APPENDIX H

PERCOLATION TEST

ALBUS-KEEFE & ASSOCIATES, INC
GEOTECHNICAL CONSULTANTS

January 20, 2020
J.N.: 2859.00

Ms. Sarah Walker
National Community Renaissance
4322 Piedmont Drive
San Diego, CA 92107

Subject: Preliminary Percolation Study, Proposed Residential Development, 1314 Angelina Drive, Placentia, California.

Dear Ms. Walker,

Albus-Keefe & Associates, Inc. has completed a geotechnical investigation of the site for evaluation of the percolation characteristics of the site soils. The scope of this investigation consisted of the following:

- Exploratory drilling, soil sampling and test well installation
- Field percolation testing
- Laboratory testing of selected soil samples
- Engineering analysis of the data
- Preparation of this report

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

Site Location and Description

The site is located at 1314 North Angelina Drive within the city of Placentia, California. The property is bordered by North Angelina Drive to the West, single-family residences to the North and East, and Morse Avenue to the South. The location of the site and its relationship to the surrounding areas is shown on Figure 1, Site Location Map.

The site consists of a rectangular-shaped property containing approximately 4 acres of land. The site is relatively flat with elevations ranging from EL. 294 to EL. 297 above mean sea level (based on Google Earth) descending to the south-west. The site is currently occupied by Blessed Sacrament Episcopal Church. There are currently two existing structures and it appears the structure located more westerly is used for church gatherings while the more easterly structure is a school facility. Associated parking areas are located along the Southern boundary with vegetation occupying the remainder of the site. Vegetation includes general landscaping in and around the structures, planters within the parking areas, grass and moderate- to large-sized trees within the open spaces. Perimeter walls run along the North and East boundaries and appear to be associated with the single-family residences.

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SITE LOCATION MAP

Proposed Residential Development
1314 Angelina Drive
Placentia, California

NOT TO SCALE

FIGURE 1

Proposed Development

Based on the conceptual site plan by RRM Design Group, dated September 5, 2019, the proposed project includes the development of two residential buildings accommodating 65 units. Building 1 at the north end of the site is a linear two-story structure with double-loaded corridors. Building 2 is a two-story, L-shaped building located interior to the site with a three-story element at the northern end of the building transitioning to two stories toward the eastern property line. Associated parking, underground utilities and a storm water disposal system are also planned.

No grading or structural plans were available in preparing of this report. However, we anticipate that minor rough grading of the site will be required to achieve future surface configuration. We expect the proposed structures will be at grade utilize wood-frame construction yielding relatively light foundation loads.

SUMMARY OF FIELD AND LABORATORY WORK

Subsurface Investigation

Subsurface exploration for this investigation was conducted on December 17, 2019, and consisted of drilling four (4) soil borings to depths ranging from approximately 31.5 to 51.5 feet below the existing ground surface (bgs). The borings were drilled using a truck-mounted, continuous flight, hollow-stem-auger drill rig. A representative of Albus-Keefe & Associates, Inc. logged the exploratory borings. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented in the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. The borings were backfilled with auger cuttings upon completion of sampling.

One additional boring was drilled adjacent to boring B-1 for percolation testing (P-1) and one additional percolation well was also installed in B-3 (P-2).

Percolation Testing

Percolation testing was performed on December 17, 2019, in general conformance with the constant-head test procedures outlined in the referenced Well Permeameter Method (USBR 7300-89). A water hose attached to a water source on site was connected to an inline flowmeter to measure the water flow. The flowmeter is capable of measuring flow rates up to 10 gallons per minute and as low as 0.06 gallons per minute. A valve was connected in line with the flowmeter to control the flow rate.

A filling hose was used to connect the flowmeter and the test wells. Water was introduced by the filling hose near the bottom of the test wells. A water level meter with 1/100-foot divisions was used to measure the depths to water surface from the top of well casings.

Flow to the wells was terminated upon either completion of testing of all the pre-determined water levels or the flow rate exceeded the maximum capacity of the flowmeter. Measurements obtained during the percolation testing are provided in Appendix C on Plates C-1 and C-2.

Laboratory Testing

Selected soil samples of representative earth materials were tested to assist in the formulation of conclusions and recommendations presented in this report. Tests consisted of in-situ moisture contents and dry densities, and sieve analyses. Results of laboratory testing relevant to percolation characteristics are presented in Appendix B and on the Exploration Logs in Appendix A.

ANALYSIS OF DATA

Subsurface Conditions

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soil materials encountered at the subject site generally consisted of Quaternary Alluvial (Qal). However, artificial fill materials were encountered within the parking lot at B-1 for an approximate depth of 4 feet below ground surface. The fill materials consisted of a sandy clay that was grayish brown, moist, very stiff with fine to medium grained sand.

The Qal materials were encountered to the maximum depth explored of 51.5 feet and are comprised of interbedded layers of damp to moist, reddish brown and light reddish-brown sandy clay, silty sand, clayey sand, silty clay, and sand. The granular alluvial soils are typically medium dense and the fine-grained alluvial soils are typically very stiff to hard.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the soil cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered during investigation. Relatively thin, often discontinuous layers of different material may occur within the major divisions.

Groundwater

Groundwater was not encountered during this firm's subsurface exploration to the maximum depth of 51.5 feet. Based on a review of the referenced CDMG Special Report, the historical groundwater for the site is not available. Additional review of the Department of Water Resources groundwater level data for the nearby well 338950N1178554W001 indicates that groundwater for the area is below 150 feet from 1970 to present. The last recorded reading at the time of this report was November 13, 2019. From this data we anticipate ground water will remain below a depth of 100 feet during the next 50 years.

Percolation Data

Analyses were performed to evaluate permeability using the flow rate obtained at the end of the constant-head stage of field percolation testing. These analyses were performed in accordance with the procedures provided in the referenced USBR 7300-89. The procedure essentially uses a closed-form solution to the percolation out of a small-diameter well.

Using the USBR method, we calculated a composite permeability value for the head conditions maintained in the wells. The results are summarized in Table 1 below and the supporting analyses are included in Appendix C, Plates C-3 and C-4.

TABLE 1
Summary of Back-Calculated Permeability Coefficient

	Total Depth of Well (ft)	Depth to Water in Well (ft)	Height of Water in Well (ft)	Static Flow Rate (gal./min.)	Estimated Permeability, k_s (in/hr.)
P-1	34.95	31.25	3.7	0.22	0.53
P-2	35	31.5	3.5	0.44	1.15

Design of Dry Well

The ***infiltration rate*** in a dry well is dependent upon several factors including the soil permeabilities of the various soil layers throughout the soil mass, hydraulic gradient of water pressure head in the soil mass, and depth to groundwater. The infiltration rate is related to the permeability by Darcy's equation:

$V = ki$

Where:

V= water velocity (infiltration rate)
k= permeability
i=hydraulic gradient

The presence of differing soil layers with differing permeabilities, the variable head condition in the well shaft, and presence of ground water are factors that make determining the effective infiltration rate of a dry well somewhat complicated. We have performed the Well Permeameter tests in accordance with the test method. This test provides a means to estimate the ***Permeability Rate*** of the soils influencing the dry well, not the infiltration rate. Therefore, the effective infiltration rate must be determined using the relationship between permeability and infiltration rate as expressed by Darcy's equation. Solution of the Darcy equation essentially requires solving a differential mass balance equation. Due to these complications, the infiltration characteristics of the proposed dry well were modeled using a computer program.

Infiltration in a dry well was modeled using the software Seep/W, version 2007, by Geo-Slope International. The program allows for modeling of both partially-saturated and saturated porous medium using a finite element approach to solve Darcy's Law. The program can evaluate both steady-state and transient flow in planar and axisymmetric cases. Boundaries of the model can be identified with various conditions including fix total head, fix pressure head, fix flow rate, and head as a function of flow. Soil conductivity properties can be modeled with either Fredlund et al (1994), Green and Corey (1971), Van Genuchten (1980), or Saxton et al. (1986). The parameters suggested by Van Genuchten (1980) were selected for use in our model and were based on test results of particle-size analyses and estimated in-place densities.

A Seep/W model was setup with the bottom of the dry well at a depth of 52 feet below ground surface. The top 20 feet of the dry well was assumed to consist of a shaft that is 6 feet in diameter and contains a settling chamber having an inside diameter of 4 feet, outside diameter of 4.5 feet, and length of 18 feet. Below 20 feet, the shaft diameter was 4 feet in diameter. The annular space around the chamber between the depths of 0 and 13 feet was assumed to consist of a cement slurry. Below a depth of 13 feet, the annular space around the chamber and below the chamber is assumed to consist of gravel. A more detailed model of the dry well design can be found on Plate 2.

The model consisted of three zones of material to represent the general soil profile. Material 1 was represented to model fine-grained clayey soils that are essentially impermeable. The saturated conductivity of material 2 was selected based on the coefficient of permeability estimated from percolation tests as well as laboratory gradation test results. The saturated conductivity of material 3 was selected based on correlations with laboratory gradation test results (Plate B-1). The soil parameters are summarized in Table 2.

