Exhibit A – Attachment 3

Discovery Bike Park

Storm Water Management & Engineering Drainage Report

Discovery Bike Park

2121 E Lake Hazel Road

Meridian, ID 83642

Storm Water Management & Engineering Drainage Report

Engineer
The Land Group, Inc.
462 East Shore Drive, Ste. 100
Eagle, Idaho 83616
Contact: Chad Rietze, PE
Ph: 208.939.4041

March 8th, 2023

TLG Project No. 122129

Project Description

The project is located on a lot immediately south of East Lake Hazel Road between South Eagle Road and South Locust Grove Road. The proposed improvements will consist of additional infrastructure to the already existing Discovery Park. These additional improvements include dirt bike trails and features with varying levels of difficulty, a bike pump track (constructed by others), asphalt pavement, landscaping and irrigation. All stormwater runoff will be treated and infiltrated on-site through infiltration facilities.

Existing Conditions

Currently, the site is partially developed as Discovery Park. The area of the proposed bike park has historically existed as an agricultural field and has since been utilized as a soil material stockpile area. A recently constructed collector road, S. Recreation Avenue, exists northeast of the site, which will be extended south in the future. Directly north of the project site exists a parking lot and access drive. The project site is bordered by a baseball field directly to the west and undeveloped land directly to the south. Stormwater falling on undeveloped areas appears to infiltrate in place.

All geotechnical considerations were investigated by Strata and detailed in the Geotechnical Engineering Evaluation dated July 26, 2017 (File No. B016068A). Referenced report is attached as Appendix C. For design purposes, groundwater depths are anticipated to remain greater than 20-ft below ground surface.

On-Site Stormwater Drainage Facilities

The proposed site development includes six tributary drainage areas shown in Appendix A.

Drainage Areas 1-4:

Runoff that does not infiltrate in-place will sheet flow into stormwater drainage swales. Stormwater will be pretreated through a 12-in (minimum) sand window prior to infiltrating into native subsoils. Culverts will be installed as necessary to route stormwater away from bike park trails and features.

Drainage Areas 5-6:

Runoff that does not infiltrate in-place will sheet flow into one of two existing stormwater drainage swales. The existing swales were constructed as part of Discovery Park, Phase 2. Each existing swale conveys stormwater to a steel, grated inlet before being routed underground to be retained in a seepage bed. During a major storm event, the conveyance swales are anticipated to detain the additional stormwater runoff generated by this project temporarily before being conveyed towards a respective seepage bed. Discovery Park Phase 2 Drain Basin Calculations, designed by others, are shown in Appendix D.

Peak Rate of Discharge and Storage Volume

Peak storm discharge and required storage volume was determined using the Rational Method, with a 100-year storm return period. The following infiltration rates were measured at the time of the Geotechnical Engineering Evaluation: 15 in/hr in the silty sand with gravel, 60 in/hr in the gravel with sand and cobbles. An infiltration rate of 8 in/hr was used for design as recommended by the project site's Geotechnical Engineering Evaluation. Drainage calculations are attached in Appendix B.

Appendix A

Drainage Basin Map

Drainage Map

Horizontal Scale: 1" = 80'

0 80' 160'

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Drainage Map
DISCOVERY BIKE PARK
CITY OF MERIDIAN PARKS & RECREATION

2121 E LAKE HAZEL RD
MERIDIAN, ID 83642

Revisions

1.

Project No.: 122129
Date of Issuance: 03.08.2023

Drainage Map

App A

File Location: p:\2022\122129-cad\civil\calcs and reports\storm_support\dwgs\122129 drainagemap.dwg
Last Plotted By: chad reitze
Date Plotted: Friday, February 24 2023 at 03:53 PM

Appendix B

Facility Sizing Calculations

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Drainage Calculations
Basin Developed Volume

Drainage Area 1

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	1,025	sf (C coefficient: 0.95)
Pervious Area	=	20,390	sf (C coefficient: 0.65)
ΣArea	=	21,415	sf
ΣArea	=	0.49	acres
C Coefficient (weighted)	=	0.66	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	0.84	506	34	472
15	900	2.18	0.71	641	51	590
20	1,200	1.81	0.59	709	68	642
30	1,800	1.51	0.49	888	101	786
40	2,400	1.15	0.38	901	135	766
50	3,000	1.00	0.33	980	169	811
60	3,600	0.96	0.31	1,129	203	**926**
120	7,200	0.54	0.18	1,270	405	865
180	10,800	0.40	0.13	1,411	608	803
360	21,600	0.25	0.08	1,764	1,216	548
720	43,200	0.16	0.05	2,258	2,432	-174
1,440	86,400	0.10	0.03	2,822	4,864	-2,042

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr	*per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)*
Swale Top Area	=	2100	sf	
Swale Bottom Area	=	486	sf	
Avg. Swale Depth	=	2.00	ft	
Storage Vol. of swale	=	1,985	cf	*per Autodesk Civil3D Surface Volume Comparison Model*
Inf Window Area	=	304	sf	
Infiltration Rate	=	203	cf/hr	

System Checks

Max. Runoff Developed (Vs Max)	=	926	cf	
Total Volume Provided	=	1,985	cf	**System OK (Excess Capacity)**
% of Req'd Volume Provided	=	214%		
System Recovery				
Maximum Runoff	=	926	cf	
Other Sources	=	0	cf	
Percolation Volume	=	926	cf	
Recovery Time	=	4.6	hours	**Recovery OK (<48 hrs)**

System Summary:	**2100**	sf x (Top Area)	**486**	sf x (Bottom Area)	**2.00**	ft deep

THE LAND GROUP

Drainage Calculations
Basin Developed Volume

Drainage Area 2

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	0	sf (C coefficient: 0.95)
Pervious Area	=	5,560	sf (C coefficient: 0.65)
ΣArea	=	5,560	sf
ΣArea	=	0.13	acres
C Coefficient (weighted)	=	0.65	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	0.21	128	20	108
15	900	2.18	0.18	163	30	133
20	1,200	1.81	0.15	180	40	140
30	1,800	1.51	0.13	226	60	165
40	2,400	1.15	0.10	229	80	149
50	3,000	1.00	0.08	249	101	148
60	3,600	0.96	0.08	287	121	**166**
120	7,200	0.54	0.04	323	241	81
180	10,800	0.40	0.03	358	362	-4
360	21,600	0.25	0.02	448	724	-276
720	43,200	0.16	0.01	573	1,448	-875
1,440	86,400	0.10	0.01	717	2,896	-2,179

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr	*per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)*
Swale Top Area	=	465	sf	
Swale Bottom Area	=	255	sf	
Avg. Swale Depth	=	0.60	ft	
Storage Vol. of swale	=	219	cf	*per Autodesk Civil3D Surface Volume Comparison Model*
Inf Window Area	=	181	sf	
Infiltration Rate	=	121	cf/hr	

System Checks

Max. Runoff Developed (Vs Max)	=	166	cf	
Total Volume Provided	=	219	cf	**System OK (Excess Capacity)**
% of Req'd Volume Provided	=	132%		
System Recovery				
Maximum Runoff	=	166	cf	
Other Sources	=	0	cf	
Percolation Volume	=	166	cf	
Recovery Time	=	1.4	hours	**Recovery OK (<48 hrs)**

System Summary:	**465**	sf x (Top Area)	**255**	sf x (Bottom	**0.60**	ft deep

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Drainage Calculations
Basin Developed Volume

Drainage Area 3

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	0	sf (C coefficient: 0.95)
Pervious Area	=	29,625	sf (C coefficient: 0.65)
ΣArea	=	29,625	sf
ΣArea	=	0.68	acres
C Coefficient (weighted)	=	0.65	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	1.14	684	32	653
15	900	2.18	0.96	867	47	820
20	1,200	1.81	0.80	960	63	897
30	1,800	1.51	0.67	1,202	95	1,107
40	2,400	1.15	0.51	1,220	126	1,094
50	3,000	1.00	0.44	1,326	158	1,168
60	3,600	0.96	0.42	1,528	189	1,338
120	7,200	0.54	0.24	1,719	379	1,340
180	10,800	0.40	0.18	1,910	568	**1,342**
360	21,600	0.25	0.11	2,387	1,136	1,251
720	43,200	0.16	0.07	3,056	2,272	784
1,440	86,400	0.10	0.04	3,819	4,544	-725

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr	*per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)*
Swale Top Area	=	1478	sf	
Swale Bottom Area	=	953	sf	
Avg. Swale Depth	=	0.85	ft	
Storage Vol. of swale	=	1,531	cf	*per Autodesk Civil3D Surface Volume Comparison Model*
Inf Window Area	=	284	sf	
Infiltration Rate	=	189	cf/hr	

System Checks

Max. Runoff Developed (Vs Max)	=	1,342	cf	
Total Volume Provided	=	1,531	cf	**System OK (Excess Capacity)**
% of Req'd Volume Provided	=	114%		
System Recovery				
Maximum Runoff	=	1,342	cf	
Other Sources	=	0	cf	
Percolation Volume	=	1,342	cf	
Recovery Time	=	7.1	hours	**Recovery OK (<48 hrs)**

System Summary:	**1478**	sf x (Top Area)	**953**	sf x (Bottom	**0.85**	ft deep

Drainage Calculations
Basin Developed Volume

Drainage Area 4

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	0	sf (C coefficient: 0.95)
Pervious Area	=	7,885	sf (C coefficient: 0.65)
ΣArea	=	7,885	sf
ΣArea	=	0.18	acres
C Coefficient (weighted)	=	0.65	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	0.30	182	18	165
15	900	2.18	0.26	231	26	205
20	1,200	1.81	0.21	256	35	220
30	1,800	1.51	0.18	320	53	267
40	2,400	1.15	0.14	325	70	255
50	3,000	1.00	0.12	353	88	265
60	3,600	0.96	0.11	407	105	**301**
120	7,200	0.54	0.06	457	211	247
180	10,800	0.40	0.05	508	316	192
360	21,600	0.25	0.03	635	632	3
720	43,200	0.16	0.02	813	1,264	-451
1,440	86,400	0.10	0.01	1,017	2,528	-1,511

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr	*per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)*
Swale Top Area	=	854	sf	
Swale Bottom Area	=	350	sf	
Avg. Swale Depth	=	0.65	ft	
Storage Vol. of swale	=	346	cf	*per Autodesk Civil3D Surface Volume Comparison Model*
Inf Window Area	=	158	sf	
Infiltration Rate	=	105	cf/hr	

System Checks

Max. Runoff Developed (Vs Max)	=	301	cf	
Total Volume Provided	=	346	cf	**System OK (Excess Capacity)**
% of Req'd Volume Provided	=	115%		
System Recovery				
Maximum Runoff	=	301	cf	
Other Sources	=	0	cf	
Percolation Volume	=	301	cf	
Recovery Time	=	2.9	hours	**Recovery OK (<48 hrs)**

System Summary:	**854**	sf x (Top Area)	**350**	sf x (Bottom	**0.65**	ft deep

THE LAND GROUP

Drainage Calculations
Basin Developed Volume

Drainage Area 5

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	0	sf (C coefficient: 0.95)
New Pervious Area	=	7,120	sf (C coefficient: 0.65)
Exist. Pervious Area	=	81,688	sf (C coefficient: 0.20)
ΣArea	=	88,808	sf
ΣArea	=	2.04	acres
C Coefficient (weighted)	=	0.24	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	1.24	745	30	715
15	900	2.18	1.05	944	45	899
20	1,200	1.81	0.87	1,045	60	985
30	1,800	1.51	0.73	1,308	90	1,218
40	2,400	1.15	0.55	1,328	120	1,208
50	3,000	1.00	0.48	1,444	150	1,294
60	3,600	0.96	0.46	1,663	180	1,483
120	7,200	0.54	0.26	1,871	360	1,511
180	10,800	0.40	0.19	2,079	540	**1,539**
360	21,600	0.25	0.12	2,599	1,080	1,519
720	43,200	0.16	0.08	3,327	2,160	1,167
1,440	86,400	0.10	0.05	4,158	4,320	-162

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr	*per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)*
Exist. Storage Trench Width	=	10.00	ft	
Exist. Storage Trench Length	=	27.00	ft	
Exist. Storage Trench Depth	=	9.00	ft	
Exist. Storage Vol. of trench	=	972	cf	*(40% void ratio, per Discovery Park Ph.2 Civil Plans)*
Exist. Swale Top Area	=	6482.00	sf	
Exist. Swale Bottom Area	=	60.00	sf	
Exist. Avg. Swale Depth	=	1.39	ft	
Exist. Storage Vol. of swale	=	4,547	cf	*per Autodesk Civil3D Surface Volume Comparison Model*
Inf Window Area	=	270	sf	
Infiltration Rate	=	180	cf/hr	

System Checks

Max. Runoff Developed (Vs Max)	=	1,539	cf	
Total Volume Provided	=	5,519	cf	**System OK (Excess Capacity)**
% of Req'd Volume Provided	=	359%		
System Recovery				
Maximum Runoff	=	1,539	cf	
Other Sources	=	0	cf	
Percolation Volume	=	1,539	cf	
Recovery Time	=	8.6	hours	**Recovery OK (<48 hrs)**

