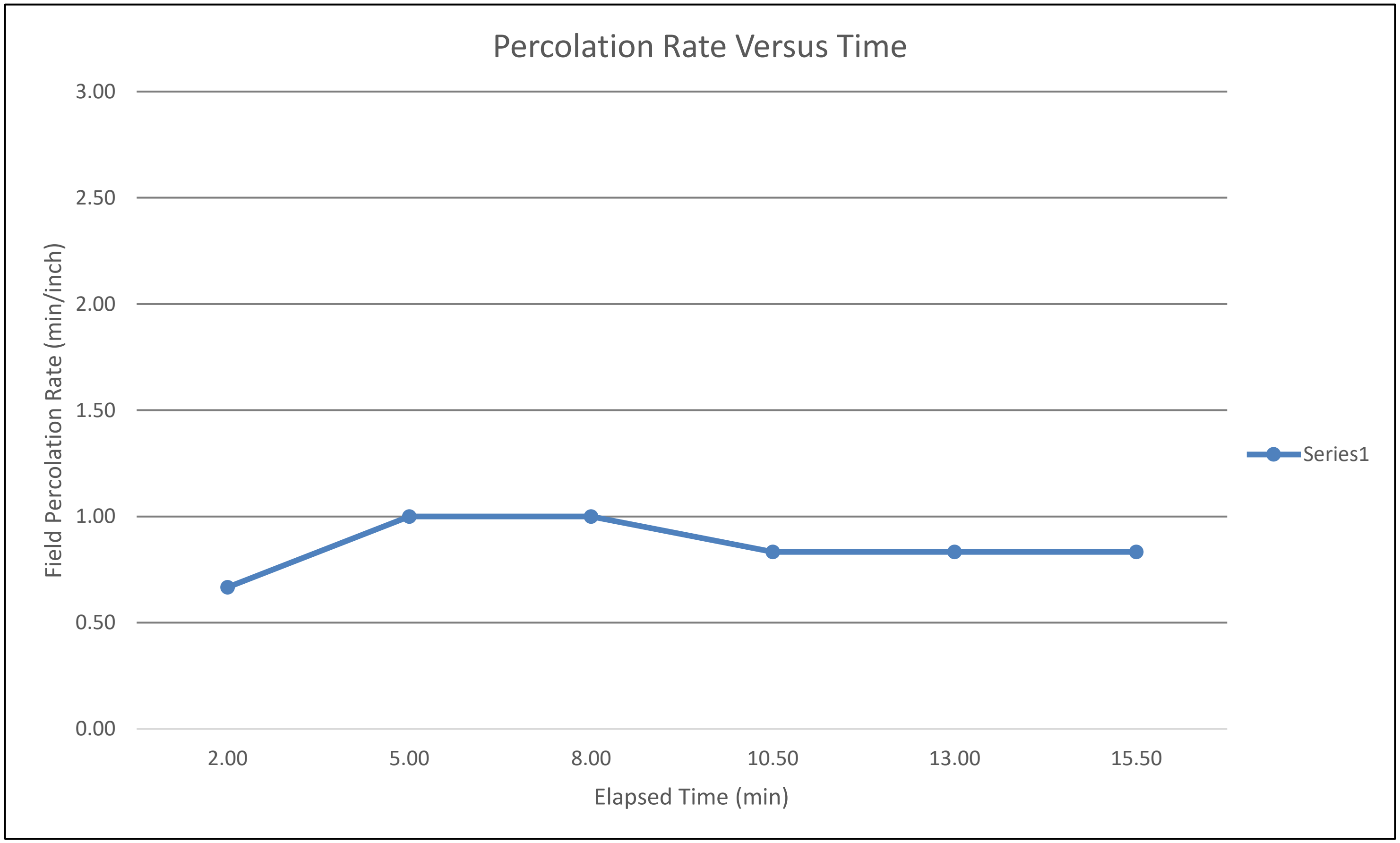


Plate No.
18

Estimated Percolation Rate from Percolation Test Data, PT-10

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-10
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	11:57	12:03	6.00	3.00	13.00	6.00	10.00	0.00	10.00	0.60	100.00
Presoak 2	12:06	12:15	9.00	3.00	13.00	15.00	10.00	0.00	10.00	0.90	66.67
1	12:17	12:19	2.00	7.00	10.00	2.00	6.00	3.00	3.00	0.67	90.00
2	12:22	12:24	2.50	7.00	10.00	4.50	6.00	3.00	3.00	0.83	72.00
3	12:26	12:29	3.50	7.00	10.00	8.00	6.00	3.00	3.00	1.17	51.43
4	12:31	12:35	4.00	7.00	10.00	12.00	6.00	3.00	3.00	1.33	45.00
5	12:38	12:42	4.50	7.00	10.00	16.50	6.00	3.00	3.00	1.50	40.00
6	12:45	12:50	5.00	7.00	10.00	21.50	6.00	3.00	3.00	1.67	36.00
7	12:53	12:58	5.00	7.00	10.00	26.50	6.00	3.00	3.00	1.67	36.00
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**1.67**
Recommended Design Percolation Rate, (inches/hour)	**36.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-10

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-10
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

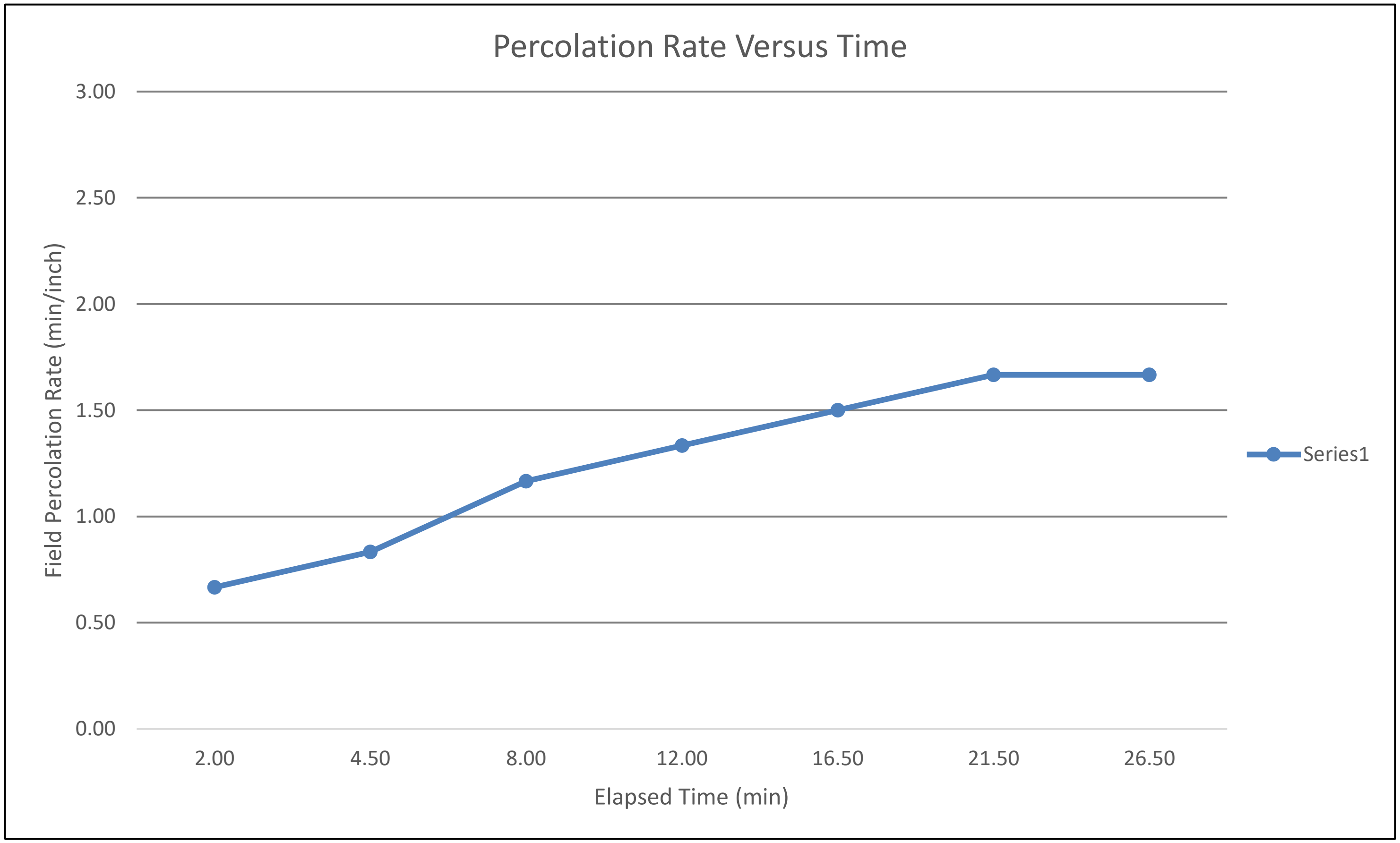


Plate No.
20

Estimated Percolation Rate from Percolation Test Data, PT-11

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-11
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	13:16	13:25	9.50	3.00	13.00	9.50	10.00	0.00	10.00	0.95	63.16
Presoak 2	13:29	13:38	9.50	3.00	13.00	19.00	10.00	0.00	10.00	0.95	63.16
1	13:41	13:43	2.00	7.00	10.00	2.00	6.00	3.00	3.00	0.67	90.00
2	13:47	13:49	2.50	7.00	10.00	4.50	6.00	3.00	3.00	0.83	72.00
3	13:52	13:54	2.50	7.00	10.00	7.00	6.00	3.00	3.00	0.83	72.00
4	13:57	13:59	2.50	7.00	10.00	9.50	6.00	3.00	3.00	0.83	72.00
5	14:03	14:05	2.50	7.00	10.00	12.00	6.00	3.00	3.00	0.83	72.00
6	14:08	14:10	2.50	7.00	10.00	14.50	6.00	3.00	3.00	0.83	72.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.83**
Recommended Design Percolation Rate, (inches/hour)	**72.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t/\Delta d$

Plate No.
21

Percolation Rate versus Time, PT-11

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-11
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

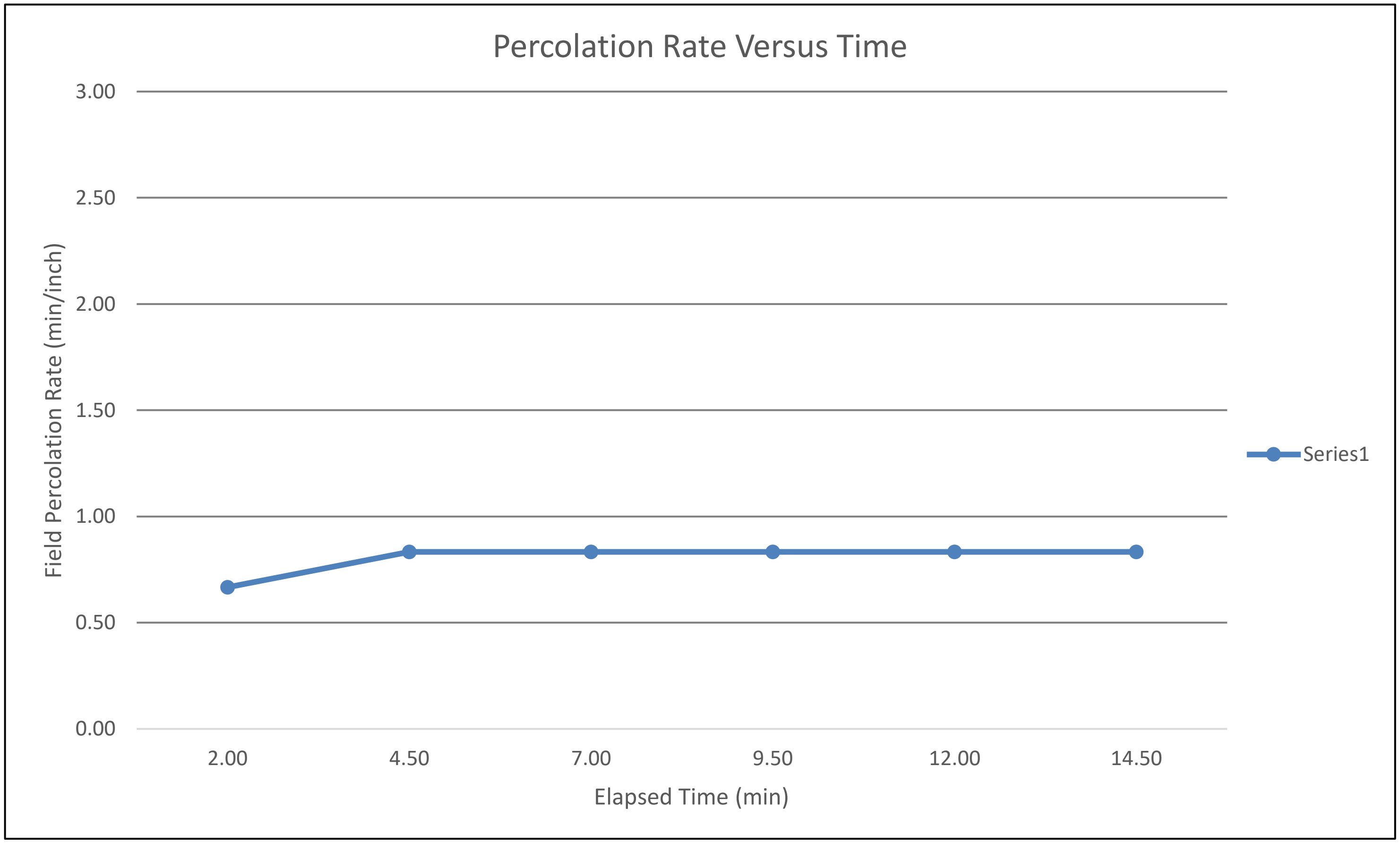


Plate No.
22

Estimated Percolation Rate from Percolation Test Data, PT-12

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-12
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	14:31	14:35	4.50	3.00	13.00	4.50	10.00	0.00	10.00	0.45	133.33
Presoak 2	14:38	14:45	7.50	3.00	13.00	12.00	10.00	0.00	10.00	0.75	80.00
1	14:49	14:51	2.00	7.00	10.00	2.00	6.00	3.00	3.00	0.67	90.00
2	14:53	14:56	3.50	7.00	10.00	5.50	6.00	3.00	3.00	1.17	51.43
3	15:00	15:03	3.50	7.00	10.00	9.00	6.00	3.00	3.00	1.17	51.43
4	15:06	15:09	3.50	7.00	10.00	12.50	6.00	3.00	3.00	1.17	51.43
5	15:11	15:15	4.00	7.00	10.00	16.50	6.00	3.00	3.00	1.33	45.00
6	15:18	15:22	4.00	7.00	10.00	20.50	6.00	3.00	3.00	1.33	45.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**1.33**
Recommended Design Percolation Rate, (inches/hour)	**45.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
23

Percolation Rate versus Time, PT-12

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-12
Test Location	Lot # 3
Personnel	Catherine Nelson
Presoak Date	1/12/2023
Test Date	1/12/2023

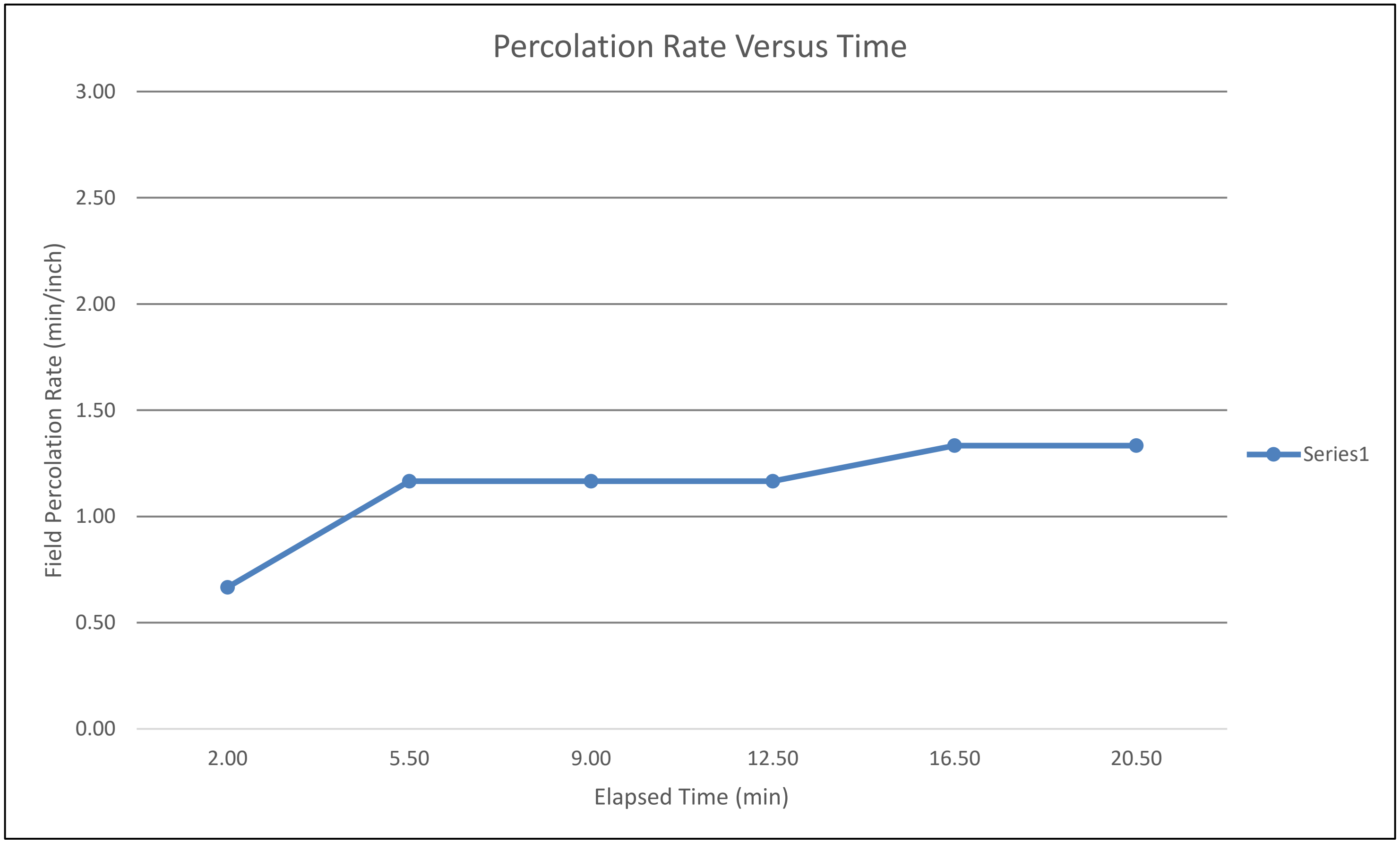


Plate No.
24

Estimated Percolation Rate from Percolation Test Data, PT-13

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-13
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	1/25/2023
Test Date	1/25/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	10:32	10:33	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	10:35	10:36	1.00	3.00	13.00	2.00	10.00	0.00	10.00	0.10	600.00
1	10:38	10:39	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	10:41	10:42	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	10:45	10:46	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	10:48	10:49	1.00	7.00	10.00	2.50	6.00	3.00	3.00	0.33	180.00
5	10:51	10:52	1.50	7.00	10.00	4.00	6.00	3.00	3.00	0.50	120.00
6	10:54	10:57	2.00	7.00	10.00	6.00	6.00	3.00	3.00	0.67	90.00
7	10:59	11:01	2.00	7.00	10.00	6.00	6.00	3.00	3.00	0.67	90.00
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.67**
Recommended Design Percolation Rate, (inches/hour)	**90.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t/\Delta d$