Water in the well was assumed to be at a depth of 7 feet below the ground surface so a fix-head boundary was set with a total head elevation of 93 feet around the edge of the well (ground surface was set to an elevation of 100 feet).

TABLE 2
Summary of Characteristic Curve Parameters

Material No.	Material Type	Depth (ft)	Sat. Perm., Ks (in/hr)	Van Genuchten Parameters				
				a (psf)	n	m	Sat. Water Content	Residual Water Content
1	Imperm	0-27.5, 42.5-47.5	0.001	208.22	1.10	0.09	0.54	0.01
2	SM	27.5-42.5	0.7	44.025	1.26	0.20	0.40	0.01
3	SC	>47.5	0.5	27.86	1.17	0.15	0.43	0.01

A steady state analysis was performed to estimate the maximum inflow that the well can accommodate. Using a well as described above, we obtain a static total flow of 0.025 ft^3/sec. A plot depicting the resulting pressure head contours and flow vectors for the model is provided on Plate C-5. The average infiltration rate can be determined by taking the flow rate divided by the wetted surface area. The surface area is equal to 546.64 square feet which includes the side and bottom area. Based on the above flow rate and surface area, the average "measured" infiltration rate across the wetted surface area is 1.9 in/hr.

To evaluate the time required to empty the well once no more water is introduced, the model was reanalyzed with a variable head condition that was dependent upon the volume of water leaving the well. As water infiltrates into the surrounding soil, the volume of water remaining in the well is reduced as well as the resulting water head. A graph of the well head versus exit volume is provided in Figure 2. The function assumes a void ratio of 0.4 within the zones occupied by gravel. If some other well configuration is used, then the analyses will require updating.

The analysis was performed as a transient case over a total time of 5.28 hours. The conditions in the model were evaluated in 40 increments of time over the total duration. From our analyses, the water is evacuated from the chamber in approximately 2.5 hours. Plots depicting the resulting pressure head contours and flow vectors at selected times are provided in Appendix C on Plates C-5 through C-8. A plot of time versus water height in the well is shown on Figure 3.

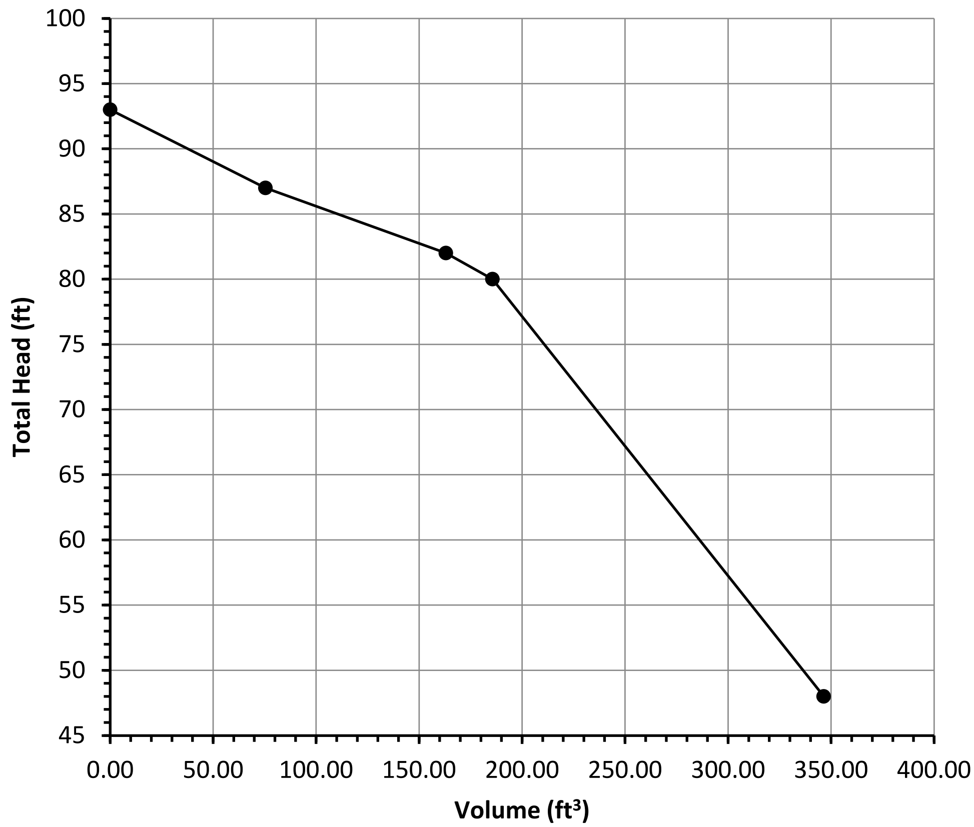


FIGURE 2- Well Head versus Exit Volume

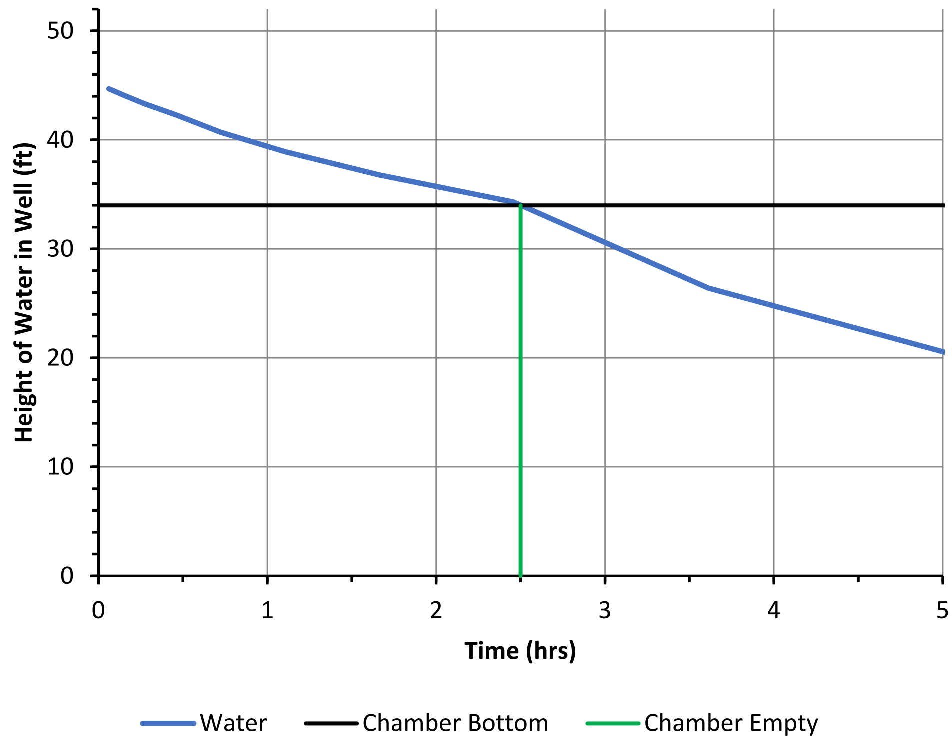


FIGURE 3- Water Head Versus Time

CONCLUSIONS AND RECOMMENDATIONS

Results of our work indicate a storm water disposal system consisting of a dry well is feasible at the site. The use of a dry well is not anticipated to result in worsening any adverse conditions or hazards that may be present for the proposed site development or adjacent properties including subsidence, landsliding, or liquefaction. As discussed above, the historic groundwater level in this area was not available. However, we estimate that groundwater is currently at least 150 feet below ground surface and we anticipate will remain at least 100 feet below ground surface for the life of the project. Therefore, a dry well having a total depth of 52 will maintain a clearance above groundwater greater than the minimum required clearance of 10 feet.

Based on the results of percolation testing and analyses, the well configuration as depicted on Plate 2 may utilize a “measured” peak flow rate of 0.025 ft^3/sec. This flow rate corresponds to an average peak infiltration rate of 1.9 in./hr. This flow rate and infiltration rate only apply to the well configuration evaluated and will differ for other configurations. These values are “measured” values and as such, an appropriate factor of safety should be applied to determine the “design” rates.

The “measured” infiltration rates reported above should be adjusted by applying an appropriate factor of safety. Table 3 includes the details of estimating this factor of safety for Factor Category A per requirements of the Santa Ana Regional Water Quality Control Board. The civil engineer should assign appropriate factor values for Factor Category B to obtain the overall factor of safety.

TABLE 3
Factor Values for Factor Category A

Infiltration Facility Safety Factor Determination Worksheet					
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w * v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	3	0.75
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.5

Once water flow to the well has ceased, we estimate the chamber will require approximately 2.5 hours to empty. As such, the time to empty the dry well should be considered in the overall draw down time of the storm system.

Should you require multiple dry wells across the site, the wells should be spaced at least 120 feet, center to center, to avoid cross influence. The wells should be located at least 10 feet horizontally from any habitable structure or property line.