System Summary:	**10.00**	ft wide x	**9.00**	ft deep x	**27.00**	ft long

THE LAND GROUP

Drainage Calculations
Basin Developed Volume

Drainage Area 6

Prepared By: C. Rietze
Date: 02/24/2023
Project #: 122129

Impervious Area	=	0	sf (C coefficient: 0.95)
New Pervious Area	=	5,300	sf (C coefficient: 0.65)
Exist. Pervious Area	=	58,543	sf (C coefficient: 0.20)
ΣArea	=	63,843	sf
ΣArea	=	1.47	acres
C Coefficient (weighted)	=	0.24	

Storage Volume Required (100-yr Storm)

(based on ACHD Boise Area IDF Curve, 100-yr Return Period)

Time (min)	Time (sec)	Intensity (in/hr)	Q dev. (cfs)	V dev. (cf)	V inf. (cf)	Vs (cf)
10	600	2.58	0.90	539	21	517
15	900	2.18	0.76	683	32	651
20	1,200	1.81	0.63	756	43	713
30	1,800	1.51	0.53	946	64	882
40	2,400	1.15	0.40	960	85	875
50	3,000	1.00	0.35	1,044	107	937
60	3,600	0.96	0.33	1,202	128	1,074
120	7,200	0.54	0.19	1,353	256	1,097
180	10,800	0.40	0.14	1,503	384	**1,119**
360	21,600	0.25	0.09	1,879	768	1,111
720	43,200	0.16	0.06	2,405	1,536	869
1,440	86,400	0.10	0.03	3,006	3,072	-66

Drainage System Characteristics

System Infiltration Rate	=	8.00	in./hr
Exist. Storage Trench Width	=	8.00	ft
Exist. Storage Trench Length	=	24.00	ft
Exist. Storage Trench Depth	=	9.00	ft
Exist. Storage Vol. of trench	=	691	cf
Exist. Swale Top Area	=	2302.00	sf
Exist. Swale Bottom Area	=	60.00	sf
Exist. Avg. Swale Depth	=	0.80	ft
Exist. Storage Vol. of swale	=	945	cf
Inf Window Area	=	192	sf
Infiltration Rate	=	128	cf/hr

per Strata Geotechnical Eng. Evaluation (File No. BO16068A, dated 7.26.2017)

(40% void ratio, per Discovery Park Ph.2 Civil Plans)

per Autodesk Civil3D Surface Volume Comparison Model

System Checks

Max. Runoff Developed (Vs Max)	=	1,119	cf
Total Volume Provided	=	1,636	cf
% of Req'd Volume Provided	=	146%	
System Recovery			
Maximum Runoff	=	1,119	cf
Other Sources	=	0	cf
Percolation Volume	=	1,119	cf
Recovery Time	=	8.7	hours

System OK (Excess Capacity)

Recovery OK (<48 hrs)

System Summary:	**8.00**	ft wide x	**9.00**	ft deep x	**24.00**	ft long

Appendix C

Geotechnical Report

STRATA

A Professional Services Corporation

Integrity from the Ground Up

July 26, 2017
File: BO16068A

Mr. Bob Schafer
The Land Group, Inc.
462 East Shore Drive, Suite 100
Eagle, Idaho 83616

RE: **REPORT**
Geotechnical Engineering Evaluation
South Meridian Regional Park
Lake Hazel Road
Meridian, Idaho

Greetings, Bob:

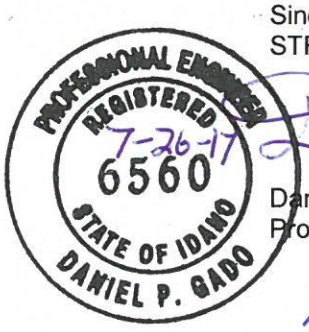
Strata, A Professional Services Corporation (STRATA) has performed the authorized geotechnical engineering evaluation for the proposed South Meridian Regional Park to be located south of Lake Hazel Road, between Locust Grove and Eagle Roads. The purpose of our geotechnical engineering evaluation was to explore the subsurface conditions for the proposed development area and to provide geotechnical engineering recommendations to assist project planning, design and construction.

The general subsurface conditions consist of surficial clay overlying variably cemented silt/silty sand underlain by a deep sand and gravel deposit. The upper lean clay is moisture sensitive and will need to be remediated to enable the planned construction to proceed. Specific geotechnical opinions and recommendations are included for foundations, floor slabs, flat work, pavement and stormwater infiltration. The geotechnical recommendations presented must be read and implemented in their entirety. Individual portions of the report cannot be relied upon without the supporting text of relevant sections.

The success of the proposed construction will depend, in part, on following the report recommendations and good construction practices. It will be important for STRATA to be on-site during construction to verify the subsurface conditions encountered and adjust our recommendations, as needed, during construction. Our experience has been that maintaining continuity with a single geotechnical consultant reduces errors and contributes to overall project success and economy.

We appreciate the opportunity to work with you on this project. Please do not hesitate to contact us if you have any questions or comments.

Sincerely,
STRATA



Daniel P. Gado, P.E.
Project Engineer

David Briggs, E.I.T., PMP
Project Manager

DB/DG/al

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www.stratageotech.com

Geotechnical Engineering Evaluation
South Meridian Regional Park
Lake Hazel Road
Meridian, Idaho

Prepared For:
Mr. Bob Schafer
The Land Group
462 East Shore Drive, Suite 100
Eagle, Idaho 83616

Prepared By:
STRATA, A Professional Services Corporation
8653 West Hackamore Drive
Boise, Idaho 83709
P. 208.376.8200
F. 208.376.8201

July 26, 2017

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REPORT
Geotechnical Engineering Evaluation
South Meridian Regional Park
Lake Hazel Road
Meridian, Idaho

INTRODUCTION

STRATA is pleased to present our authorized geotechnical engineering evaluation for the proposed South Meridian Regional Park in Meridian, Idaho. The proposed park improvements focus on concession/restroom/shelter buildings, light pole foundations, exterior flatwork, paved parking and athletic recreation fields as presented on the attached Exploration Location Plan, Plate 1. The purpose of our geotechnical engineering evaluation was to assess the soil and geologic conditions within the proposed development area and provide geotechnical opinions, design and construction recommendations with respect to the proposed development. Our recommendations are based on our subsurface investigation and experience with similar projects. To provide this evaluation, we conducted the following:

1. Coordinated access to the site with City of Meridian (City), Mr. Darwin McKay the sod farmer and contacted utility locate prior to test pit exploration.

2. Subcontracted a backhoe to observe the excavation of 17 test pits to depths on the order of 4 to 15 feet below existing grade (BEG). A field engineer observed, described and classified the subsurface conditions encountered referencing ASTM D 2487 and ASTM D 2488, Unified Soil Classification System (USCS). The test pits were loosely backfilled level with the ground surface.

3. Collected disturbed samples from test pit excavations and submitted the samples obtained for identification and laboratory testing.

4. Installed 4 standpipe piezometers in test pits to evaluate groundwater level fluctuation at the site. We accomplished 3 percolation tests to evaluate infiltration rates for subsoil for on-site stormwater disposal. The piezometers will be monitored during irrigation season on a monthly basis from July to October 2017.

5. Located all test pits in the field from known topographic/cultural features. We provide latitude and longitude coordinates for each test pit (refer to test pit logs in Appendix A) using hand held GPS. We recommend that all test pit locations be accurately located by survey methods to ease future remediation.

6. Performed engineering analyses in order to provide geotechnical design and earthwork construction recommendations. Our engineering analyses provides geotechnical recommendations for:

    - Earthwork
        - Site preparation
        - Structural fill criteria
        - Required compaction
        - Wet weather construction
        - Excavation characteristics
        - Temporary slope construction requirements
        - Geotextile applications

- Foundation Evaluation for buildings and light pole foundations
  - Allowable bearing pressure
  - LPILE lateral resistance criteria
  - Anticipated settlement
- Asphalt Pavement Evaluation
  - Subgrade preparation requirements
  - Design parameters
  - Recommended access road and parking sections
- Site Drainage
  - Subsurface Stormwater disposal infiltration rates
  - Seasonal high Groundwater
  - Exterior grading
- Additional recommended services
  - Geotechnical design continuity
  - Plan and specification review
  - Geotechnical observation during construction

PROJECT UNDERSTANDING

Existing Site Conditions

The South Meridian Regional Park is currently an approximate 77-acre turf farm maintained by Darwin McKay of The Turf Company. The site is located south of Lake Hazel Road, between Locust Grove and Eagle Roads. Farm land borders the site on the east, south and west. Two concrete lined irrigation water ways run east and west across the site. A large equipment storage area with a roof and no walls is located in the northwestern most corner of the site. The Williams-Northwest Gas Pipeline extends diagonally from the northwest side of the site (south of TP-2) to the southeast side of the site (south of TP-10) as shown on Plate 1.

Proposed Construction

We understand the City of Meridian plans to develop this site as a regional park with asphalt paved parking, play structures, athletic fields, restrooms and concessions, picnic shelters, a splash pad, sidewalks and infiltration drainage features. We understand franchise utilities will be extended to the project site. Site grading will likely require cut and fill of up to 3 to 5 feet, although ponds are planned in a portion of the site, which will likely require excavation depths of 15 to 20 feet. At the time of this report, STRATA was provided a 55% complete design development site plan.

SUBSURFACE EVALUATION PROCEDURES

STRATA accomplished subsurface exploration between May 11, 2017 and June 14, 2017 via 17 exploratory test pits extending 4 feet to 15 feet BEG. The test pit exploration was coordinated with The Turf Company's harvesting of sod to mitigate damage to the sod. The approximate exploration locations are illustrated on Plate 1, *Exploration Location Plan,* which also delineates the proposed park development. Test pit locations were established in the field by measuring from existing site features. A field engineer visually evaluated the soil encountered in each test pit and logged the soil profile referencing the USCS. We provide a brief USCS explanation in Appendix A to help interpret the terms on the test pit logs. We also provide individual test pit

logs in Appendix A. The test pits were loosely backfilled with the excavated material to the ground surface following the completion of the excavations.

SUBSURFACE CONDITIONS

STRATA's encountered subsurface conditions consisting of surficial topsoil and native sandy clay, variably cemented sandy silt/silty sand underlain by a deep deposit of sand and gravel. Basalt rock was encountered at a depth of 12 feet in test pit TP-11 on the west edge of the site. The thickness and depth of these soils can vary over the area of the planned construction. We provide the following general information regarding the anticipated subsurface soil:

- **Topsoil -** Native topsoil consisting of sandy clay with roots extending approximately 4-inches to 6-inches BEG was encountered between the existing surface elevation to a depth approximately 1 foot BEG. The top soil was observed to generally consist of sandy lean clay described as dark brown, firm and moist.

- **Clay/Sand/Silt -** Native soil consisting of sandy lean clay (CL), clayey sand (SC), or sandy silt (ML) was observed underlying the top soil encountered. This material was typically encountered between 1 feet and 3 feet BEG and was classified as brown, stiff to very stiff, loose to medium dense, and moist.

- **Cemented Silt/Sand -** Underlying the upper native clay/sand/silt was encountered cemented sandy silt (ML) or silty sand (SM) was encountered from a depth of approximately 2.5 foot BEG up to 13 feet BEG. This soil contains moderate to strong calcium carbonate cementation and in some locations, may be very hard and locally known as caliche. The materials is described as tan, very stiff to hard and moist.

- **Sand/Gravel -** Underlying the cemented silt and silty sand, we encountered sand and or gravel with vary amounts of silt and cobbles. This deposit contains silty sand with gravel (SM), sand with silt and gravel (SP-SM) and poorly graded gravel (GP) with sand, cobbles and silt. The depth to the top of this layer varied from 4 feet at TP-1 to 12.5 feet in TP-8. The above described sand and gravel is typically described as light brown to dark brown, medium dense to dense, and moist.

- **Basalt Rock** – Basalt rock was encountered at a depth of 12 feet in test pit TP-11. This was the only location where rock was encountered, however, the depth to rock could vary beneath the project site.

Groundwater is anticipated to be greater than 20 feet beneath the ground surface based on our test pit results and review of well logs in the project area.

LABORATORY TESTING

We returned soil samples collected in the field to our laboratory for further classification and testing and accomplished laboratory testing referencing ASTM procedures. We developed our laboratory testing program for this project primarily to verify soil classification through index testing, as well as to evaluate settlement characteristics of fine grained soil. Specifically, we accomplished the following laboratory testing:

- In-situ Moisture Content
- Grain Size Analysis
- Atterberg Limits
- R-Value

We present laboratory test results on test pit logs in Appendix A and the laboratory test summary and grain size plots are presented in Appendix B. We will retain soil samples for 90 days and discard after this time period unless we are notified to store the samples for an extended period of time.

GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

General

Our geotechnical opinions and recommendations are presented in the following sections to assist project planning, design, and construction. Our opinions and recommendations reflect our understanding of the project through our discussions with the design team members based on 55% design development plans. If design plans change, such as loading conditions, or the building configuration, STRATA should be notified to review our report recommendations and make necessary modifications.

The subsurface conditions may vary from what we have assumed in our *Subsurface Conditions* section of this report. These changes in conditions may not be apparent until construction. If the subsurface conditions change from the anticipated conditions, the construction schedule, plans, and costs may change.

