PD-16-00001

MDJ CONTRACTORS, LLC

MDJ Contractors, LLC
PO Box 1117
Ellensburg WA, 98926

RECEIVED
MAR 29 2019
Kittitas County CDS

To whom it may concern,

We would like to provide the following responses to the letter dated 10/5/2018:

1) A groundwater study identifying water table depths on the subject property. Part of this study will require monitoring of groundwater levels from March through October, 2019. Coordination with Kittitas County Public Works Department is necessary prior to beginning this study to ensure that the appropriate review is being completed during the specified timeframe.
   See the attached infiltration testing letter from Baer Testing for information regarding groundwater depth.
2) An updated stormwater drainage report depicting soil characteristics in regards to stormwater infiltration, and demonstrating that the proposal fully complies with the *Stormwater Management Manual of Eastern Washington.*
   An updated drainage report is attached.
3) Complete a transportation concurrency application with Kittitas County Public Works. This application shall be submitted directly to Kittitas County Public Works; application is attached to this letter.
   A transportation concurrency application for the project was submitted on 8/22/2014.
4) Provide the document "Infiltration Letter for Cottage Grove Residential Development, Kittitas, Washington".
   Said document is attached.
5) An updated access easement meeting minimum side yard setbacks of 15 feet under KCC 17.22.060.
   The 15' side yard setback is part of Kittitas County road standards which will not be used to this project as Kittitas County and the City of Ellensburg have determined that this project will be built using City of Ellensburg road standards. The setback as drawn meets City of Ellensburg road standards.
6) A revised preliminary survey meeting items 2(f - k) above.
   The attached recorded survey contains all requested items.

Regards,

Eric Jackson
Office Manager
MDJ Contractors

Baer Testing Inc.

1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

June 25, 2018

MDJ Contractors
PO Box 1117
Ellensburg, WA 98926

Attention: Mr. Eric Jackson, Office Manager

RE: INFILTRATION TESTING RESULTS; COTTAGE GROVE RESIDENTIAL DEVELOPMENT, KITTITAS COUNTY, WASHINGTON

Dear Mr. Jackson:

At your request, Baer Testing, Inc. conducted an infiltration test on June 20 and 21, 2018 at the Cottage Grove residential development site to satisfy Kittitas County requirements.

METHODOLOGY

The infiltration test location was selected by the civil design consultant in an area designated for stormwater retention. The test location is shown in Figure 1. MDJ Development excavated the test pits using a CAT excavator with a 2-foot bucket.

Initially, a test pit was excavated to identify the depth to groundwater. Groundwater was encountered 8 feet below the existing surface. A second test pit extending to the proposed 4- to 5-foot infiltration depth was then excavated for testing. A soil sample was obtained from the approximate infiltration depth for gradation testing. The subsurface conditions encountered in both test pits consisted of very dense, moist, poorly-graded gravel with cobbles up to approximately 12 inch size in a tightly packed silt/sand matrix. Photos 1 & 2 show materials excavated from the deeper test pit.

On June 20, the shallow test pit was partially filled with water to approximately 30 inches from the ground surface. This water was allowed to dissipate over approximately 18 hours until the pit was empty.

On June 21, our representative returned to the site to complete the testing. The test pit was again filled with water and the water level was measured when the filling stopped. The water level was then measured again after 30 minutes and 60 minutes. The infiltration rate was determined by the drop in water elevation between the 30 minute and 60 minute readings.

RESULTS

A copy of the sieve analysis test on the sample from the test pit is enclosed.

The water level in the test pit dropped 4.5 inches between the 30 minute and 60 minute readings. Based on this data, the calculated infiltration rate is:

0.15 inches per minute or 6.7 minutes per inch

The infiltration rate does not include a safety factor. The system designer should incorporate an appropriate factor of safety against slowing rates over time due to biological and sediment clogging.

This report was prepared for use the exclusive use of MDJ Contractors and their design team for the proposed project. This report presents the data from observation and field testing and is based on subsurface conditions at the specific locations and depths indicated. No other representation is made. This report should be made available to potential contractors for information on factual data only. Conclusions and interpretations presented in this report should not be construed as a guarantee or warranty of the subsurface conditions.

We appreciate the opportunity to be of service. If you have questions or comments, please contact our office.

Sincerely,

BAER TESTING, INC.

Dee J. Burrie, P.E.
Chief Engineer

Enclosures: Figure 1 – Test Pit Locations
Photographs
Laboratory Testing Results

Figure 1 – Test Location

Photo 1 – Material from Test Pit

Photo 2 – Test Pit showing soil profile

Baer Testing Inc.

1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

CLIENT:	MDJ	**PROJECT NUMBER:**	18-085
PROJECT:	Cottage Grove Infilitration Testing	**WORK ORDER #:**	18-514
SAMPLE SOURCE:	Onsite	**SAMPLE NUMBER:**	18-514-1
MATERIAL TYPE:	Native	**DATE TESTED:**	6/22/2018
DATE SAMPLED:	6/20/2018	**TESTED BY:**	STB

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF AGGREGATES ASTM C 136

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"	50%		#4	9%	
3"			#8		
2 1/2"			#10	8%	
2"	35%		#16		
1 1/2"			#20	7%	
1 1/4"			#30		
1"	20%		#40	6%	
3/4"	16%		#50		
5/8"	14%		#60		
1/2"	12%		#80	4%	
3/8"	11%		#100	4%	
1/4"			#200	1.9%	

