STORMWATER REPORT

PALOMINO MAJOR PLAT, PHASE II & III

LCU Inc.

Prepared by

WESTERN PACIFIC ENGINEERING and SURVEY
1328 E. Hunter Place
Moses Lake, Washington 98837
(509) 765-1023

WPES Project Number 18413
October 2019

ENGINEERS SPECIAL INSPECTORS PLANNERS SURVEYORS
WESTERN PACIFIC ENGINEERING & SURVEY
PIONEER WAY PROFESSIONAL CENTER
1328 E. HUNTER PLACE
MOSES LAKE, WASHINGTON 98837
OFFICE: (509) 765-1023
FAX: (509) 765-1298

October 18, 2019

LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, Washington 98922

SUBJECT: Revised Stormwater Report for Phase II and III of the Palomino Major Plat located in Ellensburg, WA
WPES Project No. 18413

Dear Mr. Deneen:

Please find the attached revised Stormwater Report for Phase II and III of the Palomino Major Plat in Ellensburg, Washington. This revised report incorporates the feedback and current construction conditions as they exist on-site today. As you know, you will be required to follow all Washington Department of Ecology and Kittitas County Stormwater Standards during construction.

Thank you for allowing us to serve your engineering needs. If you have any questions concerning the attached report, please feel free to contact our office.

Sincerely,

Nathaniel D. Nofziger, P.E.
WESTERN PACIFIC ENGINEERING & SURVEY
1328 E. Hunter Place
Moses Lake, Washington 98837
(509) 765-1023

Proposed Development and Existing Site Conditions

The original scope of this project included the development of approximately thirty-five hundred feet of private roadway network to serve thirty-six new single-family residences. Broken out into three phases, each phase would deal with a specific area of the development. This revised report specifically relates to the second and third phases of the overall project. This revision is required due to the reclassification of the roadway from a private road network to a public network and the presence of additional underground utilities.

Current project scope for phases two and three includes the extension of Roan Drive from its current location until it terminates at Reecer Creek Road. The development is located approximately three miles northwest of downtown Ellensburg, Washington. The site can be accessed to the northwest from Bowers Road or from the southeast by Reecer Creek Road. More specifically, the site is located in the Northwest quarter of Section 27, Township 18 North. Range 18 East, W.M., on Kittitas County's Tax Parcel No. 491033

During the preliminary phases of this project, it was determined that the site experienced extremely high-water levels during the summer months. As such, the installation of traditional ditches and swales would be unfeasible. Without the ability to excavate for stormwater collection and infiltration, an elevated roadbed is the most reasonable solution to allow for grading and stormwater management.

In raising the grade of the road, stormwater will be able to run off the roadway and collect in constructed ditches. To accommodate the runoff from the roadway, areas outside the asphalt and compacted gravel shoulder will be left uncompacted to allow maximum infiltration capability. By minimizing compacted areas and allowing plant growth in these infiltration areas, the stormwater runoff will be able to properly infiltrate into the ground.

In the original design, the roadway was intended to be a private road. With this classification, the runoff from the roadway, driveways, and structures placed on each lot would need to have a stormwater collection system. Changing to a county road allows for only the stormwater running off from the roadway itself to be collected and stored. Each property will maintain their runoff on-site.

On October 17th, 2014, Budinger & Associates performed two shallow depth bores to determine soil classification and layer thickness. These bores were located to the west of the existing Bowers Road, approximately 100' and 400' respectively. These locations serve as the primary location for the Phase I development. Results from these tests are included in the appendix. This data indicates that primarily sands and gravels are present on site with a standing water table of five and a half feet or less at the time of boring.

On June 5th, 2018, Western Pacific Engineering and Survey was on site to dig test pits and collect soil samples representative of the native material found on site. The test pits were located in the vicinity of the bridge abutments. The soil conditions, drainage characteristics, and pertinent soil design information was gathered and analyzed for use within this report. The soil analysis, as well as a map showing locations of the test pits, can be found in the appendix.

The proposed development is classified as a low-use site as defined by the 2019 Stormwater Management Manual for Eastern Washington (SWMMEW). Roan Drive is a county road with an average daily traffic (ADT) count of less than 7,500 vehicles, categorizing it as a low-use site according to Table 5.22: Pollutant Loading Classifications for Solids, Metals, and Oil in Stormwater Runoff Directed to UIC Wells.

The natural topography is generally uniform in grade, sloping downward to the southwest. The surface of property is covered in a variety of native grasses. Within the boundaries of Phase III of this project, there is an abandoned irrigation ditch that runs east to west. This irrigation ditch is no longer in use and portions of it will be filled in as necessary. Other important features to note are Currier Creek, the Town Ditch, and their proximity to the site. The Town Ditch borders the eastern portion of the site and Currier Creek is located to the west.

Basin Analysis

After placement of new roadway, the original drainage flow will be disrupted due to the elevated roadbed design. All stormwater that lands within the established Right of Way (ROW) will be collected and stored until it is able to infiltrate. The native soils are somewhat permeable, but will have limited infiltration prior to the soils becoming saturated due to the high-water table. For areas outside the ROW, runoff will be similar to pre-construction conditions.

For this development it is important that the stormwater runoff from the roadway does not directly flow into Currier Creek, due to the potential for contaminants. To protect Currier Creek, construction means and methods shall be consistent with the Stormwater Management Manual for Eastern Washington. For the purpose of this stormwater management document, only the stormwater that lands within the Right of Way will be considered.

General Calculation Procedure

When computing the required infiltration and storage areas for the site, a number of design assumptions were made. These assumptions include: each lot would have its own driveway, approximately twenty feet wide, Roan Drive will be approximately twenty-six feet wide for the 3,250 feet long roadway, approximately twenty linear feet would be subtracted from effective ditch length for each utility cluster, and the infiltration rate is assumed to be zero feet per second to account for the high groundwater table and inability for native soils to infiltrate stormwater.

By quantifying the type of ground cover present on site, a more accurate representation of infiltration and storage is possible. The impervious area, consisting of the roadway and individual driveways, covers approximately 2.2 acres. The pervious cover, consisting of the ditches and shoulders along the roadway, adds an additional 1.3 acres. In accordance with the Kittitas County Code, the rainfall intensity and time of concentration from a 25-year storm were used. A rainfall volume of 1.6 inches, along with Type 1A hydrograph were used to analyze the volume of stormwater expected from the site.

According to the United States Department of Agriculture's (USDA) Soil Survey, the soils in the area have a Hydraulic Soil Group rating of C/D or better. Runoff Curve Number (CN) values can be pulled directly from Table 4.5.2, found in the Stormwater Management Manual for Eastern Washington, published by the Washington State Department of Ecology. For the impervious paved areas, the CN value is 98. For the previous areas, the CN value of 87 for open spaces with less than 50% grassy cover was used. This CN value was chosen as the infiltration areas are designed to be seeded with low-irrigation plants and may not assist in the infiltration of stormwater.

Based on the Budinger & Associates soil exploration data, project soils are classified as poorly graded clean gravels or gravel-sand mix (GP) according to Unified Soils Classification System with a hydraulic permeability of 0.01 feet per minute.

Based on our own research and soil sampling, the soils most closely resemble silty sands or poorly graded sand-silt mix (SM) with a hydraulic permeability of 5×10^{-5} feet per minute within the first foot of depth. For the remainder of the tests, for depths greater than a foot, the soils present have a higher hydraulic conductivity than the initial layer. As such, the lowest value will be used for calculations as it is the limited factor in stormwater infiltration. The data gathered by Western Pacific Engineering & Survey has been included in the appendix.

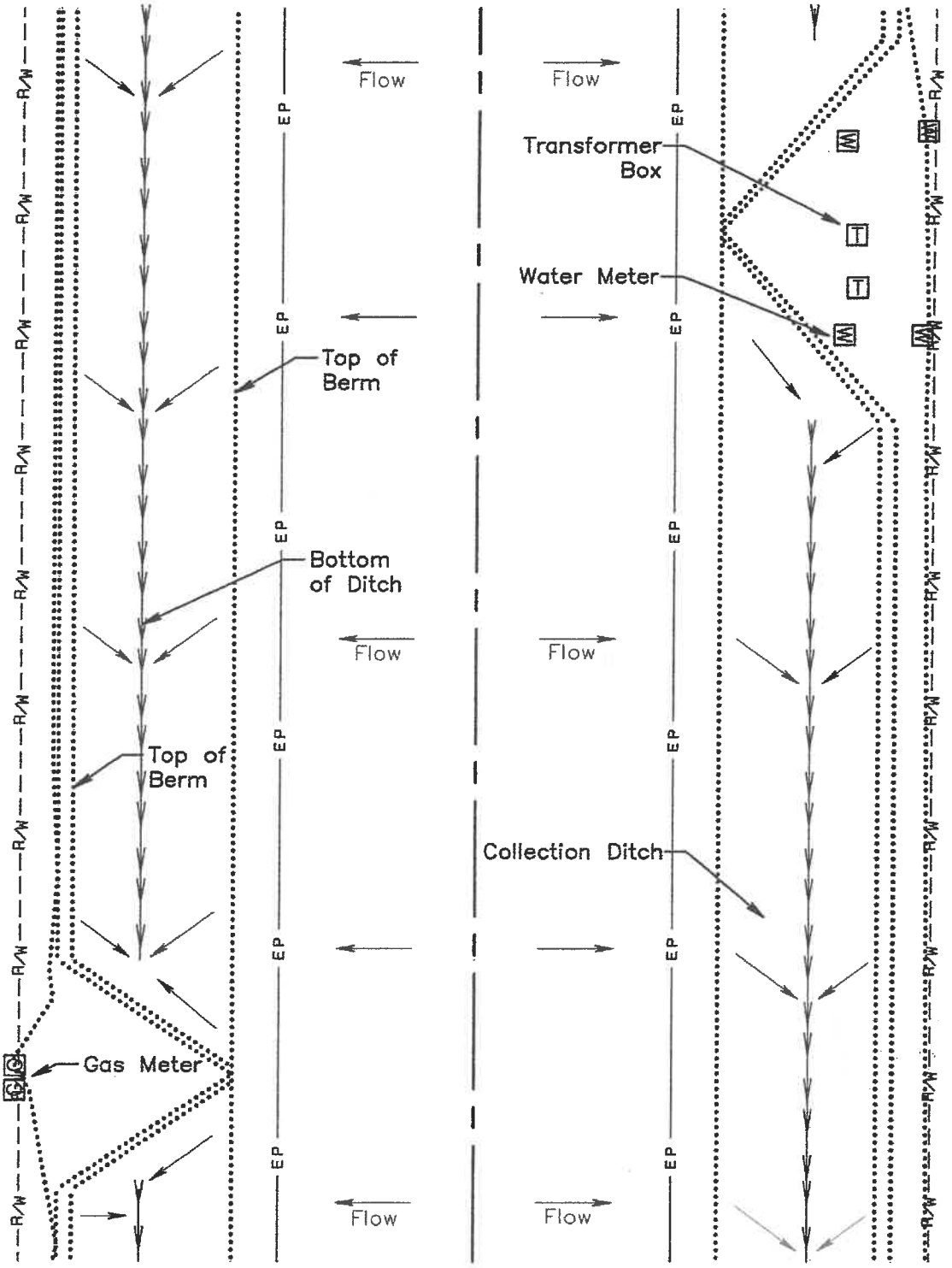
Lastly, by utilizing the United States Department of Agriculture's Web Soil Survey tool, a soil map encompassing the project site and the present soils with their respective engineering and physical properties was obtained. Using the median value for the topsoil infiltration rate returned a value of 0.0018 feet per second. Data sheets utilized to determine the soil type and infiltration rates are included in the appendix. To provide a factor of safety, an assumed infiltration rate of zero feet per second is used to determine the required 100-year storm storage capacity. As such, the required storage for a zero-infiltration scenario is the design standard.

Current earthwork design calls for a one-and-a-half-foot tall berm on the outside of the ditch and a two-foot berm on the inside of the ditch with a trough between them. This depression will contain the stormwater from the roadway. With a design infiltration value of zero feet per second, the required storage is 13,737 ft^3. This amount of water equates to approximately 7.5" and 6.5" of standing water in the left and right ditches, respectively. While the right ditch accepts more runoff, it also has a longer effective length due to the super-elevated roadway, thereby giving it a lower standing depth. With 100-year storm during frozen ground conditions, the stormwater collection system is capable of impounding all runoff without the need for any infiltration. During typical, non-frozen conditions, a storage depth of 2" or less should be expected based on median infiltration rates.

Taking all of the above information into consideration, it was determined that for an SCS Type 1A regional storm, the designed stormwater collection system is more than capable of handling the runoff from Roan Drive.

Appendices and Attachments

- Typical Layout Runoff Map
- Typical Roadway Cross-Section
- Budinger & Associates Soil Bore Data
- WPES Soil Classification
- USDA Soil Classification
- 25-Year Storm Map
- Stormwater Manual Hydrology Tables
- Infiltration Area Calculations
- Basin Runoff Calculations



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A TERRA DEVELOPMENT SERVICES CORPORATION

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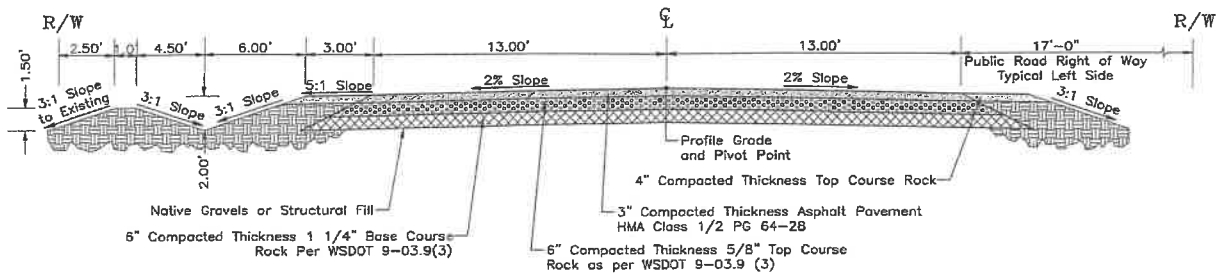
LCU, INC.

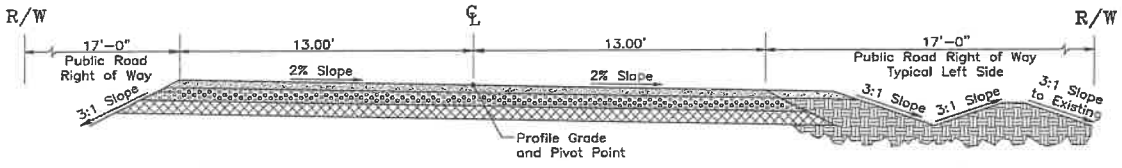
Palomino Flats Runoff Map
Typical Layout

DRAWN BY: TSL CHECKED BY: NDN	DATE: October 9, 2019	WPE PROJECT #: 18413	Scale: 1" = 10' PLATE NO.: 01

TYPICAL ROADWAY SECTION



SUPER ROADWAY SECTION
Sta. -4+23.40 to Sta. -1+44.69



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No.	Revision	Date	By

LCU, INC.
PALOMINO FLATS DRAINAGE
Typical Cross-Section
Kittitas County Washington

Designed by NDN
Drawn by Tml/TSL
Checked by NDN
Project No. 16413
Date: October, 2019
Scale:
Hor. 1" = N/A
Vert. 1" = N/A
Sec 27, T 18 N, R 16 E

SHEET NO.
1 of 1

DCPT LOCATION

TEST PIT LOCATION

N

SCALE: 1"=200'

0 100 200

Budinger & Associates

SITE PLAN	FIGURE 1
PALOMINO FIELDS PLAT ELLENSBURG, WASHINGTON	PROJECT NUMBER S14484
	DATE: 10/2014

TEST PIT 1

Date of Boring: 10-17-14
Driller: client
Type of Drill: Bobcat E42 Mini-excavator
Location: ~ 50 feet west of Reecer Creek Road at Bowers Road
Surface: sparse grass and weeds

Elevation: 100 ft
Logged by: T. Black
Size of hole: 5 ft by 10 ft

DEPTH	SAMPLES	RQD, BLOW COUNTS N (% RECOVERY) (blows/6" (italics))	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0			moist, dark brown to brown, loose	SAND with Silt and Organics (roots)	
			moist, brown to reddish brown, loose to medium dense	GRAVEL with Sand and Cobbles, occasional Boulders, coarse, rounded	
5			saturated, gray, loose to medium dense	(free groundwater at 5 feet) GRAVEL with Sand, occasional Cobbles and Boulders, coarse, rounded	
				End of Boring @ 5.5 ft	
10					

TEST RESULTS

ATTERBERG LIMITS
PL ⊢——⊣ LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ■
3" SPLIT SPOON PENETRATION, BLOWS/FT ■

10 20 30 40 50 60 70 80 90

Budinger & Associates
3820 E. Broadway Ave.
Spokane, WA 99202

TEST PIT LOGS **FIGURE 3-1**

Project: Palomino Road Extension
Location: Ellensburg, WA
Number: S14484

TEST PIT LWWWT S14484 TEST PIT LOGS.GPJ BUDINGER.GDT 10/23/14

TEST PIT 2

Date of Boring: 10-17-14
Driller: client
Type of Drill: Bobcat E42 Mini-excavator
Location: ~ 400 feet west of Reecer Creek Road at Bowers Road
Surface: sparse grass and weeds

Elevation: 95 ft
Logged by: T. Black
Size of hole: 5 ft by 10 ft

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY) (blows/6" (italics))	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown to brown, loose	SAND with Silt and Organics (roots)	
		moist, brown to reddish brown, loose to medium dense	GRAVEL with Sand and Cobbles, occasional Boulders, coarse, rounded	
			(free groundwater at 4 feet)	
5		saturated, gray, loose to medium dense	GRAVEL with Sand, occasional Cobbles and Boulders, coarse, rounded	
			End of Boring @ 5 ft	
10				

TEST RESULTS

ATTERBERG LIMITS
PL ——— LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ▣
3" SPLIT SPOON PENETRATION, BLOWS/FT ■

10 20 30 40 50 60 70 80 90

TEST PIT LWWWT S14484 TEST PIT LOGS.GPJ BUDINGER.GDT 10/23/14

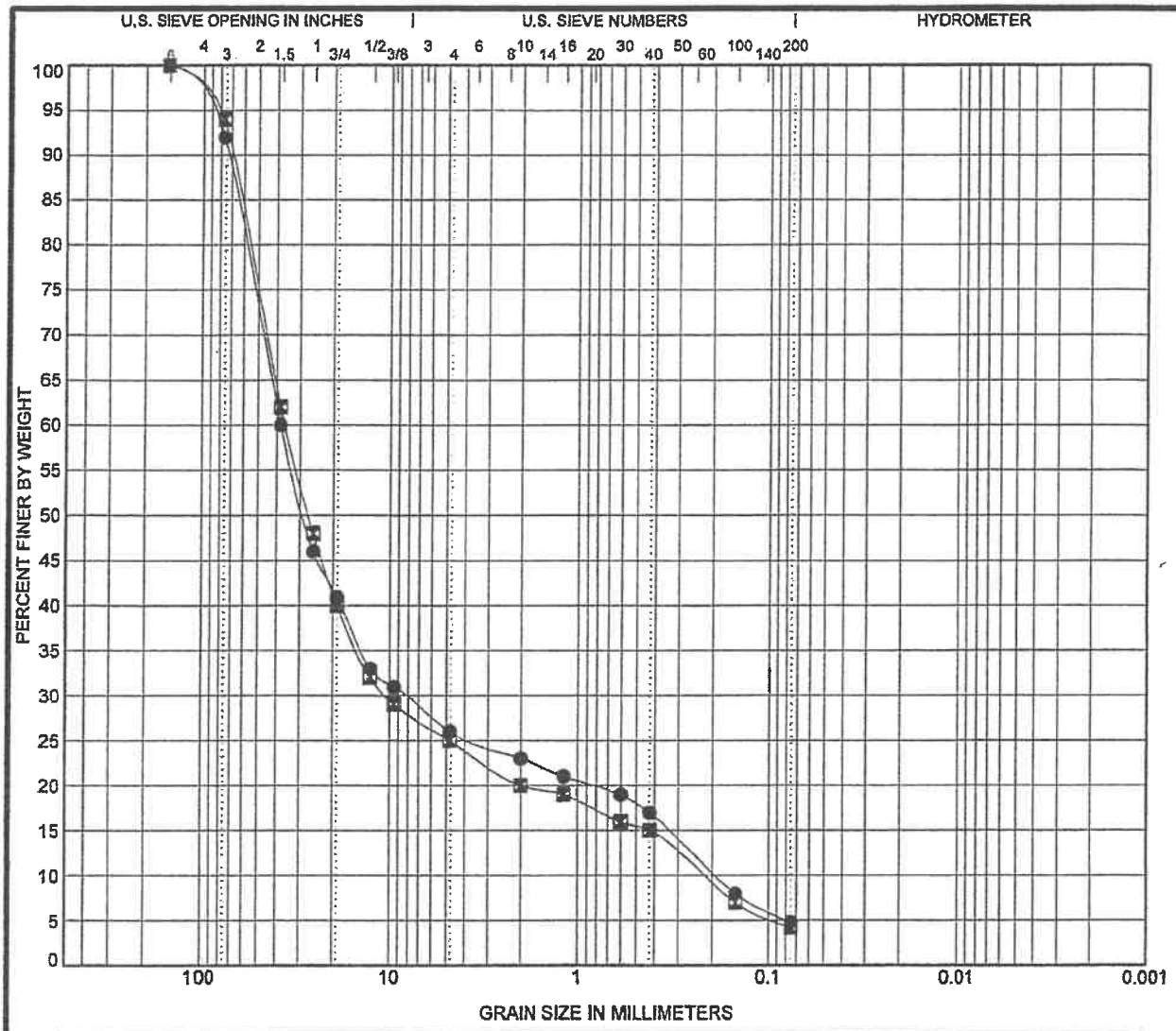
Budinger & Associates
3820 E. Broadway Ave.
Spokane, WA 99202

TEST PIT LOGS **FIGURE 3-2**

Project: Palomino Road Extension
Location: Ellensburg, WA
Number: S14484

SOIL MECHANICS
LABORATORY SUMMARY

			Units	Test Methods		
LABORATORY NUMBER					[illegible]	[illegible]
TEST PIT NUMBER					1	2
DEPTH		TOP	feet		1.0	1
		BOTTOM	feet		3.0	3
SAMPLE TYPE					Bulk	Bulk
MOISTURE			%	ASTM D2216	6.5	6.0
LIQUID LIMIT			%	ASTM D 4318	27	28
PLASTIC LIMIT			%		24	18
PLASTICITY INDEX			%		3	10
UNIFIED CLASSIFICATION				ASTM D 2487	GP	GP
	6"			ASTM D 422	100	100
	3"				92	94
S	1½"		%		60	62
I	1"				46	48
E	3/4"	GRAVEL	P		41	40
V	1/2"		A		33	32
E	3/8"		S		31	29
	#4		S		26	25
S	#10		I		23	20
I	#16		N		21	19
Z	#30	SAND	G		19	16
E	#40				17	15
	#100				8	7
	#200				4.8	4.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	1	1.0					9.56	200.99
■	2	1.0	POORLY GRADED GRAVEL with SAND(GP)				13.77	161.84

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	1.0	152.4	38	8.288	0.189	65.3	21.2	4.8	
■	2	1.0	152.4	35.875	10.465	0.222	68.3	20.7	4.2	

US_GRAIN_SIZE_S14484 TEST PIT LOGS.GPJ BUDINGER.GDT 10/23/14

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

GRAIN SIZE DISTRIBUTION RESULTS

Project: Palomino Road Extension

Location: Ellensburg, WA

Number: S14484

FIGURE 6

WESTERN PACIFIC ENGINEERING & SURVEY
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ACCREDITED #4142.01

SIEVE ANALYSIS REPORT

Report To: LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, WA 98922

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/07/18
Sampled By: WPE
Sample Method: Test Pit

Project #: 18413
Sample #: 74
Source: On Site
Description: T.P. #1 @ 6 ft

Specifications: No Specs
Sample Meets Specs ? n/a

ASTM D-2487 Unified Soils Classification System
GP, Poorly graded Gravel

Procedure: ASTM C136

$D_{(10)}$= 0.623 mm
$D_{(30)}$= 20.135 mm
$D_{(60)}$= 43.489 mm

% Gravel = 83.5%
% Sand = 14.4%
% Silt & Clay = 2.1%

Coeff. of Curvature, C_C = 14.97
Coeff. of Uniformity, C_U = 69.81
Fineness Modulus= 7.41

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00		100%		
2.50"	63.00	83%	83%		
2.00"	50.00	74%	74%		
1.75"	45.00		63%		
1.50"	37.50	48%	48%		
1.25"	31.50	41%	41%		
1.00"	25.00	34%	34%		
7/8"	22.40		32%		
3/4"	19.00	29%	29%		
5/8"	16.00		26%		
1/2"	12.50	22%	22%		
3/8"	9.50	20%	20%		
1/4"	6.30	17%	17%		
#4	4.75	16%	16%		
#8	2.360		15%		
#10	2.000	14%	14%		
#16	1.180		12%		
#20	0.850	12%	12%		
#30	0.600		10%		
#40	0.425	8%	8%		
#50	0.300		6%		
#60	0.250		5%		
#80	0.180	4%	4%		
#100	0.150		4%		
#140	0.106		3%		
#170	0.090		2%		
#200	0.075	2.1%	2.1%		

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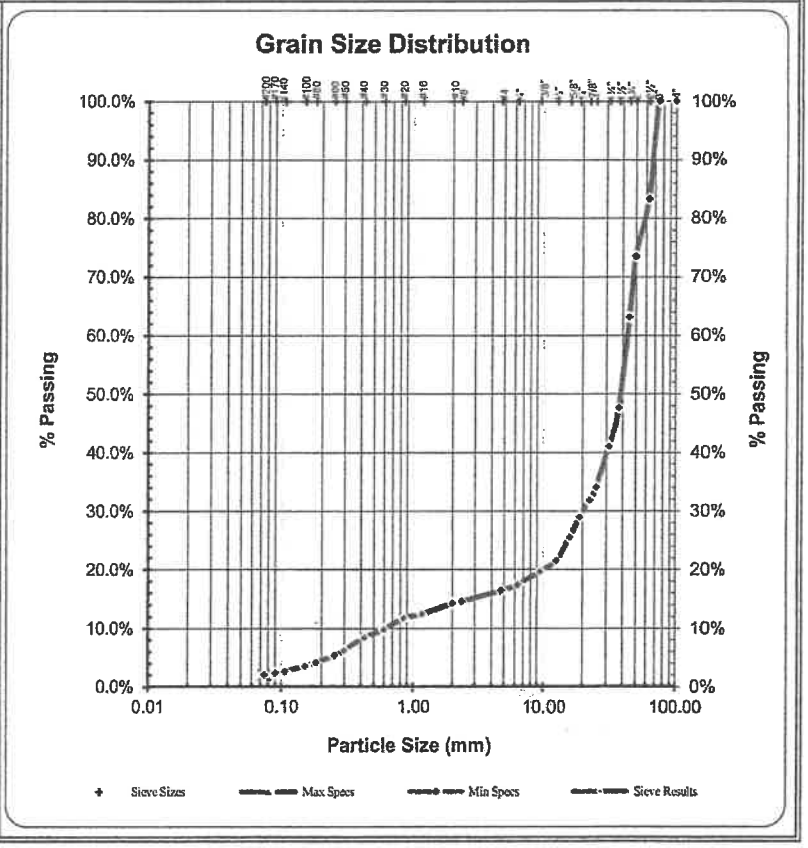

Technician: Jack Demont
Engineer: Nathan Nofziger, P.E.