Evaluation of Subsurface Soil

As discussed in the *Subsurface Conditions* section, near-surface soil to a depth of approximately 1 foot to 3 feet below existing grade consists of firm to stiff, lean sandy clay or clayey sand. The moisture sensitive clay is not suitable for support of the concession/restroom/shelter buildings or light pole foundations. However, if the recommendations in this report are adhered to, the clay soil can support interior slabs and exterior flatwork. The underlying cemented sandy silt encountered at a depth of approximately 2.5 to 3 feet is acceptable for foundation support.

Site Preparation/Earthwork

Site Stripping

In the area of the proposed building, pavement and flatwork development all surficial topsoil with roots should be stripped and removed from the area. Topsoil with roots are anticipated to extend to a depth of approximately 4 to 6 inches below the ground surface.

Site Preparation– Building Floor, Exterior Flatwork and Pavement Areas

As discussed in the *Existing Subsurface Conditions*, we encountered sandy lean clay in the upper 2 to 3 feet beneath the site. The clay subgrade should be moisture conditioned to near optimum moisture and proof-compacted with 5 passes of a minimum 5-ton, sheeps foot roller. If weaving or pumping of the subgrade is observed, the unstable soil should be removed and replaced with granular structural fill.

Soil Improvement – Building Foundation Areas

All building foundations (concession, rest rooms and shelters) should be excavated through any native clay and bear on the underlying very stiff to hard sandy silt with varying cementation or granular structural fill over the cemented sandy silt. The depth to the underlying native cemented sandy silt is anticipated to be approximately 2.5 to 3 feet below the existing grade.

Structural Fill

All fill placed for support of foundations, floor slabs, flatwork and pavement areas must be placed as structural fill. Project structural fill materials are described in Table 1 below. The on-

site lean clay and silt is moisture sensitive, will require moisture conditioning and will be difficult to reuse as structural fill during inclement weather.

Table 1. Structural Fill Specifications and Allowable Use

Structural Fill Material • Allowable use	Material Specifications	Sieve Size	% Passing
General Structural Fill • General site grading	• Soil classified as GW, GP, GP-GM, GM, SW, SP, SP-SM, SM, ML or CL according to the USCS. • Maximum particle size must be less than 6 inches. • Soil consisting of inert earth materials with less than 3 percent organics or other deleterious substances (wood, metal, plastic, waste, etc).	6 Inch	100
Granular Structural Fill • General structural fill • Over-excavations • Pavement section granular subbase	• Soil classified as GW, GP, GP-GM, according to the USCS, and meeting the gradation provided. • Soil meeting requirements stated in the latest edition of the *Idaho Standard for Public Works Construction (ISPWC), Section 801 – Aggregate Subbase*	6 Inch 3 Inch No. 4 No. 200	100 90-100 30-60 <10
Utility Trench Bedding • Utility trench construction	• Soil may not contain particles larger than 1 inch in median diameter and must meet the required gradation. • Soil meeting requirements stated in the latest edition of the *Idaho Standard for Public Works Construction (ISPWC), Section 305 – Pipe Bedding.*	1 Inch ¾ Inch 3/8 Inch No. 4 No. 8 No. 200	100 80-100 20-70 5-20 0-5 0-3
Aggregate Base Course • Granular structural fill • Pavement section base course	• Soil may not contain particles larger than 1 inch in median diameter and must meet the required gradation. • Soil meeting requirements stated in the latest edition of the *Idaho Standard for Public Works Construction (ISPWC), Section 802 – Aggregate Base*.	1 Inch ¾ Inch No. 4 No. 8 No. 200	100 90-100 40-65 30-50 3-9

All structural fill must be compacted to a minimum of 95 percent of the maximum dry density of the soil referencing ASTM D 1557 (Modified Proctor). Fill placed outside any building envelope, flatwork or road section can be placed as non-structural fill (i.e. landscape fill) providing there are no structures (flatwork, signs, etc.) planned directly above the landscape fill. We recommend landscape fill be compacted to a minimum of 85 percent of the maximum dry density of the soil according to ASTM D 1557 (Modified Proctor).

Any structural fill products must be moisture conditioned to near-optimum moisture content and placed in maximum 12-inch-thick, loose lifts. The above assumes large compaction equipment with drum energy of at least 5 tons or greater is used to attempt compaction. If smaller or lighter compaction equipment is provided, the lift thickness may have to be reduced to meet the compaction requirements presented herein.

Geosynthetics

We recommend geosynthetic fabrics may be used to improve subgrade support when constructing on soft or wet soil such as the clay and silt encountered at shallow depths at the site. Where required, apply geosynthetics directly on approved subgrade, taut, free of wrinkles and over-lapped at least 12 inches. Woven geosynthetic fabrics for subgrade stabilization and soil improvements shall have the following minimum properties of 700 pounds (CBR Puncture, ASTM D6241), 100 pounds (Puncture Strength ASTM D4833) and 200 pounds (Grab Tensile Strength ASTM D4632) such as a Contech C200. STRATA must be consulted prior to using geosynthetics for subgrade stabilization. Further, we recommend contractors carefully review subsurface conditions prior to bidding and recommend the design team include a unit price for woven geosynthetics for the earthwork portion of the project.

We recommend non-woven geosynthetic fabrics for filtration and for stormwater facilities. Non-woven fabrics and should have a maximum apparent opening size equivalent to the U.S. No. 70 sieve (ASTM D4751), a minimum weight of 3.5 ounces per square yard and minimum CBR puncture resistance of 200 pounds (ASTM D6241) and 50 pounds (Puncture Strength ASTM D4833).

Excavation Characteristics

We anticipate site soil may be excavated using conventional excavation techniques however, the strongly cemented silt may require track excavators with ripper teeth to excavate. Basalt rock was encountered in test pit TP-11 at a depth of 12 feet. If rock is encountered it will likely require pneumatic hammers, ripper teeth or drill and blast methods to excavate. Carefully plan and implement temporary excavations to be sloped, shored, or braced in accordance with the OSHA excavation regulations, *Document 29, CFR Part 1926, Occupation Safety and Health Standards – Excavations; Final Rule*.

Regulations outlined by OSHA provide temporary construction slope requirements for various soil types and slopes up to 20 feet high. Based on our exploration results, we anticipate the upper stiff clay and cemented silt is typically classified as Type B soil, which can be temporarily sloped as steep as 1H:1V (horizontal to vertical), when in a dry condition. The underlying sand and gravel is Type C soil and should be sloped no steeper than 1.5H:1V. Due to the potential for varying soil conditions during construction, we recommend earthwork contractors evaluate each slope configuration specific to *OSHA* guidelines and to seek appropriate professional guidance to create safe and stable excavations.

Construction vibrations can cause excavations to slough or cave. We recommend not stockpiling materials adjacent to or within 10 feet of excavations, which may cause a surcharge and contribute to excavation instability. Ultimately, the contractor is solely responsible for site safety and excavation configurations factoring in water infiltration, construction access, adjacent loading, and other factors that contribute to excavation stability.

The earthwork contractor shall plan excavations with water collection points and utilize conventional sumps and pumps to remove nuisance water from runoff, seeps, or precipitation. If site soil excavations are not immediately backfilled, they may degrade when exposed to runoff and require over-excavation and replacement with granular structural fill. We recommend construction activities and excavation backfilling be performed as rapidly as possible following excavation to reduce the potential for subgrades to degrade under construction traffic.

Wet Weather Construction

We strongly recommend earthwork construction take place during dry weather conditions. Native lean clay and silt are susceptible to pumping or rutting from heavy loads such as rubber-tired equipment or vehicles when the soil is above optimum moisture content. Earthwork should not be performed immediately after rainfall or until soil can dry sufficiently to allow construction traffic without disturbing the subgrade. During and after achieving subgrade elevation, the contractor must take precautions to protect the subgrade from becoming disturbed or saturated. We recommend the contractor limit construction traffic to any prepared subgrade and reduce exposure to precipitation and water. Specifically, the contractor should:

- Grade subgrades to aggressively direct surface water away from construction areas that could be adversely affected by infiltration.
- After adequate moisture conditioning efforts have failed, remove exposed subgrade soil that becomes soft or begins to pump to firm soil and replace it with structural fill as described above for over-excavations.
- Never attempt structural fill placement during or immediately following a significant precipitation event.
- Never allow subgrades to freeze or become saturated prior to fill placement.

The final subgrade conditions and careful construction procedures are critical to the long-term project performance. We recommend earthwork specifications specifically identify the contractor's responsibility to protect and maintain prepared subgrades. It may improve project economy to retain STRATA to observe the subgrade preparation activities to identify techniques or construction activities that may be attributing to unstable subgrades and contributing to the need for over-excavations.

Allowing time for proper moisture-conditioning during dry weather is critical to reducing excessive over-excavations and importing granular structural fill. However, depending on the weather and moisture conditions during construction, drying fine-grained soil may not be practical, and over-excavation in conjunction with the use of geosynthetics may be necessary to help maintain project schedule. In short, using site soil may be impractical during certain weather or soil conditions and we recommend contingencies to remove and replace wet soil.

Utility Trench Construction

Structural fill for backfilling utility trenches and all bedding should conform to ISPWC specifications, except that all trench backfill must be placed and compacted to the structural fill requirements presented herein. Loose soil must be removed from the base of utility trenches prior to placing pipe bedding. We do not anticipate utilities will encounter ground water. If groundwater is encountered, it must be removed from the base of the utility trench before placing pipe bedding. Temporary dewatering using gravel sumps and pumps should be anticipated for deeper utility trenches. We recommend utility pipes be placed on at least 4 inches of bedding placed over undisturbed native soil, structural fill or otherwise supported according to the pipe manufacturer's specifications and ISPWC requirements.

After bedding the pipe, place structural fill and compact it from the pipe invert to 1-foot above the top of the pipe with tamping bars and/or plate compactors to render the backfill in a firm and unyielding condition. Thoroughly place and compact bedding below pipe haunches or the zone between the pipe invert and the spring line. To accomplish backfilling, the distance between the side of the pipe at the spring line and the trench wall should be at least 12 inches. The remainder of the utility trench should be backfilled in accordance with the *Structural Fill* section of this report.

Construction Dewatering

We anticipate groundwater will not be encountered within approximately 20 feet of the ground surface. However, any groundwater that accumulates in excavations will require the use of gravel sumps and pumps to remove the water to enable utility construction to proceed.

Foundations

Soil Improvement

As discussed in the *Site Preparation/Earthwork* section of this report, all building foundation excavations need to extend through the surficial top soil and native lean clay to the underlying cemented sandy silt to reduce the potential for settlement. We anticipate excavations will be 2.5 feet to 3 feet BEG to encounter native cemented sandy silt. We recommend the use of shallow foundations bearing directly on native cemented sandy silt or structural fill over this material. **PLEASE NOTE** for the planned sign foundation in the vicinity of test pit TP-1, the foundation excavation should extend through the clay and silt into the underlying gravel with sand encountered at depth of 4 feet. Considering the above discussion, we recommend foundations be designed using the criteria outlined in the following section of this report.

Design and Construction Recommendations

We understand the proposed concessions, restrooms and shelters will be constructed as above-grade structures. As such, foundations shall be placed on the cemented sandy silt or structural fill placed over this material. For the planned sign foundation near test pit TP-1, foundations should extend into the underlying native gravel with sand. Foundation bearing elevations should be a minimum of 2 feet below final grades for frost protection.

We recommend the proposed building structures be constructed on shallow foundations. Excavation depths of 2.5 feet to 3 feet BEG may be necessary to encounter the underlying native cemented sandy silt. For the planned sign foundation the excavation should extend into the underlying gravel with sand at a depth of approximately 4 feet. The footing excavation should be accomplished such that precipitation runoff, groundwater or other sources of surface water are routed away from footing excavations. The footing bearing surfaces shall be free of standing water, frozen soil, debris, or deleterious material immediately prior to concrete placement. Detailed design recommendations are provided below:

1. **SITE OBSERVATION:** STRATA should be retained to observe all soil improvement and footing excavations prior to concrete placement to verify all bearing surfaces have been prepared in accordance with this report.

2. **FOOTING WIDTHS/FROST DEPTH:** Minimum strip footing widths should be consistent with the current version of the IBC. Exterior footings and interior column footings should be embedded a minimum of 2 feet below exterior grade.

3. **FOOTING SUBGRADE:** Foundations shall be placed on proof-compacted native cemented sandy silt or granular structural fill placed over this soil. Proof-compaction of the disturbed native silt subgrade should be accomplished with a large vibratory hoe-pack mounted on a track-hoe. Footings should never be constructed over loose, disturbed, saturated or frozen soil (i.e. unsuitable soil). If unsuitable soil is observed prior to placing concrete, the soil should be over-excavated to stable soil and replaced with structural fill. Structural fill soil improvement should extend a minimum of 1-foot beyond each footing edge for every 2 feet of vertical structural fill thickness.

4. **ALLOWABLE BEARING PRESSURE:** If the above recommendations are accomplished, an allowable bearing value of 3,000 psf may be used for footing design. This allowable bearing pressure can be increased 30 percent to account for transitory live loads such as wind or seismic forces.

5. **ANTICIPATED SETTLEMENT**: If the above bearing soil, site preparation, earthwork and foundation recommendations are accomplished, we anticipate total settlement will be less than 1-inch and differential settlement will be up to ½-inch per 25 feet of wall length, or between similarly loaded footings that are not less than 25 feet apart.

6. **COEFFICIENT OF SLIDING FRICTION (fs):** If the above recommendations are accomplished, structural design may use a coefficient of sliding friction of 0.40 for mass concrete cast directly on native cemented sandy silt, based on lateral movement up to 0.5-inch.