Percolation Rate versus Time, PT-13

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-13
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	1/25/2023
Test Date	1/25/2023

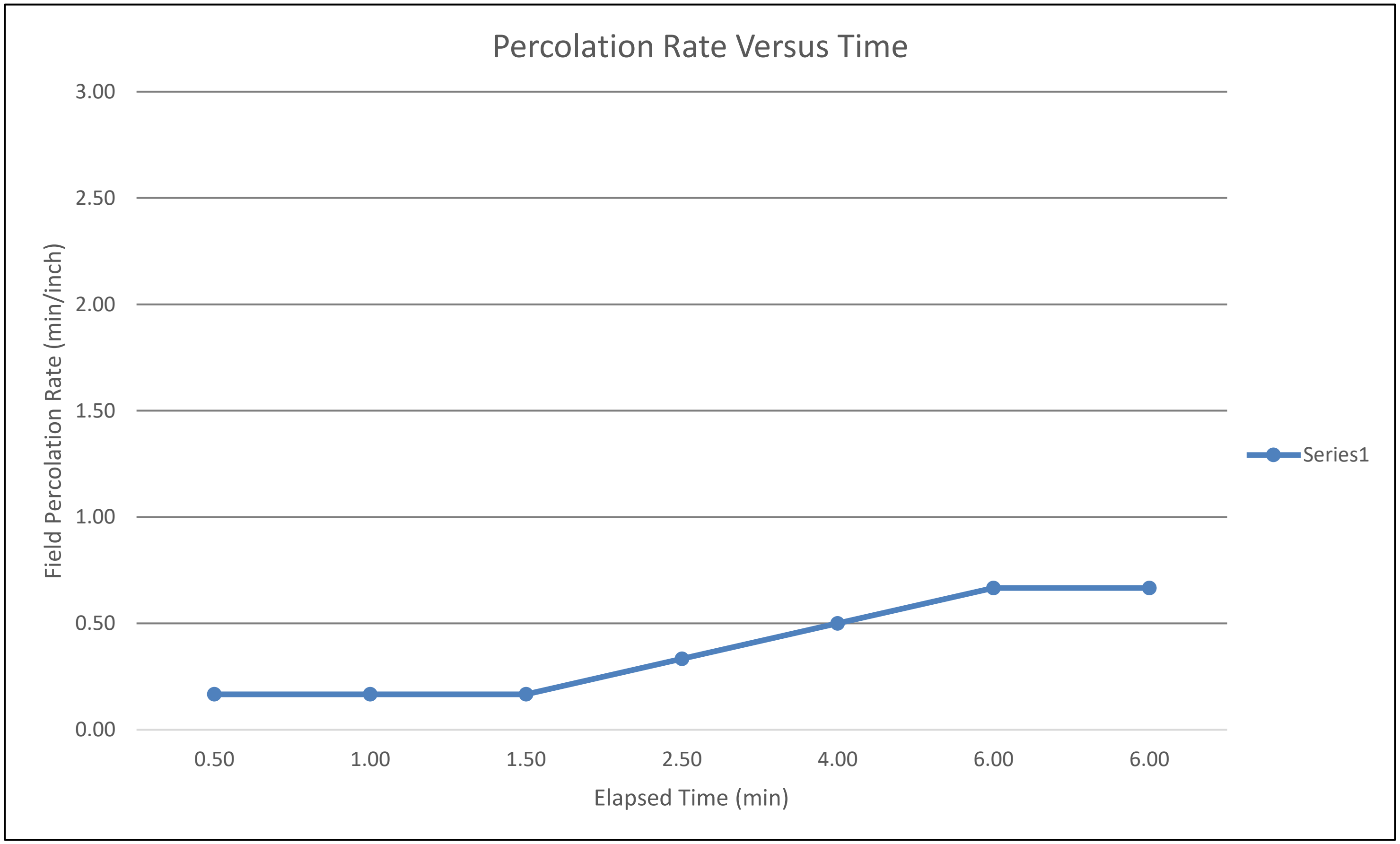


Plate No.
26

Estimated Percolation Rate from Percolation Test Data, PT-14

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-14
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	7:21	7:23	1.50	3.00	13.00	1.50	10.00	0.00	10.00	0.15	400.00
Presoak 2	7:27	7:30	3.00	3.00	13.00	4.50	10.00	0.00	10.00	0.30	200.00
1	7:33	7:34	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	7:36	7:38	1.50	7.00	10.00	2.00	6.00	3.00	3.00	0.50	120.00
3	7:41	7:43	1.50	7.00	10.00	3.50	6.00	3.00	3.00	0.50	120.00
4	7:46	7:46	1.50	7.00	10.00	5.00	6.00	3.00	3.00	0.50	120.00
5	7:50	7:52	1.50	7.00	10.00	6.50	6.00	3.00	3.00	0.50	120.00
6	7:55	7:57	1.50	7.00	10.00	8.00	6.00	3.00	3.00	0.50	120.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.50**
Recommended Design Percolation Rate, (inches/hour)	**120.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t/\Delta d$

Percolation Rate versus Time, PT-14

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-14
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

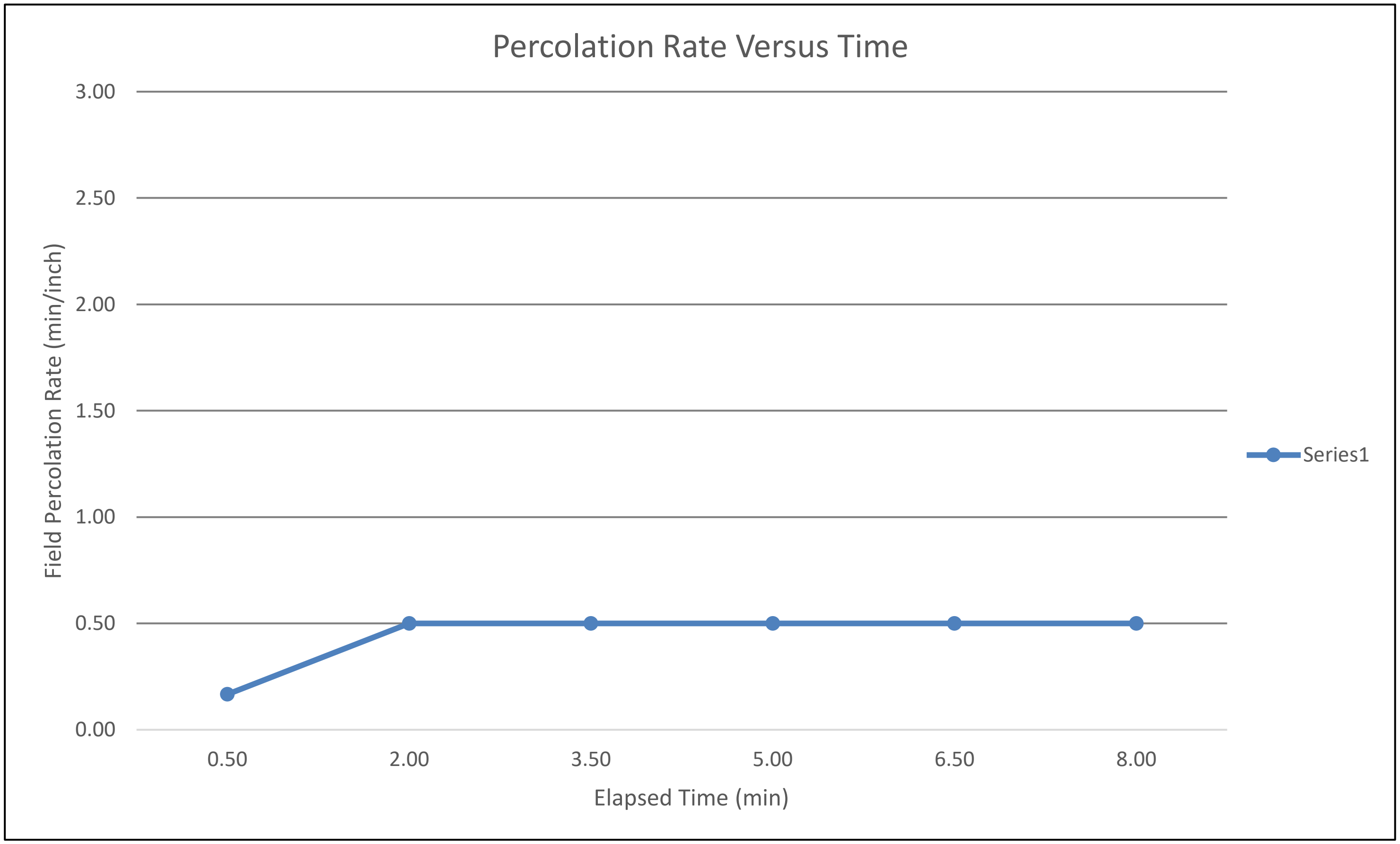


Plate No.
28

Estimated Percolation Rate from Percolation Test Data, PT-15

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-15
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	8:16	8:19	3.00	3.00	13.00	3.00	10.00	0.00	10.00	0.30	200.00
Presoak 2	8:22	8:26	4.00	3.00	13.00	7.00	10.00	0.00	10.00	0.40	150.00
1	8:29	8:31	1.50	7.00	10.00	1.50	6.00	3.00	3.00	0.50	120.00
2	8:34	8:36	1.50	7.00	10.00	3.00	6.00	3.00	3.00	0.50	120.00
3	8:38	8:40	1.50	7.00	10.00	4.50	6.00	3.00	3.00	0.50	120.00
4	8:43	8:45	1.50	7.00	10.00	6.00	6.00	3.00	3.00	0.50	120.00
5	8:51	8:52	1.00	7.00	10.00	7.00	6.00	3.00	3.00	0.33	180.00
6	8:54	8:55	1.00	7.00	10.00	8.00	6.00	3.00	3.00	0.33	180.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.33**
Recommended Design Percolation Rate, (inches/hour)	**180.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-15

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-15
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

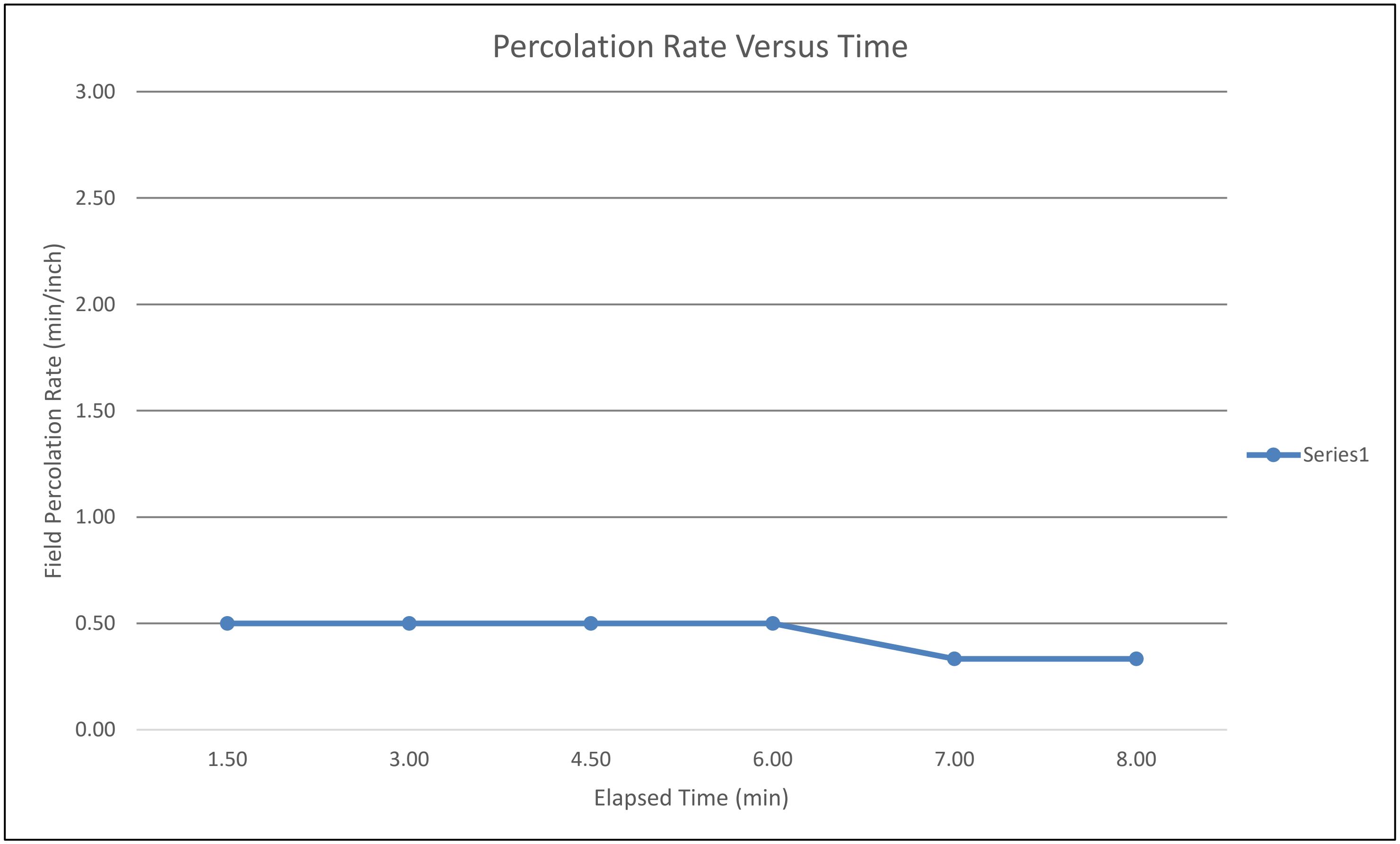


Plate No.
30

Estimated Percolation Rate from Percolation Test Data, PT-16

Shaded cells contain calculated values.

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-16
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	9:13	9:17	3.50	3.00	13.00	3.50	10.00	0.00	10.00	0.35	171.43
Presoak 2	9:20	9:29	9.00	3.00	13.00	12.50	10.00	0.00	10.00	0.90	66.67
1	9:33	9:36	3.00	7.00	10.00	3.00	6.00	3.00	3.00	1.00	60.00
2	9:39	9:42	3.00	7.00	10.00	6.00	6.00	3.00	3.00	1.00	60.00
3	9:44	9:47	3.00	7.00	10.00	9.00	6.00	3.00	3.00	1.00	60.00
4	9:51	9:54	3.00	7.00	10.00	12.00	6.00	3.00	3.00	1.00	60.00
5	9:57	10:00	3.00	7.00	10.00	15.00	6.00	3.00	3.00	1.00	60.00
6	10:02	10:05	3.00	7.00	10.00	18.00	6.00	3.00	3.00	1.00	60.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**1.00**
Recommended Design Percolation Rate, (inches/hour)	**60.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t/\Delta d$

Plate No.
31

Percolation Rate versus Time, PT-16

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-16
Test Location	Lot # 2
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