These test results relate only to the items tested, and were obtained in-lab unless otherwise specified.
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A2LA ACCREDITED #4142.01

SIEVE ANALYSIS REPORT

Report To: LCU, Inc
Attn: Pat Deneen
P.O. Box 394
Cle Elum, WA 98922

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/08/18
Sampled By: WPE
Sample Method: Test Pit

Project #: 18413
Sample #: 75
Source: On Site
Description: T.P. #1 @ 4 ft

Specifications: No Specs
Sample Meets Specs ? n/a

ASTM D-2487 Unified Soils Classification System
GP-GM, Poorly graded Gravel with Silt and Sand

Procedure: ASTM C136

$D_{(10)}$= 0.223 mm | % Gravel = 71.1% | Coeff. of Curvature, C_C = 4.93
$D_{(30)}$= 5.501 mm | % Sand = 23.9% | Coeff. of Uniformity, C_U = 123.76
$D_{(60)}$= 27.549 mm | % Silt & Clay = 5.1% | Fineness Modulus= 6.31

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00		100%		
2.50"	63.00	100%	100%		
2.00"	50.00	97%	97%		
1.75"	45.00		89%		
1.50"	37.50	77%	77%		
1.25"	31.50	67%	67%		
1.00"	25.00	56%	56%		
7/8"	22.40		52%		
3/4"	19.00	46%	46%		
5/8"	16.00		43%		
1/2"	12.50	39%	39%		
3/8"	9.50	35%	35%		
1/4"	6.30	31%	31%		
#4	4.75	29%	29%		
#8	2.360		25%		
#10	2.000	24%	24%		
#16	1.180		21%		
#20	0.850	19%	19%		
#30	0.600		17%		
#40	0.425	15%	15%		
#50	0.300		12%		
#60	0.250		11%		
#80	0.180	9%	9%		
#100	0.150	8%	8%		
#140	0.106		6%		
#170	0.090		6%		
#200	0.075	5.1%	5.1%		

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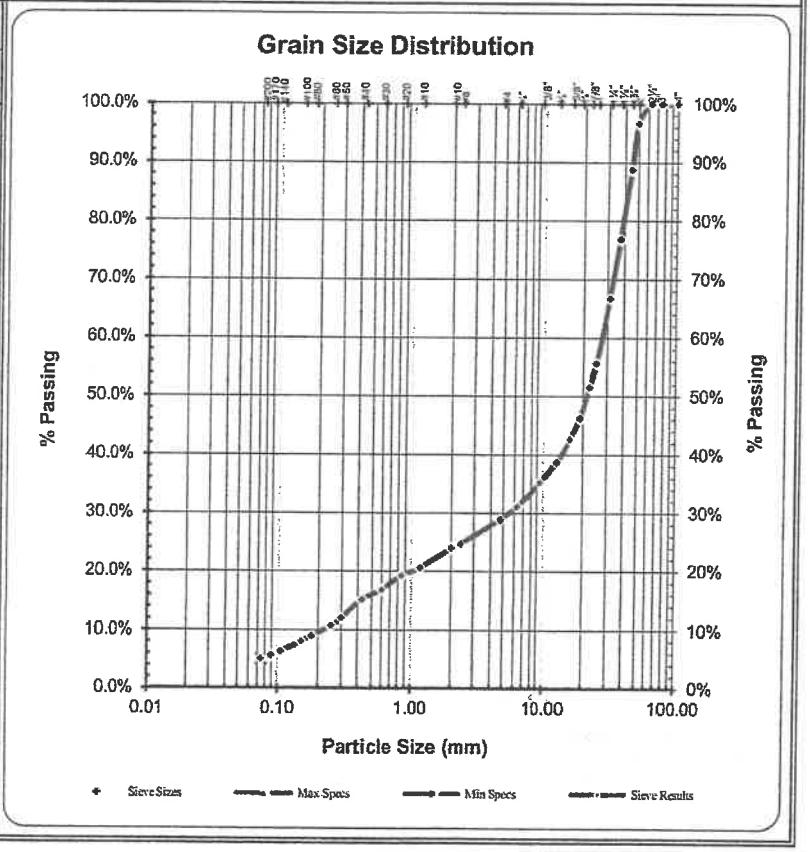

Technician: Jack Demont
Engineer: Nathan Nofziger, P.E.

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ACCREDITED #4142.01

SIEVE ANALYSIS REPORT

Report To: LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, Washington 98922

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/08/18
Sampled By: WPE
Sample Method: Manual Native

Project #: 18413
Sample #: 76
Source: On-Site
Description: T.P.# 1 @ 12"

Specifications: No Specs
Sample Meets Specs ? n/a

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand

Procedure: ASTM C117 Method B

$D_{(10)}$= 0.023 mm
$D_{(30)}$= 0.069 mm
$D_{(60)}$= 0.189 mm

% Gravel = 1.4%
% Sand = 66.1%
% Silt & Clay = 32.5%

Coeff. of Curvature, C_C = 1.10
Coeff. of Uniformity, C_U = 8.20
Fineness Modulus= 1.01

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00		100%		
2.50"	63.00		100%		
2.00"	50.00		100%		
1.75"	45.00		100%		
1.50"	37.50		100%		
1.25"	31.50		100%		
1.00"	25.00		100%		
7/8"	22.40		100%		
3/4"	19.00		100%		
5/8"	16.00	100%	100%		
1/2"	12.50	100%	100%		
3/8"	9.50	99%	99%		
1/4"	6.30	99%	99%		
#4	4.75	99%	99%		
#8	2.360		98%		
#10	2.000	98%	98%		
#16	1.180		94%		
#20	0.850	93%	93%		
#30	0.600		87%		
#40	0.425	83%	83%		
#50	0.300		71%		
#60	0.250		66%		
#80	0.180	59%	59%		
#100	0.150		52%		
#140	0.106		40%		
#170	0.090		36%		
#200	0.075	32.5%	32.5%		

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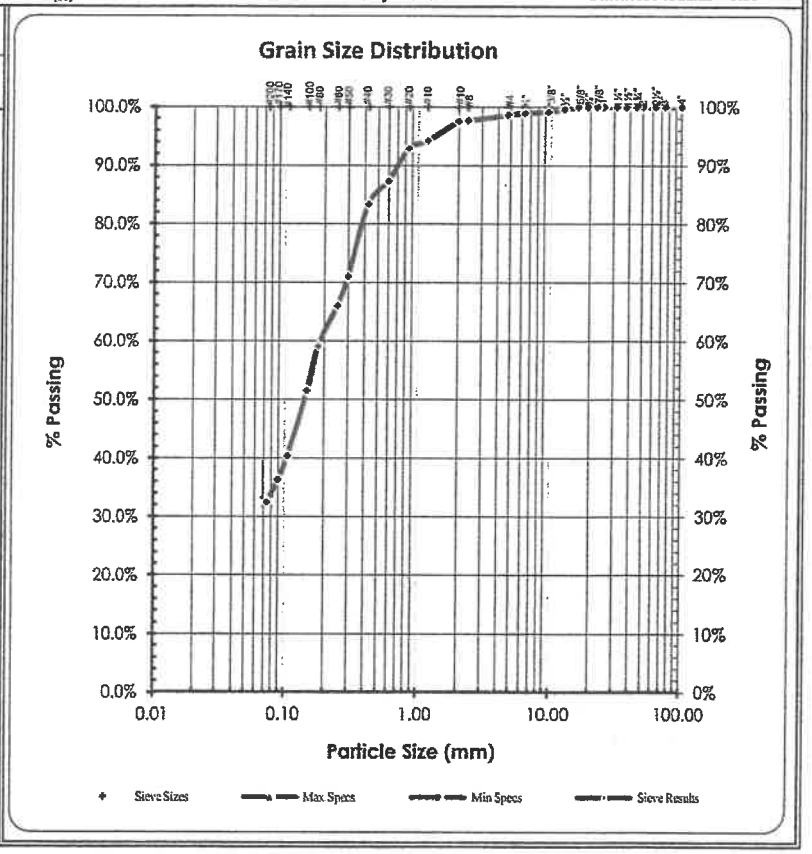

Technician: Jack Demont
Engineer: Nathan Nofziger, P.E.

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WESTERN PACIFIC ENGINEERING & SURVEY
1328 E. Hunter Place, Moses Lake, Washington
T: (509)765-1023 F: (509)765-1298

ACCREDITED
4142.01

SIEVE ANALYSIS REPORT

Report To: LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, WA 98922

Specifications: No Specs
Sample Meets Specs ? n/a

Procedure: ASTM C136

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/06/18
Sampled By: WPE
Sample Method: Test Pit

Project #: 18413
Sample #: 77
Source: On Site
Description: T.P. #2 @ 6"

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand

$D_{(10)}$= 0.034 mm
$D_{(30)}$= 0.107 mm
$D_{(60)}$= 0.252 mm

% Gravel = 0.2%
% Sand = 77.5%
% Silt & Clay = 22.3%

Coeff. of Curvature, C_C = 1.34
Coeff. of Uniformity, C_U = 7.49
Fineness Modulus= 1.03

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00		100%		
2.50"	63.00		100%		
2.00"	50.00		100%		
1.75"	45.00		100%		
1.50"	37.50		100%		
1.25"	31.50		100%		
1.00"	25.00		100%		
7/8"	22.40		100%		
3/4"	19.00		100%		
5/8"	16.00		100%		
1/2"	12.50		100%		
3/8"	9.50		100%		
1/4"	6.30	100%	100%		
#4	4.75	100%	100%		
#8	2.360		99%		
#10	2.000	99%	99%		
#16	1.180		97%		
#20	0.850	96%	96%		
#30	0.600		92%		
#40	0.425	89%	89%		
#50	0.300		68%		
#60	0.250		60%		
#80	0.180	48%	48%		
#100	0.150		41%		
#140	0.106		30%		
#170	0.090		26%		
#200	0.075	22.3%	22.3%		

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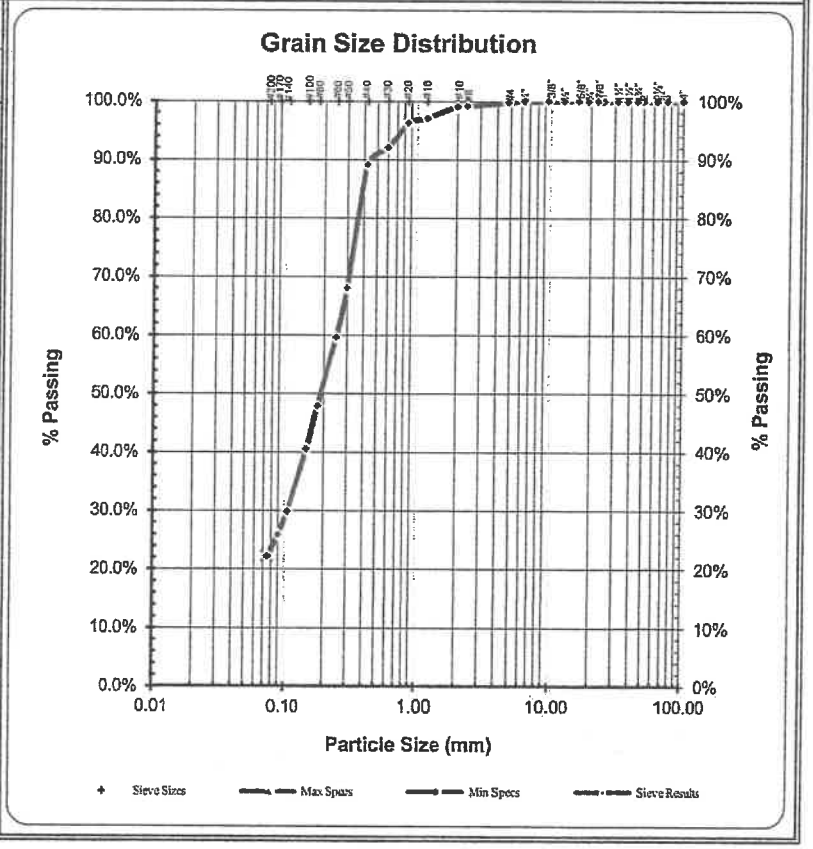

Technician: Jack Demont
Engineer: Nathan Nofziger, P.E.

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ACCREDITED #4142.01

SIEVE ANALYSIS REPORT

Report To: LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, WA 98922

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/08/18
Sampled By: WPE
Sample Method: Test Pit

Project #: 18413
Sample #: 78
Source: On Site
Description: T.P. #2 @ 3 ft

Specifications: No Specs
Sample Meets Specs ? n/a

ASTM D-2487 Unified Soils Classification System
GM, Silty Gravel with Sand

Procedure: ASTM C117 Method B

$D_{(10)}$= 0.037 mm | % Gravel = 53.5% | Coeff. of Curvature, C_C = 0.07
$D_{(30)}$= 0.243 mm | % Sand = 26.5% | Coeff. of Uniformity, C_U = 616.12
$D_{(60)}$= 23.057 mm | % Silt & Clay = 20.0% | Fineness Modulus= 4.89

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00	100%	100%		
2.50"	63.00	95%	95%		
2.00"	50.00	90%	90%		
1.75"	45.00		85%		
1.50"	37.50	78%	78%		
1.25"	31.50	69%	69%		
1.00"	25.00	61%	61%		
7/8"	22.40		60%		
3/4"	19.00	57%	57%		
5/8"	16.00		55%		
1/2"	12.50	52%	52%		
3/8"	9.50	50%	50%		
1/4"	6.30	48%	48%		
#4	4.75	47%	47%		
#8	2.360		44%		
#10	2.000	43%	43%		
#16	1.180		41%		
#20	0.850	40%	40%		
#30	0.600		37%		
#40	0.425	36%	36%		
#50	0.300		32%		
#60	0.250		30%		
#80	0.180	28%	28%		
#100	0.150	26%	26%		
#140	0.106		23%		
#170	0.090		21%		
#200	0.075	20.0%	20.0%		

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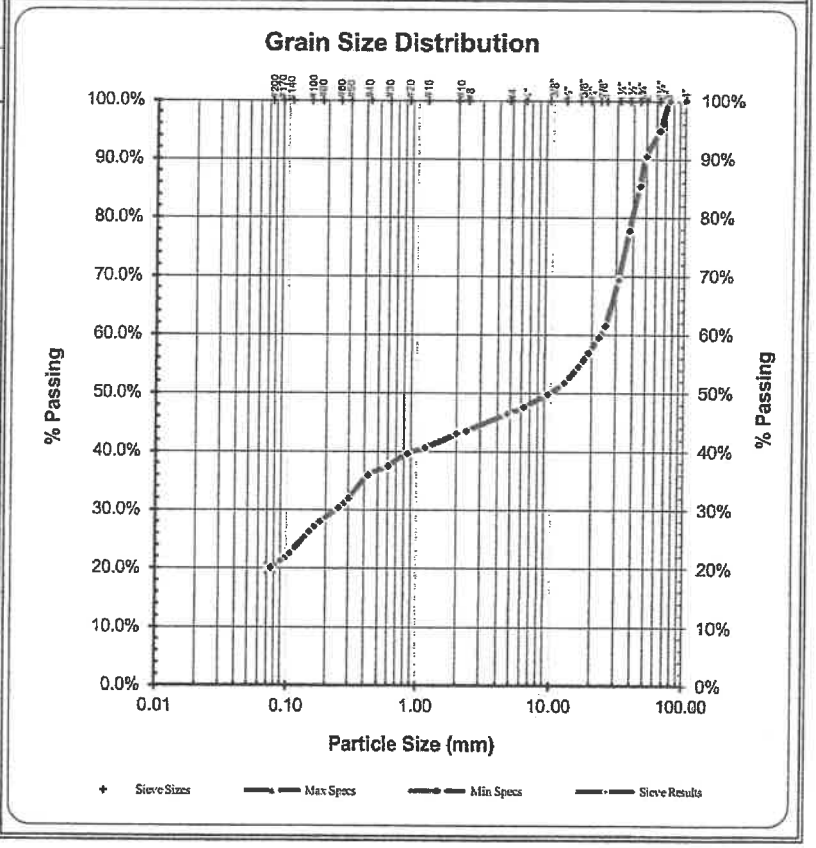

Technician: Jack Demont
Engineer: Nathan Nofziger, P.E.

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SIEVE ANALYSIS REPORT

Report To: LCU, Inc.
Attn: Pat Deneen
P.O. Box 394
Cle Elum, WA 98922

Date Sampled: 06/05/18
Date Received: 06/05/18
Date Tested: 06/08/18
Sampled By: WPE
Sample Method: Tset Pit

Project #: 18413
Sample #: 79
Source: On Site
Description: T.P. #2 @ 7 ft

Specifications: No Specs
Sample Meets Specs ? n/a

ASTM D-2487 Unified Soils Classification System
GW, Well-graded Gravel with Sand

Procedure: ASTM C136

$D_{(10)}$= 0.333	mm	% Gravel = 70.1%	Coeff. of Curvature, C_C = 2.59
$D_{(30)}$= 4.819	mm	% Sand = 28.0%	Coeff. of Uniformity, C_U = 81.19
$D_{(60)}$= 26.996	mm	% Silt & Clay = 1.9%	Fineness Modulus= 6.36

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%		
4.00"	100.00		100%		
3.00"	75.00		100%		
2.50"	63.00		100%		
2.00"	50.00	90%	90%		
1.75"	45.00		83%		
1.50"	37.50	73%	73%		
1.25"	31.50	65%	65%		
1.00"	25.00	58%	58%		
7/8"	22.40		55%		
3/4"	19.00	50%	50%		
5/8"	16.00		46%		
1/2"	12.50	41%	41%		
3/8"	9.50	36%	36%		
1/4"	6.30	32%	32%		
#4	4.75	30%	30%		
#8	2.360		25%		
#10	2.000	24%	24%		
#16	1.180		21%		
#20	0.850	20%	20%		
#30	0.600		16%		
#40	0.425	13%	13%		
#50	0.300		9%		
#60	0.250		7%		
#80	0.180	5%	5%		
#100	0.150		4%		
#140	0.106		3%		
#170	0.090		2%		
#200	0.075	1.9%	1.9%		

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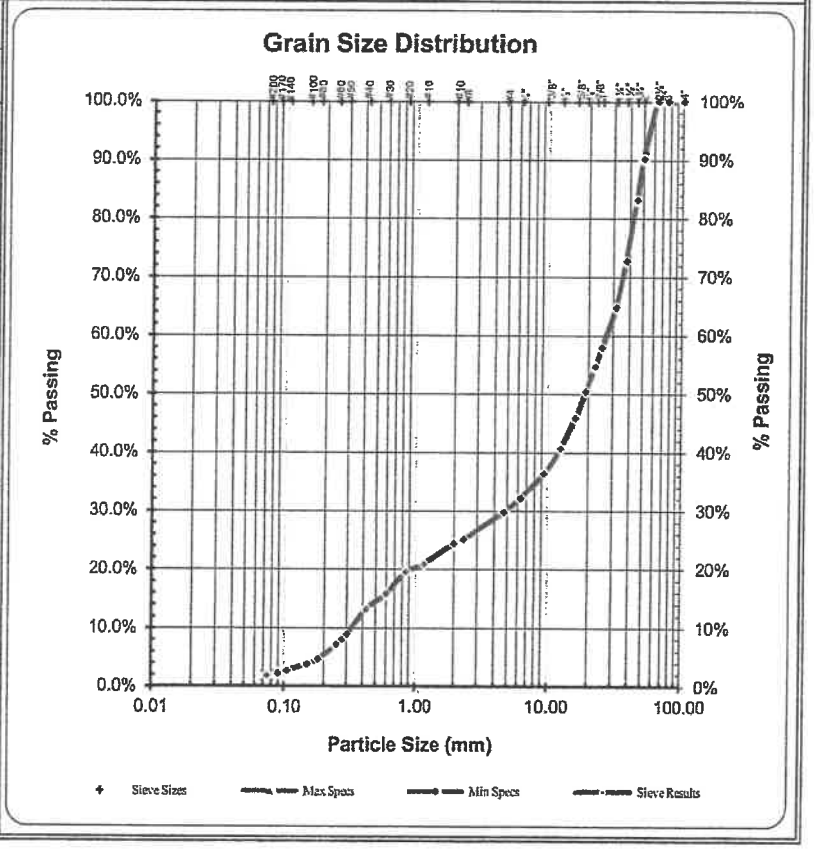

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Soil Map—Kittitas County Area, Washington

Map Scale: 1:3,240 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
480	Nanum ashy loam, 0 to 2 percent slopes	7.9	34.5%
589	Nack-Brickmill complex, 0 to 5 percent slopes	0.1	0.2%
601	Brickmill gravelly ashy loam, 0 to 2 percent slopes	8.7	37.8%
621	Mitta ashy silt loam, flooded, 0 to 2 percent slopes	6.1	26.8%
792	Brickmill gravelly ashy loam, 0 to 5 percent slopes	0.2	0.7%
Totals for Area of Interest		**22.9**	**100.0%**

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Report—Physical Soil Properties

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
480—Nanum ashy loam, 0 to 2 percent slopes														
Nanum	0-8	-39-	-37-	22-25-27	1.15-1.28 -1.40	4.00-9.00-14.00	0.17-0.19-0.20	0.0-1.5-2.9	2.0-3.5-5.0	.24	.24	3	5	56
	8-15	-38-	-36-	25-26-33	1.15-1.28 -1.40	1.40-3.00-4.00	0.17-0.19-0.20	3.0-4.5-5.9	2.0-3.5-5.0	.28	.28			
	15-28	-35-	-34-	27-31-35	1.15-1.28 -1.40	1.40-3.00-4.00	0.15-0.18-0.20	3.0-4.5-5.9	1.0-1.5-2.0	.28	.28			
	28-35	-35-	-34-	27-31-35	1.25-1.33 -1.40	1.40-3.00-4.00	0.08-0.10-0.11	3.0-4.5-5.9	1.0-1.5-2.0	.10	.28			
	35-60	-55-	-14-	27-31-35	1.25-1.33 -1.40	1.40-3.00-4.00	0.07-0.09-0.10	3.0-4.5-5.9	0.0-1.0-2.0	.02	.20			

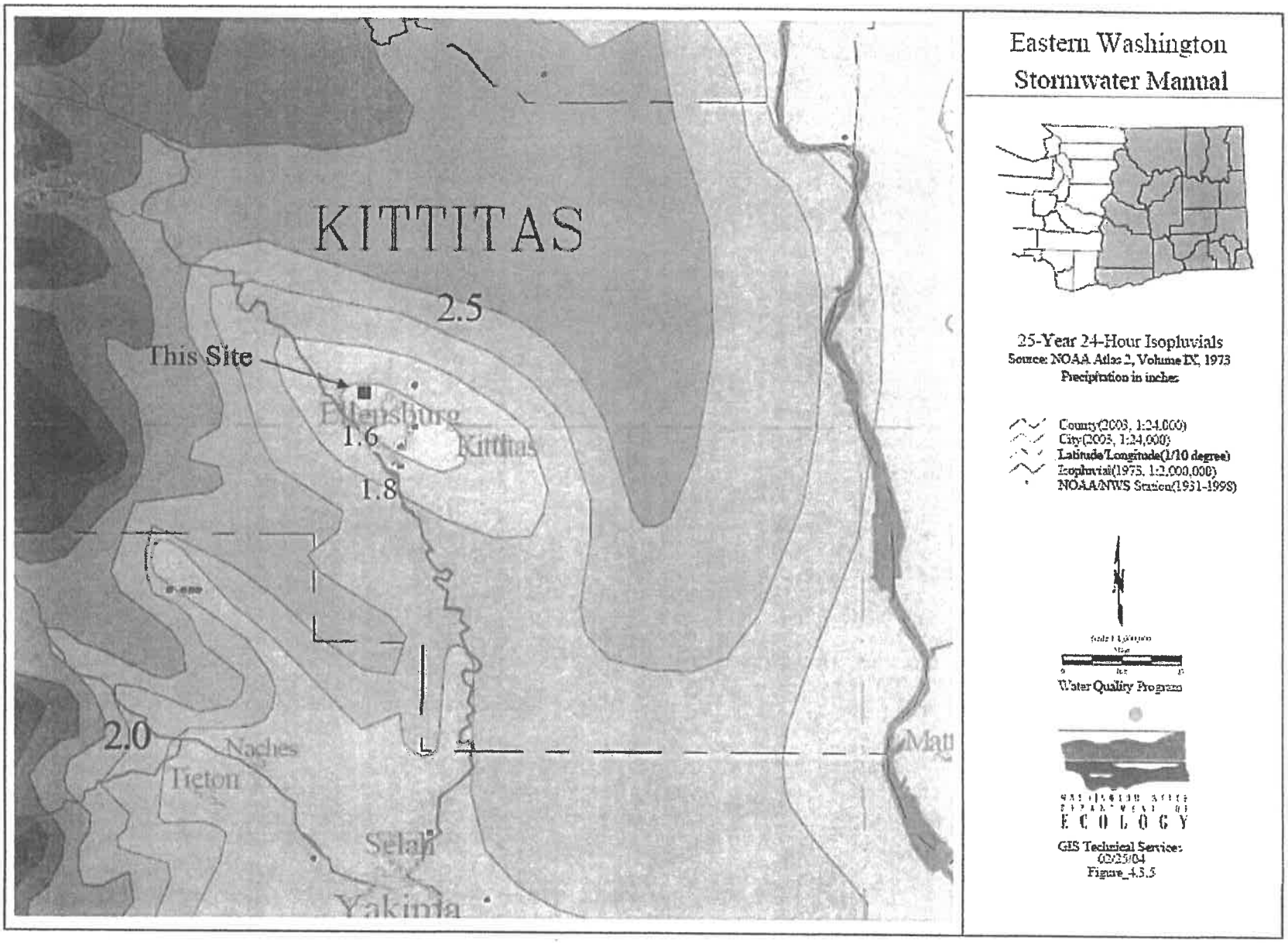
Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
589—Nack-Brickmill complex, 0 to 5 percent slopes														
Nack	0-6	-41-	-37-	18-22- 25	1.15-1.28 -1.40	4.00-9.00-14.00	0.11-0.13-0. 15	0.0- 1.5- 2.9	2.0- 3.0- 4.0	.15	.24	2	6	48
	6-15	-35-	-38-	25-28- 30	1.15-1.28 -1.40	1.40-3.00-4.00	0.11-0.14-0. 16	3.0- 4.5- 5.9	1.0- 2.0- 3.0	.32	.32			
	15-60	-53-	-12-	25-35- 40	1.30-1.40 -1.50	1.40-3.00-4.00	0.04-0.06-0. 08	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.02	.17			
Brickmill	0-12	-43-	-40-	15-18- 20	1.15-1.28 -1.40	4.00-9.00-14.00	0.07-0.09-0. 11	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.15	.28	3	5	56
	12-28	-67-	-15-	15-18- 20	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 11	0.0- 1.5- 2.9	0.5- 1.3- 2.0	.05	.20			
	28-38	-66-	-15-	15-19- 25	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 10	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.02	.20			
	38-49	-67-	-20-	12-14- 15	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 10	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.05	.24			
	49-60	-84-	-11-	0- 5- 10	1.40-1.48 -1.55	42.00-92.00-14 1.00	0.03-0.04-0. 04	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.15			

Physical Soil Properties--Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
601---Brickmill gravelly ashy loam, 0 to 2 percent slopes														
Brickmill	0-12	-43-	-40-	15-18- 20	1.15-1.28 -1.40	4.00-9.00-14.00	0.07-0.09-0. 11	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.15	.28	3	5	56
	12-28	-67-	-15-	15-18- 20	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 11	0.0- 1.5- 2.9	0.5- 1.3- 2.0	.05	.20			
	28-38	-66-	-15-	15-19- 25	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 10	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.02	.20			
	38-49	-67-	-20-	12-14- 15	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0. 10	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.05	.24			
	49-60	-84-	-11-	0- 5- 10	1.40-1.48 -1.55	42.00-92.00-14 1.00	0.03-0.04-0. 04	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.15			
621---Mitta ashy silt loam, flooded, 0 to 2 percent slopes														
Mitta, flooded	0-6	- 7-	-70-	19-23- 25	1.00-1.15 -1.30	4.00-9.00-14.00	0.19-0.20-0. 21	0.0- 1.5- 2.9	3.0- 4.0- 5.0	.32	.32	5	5	56
	6-15	- 7-	-70-	19-23- 25	1.00-1.15 -1.30	4.00-9.00-14.00	0.19-0.20-0. 21	0.0- 1.5- 2.9	2.0- 3.5- 5.0	.37	.37			
	15-34	- 7-	-70-	19-23- 25	1.00-1.15 -1.30	4.00-9.00-14.00	0.19-0.20-0. 21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49			
	34-49	- 9-	-64-	25-28- 30	1.15-1.28 -1.40	1.40-3.00-4.00	0.17-0.19-0. 21	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.43	.43			
	49-60	- 9-	-64-	25-28- 30	1.25-1.33 -1.40	1.40-3.00-4.00	0.17-0.19-0. 21	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.49	.49			

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
792—Brickmill gravelly ashy loam, 0 to 5 percent slopes														
Brickmill	0-12	-43-	-40-	15-18-20	1.15-1.28 -1.40	4.00-9.00-14.00	0.07-0.09-0.11	0.0-1.5-2.9	1.0-2.0-3.0	.15	.28	3	5	56
	12-28	-67-	-15-	15-18-20	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0.11	0.0-1.5-2.9	0.5-1.3-2.0	.05	.20			
	28-38	-66-	-15-	15-19-25	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0.10	0.0-1.5-2.9	0.5-0.8-1.0	.02	.20			
	38-49	-67-	-20-	12-14-15	1.30-1.40 -1.50	4.00-9.00-14.00	0.05-0.08-0.10	0.0-1.5-2.9	0.5-0.8-1.0	.05	.24			
	49-60	-84-	-11-	0-5-10	1.40-1.48 -1.55	42.00-92.00-141.00	0.03-0.04-0.04	0.0-1.5-2.9	0.0-0.3-0.5	.02	.15			

Data Source Information

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


KITTITAS
2.5
This Site
Ellensburg
1.6
Kittitas
1.8
2.0
Naches
Tieton
Selah
Yakima
Eastern Washington
Stormwater Manual
25-Year 24-Hour Isopluvials
Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches
County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)
Water Quality Program
ECOLOGY
GIS Technical Service:
02/25/04
Figure_4.5.5

High ground water or shallow bedrock can cause a significant increase in runoff. If either of these conditions exists, it needs to be addressed by the designer. For a more complete discussion of computing weighted CN values, see *Urban Hydrology for Small Watersheds* (USDA, 1986).