7. **DESIGN OF LIGHT POLE FOUNDATIONS:** We anticipate light pole foundations will be constructed on drilled-shaft concrete foundations. Drilled shaft foundations should be designed to resist axial and lateral loading as determined by the light pole supplier. We provide the following geotechnical design parameters for drilled shaft foundations to assist the structural designer of the light pole foundations.

Table 2A - Foundation Design – Axial Capacity Parameters

Layer	Depth to Top and Bottom of Layer (ft)		Soil Type (USCS)	Consistency/ Density	Effective Unit Weight (lbs/ft^3)	Allowable Skin Friction (psf)	Allowable Bearing Capacity (psf)
1	0	3	CL	Firm to Stiff	115	NA	Na
2	3	7	ML	Dense	115	500	3,000
3	8	15	GP	Dense	130	1,000	12,000

Table 2B – Foundation Design – Lateral Capacity (LPILE) Parameters

Layer	Depth to Top and Bottom of Layer (ft)		Soil Model P-y curve	Friction Angle (degrees)	Effective Unit Weight (lbs/ft^3)	Undrained Cohesion (lbs/ft^2)	Strain Factor (E_{50})	Soil Modulus (k) (lbs/in^3)
1	0	3	Stiff Clay	NA	115	750	0.010	100
2	3	7	Sand (Reese)	35	115	--	--	150
3	8	15	API Sand	40	130	--	--	275

Drilled Shaft Construction Recommendations – Dry Shaft Construction

We anticipate the drilled shaft structures will be less than 15 feet deep and therefore, are not likely to encounter groundwater. For these structures, we anticipate drilled shaft excavations can utilize dry construction methods during construction and the upper cohesive soil will likely allow for open-hole construction in these areas, although the contractor should be prepared with temporary casing to stabilize the lower sand or gravel which may be susceptible to sloughing or unanticipated groundwater seeps. We provide the following recommendations that we suggest be incorporated into project specifications:

- Remove disturbed soil in the excavation base prior to placing concrete for drilled shafts. A maximum of 1.5 inches of loose soil is permitted in any portion of the shaft, with no more than 0.5 inches of loose soil over more than approximately 50 percent of the shaft base. This requires cleanout buckets on shaft drilling equipment.
- Drilled shaft excavations should be filled with concrete within 24 hours of excavation. Concrete placed within drilled shaft foundations should have the minimum compressive strength required by structural design and should have a slump of 6 to 8 inches to provide workability. For dry shafts, the drilled shaft contractor may place approved self-consolidating concrete mixes using a drop chute and allowing the concrete to free-fall for the length of the drilled shaft.

Concrete Slab-on-Grade Floors

Once subgrade preparation beneath the concrete slabs is accomplished per the *Site Preparation/Earthwork* section of this report, we recommend interior concrete slab-on-grade floors be underlain by at least 4 inches of ¾-inch-minus, well-graded crushed sand and gravel base course to provide a leveling course and moisture protection for the slab. The base course should be placed over the prepared subgrade and compacted to structural fill requirements. Slab subgrade areas that become soft or disturbed must be over-excavated to undisturbed firm native soil and replaced with granular structural fill. The base course and vapor barriers (if utilized) should be installed after the majority of under-slab plumbing and utilities are completed. Floor slabs should be designed for the anticipated use and equipment or storage loading conditions. Based on correlation to our field and laboratory test results, in conjunction with the placement of 4-inch-thick granular base layer recommended in floor slab areas, we recommend a modulus of subgrade reaction (k) of 175 pounds per cubic inch (pci) be used for concrete floor slab design. This modulus is based on a proof compacted clay subgrade overlain by 4 inches of granular base beneath the floor slab.

For interior building slabs, moisture migration through floor slabs can break down a floor covering, its adhesive or cause various other floor covering performance problems. We recommend a vapor barrier be used beneath interior concrete slab-on-grade floors. Vapor barriers should consist of a thick (15 mil), puncture resistant, polyethylene sheeting covered with an additional 2-inch-thick layer of clean, coarse sand placed between the polyethylene and the concrete slab-on-grade floors.

Often, contractors elect to place the vapor retarder directly below the slab bearing surface. Although this is common practice and most retarder manufacturers allow the practice, it can increase the potential for slab curling. Further, punctures can easily occur of the retarder is unprotected. To reduce the potential for curling and punctures, 2 inches of dry sand cushion separating the polyethylene sheeting from the floor slab should be provided. However, it should be noted that slab curing time may be extended and heightened moisture levels in the slab may persist when a protective sand layer is utilized. Form stakes or other sub-slab penetrations must never be allowed to puncture the vapor retarder. Manufacturer recommendations for proper sealing slab-to-wall connections, plumbing or other penetrations must be strictly followed. Although these recommendations are used, water vapor migration through the concrete floor slab is still possible. Floor covering must be selected accordingly and manufacturer's recommendations strictly followed.

Exterior Flatwork

Exterior flatwork slabs are susceptible to frost action from the underlying moisture sensitive clay/silt and can generate frost heave at certain time of the year. The potential for frost heave

may not be acceptable at entries, exterior flatwork or other critical areas adjacent to the building that will be exposed to weather. One approach to provide partial frost protection requires removing approximately 50 percent of material (approximately 12 inches) within the frost depth and replacing it with granular structural fill. If this method is employed, the over-excavated soil must be replaced with subbase and aggregate base course as specified in the *Structural Fill* section. We recommend you consider placing up to 12 inches of base and subbase beneath the exterior slab areas to provide partial frost protection to mitigate heaving of slabs.

Pavement Section Design

General

The following flexible asphalt pavement section design is provided referencing the *Idaho Transportation Department (ITD) Gravel Equivalent Design Method* using locally accepted substitution ratios. STRATA estimated traffic loading and design parameters based on information provided by you, our proposed construction understanding, our understanding of the subsurface conditions, and our experience with similar developments.

Traffic and Subgrade

The following tables present our traffic loading, geotechnical design parameters and references, as well as the resulting flexible pavement section design recommendations.

Table 3. Pavement Design Parameters

Design Parameter	Value Used	References
Traffic Loading	8,000 – 35,000 ESALs[1] (TI = 5.0 – 6.0)	Assumed
Design Life	20 years	Assumed
Subgrade R-value	10	Based on lab test correlations (see paragraph below)
Asphalt Layer Substitution Ratio	1.95	Ada County Highway District Standard
Base Course Substitution Ratio	1.1	Ada County Highway District Standard
Subbase Course Substitution Ratio	1.0	Ada County Highway District Standard

[1]Equivalent Single Axle Loads (ESALs).

Laboratory plasticity testing and field classification on the anticipated pavement subgrade soil resulted in sandy clay (CL), clayey sand (SC) and sandy silt (ML). As such, based on our experience with these soils, we recommend an R-value of 10 be utilized for pavement section design based on encountering sandy clay subgrade. If cemented sandy silt is encountered at pavement subgrade the aggregate subbase can be reduced as presented in Table 3. To help improve subgrade characteristics, the pavement subgrade should be prepared as recommended in this report's Earthwork/Site *Preparation* section. Subgrades must be shaped (crowned) and graded to facilitate positive drainage and inverted crowns must be avoided.

Asphalt, Aggregate Base Course and Subbase Materials

Crushed aggregate base course and granular subbase shall conform to the *Structural Fill* requirements and be placed directly over a properly prepared subgrade. A woven geotextile should be used for constructability during wet and inclement weather and to increase performance at the sandy clay subgrade. The woven geotextile should have material properties

and be placed as outlined in this report's *Geosynthetics* section. We recommend STRATA observe final subgrade preparations, geotextile placement and all aggregate placements.

Asphalt concrete must be compacted to 92 percent of the maximum density for a Hveem or Superpave mix design. The final traveling surface of asphalt concrete shall meet ISPWC ½ - inch asphalt mix design requirements. Asphalt construction and final surface smoothness, joints and density should meet ISPWC specifications. If subgrade conditions appear significantly different during construction or if our assumed traffic information changes, STRATA should be notified to amend our design accordingly.

Concrete

This design method assumes the use of plain jointed concrete. Shrinkage cracks should be controlled by joint spacing not more than 24 times the concrete thickness (in inches), and should be between 1/4 and 1/3 of the slab thickness. Control joints must occur along any line where the concrete thickness changes abruptly and where marked changes in subgrade soil types occur. The outer six feet of the paved area should smoothly transition to a perimeter thickness twice that of the specified pavement thickness. 4,000 psi compressive strength (at 28 days) Portland cement concrete with a maximum 4-inch slump and 4% to 6% entrained air was utilized for design. The concrete should have a minimum modulus of rupture of 650 psi. A curing compound is recommended on all exterior concrete surfaces.

Pavement Section Thickness

STRATA evaluated the pavement sections utilizing the Gravel Equivalent pavement design methodology, soil-engineering parameters from previous field and laboratory testing and the estimated traffic-loading conditions. Based on subgrades prepared as recommended and the traffic criteria provided, Table 4, on the following page, provides the recommended asphalt section for the anticipated pavement application. If traffic loading or subgrade conditions change as design is finalized or during construction, STRATA must review our pavement analyses and resulting sections. For clarity, access drives are primary routes into the site where delivery truck, or other heavy traffic is expected.

Table 4. Pavement Design Sections

Asphalt Pavement Application	**T.I.**	**Asphalt (inches)**	**Base Aggregate (inches)**	**Subbase* Aggregate (inches)**
Standard Duty Section – Parking	5	2.5	4	8
Heavy Duty Section - Access Drive	6	2.5	4	12
Rigid Pavement Application		**Concrete (inches)**	**Base Aggregate (inches)**	
Heavy Duty Section – Trash Enclosure		6	10	

*Where cemented silt is encountered at subgrade the subbase can be eliminated and the base course increased to 8 inches.

Pavement Maintenance

We recommend crack maintenance be accomplished on all pavement surfaces every 3 to 5 years to reduce the potential for surface water infiltration into the underlying pavement subgrade. Surface and subgrade drainage are extremely important to the performance of the pavement section. Therefore, we recommend the subgrade, base and asphalt surfaces slope at

no less than 2 percent to an appropriate stormwater disposal system or other appropriate location that does not impact adjacent buildings or properties. The pavement's lifespan is dependent on achieving adequate drainage throughout the section, especially at the subgrade elevation. Ponding water at the pavement subgrade surface can induce heaving during the freeze-thaw process.

Site Drainage

Surface Drainage

Site grading, including all sidewalks and landscaped area grading, should slope a minimum of 3 to 5 percent away from the proposed building within 10 feet to help prevent ponding and to direct surface runoff away from the structure. All runoff from downspouts, roof areas, sidewalk areas, landscaped areas, and other large volumes of stormwater should be directed and maintained away from the structure and not be allowed to infiltrate the soil beneath the building area, sidewalks or footings. We recommend pavement areas slope away from the building to an approved stormwater disposal system.

Stormwater Disposal

We attempted in-situ infiltration testing to assist in evaluating storm water disposal infiltration rates throughout the site. We encountered free draining soil consisting of silty sand with gravel (SM) or gravel with sand and cobbles (GP) in test pits TP-8, TP-9, and TP-16 at 12.5 feet, 12.0 feet and 7.5 feet BEG respectively. The material was described as reddish brown to dark brown, medium dense to dense and moist. Infiltration rates of 15 inches per hour (in/hr) were measured in the silty sand with gravel and an infiltration rate of greater than 60 in/hr was measured in the gravel with sand and cobbles.

We recommend subsurface infiltration facilities be excavated at least 1 foot into either the silty sand with gravel using a design infiltration rate of 6 in/hr or the poorly graded gravel with sand and cobbles using a design infiltration rate of 8 in/hr. The depth to free draining material is shown on Plate 1. Actual infiltration rates should be confirmed at the time of construction.

Seismic Design Criteria

We anticipate the International Building Code (IBC) will be utilized for project structural design. The IBC outlines the procedure for evaluating site ground motions and design-spectral response accelerations. Based on the exploration results and our review of well logs in the area, the subsurface conditions consist of dense sandy silt over medium dense to dense gravel and we recommend a Site Class D be utilized as a basis for structural seismic design for the project.

Liquefaction

Based on the subsurface profile of dense silt over medium dense to dense native gravel, it is our opinion the potential for liquefaction beneath the planned development is negligible.

ADDITIONAL RECOMMENDED SERVICES

Geotechnical Consultation/Review of Plans and Specifications

We understand STRATA will provide geotechnical consultation with the design team during the development of construction documents. STRATA will review earthwork and geotechnical-related portions of the civil and structural plans and specifications prior to construction bidding.

Construction Observation and Testing

We recommend STRATA be retained to observe all site preparation/earthwork and foundation bearing surfaces. Additionally, we recommend that we observe the subgrade preparation beneath floor slabs and sidewalk areas to verify site stripping and excavation has been accomplished to the recommended bearing soil and that all soft or unsuitable soil has been removed as described above. Geotechnical continuity is an important part of the geotechnical design process to assist the design team in identifying potential subsurface condition changes and other unanticipated issues. STRATA will also provide construction material testing and special inspection for earthwork, masonry, and concrete. If STRATA is not retained to provide the recommended services, we cannot be responsible for soil engineering-related construction errors or omissions.