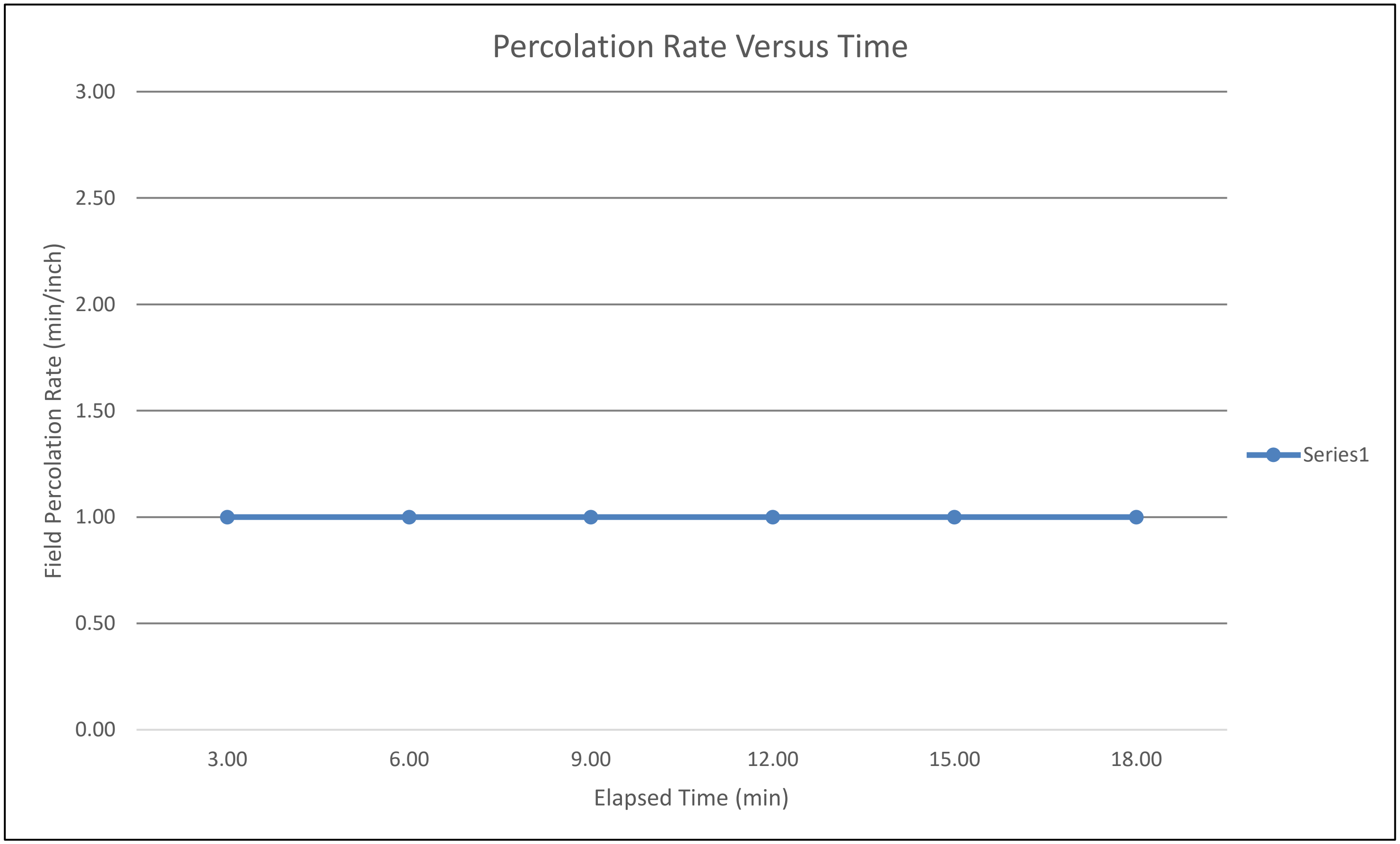


Plate No.
32

Estimated Percolation Rate from Percolation Test Data, PT-17

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-17
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	9:13	9:17	1.50	3.00	13.00	1.50	10.00	0.00	10.00	0.15	400.00
Presoak 2	9:20	9:29	2.50	3.00	13.00	4.00	10.00	0.00	10.00	0.25	240.00
1	9:33	9:36	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	9:39	9:42	1.00	7.00	10.00	1.50	6.00	3.00	3.00	0.33	180.00
3	9:44	9:47	1.00	7.00	10.00	2.50	6.00	3.00	3.00	0.33	180.00
4	9:51	9:54	1.00	7.00	10.00	3.50	6.00	3.00	3.00	0.33	180.00
5	9:57	10:00	1.00	7.00	10.00	4.50	6.00	3.00	3.00	0.33	180.00
6	10:02	10:05	1.00	7.00	10.00	5.50	6.00	3.00	3.00	0.33	180.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.33**
Recommended Design Percolation Rate, (inches/hour)	**180.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t/\Delta d$

Percolation Rate versus Time, PT-17

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-17
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

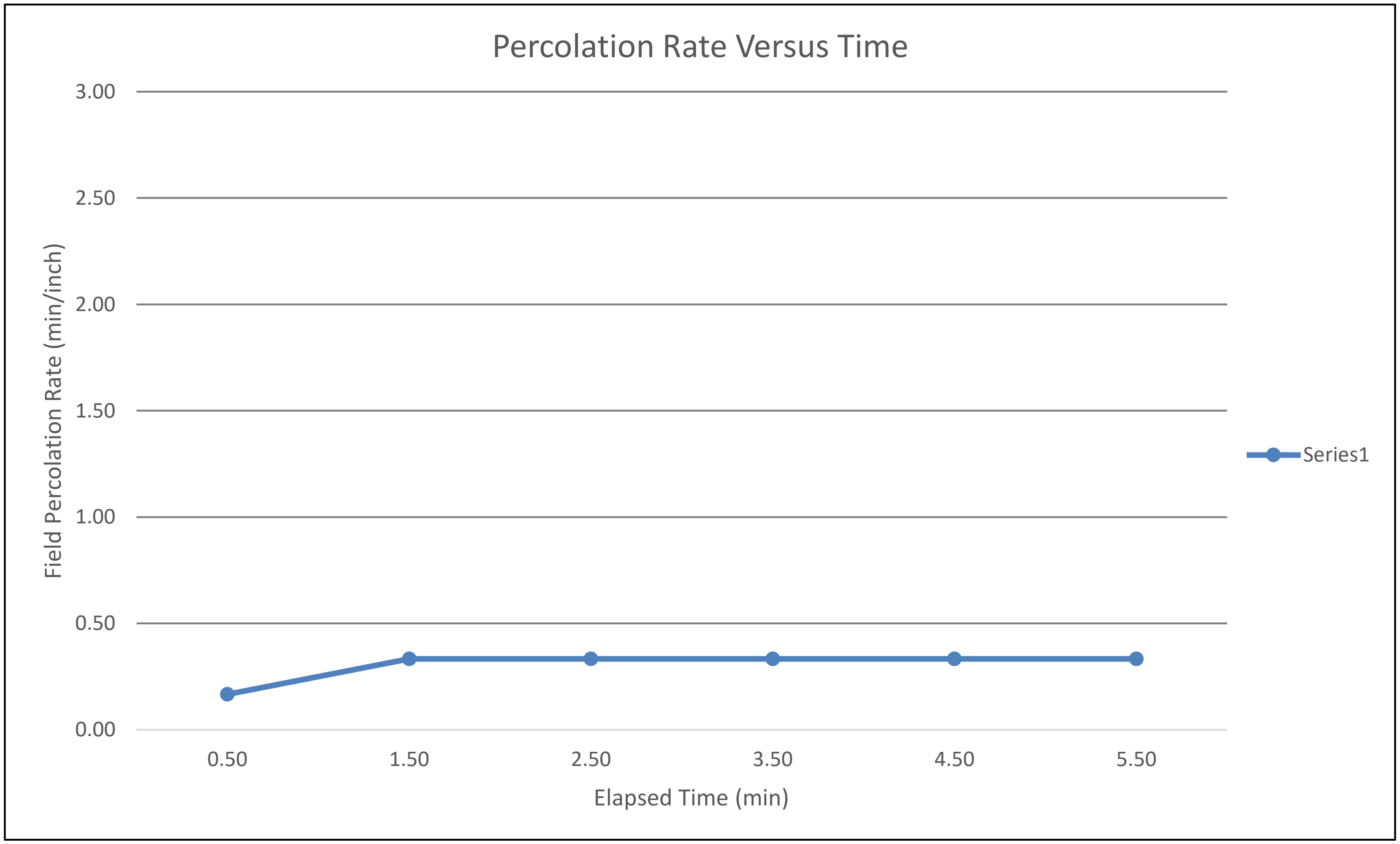


Plate No.
34

Estimated Percolation Rate from Percolation Test Data, PT-18

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-18
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	11:30	11:32	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	11:35	11:37	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
1	11:41	11:42	1.00	7.00	10.00	1.00	6.00	3.00	3.00	0.33	180.00
2	11:44	11:45	1.00	7.00	10.00	2.00	6.00	3.00	3.00	0.33	180.00
3	11:48	11:49	1.00	7.00	10.00	3.00	6.00	3.00	3.00	0.33	180.00
4	11:51	11:52	1.00	7.00	10.00	4.00	6.00	3.00	3.00	0.33	180.00
5	11:54	11:56	1.50	7.00	10.00	5.50	6.00	3.00	3.00	0.50	120.00
6	11:58	12:00	1.50	7.00	10.00	7.00	6.00	3.00	3.00	0.50	120.00
7	12:03	12:05	1.50	7.00	10.00	9.50	6.00	3.00	3.00	0.50	120.00
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.50**
Recommended Design Percolation Rate, (inches/hour)	**120.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Plate No.
35

Percolation Rate versus Time, PT-18

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-18
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

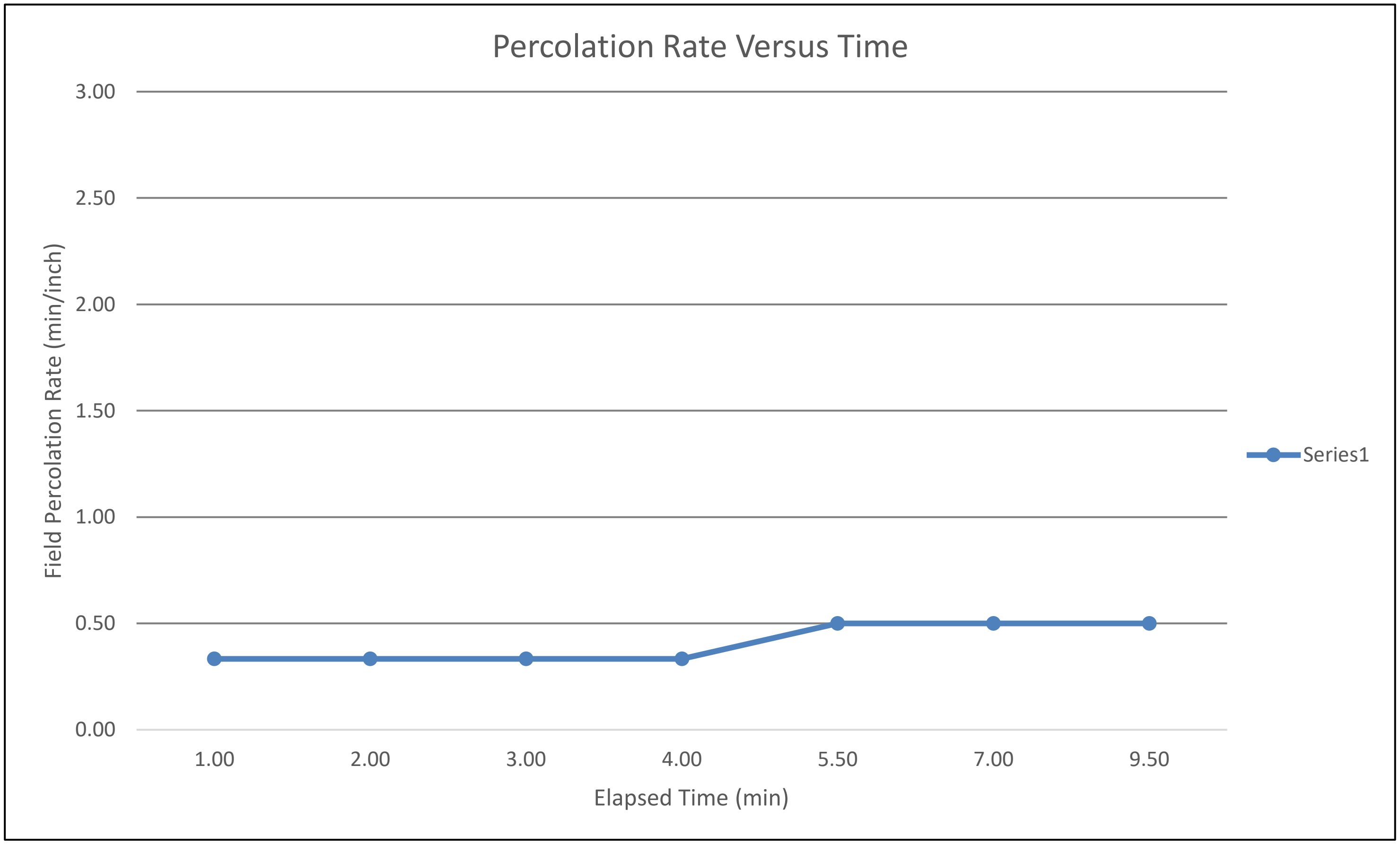


Plate No.
36

Estimated Percolation Rate from Percolation Test Data, PT-19

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-19
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	12:25	12:27	1.50	3.00	13.00	1.50	10.00	0.00	10.00	0.15	400.00
Presoak 2	12:29	12:31	1.50	3.00	13.00	3.00	10.00	0.00	10.00	0.15	400.00
1	12:34	12:35	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	12:38	12:39	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	12:42	12:43	1.00	7.00	10.00	2.00	6.00	3.00	3.00	0.33	180.00
4	12:45	12:46	1.00	7.00	10.00	3.00	6.00	3.00	3.00	0.33	180.00
5	12:49	12:51	1.50	7.00	10.00	4.50	6.00	3.00	3.00	0.50	120.00
6	12:54	12:56	2.00	7.00	10.00	6.50	6.00	3.00	3.00	0.67	90.00
7	12:58	13:00	2.00	7.00	10.00	8.50	6.00	3.00	3.00	0.67	90.00
8	13:02	13:04	2.00	7.00	10.00	10.50	6.00	3.00	3.00	0.67	90.00
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.67**
Recommended Design Percolation Rate, (inches/hour)	**90.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-19

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-19
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

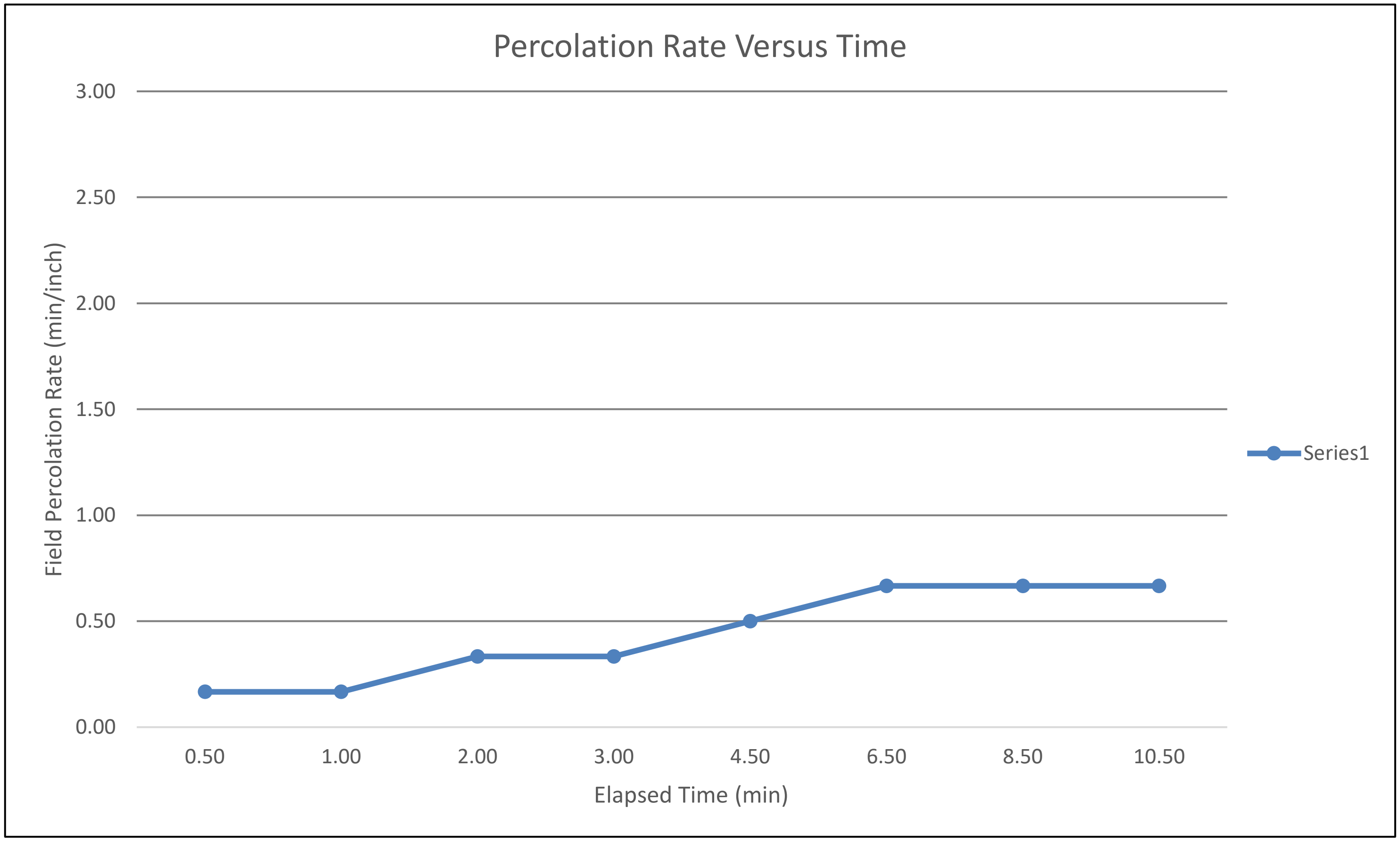


Plate No.
38

Estimated Percolation Rate from Percolation Test Data, PT-20

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-20
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	13:19	13:22	2.50	3.00	13.00	2.50	10.00	0.00	10.00	0.25	240.00
Presoak 2	13:25	13:32	6.50	3.00	13.00	9.00	10.00	0.00	10.00	0.65	92.31
1	13:34	13:37	3.00	7.00	10.00	3.00	6.00	3.00	3.00	1.00	60.00
2	13:39	13:42	3.00	7.00	10.00	6.00	6.00	3.00	3.00	1.00	60.00
3	13:44	13:47	3.50	7.00	10.00	9.50	6.00	3.00	3.00	1.17	51.43
4	13:49	13:53	4.00	7.00	10.00	13.50	6.00	3.00	3.00	1.33	45.00
5	13:56	14:01	4.50	7.00	10.00	18.00	6.00	3.00	3.00	1.50	40.00
6	14:03	14:08	5.00	7.00	10.00	23.00	6.00	3.00	3.00	1.67	36.00
7	14:10	14:15	5.00	7.00	10.00	28.00	6.00	3.00	3.00	1.67	36.00
8	14:17	14:22	5.00	7.00	10.00	33.00	6.00	3.00	3.00	1.67	36.00
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**1.67**
Recommended Design Percolation Rate, (inches/hour)	**36.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Plate No.
39