Table 4.14: Runoff Curve Numbers (CNs) for Selected Agricultural, Suburban, and Urban Areas

Cover type and hydrologic condition	CNs for hydrologic soil group			
	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, landscaping, etc.)[a]				
Poor condition (grass cover <50% of the area)	68	79	86	89
Fair condition (grass cover on 50% to 75% of the area)	49	69	79	84
Good condition (grass cover on >75% of the area)	39	61	74	80
Impervious areas				
Open water bodies: lakes, wetlands, ponds etc.	100	100	100	100
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Permeable pavers and permeable interlocking concrete (assumed as 85% impervious and 15% lawn)				
Fair lawn condition (weighted average CNs)	95	96	97	97
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Pasture, grassland, or range-continuous forage for grazing				
Poor condition (ground cover <50% or heavily grazed with no mulch)	68	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed)	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Cultivated agricultural lands				
Row Crops (good) e.g., corn, sugar beets, soy beans	64	75	82	85
Small Grain (good) e.g., wheat, barley, flax	60	72	80	84
Meadow				
Continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Brush (brush-weed-grass mixture with brush the major element)				

Table 4.14: Runoff Curve Numbers (CNs) for Selected Agricultural, Suburban, and Urban Areas (continued)

Cover type and hydrologic condition	CNs for hydrologic soil group			
	A	B	C	D
Poor (<50% ground cover)	48	67	77	83
Fair (50% to 75% ground cover)	35	56	70	77
Good (>75% ground cover)	30[b]	48	65	73
Woods-grass combination (orchard or tree farm)[c]				
Poor	57	73	82	86
Fair	43	65	76	82
Good	32	58	72	79
Woods				
Poor (Forest litter, small trees, and brush destroyed by heavy grazing or regular burning)	45	66	77	83
Fair (Woods are grazed but not burned, and some forest litter covers the soil)	36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil)	30	55	70	77
Herbaceous (mixture of grass, weeds, and low-growing brush, with brush the minor element)				
Poor (<30% ground cover)	n/a[d]	80	87	93
Fair (30% to 70% ground cover)		71	81	89
Good (>70% ground cover)		62	74	85
Sagebrush with grass understory				
Poor (<30% ground cover)	n/a[d]	67	80	85
Fair (30% to 70% ground cover)		51	63	70
Good (>70% ground cover)		35	47	55

[a]Composite CNs may be computed for other combinations of open space cover type.

[b]Actual CN is < 30; use CN = 30 for runoff computations.

[c]The indicated CNs were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CNs for woods and pasture.

[d]CNs have not been developed for hydrologic soil group A.

Stormwater Area Calcs - Left Ditch

Length of Roadway	3250	ft
Width of Roadway	13	ft
Lots Left	24	units
Width of Driveway	20	ft
Left Ditch Length	2110.0	ft
Shoulder Width	3	ft
Ditch Right Width	6	ft
Ditch Left Width	4.5	ft

Impervious Area	48730	sq. ft.	1.118	ac
Pervious Area	28485	sq. ft.	0.654	ac
Total Area	77215	sq. ft.	1.772	ac

Infiltration Area	6330	sq. ft.
Storage Volume	527.5	cu. ft.
Assumed Depth	2	inches

Stormwater Area Calcs - Right Ditch

Length of Roadway	3250	ft
Width of Roadway	13	ft
Lots Right	22	units
Width of Driveway	20	ft
Right Ditch Length	2410.0	ft
Shoulder Width	3	ft
Ditch Right Width	6	ft
Ditch Left Width	4.5	ft

Impervious Area	48190	sq. ft.	1.106	ac
Pervious Area	32535	sq. ft.	0.747	ac
Total Area	80725	sq. ft.	1.852	ac

Infiltration Area	7230	sq. ft.
Storage Volume	602.5	cu. ft.
Assumed Depth	2	inches

SCS Type 1A Regional Storm - Central Basin

Stormwater Runoff Area - Left Ditch

Area (acres) = 1.772 | P (inches) = 1.6 | d (min) = 6 | Tc (min) = 5 | Infiltration Area (ft²) = 6330.0

W= 0.375 | Max Storage (cu. ft.) = 556.6

Pervious Area (acres) = 0.654 | CN = 87 | S = 1.49 | 0.2S = 0.30 | Infiltration Rate (cf/min/ft^2) = 0.0018

Impervious Area (acres) = 1.118 | CN = 98 | S = 0.20 | 0.2S = 0.04 | Total Disp = 68.364000

1 Time Increment	2.0 Time Hours	2 Time (min)	3 Rainfall Distribution (Fraction)	4 Incremental Rainfall (inches)	5 Accum. Rainfall (inches)	6 Pervious Acc. Run (inches)	7 Pervious Inc. Run (inches)	8 Impervious Acc. Run (inches)	9 Impervious Inc. Run (inches)	10 Total Runoff (inches)	11 Instant Flow (inches)	12 Design Flow Rate (cfs)	13 Incremental Flow (cf)	14 Drywell Disp. Volume (cf)	15 Accum. Storage (cf)
1	0.0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
2	0.1	6	0.002	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
3	0.2	12	0.002	0.003	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
4	0.3	18	0.002	0.003	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
5	0.4	24	0.002	0.003	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
6	0.5	30	0.002	0.003	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
7	0.6	36	0.002	0.003	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
8	0.7	42	0.002	0.003	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
9	0.8	48	0.002	0.003	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
10	0.9	54	0.002	0.003	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
11	1.0	60	0.002	0.003	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
12	1.1	66	0.003	0.005	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
13	1.2	72	0.003	0.005	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0046	0.0
14	1.3	78	0.003	0.005	0.046	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.2	0.2274	0.0
15	1.4	84	0.003	0.005	0.051	0.000	0.000	0.001	0.000	0.000	0.004	0.002	0.8	0.8174	0.0
16	1.5	90	0.003	0.005	0.056	0.000	0.000	0.001	0.001	0.000	0.006	0.004	1.6	1.5782	0.0
17	1.6	96	0.003	0.005	0.061	0.000	0.000	0.002	0.001	0.000	0.008	0.007	2.3	2.3419	0.0
18	1.7	102	0.003	0.005	0.066	0.000	0.000	0.003	0.001	0.001	0.010	0.009	3.1	3.0697	0.0
19	1.8	108	0.003	0.005	0.070	0.000	0.000	0.004	0.001	0.001	0.012	0.010	3.8	3.7552	0.0
20	1.9	114	0.003	0.005	0.075	0.000	0.000	0.005	0.001	0.001	0.014	0.012	4.4	4.3994	0.0
21	2.0	120	0.003	0.005	0.080	0.000	0.000	0.006	0.001	0.001	0.015	0.014	5.0	5.0049	0.0
22	2.1	126	0.003	0.005	0.085	0.000	0.000	0.008	0.001	0.001	0.017	0.015	5.6	5.5748	0.0
23	2.2	132	0.003	0.005	0.090	0.000	0.000	0.009	0.002	0.001	0.018	0.017	6.1	6.1116	0.0
24	2.3	138	0.004	0.006	0.096	0.000	0.000	0.012	0.002	0.001	0.026	0.021	7.5	7.5348	0.0
25	2.4	144	0.003	0.005	0.101	0.000	0.000	0.014	0.002	0.001	0.021	0.023	8.3	8.2970	0.0
26	2.5	150	0.003	0.005	0.106	0.000	0.000	0.016	0.002	0.001	0.022	0.022	8.0	7.9550	0.0
27	2.6	156	0.003	0.005	0.110	0.000	0.000	0.018	0.002	0.001	0.023	0.023	8.2	8.1765	0.0
28	2.7	162	0.003	0.005	0.115	0.000	0.000	0.020	0.002	0.001	0.025	0.024	8.5	8.5272	0.0
29	2.8	168	0.004	0.006	0.122	0.000	0.000	0.023	0.003	0.002	0.034	0.028	10.1	10.0704	0.0
30	2.9	174	0.003	0.005	0.126	0.000	0.000	0.025	0.002	0.001	0.027	0.030	10.8	10.7615	0.0
31	3.0	180	0.003	0.005	0.131	0.000	0.000	0.028	0.002	0.002	0.028	0.028	10.0	10.0463	0.0
32	3.1	186	0.003	0.005	0.136	0.000	0.000	0.030	0.003	0.002	0.029	0.028	10.1	10.1021	0.0
33	3.2	192	0.003	0.005	0.141	0.000	0.000	0.033	0.003	0.002	0.029	0.029	10.3	10.3395	0.0
34	3.3	198	0.003	0.005	0.146	0.000	0.000	0.036	0.003	0.002	0.030	0.029	10.6	10.6118	0.0
35	3.4	204	0.004	0.006	0.152	0.000	0.000	0.039	0.004	0.002	0.041	0.034	12.3	12.2923	0.0
36	3.5	210	0.003	0.005	0.157	0.000	0.000	0.042	0.003	0.002	0.032	0.036	12.9	12.9369	0.0
37	3.6	216	0.003	0.005	0.162	0.000	0.000	0.045	0.003	0.002	0.032	0.033	11.9	11.9030	0.0
38	3.7	222	0.004	0.006	0.168	0.000	0.000	0.049	0.004	0.002	0.044	0.037	13.3	13.3251	0.0
39	3.8	228	0.004	0.006	0.174	0.000	0.000	0.053	0.004	0.003	0.045	0.043	15.4	15.4151	0.0
40	3.9	234	0.003	0.005	0.179	0.000	0.000	0.056	0.003	0.002	0.035	0.041	14.6	14.6411	0.0
41	4.0	240	0.004	0.006	0.186	0.000	0.000	0.060	0.004	0.003	0.047	0.041	14.7	14.6789	0.0
42	4.1	246	0.004	0.006	0.192	0.000	0.000	0.064	0.004	0.003	0.048	0.046	16.5	16.4812	0.0
43	4.2	252	0.003	0.005	0.197	0.000	0.000	0.068	0.003	0.002	0.036	0.043	15.5	15.5138	0.0
44	4.3	258	0.004	0.006	0.203	0.000	0.000	0.072	0.004	0.003	0.049	0.043	15.5	15.4707	0.0
45	4.4	264	0.004	0.006	0.210	0.000	0.000	0.076	0.004	0.003	0.050	0.048	17.3	17.3045	0.0
46	4.5	270	0.004	0.006	0.216	0.000	0.000	0.081	0.005	0.003	0.051	0.050	18.0	17.9687	0.0
47	4.6	276	0.004	0.006	0.222	0.000	0.000	0.085	0.005	0.003	0.052	0.051	18.3	18.3302	0.0
48	4.7	282	0.004	0.006	0.229	0.000	0.000	0.090	0.005	0.003	0.052	0.052	18.6	18.6063	0.0
49	4.8	288	0.004	0.006	0.235	0.000	0.000	0.095	0.005	0.003	0.053	0.052	18.9	18.8521	0.0
50	4.9	294	0.005	0.008	0.243	0.000	0.000	0.101	0.006	0.004	0.067	0.058	20.9	20.9005	0.0
51	5.0	300	0.004	0.006	0.250	0.000	0.000	0.106	0.005	0.003	0.054	0.060	21.6	21.5920	0.0
52	5.1	306	0.005	0.008	0.258	0.000	0.000	0.112	0.006	0.004	0.069	0.061	22.0	21.9774	0.0
53	5.2	312	0.004	0.006	0.264	0.000	0.000	0.117	0.005	0.003	0.055	0.062	22.2	22.2352	0.0
54	5.3	318	0.005	0.008	0.272	0.000	0.000	0.123	0.006	0.004	0.070	0.062	22.5	22.4913	0.0
55	5.4	324	0.005	0.008	0.280	0.000	0.000	0.129	0.006	0.004	0.071	0.068	24.6	24.6180	0.0
56	5.5	330	0.005	0.008	0.288	0.000	0.000	0.135	0.006	0.004	0.071	0.070	25.3	25.3413	0.0
57	5.6	336	0.005	0.008	0.296	0.000	0.000	0.142	0.006	0.004	0.072	0.071	25.7	25.7036	0.0
58	5.7	342	0.005	0.008	0.304	0.000	0.000	0.148	0.006	0.004	0.073	0.072	26.0	25.9821	0.0
59	5.8	348	0.005	0.008	0.312	0.000	0.000	0.155	0.006	0.004	0.074	0.073	26.3	26.3014	0.0
60	5.9	354	0.005	0.008	0.320	0.000	0.000	0.161	0.007	0.004	0.075	0.074	26.7	26.6813	0.0
61	6.0	360	0.006	0.010	0.330	0.001	0.000	0.169	0.008	0.005	0.091	0.081	29.1	29.1427	0.0
62	6.1	366	0.006	0.010	0.339	0.001	0.000	0.177	0.008	0.005	0.093	0.089	32.2	32.1756	0.0
63	6.2	372	0.006	0.010	0.349	0.002	0.001	0.185	0.008	0.005	0.094	0.093	33.3	33.3283	0.0
64	6.3	378	0.006	0.010	0.358	0.002	0.001	0.193	0.008	0.005	0.096	0.094	34.0	33.9965	0.0
65	6.4	384	0.007	0.011	0.370	0.003	0.001	0.203	0.010	0.006	0.113	0.102	36.7	36.7314	0.0
66	6.5	390	0.006	0.010	0.379	0.004	0.001	0.211	0.008	0.006	0.099	0.105	37.8	37.7973	0.0
67	6.6	396	0.006	0.010	0.389	0.005	0.001	0.219	0.008	0.006	0.100	0.101	36.2	36.2318	0.0
68	6.7	402	0.006	0.010	0.398	0.006	0.001	0.228	0.008	0.006	0.101	0.100	36.2	36.1691	0.0
69	6.8	408	0.006	0.010	0.408	0.007	0.001	0.236	0.008	0.006	0.102	0.101	36.5	36.4715	0.0
70	6.9	414	0.006	0.010	0.418	0.009	0.001	0.244	0.008	0.006	0.103	0.102	36.9	36.8551	0.0
71	7.0	420	0.007	0.011	0.429	0.010	0.002	0.254	0.010	0.007	0.122	0.110	39.6	39.6120	0.0
72	7.1	426	0.007	0.011	0.440	0.012	0.002	0.264	0.010	0.007	0.123	0.119	43.0	43.0038	0.0
73	7.2	432	0.008	0.013	0.453	0.014	0.002	0.276	0.011	0.008	0.143	0.130	46.7	46.6509	0.0
74	7.3	438	0.008	0.013	0.466	0.017	0.002	0.287	0.011	0.008	0.144	0.140	50.4	50.4031	0.0
75	7.4	444	0.009	0.014	0.480	0.020	0.003	0.300	0.013	0.009	0.164	0.151	54.3	54.2808	0.0
76	7.5	450	0.010	0.016	0.496	0.023	0.003	0.314	0.014	0.010	0.185	0.169	60.7	60.7423	0.0
77	7.6	456	0.021	0.034	0.530	0.031	0.008	0.345	0.031	0.022	0.396	0.260	93.7	68.3640	25.3
78	7.7	462	0.024	0.038	0.568	0.041	0.010	0.380	0.035	0.026	0.465	0.388	139.6	68.3640	96.6
79	7.8	468	0.024	0.038	0.606	0.052	0.011	0.416	0.036	0.027	0.476	0.450	161.9	68.3640	190.1
80	7.9	474	0.024	0.038	0.645	0.065	0.013	0.451	0.036	0.027	0.487	0.473	170.4	68.3640	292.2
81	8.0	480	0.022	0.035	0.680	0.077	0.012	0.484	0.033	0.025	0.455	0.471	169.7	68.3640	393.5
82	8.1	486	0.014	0.022	0.702	0.086	0.008	0.506	0.021	0.016	0.293	0.398	143.4	68.3640	468.5
83	8.2	492	0.013	0.021	0.723	0.094	0.008	0.525	0.020	0.015	0.275	0.313	112.5	68.3640	512.6
84	8.3	498	0.010	0.016	0.739	0.100	0.006	0.540	0.015	0.012	0.213	0.261	94.0	68.3640	538.3

85	8.4	504	0.010	0.016	0.755	0.107	0.007	0.556	0.015	0.012	0.214	0.226	81.2	68.3640	551.1
86	8.5	510	0.008	0.013	0.768	0.112	0.005	0.568	0.012	0.010	0.172	0.201	72.5	68.3640	555.3
87	8.6	516	0.009	0.014	0.782	0.118	0.006	0.582	0.014	0.011	0.195	0.188	67.7	67.7418	555.3
88	8.7	522	0.009	0.014	0.797	0.124	0.006	0.595	0.014	0.011	0.196	0.194	69.7	68.3640	556.6
89	8.8	528	0.007	0.011	0.808	0.129	0.005	0.606	0.011	0.009	0.153	0.179	64.6	64.5733	556.6
90	8.9	534	0.008	0.013	0.821	0.135	0.006	0.618	0.012	0.010	0.176	0.168	60.5	60.5474	556.6
91	9.0	540	0.007	0.011	0.832	0.140	0.005	0.629	0.011	0.009	0.154	0.166	59.7	59.7090	556.6
92	9.1	546	0.007	0.011	0.843	0.145	0.005	0.640	0.011	0.009	0.155	0.157	56.7	56.6926	556.6
93	9.2	552	0.006	0.010	0.853	0.150	0.004	0.649	0.009	0.007	0.133	0.147	53.1	53.0851	556.6
94	9.3	558	0.006	0.010	0.862	0.154	0.005	0.658	0.009	0.007	0.134	0.137	49.3	49.3077	556.6
95	9.4	564	0.006	0.010	0.872	0.159	0.005	0.667	0.009	0.008	0.134	0.135	48.5	48.4700	556.6
96	9.5	570	0.005	0.008	0.880	0.163	0.004	0.675	0.008	0.006	0.112	0.126	45.3	45.3369	556.6
97	9.6	576	0.006	0.010	0.890	0.167	0.005	0.684	0.009	0.008	0.135	0.124	44.6	44.6483	556.6
98	9.7	582	0.005	0.008	0.898	0.171	0.004	0.692	0.008	0.006	0.113	0.124	44.6	44.5538	556.6
99	9.8	588	0.006	0.010	0.907	0.176	0.005	0.701	0.009	0.008	0.135	0.124	44.6	44.6220	556.6
100	9.9	594	0.005	0.008	0.915	0.180	0.004	0.709	0.008	0.006	0.113	0.124	44.7	44.7145	556.6
101	10.0	600	0.005	0.008	0.923	0.184	0.004	0.717	0.008	0.006	0.113	0.116	41.8	41.7611	556.6
102	10.1	606	0.005	0.008	0.931	0.188	0.004	0.724	0.008	0.006	0.114	0.114	41.1	41.0894	556.6
103	10.2	612	0.005	0.008	0.939	0.192	0.004	0.732	0.008	0.006	0.114	0.114	41.0	40.9872	556.6
104	10.3	618	0.005	0.008	0.947	0.196	0.004	0.740	0.008	0.006	0.114	0.114	41.0	41.0265	556.6
105	10.4	624	0.004	0.006	0.954	0.199	0.003	0.746	0.006	0.005	0.091	0.106	38.0	38.0103	556.6
106	10.5	630	0.005	0.008	0.962	0.204	0.004	0.754	0.008	0.006	0.115	0.104	37.3	37.3131	556.6
107	10.6	636	0.005	0.008	0.970	0.208	0.004	0.761	0.008	0.006	0.115	0.112	40.3	40.2851	556.6
108	10.7	642	0.004	0.006	0.976	0.211	0.003	0.768	0.006	0.005	0.092	0.106	38.0	37.9825	556.6
109	10.8	648	0.005	0.008	0.984	0.215	0.004	0.775	0.008	0.006	0.115	0.104	37.5	37.4617	556.6
110	10.9	654	0.005	0.008	0.992	0.220	0.004	0.783	0.008	0.006	0.115	0.112	40.5	40.4930	556.6
111	11.0	660	0.004	0.006	0.998	0.223	0.003	0.789	0.006	0.005	0.092	0.106	38.2	38.1864	556.6
112	11.1	666	0.004	0.006	1.005	0.227	0.003	0.796	0.006	0.005	0.093	0.096	34.5	34.5340	556.6
113	11.2	672	0.005	0.008	1.013	0.231	0.004	0.803	0.008	0.006	0.116	0.102	36.8	36.7915	556.6
114	11.3	678	0.004	0.006	1.019	0.234	0.003	0.810	0.006	0.005	0.093	0.104	37.4	37.3973	556.6
115	11.4	684	0.004	0.006	1.026	0.238	0.003	0.816	0.006	0.005	0.093	0.096	34.5	34.4566	556.6
116	11.5	690	0.004	0.006	1.032	0.241	0.004	0.822	0.006	0.005	0.093	0.094	33.8	33.7574	556.6
117	11.6	696	0.004	0.006	1.038	0.245	0.004	0.828	0.006	0.005	0.093	0.093	33.6	33.6184	556.6
118	11.7	702	0.004	0.006	1.045	0.248	0.004	0.834	0.006	0.005	0.093	0.093	33.6	33.6190	556.6
119	11.8	708	0.004	0.006	1.051	0.252	0.004	0.841	0.006	0.005	0.094	0.093	33.7	33.6542	556.6
120	11.9	714	0.003	0.005	1.056	0.255	0.003	0.845	0.005	0.004	0.070	0.085	30.5	30.5334	556.6
121	12.0	720	0.004	0.006	1.062	0.258	0.004	0.851	0.006	0.005	0.094	0.083	29.8	29.7833	556.6
122	12.1	726	0.004	0.006	1.069	0.262	0.004	0.858	0.006	0.005	0.094	0.091	32.8	32.7899	556.6
123	12.2	732	0.003	0.005	1.074	0.265	0.003	0.862	0.005	0.004	0.071	0.084	30.4	30.3994	556.6
124	12.3	738	0.004	0.006	1.080	0.268	0.004	0.869	0.006	0.005	0.094	0.083	29.8	29.8311	556.6
125	12.4	744	0.004	0.006	1.086	0.272	0.004	0.875	0.006	0.005	0.094	0.091	32.9	32.8939	556.6
126	12.5	750	0.004	0.006	1.093	0.275	0.004	0.881	0.006	0.005	0.094	0.094	33.7	33.6925	556.6
127	12.6	756	0.004	0.006	1.099	0.279	0.004	0.887	0.006	0.005	0.095	0.094	33.9	33.9247	556.6
128	12.7	762	0.003	0.005	1.104	0.282	0.003	0.892	0.005	0.004	0.071	0.086	30.8	30.8198	556.6
129	12.8	768	0.004	0.006	1.110	0.286	0.004	0.898	0.006	0.005	0.095	0.084	30.1	30.0716	556.6
130	12.9	774	0.003	0.005	1.115	0.288	0.003	0.903	0.005	0.004	0.071	0.083	29.9	29.9054	556.6
131	13.0	780	0.004	0.006	1.122	0.292	0.004	0.909	0.006	0.005	0.095	0.083	29.9	29.8914	556.6
132	13.1	786	0.004	0.006	1.128	0.296	0.004	0.915	0.006	0.005	0.095	0.092	33.1	33.1173	556.6
133	13.2	792	0.003	0.005	1.133	0.299	0.003	0.920	0.005	0.004	0.071	0.085	30.7	30.7419	556.6
134	13.3	798	0.004	0.006	1.139	0.302	0.004	0.926	0.006	0.005	0.095	0.084	30.2	30.1749	556.6
135	13.4	804	0.004	0.006	1.146	0.306	0.004	0.933	0.006	0.005	0.095	0.092	33.3	33.2726	556.6
136	13.5	810	0.003	0.005	1.150	0.309	0.003	0.937	0.005	0.004	0.072	0.086	30.9	30.8540	556.6
137	13.6	816	0.003	0.005	1.155	0.312	0.003	0.942	0.005	0.004	0.072	0.075	27.0	27.0496	556.6
138	13.7	822	0.004	0.006	1.162	0.316	0.004	0.948	0.006	0.005	0.096	0.082	29.3	29.3439	556.6
139	13.8	828	0.003	0.005	1.166	0.319	0.003	0.953	0.005	0.004	0.072	0.083	29.9	29.9368	556.6
140	13.9	834	0.004	0.006	1.173	0.323	0.004	0.959	0.006	0.005	0.096	0.084	30.1	30.1106	556.6
141	14.0	840	0.003	0.005	1.178	0.325	0.003	0.964	0.005	0.004	0.072	0.084	30.2	30.1731	556.6
142	14.1	846	0.003	0.005	1.182	0.328	0.003	0.968	0.005	0.004	0.072	0.075	27.0	26.9726	556.6
143	14.2	852	0.004	0.006	1.189	0.332	0.004	0.975	0.006	0.005	0.096	0.082	29.4	29.4325	556.6
144	14.3	858	0.003	0.005	1.194	0.335	0.003	0.979	0.005	0.004	0.072	0.084	30.1	30.0661	556.6
145	14.4	864	0.003	0.005	1.198	0.338	0.003	0.984	0.005	0.004	0.072	0.075	27.0	26.9990	556.6
146	14.5	870	0.004	0.006	1.205	0.342	0.004	0.990	0.006	0.005	0.096	0.082	29.5	29.5007	556.6
147	14.6	876	0.003	0.005	1.210	0.345	0.003	0.995	0.005	0.004	0.072	0.084	30.1	30.1443	556.6
148	14.7	882	0.003	0.005	1.214	0.348	0.003	1.000	0.005	0.004	0.072	0.075	27.1	27.0705	556.6
149	14.8	888	0.004	0.006	1.221	0.352	0.004	1.006	0.006	0.005	0.097	0.082	29.6	29.5787	556.6
150	14.9	894	0.003	0.005	1.226	0.355	0.003	1.011	0.005	0.004	0.073	0.084	30.2	30.2236	556.6
151	15.0	900	0.003	0.005	1.230	0.358	0.003	1.015	0.005	0.004	0.073	0.075	27.1	27.1412	556.6
152	15.1	906	0.003	0.005	1.235	0.361	0.003	1.020	0.005	0.004	0.073	0.073	26.4	26.3857	556.6
153	15.2	912	0.004	0.006	1.242	0.365	0.004	1.026	0.006	0.005	0.097	0.082	29.5	29.4838	556.6
154	15.3	918	0.003	0.005	1.246	0.368	0.003	1.031	0.005	0.004	0.073	0.084	30.3	30.2757	556.6
155	15.4	924	0.003	0.005	1.251	0.371	0.003	1.036	0.005	0.004	0.073	0.076	27.2	27.2187	556.6
156	15.5	930	0.003	0.005	1.256	0.374	0.003	1.040	0.005	0.004	0.073	0.074	26.5	26.4691	556.6
157	15.6	936	0.003	0.005	1.261	0.377	0.003	1.045	0.005	0.004	0.073	0.073	26.3	26.2962	556.6
158	15.7	942	0.004	0.006	1.267	0.381	0.004	1.051	0.006	0.005	0.097	0.082	29.6	29.5524	556.6
159	15.8	948	0.003	0.005	1.272	0.384	0.003	1.056	0.005	0.004	0.073	0.084	30.4	30.3832	556.6
160	15.9	954	0.003	0.005	1.277	0.387	0.003	1.061	0.005	0.004	0.073	0.076	27.3	27.3225	556.6
161	16.0	960	0.003	0.005	1.282	0.390	0.003	1.066	0.005	0.004	0.073	0.074	26.6	26.5714	556.6
162	16.1	966	0.003	0.005	1.286	0.393	0.003	1.070	0.005	0.004	0.073	0.073	26.4	26.3977	556.6
163	16.2	972	0.003	0.005	1.291	0.396	0.003	1.075	0.005	0.004	0.073	0.073	26.4	26.3682	556.6
164	16.3	978	0.003	0.005	1.296	0.399	0.003	1.080	0.005	0.004	0.073	0.073	26.4	26.3747	556.6
165	16.4	984	0.003	0.005	1.301	0.402	0.003	1.084	0.005	0.004	0.073	0.073	26.4	26.3901	556.6
166	16.5	990	0.003	0.005	1.306	0.405	0.003	1.089	0.005	0.004	0.073	0.073	26.4	26.4076	556.6
167	16.6	996	0.003	0.005	1.310	0.408	0.003	1.094	0.005	0.004	0.073	0.073	26.4	26.4256	556.6
168	16.7	1002	0.003	0.005	1.315	0.411	0.003	1.098	0.005	0.004	0.073	0.073	26.4	26.4436	556.6
169	16.8	1008	0.003	0.005	1.320	0.415	0.003	1.103	0.005	0.004	0.074	0.074	26.5	26.4615	556.6
170	16.9	1014	0.003	0.005	1.325	0.418	0.003	1.108	0.005	0.004	0.074	0.074	26.5	26.4794	556.6
171	17.0	1020	0.003	0.005	1.330	0.421	0.003	1.113	0.005	0.004	0.074	0.074	26.5	26.4971	556.6
172	17.1	1026	0.003	0.005	1.334	0.424	0.003	1.117	0.005	0.004	0.074	0.074	26.5	26.5147	556.6
173	17.2	1032	0.003	0.005	1.339	0.427	0.003	1.122	0.005	0.004	0.074	0.074	26.5	26.5322	556.6
174	17.3	1038	0.003	0.005	1.344	0.430	0.003	1.127	0.005	0.004	0.074	0.074	26.5	26.5496	556.6
175	17.4	1044	0.003	0.005	1.349	0.433	0.003	1.131	0.005	0.004	0.074	0.074	26.6	26.5668	556.6
176	17.5	1050	0.003	0.005	1.354	0.436	0.003	1.136	0.005	0.004	0.074	0.074	26.6	26.5840	556.6
177	17.6	1056	0.003	0.005	1.358	0.440	0.003	1.141	0.005	0.004	0.074	0.074	26.6	26.6011	556.6
178	17.7	1062	0.002	0.003	1.362	0.442	0.002	1.144	0.003	0.003	0.049	0.065	23.3	23.2883	556.6
179	17.8	1068	0.003	0.005	1.366	0.445	0.003	1.149	0.005	0.004	0.074	0.062	22.5	22.4707	556.6
180	17.9	1074	0.003	0.005	1.371	0.448	0.003	1.153	0.005	0.004	0.074	0.071	25.6	25.6064	556.6
181	18.0	1080	0.003	0.005	1.376	0.451	0.003	1.158	0.005	0.004	0.074	0.073	26.4	26.4029	556.6
182	18.1	1086	0.003	0.005	1.381	0.454	0.003	1.163	0.005	0.004	0.074	0.074	26.6	26.6144	556.6