EVALUATION LIMITATIONS

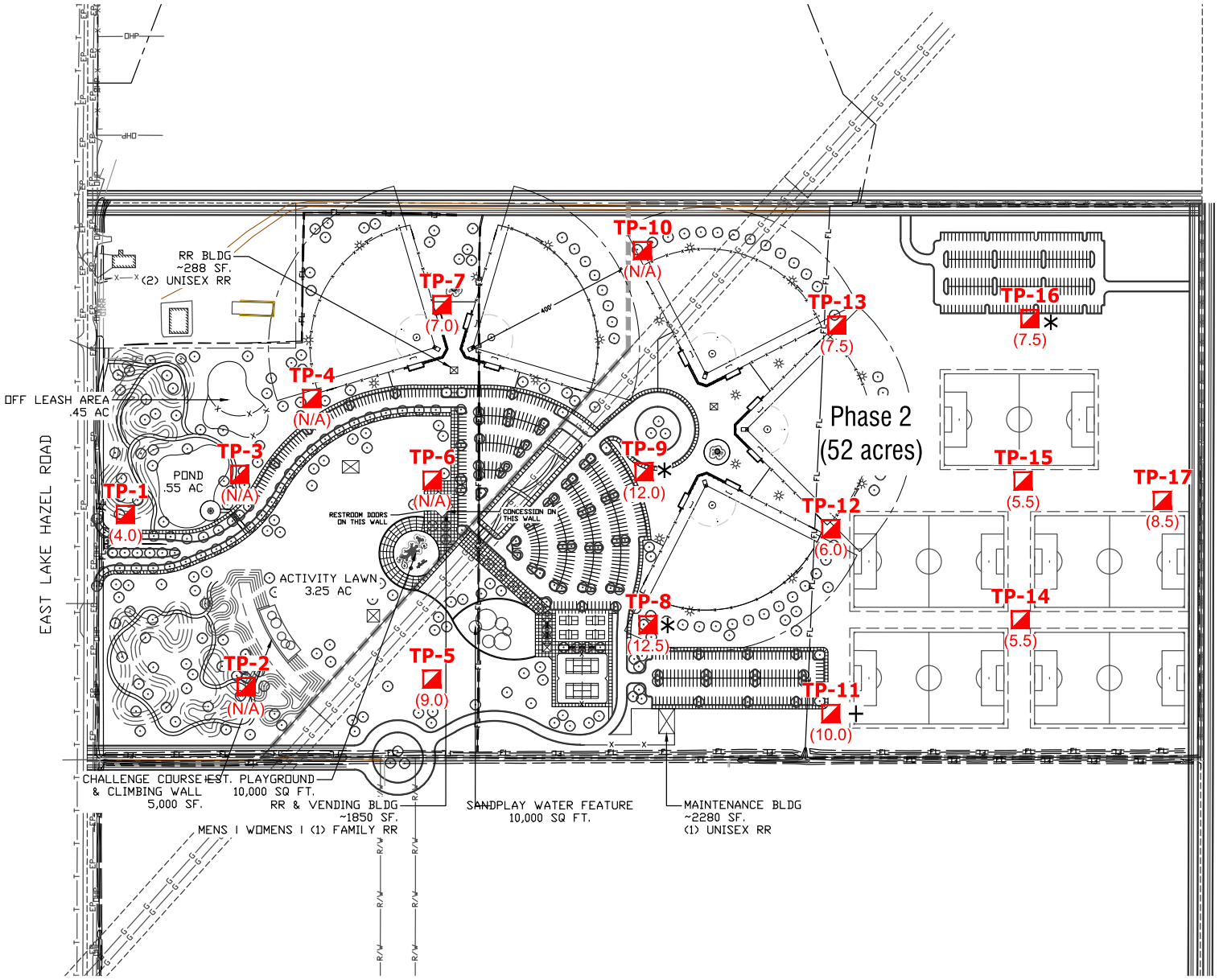
This report has been prepared to assist project planning design and construction of the proposed South Meridian Regional Park in Meridian, Idaho. Our geotechnical findings and opinions have been developed based on the authorized subsurface exploration and laboratory testing, as well as our understanding of the project at this time. Our geotechnical design recommendations are specific to the planned design and infrastructure construction and should not be extrapolated to other future site developments without allowing adequate geotechnical consultation by STRATA.

Our services consist of professional opinions and findings made in accordance with generally accepted geotechnical engineering principles and practices in southwest Idaho at the time of this report. The geotechnical recommendations provided herein are based on the premise that appropriate geotechnical consultation during subsequent design phases is implemented and an adequate program of tests and observations will be conducted by STRATA during construction to verify compliance with our recommendations and to confirm conditions between exploration locations. This acknowledgment is in lieu of all warranties either express or implied.

The following plate accompany and complete this report:

Plate 1: Exploration Location Plan

Appendix A: Exploratory Soil Boring Logs
Unified Soil Classification System (USCS)
Appendix B: Summary of Laboratory Test Results



LEGEND

- **TP-1** — Approximate test pit locations observed by STRATA on between May 11 and June 14, 2017
- ✱ — Percolation test performed and piezometer installed
- \+ — Just piezometer installed
- (4.0) — Depth (ft) from surface to draining silty sand, sand or gravel

VICINITY MAP

NOT TO SCALE

EXPLORATION LOCATION PLAN

South Meridian Regional Park
Meridian, Idaho

0 120 240 480

SCALE: 1 inch = 240 ft

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DRAWING DATE: 6-29-2017		
DRAWING BY: MAT	CHECKED BY: DB	
Client: The Land Group, Inc.	Project No.: BO16068A	PLATE: 1

REFERENCE: D 170426 SMRP 55% DD Site Phase Plans 116007.dwg, Dated 4-26-17.

APPENDIX A

Exploratory Soil Test Pit Logs
Unified Soil Classification System
(USCS)

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm to stiff, moist - Topsoil	0.0	CL		BG				0.75 - 1.0		Lat.: 43.546350°, Long.: -116.367807° Roots: 4"-6"
SILT WITH SAND, (ML) tan, hard, moist	2.5	ML		BG						Moderate cementation
SANDY LEAN CLAY, (CL) dark brown, soft, moist		CL		BG				0.25		
POORLY GRADED GRAVEL WITH SAND, (GP) light brown, dense, moist	5.0	GP		BG	0.2		2.5			
	7.5									

Test Pit Terminated at 8.0 Feet.

Client: The Land Group, Inc.	**Test Pit Number:** TP-1	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 06-14-2017		
Backhoe: CAT 416	**Bucket Width:** 18"		Sheet 1 Of 1
Depth to Groundwater: N.E.	**Logged By:** EF		

STRATA TEST PIT - STRATA.GDT - 7/26/17 13:30 - T:\CLIENTS\LL\LAND GROUP\BO16068A - SOUTH MERIDIAN REGIONAL PARK\ELECTRONIC LOGS\BO16068A - TEST PIT LOGS.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm to stiff, moist - Topsoil	0.0	CL						0.75 - 1.0		Lat.: 43.545526°, Long.: -116.369139° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, very stiff, moist		CL		BG				2.25		
SANDY SILT, (ML) tan, hard, moist to dry	2.5	ML		BG				4.5+		Strong cementation Refusal on highly cemented silt

Test Pit Terminated at 4.0 Feet.

Client: The Land Group, Inc.	**Test Pit Number:** TP-2	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 06-14-2017		
Backhoe: CAT 416	**Bucket Width:** 18"		
Depth to Groundwater: N.E.	**Logged By:** EF		Sheet 1 Of 1

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL	Atterberg Limits PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm to stiff, moist - Topsoil	0.0	CL		BG							Lat.: 43.545570°, Long.: -116.367563° Roots: 4"-6"
CLAYEY SAND, (SC) brown, medium dense, moist		SC		BG			19.3	2.5 - 4.0	29	9	
SANDY SILT, (ML) tan, hard, moist to dry	2.5	ML		BG							Strong cementation Refusal on highly cemented silt
Test Pit Terminated at 4.0 Feet.											

Client: The Land Group, Inc.	**Test Pit Number:** TP-3	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 06-09-2017		
Backhoe: CAT 416	**Bucket Width:** 2'		
Depth to Groundwater: N.E.	**Logged By:** EF		Sheet 1 Of 1

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm to stiff, moist - Topsoil	0.0	CL		BG						Lat.: 43.544932°, Long.: -116.366258° Roots: 4"-6"
LEAN CLAY WITH SAND, (CL) brown to dark brown, stiff to very stiff, moist		CL		BG				1		
								2		
SANDY SILT, (ML) tan, hard, moist to dry	2.5	ML		BG						Strong cementation Refusal on highly cemented silt

Test Pit Terminated at 4.5 Feet.

Client: The Land Group, Inc.	**Test Pit Number:** TP-4	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 06-09-2017		
Backhoe: CAT 416	**Bucket Width:** 2'		Sheet 1 Of 1
Depth to Groundwater: N.E.	**Logged By:** EF		

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL	Atterberg Limits PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm to stiff, moist - Topsoil	0.0	CL		BG				1			Lat.: 43.544487°, Long.: -116.368316° Roots: upper 6"
SILTY SAND, (SM) brown, loose to medium dense, moist	2.5	SM		BK	37.3		31.6	2			R-Value = 38.0
SANDY SILT, (ML) tan, very stiff to hard, moist to dry		ML		BG				4.5+			Moderate cementation
POORLY GRADED SAND WITH SILT, (SP-SM) brown, medium dense to dense, moist	7.5	SP-SM		BG							Moderate cementation
SANDY SILT, (ML) tan, very stiff, moist	10.0	ML									Moderate cementation
SILTY SAND, (SM) brown, medium dense, moist		SM		BG							
POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP) light brown to gray, medium dense, moist	12.5	GP		BG							Cobbles up to 10"
Test Pit Terminated at 15.0 Feet.	15.0										

Client: The Land Group, Inc.	**Test Pit Number:** TP-5
Project: BO16068A	**Date Excavated:** 06-12-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** EF

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EXPLORATORY TEST PIT LOG

Sheet 1 Of 1

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.544347°, Long.: -116.366800° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, stiff, moist		CL		BG				1.0 - 1.25		
SANDY SILT, (ML) tan, hard, moist to dry	2.5	ML		BG				4.5+		Strong cementation
	5.0									Refusal on highly cemented silt

Test Pit Terminated at 5.5 Feet.

Client: The Land Group, Inc.	**Test Pit Number:** TP-6	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 06-14-2017		
Backhoe: CAT 416	**Bucket Width:** 2'		Sheet 1 Of 1
Depth to Groundwater: N.E.	**Logged By:** EF		

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG				0.75		Lat.: 43.544390°, Long.: -116.365397° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, stiff, moist		CL		BG				1.5		
SANDY SILT, (ML) tan, hard, moist	2.5	ML		BG				4.5+		Moderate cementation
SILTY SAND, (SM) brown, medium dense to dense, moist	5.0 / 7.5	SM		BG						
Test Pit Terminated at 10.5 Feet.	10.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-7
Project: BO16068A	**Date Excavated:** 06-14-2017
Backhoe: CAT 416	**Bucket Width:** 18"
Depth to Groundwater: N.E.	**Logged By:** EF

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, soft, moist - Topsoil	0.0	CL		BG				0.5		Lat.: 43.543047°, Long.: -116.368106° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, very stiff, moist		CL		BG				2.5		
SANDY SILT, (ML) tan, hard, moist to dry	2.5			BG				4.5+		Moderate cementation
	5.0	ML								
	7.5									
	10.0									
SILTY SAND WITH GRAVEL, (SM) dark brown, medium dense, moist	12.5	SM		BG	31.1		18.4			Infiltration test performed at 13', field infiltration rate approx. 15" per hour Piezometer installed at 15 feet.
Test Pit Terminated at 15.0 Feet.	15.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-8
Project: BO16068A	**Date Excavated:** 06-12-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** EF

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG				0.75		Lat.: 43.543031°, Long.: -116.366930° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, very stiff, moist	2.5	CL		BG				3.5		
SANDY SILT, (ML) tan, hard, moist	5.0	ML		BG						Moderate cementation
SILTY SAND WITH GRAVEL, (SM) dark brown, medium dense, moist	12.5	SM		BG	24.1		16.3			Infiltration test performed at 12.5', field infiltration rate approx. 15" per hour
SANDY SILT, (ML) tan, hard, moist	15.0	ML								Strong cementation Piezometer installed at 15 feet.
Test Pit Terminated at 15.0 Feet.										

Client: The Land Group, Inc.	**Test Pit Number:** TP-9
Project: BO16068A	**Date Excavated:** 06-09-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** EF

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, soft to firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.543102°, Long.: -116.364842° Roots: 4"-6"
SANDY LEAN CLAY, (CL) brown, medium stiff, moist		CL		BG						
SANDY SILT, (ML) tan, very stiff to hard, moist	2.5			BG						Moderate cementation
	5.0									
	7.5	ML		BG						
	10.0									
	12.5									
SILTY SAND, (SM) brown, medium dense, moist		SM		BG						

Test Pit Terminated at 14.5 Feet.