Percolation Rate versus Time, PT-20

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-20
Test Location	Lot # 1
Personnel	Catherine Nelson
Presoak Date	2/2/2023
Test Date	2/2/2023

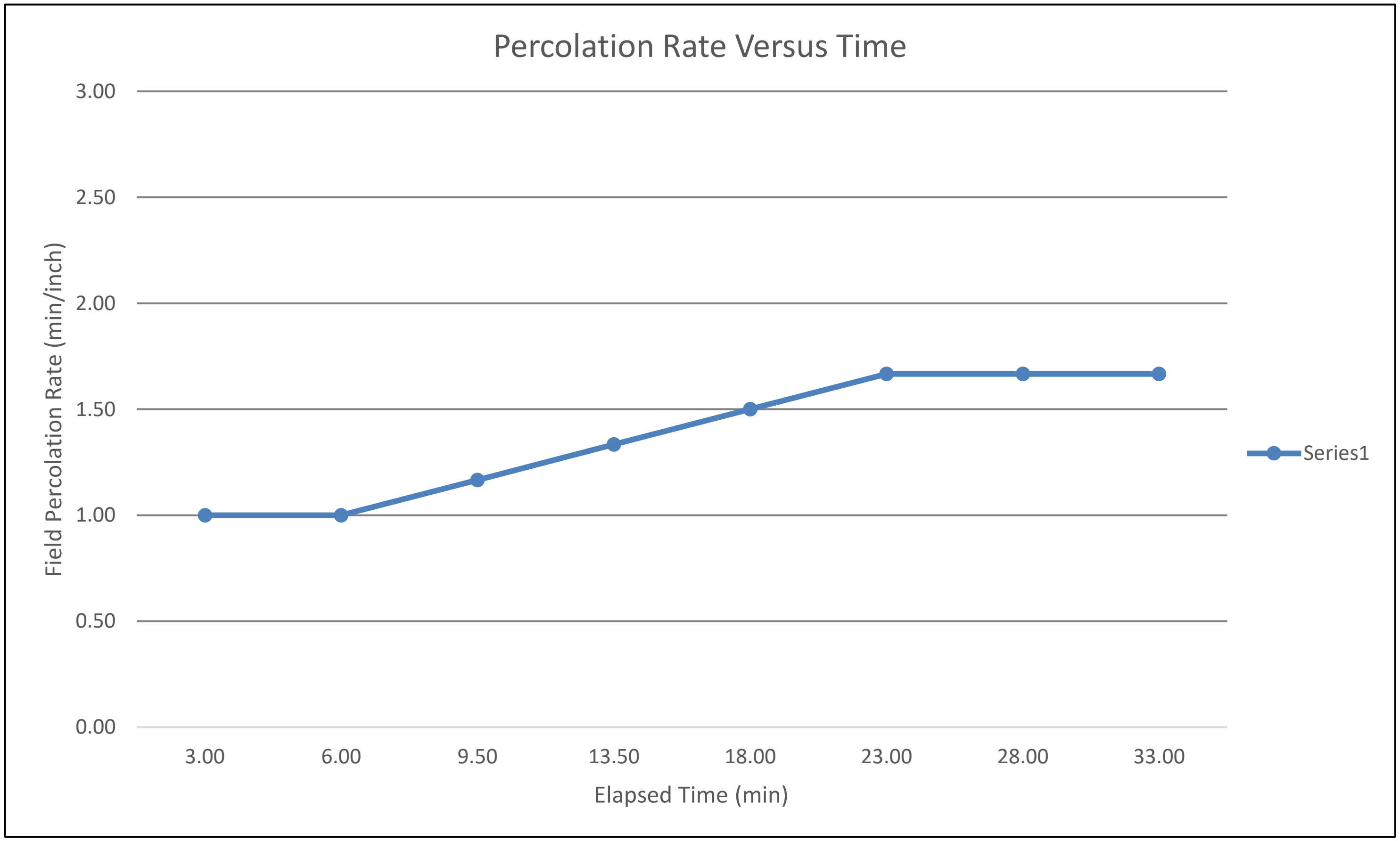


Plate No.
40

Estimated Percolation Rate from Percolation Test Data, PT-21

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-21
Test Location	Lot # 8
Personnel	Catherine Nelson/JD Hightower
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	6:07	6:09	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	6:11	6:15	4.00	3.00	13.00	6.00	10.00	0.00	10.00	0.40	150.00
1	6:17	6:19	1.50	7.00	10.00	1.50	6.00	3.00	3.00	0.50	120.00
2	6:21	6:23	2.00	7.00	10.00	3.50	6.00	3.00	3.00	0.67	90.00
3	6:25	6:28	2.50	7.00	10.00	6.00	6.00	3.00	3.00	0.83	72.00
4	6:30	6:33	3.00	7.00	10.00	9.00	6.00	3.00	3.00	1.00	60.00
5	6:36	6:39	2.50	7.00	10.00	11.50	6.00	3.00	3.00	0.83	72.00
6	6:42	6:45	2.50	7.00	10.00	13.00	6.00	3.00	3.00	0.83	72.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.83**
Recommended Design Percolation Rate, (inches/hour)	**72.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-21

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-21
Test Location	Lot # 8
Personnel	Catherine Nelson/JD Hightower
Presoak Date	2/8/2023
Test Date	2/8/2023

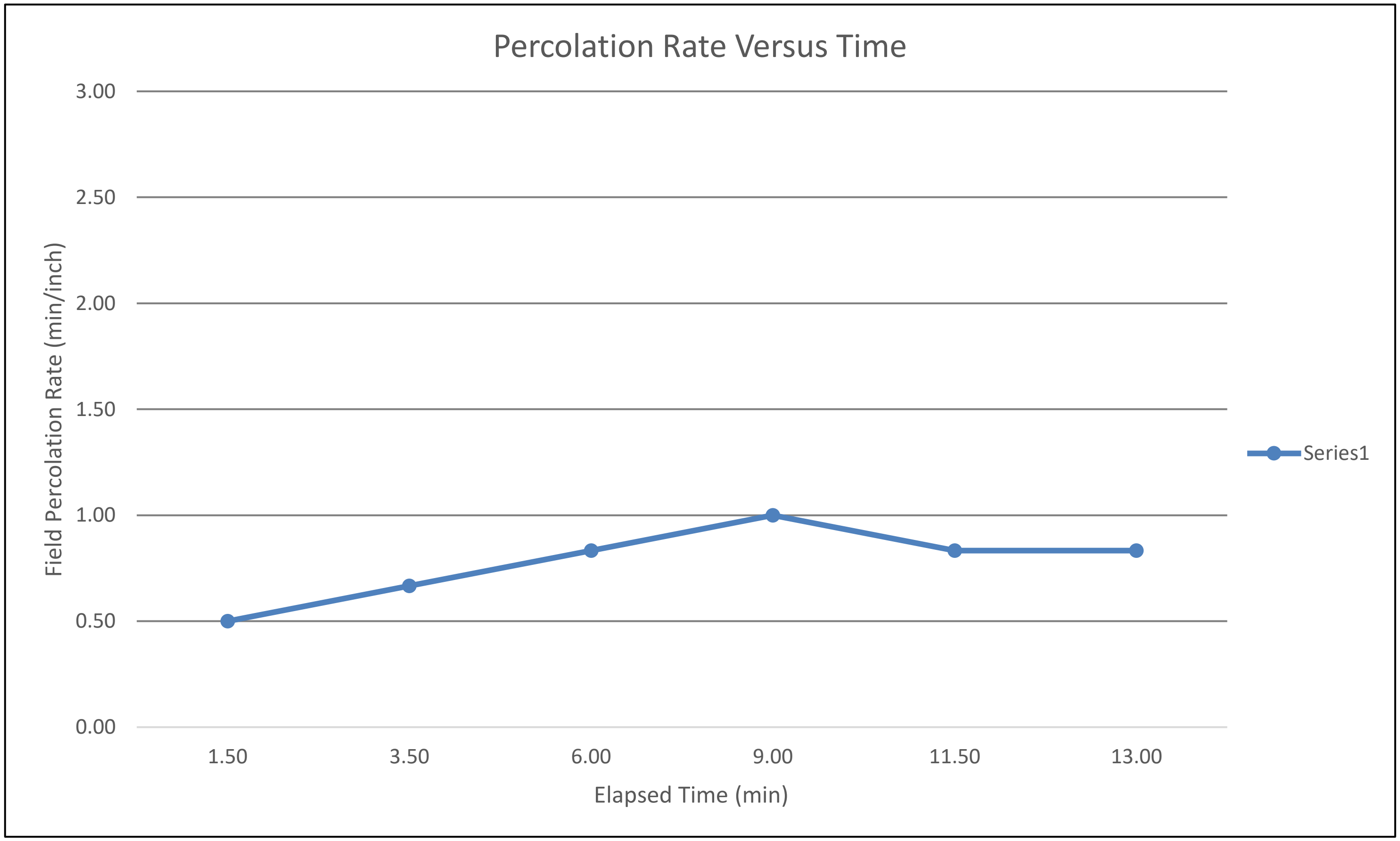


Plate No.
42

Estimated Percolation Rate from Percolation Test Data, PT-22

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-22
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	7:04	7:06	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	7:07	7:09	2.00	3.00	13.00	4.00	10.00	0.00	10.00	0.20	300.00
1	7:12	7:13	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	7:15	7:16	1.00	7.00	10.00	1.50	6.00	3.00	3.00	0.33	180.00
3	7:18	7:19	1.00	7.00	10.00	2.50	6.00	3.00	3.00	0.33	180.00
4	7:21	7:22	1.00	7.00	10.00	3.50	6.00	3.00	3.00	0.33	180.00
5	7:24	7:25	1.00	7.00	10.00	4.50	6.00	3.00	3.00	0.33	180.00
6	7:27	7:28	1.00	7.00	10.00	5.50	6.00	3.00	3.00	0.33	180.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.33**
Recommended Design Percolation Rate, (inches/hour)	**180.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-22

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-22
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

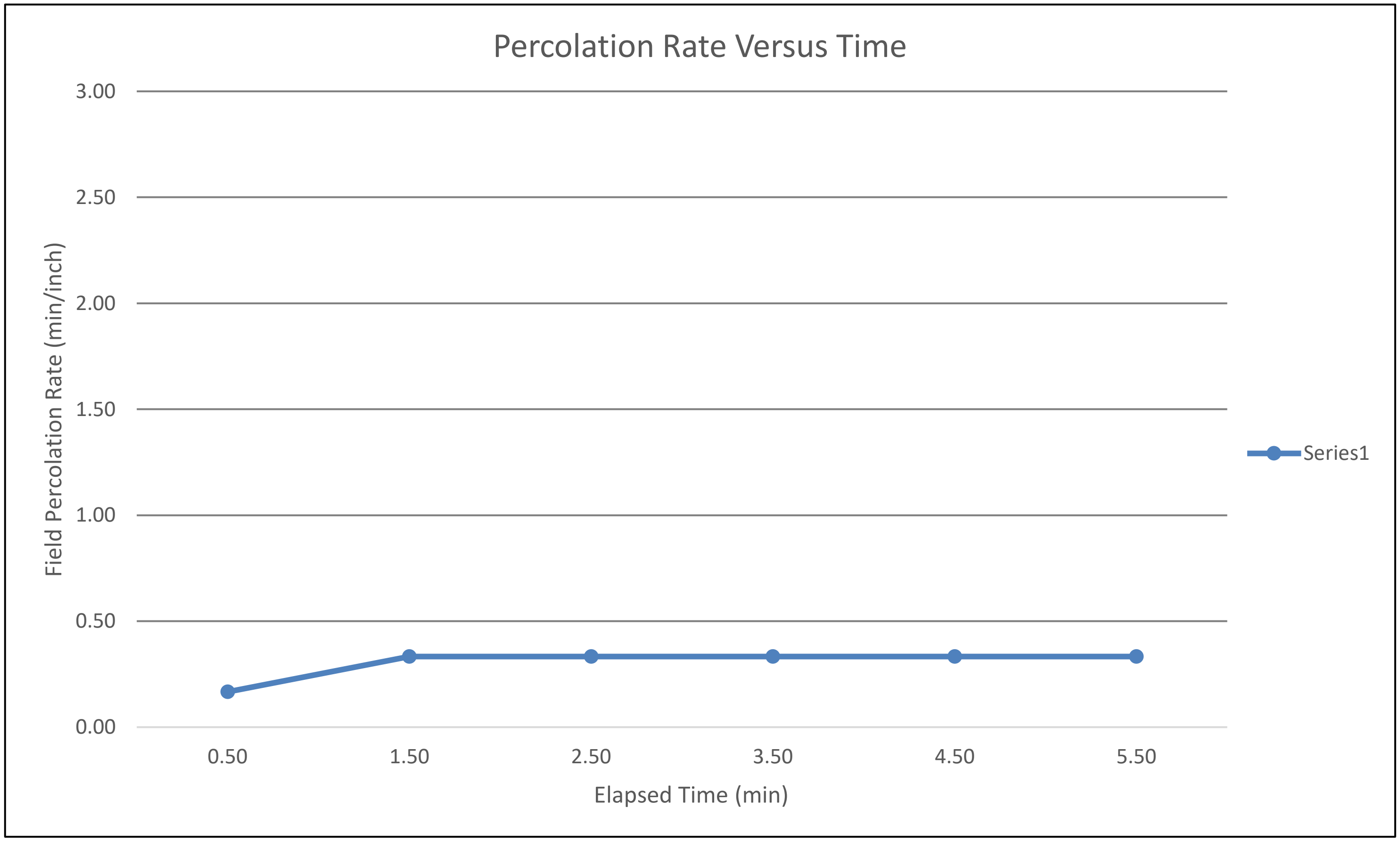


Plate No.
44

Estimated Percolation Rate from Percolation Test Data, PT-23

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-23
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	8:00	8:02	1.50	3.00	13.00	1.50	10.00	0.00	10.00	0.15	400.00
Presoak 2	8:03	8:05	2.00	3.00	13.00	3.50	10.00	0.00	10.00	0.20	300.00
1	8:06	8:07	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	8:08	8:08	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	8:09	8:09	1.00	7.00	10.00	2.00	6.00	3.00	3.00	0.33	180.00
4	8:10	8:10	1.00	7.00	10.00	3.00	6.00	3.00	3.00	0.33	180.00
5	8:11	8:13	1.50	7.00	10.00	4.50	6.00	3.00	3.00	0.50	120.00
6	8:13	8:15	1.50	7.00	10.00	6.00	6.00	3.00	3.00	0.50	120.00
7	8:15	8:17	1.50	7.00	10.00	7.50	6.00	3.00	3.00	0.50	120.00
8											0.50
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.50**
Recommended Design Percolation Rate, (inches/hour)	**120.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-23

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-23
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

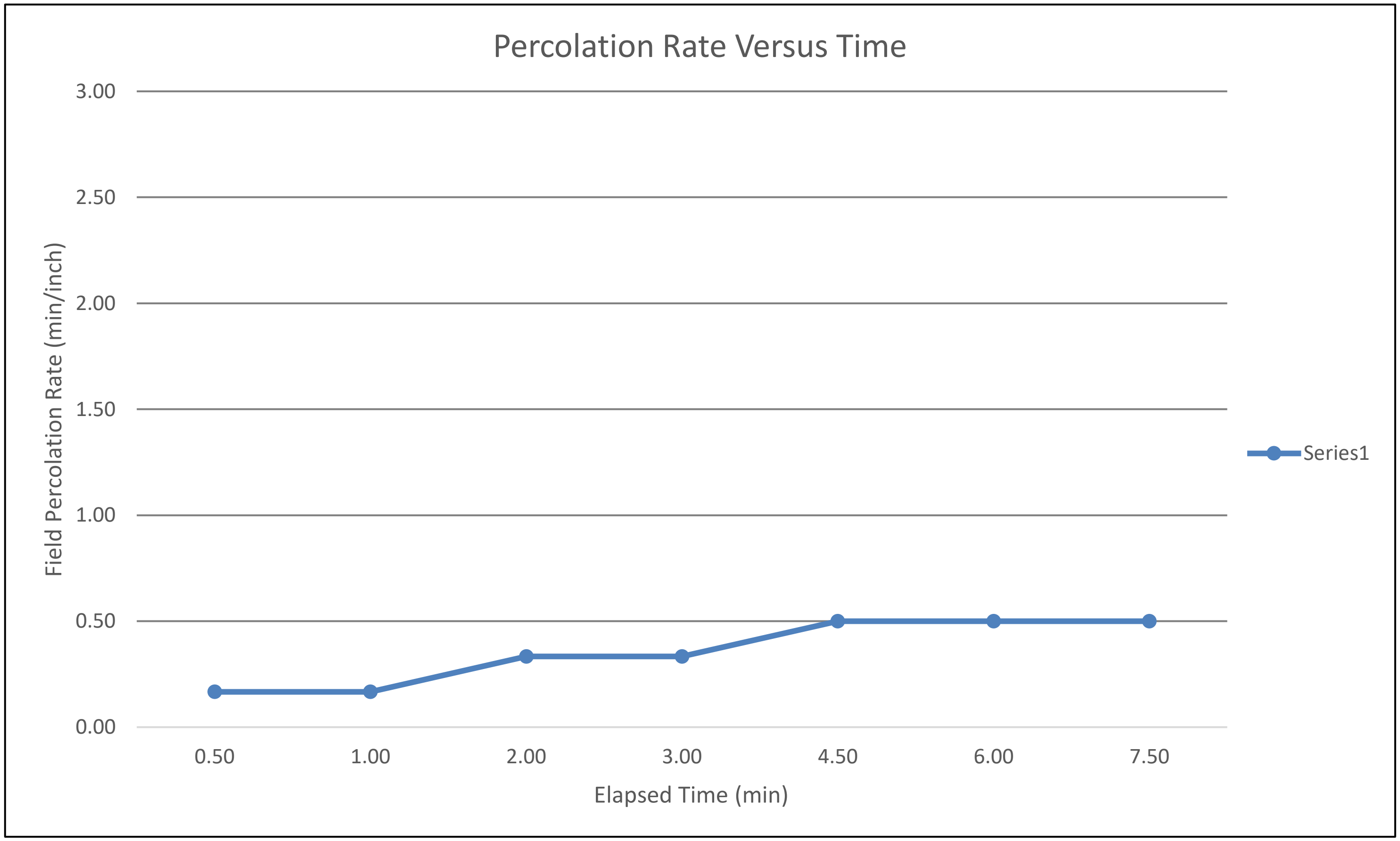


Plate No.
46

Estimated Percolation Rate from Percolation Test Data, PT-24

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-24
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	8:34	8:35	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	8:37	8:39	1.50	3.00	13.00	2.50	10.00	0.00	10.00	0.15	400.00
1	8:41	8:41	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	8:43	8:44	1.00	7.00	10.00	1.50	6.00	3.00	3.00	0.33	180.00
3	8:47	8:48	1.00	7.00	10.00	2.50	6.00	3.00	3.00	0.33	180.00
4	8:50	8:52	1.50	7.00	10.00	4.00	6.00	3.00	3.00	0.50	120.00
5	8:55	8:57	1.50	7.00	10.00	5.50	6.00	3.00	3.00	0.50	120.00
6	8:58	9:00	1.50	7.00	10.00	7.00	6.00	3.00	3.00	0.50	120.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.50**
Recommended Design Percolation Rate, (inches/hour)	**120.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