183	18.2	1092	0.002	0.003	1.384	0.457	0.002	1.166	0.003	0.003	0.049	0.065	23.3	23.3402	556.6
184	18.3	1098	0.003	0.005	1.389	0.460	0.003	1.171	0.005	0.004	0.074	0.063	22.5	22.5319	556.6
185	18.4	1104	0.003	0.005	1.394	0.463	0.003	1.175	0.005	0.004	0.074	0.071	25.7	25.6794	556.6
186	18.5	1110	0.003	0.005	1.398	0.466	0.003	1.180	0.005	0.004	0.074	0.074	26.5	26.4784	556.6
187	18.6	1116	0.002	0.003	1.402	0.468	0.002	1.183	0.003	0.003	0.050	0.065	23.3	23.3434	556.6
188	18.7	1122	0.003	0.005	1.406	0.471	0.003	1.188	0.005	0.004	0.074	0.063	22.6	22.5697	556.6
189	18.8	1128	0.003	0.005	1.411	0.475	0.003	1.193	0.005	0.004	0.074	0.071	25.7	25.7330	556.6
190	18.9	1134	0.002	0.003	1.414	0.477	0.002	1.196	0.003	0.003	0.050	0.064	23.2	23.1836	556.6
191	19.0	1140	0.003	0.005	1.419	0.480	0.003	1.201	0.005	0.004	0.075	0.063	22.6	22.5562	556.6
192	19.1	1146	0.003	0.005	1.424	0.483	0.003	1.205	0.005	0.004	0.075	0.072	25.8	25.7611	556.6
193	19.2	1152	0.002	0.003	1.427	0.485	0.002	1.208	0.003	0.003	0.050	0.064	23.2	23.2168	556.6
194	19.3	1158	0.003	0.005	1.432	0.489	0.003	1.213	0.005	0.004	0.075	0.063	22.6	22.5904	556.6
195	19.4	1164	0.002	0.003	1.435	0.491	0.002	1.216	0.003	0.003	0.050	0.062	22.4	22.4403	556.6
196	19.5	1170	0.003	0.005	1.440	0.494	0.003	1.221	0.005	0.004	0.075	0.062	22.4	22.4123	556.6
197	19.6	1176	0.003	0.005	1.445	0.497	0.003	1.226	0.005	0.004	0.075	0.072	25.8	25.7753	556.6
198	19.7	1182	0.002	0.003	1.448	0.500	0.002	1.229	0.003	0.003	0.050	0.065	23.3	23.2619	556.6
199	19.8	1188	0.003	0.005	1.453	0.503	0.003	1.234	0.005	0.004	0.075	0.063	22.6	22.6430	556.6
200	19.9	1194	0.002	0.003	1.456	0.505	0.002	1.237	0.003	0.003	0.050	0.062	22.5	22.4946	556.6
201	20.0	1200	0.003	0.005	1.461	0.508	0.003	1.242	0.005	0.004	0.075	0.062	22.5	22.4668	556.6
202	20.1	1206	0.002	0.003	1.464	0.510	0.002	1.245	0.003	0.003	0.050	0.062	22.5	22.4661	556.6
203	20.2	1212	0.003	0.005	1.469	0.514	0.003	1.249	0.005	0.004	0.075	0.062	22.5	22.4752	556.6
204	20.3	1218	0.002	0.003	1.472	0.516	0.002	1.253	0.003	0.003	0.050	0.062	22.5	22.4836	556.6
205	20.4	1224	0.002	0.003	1.475	0.518	0.002	1.256	0.003	0.003	0.050	0.053	19.1	19.1189	556.6
206	20.5	1230	0.003	0.005	1.480	0.521	0.003	1.260	0.005	0.004	0.075	0.060	21.7	21.6598	556.6
207	20.6	1236	0.002	0.003	1.483	0.524	0.002	1.264	0.003	0.003	0.050	0.062	22.3	22.3011	556.6
208	20.7	1242	0.003	0.005	1.488	0.527	0.003	1.268	0.005	0.004	0.075	0.062	22.5	22.4704	556.6
209	20.8	1248	0.002	0.003	1.491	0.529	0.002	1.271	0.003	0.003	0.050	0.063	22.5	22.5188	556.6
210	20.9	1254	0.002	0.003	1.494	0.531	0.002	1.275	0.003	0.003	0.050	0.053	19.2	19.1566	556.6
211	21.0	1260	0.003	0.005	1.499	0.535	0.003	1.279	0.005	0.004	0.075	0.060	21.7	21.7053	556.6
212	21.1	1266	0.002	0.003	1.502	0.537	0.002	1.283	0.003	0.003	0.050	0.062	22.3	22.3483	556.6
213	21.2	1272	0.002	0.003	1.506	0.539	0.002	1.286	0.003	0.003	0.050	0.053	19.1	19.1306	556.6
214	21.3	1278	0.003	0.005	1.510	0.542	0.003	1.290	0.005	0.004	0.075	0.060	21.7	21.7194	556.6
215	21.4	1284	0.002	0.003	1.514	0.545	0.002	1.294	0.003	0.003	0.050	0.062	22.4	22.3724	556.6
216	21.5	1290	0.002	0.003	1.517	0.547	0.002	1.297	0.003	0.003	0.050	0.053	19.2	19.1530	556.6
217	21.6	1296	0.003	0.005	1.522	0.550	0.003	1.301	0.005	0.004	0.075	0.060	21.7	21.7453	556.6
218	21.7	1302	0.002	0.003	1.525	0.553	0.002	1.305	0.003	0.003	0.050	0.062	22.4	22.3992	556.6
219	21.8	1308	0.002	0.003	1.528	0.555	0.002	1.308	0.003	0.003	0.050	0.053	19.2	19.1758	556.6
220	21.9	1314	0.002	0.003	1.531	0.557	0.002	1.311	0.003	0.003	0.050	0.051	18.4	18.3746	556.6
221	22.0	1320	0.002	0.003	1.534	0.559	0.002	1.314	0.003	0.003	0.050	0.050	18.2	18.1788	556.6
222	22.1	1326	0.003	0.005	1.539	0.563	0.003	1.319	0.005	0.004	0.076	0.060	21.5	21.5333	556.6
223	22.2	1332	0.002	0.003	1.542	0.565	0.002	1.322	0.003	0.003	0.050	0.062	22.4	22.3775	556.6
224	22.3	1338	0.002	0.003	1.546	0.567	0.002	1.325	0.003	0.003	0.050	0.053	19.2	19.1954	556.6
225	22.4	1344	0.002	0.003	1.549	0.569	0.002	1.328	0.003	0.003	0.050	0.051	18.4	18.4043	556.6
226	22.5	1350	0.002	0.003	1.552	0.572	0.002	1.331	0.003	0.003	0.050	0.051	18.2	18.2110	556.6
227	22.6	1356	0.002	0.003	1.555	0.574	0.002	1.335	0.003	0.003	0.050	0.050	18.2	18.1672	556.6
228	22.7	1362	0.002	0.003	1.558	0.576	0.002	1.338	0.003	0.003	0.050	0.050	18.2	18.1606	556.6
229	22.8	1368	0.002	0.003	1.562	0.578	0.002	1.341	0.003	0.003	0.050	0.050	18.2	18.1634	556.6
230	22.9	1374	0.002	0.003	1.565	0.581	0.002	1.344	0.003	0.003	0.050	0.050	18.2	18.1685	556.6
231	23.0	1380	0.002	0.003	1.568	0.583	0.002	1.347	0.003	0.003	0.050	0.050	18.2	18.1741	556.6
232	23.1	1386	0.002	0.003	1.571	0.585	0.002	1.350	0.003	0.003	0.051	0.050	18.2	18.1799	556.6
233	23.2	1392	0.002	0.003	1.574	0.587	0.002	1.353	0.003	0.003	0.051	0.051	18.2	18.1857	556.6
234	23.3	1398	0.002	0.003	1.578	0.590	0.002	1.357	0.003	0.003	0.051	0.051	18.2	18.1915	556.6
235	23.4	1404	0.002	0.003	1.581	0.592	0.002	1.360	0.003	0.003	0.051	0.051	18.2	18.1973	556.6
236	23.5	1410	0.002	0.003	1.584	0.594	0.002	1.363	0.003	0.003	0.051	0.051	18.2	18.2030	556.6
237	23.6	1416	0.002	0.003	1.587	0.597	0.002	1.366	0.003	0.003	0.051	0.051	18.2	18.2087	556.6
238	23.7	1422	0.002	0.003	1.590	0.599	0.002	1.369	0.003	0.003	0.051	0.051	18.2	18.2144	556.6
239	23.8	1428	0.002	0.003	1.594	0.601	0.002	1.372	0.003	0.003	0.051	0.051	18.2	18.2201	556.6
240	23.9	1434	0.002	0.003	1.597	0.603	0.002	1.376	0.003	0.003	0.051	0.051	18.2	18.2258	556.6
241	24.0	1440	0.002	0.003	1.600	0.606	0.002	1.379	0.003	0.003	0.051	0.051	18.2	18.2314	556.6
														Max Storage Req=	556.6 C.F.

SCS Type 1A Regional Storm - Central Basin

Stormwater Runoff Area - Right Ditch

Area (acres) = 1.852 | P (inches) = 1.6 | d (min) = 6 | Tc (min) = 5 | Infiltration Area (ft²) = 7230.0

W= 0.375 | Max Storage (cu. ft.) = 480.2

Pervious Area (acres) = 0.746 | CN = 87 | S = 1.49 | 0.2S = 0.30 | Infiltration Rate (cf/min/ft^2) = 0.0018

Impervious Area (acres) = 1.106 | CN = 98 | S = 0.20 | 0.2S = 0.04 | Total Disp = 78.084000

1 Time Increment	2.0 Time Hours	2 Time (min)	3 Rainfall Distribution (Fraction)	4 Incremental Rainfall (inches)	5 Accum. Rainfall (inches)	6 Pervious Acc. Run (inches)	7 Pervious Inc. Run (inches)	8 Impervious Acc. Run (inches)	9 Impervious Inc. Run (inches)	10 Total Runoff (inches)	11 Instant Flow (inches)	12 Design Flow Rate (cfs)	13 Incremental Flow (cf)	14 Drywell Disp. Volume (cf)	15 Accum. Storage (cf)
1	0.0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
2	0.1	6	0.002	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
3	0.2	12	0.002	0.003	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
4	0.3	18	0.002	0.003	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
5	0.4	24	0.002	0.003	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
6	0.5	30	0.002	0.003	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
7	0.6	36	0.002	0.003	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
8	0.7	42	0.002	0.003	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
9	0.8	48	0.002	0.003	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
10	0.9	54	0.002	0.003	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
11	1.0	60	0.002	0.003	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
12	1.1	66	0.003	0.005	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0000	0.0
13	1.2	72	0.003	0.005	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0045	0.0
14	1.3	78	0.003	0.005	0.046	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.2	0.2250	0.0
15	1.4	84	0.003	0.005	0.051	0.000	0.000	0.001	0.000	0.000	0.004	0.002	0.8	0.8086	0.0
16	1.5	90	0.003	0.005	0.056	0.000	0.000	0.001	0.001	0.000	0.006	0.004	1.6	1.5813	0.0
17	1.6	96	0.003	0.005	0.061	0.000	0.000	0.002	0.001	0.000	0.008	0.006	2.3	2.3167	0.0
18	1.7	102	0.003	0.005	0.066	0.000	0.000	0.003	0.001	0.001	0.010	0.008	3.0	3.0368	0.0
19	1.8	108	0.003	0.005	0.070	0.000	0.000	0.004	0.001	0.001	0.012	0.010	3.7	3.7149	0.0
20	1.9	114	0.003	0.005	0.075	0.000	0.000	0.005	0.001	0.001	0.014	0.012	4.4	4.3522	0.0
21	2.0	120	0.003	0.005	0.080	0.000	0.000	0.006	0.001	0.001	0.015	0.014	5.0	4.9512	0.0
22	2.1	126	0.003	0.005	0.085	0.000	0.000	0.008	0.001	0.001	0.017	0.015	5.5	5.5149	0.0
23	2.2	132	0.003	0.005	0.090	0.000	0.000	0.009	0.002	0.001	0.018	0.017	6.0	6.0460	0.0
24	2.3	138	0.004	0.006	0.096	0.000	0.000	0.012	0.002	0.001	0.026	0.021	7.5	7.4539	0.0
25	2.4	144	0.003	0.005	0.101	0.000	0.000	0.014	0.002	0.001	0.021	0.023	8.2	8.2079	0.0
26	2.5	150	0.003	0.005	0.106	0.000	0.000	0.016	0.002	0.001	0.022	0.022	7.9	7.8696	0.0
27	2.6	156	0.003	0.005	0.110	0.000	0.000	0.018	0.002	0.001	0.023	0.022	8.1	8.0907	0.0
28	2.7	162	0.003	0.005	0.115	0.000	0.000	0.020	0.002	0.001	0.024	0.023	8.4	8.4357	0.0
29	2.8	168	0.004	0.006	0.122	0.000	0.000	0.023	0.003	0.002	0.034	0.028	10.0	9.9624	0.0
30	2.9	174	0.003	0.005	0.126	0.000	0.000	0.025	0.002	0.001	0.027	0.030	10.6	10.6460	0.0
31	3.0	180	0.003	0.005	0.131	0.000	0.000	0.028	0.002	0.001	0.027	0.028	9.9	9.9384	0.0
32	3.1	186	0.003	0.005	0.136	0.000	0.000	0.030	0.003	0.002	0.028	0.028	10.0	9.9937	0.0
33	3.2	192	0.003	0.005	0.141	0.000	0.000	0.033	0.003	0.002	0.029	0.028	10.2	10.2285	0.0
34	3.3	198	0.003	0.005	0.146	0.000	0.000	0.036	0.003	0.002	0.030	0.029	10.5	10.4979	0.0
35	3.4	204	0.004	0.006	0.152	0.000	0.000	0.039	0.004	0.002	0.041	0.034	12.2	12.1604	0.0
36	3.5	210	0.003	0.005	0.157	0.000	0.000	0.042	0.003	0.002	0.031	0.036	12.8	12.7980	0.0
37	3.6	216	0.003	0.005	0.162	0.000	0.000	0.045	0.003	0.002	0.032	0.033	11.8	11.7752	0.0
38	3.7	222	0.004	0.006	0.168	0.000	0.000	0.049	0.004	0.002	0.044	0.037	13.2	13.1821	0.0
39	3.8	228	0.004	0.006	0.174	0.000	0.000	0.053	0.004	0.002	0.045	0.042	15.2	15.2497	0.0
40	3.9	234	0.003	0.005	0.179	0.000	0.000	0.056	0.003	0.002	0.034	0.040	14.5	14.4840	0.0
41	4.0	240	0.004	0.006	0.186	0.000	0.000	0.060	0.004	0.002	0.046	0.040	14.5	14.5213	0.0
42	4.1	246	0.004	0.006	0.192	0.000	0.000	0.064	0.004	0.003	0.047	0.045	16.3	16.3043	0.0
43	4.2	252	0.003	0.005	0.197	0.000	0.000	0.068	0.003	0.002	0.036	0.043	15.3	15.3473	0.0
44	4.3	258	0.004	0.006	0.203	0.000	0.000	0.072	0.004	0.003	0.049	0.043	15.3	15.3046	0.0
45	4.4	264	0.004	0.006	0.210	0.000	0.000	0.076	0.004	0.003	0.050	0.048	17.1	17.1188	0.0
46	4.5	270	0.004	0.006	0.216	0.000	0.000	0.081	0.005	0.003	0.050	0.049	17.8	17.7759	0.0
47	4.6	276	0.004	0.006	0.222	0.000	0.000	0.085	0.005	0.003	0.051	0.050	18.1	18.1334	0.0
48	4.7	282	0.004	0.006	0.229	0.000	0.000	0.090	0.005	0.003	0.052	0.051	18.4	18.4066	0.0
49	4.8	288	0.004	0.006	0.235	0.000	0.000	0.095	0.005	0.003	0.052	0.052	18.6	18.6497	0.0
50	4.9	294	0.005	0.008	0.243	0.000	0.000	0.101	0.006	0.004	0.066	0.057	20.7	20.6762	0.0
51	5.0	300	0.004	0.006	0.250	0.000	0.000	0.106	0.005	0.003	0.054	0.059	21.4	21.3602	0.0
52	5.1	306	0.005	0.008	0.258	0.000	0.000	0.112	0.006	0.004	0.068	0.060	21.7	21.7415	0.0
53	5.2	312	0.004	0.006	0.264	0.000	0.000	0.117	0.005	0.003	0.055	0.061	22.0	21.9965	0.0
54	5.3	318	0.005	0.008	0.272	0.000	0.000	0.123	0.006	0.004	0.069	0.062	22.2	22.2499	0.0
55	5.4	324	0.005	0.008	0.280	0.000	0.000	0.129	0.006	0.004	0.070	0.068	24.4	24.3538	0.0
56	5.5	330	0.005	0.008	0.288	0.000	0.000	0.135	0.006	0.004	0.071	0.070	25.1	25.0693	0.0
57	5.6	336	0.005	0.008	0.296	0.000	0.000	0.142	0.006	0.004	0.071	0.071	25.4	25.4278	0.0
58	5.7	342	0.005	0.008	0.304	0.000	0.000	0.148	0.006	0.004	0.072	0.071	25.7	25.7056	0.0
59	5.8	348	0.005	0.008	0.312	0.000	0.000	0.155	0.006	0.004	0.073	0.072	26.0	26.0351	0.0
60	5.9	354	0.005	0.008	0.320	0.000	0.000	0.161	0.007	0.004	0.074	0.073	26.4	26.4363	0.0
61	6.0	360	0.006	0.010	0.330	0.001	0.000	0.169	0.008	0.005	0.091	0.080	28.9	28.9084	0.0
62	6.1	366	0.006	0.010	0.339	0.001	0.000	0.177	0.008	0.005	0.092	0.089	32.0	31.9531	0.0
63	6.2	372	0.006	0.010	0.349	0.002	0.001	0.185	0.008	0.005	0.094	0.092	33.1	33.1354	0.0
64	6.3	378	0.006	0.010	0.358	0.002	0.001	0.193	0.008	0.005	0.095	0.094	33.8	33.8374	0.0
65	6.4	384	0.007	0.011	0.370	0.003	0.001	0.203	0.010	0.006	0.113	0.102	36.6	36.6019	0.0
66	6.5	390	0.006	0.010	0.379	0.004	0.001	0.211	0.008	0.005	0.098	0.105	37.7	37.7029	0.0
67	6.6	396	0.006	0.010	0.389	0.005	0.001	0.219	0.008	0.005	0.100	0.100	36.2	36.1780	0.0
68	6.7	402	0.006	0.010	0.398	0.006	0.001	0.228	0.008	0.005	0.101	0.100	36.2	36.1501	0.0
69	6.8	408	0.006	0.010	0.408	0.007	0.001	0.236	0.008	0.005	0.102	0.101	36.5	36.4854	0.0
70	6.9	414	0.006	0.010	0.418	0.009	0.001	0.244	0.008	0.006	0.103	0.103	36.9	36.9011	0.0
71	7.0	420	0.007	0.011	0.429	0.010	0.002	0.254	0.010	0.007	0.122	0.110	39.7	39.6972	0.0
72	7.1	426	0.007	0.011	0.440	0.012	0.002	0.264	0.010	0.007	0.124	0.120	43.1	43.1335	0.0
73	7.2	432	0.008	0.013	0.453	0.014	0.002	0.276	0.011	0.008	0.143	0.130	46.8	46.8348	0.0
74	7.3	438	0.008	0.013	0.466	0.017	0.002	0.287	0.011	0.008	0.145	0.141	50.6	50.6476	0.0
75	7.4	444	0.009	0.014	0.480	0.020	0.003	0.300	0.013	0.009	0.165	0.152	54.6	54.5964	0.0
76	7.5	450	0.010	0.016	0.496	0.023	0.003	0.314	0.014	0.010	0.186	0.170	61.2	61.1560	0.0
77	7.6	456	0.021	0.034	0.530	0.031	0.008	0.345	0.031	0.021	0.400	0.262	94.4	78.0840	16.4
78	7.7	462	0.024	0.038	0.568	0.041	0.010	0.380	0.035	0.025	0.470	0.392	141.0	78.0840	79.3
79	7.8	468	0.024	0.038	0.606	0.052	0.011	0.416	0.036	0.026	0.482	0.455	163.8	78.0840	165.0
80	7.9	474	0.024	0.038	0.645	0.065	0.013	0.451	0.036	0.026	0.494	0.480	172.8	78.0840	259.7
81	8.0	480	0.022	0.035	0.680	0.077	0.012	0.484	0.033	0.025	0.462	0.478	172.2	78.0840	353.9
82	8.1	486	0.014	0.022	0.702	0.086	0.008	0.506	0.021	0.016	0.298	0.405	145.7	78.0840	421.5
83	8.2	492	0.013	0.021	0.723	0.094	0.008	0.525	0.020	0.015	0.280	0.318	114.5	78.0840	457.9
84	8.3	498	0.010	0.016	0.739	0.100	0.006	0.540	0.015	0.012	0.217	0.266	95.7	78.0840	475.5