The actual flow capacity of the dry well could be less or more than the estimated value. As such, provisions should be made to accommodate excess flow quantities in the event the dry well does not infiltrate the anticipated amount. The design also assumes that sediments will be removed from the inflowing water through an upper chamber or other device. Sediments that are allowed to enter the dry well will tend to degrade the flow capacity by plugging up the infiltration surfaces.

In general, the dry well shaft is anticipated to be adequately stable under temporary construction conditions for uncased drilling. However, layers or lenses of granular materials are present and may be prone to sloughing and caving. In the event of caving, casing will be required to install the well. Workers should not enter the shaft unless the excavation is laid back or shored in accordance with OSHA requirements. The placement and compaction of backfill materials, including the gravel and slurry, should be observed by the project geotechnical consultant.

LIMITATIONS

This report is based on the geotechnical data as described herein. The materials encountered in our boring excavations and utilized in our laboratory testing for this investigation are believed representative of the project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil and bedrock materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observations by a geotechnical consultant during the construction phase of the storm water infiltration systems are essential to confirming the basis of this report.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **National Community Renaissance** to assist the project consultants in the design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

David E. Albus
Principal Engineer
GE 2455

REGISTERED PROFESSIONAL ENGINEER
DAVID E. ALBUS
No. 2455
Exp. 12/31/20
GEOTECHNICAL
STATE OF CALIFORNIA

Enclosures: Plate 1- Geotechnical Map
Plate 2- Dry Well Diagram
Appendix A - Exploratory Logs
Appendix B – Laboratory Testing
Appendix C - Percolation Testing and Analyses

REFERENCES

Publications and Reports

CDMG, "Seismic Hazard Zone Report for the Yorba Linda 7.5-Minute Quadrangle, Orange County, California", Seismic Hazard Zone Report 010, 2005.

Californian Department of Water Resources Water Data Library (accessed 2019): http://wdl.water.ca.gov/waterdatalibrary/

Procedure for Performing Field Permeability Testing by the Well Permeameter Method, by United States Department of The Interior, Bureau of Reclamation (USBR 7300-89).

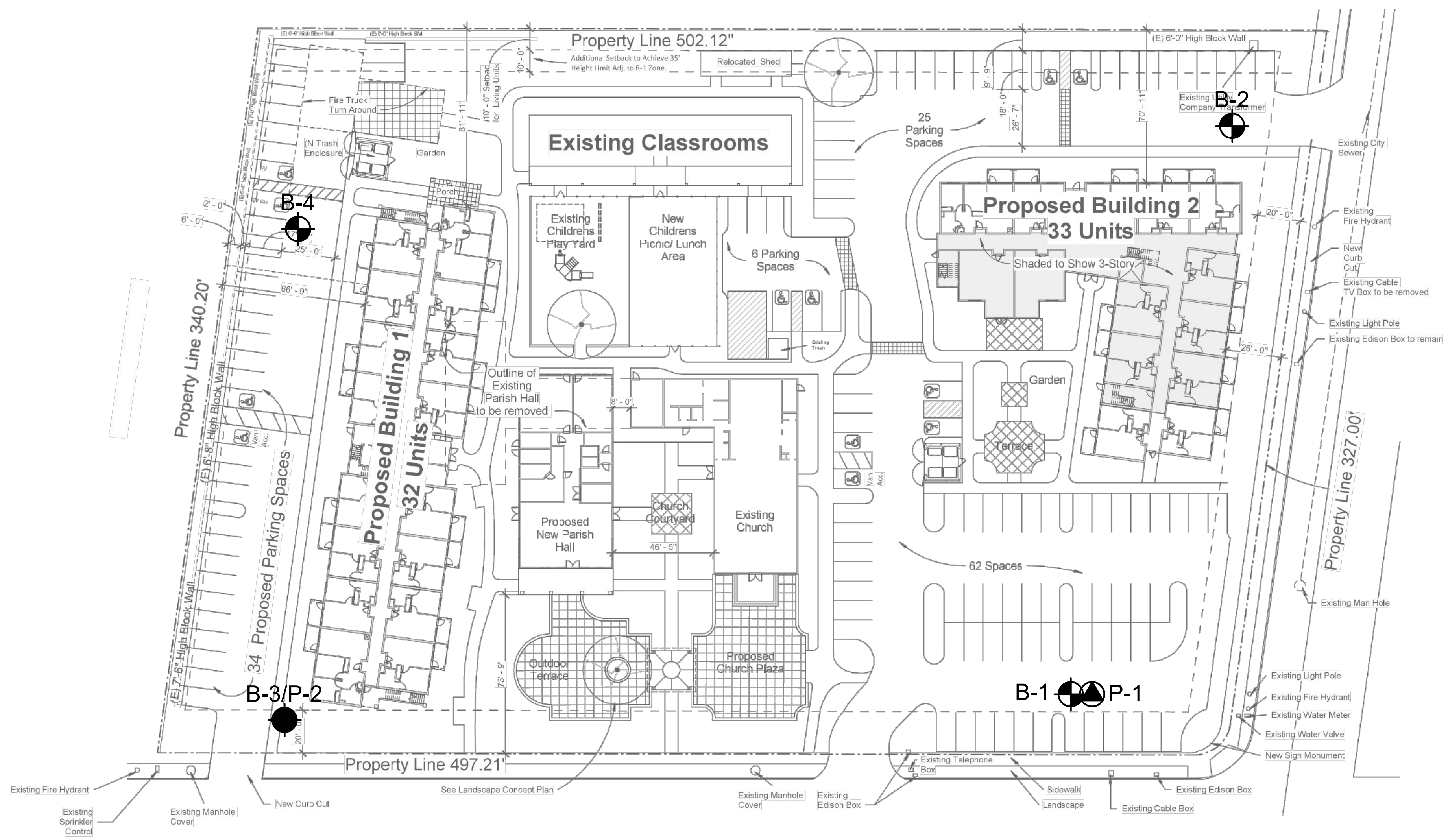
Saxton, K.E., W.J. Rawls, J.S. Romberger, and R.I. Papendick. 1986. Estimating generalized soil-water characteristics from texture. Soil Sci. Soc. Am. J. 50(4):1031-103.

Department of The Navy, (1982), *Soil Mechanics, Design Manual 7.1*, Naval Facilities Engineering Command (NAVFAC).

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

GEOTECHNICAL MAP

Job No.: 2859.00 | Date: 1/20/20 | Plate: 1



EXPLANATION
(Locations Approximate)

- Exploratory Boring
- Exploratory Percolation Test Boring
- Exploratory Boring and Percolation Test Boring

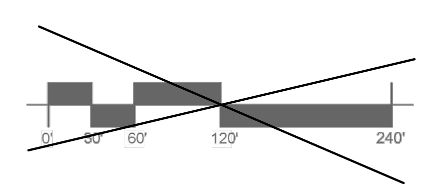
Site Coverage

Name	Area	Percentage
Lot Area (SF) :		169,716 SF/ 3.90 acres
Maximum Lot Coverage allowed:		60% (101,830 SF)
Proposed Lot Coverage:		55%
Building Footprints (Existing and Proposed)		35,631 SF
Parking and Driveways		53,824 SF
Covered Patios		3,678 SF
Total Proposed Lot Coverage		93,133 SF (55%)
Percentage Open Space Required:		40%
Percentage Open Space Provided:		45%