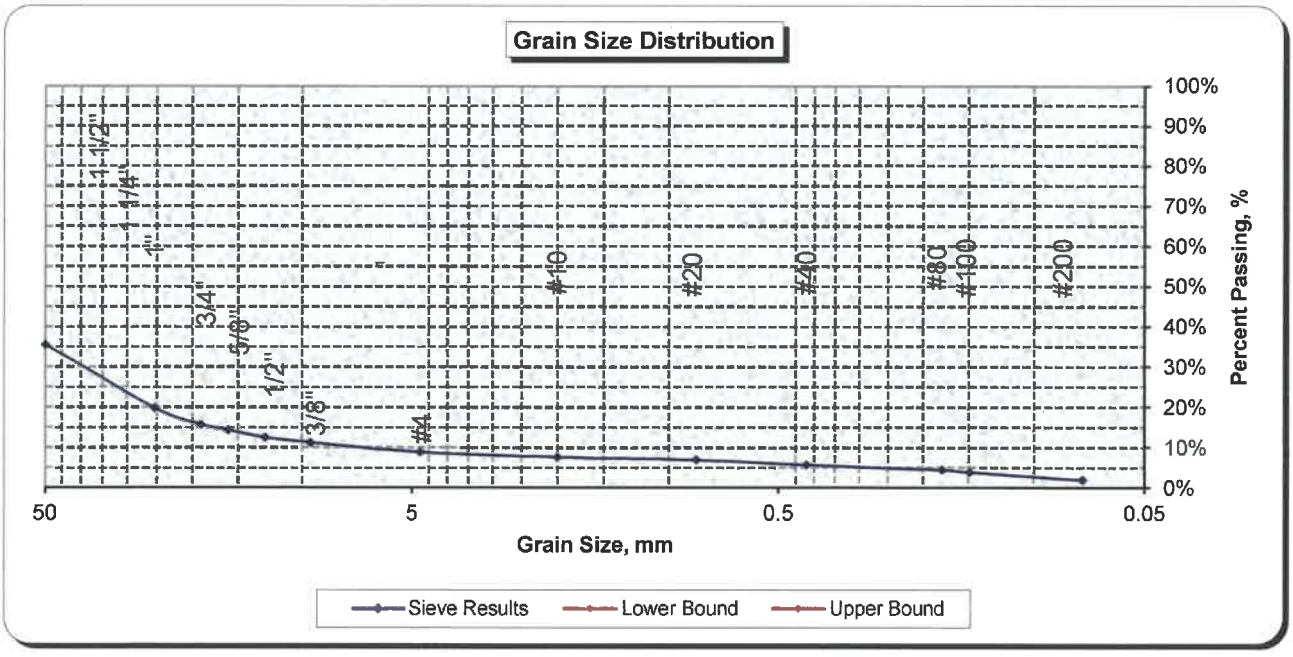
SOIL MOISTURE DETERMINATION - ASTM D 2216

SAND EQUIVALENT - D 2419

FRACTURED FACE - D 5821

FLAT AND ELONGATED - D 4791

NOTE:



REVIEWED BY:

X

Dee Burrie
Technical Director
Signed by: S. Randy Baer

The Commons at Dry Creek

Preliminary Drainage Report

Prepared for

MDJ Contractors, LLC.
Contact: Eric Jackson
700 E Mountain View Ave #508
Ellensburg, WA 98926
(509) 925-6640

Prepared by

LDC
THE CIVIL ENGINEERING GROUP

Jason Tacchini, PE
20210 142nd Avenue NE
Woodinville, WA 98072
(425) 806-1869

March 27, 2019

Job No: 16-115A

1.0 PROJECT OVERVIEW

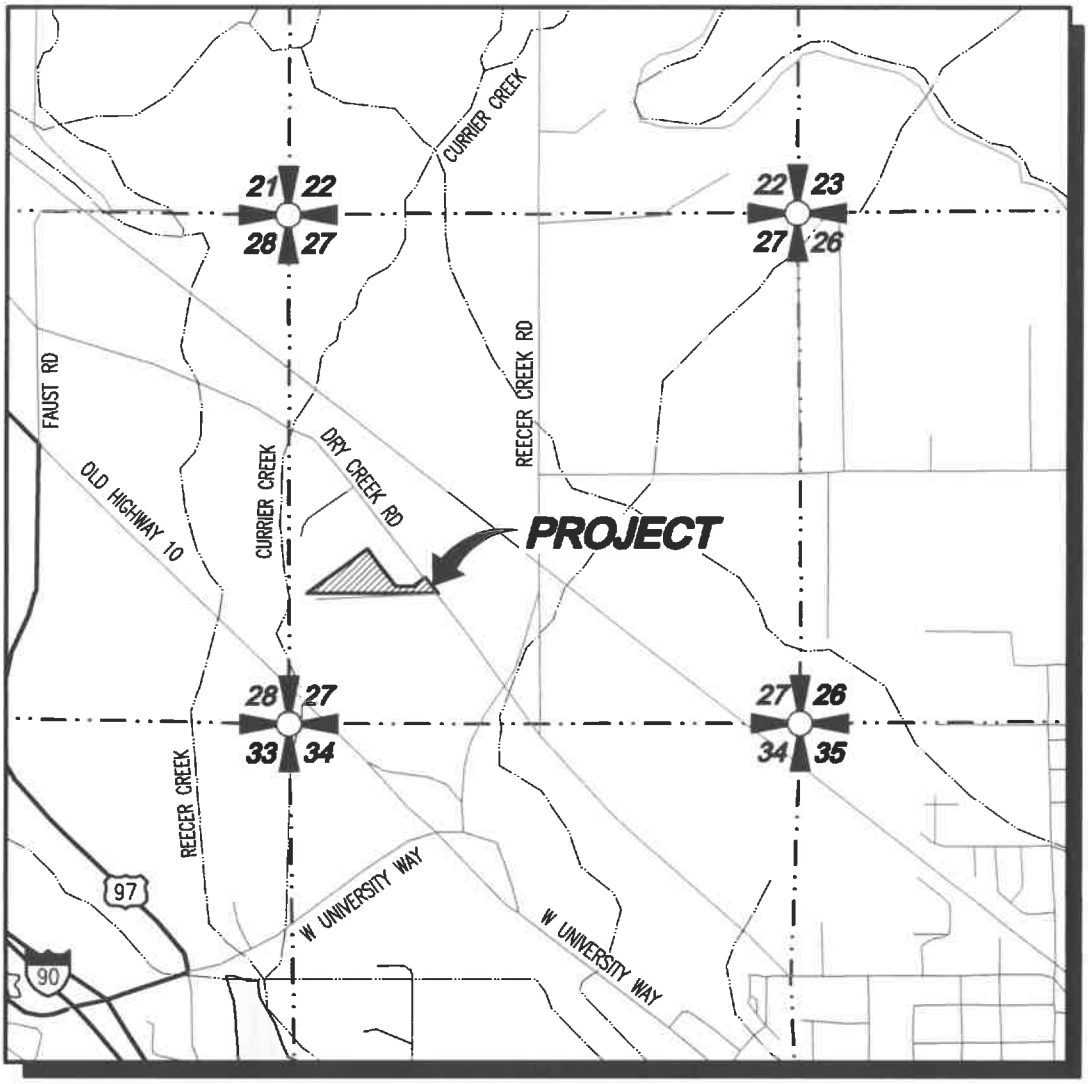
The Commons at Dry Creek project is located in Kittitas County within parcel numbers 801033 and 791033. The site is located at 1910 W Dry Creek Road, Ellensburg, WA 98926. More specifically the project is located in the NW ¼ of the SW ¼ of Section 27, Township 18 N, Range 18 E, W.M., as shown in Figure 1.