85	8.4	504	0.010	0.016	0.755	0.107	0.007	0.556	0.015	0.012	0.219	0.230	82.8	78.0840	480.2
86	8.5	510	0.008	0.013	0.768	0.112	0.005	0.568	0.012	0.009	0.176	0.205	74.0	73.9530	480.2
87	8.6	516	0.009	0.014	0.782	0.118	0.006	0.582	0.014	0.011	0.199	0.192	69.1	69.1106	480.2
88	8.7	522	0.009	0.014	0.797	0.124	0.006	0.595	0.014	0.011	0.200	0.198	71.2	71.1691	480.2
89	8.8	528	0.007	0.011	0.808	0.129	0.005	0.606	0.011	0.008	0.156	0.183	65.9	65.9339	480.2
90	8.9	534	0.008	0.013	0.821	0.135	0.006	0.618	0.012	0.010	0.180	0.172	61.8	61.8476	480.2
91	9.0	540	0.007	0.011	0.832	0.140	0.005	0.629	0.011	0.008	0.158	0.169	61.0	61.0123	480.2
92	9.1	546	0.007	0.011	0.843	0.145	0.005	0.640	0.011	0.008	0.158	0.161	57.9	57.9493	480.2
93	9.2	552	0.006	0.010	0.853	0.150	0.004	0.649	0.009	0.007	0.136	0.151	54.3	54.2778	480.2
94	9.3	558	0.006	0.010	0.862	0.154	0.005	0.658	0.009	0.007	0.137	0.140	50.4	50.4296	480.2
95	9.4	564	0.006	0.010	0.872	0.159	0.005	0.667	0.009	0.007	0.137	0.138	49.6	49.5859	480.2
96	9.5	570	0.005	0.008	0.880	0.163	0.004	0.675	0.008	0.006	0.115	0.129	46.4	46.3914	480.2
97	9.6	576	0.006	0.010	0.890	0.167	0.005	0.684	0.009	0.007	0.138	0.127	45.7	45.6978	480.2
98	9.7	582	0.005	0.008	0.898	0.171	0.004	0.692	0.008	0.006	0.115	0.127	45.6	45.6107	480.2
99	9.8	588	0.006	0.010	0.907	0.176	0.005	0.701	0.009	0.007	0.139	0.127	45.7	45.6909	480.2
100	9.9	594	0.005	0.008	0.915	0.180	0.004	0.709	0.008	0.006	0.116	0.127	45.8	45.7947	480.2
101	10.0	600	0.005	0.008	0.923	0.184	0.004	0.717	0.008	0.006	0.116	0.119	42.8	42.7786	480.2
102	10.1	606	0.005	0.008	0.931	0.188	0.004	0.724	0.008	0.006	0.116	0.117	42.1	42.0986	480.2
103	10.2	612	0.005	0.008	0.939	0.192	0.004	0.732	0.008	0.006	0.117	0.117	42.0	42.0017	480.2
104	10.3	618	0.005	0.008	0.947	0.196	0.004	0.740	0.008	0.006	0.117	0.117	42.0	42.0496	480.2
105	10.4	624	0.004	0.006	0.954	0.199	0.003	0.746	0.006	0.005	0.094	0.108	39.0	38.9644	480.2
106	10.5	630	0.005	0.008	0.962	0.204	0.004	0.754	0.008	0.006	0.117	0.106	38.3	38.2564	480.2
107	10.6	636	0.005	0.008	0.970	0.208	0.004	0.761	0.008	0.006	0.118	0.115	41.3	41.3103	480.2
108	10.7	642	0.004	0.006	0.976	0.211	0.003	0.768	0.006	0.005	0.094	0.108	39.0	38.9549	480.2
109	10.8	648	0.005	0.008	0.984	0.215	0.004	0.775	0.008	0.006	0.118	0.107	38.4	38.4271	480.2
110	10.9	654	0.005	0.008	0.992	0.220	0.004	0.783	0.008	0.006	0.118	0.115	41.5	41.5431	480.2
111	11.0	660	0.004	0.006	0.998	0.223	0.003	0.789	0.006	0.005	0.095	0.109	39.2	39.1822	480.2
112	11.1	666	0.004	0.006	1.005	0.227	0.003	0.796	0.006	0.005	0.095	0.098	35.4	35.4397	480.2
113	11.2	672	0.005	0.008	1.013	0.231	0.004	0.803	0.008	0.006	0.119	0.105	37.8	37.7620	480.2
114	11.3	678	0.004	0.006	1.019	0.234	0.003	0.810	0.006	0.005	0.095	0.107	38.4	38.3888	480.2
115	11.4	684	0.004	0.006	1.026	0.238	0.003	0.816	0.006	0.005	0.096	0.098	35.4	35.3748	480.2
116	11.5	690	0.004	0.006	1.032	0.241	0.004	0.822	0.006	0.005	0.096	0.096	34.7	34.6615	480.2
117	11.6	696	0.004	0.006	1.038	0.245	0.004	0.828	0.006	0.005	0.096	0.096	34.5	34.5230	480.2
118	11.7	702	0.004	0.006	1.045	0.248	0.004	0.834	0.006	0.005	0.096	0.096	34.5	34.5278	480.2
119	11.8	708	0.004	0.006	1.051	0.252	0.004	0.841	0.006	0.005	0.096	0.096	34.6	34.5681	480.2
120	11.9	714	0.003	0.005	1.056	0.255	0.003	0.845	0.005	0.004	0.072	0.087	31.4	31.3658	480.2
121	12.0	720	0.004	0.006	1.062	0.258	0.004	0.851	0.006	0.005	0.096	0.085	30.6	30.5988	480.2
122	12.1	726	0.004	0.006	1.069	0.262	0.004	0.858	0.006	0.005	0.097	0.094	33.7	33.6913	480.2
123	12.2	732	0.003	0.005	1.074	0.265	0.003	0.862	0.005	0.004	0.072	0.087	31.2	31.2381	480.2
124	12.3	738	0.004	0.006	1.080	0.268	0.004	0.869	0.006	0.005	0.097	0.085	30.7	30.6575	480.2
125	12.4	744	0.004	0.006	1.086	0.272	0.004	0.875	0.006	0.005	0.097	0.094	33.8	33.8088	480.2
126	12.5	750	0.004	0.006	1.093	0.275	0.004	0.881	0.006	0.005	0.097	0.096	34.6	34.6333	480.2
127	12.6	756	0.004	0.006	1.099	0.279	0.004	0.887	0.006	0.005	0.097	0.097	34.9	34.8758	480.2
128	12.7	762	0.003	0.005	1.104	0.282	0.003	0.892	0.005	0.004	0.073	0.088	31.7	31.6868	480.2
129	12.8	768	0.004	0.006	1.110	0.286	0.004	0.898	0.006	0.005	0.097	0.086	30.9	30.9208	480.2
130	12.9	774	0.003	0.005	1.115	0.288	0.003	0.903	0.005	0.004	0.073	0.085	30.8	30.7526	480.2
131	13.0	780	0.004	0.006	1.122	0.292	0.004	0.909	0.006	0.005	0.098	0.085	30.7	30.7413	480.2
132	13.1	786	0.004	0.006	1.128	0.296	0.004	0.915	0.006	0.005	0.098	0.095	34.1	34.0623	480.2
133	13.2	792	0.003	0.005	1.133	0.299	0.003	0.920	0.005	0.004	0.073	0.088	31.6	31.6219	480.2
134	13.3	798	0.004	0.006	1.139	0.302	0.004	0.926	0.006	0.005	0.098	0.086	31.0	31.0418	480.2
135	13.4	804	0.004	0.006	1.146	0.306	0.004	0.933	0.006	0.005	0.098	0.095	34.2	34.2316	480.2
136	13.5	810	0.003	0.005	1.150	0.309	0.003	0.937	0.005	0.004	0.074	0.088	31.7	31.7460	480.2
137	13.6	816	0.003	0.005	1.155	0.312	0.003	0.942	0.005	0.004	0.074	0.077	27.8	27.8340	480.2
138	13.7	822	0.004	0.006	1.162	0.316	0.004	0.948	0.006	0.005	0.098	0.084	30.2	30.1976	480.2
139	13.8	828	0.003	0.005	1.166	0.319	0.003	0.953	0.005	0.004	0.074	0.086	30.8	30.8101	480.2
140	13.9	834	0.004	0.006	1.173	0.323	0.004	0.959	0.006	0.005	0.099	0.086	31.0	30.9919	480.2
141	14.0	840	0.003	0.005	1.178	0.325	0.003	0.964	0.005	0.004	0.074	0.086	31.1	31.0586	480.2
142	14.1	846	0.003	0.005	1.182	0.328	0.003	0.968	0.005	0.004	0.074	0.077	27.8	27.7663	480.2
143	14.2	852	0.004	0.006	1.189	0.332	0.004	0.975	0.006	0.005	0.099	0.084	30.3	30.3013	480.2
144	14.3	858	0.003	0.005	1.194	0.335	0.003	0.979	0.005	0.004	0.074	0.086	31.0	30.9558	480.2
145	14.4	864	0.003	0.005	1.198	0.338	0.003	0.984	0.005	0.004	0.074	0.077	27.8	27.8001	480.2
146	14.5	870	0.004	0.006	1.205	0.342	0.004	0.990	0.006	0.005	0.099	0.084	30.4	30.3786	480.2
147	14.6	876	0.003	0.005	1.210	0.345	0.003	0.995	0.005	0.004	0.074	0.086	31.0	31.0435	480.2
148	14.7	882	0.003	0.005	1.214	0.348	0.003	1.000	0.005	0.004	0.075	0.077	27.9	27.8801	480.2
149	14.8	888	0.004	0.006	1.221	0.352	0.004	1.006	0.006	0.005	0.099	0.085	30.5	30.4659	480.2
150	14.9	894	0.003	0.005	1.226	0.355	0.003	1.011	0.005	0.004	0.075	0.086	31.1	31.1322	480.2
151	15.0	900	0.003	0.005	1.230	0.358	0.003	1.015	0.005	0.004	0.075	0.078	28.0	27.9592	480.2
152	15.1	906	0.003	0.005	1.235	0.361	0.003	1.020	0.005	0.004	0.075	0.076	27.2	27.1828	480.2
153	15.2	912	0.004	0.006	1.242	0.365	0.004	1.026	0.006	0.005	0.100	0.084	30.4	30.3769	480.2
154	15.3	918	0.003	0.005	1.246	0.368	0.003	1.031	0.005	0.004	0.075	0.087	31.2	31.1948	480.2
155	15.4	924	0.003	0.005	1.251	0.371	0.003	1.036	0.005	0.004	0.075	0.078	28.0	28.0470	480.2
156	15.5	930	0.003	0.005	1.256	0.374	0.003	1.040	0.005	0.004	0.075	0.076	27.3	27.2764	480.2
157	15.6	936	0.003	0.005	1.261	0.377	0.003	1.045	0.005	0.004	0.075	0.075	27.1	27.1000	480.2
158	15.7	942	0.004	0.006	1.267	0.381	0.004	1.051	0.006	0.005	0.100	0.085	30.5	30.4580	480.2
159	15.8	948	0.003	0.005	1.272	0.384	0.003	1.056	0.005	0.004	0.075	0.087	31.3	31.3163	480.2
160	15.9	954	0.003	0.005	1.277	0.387	0.003	1.061	0.005	0.004	0.075	0.078	28.2	28.1634	480.2
161	16.0	960	0.003	0.005	1.282	0.390	0.003	1.066	0.005	0.004	0.075	0.076	27.4	27.3910	480.2
162	16.1	966	0.003	0.005	1.286	0.393	0.003	1.070	0.005	0.004	0.075	0.076	27.2	27.2137	480.2
163	16.2	972	0.003	0.005	1.291	0.396	0.003	1.075	0.005	0.004	0.076	0.076	27.2	27.1849	480.2
164	16.3	978	0.003	0.005	1.296	0.399	0.003	1.080	0.005	0.004	0.076	0.076	27.2	27.1933	480.2
165	16.4	984	0.003	0.005	1.301	0.402	0.003	1.084	0.005	0.004	0.076	0.076	27.2	27.2108	480.2
166	16.5	990	0.003	0.005	1.306	0.405	0.003	1.089	0.005	0.004	0.076	0.076	27.2	27.2305	480.2
167	16.6	996	0.003	0.005	1.310	0.408	0.003	1.094	0.005	0.004	0.076	0.076	27.3	27.2506	480.2
168	16.7	1002	0.003	0.005	1.315	0.411	0.003	1.098	0.005	0.004	0.076	0.076	27.3	27.2708	480.2
169	16.8	1008	0.003	0.005	1.320	0.415	0.003	1.103	0.005	0.004	0.076	0.076	27.3	27.2909	480.2
170	16.9	1014	0.003	0.005	1.325	0.418	0.003	1.108	0.005	0.004	0.076	0.076	27.3	27.3108	480.2
171	17.0	1020	0.003	0.005	1.330	0.421	0.003	1.113	0.005	0.004	0.076	0.076	27.3	27.3307	480.2
172	17.1	1026	0.003	0.005	1.334	0.424	0.003	1.117	0.005	0.004	0.076	0.076	27.4	27.3504	480.2
173	17.2	1032	0.003	0.005	1.339	0.427	0.003	1.122	0.005	0.004	0.076	0.076	27.4	27.3700	480.2
174	17.3	1038	0.003	0.005	1.344	0.430	0.003	1.127	0.005	0.004	0.076	0.076	27.4	27.3895	480.2
175	17.4	1044	0.003	0.005	1.349	0.433	0.003	1.131	0.005	0.004	0.076	0.076	27.4	27.4089	480.2
176	17.5	1050	0.003	0.005	1.354	0.436	0.003	1.136	0.005	0.004	0.076	0.076	27.4	27.4281	480.2
177	17.6	1056	0.003	0.005	1.358	0.440	0.003	1.141	0.005	0.004	0.076	0.076	27.4	27.4472	480.2
178	17.7	1062	0.002	0.003	1.362	0.442	0.002	1.144	0.003	0.003	0.051	0.057	24.0	24.0302	480.2
179	17.8	1068	0.003	0.005	1.366	0.445	0.003	1.149	0.005	0.004	0.076	0.064	23.2	23.1878	480.2
180	17.9	1074	0.003	0.005	1.371	0.448	0.003	1.153	0.005	0.004	0.076	0.073	26.4	26.4249	480.2
181	18.0	1080	0.003	0.005	1.376	0.451	0.003	1.158	0.005	0.004	0.076	0.076	27.2	27.2482	480.2
182	18.1	1086	0.003	0.005	1.381	0.454	0.003	1.163	0.005	0.004	0.077	0.076	27.5	27.4679	480.2

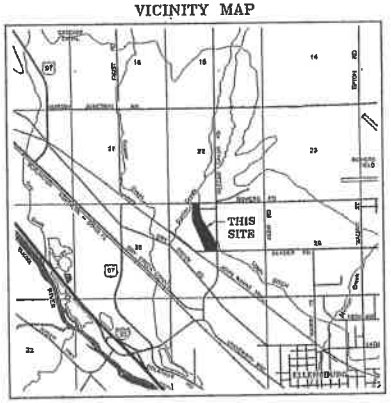
183	18.2	1092	0.002	0.003	1.384	0.457	0.002	1.166	0.003	0.003	0.051	0.067	24.1	24.0898	480.2
184	18.3	1098	0.003	0.005	1.389	0.460	0.003	1.171	0.005	0.004	0.077	0.065	23.3	23.2568	480.2
185	18.4	1104	0.003	0.005	1.394	0.463	0.003	1.175	0.005	0.004	0.077	0.074	26.5	26.5068	480.2
186	18.5	1110	0.003	0.005	1.398	0.466	0.003	1.180	0.005	0.004	0.077	0.076	27.3	27.3329	480.2
187	18.6	1116	0.002	0.003	1.402	0.468	0.002	1.183	0.003	0.003	0.051	0.067	24.1	24.0978	480.2
188	18.7	1122	0.003	0.005	1.406	0.471	0.003	1.188	0.005	0.004	0.077	0.065	23.3	23.3002	480.2
189	18.8	1128	0.003	0.005	1.411	0.475	0.003	1.193	0.005	0.004	0.077	0.074	26.6	26.5672	480.2
190	18.9	1134	0.002	0.003	1.414	0.477	0.002	1.196	0.003	0.003	0.051	0.066	23.9	23.9361	480.2
191	19.0	1140	0.003	0.005	1.419	0.480	0.003	1.201	0.005	0.004	0.077	0.065	23.3	23.2894	480.2
192	19.1	1146	0.003	0.005	1.424	0.483	0.003	1.205	0.005	0.004	0.077	0.074	26.6	26.5998	480.2
193	19.2	1152	0.002	0.003	1.427	0.485	0.002	1.208	0.003	0.003	0.051	0.067	24.0	23.9736	480.2
194	19.3	1158	0.003	0.005	1.432	0.489	0.003	1.213	0.005	0.004	0.077	0.065	23.3	23.3279	480.2
195	19.4	1164	0.002	0.003	1.435	0.491	0.002	1.216	0.003	0.003	0.051	0.064	23.2	23.1737	480.2
196	19.5	1170	0.003	0.005	1.440	0.494	0.003	1.221	0.005	0.004	0.077	0.064	23.1	23.1459	480.2
197	19.6	1176	0.003	0.005	1.445	0.497	0.003	1.226	0.005	0.004	0.077	0.074	26.6	26.6202	480.2
198	19.7	1182	0.002	0.003	1.448	0.500	0.002	1.229	0.003	0.003	0.051	0.067	24.0	24.0254	480.2
199	19.8	1188	0.003	0.005	1.453	0.503	0.003	1.234	0.005	0.004	0.077	0.065	23.4	23.3873	480.2
200	19.9	1194	0.002	0.003	1.456	0.505	0.002	1.237	0.003	0.003	0.052	0.065	23.2	23.2348	480.2
201	20.0	1200	0.003	0.005	1.461	0.508	0.003	1.242	0.005	0.004	0.077	0.064	23.2	23.2071	480.2
202	20.1	1206	0.002	0.003	1.464	0.510	0.002	1.245	0.003	0.003	0.052	0.064	23.2	23.2072	480.2
203	20.2	1212	0.003	0.005	1.469	0.514	0.003	1.249	0.005	0.004	0.077	0.064	23.2	23.2176	480.2
204	20.3	1218	0.002	0.003	1.472	0.516	0.002	1.253	0.003	0.003	0.052	0.065	23.2	23.2271	480.2
205	20.4	1224	0.002	0.003	1.475	0.518	0.002	1.256	0.003	0.003	0.052	0.055	19.8	19.7518	480.2
206	20.5	1230	0.003	0.005	1.480	0.521	0.003	1.260	0.005	0.004	0.078	0.062	22.4	22.3778	480.2
207	20.6	1236	0.002	0.003	1.483	0.524	0.002	1.264	0.003	0.003	0.052	0.064	23.0	23.0411	480.2
208	20.7	1242	0.003	0.005	1.488	0.527	0.003	1.268	0.005	0.004	0.078	0.064	23.2	23.2171	480.2
209	20.8	1248	0.002	0.003	1.491	0.529	0.002	1.271	0.003	0.003	0.052	0.065	23.3	23.2678	480.2
210	20.9	1254	0.002	0.003	1.494	0.531	0.002	1.275	0.003	0.003	0.052	0.055	19.8	19.7945	480.2
211	21.0	1260	0.003	0.005	1.499	0.535	0.003	1.279	0.005	0.004	0.078	0.062	22.4	22.4289	480.2
212	21.1	1266	0.002	0.003	1.502	0.537	0.002	1.283	0.003	0.003	0.052	0.064	23.1	23.0941	480.2
213	21.2	1272	0.002	0.003	1.506	0.539	0.002	1.286	0.003	0.003	0.052	0.055	19.8	19.7697	480.2
214	21.3	1278	0.003	0.005	1.510	0.542	0.003	1.290	0.005	0.004	0.078	0.062	22.4	22.4459	480.2
215	21.4	1284	0.002	0.003	1.514	0.545	0.002	1.294	0.003	0.003	0.052	0.064	23.1	23.1215	480.2
216	21.5	1290	0.002	0.003	1.517	0.547	0.002	1.297	0.003	0.003	0.052	0.055	19.8	19.7949	480.2
217	21.6	1296	0.003	0.005	1.522	0.550	0.003	1.301	0.005	0.004	0.078	0.062	22.5	22.4750	480.2
218	21.7	1302	0.002	0.003	1.525	0.553	0.002	1.305	0.003	0.003	0.052	0.064	23.2	23.1515	480.2
219	21.8	1308	0.002	0.003	1.528	0.555	0.002	1.308	0.003	0.003	0.052	0.055	19.8	19.8206	480.2
220	21.9	1314	0.002	0.003	1.531	0.557	0.002	1.311	0.003	0.003	0.052	0.053	19.0	18.9930	480.2
221	22.0	1320	0.002	0.003	1.534	0.559	0.002	1.314	0.003	0.003	0.052	0.052	18.8	18.7912	480.2
222	22.1	1326	0.003	0.005	1.539	0.563	0.003	1.319	0.005	0.004	0.078	0.062	22.3	22.2594	480.2
223	22.2	1332	0.002	0.003	1.542	0.565	0.002	1.322	0.003	0.003	0.052	0.064	23.1	23.1328	480.2
224	22.3	1338	0.002	0.003	1.546	0.567	0.002	1.325	0.003	0.003	0.052	0.055	19.8	19.8439	480.2
225	22.4	1344	0.002	0.003	1.549	0.569	0.002	1.328	0.003	0.003	0.052	0.053	19.0	19.0267	480.2
226	22.5	1350	0.002	0.003	1.552	0.572	0.002	1.331	0.003	0.003	0.052	0.052	18.8	18.8274	480.2
227	22.6	1356	0.002	0.003	1.555	0.574	0.002	1.335	0.003	0.003	0.052	0.052	18.8	18.7826	480.2
228	22.7	1362	0.002	0.003	1.558	0.576	0.002	1.338	0.003	0.003	0.052	0.052	18.8	18.7764	480.2
229	22.8	1368	0.002	0.003	1.562	0.578	0.002	1.341	0.003	0.003	0.052	0.052	18.8	18.7798	480.2
230	22.9	1374	0.002	0.003	1.565	0.581	0.002	1.344	0.003	0.003	0.052	0.052	18.8	18.7856	480.2
231	23.0	1380	0.002	0.003	1.568	0.583	0.002	1.347	0.003	0.003	0.052	0.052	18.8	18.7919	480.2
232	23.1	1386	0.002	0.003	1.571	0.585	0.002	1.350	0.003	0.003	0.052	0.052	18.8	18.7984	480.2
233	23.2	1392	0.002	0.003	1.574	0.587	0.002	1.353	0.003	0.003	0.052	0.052	18.8	18.8050	480.2
234	23.3	1398	0.002	0.003	1.578	0.590	0.002	1.357	0.003	0.003	0.052	0.052	18.8	18.8114	480.2
235	23.4	1404	0.002	0.003	1.581	0.592	0.002	1.360	0.003	0.003	0.052	0.052	18.8	18.8179	480.2
236	23.5	1410	0.002	0.003	1.584	0.594	0.002	1.363	0.003	0.003	0.052	0.052	18.8	18.8244	480.2
237	23.6	1416	0.002	0.003	1.587	0.597	0.002	1.366	0.003	0.003	0.052	0.052	18.8	18.8308	480.2
238	23.7	1422	0.002	0.003	1.590	0.599	0.002	1.369	0.003	0.003	0.052	0.052	18.8	18.8372	480.2
239	23.8	1428	0.002	0.003	1.594	0.601	0.002	1.372	0.003	0.003	0.052	0.052	18.8	18.8436	480.2
240	23.9	1434	0.002	0.003	1.597	0.603	0.002	1.376	0.003	0.003	0.052	0.052	18.8	18.8499	480.2
241	24.0	1440	0.002	0.003	1.600	0.606	0.002	1.379	0.003	0.003	0.052	0.052	18.9	18.8563	480.2
														Max Storage Req=	480.2 C.F.

PRIVATE ROAD NETWORK DRAWINGS FOR PALOMINO MAJOR PLAT, PHASE 3

Prepared By

WESTERN PACIFIC ENGINEERING & SURVEY

VICINITY MAP



BENCH MARK LISTING

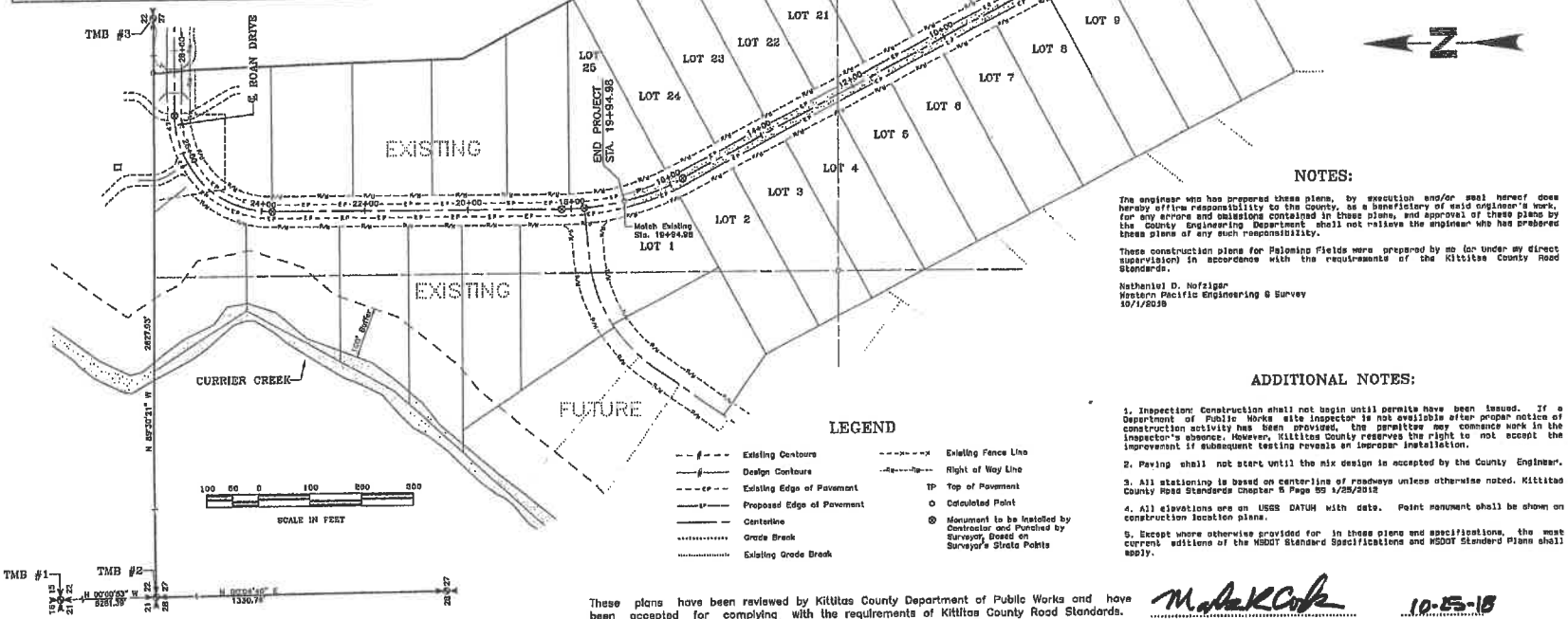
TBM#1 - Found monument marking the northwest corner of Section 22 (Elevation=1645.95)

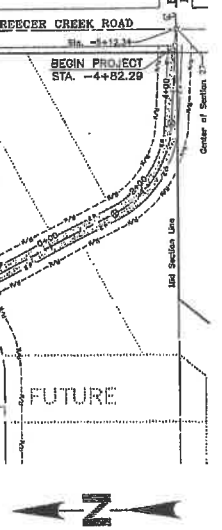
TBM#2 - Found monument marking the southwest corner of Section 22 (Elevation=1589.32)

TBM#3 - Found monument marking the southeast corner of the southwest quarter of Section 22. (Elevation=1615.85)

SHEET INDEX

C1.0 Cover Sheet
C1.1 Plan and Profile Sta. -5+00 to Sta. 2+00
C1.2 Plan and Profile Sta. -1+00 to Sta. 7+00
C1.3 Plan and Profile Sta. 4+75 to Sta. 12+50
C1.4 Plan and Profile Sta. 10+75 to Sta. 18+50
C2.1 Construction Details and Specifications
C2.1 Best management Practices Plan & Specifications
C2.2 Best management Practices Details





LEGEND

- Existing Contours
- Design Contours
- Existing Edge of Pavement
- Proposed Edge of Pavement
- Centerline
- Grade Break
- Existing Grade Break
- Existing Fence Line
- Right of Way Line
- TP Top of Pavement
- Calculated Point
- Monument to be installed by Contractor and Punched by Surveyor, Based on Surveyor's Strata Points

NOTES:

The engineer who has prepared these plans, by execution and/or seal hereof does hereby affirm responsibility to the County, as a beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the County Engineering Department shall not relieve the engineer who has prepared these plans of any such responsibility.