Residential Unit Count

	One Bedroom	Two Bedroom
Building 1	28	4
Building 2	31	2
	59 units	6 units

Total Residential Units: 65



rrm design group

SITE PLAN

1314 N. ANGELINA DR. - PLACENTIA, CA

09/05/19
#0934-02-RS17

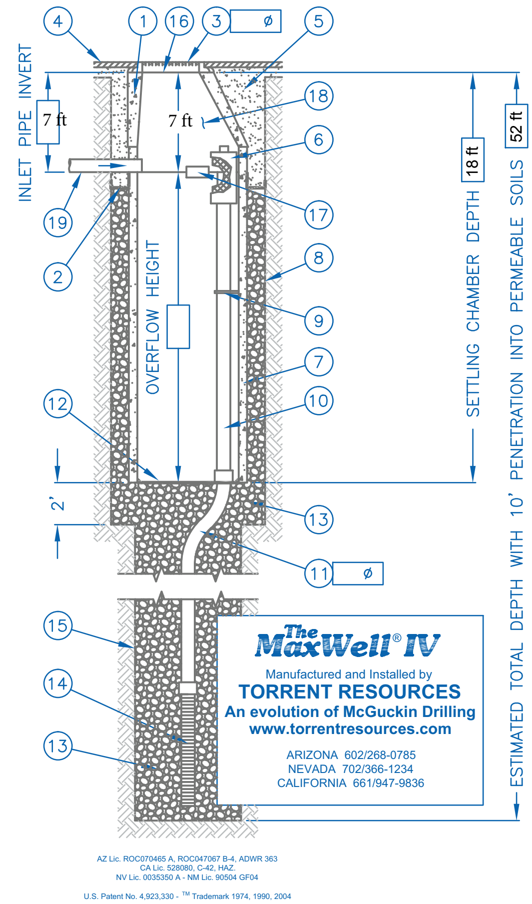
A4

MAXWELL® IV DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

ITEM NUMBERS

1. **Manhole Cone** - Modified Flat Bottom.
2. **Moisture Membrane** - 6 Mil. Plastic. Applies only when native material is used for backfill. Place membrane securely against eccentric cone and hole sidewall.
3. **Bolted Ring & Grate** - Diameter as shown. Clean cast iron with wording **"Storm Water Only"** in raised letters. **Bolted in 2 locations** and secured to cone with mortar. Rim elevation ±0.02' of plans.
4. **Graded Basin or Paving** (by Others).
5. **Compacted Base Material** - 1-Sack Slurry except in landscaped installtions with no pipe connections.
6. **PureFlo® Debris Shield** - Rolled 16 ga. steel X 24" length with vented anti-siphon and Internal .265" Max. SWO flattened expanded steel screen X 12" length. **Fusion bonded epoxy coated.**
7. **Pre-cast Liner** - 4000 PSI concrete 48" ID. X 54" OD. **Center in hole** and align sections **to maximize bearing surface.**
8. **Min. 6' Ø Drilled Shaft.**
9. **Support Bracket** - Formed 12 Ga. steel. **Fusion bonded epoxy coated.**
10. **Overflow Pipe** - Sch. 40 PVC mated to drainage pipe at base seal.
11. **Drainage Pipe** - ADS highway grade with TRI-A coupler. **Suspend pipe** during backfill operations to prevent buckling or breakage. Diameter as noted.
12. **Base Seal** - Geotextile or concrete slurry.
13. **Rock** - Washed, sized between 3/8" and 1-1/2" to **best complement soil conditions.**
14. **FloFast® Drainage Screen** - Sch. 40 PVC 0.120" slotted well screen with 32 slots per row/ft.Diameter varies 120" overall length with TRI-B coupler.
15. **Min. 4' Ø Shaft** - Drilled to **maintain permeability** of drainage soils.
16. **Fabric Seal** - U.V. resistant geotextile - **to be removed by customer** at project completion.
17. **Absorbent** – Hydrophobic Petrochemical Sponge. Min. to 128 oz. capacity.
18. **Freeboard Depth** Varies with inlet pipe elevation. Increase settling chamber depth as needed to maintain all inlet pipe elevations above overflow pipe inlet.
19. **Optional Inlet Pipe** (Maximum 4", by Others). Extend moisture membrane and compacted base material or 1 sack slurry backfill below pipe invert.

The referenced drawing and specifications are available on CAD either through our office or web site. This detail is copyrighted (2004) but may be used as is in construction plans without further release. For information on product application, individual project specifications or site evaluation, contact our Design Staff for no-charge assistance in any phase of your planning.



CALCULATING MAXWELL IV REQUIREMENTS

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained stormwater, use one standard **MaxWell IV** per the instructions below for up to 3 acres of landscaped contributory area, and up to 1 acre of paved surface. For larger paved surfaces, subdivision drainage, nuisance water drainage, connecting pipes larger than 4" Ø from catch basins or underground storage, or other demanding applications, refer to our **MaxWell® Plus** System. For industrial drainage, including gasoline service stations, our **Envibro® System** may be recommended. For additional considerations, please refer to **"Design Suggestions For Retention And Drainage Systems"** or consult our Design Staff.

COMPLETING THE MAXWELL IV DRAWING

To apply the **MaxWell IV** drawing to your specific project, simply fill in the blue boxes per instructions below. For assistance, please consult our Design Staff.

35 feet

ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate depth required to achieve 10 continuous feet of penetration into permeable soils. Torrent utilizes specialized **"crowd"** equipped drill rigs to penetrate difficult, cemented soils and to reach permeable materials at depths up to **180 feet.** Our extensive database of drilling logs and soils information is available for use as a reference. Please contact our Design Staff for site-specific information on your project.

18 feet

SETTLING CHAMBER DEPTH

On MaxWell IV Systems of over 30 feet overall depth and up to 0.25cfs design rate, the **standard** Settling Chamber Depth is **18 feet .** For systems exposed to greater contributory area than noted above, extreme service conditions, or that require higher design rates, chamber depths up to 25 feet are recommended.

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OVERFLOW HEIGHT

The Overflow Height and Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. For normal drainage applications, an overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet**. Sites with higher design rates than noted above, heavy debris loading or unusual service conditions require greater settling capacities

"Ø

DRAINAGE PIPE

This dimension also applies to the **PureFlo®** Debris Shield, the **FloFast®** Drainage Screen, and fittings. The size selected is based upon system design rates, soil conditions, and the need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to "Design Suggestions for Retention and Drainage Systems" for recommendations on which size best matches your application.

"Ø

BOLTED RING & GRATE

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording "Storm Water Only" in raised letters. For other surface treatments, please refer to "Design Suggestions for Retention and Drainage Systems."

"Ø

INLET PIPE INVERT

Pipes up to 4" in diameter from catch basins, underground storage, etc. may be connected into the settling chamber. Inverts deeper than 5 feet will require additional settling chamber depth to maintain effective overflow height.

TORRENT RESOURCES INCORPORATED

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TORRENT RESOURCES (CA) INCORPORATED

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The watermark for drainage solutions.®

PLATE 2

TORRENT® RESOURCES

APPENDIX A

EXPLORATORY LOGS

EXPLORATION LOG

Project:		Location:
Address:		Elevation:
Job Number:	Client:	Date:
Drill Method:	Driving Weight:	Logged By:

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
5		Dashed lines indicate unknown depth of geologic unit change or material type change.							
		Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).							
		Double triangle in core column represents SPT sampler.							
10		**Vertical Lines** in core column represents Shelby sampler.							
		Solid black rectangle in Bulk column respresents large bag sample.							
15		**Other Laboratory Tests:** Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content DSR = Direct Shear, Remolded DS = Direct Shear, Undisturbed SA = Sieve Analysis (1" through #200 sieve) Hydro = Particle Size Analysis (SA with Hydrometer) 200 = Percent Passing #200 Sieve Consol = Consolidation SE = Sand Equivalent Rval = R-Value ATT = Atterberg Limits							
20									

Albus-Keefe & Associates, Inc.

Plate A-1

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Material Description	Water	Samples: Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Asphalt = 3.5"							
	Base = 5"							
	ARTIFICIAL FILL (Af) Sandy Clay (CL): Grayish brown, moist, very stiff, fine to medium grained sand		25			15.9	113.2	
5	**ALLUVIUM (Qal)** Sandy Clay (CL): Reddish brown, moist, very stiff, fine to medium grained sand, more sand		34			14.4	115	Consol
	Clayey Sand (SC): Reddish brown, moist, medium dense, fine to coarse grained sand, trace pinhole pores		28			12.7	119.3	
10	@ 10 ft, trace pinhole pores		21			12.8	117.3	
15	Sand (SP): Reddish brown, moist, medium dense, fine to medium grained sand		10					
	Clayey Sand (SC): Reddish brown, moist, medium dense, fine to medium grained sand							
20	Sandy Clay (CL): Reddish brown, moist, hard, fine grained sand		28					

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
	Silty Clay with Sand (CL): Light reddish brown, moist, hard, fine grained sand		19					
30	Silty Sand trace Clay (SM): Light reddish brown, moist, medium dense, fine grained sand		12					200
35	Clayey Sand (SC): Light reddish brown, moist, medium dense, fine to medium grained sand		10					SA Hydro
	Sand with Silt (SP): Light reddish brown, moist, medium dense, fine to medium grained sand							
40	Silty Sand trace Clay (SM): Light reddish brown, moist, dense, fine grained sand		16					200
45	Sandy Clay (CL): Reddish brown, moist, hard, fine grained sand		20					

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Clayey Sand (SC): Light reddish brown, moist, very dense, fine to coarse grained sand		28					
		Total Depth 51.5 feet No Groundwater Boring backfilled with soil cuttings Percolation Well (10ft offset): 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 25', no gravel added							

Albus-Keefe & Associates, Inc.

Plate A-4

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Grass							
		ALLUVIUM (Qal) Sandy Clay (CL): Light reddish brown, dry to damp, hard, fine grained sand, trace pinhole pores and fine roots		58			5.7	115.1	
5		@ 4 ft, some medium grained sand, trace pinhole pores and fine roots		38			10.1	120	Consol
		Silty Sand with Clay (SM): Light reddish brown, moist, medium dense, fine to medium grained sand, some coarse grained sand, trace pinhole pores		20			7.3	110.6	Consol
10		Silty Clay with Sand (CL-ML): Light reddish brown to reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		28			14.8	109.1	
15		Silty Clay (CL-ML): Light reddish brown to light gray, moist, stiff		8					
20				11					

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				10					
30		Sandy Clay (CL): Reddish brown, moist, very stiff, fine grained sand		8					
		Total Depth 31.5 feet No Groundwater Boring backfilled with soil cuttings							

Albus-Keefe & Associates, Inc.