The existing site is predominately pasture. There are currently no existing single-family residences on the property. Please refer to Figure 4.0 for a depiction of the existing site conditions.

The existing site lies within the Yakima River sub-basin which is part of the Columbia River basin. The existing site runoff is best described as overland sheet flow which moves southwest across the site. It is likely that the majority of the storm water is infiltrating on site. The remainder of the storm water enters Currier Creek adjacent to the soutwestern property boundary.

The proposed developed site will include approximately 5.77 acres. The developed site will include 34 new single family lots detached cottage units, and approximately 3,098 lineal feet of roadway with associated utilities. The access to the site will enter the property from Dry Creek Road, approximately 1,400' northwest of the intersection of Reecer Creek Road and Dry Creek Road. See Figure RD-01 for the proposed site layout.

According to the SCS soil survey for Kittitas County the proposed development area of the site is underlain by Mitta Ashy Silt Loam, Nack-Opnish Complex, Brickmill Gravelly Ashy Loam, and Nanum Ashy Loam, see figures in Appendix 1-A.



VICINITY MAP

SCALE: 1"=2000'

Drawing: P:\2017\17-132 Cottage Grove\Exhibits\17132E-VM.dwg Plotted: Jun 19, 2017 - 2:55pm

LDC
THE CIVIL ENGINEERING GROUP

Engineering
Structural
Planning
Survey

20210 142nd Avenue NE
Woodinville, WA 98072

Ph. 425.806.1869
Fx. 425.482.2893

www.LDCcorp.com

MDJ CONTRACTORS, LLC.

COTTAGE GROVE

VICINITY MAP

APPENDIX 1-A

PROJECT OVERVIEW FIGURES

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 10, Sep 7, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 3, 2014—Sep 21, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Kittitas County Area, Washington

480—Nanum ashy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l11
Elevation: 1,400 to 2,500 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nanum and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nanum

Setting

Landform: Alluvial fans, terraces
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Alluvium with an influence of volcanic ash in th upper part

Typical profile

H1 - 0 to 8 inches: ashy loam
H2 - 8 to 15 inches: ashy loam
H3 - 15 to 28 inches: ashy clay loam
H4 - 28 to 35 inches: very gravelly clay loam
H5 - 35 to 60 inches: extremely gravelly sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 21 to 28 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w

Kittitas County Area, Washington

621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l5c
Elevation: 1,500 to 2,300 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mitta, flooded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mitta, Flooded

Setting

Landform: Flood plains, fan aprons, fan skirts, inset fans
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium mixed with volcanic ash in the upper part

Typical profile

H1 - 0 to 6 inches: ashy silt loam
H2 - 6 to 15 inches: ashy silt loam
H3 - 15 to 34 inches: ashy silt loam
H4 - 34 to 49 inches: silty clay loam
H5 - 49 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 34 to 49 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C

Kittitas County Area, Washington

792—Brickmill gravelly ashy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2l92
Elevation: 1,400 to 2,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brickmill and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brickmill

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with an influence of volcanic ash in the surface

Typical profile

H1 - 0 to 12 inches: gravelly ashy loam
H2 - 12 to 28 inches: very gravelly ashy sandy loam
H3 - 28 to 38 inches: extremely gravelly sandy loam
H4 - 38 to 49 inches: extremely gravelly sandy loam
H5 - 49 to 60 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 28 to 38 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w

Kittitas County Area, Washington

795—Nack-Opnish complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l95
Elevation: 1,400 to 2,400 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nack and similar soils: 55 percent
Opnish and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nack

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with a mantle of volcanic ash

Typical profile

H1 - 0 to 6 inches: gravelly ashy loam
H2 - 6 to 15 inches: clay loam
H3 - 15 to 60 inches: extremely gravelly sandy clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 15 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: No

2.0 RISK ASSESSMENT ANALYSIS AND TEMPORARY EROSION AND SEDIMENT CONTROL DESIGN

Risk Assessment

The proposed site consists of 5.77 acres, all of which will be developed. According to the SCS soil survey for Kittitas County the proposed development area of the site is underlain by Mitta Ashy Silt Loam, Nack-Opnish Complex, Brickmill Gravelly Ashy Loam, and Nanum Ashy Loam. The Infiltration Testing Letter, prepared by Baer Testing Inc. on June 25th, 2018, included within Appendix 5-A, contains a more detailed description of the onsite soils. By implementing BMP's, as described in the Stormwater Pollution Prevention Plan, the risk of erosion will be greatly reduced.

According to the survey, there appear to be no critical areas on-site, however, Currier Creek is located approximately 150' to the west of the western parcel boundary.

Temporary Erosion and Sediment Control

The Stormwater Pollution Prevention Plan for the project will be included with the construction plan submittal.

APPENDIX 3-A

DOWNSTREAM ANALYSIS
FIGURE

4.0 FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

The drainage analysis was modeled using Stormshed 3G hydrology software utilizing SBUH methodology as outlined in the 2004 Stormwater Management Manual for Eastern Washington.