These construction plans for Palomino Fields were prepared by me (or under my direct supervision) in accordance with the requirements of the Kittitas County Road Standards.

Nathaniel D. Nofziger
Western Pacific Engineering & Survey
10/1/2018

ADDITIONAL NOTES:

1. Inspection: Construction shall not begin until permits have been issued. If a Department of Public Works site inspector is not available after proper notice of construction activity has been provided, the permittee may commence work in the inspector's absence. However, Kittitas County reserves the right to not accept the improvement if subsequent testing reveals an improper installation.

2. Paving shall not start until the mix design is accepted by the County Engineer.

3. All stationing is based on centerline of roadways unless otherwise noted. Kittitas County Road Standards Chapter 5 Page 59 1/25/2012

4. All elevations are on USGS DATUM with date. Point monument shall be shown on construction location plans.

5. Except where otherwise provided for in these plans and specifications, the most current editions of the WSDOT Standard Specifications and WSDOT Standard Plans shall apply.

These plans have been reviewed by Kittitas County Department of Public Works and have been accepted for complying with the requirements of Kittitas County Road Standards.

Mark K Cook
County Engineer

10-25-18
Date

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1326 E. Hunter Place, Moses Lake, Washington
T(509)765-1823 F(509)765-1338
Services in Washington and Idaho

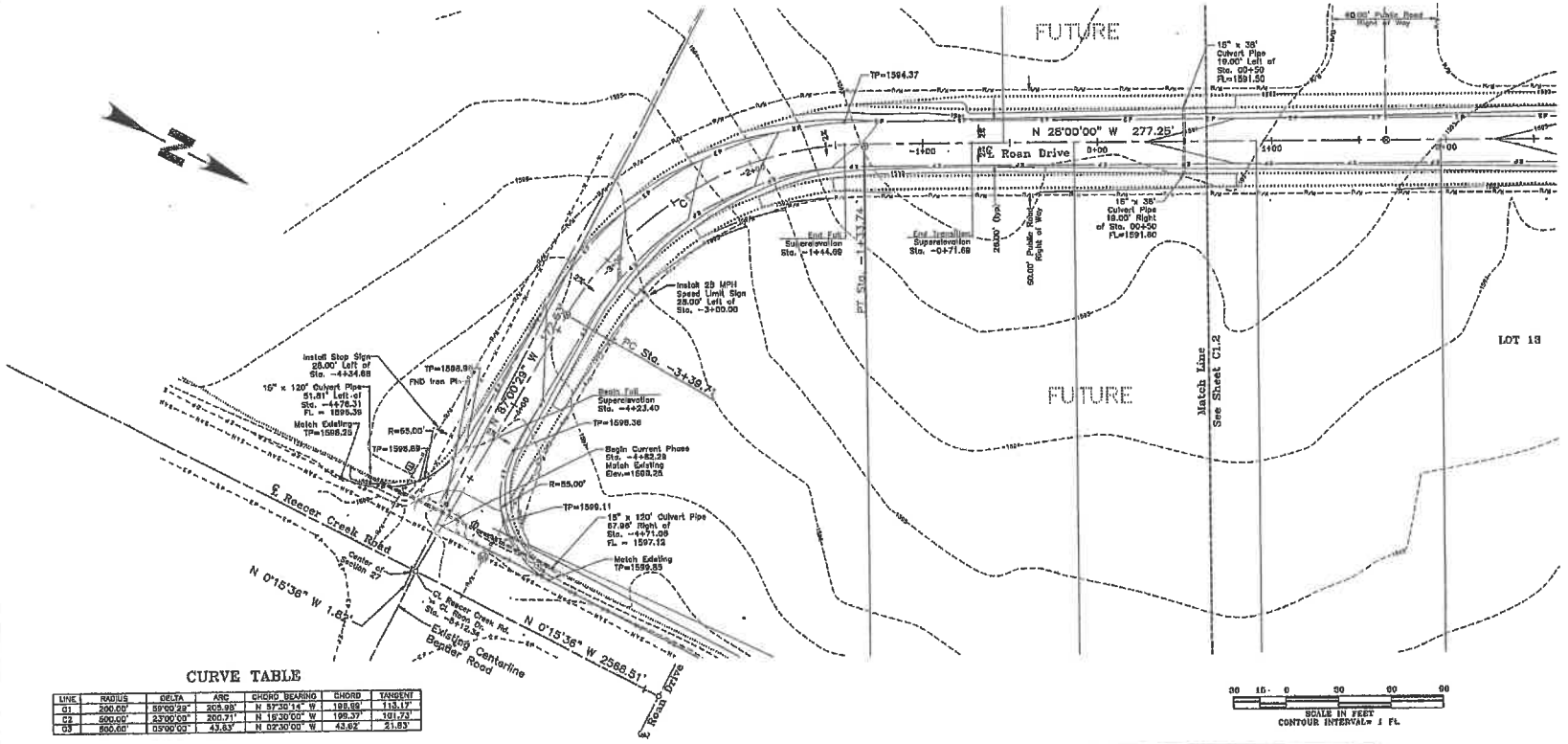
No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Cover Sheet
Kittitas County Washington

Designed by NDN
Drawn by NDN/JAG
Checked by NDN
Project No. 18418
Date: October 2018
Scale:
Hor. 1" = 100'
Vert. 1" = N/A
Sec 27, T 18 N, R 18 E

SHEET NO.
C1.0

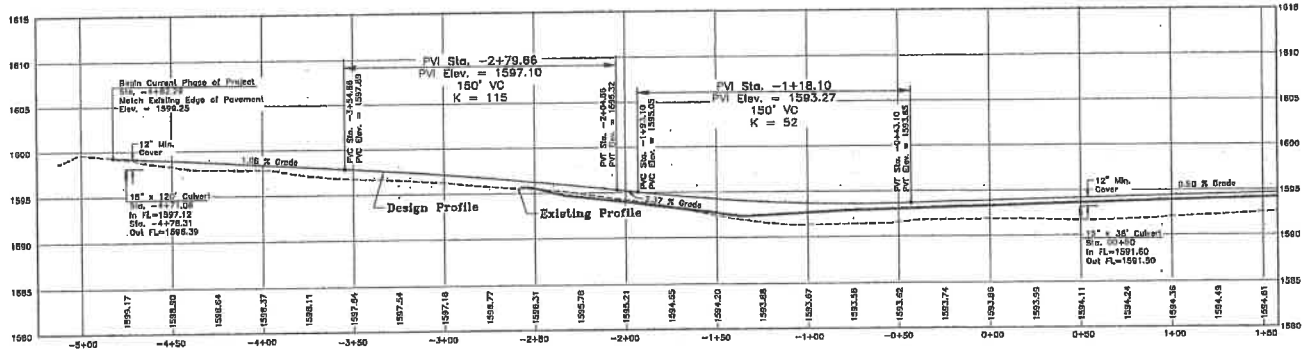
181827



CURVE TABLE

LINE	RADIUS	DELTA	ARC	CHORD BEARING	CHORD	TANGENT
C1	300.00'	39°00'29"	205.98'	N 57°30'14" W	189.59'	113.17'
C2	500.00'	23°00'00"	200.71'	N 15°30'00" W	199.37'	101.73'
C3	500.00'	03°00'00"	43.63'	N 02°30'00" W	43.62'	21.83'

SCALE IN FEET
CONTOUR INTERVAL= 1 Ft.



10/25/18

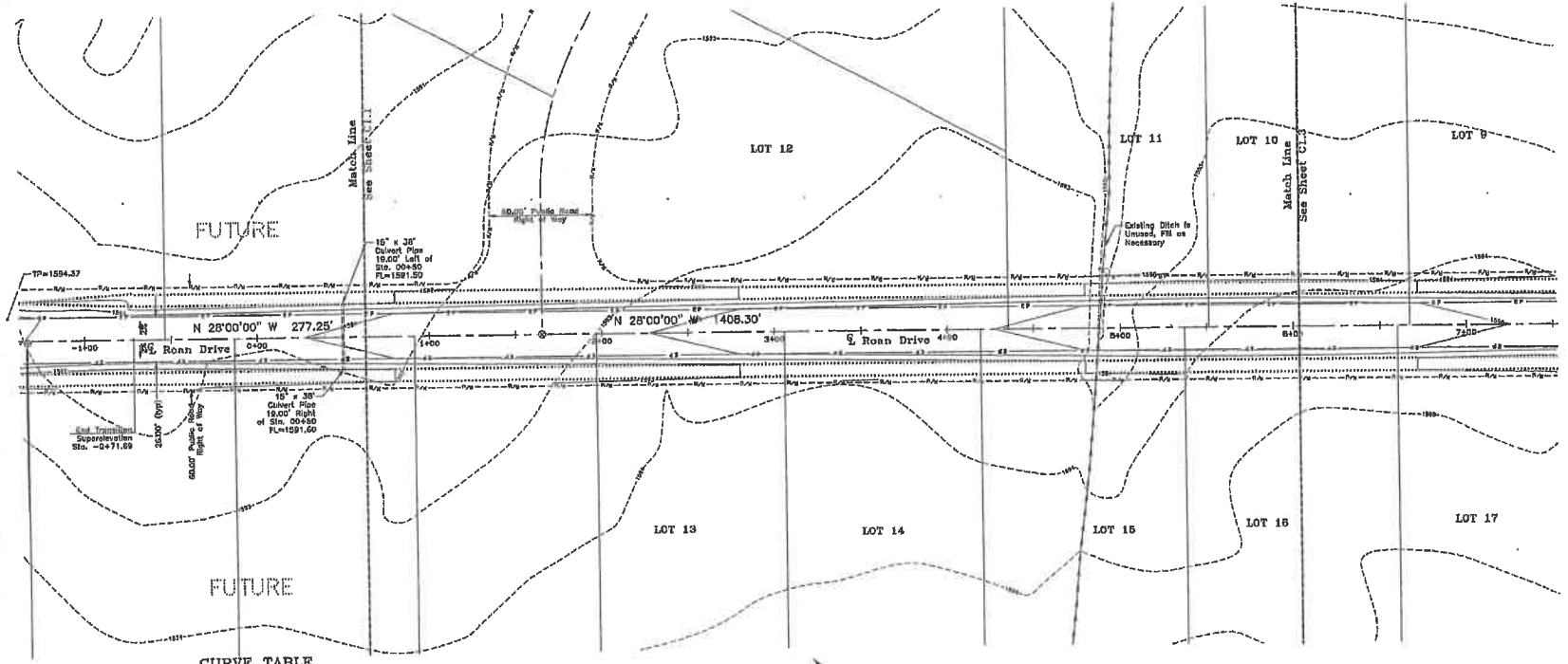
WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1329 E. Homer Place, Kennewick, Washington 99336 (509) 735-7228

No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. -5+00 to Sta. 2+00
Whitman County Washington

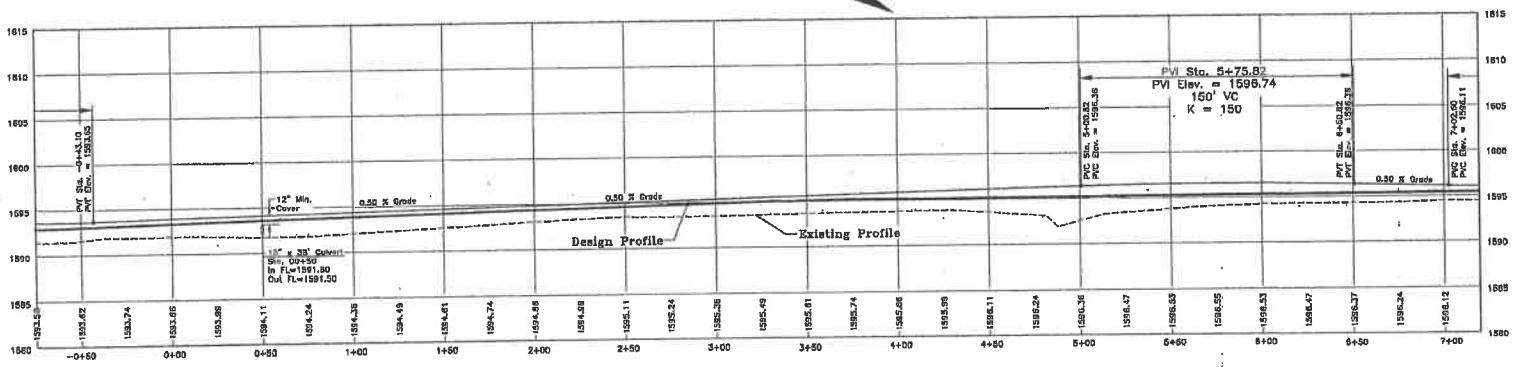
Designed by NDN
Drawn by Tml/JAC
Checked by NDN
Project No. 18118
Date: October 2018
Scale:
Hor. 1" = 50'
Vert. 1" = 5'
Sec 27, T 15 N, R 46 E

SHEET NO.
C1.1
1B1827



CURVE TABLE

LINE	RADIUS	DELTA	ARC	CHORD BEARING	CHORD	TANGENT
C1	200.00'	58°00'26"	205.98'	N 57°30'14" W	198.99'	113.12'
C2	600.00'	23°03'00"	200.71'	N 16°29'09" W	199.37'	101.73'
C3	500.00'	05°00'00"	43.63'	N 02°30'00" W	43.62'	21.83'



10/25/10 @

WESTERN PACIFIC ENGINEERING & SURVEY
A WASHINGTON CORPORATION
TESSA LEVELLEUR, PRESIDENT
KEENAN PHELPS, SENIOR PROJECT MANAGER
Coeur d'Alene Lakes, Washington
T(509)765-1213 F(509)765-1283
Serving the Washington and Idaho

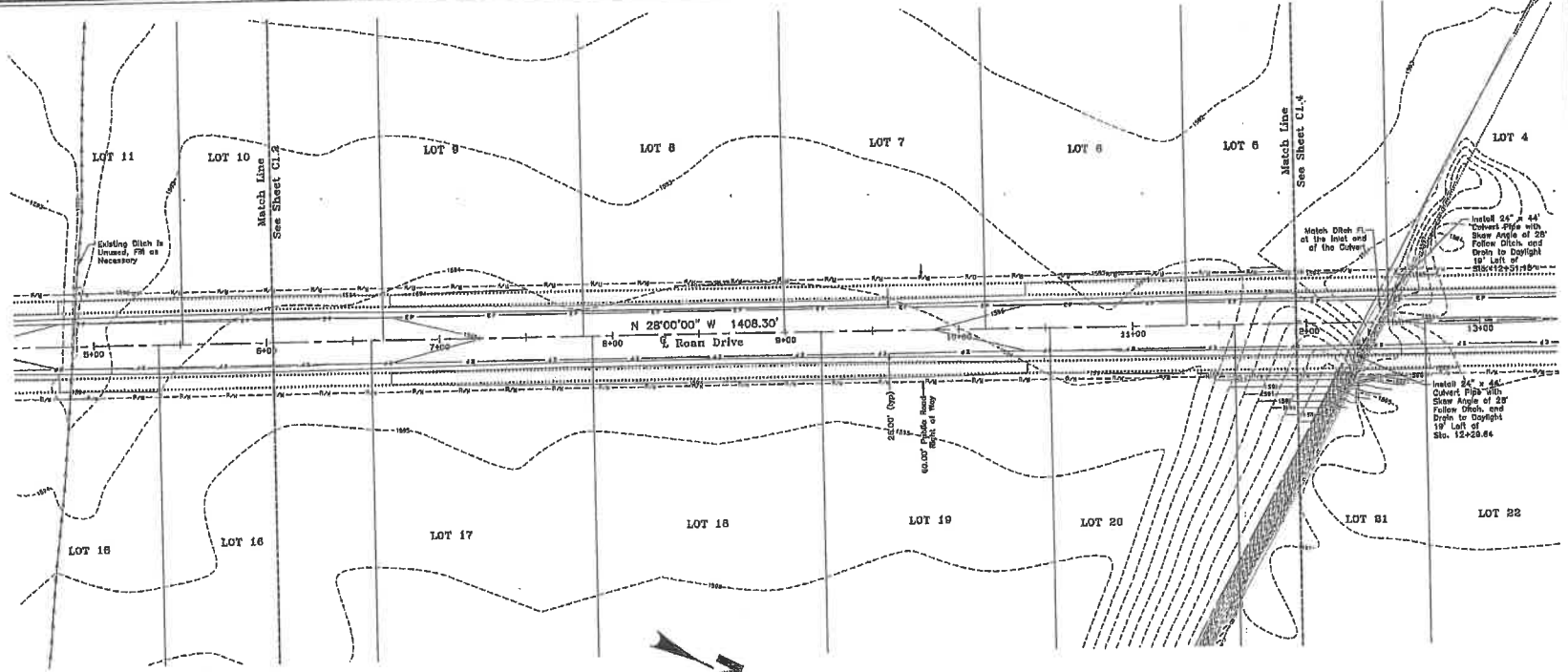
No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. -1+00 to Sta. 7+00
Washington
Kittitas County

Designed by NDN
Drawn by Tmi/Ldo
Checked by NDN
Project No. 10410
Date: October 2010
Scale:
Hor. 1" = 30'
Vert. 1" = 6'
Sec 27, T 18 N, R 18 E

SHEET NO.
C1.2

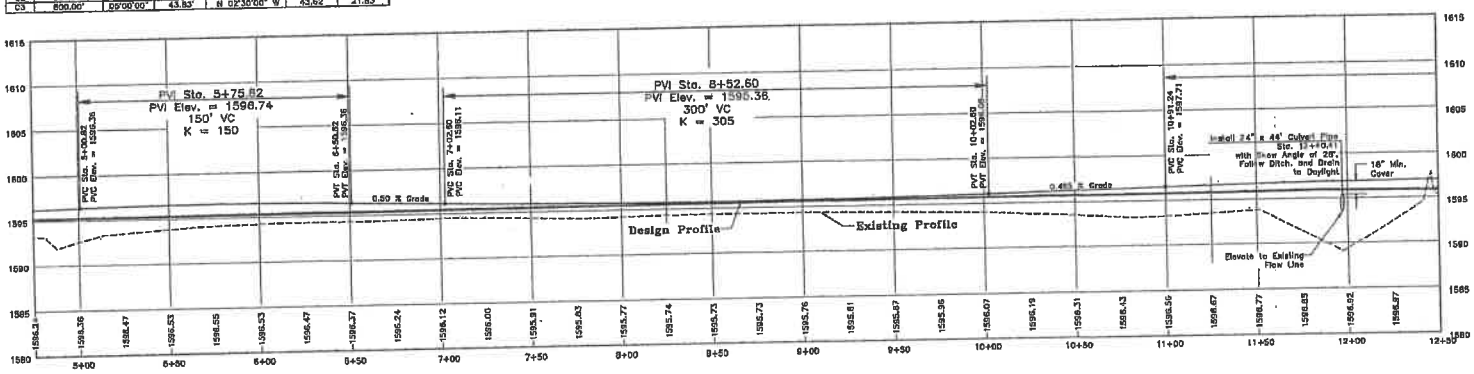
181827



CURVE TABLE

LINE	RADIUS	DELTA	ARC	CHORD BEARING	CHORD	TANGENT
C1	200.00'	59°00'29"	205.98'	N 37°30'14" W	196.89'	113.17'
C2	500.00'	23°00'00"	200.71'	N 16°30'00" W	199.37'	101.73'
C3	600.00'	05°00'00"	43.63'	N 02°30'00" W	43.62'	21.83'

SCALE IN FEET
CONTOUR INTERVAL = 1 FT.



10/25/18

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1325 E. Hunter Place, Moses Lake, Washington
(509)765-9483 FAX (509)765-9484
Serving the Northwest and Alaska

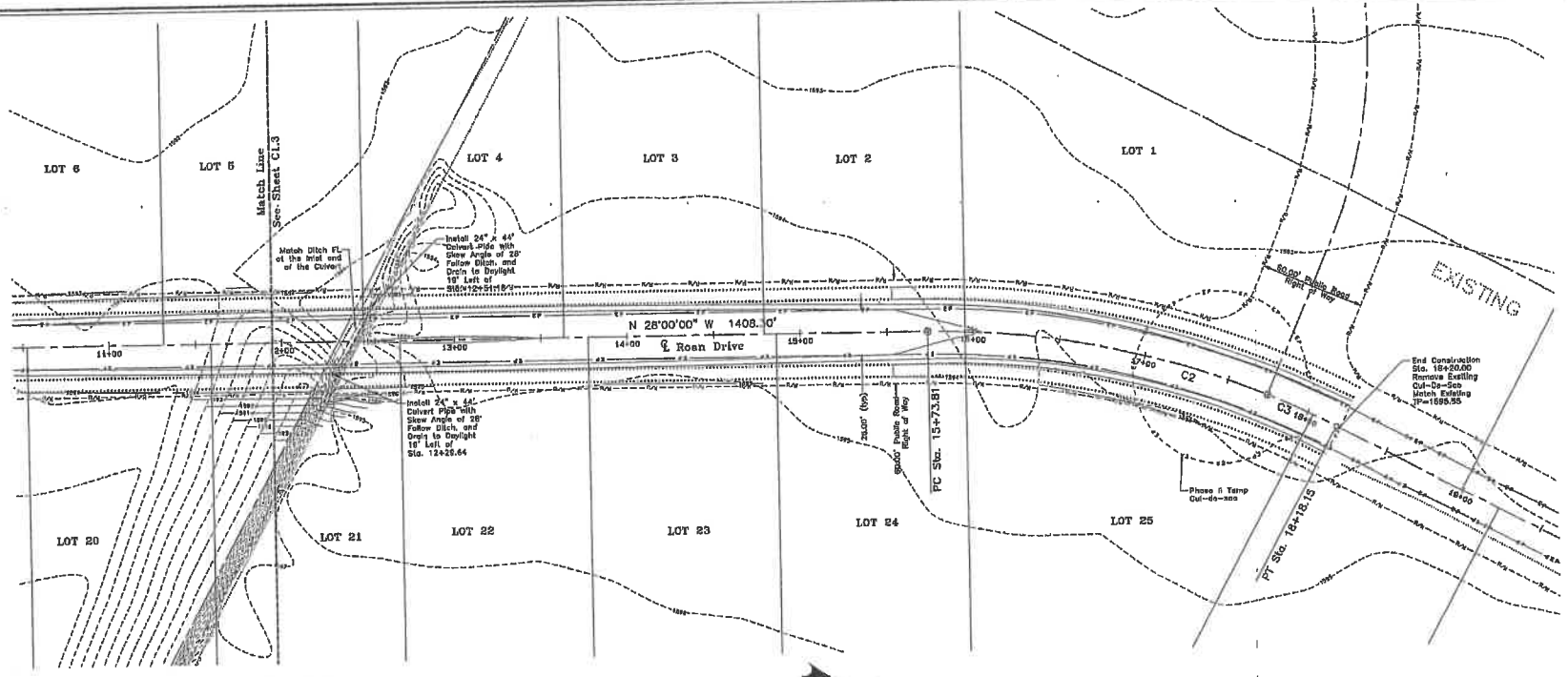
No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. 4+75 to Sta. 12+50
Washington
Kittitas County

Designed by MDN
Drawn by Tml/JAD
Checked by MDN
Project No. 18413
Date: October 2018
Scale:
Hor. 1" = 30'
Vert. 1" = 6'
Sec 27, T 18 N, R 18 E

SHEET NO.
C1.3

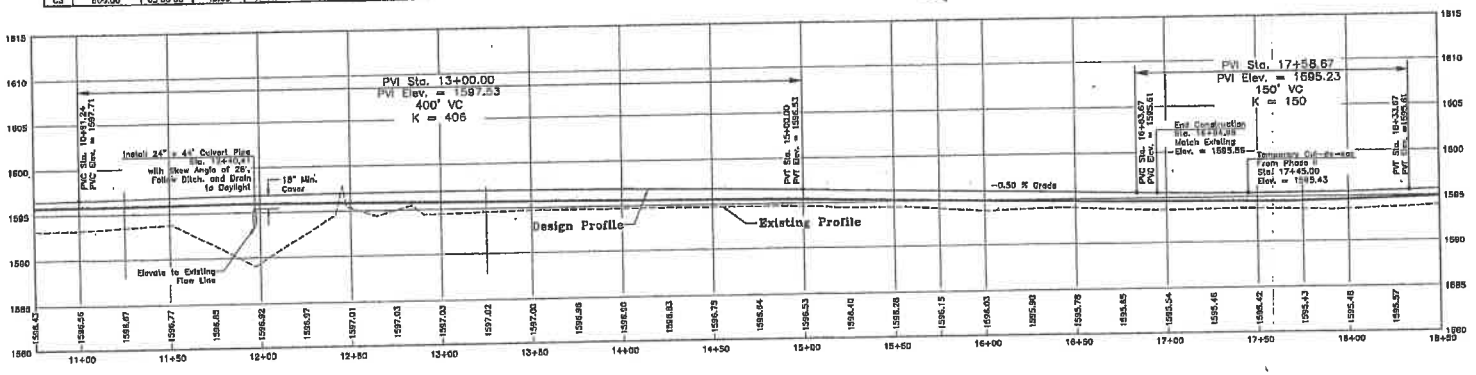
181827



CURVE TABLE

LINE	RADIUS	DELTA	ARC	CHORD BEARING	CHORD	TANGENT
C1	200.00'	68°00'29"	295.58'	N 87°30'14" W	186.99'	113.17'
C2	500.00'	23°00'00"	200.71'	N 16°30'00" W	199.37'	101.73'
C3	802.00'	05°00'00"	43.83'	N 02°30'00" W	43.82'	21.93'

SCALE IN FEET
CONTOUR INTERVAL= 1 Ft.