Plate A-3

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Grass							
		ALLUVIUM (Qal) Sandy Clay (CL): Light reddish brown, dry to damp, very stiff, fine grained sand, trace pinhole pores		38			10	112.1	
		@ 4 ft, moist, hard		74			11.1	119.4	
5									
		@ 6 ft, Gray to reddish brown, very stiff, less sand		32			14.4	117	
10		@ 10 ft, hard, less gray, more sand		37			14.3	113.6	
15		@ 15 ft, very stiff		10					
20				14					

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		@ 25 ft, hard, more sand		17					
30		Silty Sand / Sandy Silty trace Clay (SM/ML): Light reddish brown, moist, medium dense / very stiff		8					200
35		Silty Sand trace Clay (SM): Light reddish brown, moist, very stiff		13					200
		Total Depth 36.5 feet No Groundwater Boring backfilled with soil cuttings Percolation Well: 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 27', no gravel added							

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-4
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Material Description	Water	Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							Max EI SO4 DS ATT pH Resist Ch
	ALLUVIUM (Qal) Sandy Clay with Silt (CL): Reddish brown, damp to moist, stiff, fine grained sand, trace pinhole pores and fine roots		16			10.6	103.2	
	@ 4 ft, hard		41			10.3	114.5	Consol
5	Clayey Sand (SC): Light reddish brown, moist, dense, fine to medium grained sand							
	Sandy Clay with Silt (CL): Reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		35			19.9	103.7	
10	@ 10 ft, trace pinhole pores		29			22.2	98	
15	Silty Clay trace Sand (CL): Light reddish brown to light gray, damp, very stiff, fine grained sand		13					
20	Silty Sand / Sandy Silt trace Clay (SM/ML): Light reddish brown, damp, medium dense / very stiff, fine grained sand		15					

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-4
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

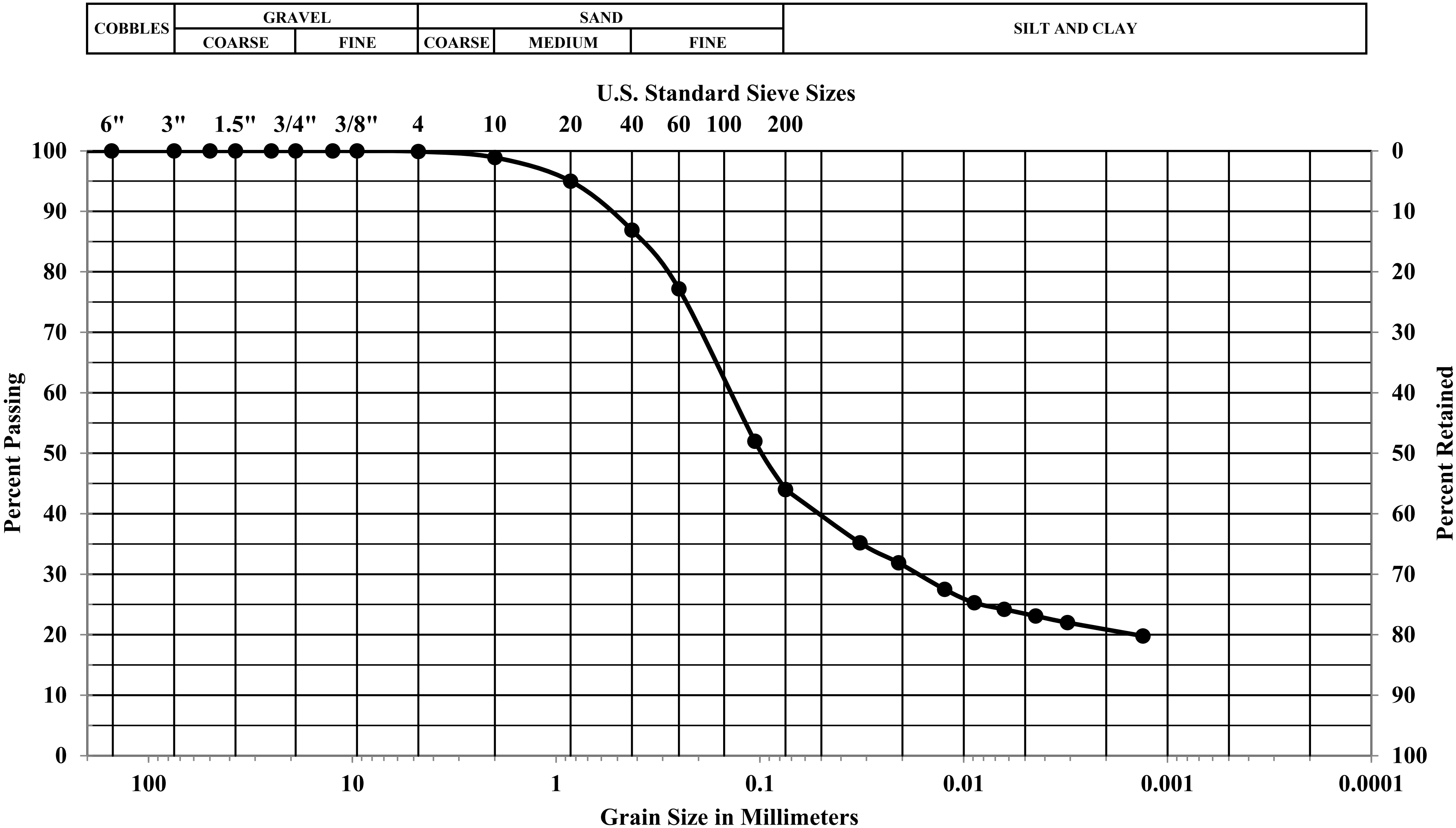
Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Core	Bulk	Laboratory Tests: Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		Silty Sand trace Clay (SM): Light reddish brown, damp, medium dense, fine grained sand		11					
30		Sand (SP): Light reddish brown, damp, very dense, fine to coarse grained sand		32					
		Total Depth 31.5 feet No Groundwater Boring backfilled with soil cuttings							

Albus-Keefe & Associates, Inc.

APPENDIX B

LABORATORY TEST PROGRAM

GRAIN SIZE DISTRIBUTION



Job Number	Location	Depth	Description
2859.00	B-1	35-36.2	Clayey Sand (SC)

APPENDIX C

PERCOLATION TESTING AND ANALYSES

Field Percolation Testing - Constant Head

Client: NCR

Job. No.: 2859.00

Date Tested: 12/17/2019

Test by: ddalbus

Location: B-1 / P-1

Top of Casing to Bottom of Well (ft): 35.1

Elev. of Ground Surface (ft): 294

Diam. of Test Hole (in): 8

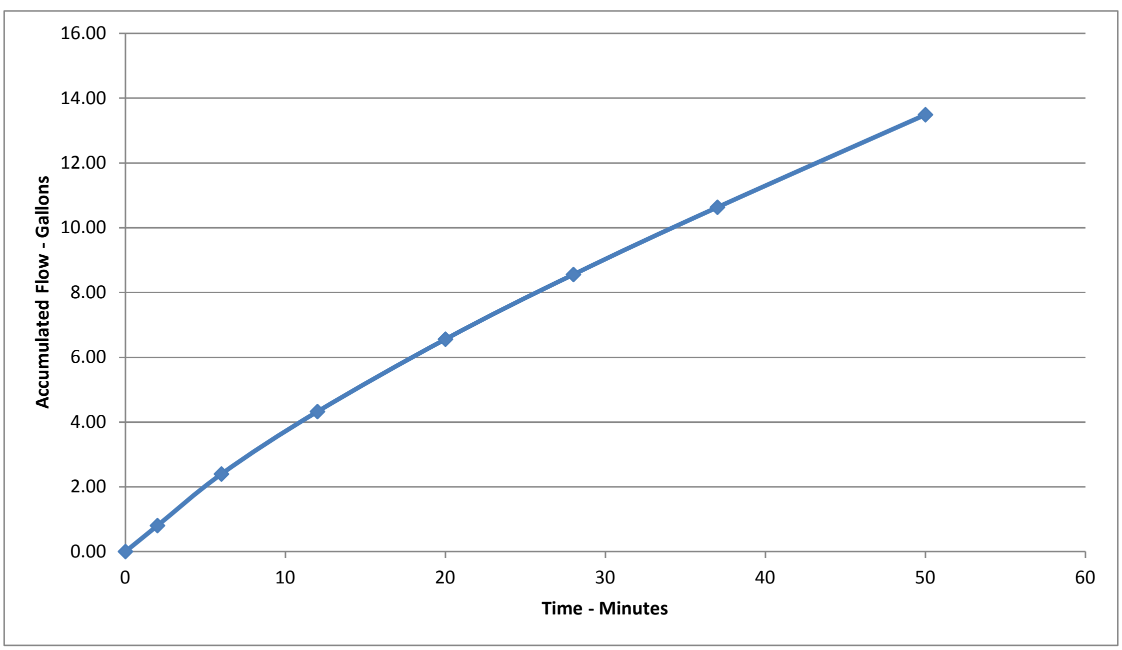
Diam. of Casing (in): 3

Ht. to Top of Casing (ft): 0.15

Water Tempurature (C°): 21

Constant Head

Elapsed Time (minutes)	Time	Depth to H2O (ft)	Flow Rate (gal./min.)	Total H_2O used (gal)
0	15:40	31.4	0.46	0.00
2	15:42	31.4	0.34	0.80
6	15:46	31.4	0.30	2.40
12	15:52	31.4	0.26	4.32
20	16:00	31.4	0.24	6.56
28	16:08	31.4	0.22	8.56
37	16:17	31.40	0.22	10.63
50	16:30	31.40	0.22	13.49