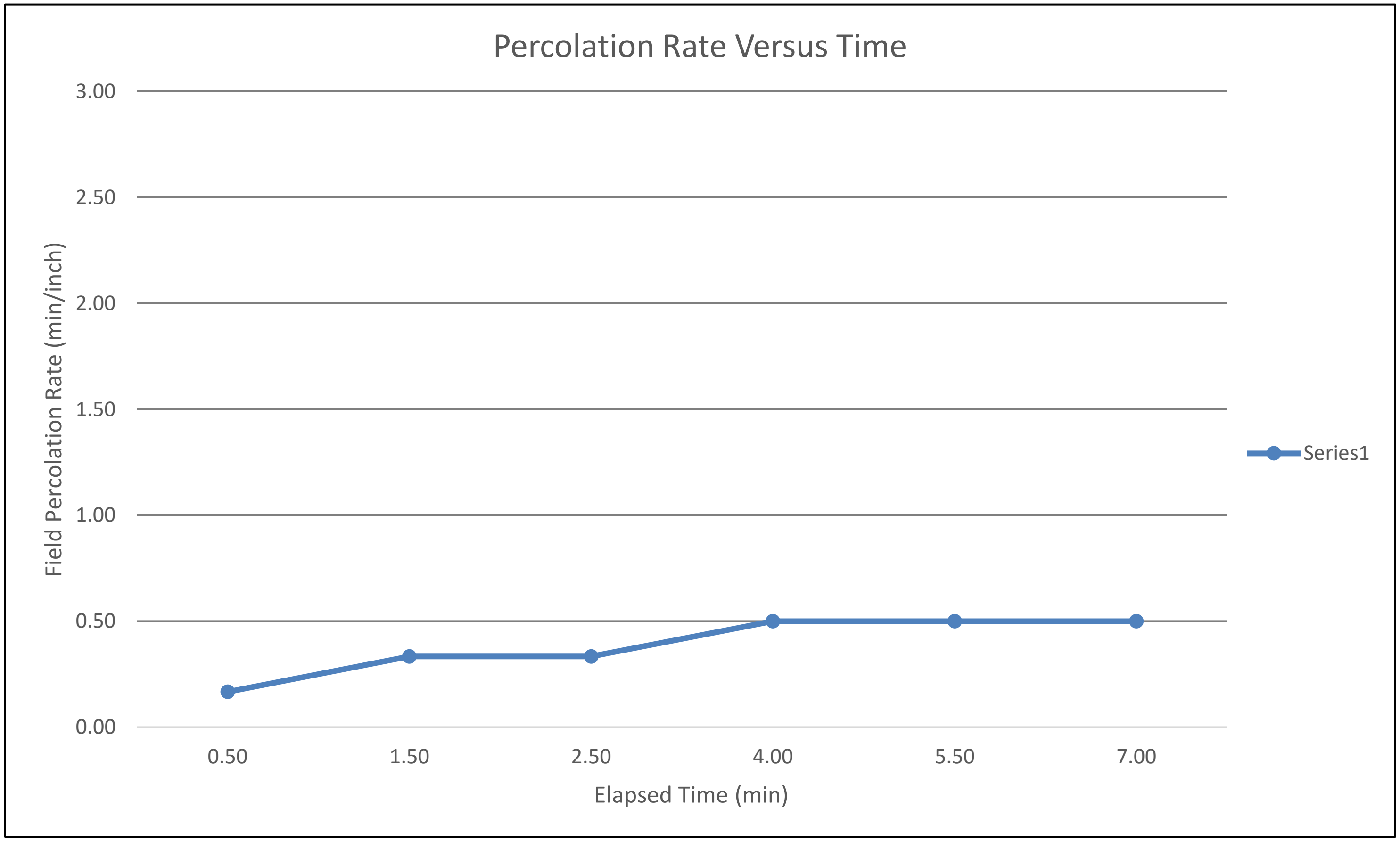
$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-24

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-24
Test Location	Lot # 8
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023



Estimated Percolation Rate from Percolation Test Data, PT-25

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-25
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	9:21	9:24	2.50	3.00	13.00	2.50	10.00	0.00	10.00	0.25	240.00
Presoak 2	9:26	9:29	3.00	3.00	13.00	5.50	10.00	0.00	10.00	0.30	200.00
1	9:32	9:34	2.50	7.00	10.00	2.50	6.00	3.00	3.00	0.83	72.00
2	9:36	9:39	3.00	7.00	10.00	5.50	6.00	3.00	3.00	1.00	60.00
3	9:41	9:46	5.00	7.00	10.00	10.50	6.00	3.00	3.00	1.67	36.00
4	9:48	9:54	6.00	7.00	10.00	16.50	6.00	3.00	3.00	2.00	30.00
5	9:57	10:03	6.50	7.00	10.00	23.00	6.00	3.00	3.00	2.17	27.69
6	10:05	10:12	7.50	7.00	10.00	30.50	6.00	3.00	3.00	2.50	24.00
7	10:15	10:22	7.50	7.00	10.00	38.00	6.00	3.00	3.00	2.50	24.00
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**2.50**
Recommended Design Percolation Rate, (inches/hour)	**24.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Plate No.
49

Percolation Rate versus Time, PT-25

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-25
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

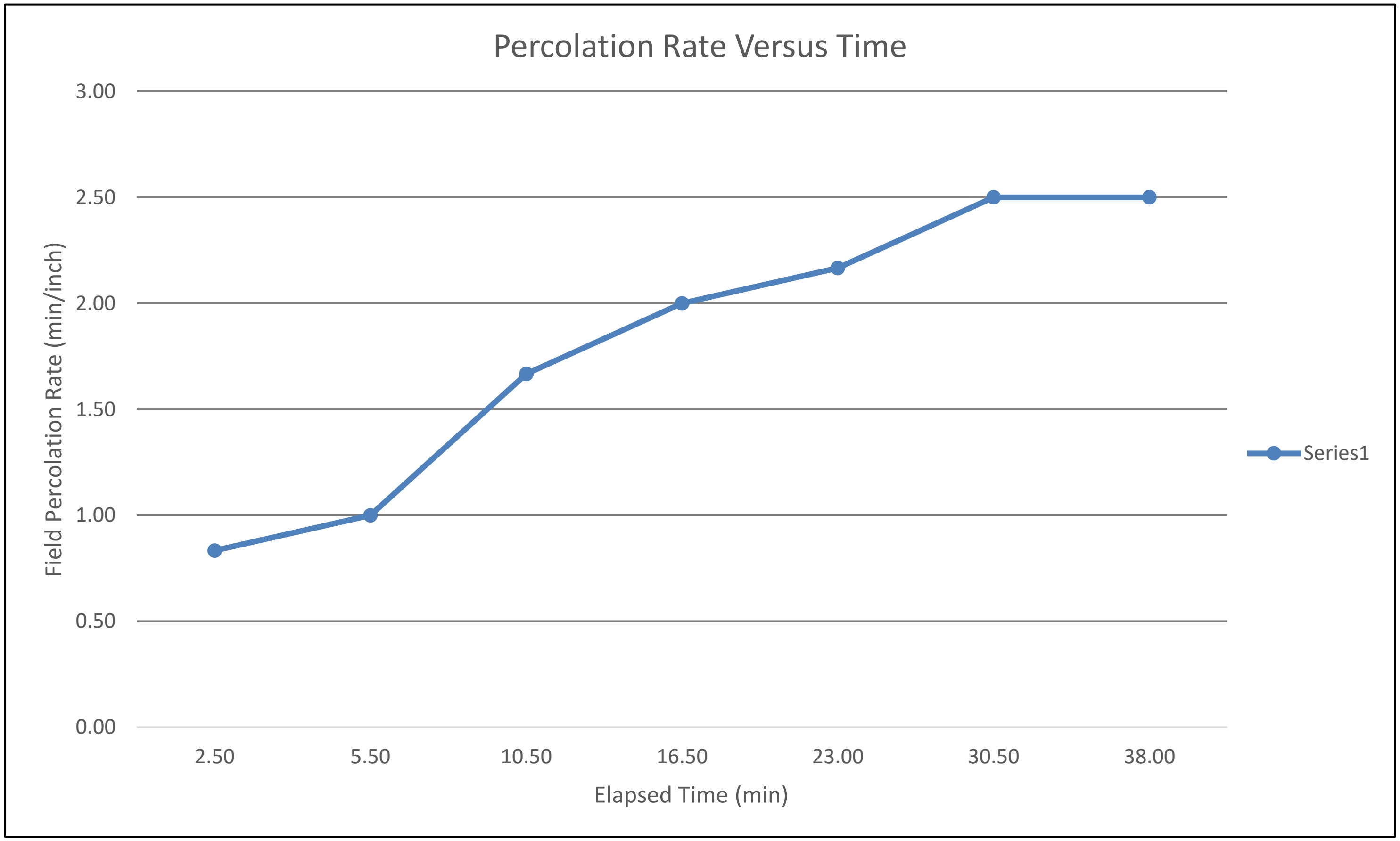


Plate No.
50

Estimated Percolation Rate from Percolation Test Data, PT-26

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-26
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	10:38	10:43	5.00	3.00	13.00	5.00	10.00	0.00	10.00	0.50	120.00
Presoak 2	10:44	10:53	9.50	3.00	13.00	14.50	10.00	0.00	10.00	0.95	63.16
1	10:54	10:58	4.50	7.00	10.00	4.50	6.00	3.00	3.00	1.50	40.00
2	10:59	11:05	5.50	7.00	10.00	10.00	6.00	3.00	3.00	1.83	32.73
3	11:06	11:15	9.00	7.00	10.00	19.00	6.00	3.00	3.00	3.00	20.00
4	11:15	11:24	9.00	7.00	10.00	28.00	6.00	3.00	3.00	3.00	20.00
5	11:28	11:35	9.00	7.00	10.00	37.00	6.00	3.00	3.00	3.00	20.00
6	11:37	11:46	9.00	7.00	10.00	46.00	6.00	3.00	3.00	3.00	20.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**3.00**
Recommended Design Percolation Rate, (inches/hour)	**20.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-26

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-26
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

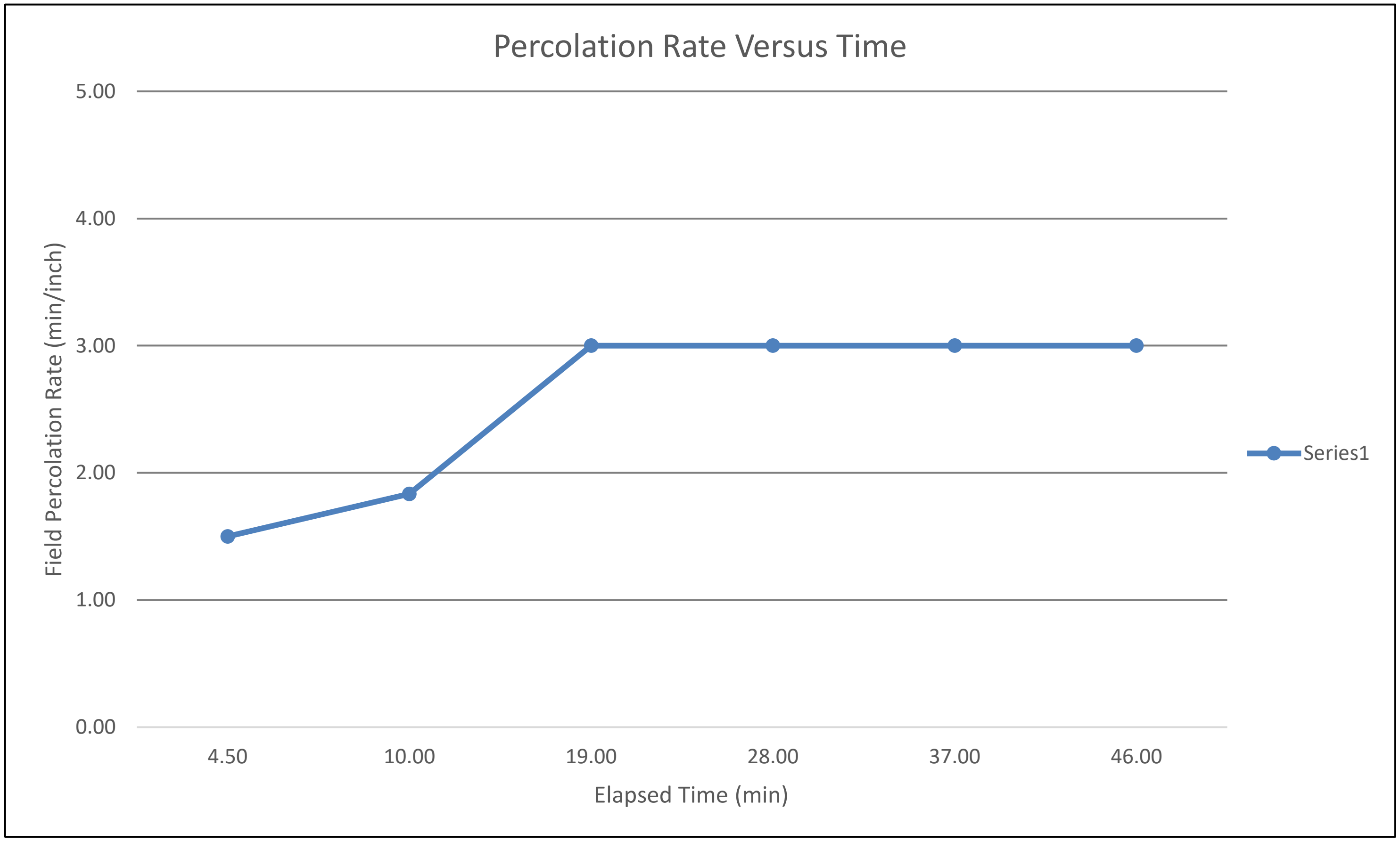


Plate No.
52

Estimated Percolation Rate from Percolation Test Data, PT-27

Shaded cells contain calculated values.

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-27
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	12:06	12:07	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	12:07	12:08	1.00	3.00	13.00	2.00	10.00	0.00	10.00	0.10	600.00
1	12:10	12:10	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	12:11	12:11	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	12:13	12:13	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	12:15	12:15	0.50	7.00	10.00	2.00	6.00	3.00	3.00	0.17	360.00
5	12:17	12:17	0.50	7.00	10.00	2.50	6.00	3.00	3.00	0.17	360.00
6	12:19	12:19	0.50	7.00	10.00	3.00	6.00	3.00	3.00	0.17	360.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t / \Delta d$

Plate No.
53

Percolation Rate versus Time, PT-27

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-27
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