10/25/18

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
13228 Bothell Everett Highway, Suite 200, Bothell, Washington 98021
Phone (425)745-1235 FAX (425)745-1238
Services in Washington and Idaho

No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. 10+75 to Sta. 18+50

Kittitas County, Washington

Designed by NDN
Drawn by Tnl/JAG
Checked by NDN
Project No. 18413
Date: October 2018
Scale:
Hor. 1" = 50'
Vert. 1" = 5'
Sec 27, T 18 N, R 18 E

SHEET NO.
C1.4

181827

GENERAL SPECIFICATIONS

The Washington State Department of Transportation "Standard Specifications for Road, Bridge and Municipal Construction" 2018 Edition as amended by the APWA and the Kittitas County Public Works Road Standards, and referred to as the "Standard Specifications", are hereby part of the contract plans. Any inconsistency in the parts of the contract including these contract plans shall be brought to the attention of Western Pacific Engineering & Survey, Inc. and to the Kittitas County Public Works, prior to construction. During the performance of the work, if the contractor discovers any conflict, error, ambiguity, or discrepancy within the contract plans, contractor shall report it immediately, in writing, to Western Pacific Engineering & Survey, Inc., and to the responsible agency's designated engineer. The Standard Specifications can be obtained at the following web sites:

http://www.wsdot.wa.gov/publications/manuals/
https://www.co.kittitas.wa.us/public-works/development

Responsible Agencies

Evergreen Valley Utilities:
All water mains and lines.

Kittitas County Public Works:
All roadways from the existing edge of pavement and all other utility work within the County Road Right of Way.

Kittitas County Building Department:
All other aspects of construction.

Prior to the start of construction, a pre-construction conference shall be scheduled with the contractor, the developer's design engineer, city personnel and any affected utilities and agencies.

Special Provisions

The following special provisions and responsible agency standards amend the Standard Specifications. The contractor shall do all work in accordance with the contract plans, these special provisions, responsible agency standards, and the Standard Specifications.

1-05.4 Conformity with and Deviations from Plans:

Construction staking shall be performed under the direct supervision of a licensed Professional Surveyor. A copy of the staking notes will be provided to the responsible agency.

The Contractor shall keep the surveyor informed of their staking requirements far enough in advance of the time when the stakes will be required to provide a reasonable amount of time to set the stakes. Requests for stakes shall be made at least two working days prior to the need to commence staking operations. The request shall include the offset distance and direction.

As-Constructed Drawings shall be prepared and submitted to the Kittitas County Engineer by the Design Engineer upon completion of the construction.

1-05.3 Approval of Materials:

Delete the first paragraph and replace with the following: The Contractor shall submit a written list of all materials to the design engineer prior to construction. Submittals for all non-standard materials used in the project shall be reviewed and approved by the governing agency prior to use. The contractor shall provide materials submitted for all non-standard materials to the reasoctive agencies. All materials shall be approved by the design engineer and the agency prior to the start of construction.

1-06.2(1) Samples and Tests for Acceptance:

Modify the section as follows: The word Engineer or Project engineer shall refer to the owner and their designated inspector.

Special inspection shall be as follows, unless modified by the design engineer due to field conditions.

1. Soil subgrade shall be randomly tested for compaction with a minimum of one test per 10,000 square feet but no less than three tests in any given area.
2. Embankment and trench backfill shall be randomly tested for compaction on every four feet of lift.
3. Each layer of rock base shall be randomly tested for compaction with a minimum of one test per 10,000 square feet but no less than three tests in any given area.
4. Each layer of asphalt shall be randomly tested for compaction with a minimum of one test per 5,000 square feet but no less than three tests in any given area.
5. Soil subgrade on roadways shall be randomly tested for compaction with a minimum of three tests per each five hundred feet of roadway.
6. Concrete pavements shall have a minimum compressive strength at 28 days of 4000 psi. One set of four cylinders shall be cast for every 100 cubic yards of concrete poured per day. Individual concrete slabs, walkways and pads containing less than 1.5 cubic yards or of concrete need not be tested.

1-07.1 Laws to be Observed:

This Section is supplemented by adding the following:

Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. All persons on the site or who may be affected by the work;
2. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3. Other property at site or adjacent thereto.

Contractor shall comply with all applicable laws and regulations related to the safety of persons or property including MUTCD and OSHA regulations.

It is the responsibility of the Contractor to obtain all necessary permits and pay all associated fees to perform the work required by these plans.

1-07.1 Laws to be Observed Continued:

Before commencing construction, the contractor must have a Kittitas County Construction bond in the amount of 125 percent of the estimated construction costs. When a letter of escrow or cash is used, the amount covered shall be for 115 percent of the estimated construction costs as reviewed by the County Engineer.

Construction Permit: Prior to construction the contractor shall obtain the permit and pay to Kittitas County a fee as required.

1-07.16 Protection and Restoration of Property:

This Section is supplemented by adding the following: If any unknown subsurface structures are encountered during construction, they shall immediately be brought to the attention of the owner and prior to proceeding further with the work, protective measures shall be taken by the contractor to protect adjacent properties, public and private, at all times during construction. The contractor shall take all necessary precautions to control dust to meet the requirements of the responsible agency. Hydrant meter, irrigation equipment and any fees are the responsibility of the contractor.

All disturbed soils areas within the clearing limits shall be covered with a minimum of 4" of stockpiled strippings and seeded with native grass seed as per the table located on sheet C3.2

1-07.17 Utilities and Similar Facilities:

This Section is supplemented by adding the following: The contractor shall be responsible for verifying the location, dimension and depth of all existing utilities prior to construction, whether shown on the contract plans or not. Locations of said utilities as shown on the contract plans are based upon the best-known records available and are subject to a degree of unknown variation. If conflict should occur, the contractor shall immediately advise the design engineer to prepare a design revision. Approval of the design revision from the engineer and design engineer shall be obtained prior to proceeding with construction. It is the contractor's responsibility to notify the appropriate utilities involved prior to the start of any excavation. Call 811 for utility locates two working days prior to excavation. The contractor shall make all necessary arrangements for construction of utilities shown on the contract plans and/or indicated in the contract document with the serving utility. The contractor shall perform all work and shall furnish and install all materials as required by the utility. In cases where the serving utility furnishes materials and/or installs some components, the contractor shall furnish and/or install all other items of work not provided by the utility that are necessary for a complete and functioning utility system.

1-08.0 Preseruction and Preprcon: Preliminary Matters:

This Section is supplemented with the following: The contractor shall have and maintain on the job site during the performance of the work complete sets or copies of the following documents:

1. Contract plans which have been signature approved by the Engineer;
2. Responsible agency standards applicable to the construction operations; and
3. One set of record drawings

All work shall be constructed according to the approved contract plans and standard specifications. Any deviation from the approved contract plans will require written approval from the engineer. The contractor shall keep and maintain on the site one set of record drawings. The contractor shall mark on the record drawings all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original contract plans. When construction is complete, the record drawings shall be submitted to the design engineer for use in preparing permanent record drawings.

The contractor shall obtain and have available, copies of the applicable responsible agency standards at the job site during the related construction operations.

2-01 Clearing, grubbing and Roadside Cleanup:

The description shall be supplemented as follows: clearing, grubbing, stripping and cleanup shall be performed in accordance with 2-01 within the following limits: to the limits shown on Sheets 2.1 and 3.1. Clearing - prior to the start of any earthwork, all existing vegetation, debris, rubble, asphalt pavement, etc., shall be removed from the project area and disposed of at an approved waste site secured by the contractor. Excavation and grading outside of the right-of-way shall comply with the current edition of the International Building Code. All slopes shall be a maximum of 2 horizontal to 1 vertical (2H:1V unless otherwise noted on the contract plans.

2-01.3(2) Disposal Method No. 2 - Waste Site:

Supplement the following to Section 2-01.3(2): The contracting agency provides no waste site to the contractor.

2-03 Excavation and Embankment:

This Section is revised and supplemented by the following: Prior to any excavation, including trenching, strip the topsoil as provided in section 2-01. The subgrade for embankments shall be prepared by stripping topsoil as provided in Section 2-01 and then compact (proof roll) the subgrade to at least 95 percent of the maximum density. Embankment material shall be native soils less than 12" in greatest diameter.

Compaction - All materials and layers shall be placed and compacted to 95% in loose layers not exceeding eight inches in thickness. The contractor shall be responsible for importing and/or exporting all materials as required to construct the earthwork and surfacing to the lines and grades shown on the approved contract plans. In areas of proposed landscaping, compaction need not exceed 90%.

2-03.3(2) Disposal of Surplus Material:

Supplement the following: Excess native soils may be placed on the surrounding lots.

Excess native strippings may be placed on the site as shown as discussed herein. Excess strippings beyond what can be placed on site shall be removed from the project site.

2-03.3(14)D Compaction and Moisture Control Tests:

This Section is replaced with the following: Materials with 35 percent or more retained on the No. 4 sieve shall be determined by the WSDOT Test Method T606. This variation does not modify standard testing procedures that are defined by WSDOT or AASHTO. Maximum density and optimum moisture for materials of 35 percent or less retained on the No. 4 sieve shall be determined by the ASTM D1557 test method for maximum density/optimum moisture. The contractor shall provide all necessary excavation, vibratory compaction equipment, and labor to facilitate the taking compaction tests. The contractor shall provide all necessary test pits and additional work as directed by the owners representative. The contractor shall provide the responsible agency an opportunity to be present during compaction testing. All compaction results shall be with referral to required maximum densities.

4-04.3(5) Shaping and Compaction:

Replace the first sentence of the first paragraph with the following: Immediately following spreading and final shaping, each layer of surfacing shall be compacted at least 95 percent of the density determined by the control tests. In areas of proposed landscaping, compaction need not exceed 90%.

5-04.3(5) A Preparation of Existing Surfaces:

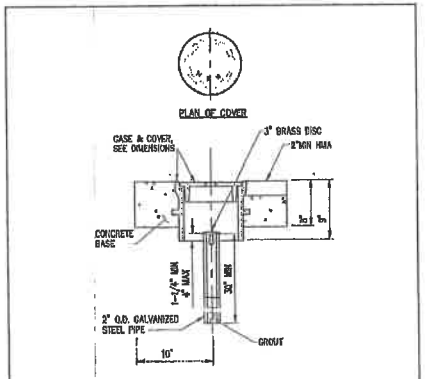
Add the following: A tack coat shall be applied to all asphalt edges to which bituminous surface treatment is to be applied.

5-09.3(2)C and 5-04.3(5)D Soil Residual Herbicide:

Soil sterilization shall be applied in areas to be paved. Keep 2-foot minimum clear of existing and proposed landscape areas. Apply at manufacture's recommended rate to assure 3-inches minimum penetration.

5-04.3(13) Surface Smoothness:

Add the following: Ponding or "birdbaths" exceeding one quarter inch in depth in surfaced areas shall not be acceptable and shall be accepted by the contractor.

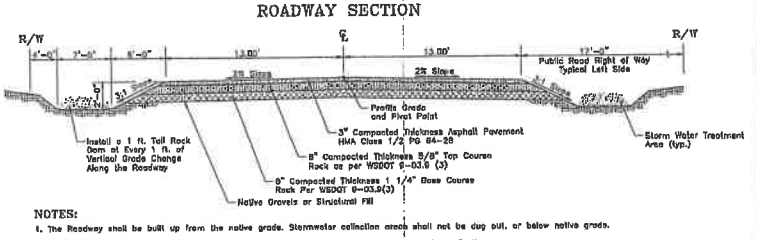


NOTES:

1. Refer to Kittitas County Standard Plan for Survey Monuments.
2. Brass discs shall be set by a professional land surveyor licensed by the State of Washington and shall bear the license number of the land surveyor responsible for setting the monument.
3. Monument case and cover shall be cast iron ASTM A48 Class 30.
4. Legend cover shall be 1/8" raised integrally least 2" letter height with a min face width of 3/16".
5. The brass disc shall be oriented so it can be read if the observer is facing north.

MONUMENT
05/2018
WESTERN PACIFIC ENGINEERING & SURVEY
B

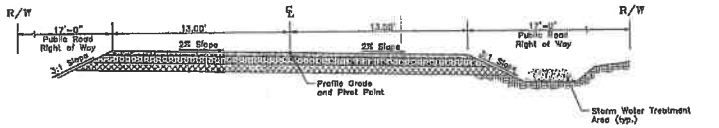
ROADWAY SECTION



NOTES:

1. The Roadway shall be built up from the native grade. Stormwater collection areas shall not be dug out, or below native grade.
2. Vegitation Plant Drought resistant, low growing grasses shall be planted in the stormwater collection area.

SUPER ROADWAY SECTION
Sta. -4+23.40 to Sta. -1+44.69



10/25/18

1-800-424-5555 CALL BEFORE YOU DIG

Western Pacific Engineering & Survey
A TERRA DEVELOPMENT SERVICES CORPORATION
1326 N. Kittitas Ave. Ellensburg, Washington
509/925-1830 FAX 509/925-1239
Surveying in Washington and Idaho

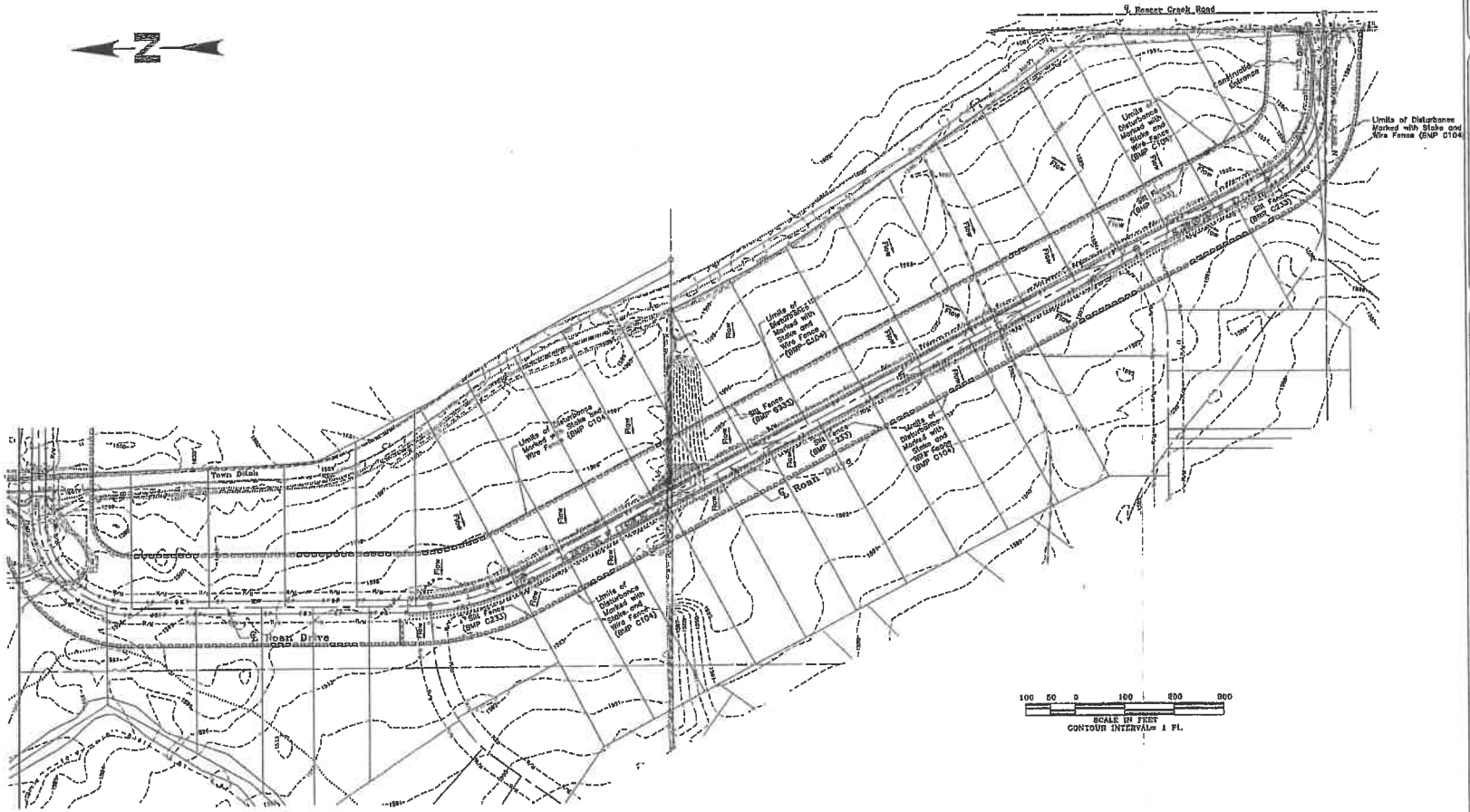
No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
ROAN DRIVE IMPROVEMENTS
Construction Details and Specifications
Ellensburg Washington

Designed by NDN
Drawn by Tml/JMB
Checked by NDN
Project No. 18419
Date: October 2018
Scale:
Hor. 1" = N/A
Vert. 1" = N/A
Sec 27, T 18 N, R 18 E

SHEET NO.
C2.1

181827



NOTES:

K Mark Clearing Limits

To protect and reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits that will be applied for this project include:
- Temporary property corners.
- High Visibility Plastic or Metal Fence (BMP C103)

K Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering State waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on the project:
- Stabilized Construction Entrance (BMP C105)

K Control Flow Rate

Due to all stormwater runoff being retained on site, there will be no flow control required.

K Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project include:
- Silt Fence (BMP C105) – locations outlined in Construction Drawing Sheet C3.2

K Stabilize Soils

Exposed and un-worked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:
- Mulching (BMP C121) – with gravel and rock
- Plastic Covering (BMP C123)
- Dust Control (BMP C140)

K Protect Slopes

All cut and fill slopes will be designed, constructed and protected in a manner that minimizes erosion. The following specific BMPs will be used to protect slopes for this project:
- Temporary and Permanent Seeding (BMP C120)
- Plastic Covering (BMP C123)

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

10/25/10

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1329 E. Hunter Place, Mount Vernon, Washington 98273 (360) 336-9363 FAX (360) 336-9363
Services in Washington and Idaho

No.	Revision	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
Best Management Practices Plan and Specifications

Skagit County Washington

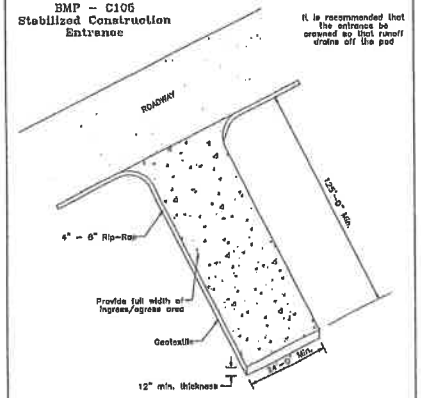
Designed by NDN
Drawn by Tml/AKG
Checked by NDN
Project No. 18413
Date: October 2010
Scale:
Hor. 1" = 100'
Vert. 1" = N/A
Sec 27, T 16 N, R 4 E

SHEET NO.
C3.1

161827

BMP – C106
Stabilized Construction Entrance

It is recommended that the entrance be crowned so that runoff drains off the pad



CONSTRUCTION ENTRANCE

WESTERN PACIFIC ENGINEERING & SURVEY

04/2018

E-1

8" – 16" precip – Loamy/Limited Rock Shrub-Steppe

Common Name	Botanical Name	Seeding Method		
		Hydro-Seed	Broadcast	Drill
Bluebunch Wheatgrass	Pseudoroegneria spicata	12	7	4
Bottlebrush Squirreltail	Elymus elymoides	2	2	1
Blt Squirreltail	Elymus multisetus	3	3	2
Idaho Fescue	Festuca idahoensis	1	3	1.5
Prairie Junegrass	Koeleria cristata		1	0.5
Sandberg Bluegrass	Poa secunda	1	2	1.5
Streambank Wheatgrass	Elymus lanceolatus ssp.	5	3	1.5
	Total Lbs./Acre	30	20	11

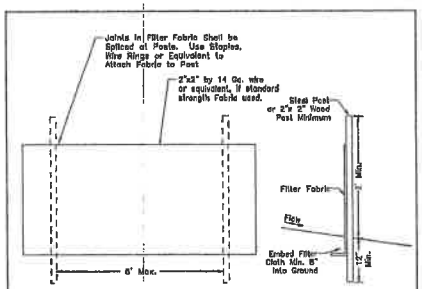
Gaura hirtiflora — *Lupinus albicaulis*
Spring application of wildflower to swales and other riparian areas

NATIVE SEEDING CHART

WESTERN PACIFIC ENGINEERING & SURVEY

07/2018

E-2



GEOTEXTILE STANDARDS

Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for silt film wovens (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve)
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric.
	100 lbs. Minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

NOTE:
Conforms to Eastern Washington Storm Water Manual BMP – C233 for a Silt Fence

SILT FENCE

WESTERN PACIFIC ENGINEERING & SURVEY

04/2018

E-3

10/23/18

D. HOFFINGER EXPIRES 9/29/2019 STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1329 E. Alder – P.O. Box 1223 Walla Walla, Washington
(509)529-1123 FAX(509)525-1228
Service in Washington and Idaho

No.	Revisions	Date	By

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 3
Best Management Practices
Details
Kittitas County Washington

Designed by NDN
Drawn by Tml/JAG
Checked by NDN
Project No. 18618
Date: October 2018
Scale:
Hor. 1" = N/A
Vert. 1" = N/A
Sec 27, T 16 N, R 18 E

SHEET NO.
C3.2

181827

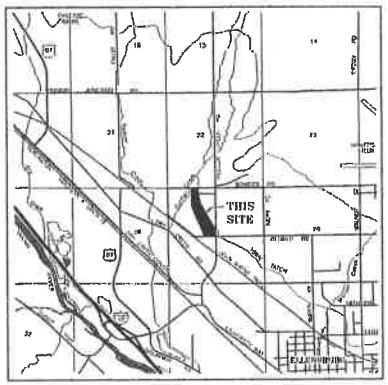
Plu -- Project Docs: Palomino Estate Plat - Ph 3 - Proj #s 18618\Engineering\Plans 2018\18618-Palomino Estate Plat-Ph3 17, 2018

PRIVATE ROAD NETWORK DRAWINGS FOR PALOMINO MAJOR PLAT, PHASE II

Prepared By

WESTERN PACIFIC ENGINEERING & SURVEY

VICINITY MAP



BENCH MARK LISTING

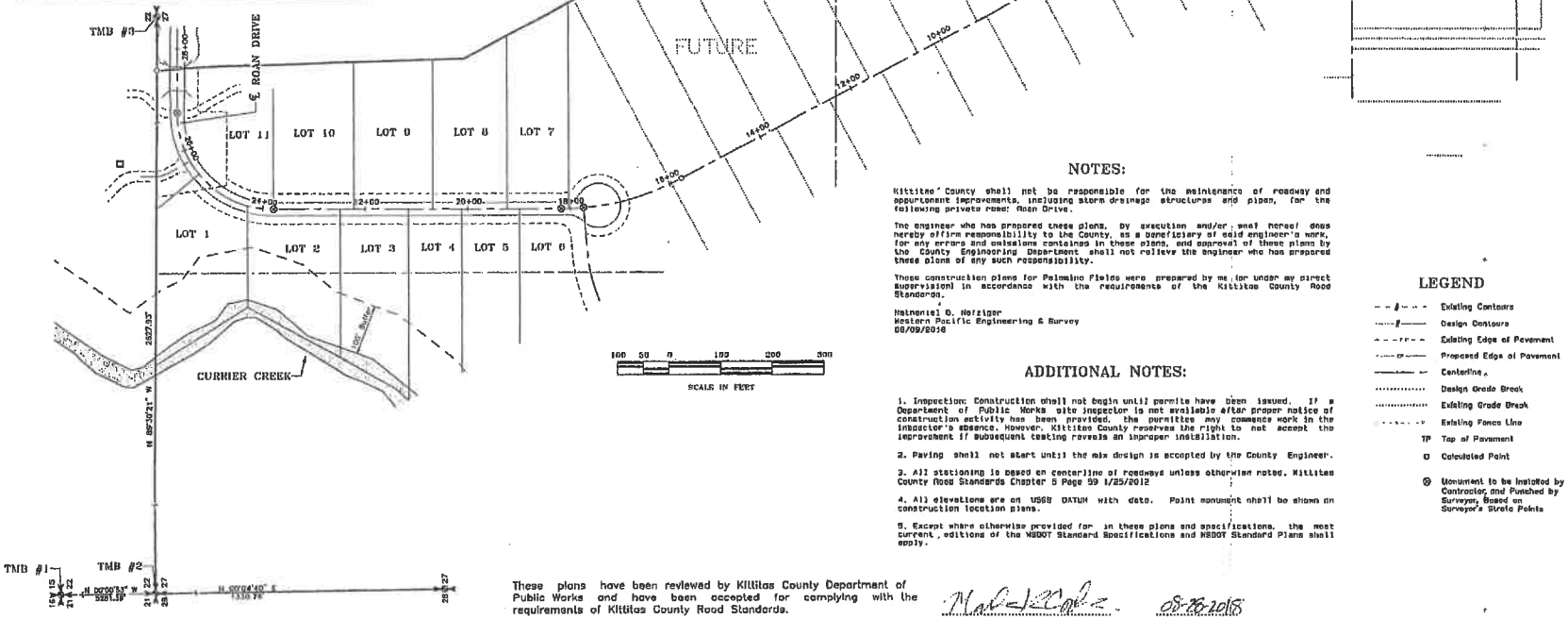
TBM#1 - Found monument marking the northwest corner of Section 22 (Elevation=1645.93)

TBM#2 - Found monument marking the southwest corner of Section 22 (Elevation=1986.32)

TBM#3 - Found monument marking the southeast corner of the southwest quarter of Section 22. (Elevation=1835.85)

SHEET INDEX

C1.0 Cover Sheet
C1.1 Plan and Profile Sta. 16+00 to Sta. 23+00
C1.2 Plan and Profile Sta. 18+00 to Sta. 27+50
C2.1 Construction Details and Specifications
C3.1 Best management Practices Plan & Details
C3.2 Best management Practices Plan & Specifications



NOTES:

Kittitas County shall not be responsible for the maintenance of roadway and appurtenant improvements, including storm drainage structures and pipes, for the following private road: Roan Drive.

The engineer who has prepared these plans, by execution and/or seal hereof does hereby affirm responsibility to the County, as a beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the County Engineering Department shall not relieve the engineer who has prepared these plans of any such responsibility.

These construction plans for Palomino Fields were prepared by me (or under my direct supervision) in accordance with the requirements of the Kittitas County Road Standards.

Nathaniel G. Metzger
Western Pacific Engineering & Survey
08/09/2018

ADDITIONAL NOTES:

1. Inspection: Construction shall not begin until permits have been issued. If a Department of Public Works site inspector is not available after proper notice of construction activity has been provided, the permittee may commence work in the inspector's absence. However, Kittitas County reserves the right to not accept the improvement if subsequent testing reveals an improper installation.