Field Percolation Testing - Constant Head

Client: NCR

Job. No.: 2859.00

Date Tested: 12/17/2019

Test by: ddalbus

Location: B-3 / P-2

Top of Casing to Bottom of Well (ft): 35

Elev. of Ground Surface (ft): 297

Diam. of Test Hole (in): 8

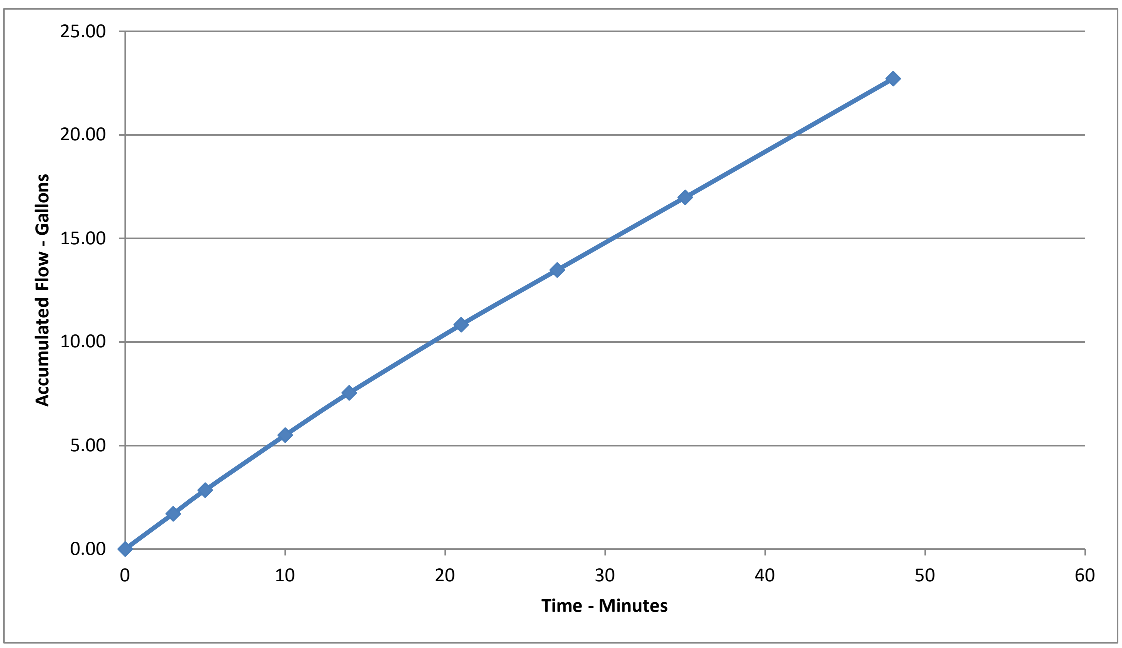
Diam. of Casing (in): 3

Ht. to Top of Casing (ft): 0

Water Tempurature (C°): 21

Constant Head

Elapsed Time (minutes)	Time	Depth to H2O (ft)	Flow Rate (gal./min.)	Total H_2O used (gal)
0	14:27	31.5	0.60	0.00
3	14:30	31.5	0.54	1.71
5	14:32	31.5	0.52	2.85
10	14:37	31.5	0.50	5.50
14	14:41	31.5	0.44	7.54
21	14:48	31.5	0.44	10.83
27	14:54	31.50	0.44	13.47
35	15:02	31.50	0.44	16.99
48	15:15	31.50	0.44	22.71



INFILTRATION WELL DESIGN

Constant Head
USBR 7300-89 Method

J.N.: 2859.00
Client: NCR
Well No.: B-1 / P-1

Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	1	
Ground Surface to Bottom of Well (**h_1**):	34.95	feet
Depth to Water (**h_2**):	31.25	feet
Height of Water in the Well (h_1-h_2=**h**):	3.7	feet
Radius of Well (**r**):	4.0	Inches
Minimum Volume Required:	729.4	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (**q**):	0.22	Gal/min.
Temperature (**T**):	21	Celsius
(Viscosity of Water @ Temp. T) / (Viscosity of water @ 20° C) (**V**):	0.9647	ft^3/min.
Unsaturated Distance Between the Water Surface in the Well and the Water table (**T_u**):		Ignore T_u
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (**k_{20}**):	7.29E-04	ft/min.
Design k_{20}:	0.53	in./hr.

The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as **Condition I**, **Condition II**, **Condtion III**.

Low Water Table-When the distance from the water surface in the test well to the ground water table, or to an impervious soil layer which is considered for test puposes to be equivalent to a water table, is greater than three times the depth of water in the well, classify as **Condition I**.

High Water Table-When the distance from the water surface in the test well to the ground water table or to an impervious layer is less than three times the depth of water in the well, a high water table condition exists. Use **Condition II** when the water table or impervious layer is below the well bottom. Use **Condition III** when the water table or impervious layer is above the well bottom.

INFILTRATION WELL DESIGN

Constant Head
USBR 7300-89 Method

J.N.: 2859.00
Client: NCR
Well No.: B-3 / P-2

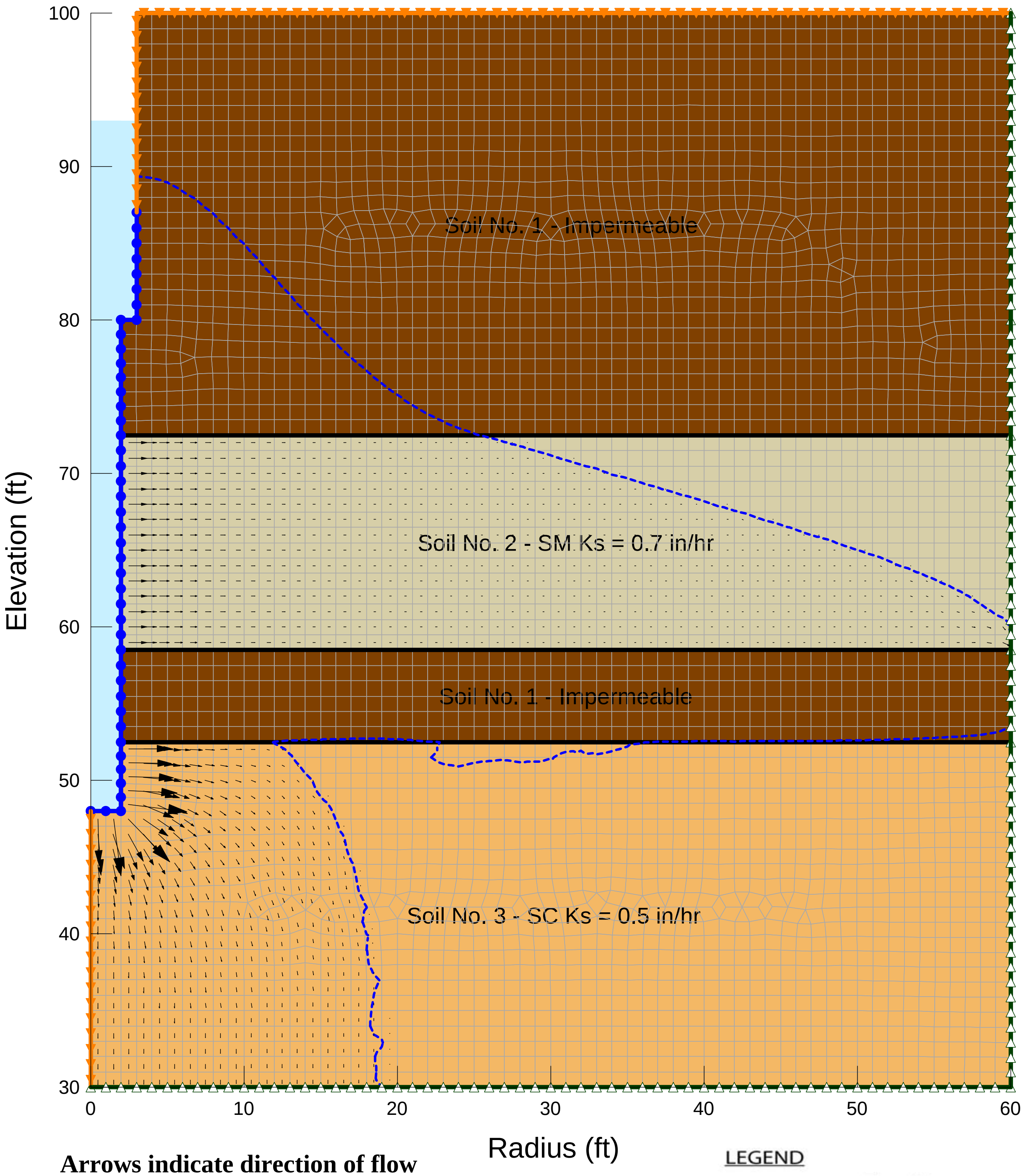
Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	1	
Ground Surface to Bottom of Well (h_1):	35	feet
Depth to Water (h_2):	31.5	feet
Height of Water in the Well (h_1-h_2=**h**):	3.5	feet
Radius of Well (**r**):	4.0	Inches
Minimum Volume Required:	642.6	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (**q**):	0.44	Gal/min.
Temperature (**T**):	21	Celsius
(Viscosity of Water @ Temp. T) / (Viscosity of water @ 20° C) (**V**):	0.9647	ft^3/min.
Unsaturated Distance Between the Water Surface in the Well and the Water table (T_u):		Ignore T_u
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (k_{20}):	1.59E-03	ft/min.
Design k_{20}:	1.15	in./hr.