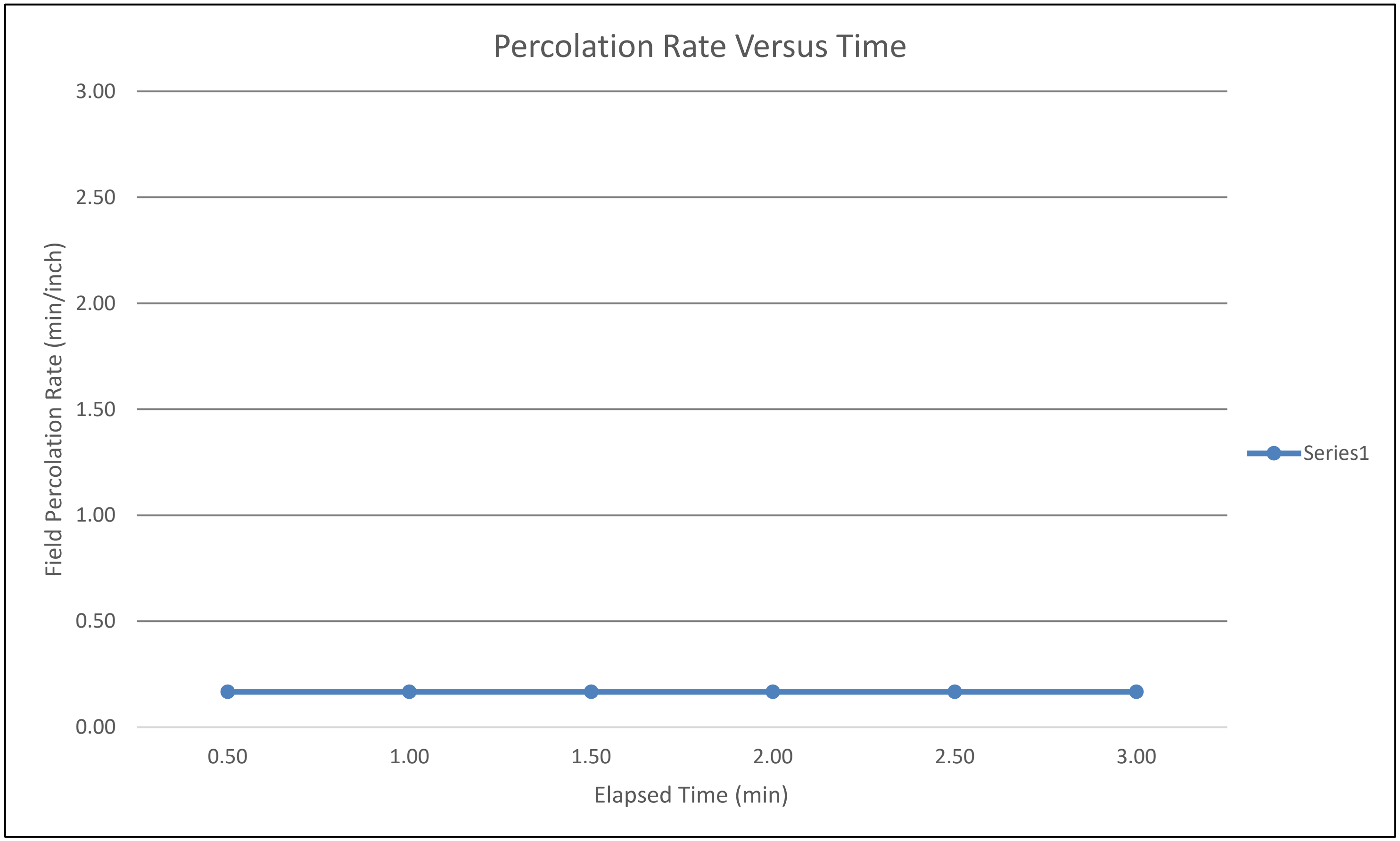


Plate No.
54

Estimated Percolation Rate from Percolation Test Data, PT-28

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-28
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	12:35	12:37	2.00	3.00	13.00	2.00	10.00	0.00	10.00	0.20	300.00
Presoak 2	12:39	12:41	2.50	3.00	13.00	4.50	10.00	0.00	10.00	0.25	240.00
1	12:42	12:43	1.50	7.00	10.00	1.50	6.00	3.00	3.00	0.50	120.00
2	12:45	12:47	2.00	7.00	10.00	3.50	6.00	3.00	3.00	0.67	90.00
3	12:49	12:50	1.50	7.00	10.00	5.00	6.00	3.00	3.00	0.50	120.00
4	12:51	12:53	2.00	7.00	10.00	7.00	6.00	3.00	3.00	0.67	90.00
5	12:54	12:56	2.00	7.00	10.00	9.00	6.00	3.00	3.00	0.67	90.00
6	12:57	12:59	2.00	7.00	10.00	11.00	6.00	3.00	3.00	0.67	90.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.67**
Recommended Design Percolation Rate, (inches/hour)	**90.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Plate No.
55

Percolation Rate versus Time, PT-28

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-28
Test Location	Lot # 7
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

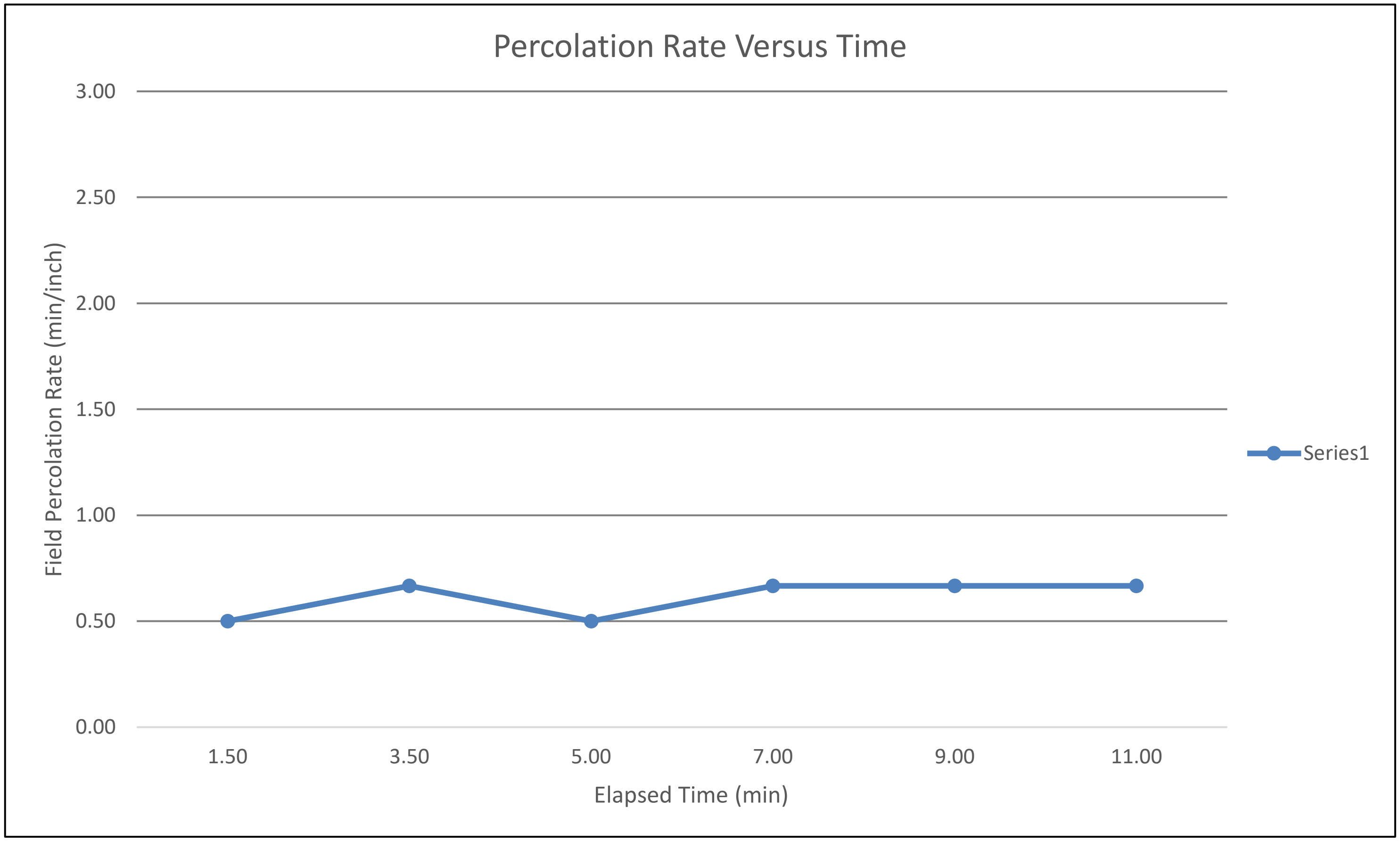


Plate No.
56

Estimated Percolation Rate from Percolation Test Data, PT-29

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-29
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)			3
Total Depth of Test hole, D_T (inches)			13
Inside Diameter of Pipe, I (inches)			6.00
Outside Diameter of Pipe, O (inches)			6.21
Trench Depth to Top of Perc Test (in)			4
Factor of Safety (FOS), F			1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	13:18	13:20	2.50	3.00	13.00	2.50	10.00	0.00	10.00	0.25	240.00
Presoak 2	13:22	13:25	3.50	3.00	13.00	6.00	10.00	0.00	10.00	0.35	171.43
1	13:27	13:29	2.00	7.00	10.00	2.00	6.00	3.00	3.00	0.67	90.00
2	13:31	13:33	2.00	7.00	10.00	4.00	6.00	3.00	3.00	0.67	90.00
3	13:35	13:37	2.50	7.00	10.00	6.50	6.00	3.00	3.00	0.83	72.00
4	13:40	13:42	2.50	7.00	10.00	9.00	6.00	3.00	3.00	0.83	72.00
5	13:43	13:45	2.50	7.00	10.00	11.50	6.00	3.00	3.00	0.83	72.00
6	13:49	13:51	2.50	7.00	10.00	14.00	6.00	3.00	3.00	0.83	72.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.83**
Recommended Design Percolation Rate, (inches/hour)	**72.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t / \Delta d$

Percolation Rate versus Time, PT-29

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-29
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

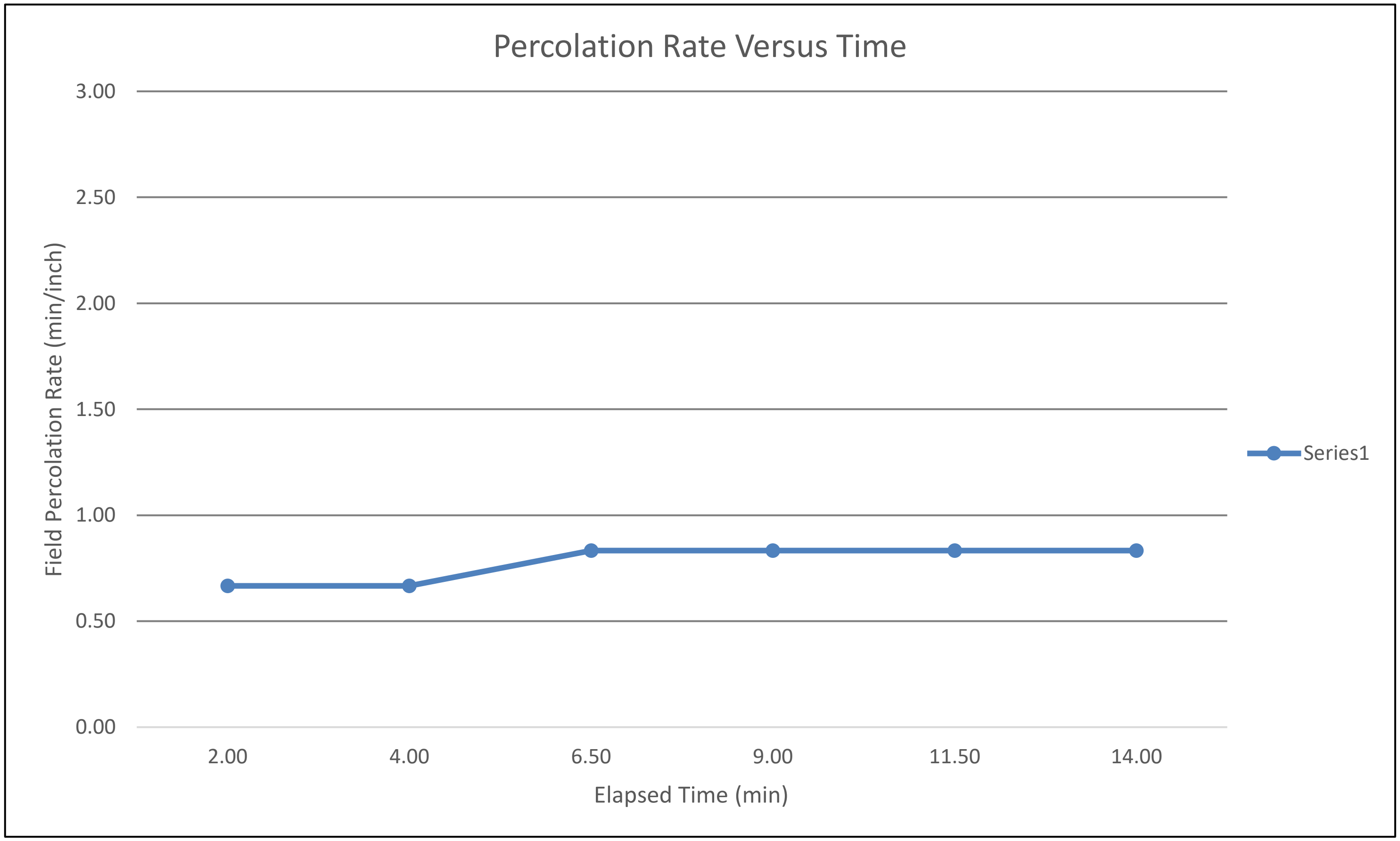


Plate No.
58

Estimated Percolation Rate from Percolation Test Data, PT-30

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-30
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	14:25	14:26	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	14:27	14:28	1.00	3.00	13.00	2.00	10.00	0.00	10.00	0.10	600.00
1	14:29	14:30	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	14:31	14:32	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	14:33	14:34	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	14:35	14:36	0.50	7.00	10.00	2.00	6.00	3.00	3.00	0.17	360.00
5	14:37	14:38	0.50	7.00	10.00	2.50	6.00	3.00	3.00	0.17	360.00
6	14:39	14:40	0.50	7.00	10.00	3.00	6.00	3.00	3.00	0.17	360.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t/\Delta d$

Percolation Rate versus Time, PT-30

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-30
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

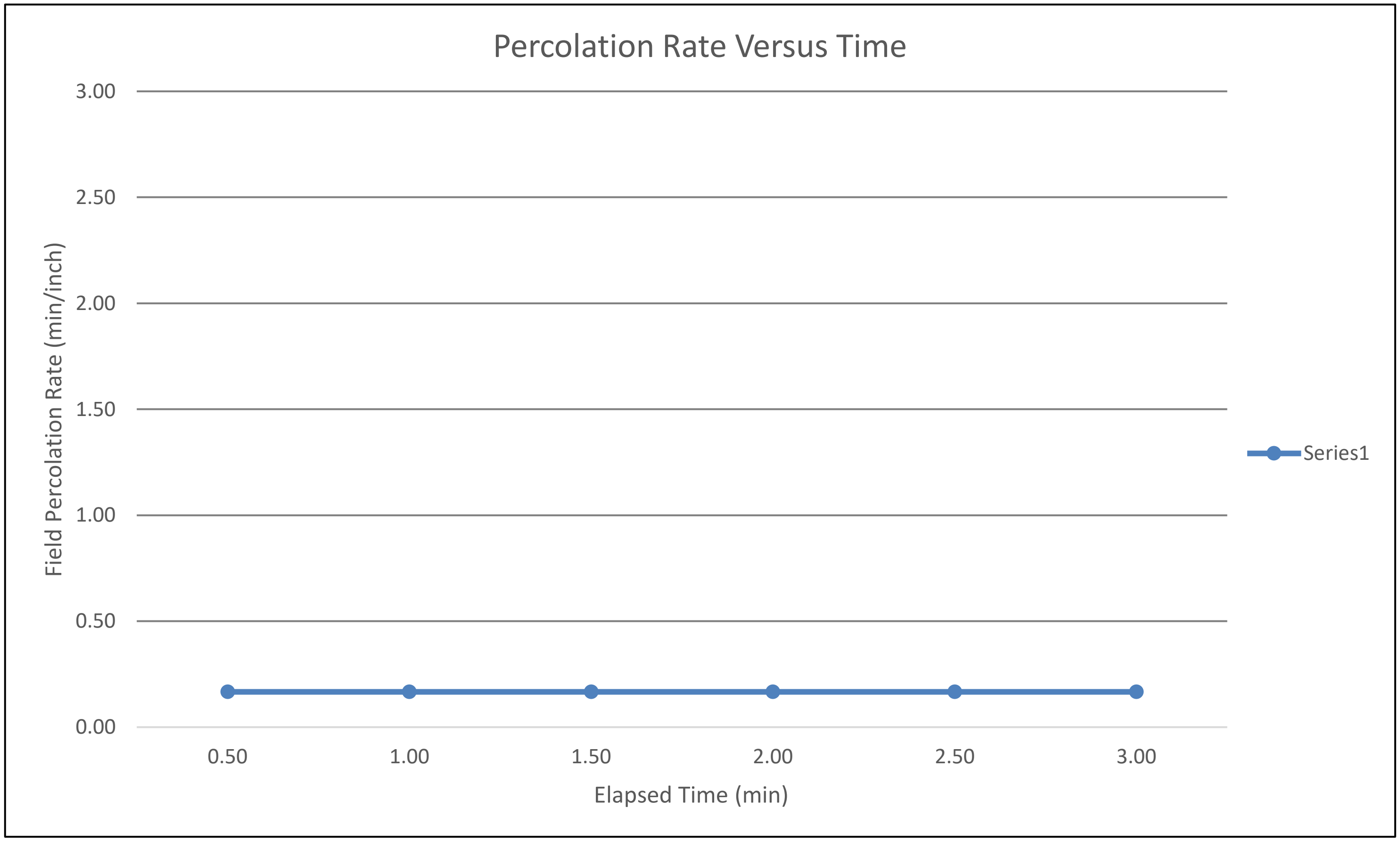


Plate No.
60

Estimated Percolation Rate from Percolation Test Data, PT-31

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-31
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	15:01	15:02	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	15:03	15:04	1.00	3.00	13.00	2.00	10.00	0.00	10.00	0.10	600.00
1	15:06	15:06	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	15:08	15:08	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	15:10	15:10	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	15:12	15:12	0.50	7.00	10.00	2.00	6.00	3.00	3.00	0.17	360.00
5	15:15	15:15	0.50	7.00	10.00	2.50	6.00	3.00	3.00	0.17	360.00
6	15:17	15:20	0.50	7.00	10.00	3.00	6.00	3.00	3.00	0.17	360.00
7	15:20	15:20	0.50	7.00	10.00	3.50	6.00	3.00	3.00	0.17	360.00
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$
$d_f = D_T - D_f$
$\Delta d = d_i - d_f$
$MPI = \Delta t/\Delta d$

Plate No.
61

Percolation Rate versus Time, PT-31

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-31
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