2. Paving shall not start until the mix design is accepted by the County Engineer.

3. All stationing is based on centerline of roadways unless otherwise noted. Kittitas County Road Standards Chapter 5 Page 99 1/25/2012

4. All elevations are on USGS DATUM with data. Point monument shall be shown on construction location plans.

5. Except where otherwise provided for in these plans and specifications, the most current, editions of the WSDOT Standard Specifications and WSDOT Standard Plans shall apply.

LEGEND

- Existing Contours
- Design Contours
- Existing Edge of Pavement
- Proposed Edge of Pavement
- Centerline
- Design Grade Break
- Existing Grade Break
- Existing Fence Line
- TP Top of Pavement
- Calculated Point
- Monument to be installed by Contractor, and Punched by Surveyor, Based on Surveyor's Strata Points

These plans have been reviewed by Kittitas County Department of Public Works and have been accepted for complying with the requirements of Kittitas County Road Standards.

County Engineer

08-26-2018
Date

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1324 E. Mountain View Ave. Ellensburg, Washington
(509)925-1415 FAX(509)925-1295

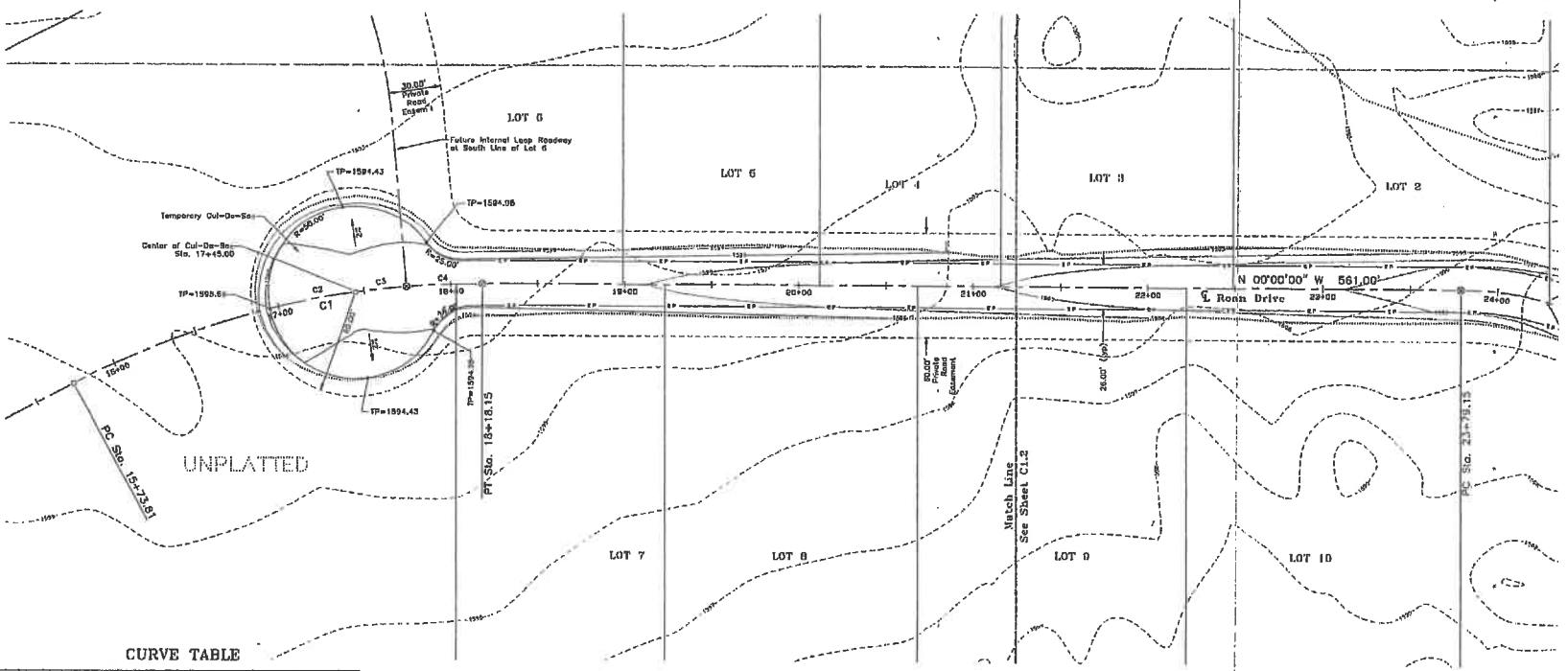
No.	Revision	Date	By
01	County Review Comments	05/18	NDN
02	County Review Comments - 2	05/18	NDN

LCU, INC.
PALOMINO MAJOR PLAT, PHASE II
ROAN DRIVE IMPROVEMENTS
Cover Sheet
Kittitas County Washington

Designed by NDN
Drawn by NDN/AAG
Checked by NDN
Project No. 18018
Date: July 2018
Scale:
Hor. 1" = 100'
Vert. 1" = N/A
Sec 27, T 18 N, R 18 E

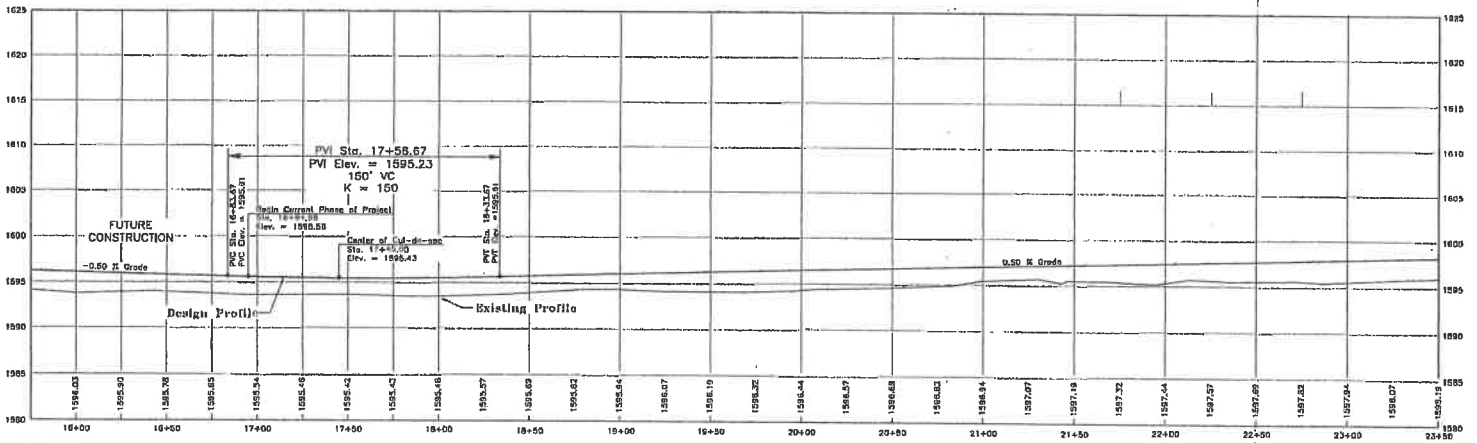
SHEET NO.
C1.0

181027



CURVE TABLE

LINE	DELTA	RADIUS	ARC	CHORD BEARING	CHORD	TANGENT
C1	26°00'00"	500.00'	244.35'	N 14°00'00" W	242.02'	124.68'
C2	19°37'03"	500.00'	171.19	N 16°11'29" W	170.36'	86.44'
C3	03°22'57"	500.00'	29.52'	N 06°41'29" W	29.51'	14.76'
C4	05°00'00"	500.00'	43.63'	N 02°30'00" W	43.62'	21.83'
C5	90°29'39"	197.04'	295.61'	N 48°14'48" E	265.68'	188.66'



B-28-18

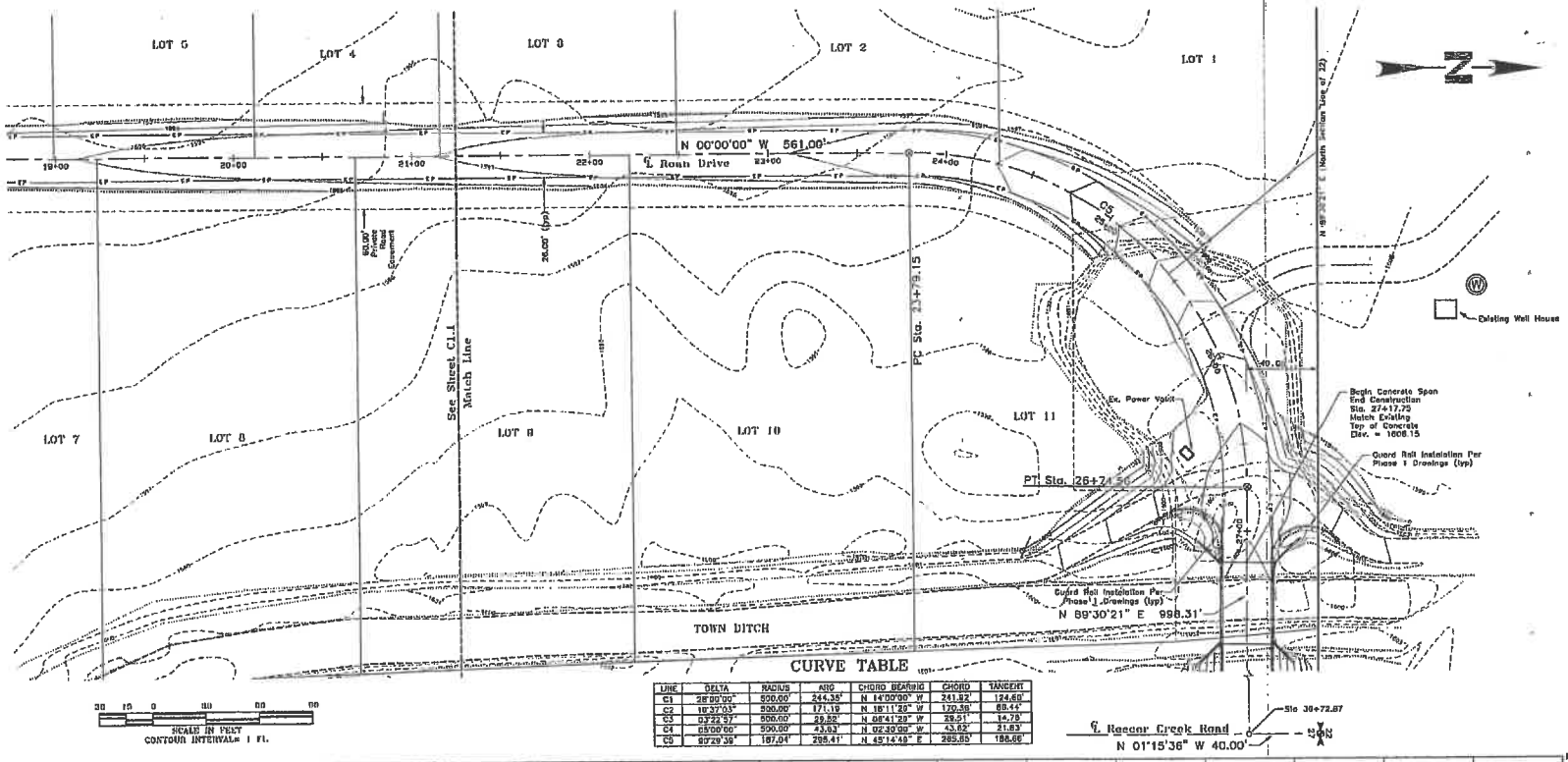
WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1329 E. Hunter Place, Mount Vernon, Washington
Phone: (360) 336-3284
Surveyors in Washington and Idaho

No.	Revisions	Date	By
01	County Review Comments	05/18	NDM
02	County Review Comments	05/18	NDM

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 2
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. 16+00 to Sta. 23+00
Whidbey Island
Skagit County

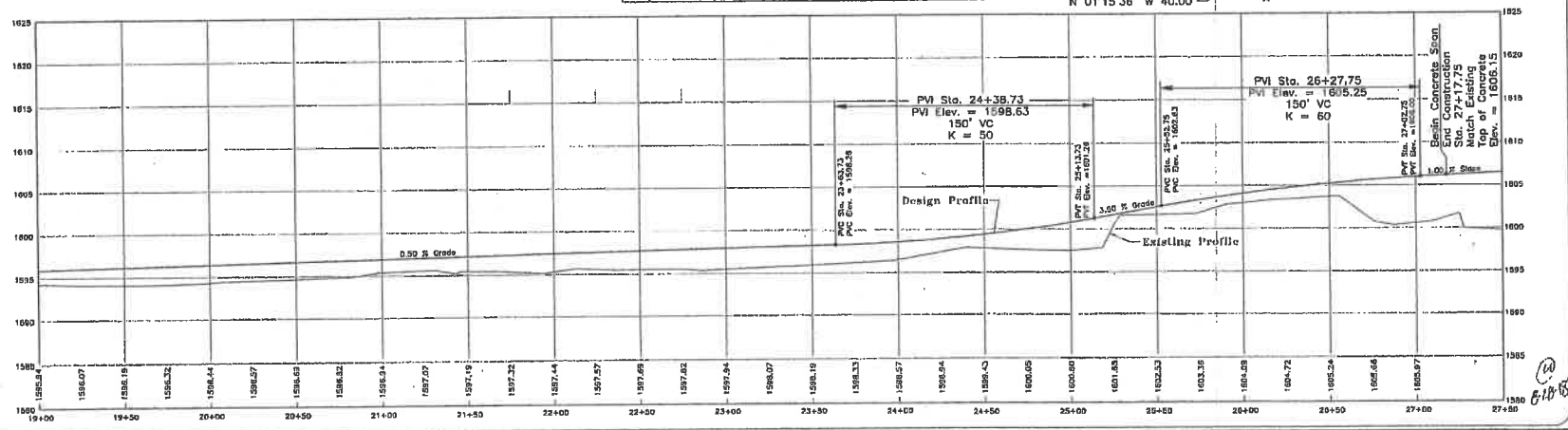
Designed by NDM
Drawn by Tmk/NDM
Checked by NDM
Project No. 161627
Date: April 2018
Scales:
Horz. 1" = 50'
Vert. 1" = 5'
Sec 27, T 16 N, R 1E E

SHEET NO.
C1.1
161627



CURVE TABLE

LINE	DELTA	RADIUS	ARC	CHORD BEARING	CHORD	TANGENT
C1	28°00'00"	500.00'	244.35'	N 14°00'00" W	241.92'	124.69'
C2	19°37'03"	500.00'	171.19	N 18°11'28" W	170.36'	86.44'
C3	03°22'57"	500.00'	29.52'	N 08°41'28" W	29.51'	14.76'
C4	05°00'00"	500.00'	43.63'	N 02°30'00" W	43.62'	21.83'
C5	89°29'36"	187.04'	292.41'	N 45°15'48" E	263.55'	186.66'



WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1326 E. Hunter Place, Moses Lake, Washington
P.(509)765-1623 F.(509)765-7296

No.	Revision	Date	By
02	County Review Comments - 2	05/18	MDN
01	County Review Comments	05/18	MDN

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 2
ROAN DRIVE IMPROVEMENTS
Plan and Profile Sta. 19+00 to Sta. 27+50
Kittitas County Washington

Designed by MDN
Drawn by Tml/MDN
Checked by MDN
Project No. 10413
Date: April 2018
Scales:
Hor. 1" = 20'
Vert. 1" = 4'
Sec 27, T 18 N, R 18 E

SHEET NO.
C1.2

181827

GENERAL SPECIFICATIONS

The Washington State Department of Transportation "Standard Specifications for Road, Bridge and Municipal Construction" 2010 Edition as amended by the APWA and the Kittitas County Public Works Road Standards, and referred to as the "Standard Specifications", are hereby part of the contract including these contract plans shall be brought to the attention of Western Pacific Engineering & Survey, Inc. and the Kittitas County Public Works, prior to construction. During the performance of the work, if the contractor discovers any conflict, error, ambiguity, or discrepancy within the contract plans, contractor shall report it immediately, in writing, to Western Pacific Engineering & Survey, Inc., and to the responsible agency's designated engineer. The Standard Specifications can be obtained at the following web sites:

http://www.wsdot.wa.gov/publications/manuals/
https://www.co.kittitas.wa.us/public-works/development

Responsible Agencies:

Evergreen Valley Utilities:
All water mains and lines.

Kittitas County Public Works:
All roadways from the existing edge of pavement and all other utility work within the County Road Right of Way.

Kittitas County Building Department:
All other aspects of construction.

Prior to the start of construction, a pre-construction conference shall be scheduled with the contractor, the developer's design engineer, city personnel and any affected utilities and agencies.

Special Provisions:

The following special provisions and responsible agency standards amend the Standard Specifications. The contractor shall do all work in accordance with the contract plans, these special provisions, responsible agency standards, and the Standard Specifications.

1-05.4 Conformity With and Deviations from Plans:

Construction staking shall be performed under the direct supervision of a licensed Professional Surveyor. A copy of the staking notes will be provided to the responsible agency.

The Contractor shall keep the surveyor informed of their staking requirements far enough in advance of the time when the stakes will be required to provide a reasonable amount of time to set the stakes. Requests for stakes shall be made at least two working days prior to the need to commence staking operations. The request shall include the offset distance and direction.

As-Constructed Drawings shall be prepared and submitted to the Kittitas County Engineer by the Design Engineer upon completion of the construction.

1-08.1 Approval of Materials:

Delete the first paragraph and replace with the following: The Contractor shall submit a written list of all materials to the design engineer prior to construction. Submittals for all non-standard materials used in the project shall be reviewed and approved by the governing agency prior to use. The contractor shall provide materials submitted for all non-standard materials to the respective agencies. All materials shall be approved by the design engineer and the agency prior to the start of construction.

1-06.2(1) Samples and Tests for Acceptance:

Modify the section as follows: The word Engineer or Project engineer shall refer to the owner and their designated inspector.

Special inspection shall be as follows, unless modified by the design engineer due to field conditions.

1. Soil subgrade shall be randomly tested for compaction with a minimum of one test per 10,000 square feet but no less than three tests in any given area.
2. Embankment and trench backfill shall be randomly tested for compaction on every four feet of lift.
3. Each layer of rock base shall be randomly tested for compaction with a minimum of one test per 10,000 square feet but no less than three tests in any given area.
4. Each layer of asphalt shall be randomly tested for compaction with a minimum of one test per 5,000 square feet but no less than three tests in any given area.
5. Soil subgrade on roadways shall be randomly tested for compaction with a minimum of three tests per each five hundred feet of roadway.
6. Concrete pavements shall have a minimum compressive strength at 28 days of 4000 psi. One set of four cylinders shall be cast for every 100 cubic yards of concrete poured per day. Individual concrete slabs, walkways and pads containing less than 1.5 cubic yards or of concrete need not be tested.

1-07.1 Laws to be Observed:

This Section is supplemented by adding the following:

Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. All persons on the site or who may be affected by the work;
2. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3. Other property at site or adjacent thereto.

Contractor shall comply with all applicable laws and regulations related to the safety of persons or property including WISHA and OSHA regulations.

It is the responsibility of the Contractor to obtain all necessary permits and pay all associated fees to perform the work required by these plans.

1-07.1 Laws to be Observed Continued:

Before commencing construction, the contractor must have a Kittitas County Construction bond in the amount of 130 percent of the estimated construction costs. When a letter of escrow or cash is used, the amount covered shall be for 110 percent of the estimated construction costs as reviewed by the Public Works Director.

Construction Permit: Prior to construction the contractor shall obtain the permit and pay to Kittitas County a fee as required.

1-07.16 Protection and Restoration of Property:

This Section is supplemented by adding the following: If any unknown subsurface structures are encountered during construction, they shall immediately be brought to the attention of the owner and prior to proceeding further with the work, protective measures shall be taken by the contractor to protect adjacent properties, public and private, at all times during construction. The contractor shall take all necessary precautions to control dust to meet the requirements of the responsible agency. Hydrant meter, irrigation equipment and any fees are the responsibility of the contractor.

All disturbed soils areas within the clearing limits shall be covered with a minimum of 4" of stockpiled strippings and seeded with native grass seed as per the table located on sheet CD.6

1-07.17 Utilities and Similar Facilities:

This Section is supplemented by adding the following: The contractor shall be responsible for verifying the location, dimension and depth of all existing utilities prior to construction, whether shown on the contract plans or not. Locations of said utilities as shown on the contract plans are based upon the best-known records available and are subject to a degree of unknown variation. If conflict should occur, the contractor shall immediately advise the design engineer to prepare a design revision. Approval of the design revision from the engineer and design engineer shall be obtained prior to processing with construction. It is the contractor's responsibility to notify the appropriate utilities involved prior to the start of any excavation. Call 811 for utility locates two working days prior to excavation. The contractor shall make all necessary arrangements, for construction of utilities shown on the contract plans and/or indicated in the contract document, with the serving utility. The contractor shall perform all work and shall furnish and install all materials as required by the utility. In cases where the serving utility furnishes materials and/or installs some components, the contractor shall furnish and/or install all other items of work not provided by the utility that are necessary for a complete and functioning utility system.

1-08.0 Preparation and Progress; Preliminary Matters:

This Section is supplemented with the following: The contractor shall have and maintain on the job site during the performance of the work complete sets or copies of the following documents:

1. Contract plans which have been signature approved by the Engineer;
2. Responsible agency standards applicable to the construction operations; and
3. One set of record drawings

All work shall be constructed according to the approved contract plans and standard specifications. Any deviation from the approved contract plans will require written approval from the engineer. The contractor shall keep and maintain on the site one set of record drawings. The contractor shall mark on the record drawings all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original contract plans. When construction is complete, the record drawings shall be submitted to the design engineer for use in preparing permanent record drawings.

The contractor shall obtain and have available, copies of the applicable responsible agency standards at the job site during the related construction operations.

2-01 Clearing, Grubbing and Roadside Cleanup:

The description shall be supplemented as follows: clearing, grubbing, stripping and cleanup shall be performed in accordance with 2-01 within the following limits: to the limits shown on Sheets 3.1 and 3.1. Clearing - prior to the start of any earthwork, all existing vegetation, debris, rubble, asphalt pavement, etc., shall be removed from the project area and disposed of at an approved waste site secured by the contractor. Excavation and grading outside of the right-of-way shall comply with the current edition of the International Building Code. All slopes shall be a maximum of 2 horizontal to 1 vertical (2H:1V unless otherwise noted on the contract plans.

2-01.3(2) Disposal Method No. 2 - Waste Site:

Supplement the following to Section 2-01.3(2): The contracting agency provides no waste site to the contractor.

2-03 Excavation and Embankment:

This Section is revised and supplemented by the following: Prior to any excavation, including trenching, strip the topsoil as provided in section 2-01. The subgrade for embankments shall be prepared by stripping topsoil as provided in Section 2-01 and then compact (proof roll) the subgrade to at least 90 percent of the maximum density. Embankment material shall be native soils less than 12" in greatest diameter.

Compaction - All materials and layers shall be placed and compacted to 95% in loose layers not exceeding eight inches in thickness. The contractor shall be responsible for importing and/or exporting all materials as required to construct the earthwork and surfacing to the lines and grades shown on the approved contract plans. In areas of proposed landscaping, compaction need not exceed 90%.

2-03.3(7) Disposal of Surplus Materials:

Supplement the following: Excess native soils may be placed on the surrounding lots.

Excess native strippings may be placed on the site as shown as discussed herein. Excess strippings beyond what can be placed on site shall be removed from the project site.

2-03.3(14)D Compaction and Moisture Control Tests:

This Section is replaced with the following: Materials with 35 percent or more retained on the No. 4 sieve shall be determined by the WSDOT Test Method T606. This variation does not modify standard testing procedures that are defined by WSDOT or AASHTO. Maximum density and optimum moisture for materials of 35 percent or less retained on the No. 4 sieve shall be determined by the ASTM D1557 test method for maximum density/optimum moisture. The contractor shall provide all necessary excavation, vibratory compaction equipment, and labor to facilitate the taking compaction tests. The contractor shall provide all necessary test pits and additional work as directed by the owners representative. The contractor shall provide the responsible agency an opportunity to be present during compaction testing. All compaction results shall be with referral to required maximum densities.

4-04.3(9) Shaping and Compaction:

Replace the first sentence of the first paragraph with the following: Immediately following spreading and final shaping, each layer of surfacing shall be compacted at least 95 percent of the density determined by the control tests. In areas of proposed landscaping, compaction need not exceed 90%.

5-04.3(9) A Preparation of Existing Surfaces:

Add the following: A tack coat shall be applied to all asphalt edges to which bituminous surface treatment is to be applied.

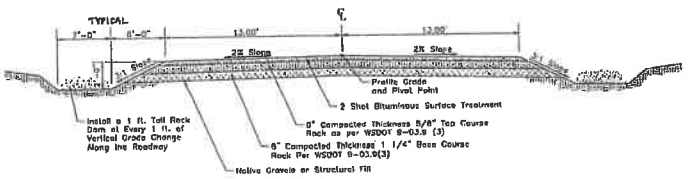
5-02.3(6) C and 5-04.3(6)D Soil Residual Herbicide:

Soil sterilization shall be applied in areas to be paved. Keep 2-foot minimum clear of existing and proposed landscape areas. Apply at manufacture's recommended rate to assure 3-inches minimum penetration.

5-04.3(13) Surface Smoothness:

Add the following: Ponding or "birdbaths" exceeding one quarter inch in depth in surfaced areas shall not be acceptable and shall be accepted by the contractor.

ROADWAY SECTION



NOTES:

1. The Roadway shall be built up from the native grade. Stormwater collection areas shall not be dug out, or below native grade.
2. Vegitation Plant Drought resistant, low growing grasses shall be planted in the stormwater collection areas.

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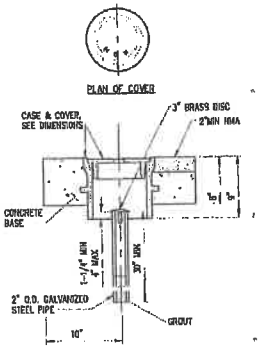
CALL BEFORE YOU DIG



NOTES:

1. Refer to Kittitas County Standard Plan for Survey Monuments.
2. Brass disce shall be set by a professional land surveyor liscensed by the State of Washington and shall bear the liscense number of the land surveyor responsible for setting the monument.
3. Monument case and cover shall be cast from ASTH A48 Class 30.
4. Legend cover shall be 1/8" raised integrally cast 1" letter height with a min face width of 3/16".
5. The brass disc shall be oriented so it can be read if the observer is facing north.

MONUMENT

WESTERN PACIFIC ENGINEERING & SURVEY	06/2016 B

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
Civil Engineering Land Surveying Land Development
1326 S. Mission Street Wenatchee, WA 98801
P(509)667-1023 F(509)783-1236
Services in Washington and Idaho

No.	Revisions	Date	By
02	County Review Comments - 2	06/16	NBN
01	County Review Comments	03/16	NBN

LCU, INC.
PALOMINO MAJOR PLAT, PHASE 2
ROAN DRIVE IMPROVEMENTS
Construction Details and Specifications
Kittitas County Washington

Designed by NBN
Drawn by Tml/DNG
Checked by NBN
Project No. 10418
Date April 2016
Scales
Hor. 1" = N/A
Vert. 1" = N/A
Sec 27, T 18 N, R 18 E

SHEET NO.
C2.1

161027