Precipitation depths for 24-hour storms at various recurrence intervals are derived from isopluvial mapping contained within the Stormwater Management Manual for Eastern Washington. The precipitation depths for the area in which the site is located are as follows:

2 year, 24-hour storm	0.90 in.
10 year, 24-hour storm	1.30 in.
25 year, 24-hour storm	1.60 in.
100 year, 24-hour storm	2.10 in.

Existing Site Hydrology

The existing site is predominately pasture and gently slopes from east to west. There are currently no existing single-family residences on the property. The existing site is shown in Figure 4.0.

Developed Site Hydrology

The proposed developed site will include approximately 5.77 acres. The developed site will include 34 new single family lots detached cottage units, and approximately 3,098 lineal feet of roadway with associated utilities. The access to the site will enter the property from Dry Creek Road, approximately 1,400' northwest of the intersection of Reecer Creek Road and Dry Creek Road. The developed site is shown in Figure 5.0.

Flow Control System

Detention calculations were performed using Stormshed 3G, SBUH methodology. The proposed detention and infiltration facility has been designed in conformance with the Stormwater Management Manual for Eastern Washington to infiltrate and/or retain the storm water runoff from the 2-year, 24-hour design storm event to the 25-year storm event without impairing ground water quality. The stormwater calculations and all supporting documents have been included in Appendix 4-A of this report. For this project the soil types were averaged and determined to be soil class C.

Existing Conditions:

The existing conditions were modeled using pasture. The curve numbers used with the associated land covers are from the Stormwater Management Manual for Eastern Washington. See appendix 4-A for further details of basins.

Existing Basin

CN for Till Pasture = 79

Undisturbed Forest = 5.77 Acres

Peak Flow Rates

2-year	0.025 CFS
25-year	0.112 CFS

Water Quality System

Additional soils testing may be required to determine if the soils present have appropriate characteristics to provide water quality treatment for the site.

Conveyance System

The site drainage system will be analyzed with 25-year return period flows generated using the SBUH methodology. The analysis will be performed using StormShed computer program. The flow analysis is will be completed with the construction documents.

Infiltration/Retention Facilities

As described previously, the entirety of stormwater runoff is intended to be infiltrated on site. The infiltration/retention facilities for the project site will be comprised of both an infiltration gallery and a perforated infiltration conveyance system. The infiltration gallery is 3' deep with dimensions of 50' wide by 70' long and filled with 40% void space rock. The conveyance system, for the entire project, will be comprised of 12" perforated conveyance pipe, which has been installed in a 3' deep by 3' wide trench and filled with 40% void space rock. Stormwater generated by individual lots will be directed to the perforated pipe conveyance system adjacent to the lots.

Infiltration/Retention Facility

The Infiltration/Retention Facility is located in the southwest corner of the site. Infiltration rates used for design are based on testing conducted by Baer Testing, Inc. (see Appendix 5-A for soil testing letter). A correction factor of 0.5 for long term maintenance and performance was applied. The design infiltration rate used for this project is 4.5 inches/hour. The soils testing done by Baer Testing, Inc. also concluded that the groundwater lever was approximately 8' below grade at the westerly portion of the site, which is also the low point of the site. The infiltration facilities are intended to be installed at a depth of 3' below grade, providing a minimum of 5' of separation from the identified groundwater level.

See next page for facility flow and volume requirements.

SBUH Analysis Basin Summary

Predeveloped Basin

Design Method	SBUH	**Rainfall type**	TYPE1A.RAC
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	5.77 ac	**DCIA**	0.00 ac
Pervious CN	79.00	**DC CN**	0.00
Pervious TC	52.2803 min	**DC TC**	0.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Pasture or range (fair)	5.77 ac	79.00
Pervious Composited CN (AMC 2)		79.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet	Short prairie grass and lawns.	300.00 ft	2.0%	0.15	2.50 in	26.6955 min
Shallow	Short grass, pasture and lawns (n=0.030)	500.00 ft	1.0%	0.03		7.7879 min
Pervious TC						34.4834 min

Event Summary

BasinID	Event	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-cf)	Area (ac)	Method/Loss	Raintype
Predeveloped Basin	2 yr 24 hr	0.0254	24.00	0.0215	5.77	SBUH	TYPE1A.RAC
Predeveloped Basin	25 year	0.112	10.17	0.1473	5.77	SBUH	TYPE1A.RAC

Detention Model Summary

Rainfall Intensities for Significant Storm Events:

Event	Precip (in)
2 yr 24 hr	0.90
10 year	1.30
25 year	1.60
100 year	2.10

Storage Facility Definition:

Perforated Conveyance Pipe

Record Id: Trench

Descrip:	Prototype Record	Increment	0.10 ft
Start El.	100.00 ft	Max El.	103.00 ft
Void Ratio	40.00		
Length	2085.00 ft	Width	3.00 ft
		Consider Bottom Only	
Vault Type Node			

Infiltration Gallery

Record Id: Facility

Descrip:	Prototype Record	Increment	0.10 ft
Start El.	100.00 ft	Max El.	103.00 ft
Void Ratio	40.00		
Length	70.00 ft	Width	50.00 ft
		Consider Bottom Only	
Vault Type Node			

Combo

Record Id: Combo

Descrip:	Prototype Record	Increment	0.10 ft
Start El.	100.00 ft	Max El.	103.00 ft
Void Ratio	100.00		
Combination Storage Type Node			

5.0 SPECIAL REPORTS AND STUDIES

- The Infiltration Testing Letter for Cottage Grove Residential Development, Kittitas, Washington, completed by Baer Testing, Inc. on June 25th, 2018, is located in Appendix 5-A.

- A Stormwater Operations and Maintenance manual is located in Appendix 5-B.

Baer Testing Inc.

1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

June 25, 2018

MDJ Contractors
PO Box 1117
Ellensburg, WA 98926

Attention: Mr. Eric Jackson, Office Manager

RE: INFILTRATION TESTING RESULTS; COTTAGE GROVE RESIDENTIAL DEVELOPMENT, KITTITAS COUNTY, WASHINGTON

Dear Mr. Jackson:

At your request, Baer Testing, Inc. conducted an infiltration test on June 20 and 21, 2018 at the Cottage Grove residential development site to satisfy Kittitas County requirements.