Client: The Land Group, Inc.	**Test Pit Number:** TP-10
Project: BO16068A	**Date Excavated:** 06-14-2017
Backhoe: CAT 416	**Bucket Width:** 18"
Depth to Groundwater: N.E.	**Logged By:** EF

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.541505°, Long.: -116.368985° Roots: 4"-6"
SANDY SILT, (ML) brown, firm, moist		ML		BG						
SANDY SILT, (ML) tan, hard, moist	2.5			BG						Moderate cementation
	5.0	ML								
	7.5			BG						
POORLY GRADED GRAVEL WITH SAND, (GP) light brown, dense to very dense, moist	10.0	GP		BG						Piezometer installed at 12 feet.
				BG						
Test Pit Terminated at 12.0 Feet.										**Refusal on basalt bedrock**

Client: The Land Group, Inc.	**Test Pit Number:** TP-11
Project: BO16068A	**Date Excavated:** 05-11-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.541459°, Long.: -116.367180° Roots: 4"-6"
SANDY SILT, (ML) tan, firm, moist		ML								
SANDY SILT, (ML) tan, hard, moist	2.5	ML								Moderate cementation
POORLY GRADED GRAVEL WITH SAND, (GP) brown, medium dense to dense, moist	5.0	GP		BG						
Test Pit Terminated at 9.0 Feet.	7.5									

Client: The Land Group, Inc.	**Test Pit Number:** TP-12
Project: BO16068A	**Date Excavated:** 05-12-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.541407°, Long.: -116.365289° Roots: 4"-6"
SANDY SILT, (ML) tan, firm, moist	2.5	ML								
SANDY SILT, (ML) tan, hard, moist	5.0	ML		BG						Moderate cementation
POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP) brown, medium dense to dense, moist	7.5	GP		BG						
Test Pit Terminated at 9.0 Feet.										

Client: The Land Group, Inc.	**Test Pit Number:** TP-13	STRATA A Professional Services Corporation Integrity from the Ground Up	**EXPLORATORY TEST PIT LOG**
Project: BO16068A	**Date Excavated:** 05-12-2017		
Backhoe: CAT 416	**Bucket Width:** 2'		
Depth to Groundwater: N.E.	**Logged By:** DB		Sheet 1 Of 1

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL								Lat.: 43.540343°, Long.: -116.368419° Roots: 4"-6"
SANDY SILT, (ML) tan to reddish brown, firm, moist		ML								
SANDY SILT, (ML) tan, hard, moist	2.5	ML								Moderate cementation
POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP) light brown, medium dense to dense, moist	5.0	GP		BG						
Test Pit Terminated at 12.0 Feet.	7.5									
	10.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-14
Project: BO16068A	**Date Excavated:** 05-11-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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EXPLORATORY TEST PIT LOG

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL								Lat.: 43.540301°, Long.: -116.367141° Roots: 4"-6"
SANDY SILT, (ML) tan, firm, moist		ML								
SANDY SILT, (ML) tan, hard, moist	2.5	ML								Moderate cementation
POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP) light brown, medium dense to dense, moist	5.0	GP		BG						
Test Pit Terminated at 10.0 Feet.	7.5									
	10.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-15
Project: BO16068A	**Date Excavated:** 05-11-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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EXPLORATORY TEST PIT LOG

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL		BG						Lat.: 43.540178°, Long.: -116.365646° Roots: 4"-6"
SANDY SILT, (ML) tan, firm, moist		ML								
SANDY SILT, (ML) tan, hard, moist	2.5			BK	25.7		26.5			R-Value = 62.0
		ML								Moderate cementation
POORLY GRADED SAND WITH SILT, GRAVEL, AND COBBLES, (SP-SM) reddish brown, medium dense to dense, moist	5.0 / 7.5	SP-SM		BG	9.0		7.4			Infiltration test performed at 9.5', field infiltration rate greater than 60" per hour
POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP) light brown, dense, moist	10.0	GP		BG						Piezometer installed at 15 feet.
Test Pit Terminated at 15.0 Feet.	12.5 / 15.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-16
Project: BO16068A	**Date Excavated:** 05-11-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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EXPLORATORY TEST PIT LOG

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USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks
SANDY LEAN CLAY, With Organics, (CL) dark brown, firm, moist - Topsoil	0.0	CL								Lat.: 43.539480°, Long.: -116.367158° Roots: 4"-6"
SANDY SILT, (ML) tan, firm, moist		ML								
SANDY SILT, (ML) tan, hard, moist	2.5	ML								Moderate cementation
POORLY GRADED GRAVEL WITH SILT, SAND, AND COBBLES, (GP) brown, dense, moist	7.5	GP								
Test Pit Terminated at 10.0 Feet.	10.0									

Client: The Land Group, Inc.	**Test Pit Number:** TP-17
Project: BO16068A	**Date Excavated:** 05-12-2017
Backhoe: CAT 416	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** DB

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EXPLORATORY TEST PIT LOG

Sheet 1 Of 1

STRATA TEST PIT - STRATA.GDT - 7/26/17 13:30 - T:\CLIENTS\LAND GROUP\BO16068A - SOUTH MERIDIAN REGIONAL PARK\ELECTRONIC LOGS\BO16068A - TEST PIT LOGS.GPJ

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
COARSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	Well–Graded Gravel, Gravel–Sand Mixtures.
				GP	Poorly–Graded Gravel, Gravel–Sand Mixtures.
		GRAVEL WITH FINES		GM	Silty Gravel, Gravel–Sand–Silt Mixtures.
				GC	Clayey Gravel, Gravel–Sand–Clay Mixtures.
	SAND	CLEAN SAND		SW	Well–Graded Sand, Gravelly Sand.
				SP	Poorly–Graded Sand, Gravelly Sand.
		SAND WITH FINES		SM	Silty Sand, Sand–Silt Mixtures.
				SC	Clayey Sand, Sand–Clay Mixtures.
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	Inorganic Silt, Sandy or Clayey Silt.
				CL	Inorganic Clay of Low to Medium Plasticity, Sandy or Silty Clay.
				OL	Organic Silt and Clay of Low Plasticity.
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	Inorganic Silt, Micaceous Silt, Plastic Silt.
				CH	Inorganic Clay of High Plasticity, Fat Clay.
				OH	Organic Clay of Medium to High Plasticity.
				PT	Peat, Muck and Other Highly Organic Soil.

BORING LOG SYMBOLS

- Standard 2–Inch OD Split–Spoon Sample
- California Modified 3–Inch OD Split–Spoon Sample
- Rock Core
- Shelby Tube 3–Inch OD Undisturbed Sample

GROUNDWATER SYMBOLS

- Groundwater After 24 Hours
- (7–3–07) Indicates Date of Reading
- Groundwater at Time of Drilling

TEST PIT LOG SYMBOLS

- BG — Baggie Sample
- BK — Bulk Sample
- RG — Ring Sample

Shorthand Notation:
BGS = Below Existing Ground Surface
N.E. = None Encountered

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APPENDIX B

Summary of Laboratory Test Results

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Summary of Test Results

Project: South Meridian Regional Park
Client: The Land Group

Project Number: BO16068A
Date: 6/20/2017

Test Pit	Depth	Lab Number	Soil Classification (remarks)	Dry Unit Weight, pcf	In Situ Moisture, %	Passing No. 200,%	Atterberg Limits LL	Atterberg Limits PI	Fines Class.
5	2'	BL1701879	Silty Sand		31.6	37.3			ML
16	3'	BL1701880	Sandy Silt		26.5	25.7			ML
16	8.5'	BL1701881	Sand With Gravel and Silt		7.4	9.0			ML
9	12'	BL1701882	Silty Sand		16.3	24.1			ML
8	13'	BL1701883	Silty Sand		18.4	31.1			ML
3	2'	BL1701884	Clayey Sand		19.3		29	9	CL
1	7'	BL1701929	Gravel With Sand		2.5	0.2			ML

R-VALUE
Idaho T 8

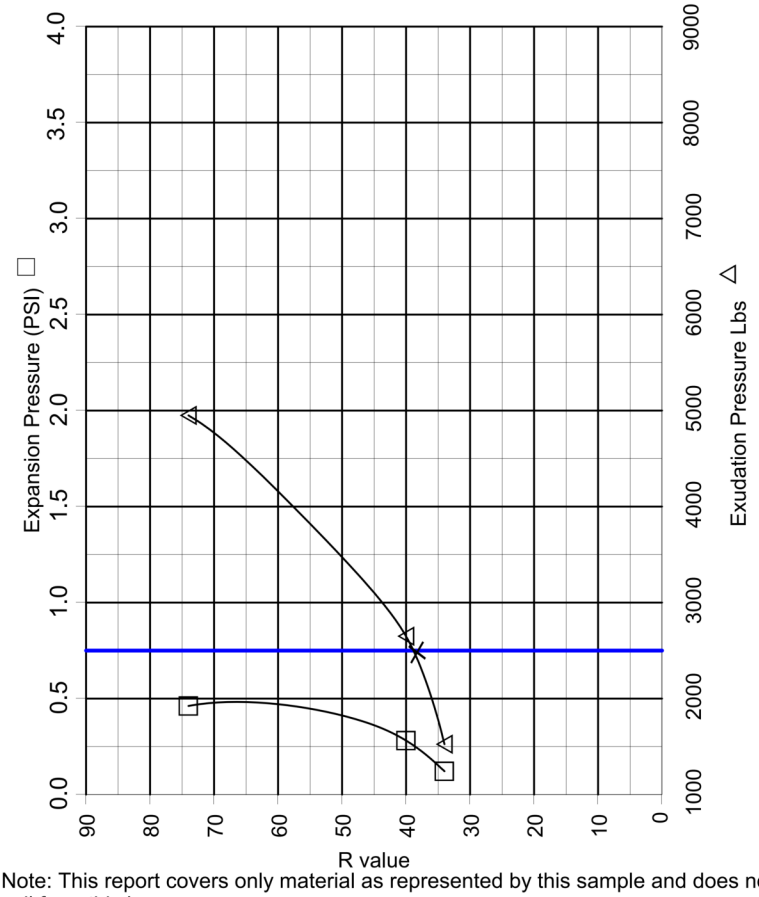
Project: South Meridian Regional Park
Client: The Land Group
Sample Identification: TP-5 @ 2'
Sample Classification: Silty Sand

Project Number: BO16068A
Lab Number: BL1701879
Date Received: 6/13/17
Date Tested: 6/21/17 By: KW

R VALUE DATA			
Percolation: None	Point 1	Point 2	Point 3
Exudation, PSI	121	211	394
Dry Density, PCF	89.7	91.0	94.9
Moisture Content, %	27.6	25.4	23.2
Exp. Pressure, PSI	0.12	0.28	0.46

SOIL CONSTANTS

R VALUE: 38



GRADATION: AASHTO T-11, T27		
SCREEN SIZE	AS RECEIVED % PASSING	AS TESTED % PASSING
4"		
3"		
2"		
1"	100	100
3/4"		
1/2"		
3/8"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Note: This report covers only material as represented by this sample and does not necessarily cover all soil from this layer or source.

Reviewed by: _____

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R-VALUE
Idaho T 8

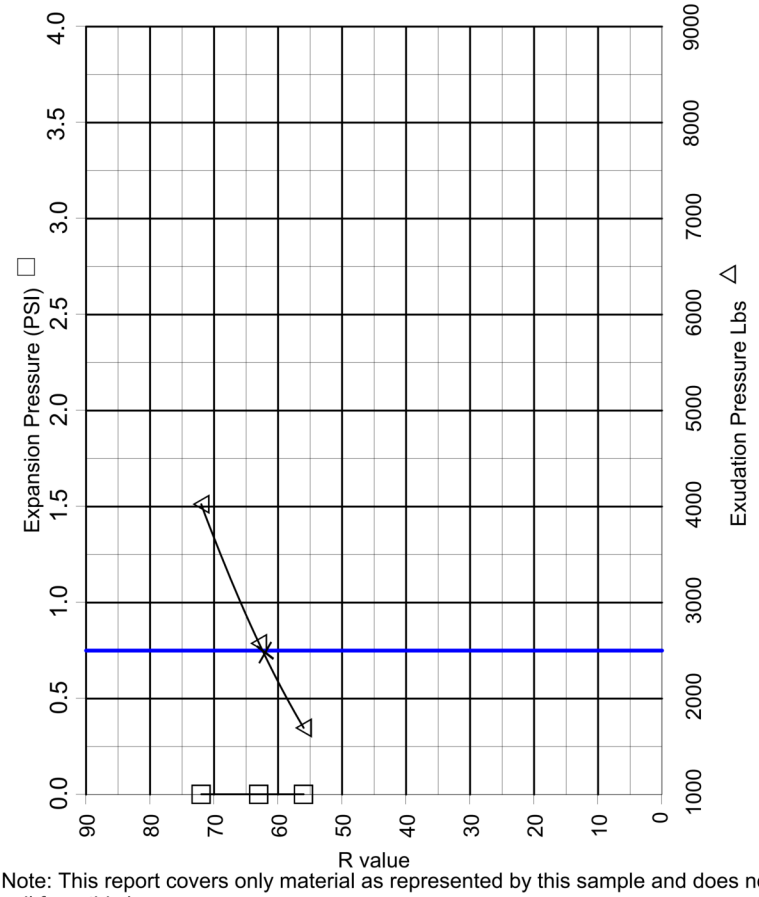
Project: South Meridian Regional Park
Client: The Land Group
Sample Identification: TP- 16 @ 3'
Sample Classification: Sandy Silt with Cementation

Project Number: BO16068A
Lab Number: BL1701880
Date Received: 6/13/17
Date Tested: 6/21/17 By: KW

R VALUE DATA			
Percolation: None	Point 1	Point 2	Point 3
Exudation, PSI	320	205	135
Dry Density, PCF	90.4	83.2	92.6
Moisture Content, %	28.6	27.6	26.5
Exp. Pressure, PSI	0.00	0.00	0.00

SOIL CONSTANTS

R VALUE: 62



GRADATION: AASHTO T-11, T27		
SCREEN SIZE	AS RECEIVED % PASSING	AS TESTED % PASSING
4"		
3"		
2"		
1"	100	100
3/4"		
1/2"		
3/8"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Note: This report covers only material as represented by this sample and does not necessarily cover all soil from this layer or source.