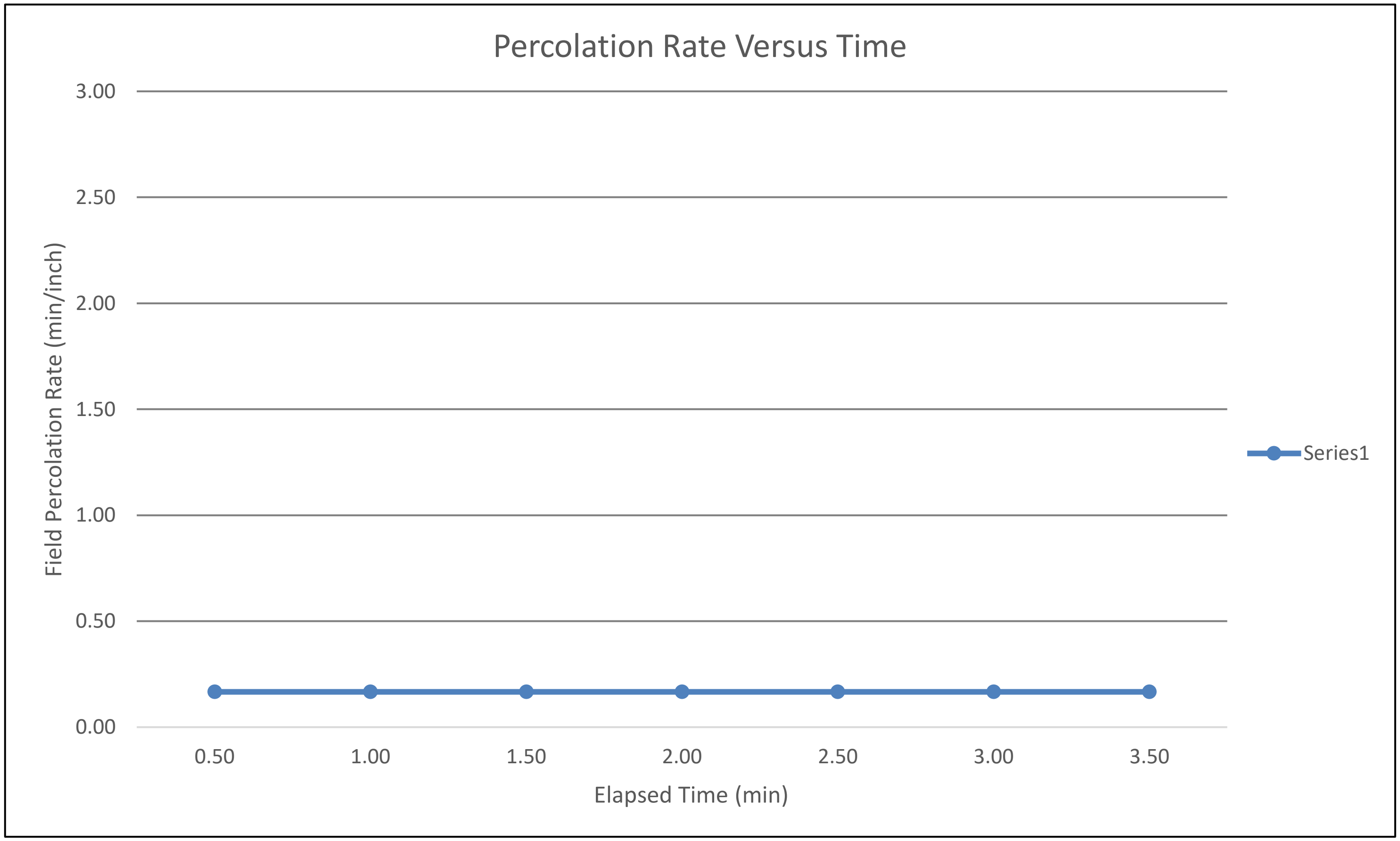


Plate No.
62

Estimated Percolation Rate from Percolation Test Data, PT-32

Shaded cells contain calculated values.

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-32
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

Test Hole Radius, r (inches)	3
Total Depth of Test hole, D_T (inches)	13
Inside Diameter of Pipe, I (inches)	6.00
Outside Diameter of Pipe, O (inches)	6.21
Trench Depth to Top of Perc Test (in)	4
Factor of Safety (FOS), F	1

Interval No.	Initial Time Filling Water t_i (hour and minutes)	Final Time Reading Water t_f (hour and minutes)	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, d_f (inches)	Elapsed Time (min)	Initial Height of Water, d_i (inches)	Final Height of Water, d_f (inches)	Change in Height of Water, Δd (inches)	Field Percolation Rate, MPI (min/inch)	Design Percolation Rate (inches/hr)
Presoak 1	15:01	15:02	1.00	3.00	13.00	1.00	10.00	0.00	10.00	0.10	600.00
Presoak 2	15:03	15:04	1.00	3.00	13.00	2.00	10.00	0.00	10.00	0.10	600.00
1	15:06	15:06	0.50	7.00	10.00	0.50	6.00	3.00	3.00	0.17	360.00
2	15:08	15:08	0.50	7.00	10.00	1.00	6.00	3.00	3.00	0.17	360.00
3	15:10	15:10	0.50	7.00	10.00	1.50	6.00	3.00	3.00	0.17	360.00
4	15:12	15:12	0.50	7.00	10.00	2.00	6.00	3.00	3.00	0.17	360.00
5	15:15	15:15	0.50	7.00	10.00	2.50	6.00	3.00	3.00	0.17	360.00
6	15:17	15:20	0.50	7.00	10.00	3.00	6.00	3.00	3.00	0.17	360.00
7											
8											
9											
10											

Field Percolation Rate, MPI (minutes/inch)	**0.17**
Recommended Design Percolation Rate, (inches/hour)	**360.00**

Percolation calculations are based on the Percolation Testing and Reporting Standards for Onsite Wastewater Treatment Systems (San Bernardino County Public Heatlth, Environmental Health Services; revised September, 2019)

$d_i = D_T - D_0$

$d_f = D_T - D_f$

$\Delta d = d_i - d_f$

$MPI = \Delta t/\Delta d$

Plate No.
63

Percolation Rate versus Time, PT-32

Project Name	Sunburst
Project Number	22-81-308-01
Test Number	PT-32
Test Location	Lot # 6
Personnel	Catherine Nelson
Presoak Date	2/8/2023
Test Date	2/8/2023

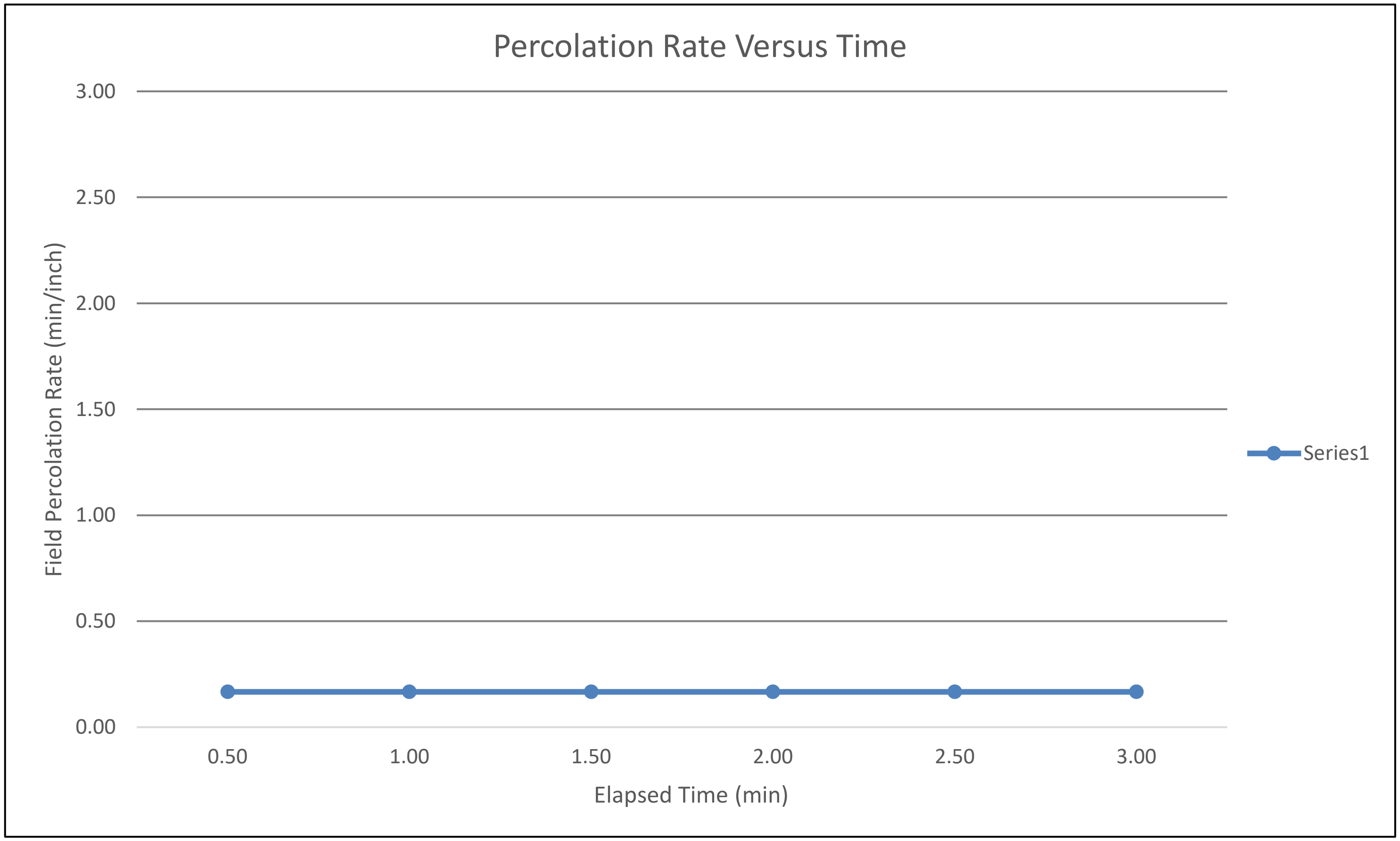


Plate No.
64

Appendix D

Liquefaction and Settlement Analyses

APPENDIX D

LIQUEFACTION AND SETTLEMENT ANALYSES

The subsurface data obtained from the borings BH-05 was used to evaluate the liquefaction potential and associated dry seismic settlement when subjected to ground shaking during earthquakes.

A simplified liquefaction hazard analysis was performed using the program SPTLIQ (InfraGEO Software, 2021) using the liquefaction triggering analysis method by Boulanger and Idriss (2014). A mode earthquake magnitude (M_W) of 7.29 was selected based on the results of seismic deaggregation analysis using the USGS interactive online tool (https://earthquake.usgs.gov/hazards/interactive/).

A peak ground acceleration (PGA_M) of 0.93 for the MCE design event, where g is the acceleration due to gravity, was selected for this analysis. The PGA_M was based on the CBC seismic design parameters presented in Section 7.2, *CBC 2022 Seismic Parameters.* The result of our analysis is presented on Plates No. D-1 through D-3 and summarized in the following table.

Table D-1, Estimated Dynamic Settlements

Location	Groundwater Conditions	Groundwater Depth (feet bgs)	Dry Seismic Settlement (inches)	Liquefaction Induced Settlement (inches)
BH-05	Current	>50	0.13	Negligible
	Historical	>50		

Based on our analysis, the project site has the potential for up to 0.13 inches of dry seismic settlement with negligible liquefaction induced settlement under groundwater conditions. The soil profile across the site is relatively similar. So, we anticipate that the total dynamic settlement will be uniform. We recommend that the planned structure be designed in anticipation of dynamic differential settlement of at least 0.5 inches in 40 horizontal feet.

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

PROJECT INFORMATION

Project Name	Sunburst Site Approximately 20-Acre
Project No.	22-81-308-01
Project Location	Joshua Tree, CA
Analyzed By	Mahmoud Suliman
Reviewed By	Hashmi Quazi

SELECTED METHODS OF ANALYSIS

Analysis Description	Liquefaction
Triggering of Liquefaction	Boulanger-Idriss (2014)
Severity of Liquefaction	LPI: Liquefaction Potential Index based on Iwasaki et al. (1978)
Seismic Compression Settlement (Dry/Unsaturated Soil)	Pradel (1998)
Liquefaction-Induced Settlement (Saturated Soil)	Ishihara and Yoshimine (1992)
Liquefaction-Induced Lateral Spreading	Zhang et al. (2004)
Residual Shear Strength of Liquefied Soil	Idriss and Boulanger (2008)

SEISMIC DESIGN PARAMETERS

Earthquake Moment Magnitude, M_w	7.29	
Peak Ground Acceleration, A_{max}	0.93	g
Factor of Safety Against Liquefaction, FS	1.20	

BORING DATA AND SITE CONDITIONS

Boring No.	BH-05	
Ground Surface Elevation	2,801.00	feet
Proposed Grade Elevation	2,801.00	feet
GWL Depth Measured During Test	52.00	feet
GWL Depth Used in Design	52.00	feet
Borehole Diameter	8.00	inches
Hammer Weight	140.00	pounds
Hammer Drop	30.00	inches
Hammer Energy Efficiency Ratio, ER (%)	86.00	%
Hammer Distance to Ground Surface	5.00	feet
Topographic Site Condition:	TSC1	(Level Ground with No Nearby Free Face)
- Ground Slope, S (%)		<<= Leave this blank
- Free Face Distance to Slope Height Ratio, (L/H)		<<= Leave this blank Set H to zero =>> 0.00 feet

INPUT SOIL PROFILE DATA

Depth to Top of Soil Layer (feet)	Depth to Bottom of Soil Layer (feet)	Material Type USCS Group Symbol (ASTM D2487)	Liquefaction Screening *Susceptible Soil? (Y, N)*	Total Soil Unit Weight γ_t (pcf)	Type of Soil Sampler	Field Blow Count N_{field} (blows/ft)	Fines Content FC (%)
0.00	5.00	SM	Y	105.1	SPT1	18.20	15.60
5.00	10.00	SM	Y	110.2	SPT1	30.00	9.90
10.00	15.00	SC	Y	121.0	SPT1	32.50	12.10
15.00	20.00	SC	Y	110.3	SPT1	32.50	12.00
20.00	25.00	SC	Y	110.3	SPT1	50.00	12.00
25.00	30.00	ML	Y	113.2	SPT1	32.50	12.00
30.00	35.00	ML	Y	113.2	SPT1	48.00	12.00
35.00	40.00	SM	Y	103.0	SPT1	32.50	12.00
40.00	45.00	SM	Y	103.0	SPT1	37.00	12.00
45.00	50.00	SM	Y	103.0	SPT1	32.50	12.00

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

PROJECT INFORMATION

Project Name	Sunburst Site Approximately 20-Acre
Project No.	22-81-308-01
Project Location	Joshua Tree, CA
Analyzed By	Mahmoud Suliman
Reviewed By	Hashmi Quazi

SEISMIC DESIGN PARAMETERS

Earthquake Moment Magnitude, M_w	7.29
Peak Ground Acceleration, A_{max}	0.93 g
Factor of Safety Against Liquefaction, FS	1.20

BORING DATA AND SITE CONDITIONS

Boring No.	BH-05
Ground Surface Elevation	2,801.00 feet
Proposed Grade Elevation	2,801.00 feet
GWL Depth Measured During Test	52.00 feet
GWL Depth Used in Design	52.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	86.00 %
Hammer Distance to Ground Surface	5.00 feet
Topographic Site Condition:	TSC1 (Level Ground with No Nearby Free Face)
- Ground Slope, S	0.00 %
- Free Face (L/H) Ratio	N/A H = 0 feet
Average Total Unit Weight of New Fill	120.00 pcf (assumed)

SUMMARY OF RESULTS

Severity of Liquefaction:

Total Thickness of Liquefiable Soils: 0.00 feet (cumulative total thickness in the upper 65 feet)

Liquefaction Potential Index (LPI): 0.00 *** (Very low risk, with no surface manifestation of liquefaction)

Seismic Ground Settlements:

	Analysis Method	Upper 30 feet	Upper 50 feet	Upper 65 feet	
Seismic Compression Settlement:	Pradel (1998)	0.13 inches	0.13 inches	0.13 inches	(Dry/Unsaturated Soils)
Liquefaction-Induced Settlement:	Ishihara and Yoshimine (1992)	0.00 inches	0.00 inches	0.00 inches	(Saturated Soils)
Total Seismic Settlement:		0.13 inches	0.13 inches	0.13 inches	

Seismic Lateral Displacements:

	Analysis Method	Upper 30 feet	Upper 50 feet	Upper 65 feet	
Cyclic Lateral Displacement:	Tokimatsu and Asaka (1998)	0.16 inches	0.16 inches	0.16 inches	(During Ground Shaking)
Lateral Spreading Displacement:	Zhang et al. (2004)	0.00 inches	0.00 inches	0.00 inches	(After Ground Shaking)

NOTES AND REFERENCES

\+ This method of analysis is based on observed seismic performance of level ground sites using correlation with normalized and fines-corrected SPT blow count, $(N_1)_{60cs} = f\{(N_1)_{60}, FC\}$ where $(N_1)_{60} = N_{field}\, C_N\, C_E\, C_B\, C_R\, C_S$

++ Liquefaction susceptibility screening is performed to identify soil layers assessed to be non-liquefiable based on laboratory test results using the criteria proposed by Cetin and Seed (2003), Bray and Sancio (2006), or Idriss and Boulanger (2008).

* FS_{liq} = Factor of Safety against liquefaction = (CRR/CSR), where CRR = $CRR_{7.5}$ MSF K_σ K_α , MSF = Magnitude Scaling Factor, $K_\sigma = f[(N_1)_{60}, \sigma'_{vo}]$, K_α =1.0, (level ground),
CSR = Cyclic Stress Ratio = $0.65\, A_{max}\, (\sigma_{vo}/\sigma'_{vo})\, r_d$, and $CRR_{7.5}$ = Cyclic Resistance Ratio is a function of $(N_1)_{60cs}$ and corrected for an earthquake magnitude M_w of 7.5.

** Residual strength values of liquefied soils are based on correlation with post-earthquake, normalized and fines-corrected SPT blow count derived by Idriss and Boulanger (2008).

*** Based on Iwasaki et al. (1978) and Toprak and Holzer (2003)

\+ Reference: Boulanger, R.W. and Idriss, I.M. (2014), "CPT and SPT Based Liquefaction Triggering Procedures," University of California Davis, Center for Geotechnical Modeling Report No. UCD/CGM-14/01, 1-134.