METHODOLOGY

The infiltration test location was selected by the civil design consultant in an area designated for stormwater retention. The test location is shown in Figure 1. MDJ Development excavated the test pits using a CAT excavator with a 2-foot bucket.

Initially, a test pit was excavated to identify the depth to groundwater. Groundwater was encountered 8 feet below the existing surface. A second test pit extending to the proposed 4- to 5-foot infiltration depth was then excavated for testing. A soil sample was obtained from the approximate infiltration depth for gradation testing. The subsurface conditions encountered in both test pits consisted of very dense, moist, poorly-graded gravel with cobbles up to approximately 12 inch size in a tightly packed silt/sand matrix. Photos 1 & 2 show materials excavated from the deeper test pit.

On June 20, the shallow test pit was partially filled with water to approximately 30 inches from the ground surface. This water was allowed to dissipate over approximately 18 hours until the pit was empty.

On June 21, our representative returned to the site to complete the testing. The test pit was again filled with water and the water level was measured when the filling stopped. The water level was then measured again after 30 minutes and 60 minutes. The infiltration rate was determined by the drop in water elevation between the 30 minute and 60 minute readings.

Figure 1 – Test Location

Baer Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902
(509)469-3068 Office
(509)469-3070 Fax

CLIENT:	MDJ	**PROJECT NUMBER:**	18-085
PROJECT:	Cottage Grove Infilitration Testing	**WORK ORDER #:**	18-514
SAMPLE SOURCE:	Onsite	**SAMPLE NUMBER:**	18-514-1
MATERIAL TYPE:	Native	**DATE TESTED:**	6/22/2018
DATE SAMPLED:	6/20/2018	**TESTED BY:**	STB

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF AGGREGATES ASTM C 136

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"	50%		#4	9%	
3"			#8		
2 1/2"			#10	8%	
2"	35%		#16		
1 1/2"			#20	7%	
1 1/4"			#30		
1"	20%		#40	6%	
3/4"	16%		#50		
5/8"	14%		#60		
1/2"	12%		#80	4%	
3/8"	11%		#100	4%	
1/4"			#200	1.9%	

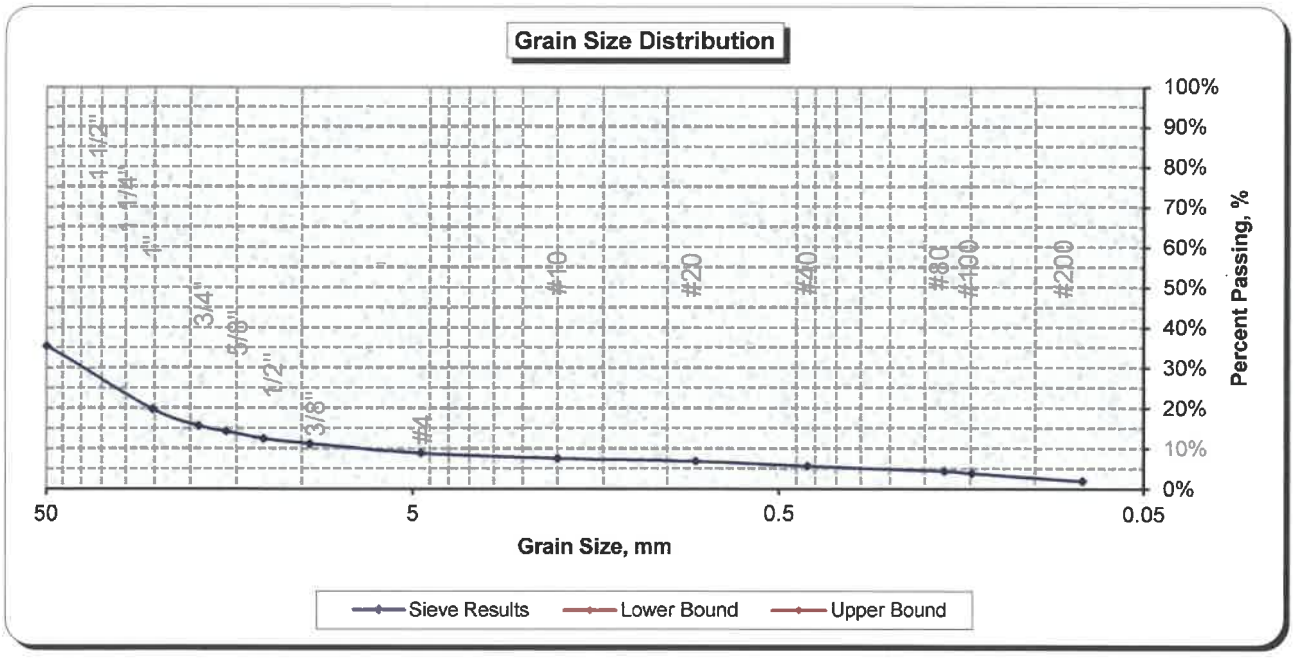
SOIL MOISTURE DETERMINATION - ASTM D 2216

SAND EQUIVALENT - D 2419

FRACTURED FACE - D 5821

FLAT AND ELONGATED - D 4791

NOTE:



REVIEWED BY:

X

Dee Burrie
Technical Director
Signed by: S. Randy Baer

Operation and Maintenance

The Storm System will consist of buried pipes, catch basins, infiltration gallery facilities. These facilities will require periodic maintenance and inspection. Inspection and maintenance procedures are contained in the following pages.

NO. 2 - INFILTRATION

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Poisonous Vegetation	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Pollution	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Unmowed Grass/ Ground Cover	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Rodent Holes	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Insects	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
Storage Area	Sediment	A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. If two inches or more sediment is present, remove.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.
	Sheet Cover (If Applicable)	Sheet cover is visible and has more that three 1/4-inch holes in it.	Sheet cover repaired or replaced.
	Sump Filled with Sediment and Debris (If Applicable)	Any sediment and debris filling vault to 10% of depth from sump bottom to bottom of outlet pipe or obstructing flow into the connector pipe.	Clean out sump to design depth.
Filter Bags	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Replace filter bag or redesign system.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Replace gravel in rock filter.
Side Slopes of Pond	Erosion	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
Emergency Overflow Spillway	Rock Missing	See "Ponds" Standard No. 1	
Settling Ponds and Vaults	Sediment	Remove when 6" or more.	