Reviewed by: _____

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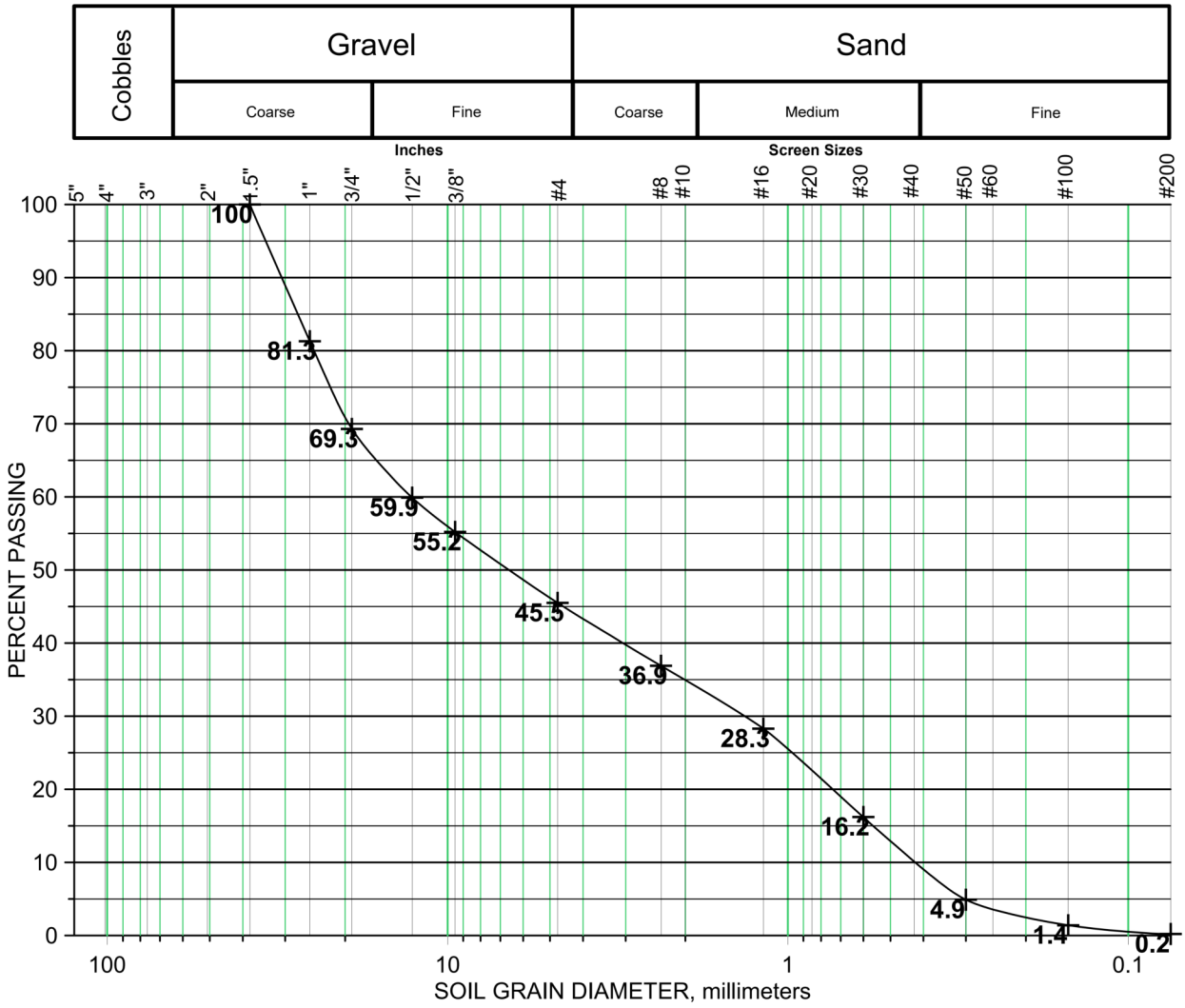
Integrity from the Ground Up

GRADATION ANALYSIS
ASTM D 6913

Project: South Meridian Regional Park
Client: The Land Group
Project Number: BO16068A
Sample Number: BL1701929
Sample Location: TP-1 @ 7'
Sample Classification: Gravel With Sand
Date tested: 6/19/17 By: RM



Reviewed by: David Briggs

STRATA
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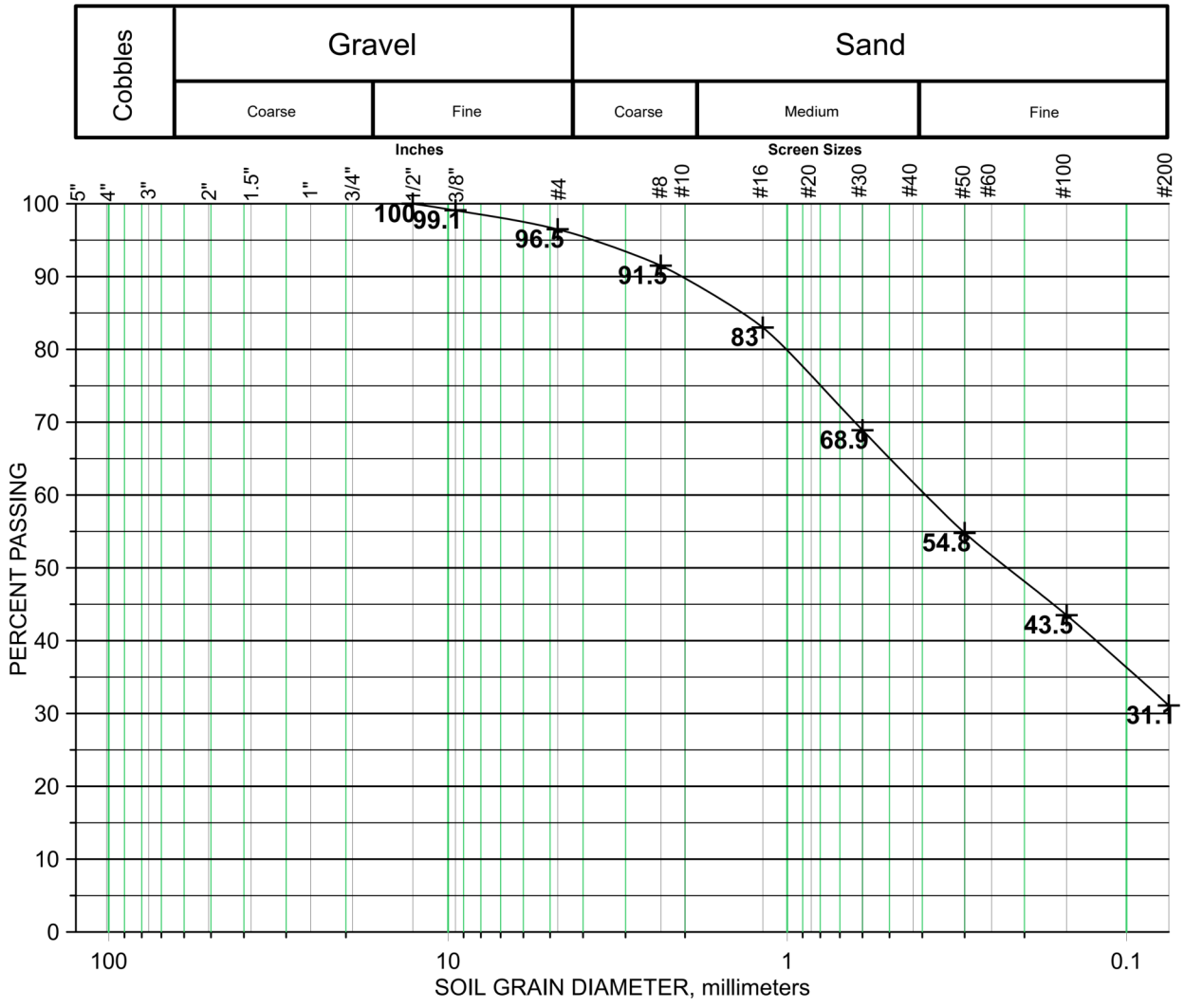
GRADATION ANALYSIS
ASTM D 6913

Project: South Meridian Regional Park
Client: The Land Group
Project Number: BO16068A
Sample Number: BL1701883
Sample Location: TP-8 @ 13'
Sample Classification: Silty Sand
Date tested: 6/15/17 By: AJM



Reviewed by: _____

STRATA
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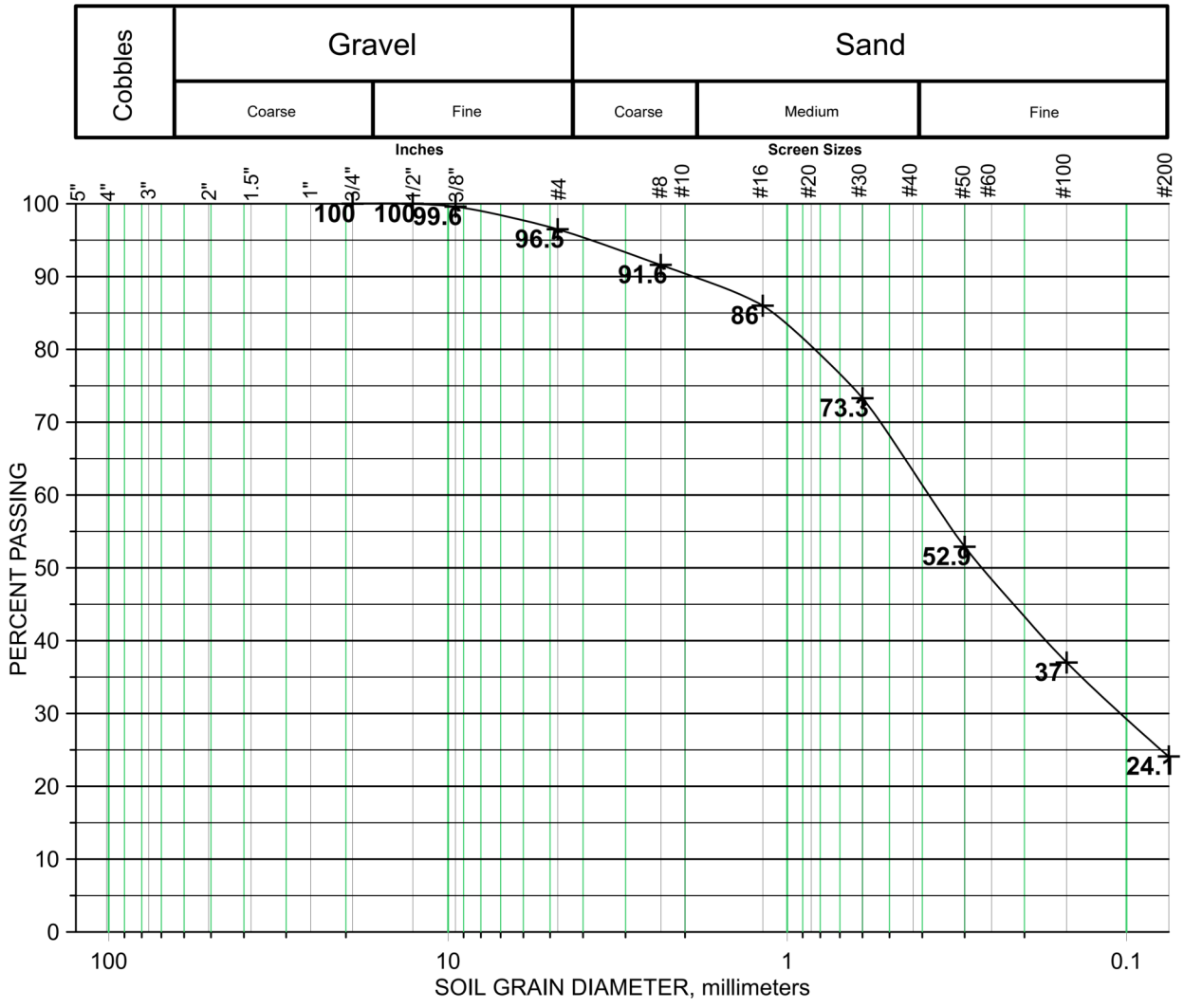
Integrity from the Ground Up

GRADATION ANALYSIS
ASTM D 6913

Project: South Meridian Regional Park
Client: The Land Group
Project Number: BO16068A
Sample Number: BL1701882
Sample Location: TP-9 @ 12'
Sample Classification: Silty Sand
Date tested: 6/15/17 By: RM