The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as **Condition I**, **Condition II**, **Condtion III**.

Low Water Table-When the distance from the water surface in the test well to the ground water table, or to an impervious soil layer which is considered for test puposes to be equivalent to a water table, is greater than three times the depth of water in the well, classify as **Condition I**.

High Water Table-When the distance from the water surface in the test well to the ground water table or to an impervious layer is less than three times the depth of water in the well, a high water table condition exists. Use **Condition II** when the water table or impervious layer is below the well bottom. Use **Condition III** when the water table or impervious layer is above the well bottom.

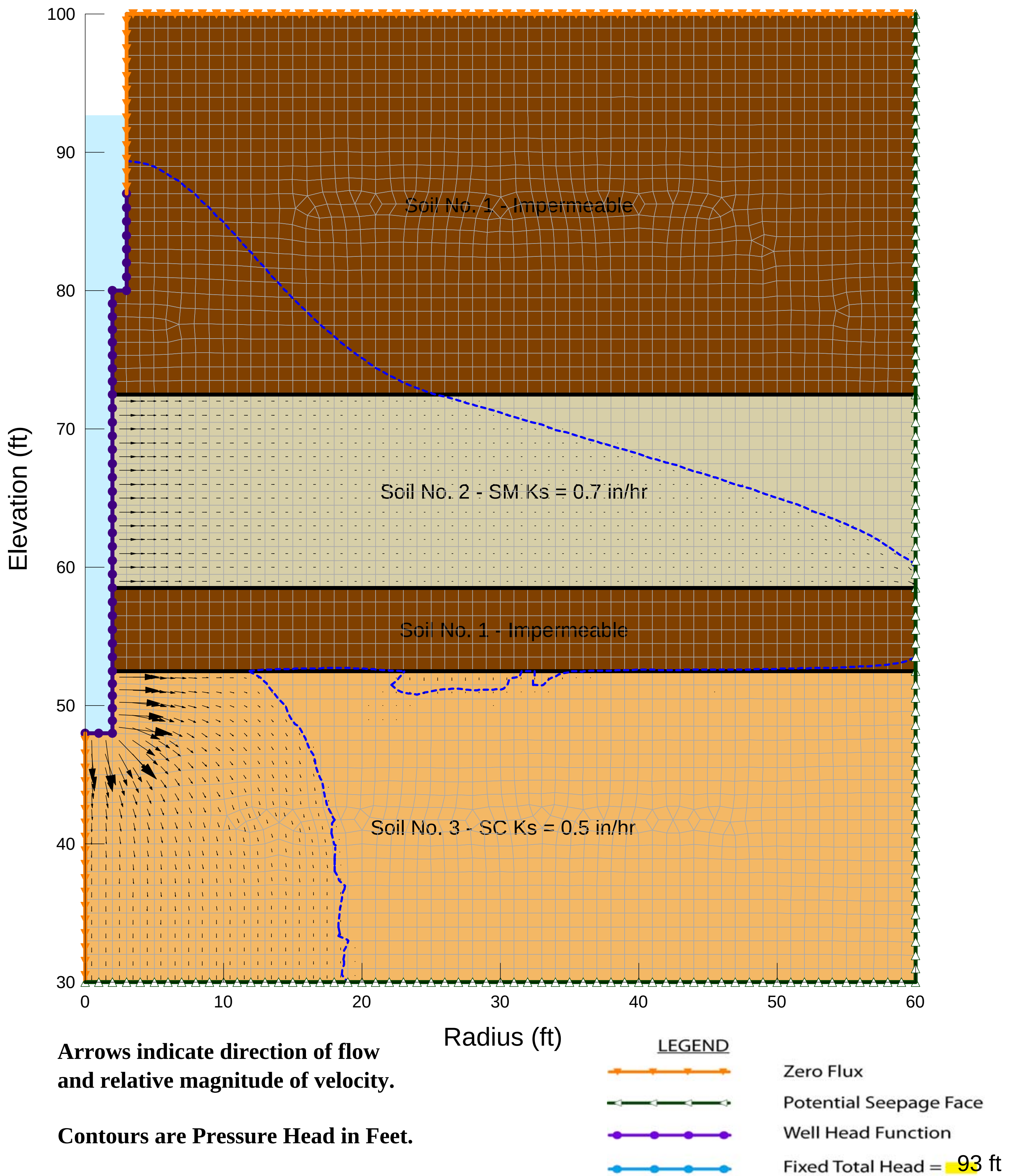
STEADY STATE
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

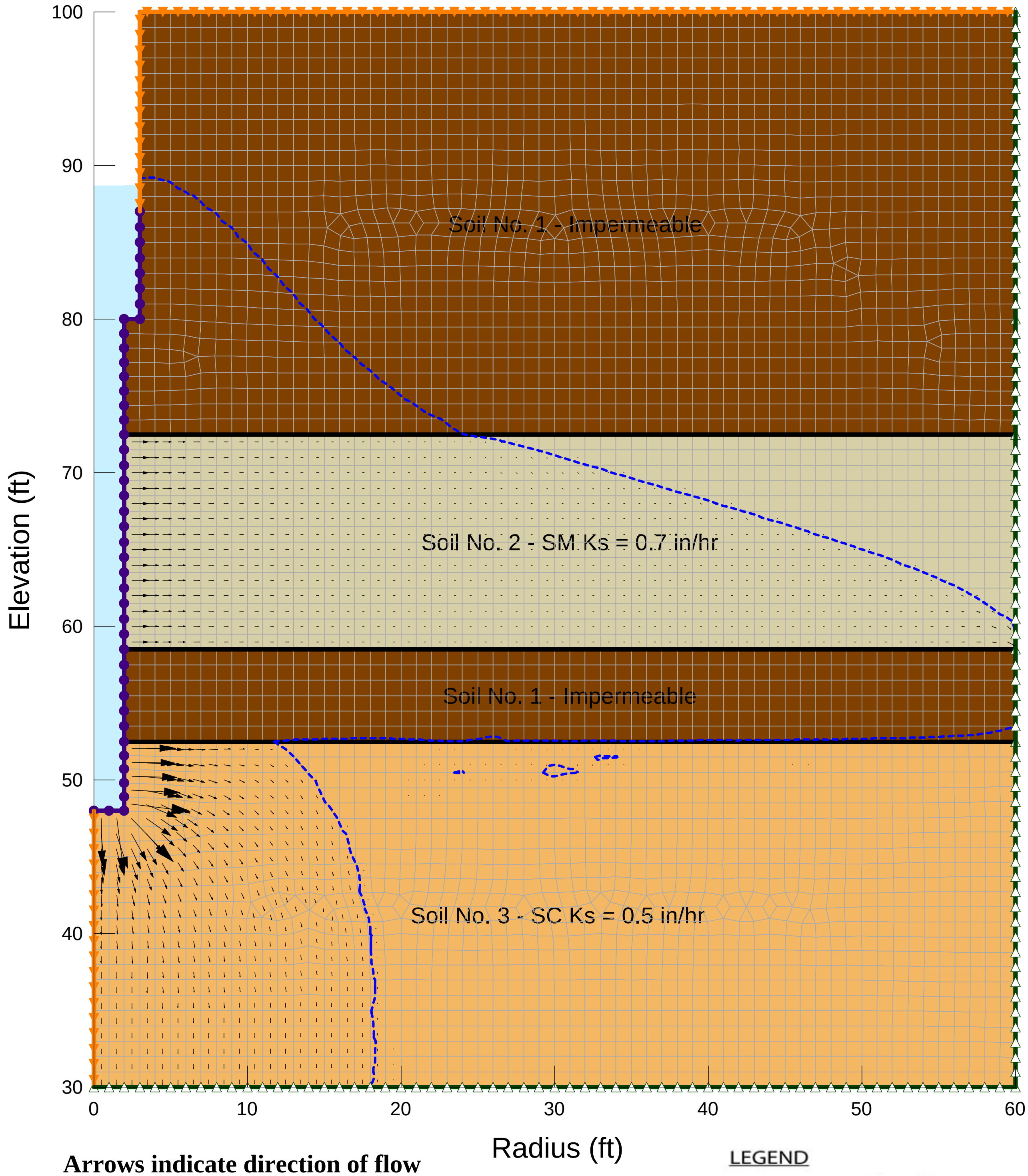
TRANSIENT @ 0.06 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