Note: Sediment accumulation of more than .25 inches per year may indicate excessive erosion is occurring upstream of the facility or that conveyance systems are not being properly maintained. The contributing drainage area should be checked for erosion problems or inadequate maintenance of conveyance systems if excessive sedimentation is noted in an infiltration facility.

Check twice a year during first 2 years of operation; once a year thereafter. Clean manholes/catch basins, repair damaged inlets/outlets, clean trash racks.

NO. 5 - CATCH BASINS (*CONTINUED*)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	Fire Hazard	Presence of chemicals such as natural gas, oil and gasoline.	No flammable chemicals present.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Pollution	Nonflammable chemicals of more than 1/2 cubic foot per three feet of basin length.	No pollution present other than surface film.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by on maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying 80 lbs. of lift; intent is keep cover from sealing off access to maintenance.	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)		Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

NO. 6 DEBRIS BARRIERS (E.G., TRASH RACKS)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed.
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier clear to receive capacity flow.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Repair or replace barrier to design standards.

NO. 10 - CONVEYANCE SYSTEMS (PIPES & DITCHES)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20% of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
	Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipes.
	Damaged	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.	Pipe repaired or replaced.
		Any dent that decreases the cross section area of pipe by more than 20%.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment	Accumulated sediment that exceeds 20 % of the design depth.	Ditch cleaned/ flushed of all sediment and debris so that it matches design.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion Damage to Slopes	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Rock Lining Out of Place or Missing (If Applicable).	Maintenance person can see native soil beneath the rock lining.	Replace rocks to design standards.
Catch Basins		See "Catch Basins: Standard No. 5	See "Catch Basins" Standard No. 5
Debris Barriers (e.g., Trash Rack)		See "Debris Barriers" Standard No.6	See "Debris Barriers" Standard No. 6

NO. 11 - GROUNDS (LANDSCAPING)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Weeds (Nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Safety Hazard	Any presence of poison ivy or other poisonous vegetation.	No poisonous vegetation present in landscaped area.
	Trash or Litter	Paper, cans, bottles, totaling more than 1 cubic foot within a landscaped area (trees and shrubs only) of 1,000 square feet.	Area clear of litter.
Trees and Shrubs	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	Tree or shrub in place free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; remove any dead or diseased trees.

Baer Testing Inc.

1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

June 25, 2018

MDJ Contractors
PO Box 1117
Ellensburg, WA 98926

Attention: Mr. Eric Jackson, Office Manager

RE: INFILTRATION TESTING RESULTS; COTTAGE GROVE RESIDENTIAL DEVELOPMENT, KITTITAS COUNTY, WASHINGTON

Dear Mr. Jackson:

At your request, Baer Testing, Inc. conducted an infiltration test on June 20 and 21, 2018 at the Cottage Grove residential development site to satisfy Kittitas County requirements.

METHODOLOGY

The infiltration test location was selected by the civil design consultant in an area designated for stormwater retention. The test location is shown in Figure 1. MDJ Development excavated the test pits using a CAT excavator with a 2-foot bucket.

Initially, a test pit was excavated to identify the depth to groundwater. Groundwater was encountered 8 feet below the existing surface. A second test pit extending to the proposed 4- to 5-foot infiltration depth was then excavated for testing. A soil sample was obtained from the approximate infiltration depth for gradation testing. The subsurface conditions encountered in both test pits consisted of very dense, moist, poorly-graded gravel with cobbles up to approximately 12 inch size in a tightly packed silt/sand matrix. Photos 1 & 2 show materials excavated from the deeper test pit.

On June 20, the shallow test pit was partially filled with water to approximately 30 inches from the ground surface. This water was allowed to dissipate over approximately 18 hours until the pit was empty.

On June 21, our representative returned to the site to complete the testing. The test pit was again filled with water and the water level was measured when the filling stopped. The water level was then measured again after 30 minutes and 60 minutes. The infiltration rate was determined by the drop in water elevation between the 30 minute and 60 minute readings.

RESULTS

A copy of the sieve analysis test on the sample from the test pit is enclosed.

The water level in the test pit dropped 4.5 inches between the 30 minute and 60 minute readings. Based on this data, the calculated infiltration rate is:

0.15 inches per minute or 6.7 minutes per inch

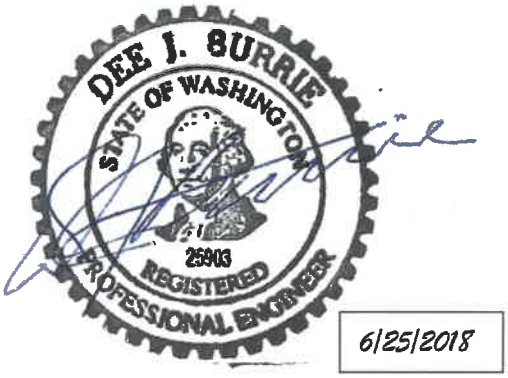
The infiltration rate does not include a safety factor. The system designer should incorporate an appropriate factor of safety against slowing rates over time due to biological and sediment clogging.

This report was prepared for use the exclusive use of MDJ Contractors and their design team for the proposed project. This report presents the data from observation and field testing and is based on subsurface conditions at the specific locations and depths indicated. No other representation is made. This report should be made available to potential contractors for information on factual data only. Conclusions and interpretations presented in this report should not be construed as a guarantee or warranty of the subsurface conditions.

We appreciate the opportunity to be of service. If you have questions or comments, please contact our office.

Sincerely,

BAER TESTING, INC.