Reviewed by: _____

STRATA
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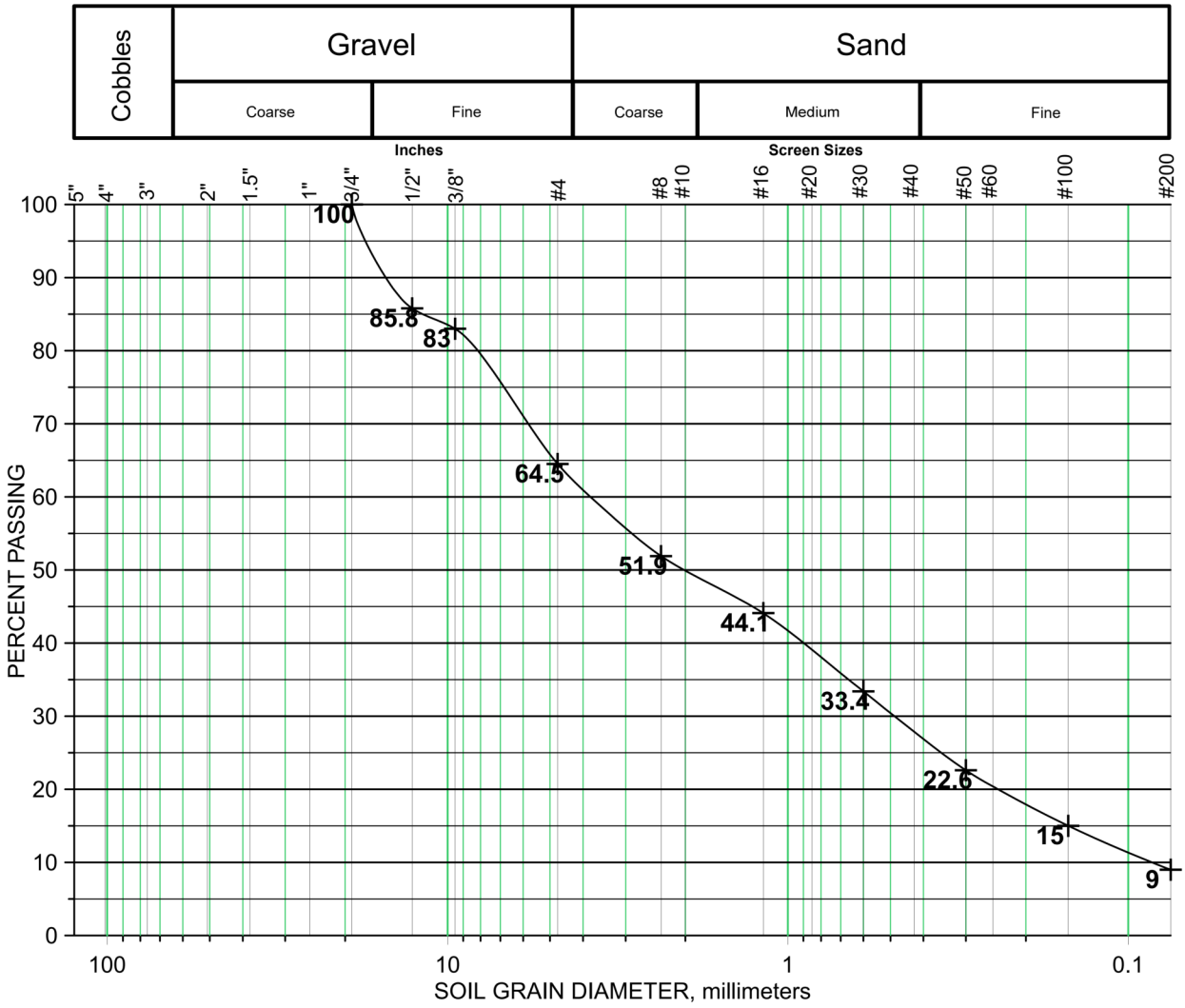
Integrity from the Ground Up

GRADATION ANALYSIS
ASTM D 6913

Project: South Meridian Regional Park
Client: The Land Group
Project Number: BO16068A
Sample Number: BL1701881
Sample Location: TP-16 @ 8.5'
Sample Classification: Sand With Gravel and Silt
Date tested: 6/15/17 By: RM



Reviewed by: _____

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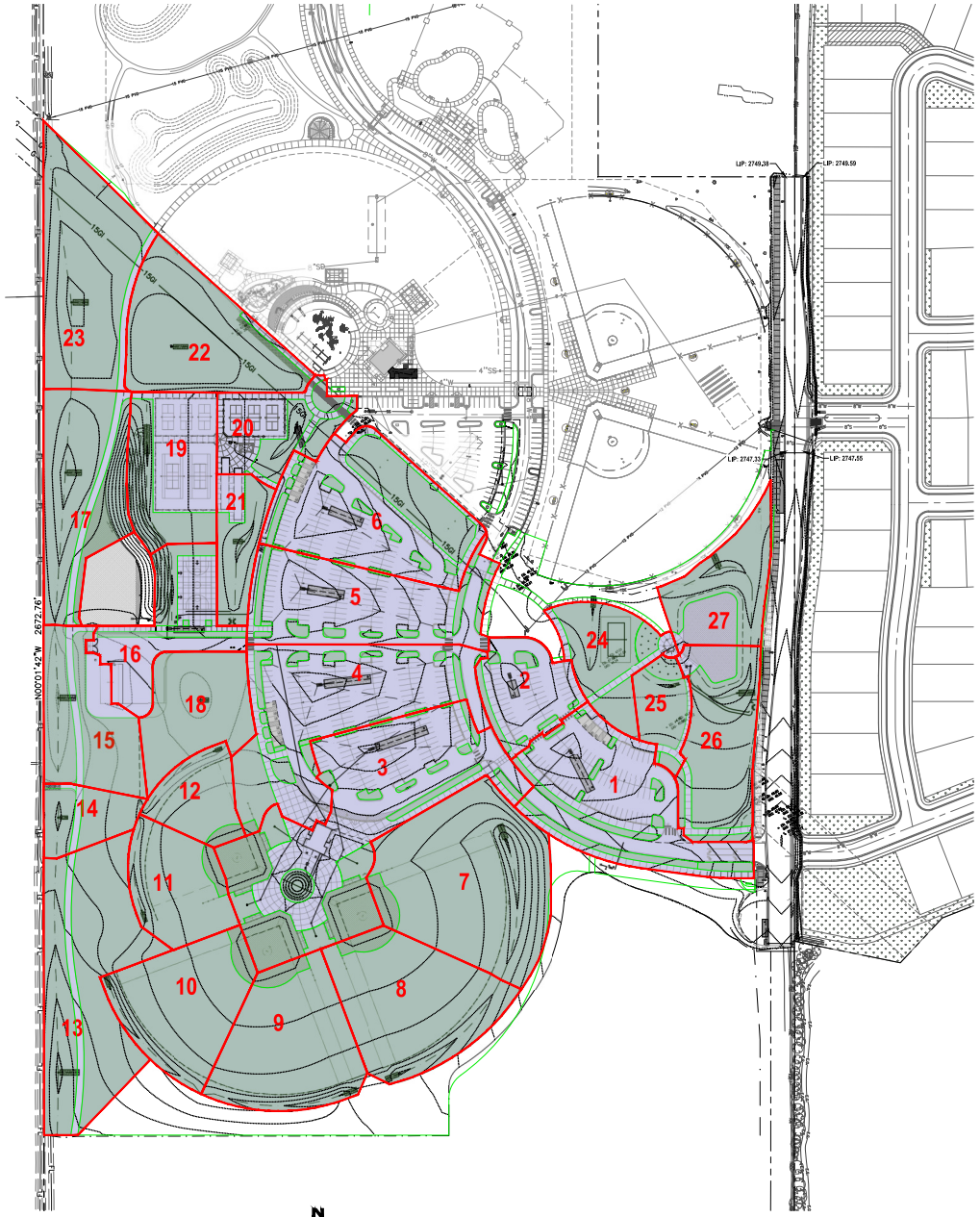
Integrity from the Ground Up

Appendix D

Discovery Park Phase 2 Drain Basin Calculations



N

PRIVATE DRAINAGE BASINS

0 100 200 FEET

Seepage Bed Sizing Calculator

Design Storm Return Period (ie. 20, 50, 100) =	100
Design Storm Duration =	1 Hr
Drain Rock Void Ration =	0.4
C-Value Pavement =	0.85
C-Value Roof =	0.9
C-Value Landscape =	0.15
Depth to Seasonal High Ground Water =	20 Feet BGS

SIZE SEEPAGE BEDS! RESET

									Goal								Provided
Onsite BASIN #	TOTAL AREA (SF)	PAVEMENT (SF)	LANDSCAPE (SF)	Roof Area (SF)	Weighted C-Value	Storm Return Period	Storm Intensity (in/hr)	Underlying Soil Infiltratrion Rate (in/hr.)	Runoff Vol. w/o Infiltration (cuft)	Infiltration Vol. for 1-hr Storm (cuft)	Drain Rock Thickness (ft)	Drain Rock Width (ft)	Calculated Min. Rock Length (ft)	Provided Seepage Bed Capacity w/o FOS (cuft)	Seepage Bed Factor of Safety	Design Seepage Bed Length (ft)	Seepage Bed Capacity Provided (cuft)
1	67440	55949	11491	0	0.73	100	0.96	8	3942	616	9	15	61.60	3942	1.15	71	4450
2	26966	23125	3841	0	0.75	100	0.96	8	1619	253	9	15	25.29	1619	1.15	30	1873
3	110912	67077	43835	0	0.57	100	0.96	8	5087	795	9	15	79.49	5087	1.15	92	5763
4	81027	63306	17721	0	0.70	100	0.96	8	4517	706	9	15	70.59	4517	1.15	82	5134
5	59354	51445	7909	0	0.76	100	0.96	8	3593	561	9	15	56.14	3593	1.15	65	4071
6	70012	45861	24151	0	0.61	100	0.96	8	3408	533	9	15	53.26	3408	1.15	62	3881
7	81688	0	81688	0	0.15	100	0.96	8	980	153	9	10	22.97	980	1.15	27	1125
8	58543	0	58543	0	0.15	100	0.96	8	703	110	9	8	20.58	703	1.15	24	801
9	54743	0	54743	0	0.15	100	0.96	8	657	103	9	8	19.25	657	1.15	23	765
10	46904	0	46904	0	0.15	100	0.96	8	563	88	9	8	16.49	563	1.15	19	635
11	31765	0	31765	0	0.15	100	0.96	8	381	60	9	6	14.89	381	1.15	18	448
12	20810	0	20810	0	0.15	100	0.96	8	250	39	9	6	9.75	250	1.15	12	298
13	74757	6038	68719	0	0.21	100	0.96	8	1235	193	9	10	28.95	1235	1.15	34	1417
14	16982	1912	15070	0	0.23	100	0.96	8	311	49	9	6	12.14	311	1.15	14	351
15	40371	9263	31108	0	0.31	100	0.96	8	1003	157	9	10	23.51	1003	1.15	28	1165
16	37071	26817	10254	0	0.66	100	0.96	8	1947	304	9	10	45.62	1947	1.15	53	2212
17	51587	5393	46194	0	0.22	100	0.96	8	921	144	9	10	21.59	921	1.15	25	1044
18	34808	0	34808	0	0.15	100	0.96	8	418	65	9	8	12.24	418	1.15	15	497
19	41948	24566	17382	0	0.56	100	0.96	8	1879	294	9	10	44.04	1879	1.15	51	2130
20	30254	18399	11855	0	0.58	100	0.96	8	1393	218	9	10	32.66	1393	1.15	38	1586
21	19693	3936	15757	0	0.29	100	0.96	8	457	71	9	8	13.38	457	1.15	16	532
22	55609	1817	53792	0	0.17	100	0.96	8	769	120	9	8	22.53	769	1.15	26	869
23	64282	3620	60662	0	0.19	100	0.96	8	974	152	9	10	22.83	974	1.15	27	1124
24	28840	4329	24511	0	0.26	100	0.96	8	589	92	9	8	17.24	589	1.15	20	668
25	15630	1821	13809	0	0.23	100	0.96	8	290	45	9	6	11.31	290	1.15	14	348
26	44559	8548	36011	0	0.28	100	0.96	8	1013	158	9	10	23.75	1013	1.15	28	1166
27	31817	8535	23282	0	0.34	100	0.96	8	860	134	9	10	20.15	860	1.15	24	998

APPROVED* CONST*
NOT APPROVED FOR CONSTRUCTION
Plans Are Accepted For Public Street Construction
ADA COUNTY HIGHWAY DISTRICT

811 CONTACT DIGLINE 48-HOURS BEFORE DIGGING 1-800-342-1585

OWNER: CITY OF MERIDIAN
PROJECT TITLE: DISCOVERY PARK PHASE 2 MERIDIAN, ID

PROFESSIONAL ENGINEER REGISTERED 10813 STATE OF IDAHO ROSS K. ERICKSON

6213 N. Cloverdale Rd.
Suite 105
Boise, Idaho 83714
t (208) 846.8895
f (208) 887.8894
c (208) 887.8894
ross@ericksoncivil.com
erickson civil

SHEET TITLE: PRIVATE DRAINAGE CALCULATIONS

NO.	REVISION	DATE

PROJECT MANAGER:
PREPARED BY: ERICKSON CIVIL, INC. PHONE (208) 846-8895 FAX (208) 846-8896
DRAWN BY: RKE

JOB NUMBER: IDB19075
DATE: 08/31/21
SHEET NUMBER: DC.1

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