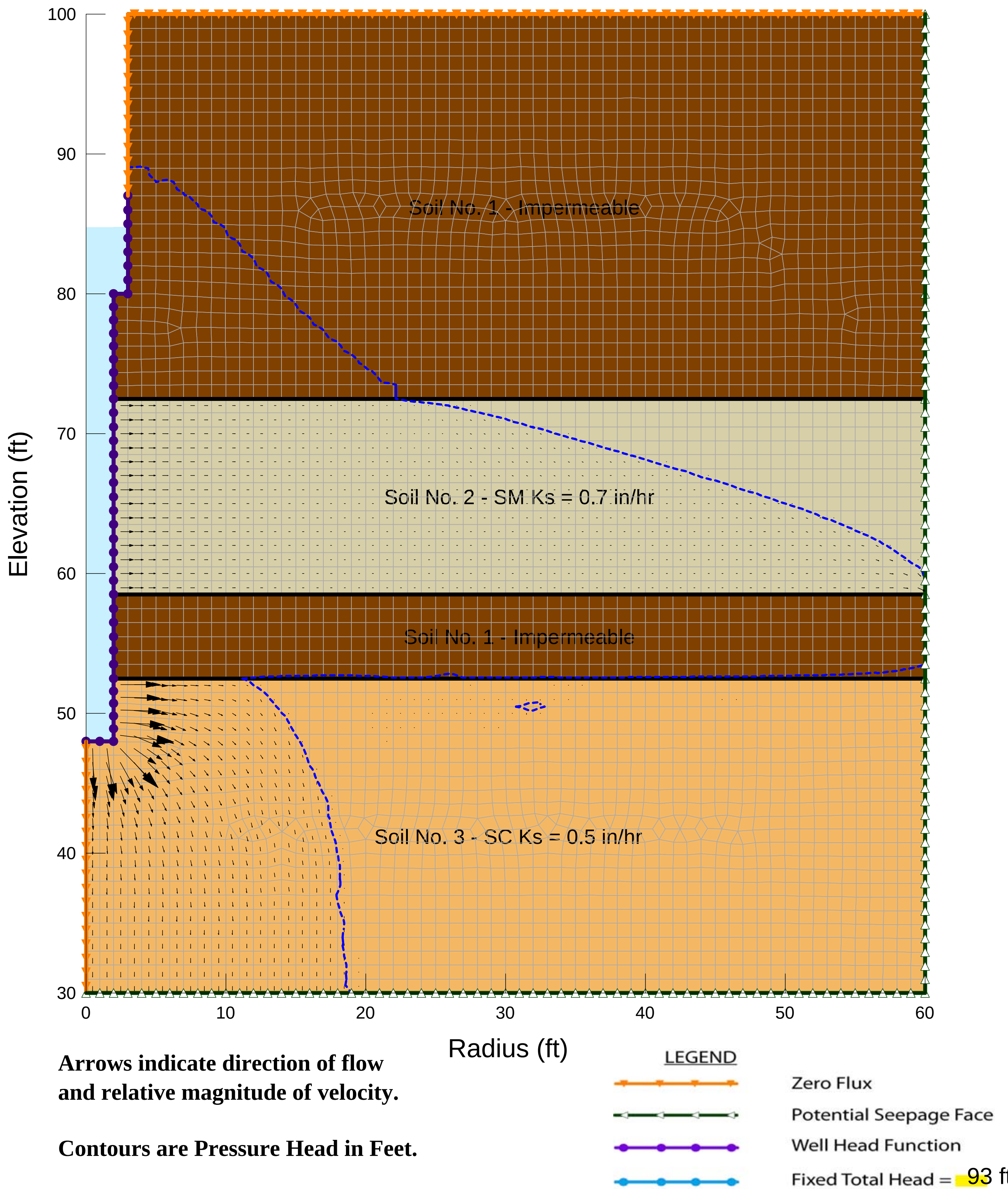
TRANSIENT @ 0.72 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

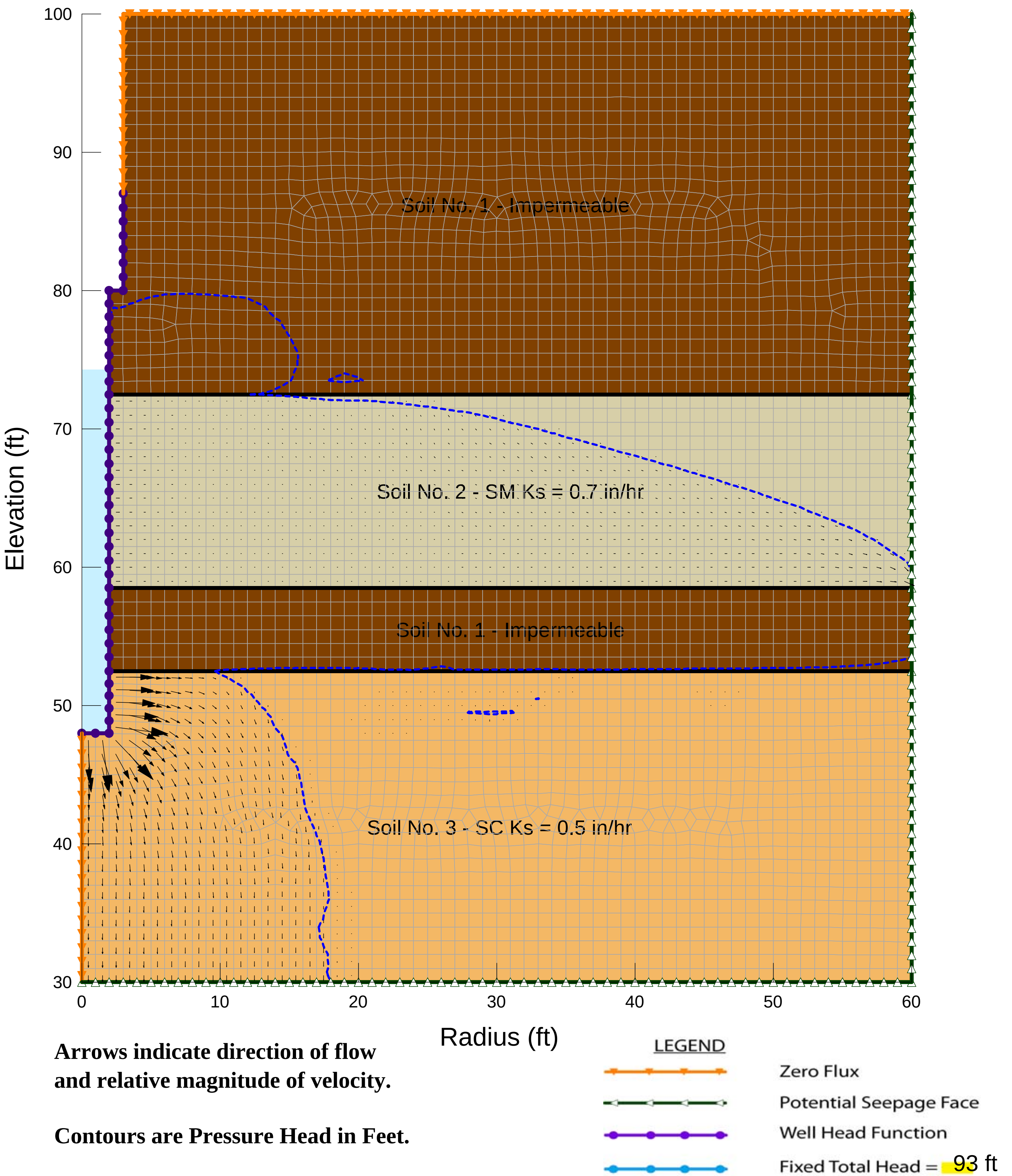
TRANSIENT @ 1.66 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

TRANSIENT @ 3.6 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.