Dee J. Burrie, P.E.
Chief Engineer

Enclosures: Figure 1 – Test Pit Locations
Photographs
Laboratory Testing Results

Figure 1 – Test Location

Photo 1 – Material from Test Pit

Photo 2 – Test Pit showing soil profile

Baer Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902
(509)469-3068 Office
(509)469-3070 Fax

CLIENT:	MDJ	**PROJECT NUMBER:**	18-085
PROJECT:	Cottage Grove Infilitration Testing	**WORK ORDER #:**	18-514
SAMPLE SOURCE:	Onsite	**SAMPLE NUMBER:**	18-514-1
MATERIAL TYPE:	Native	**DATE TESTED:**	6/22/2018
DATE SAMPLED:	6/20/2018	**TESTED BY:**	STB

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF AGGREGATES ASTM C 136

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"	50%		#4	9%	
3"			#8		
2 1/2"			#10	8%	
2"	35%		#16		
1 1/2"			#20	7%	
1 1/4"			#30		
1"	20%		#40	6%	
3/4"	16%		#50		
5/8"	14%		#60		
1/2"	12%		#80	4%	
3/8"	11%		#100	4%	
1/4"			#200	1.9%	

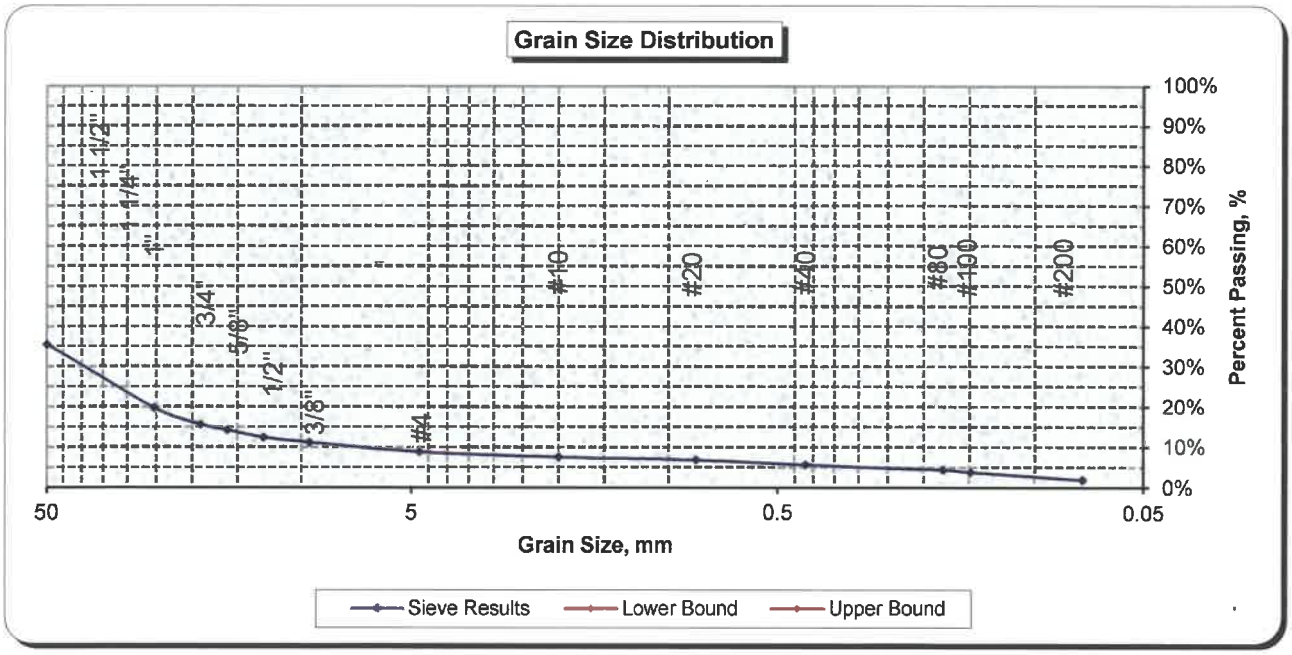
SOIL MOISTURE DETERMINATION - ASTM D 2216

SAND EQUIVALENT - D 2419

FRACTURED FACE - D 5821

FLAT AND ELONGATED - D 4791

NOTE:



REVIEWED BY:

X

Dee Burrie
Technical Director
Signed by: S. Randy Baer

PART OF SECTION 27, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, WASHINGTON

NOTES:

1. THIS SURVEY WAS PERFORMED USING A TOPCON GTS SERIES TOTAL STATION. THE CONTROLLING MONUMENTS AND PROPERTY CORNERS SHOWN HEREON WERE LOCATED, STAKED AND CHECKED FROM A CLOSED FIELD TRAVERSE IN EXCESS OF 1:10,000 LINEAR CLOSURE AFTER AZIMUTH ADJUSTMENT.