INPUT SOIL PROFILE DATA

Depth to Top of Soil Layer (feet)	Depth to Bottom of Soil Layer (feet)	Material Type USCS Group Symbol (ASTM D2487)	Liquefaction Susceptibility Screening ++ Susceptible Soil? (Y/N)	Total Soil Unit Weight γ_t (pcf)	Type of Soil Sampler	Field SPT Blow Count N_{field} (blows/ft)	Fines Content FC (%)
0.00	5.00	SM	Y	105.06	SPT1	18.20	15.60
5.00	10.00	SM	Y	110.20	SPT1	30.00	9.90
10.00	15.00	SC	Y	121.00	SPT1	32.50	12.10
15.00	20.00	SC	Y	110.25	SPT1	32.50	12.00
20.00	25.00	SC	Y	110.30	SPT1	50.00	12.00
25.00	30.00	ML	Y	113.20	SPT1	32.50	12.00
30.00	35.00	ML	Y	113.20	SPT1	48.00	12.00
35.00	40.00	SM	Y	103.00	SPT1	32.50	12.00
40.00	45.00	SM	Y	103.00	SPT1	37.00	12.00
45.00	50.00	SM	Y	103.00	SPT1	32.50	12.00

LIQUEFACTION TRIGGERING ANALYSIS BASED ON R.W. BOULANGER AND I.M. IDRISS (2014) METHOD +

Depth to Top of Soil Layer (feet)	Total Vert. Stress (Design) σ_{vo} (psf)	Effective Vert. Stress (Design) σ'_{vo} (psf)	SPT Corr. for Vert. Stress C_N	SPT Corr. for Hammer Energy C_E	SPT Corr. for Borehole Size C_B	SPT Corr. for Rod Length C_R	SPT Corr. for Sampling Method C_S	Corrected SPT Blow Count N_{60}	Normalized SPT Blow Count $(N_1)_{60}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Shear Stress Reduction Coefficient r_d	Correction for High Overburden Stress K_σ	Cyclic Stress Ratio CSR	Cyclic Resistance Ratio CRR	Factor of Safety * FS_{liq}	Liquefaction Analysis Results	Residual Shear Strength ** S_r (psf)	Seismic Porewater Pressure Ratio r_u (%)	Cumulative Seismic Settlement (inches)	Cumulative Cyclic Lateral Displacement (inches)	Cumulative Lateral Spreading Displacement (inches)
0.00	262.65	262.65	1.700	1.433	1.150	0.750	1.000	22.5	38.2	41.7	1.000	1.100	0.601			Unsaturated Soil			0.13	0.16	0.00
5.00	800.80	800.80	1.250	1.433	1.150	0.800	1.000	39.6	49.5	50.6	0.986	1.100	0.593			Unsaturated Soil			0.00	0.00	0.00
10.00	1,378.80	1,378.80	1.094	1.433	1.150	0.850	1.000	45.5	49.8	51.9	0.969	1.100	0.583			Unsaturated Soil			0.00	0.00	0.00
15.00	1,956.93	1,956.93	1.005	1.433	1.150	0.950	1.000	50.9	51.2	53.2	0.950	1.007	0.571			Unsaturated Soil			0.00	0.00	0.00
20.00	2,508.30	2,508.30	0.975	1.433	1.150	0.950	1.000	78.3	76.3	78.4	0.929	0.932	0.559			Unsaturated Soil			0.00	0.00	0.00
25.00	3,067.05	3,067.05	0.892	1.433	1.150	0.950	1.000	50.9	45.4	47.5	0.907	0.872	0.545			Unsaturated Soil			0.00	0.00	0.00
30.00	3,633.05	3,633.05	0.927	1.433	1.150	1.000	1.000	79.1	73.4	75.5	0.883	0.821	0.531			Unsaturated Soil			0.00	0.00	0.00
35.00	4,173.55	4,173.55	0.816	1.433	1.150	1.000	1.000	53.6	43.7	45.8	0.859	0.779	0.516			Unsaturated Soil			0.00	0.00	0.00
40.00	4,688.55	4,688.55	0.813	1.433	1.150	1.000	1.000	61.0	49.6	51.6	0.834	0.744	0.501			Unsaturated Soil			0.00	0.00	0.00
45.00	5,203.55	5,203.55	0.753	1.433	1.150	1.000	1.000	53.6	40.4	42.4	0.809	0.713	0.486			Unsaturated Soil			0.00	0.00	0.00

REFERENCES:

1. Boulanger, R.W. and Idriss, I.M. (2014), "CPT and SPT Based Liquefaction Triggering Procedures," University of California Davis, Center for Geotechnical Modeling Report No. UCD/CGM-14/01, 1-134.
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SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

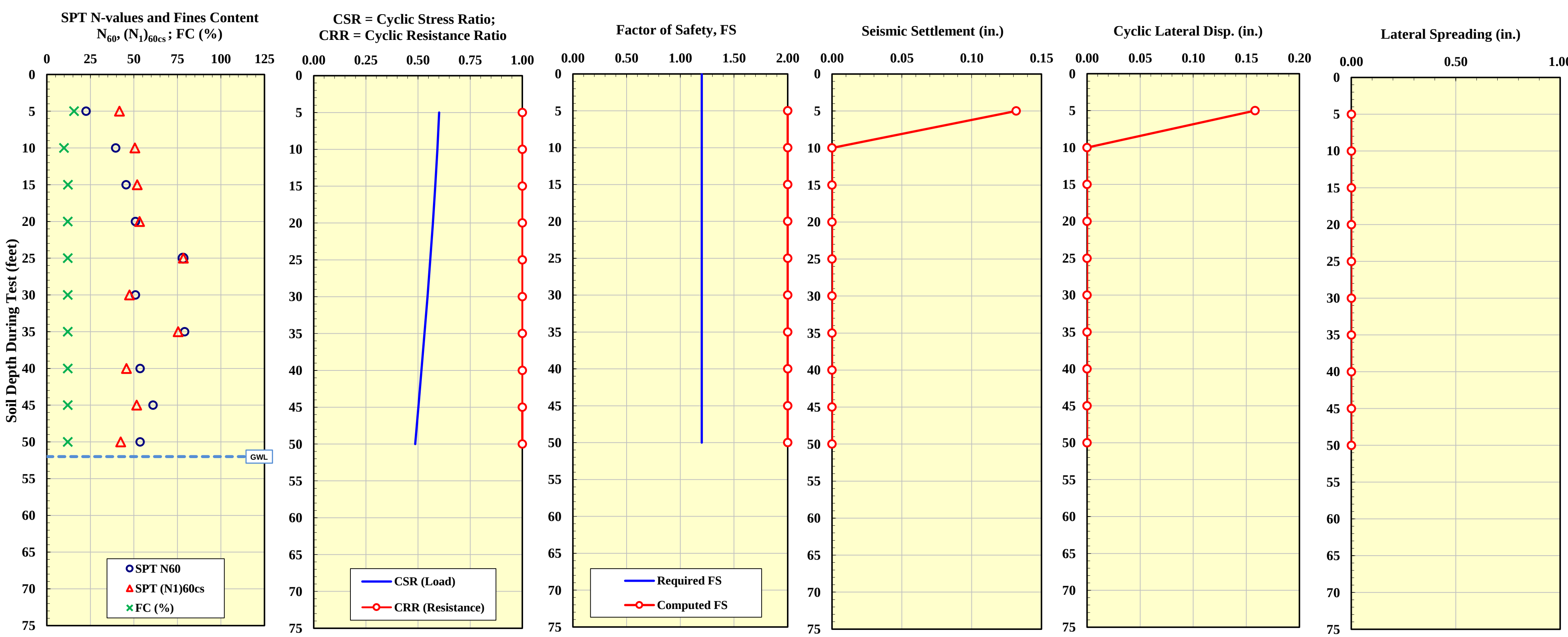
PROJECT INFORMATION	
Project Name	Sunburst Site Approximately 20-Acre
Project No.	22-81-308-01
Project Location	Joshua Tree, CA
Analyzed By	Mahmoud Suliman
Reviewed By	Hashmi Quazi

TOPOGRAPHIC CONDITIONS	
Ground Slope, S	0.00 %
Free Face (L/H) Ratio	N/A H = 0.00 feet

GROUNDWATER DATA	
GWL Depth Measured During Test	52.00 feet
GWL Depth Used in Design	52.00 feet

BORING DATA	
Boring No.	BH-05
Ground Surface Elevation	2,801.00 feet
Proposed Grade Elevation	2,801.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	86.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	7.29
Peak Ground Acceleration, A_{max}	0.93 g
Factor of Safety Against Liquefaction, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new NSHM Hazard Tool for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.175907

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

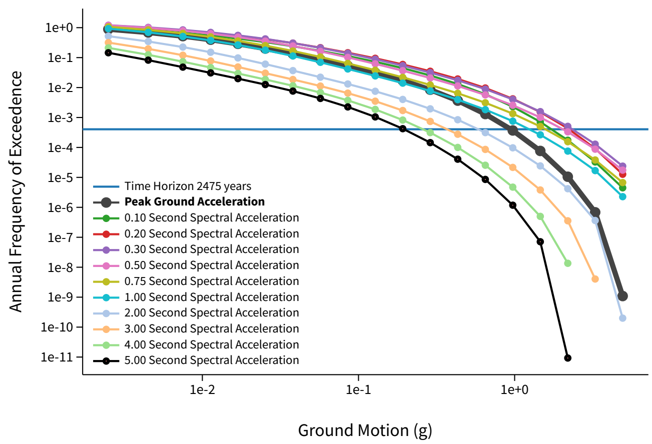
-116.310592

Site Class

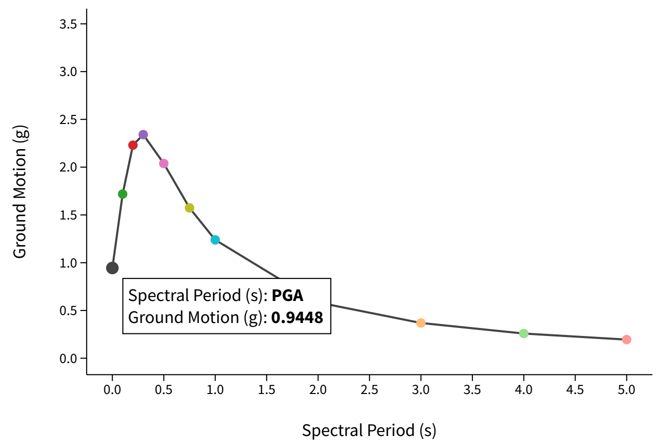
360 m/s (C/D boundary)

Hazard Curve

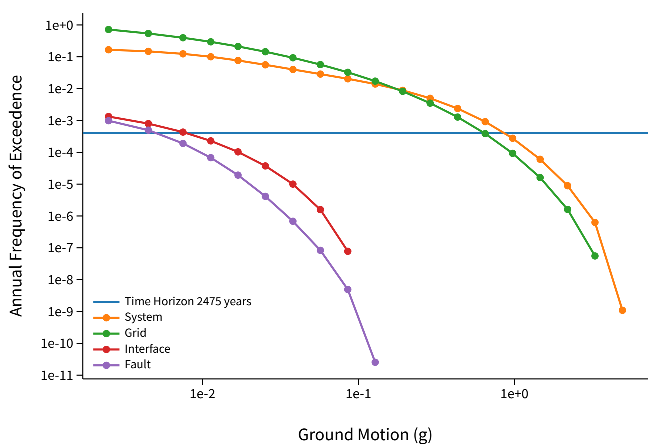
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

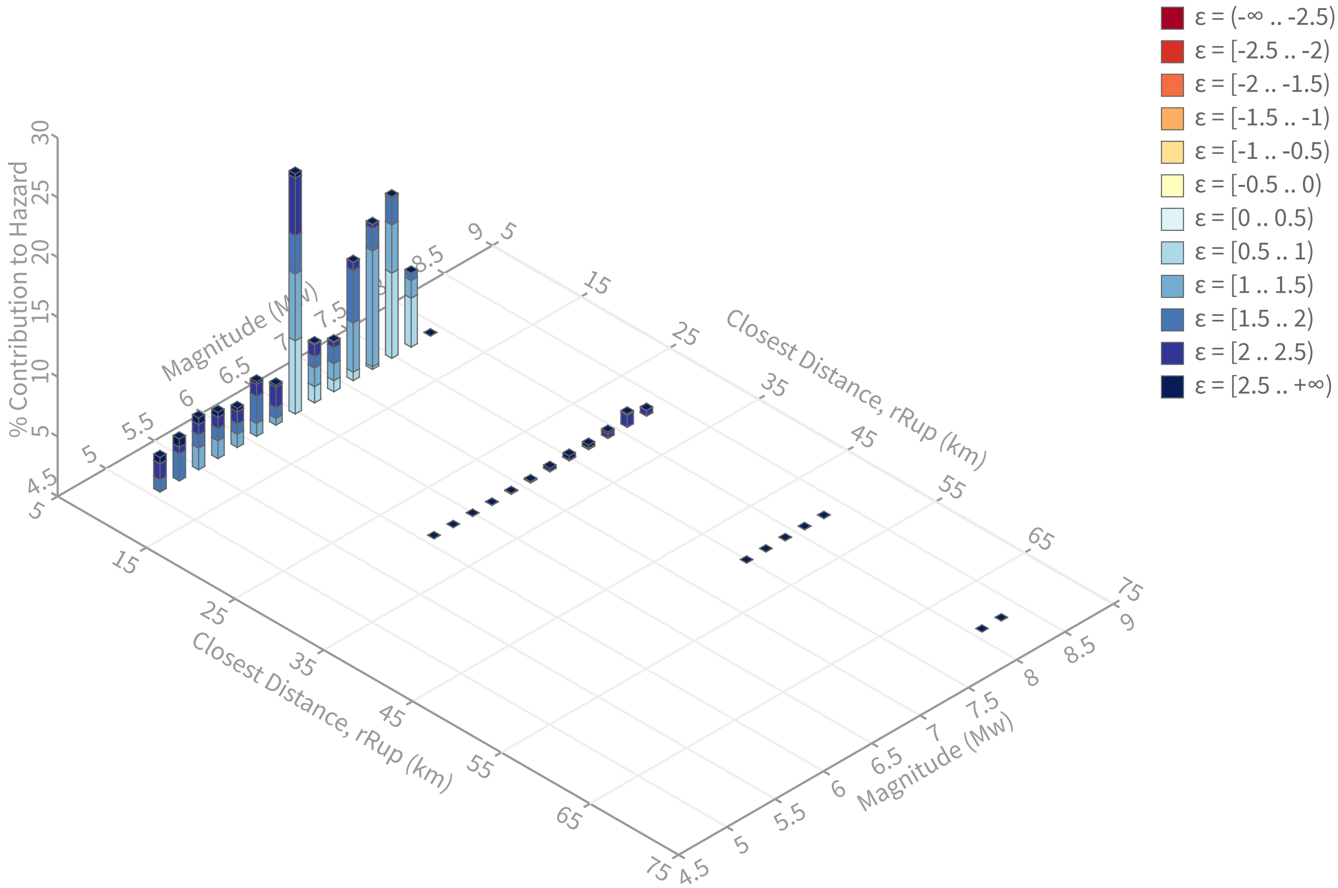


View Raw Data

Deaggregation

Component

Total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ε = [0 .. 0.5)
ε = [0.5 .. 1)
ε = [1 .. 1.5)
ε = [1.5 .. 2)
ε = [2 .. 2.5)
ε = [2.5 .. +∞)
% Contribution to Hazard
Magnitude (Mw)
Closest Distance, rRup (km)
Closest Distance, rRup (km)
Magnitude (Mw)

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.94481553 g

Recovered targets

Return period: 3008.2676 yrs
Exceedance rate: 0.00033241724 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.03 %

Mean (over all sources)

m: 6.74
r: 6.68 km
ε_0: 1.52 σ

Mode (largest m-r bin)

m: 6.51
r: 5.11 km
ε_0: 1.49 σ
Contribution: 20.08 %

Mode (largest m-r-ε_0 bin)

m: 7.29
r: 4.34 km
ε_0: 1.12 σ
Contribution: 9.71 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							38.06
Pinto Mtn [5]		4.10	7.40	1.12	116.310°W	34.142°N	179.23	15.41
Homestead Valley 2011 [0]		1.91	6.66	1.05	116.322°W	34.175°N	267.10	8.89
Emerson-Copper Mtn 2011 [1]		7.53	6.97	1.65	116.249°W	34.218°N	50.26	2.85
Eureka Peak [2]		9.86	6.47	2.14	116.395°W	34.122°N	232.46	2.74
Johnson Valley (No) 2011 rev [0]		10.32	6.89	1.97	116.421°W	34.168°N	265.21	1.88
San Andreas (San Gorgonio Pass-Garnet HIll) [2]		31.93	7.93	2.41	116.377°W	33.854°N	189.71	1.09
UC33brAvg_FM31	System							37.90
Pinto Mtn [5]		4.10	7.44	1.11	116.310°W	34.142°N	179.23	15.25
Homestead Valley 2011 [0]		1.91	6.67	1.05	116.322°W	34.175°N	267.10	9.05
Emerson-Copper Mtn 2011 [1]		7.53	7.00	1.64	116.249°W	34.218°N	50.26	2.87
Eureka Peak [2]		9.86	6.47	2.14	116.395°W	34.122°N	232.46	2.59
Johnson Valley (No) 2011 rev [0]		10.32	6.89	1.97	116.421°W	34.168°N	265.21	2.01
San Andreas (San Gorgonio Pass-Garnet HIll) [2]		31.93	7.92	2.42	116.377°W	33.854°N	189.71	1.09
UC33brAvg_FM31 (opt)	Grid							12.02
PointSourceFinite: -116.311, 34.198		5.78	5.59	1.65	116.311°W	34.198°N	0.00	3.80
PointSourceFinite: -116.311, 34.198		5.78	5.59	1.65	116.311°W	34.198°N	0.00	3.80
PointSourceFinite: -116.311, 34.252		9.41	5.77	2.18	116.311°W	34.252°N	0.00	1.53
PointSourceFinite: -116.311, 34.252		9.41	5.77	2.18	116.311°W	34.252°N	0.00	1.53
UC33brAvg_FM32 (opt)	Grid							12.02
PointSourceFinite: -116.311, 34.198		5.78	5.59	1.65	116.311°W	34.198°N	0.00	3.80
PointSourceFinite: -116.311, 34.198		5.78	5.59	1.65	116.311°W	34.198°N	0.00	3.80
PointSourceFinite: -116.311, 34.252		9.41	5.77	2.18	116.311°W	34.252°N	0.00	1.53
PointSourceFinite: -116.311, 34.252		9.41	5.77	2.18	116.311°W	34.252°N	0.00	1.53