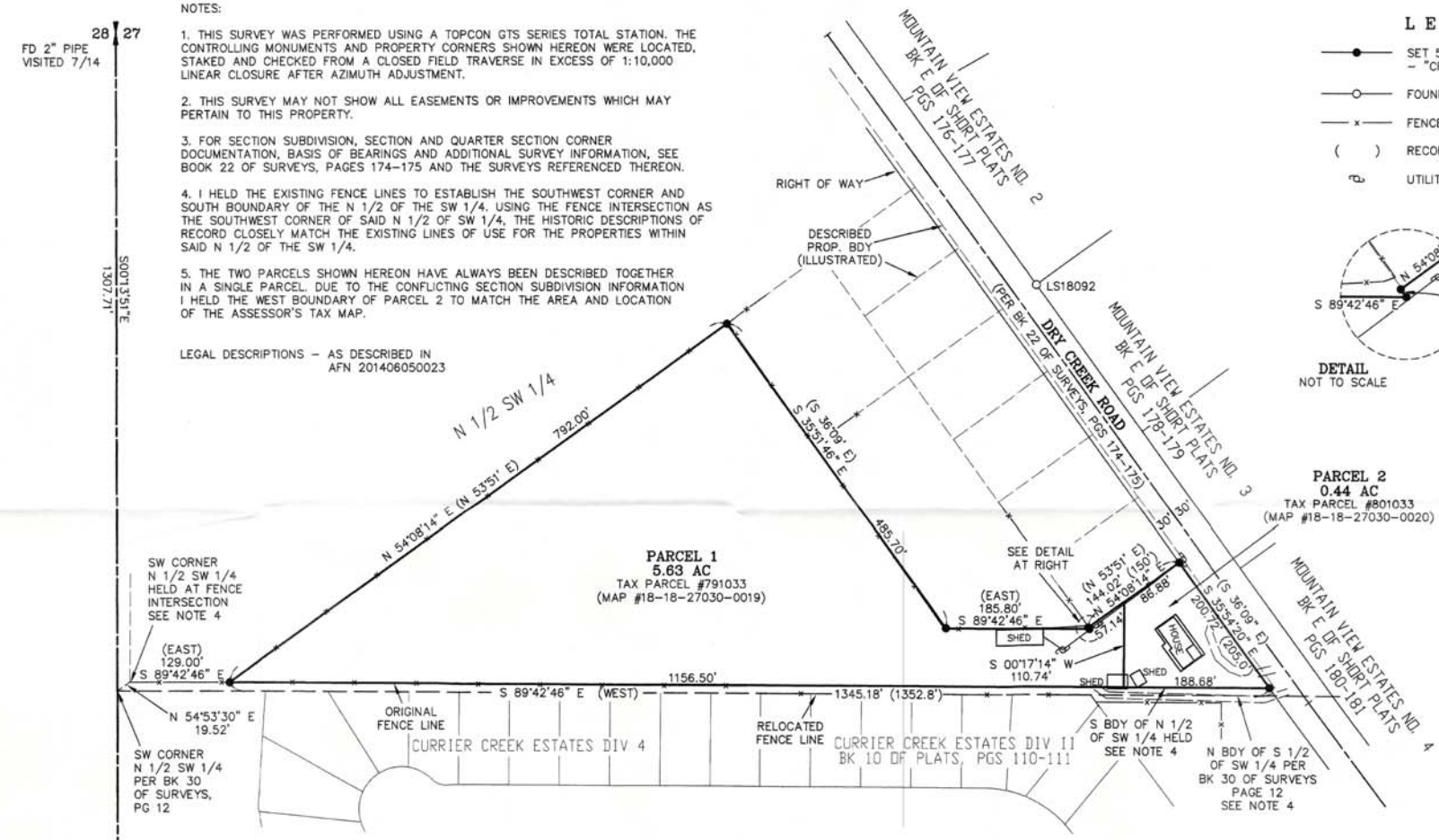
2. THIS SURVEY MAY NOT SHOW ALL EASEMENTS OR IMPROVEMENTS WHICH MAY PERTAIN TO THIS PROPERTY.

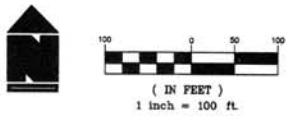
3. FOR SECTION SUBDIVISION, SECTION AND QUARTER SECTION CORNER DOCUMENTATION, BASIS OF BEARINGS AND ADDITIONAL SURVEY INFORMATION, SEE BOOK 22 OF SURVEYS, PAGES 174–175 AND THE SURVEYS REFERENCED THEREON.

4. I HELD THE EXISTING FENCE LINES TO ESTABLISH THE SOUTHWEST CORNER AND SOUTH BOUNDARY OF THE N 1/2 OF THE SW 1/4. USING THE FENCE INTERSECTION AS THE SOUTHWEST CORNER OF SAID N 1/2 OF SW 1/4, THE HISTORIC DESCRIPTIONS OF RECORD CLOSELY MATCH THE EXISTING LINES OF USE FOR THE PROPERTIES WITHIN SAID N 1/2 OF THE SW 1/4.

5. THE TWO PARCELS SHOWN HEREON HAVE ALWAYS BEEN DESCRIBED TOGETHER IN A SINGLE PARCEL. DUE TO THE CONFLICTING SECTION SUBDIVISION INFORMATION I HELD THE WEST BOUNDARY OF PARCEL 2 TO MATCH THE AREA AND LOCATION OF THE ASSESSOR'S TAX MAP.

LEGAL DESCRIPTIONS – AS DESCRIBED IN AFN 201406050023





LEGEND

- SET 5/8" REBAR W/ CAP – "CRUSE 36815"
- FOUND PIN & CAP
- FENCE
- ( ) RECORD INFORMATION
- UTILITY POLE

DETAIL
NOT TO SCALE

NEW DESCRIPTIONS

PARCEL 1

PARCEL 1 OF THAT CERTAIN SURVEY RECORDED JUNE 22, 2017, IN BOOK 40 OF SURVEYS AT PAGE 227, UNDER AUDITOR'S FILE NO. 20170622 0007, RECORDS OF KITTITAS COUNTY, WASHINGTON; BEING A PORTION OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF SECTION 27, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON.

PARCEL 2

PARCEL 2 OF THAT CERTAIN SURVEY RECORDED JUNE 22, 2017, IN BOOK 40 OF SURVEYS AT PAGE 227, UNDER AUDITOR'S FILE NO. 20170622 0007, RECORDS OF KITTITAS COUNTY, WASHINGTON; BEING A PORTION OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF SECTION 27, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON.

SURVEYOR'S CERTIFICATE

This map correctly represents a survey made by me or under my direction in conformance with the requirements of the Survey Recording Act at the request of MIKE JACKSON in MARCH of 2017.

Chris Cruse
CHRISTOPHER C. CRUSE
Professional Land Surveyor
License No. 36815
6/21/2017
DATE

CHRISTOPHER C. CRUSE — LS 36815 — REGISTERED PROFESSIONAL LAND SURVEYOR

AUDITOR'S CERTIFICATE

Filed for record this 22ND day of JUNE,
2017, at 9:45 A.M., in Book 40 of Surveys
at page(s) 227 at the request of Cruse & Associates.
RECEIVING NO. 201706220007
JERALD V. PETTIT by: _____, Deputy
KITTITAS COUNTY AUDITOR

X X 27

CRUSE & ASSOCIATES
PROFESSIONAL LAND SURVEYORS
217 E. Fourth St. P.O. Box 959
Ellensburg, WA 98926 (509) 962-8242

LOWELL/JACKSON PROP.