ASH & WARD COULEE WATERSHED

For

City of Bismarck, ND

STORMWATER MASTER PLAN EXECUTIVE SUMMARY

August 2015

AE2S Project #: *P00501-2013-006*

EXECUTIVE SUMMARY

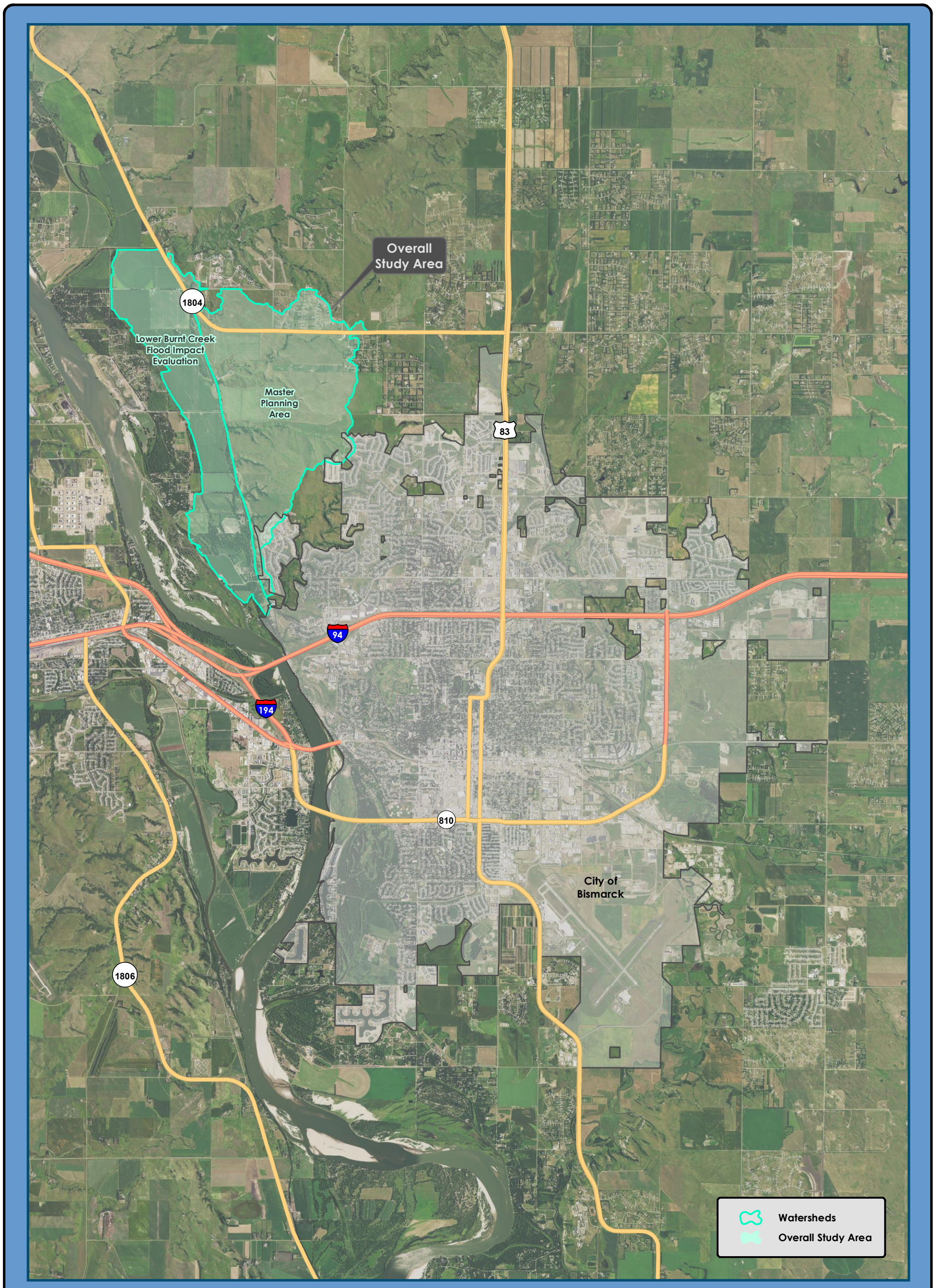
Project Background

The City of Bismarck is experiencing growth, with development pressure generally expanding to the north. The focus of this stormwater master plan is the Ash & Ward Coulee Watershed located generally east of River Road, south of North Dakota State Highway 1804 (ND 1804), north of the Tyler Coulee Watershed, and west of the N. Washington Street Watershed (***Figure ES-1, Figure 1-1*** in main report). This watershed consists of six coulees, and encompasses an area of approximately 3.9 square miles. For the purposes of this study, the coulees are numbered one to six from north to south (***Figure ES-2, Figure 1-2*** in main report).

The Ash & Ward Coulee Watershed is tributary to Lower Burnt Creek, which is the reach of Burnt Creek that remained after the Burnt Creek Bypass Channel was constructed in the late 1990's. Lower Burnt Creek has a local contributing watershed of approximately 6.7 square miles that includes the Ash & Ward Coulee Master Plan area, but also receives a small fraction of Burnt Creek flow that discharges into Lower Burnt Creek at the upstream end of the Bypass Channel at ND 1804. The Ash & Ward Coulee Watershed discharges into Lower Burnt Creek through culvert crossings installed under River Road at the mouth of each of the six coulees previously mentioned.

As the watershed urbanizes to the anticipated full build-out land use shown in ***Figure ES-3*** (***Figure 2-2*** in main report), increased stormwater runoff can lead to local flooding and degradation of water quality without proper stormwater management facilities. The City's general policy is to develop regional stormwater master plans prior to areas developing. The overall goal of a stormwater master plan is to outline the key stormwater and drainage infrastructure that will be needed to provide the appropriate level of service for roadways, meet the City's stormwater management ordinance and design criteria, and address project specific considerations such as the potential for impacts to downstream property. This Master Plan was developed to act as a stormwater management and drainage guide for the City, landowners, developers, and associated stakeholders as the Ash & Ward Coulee Watershed develops. The scope of this study also includes an evaluation of the conditions within the Lower Burnt Creek Watershed to determine the performance of the proposed stormwater and drainage improvements as they relate to mitigating the potential impacts to Lower Burnt Creek from development of the Ash & Ward Coulee Watershed.

The Ash and Ward Coulee Watershed has the additional challenge of having steep coulees throughout the study area and the Missouri River bluffs located east of River Road. Past experiences by the City and County have indicated that geotechnical stability in these areas can be challenging and that managing development and surface and groundwater in these areas is critical to limiting the risk of large slope failures. For this reason, a preliminary geotechnical evaluation was included in this Stormwater Master Plan.



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0 3,000 6,000 Feet

1 inch = 6,000 feet

Locator Map Not to Scale

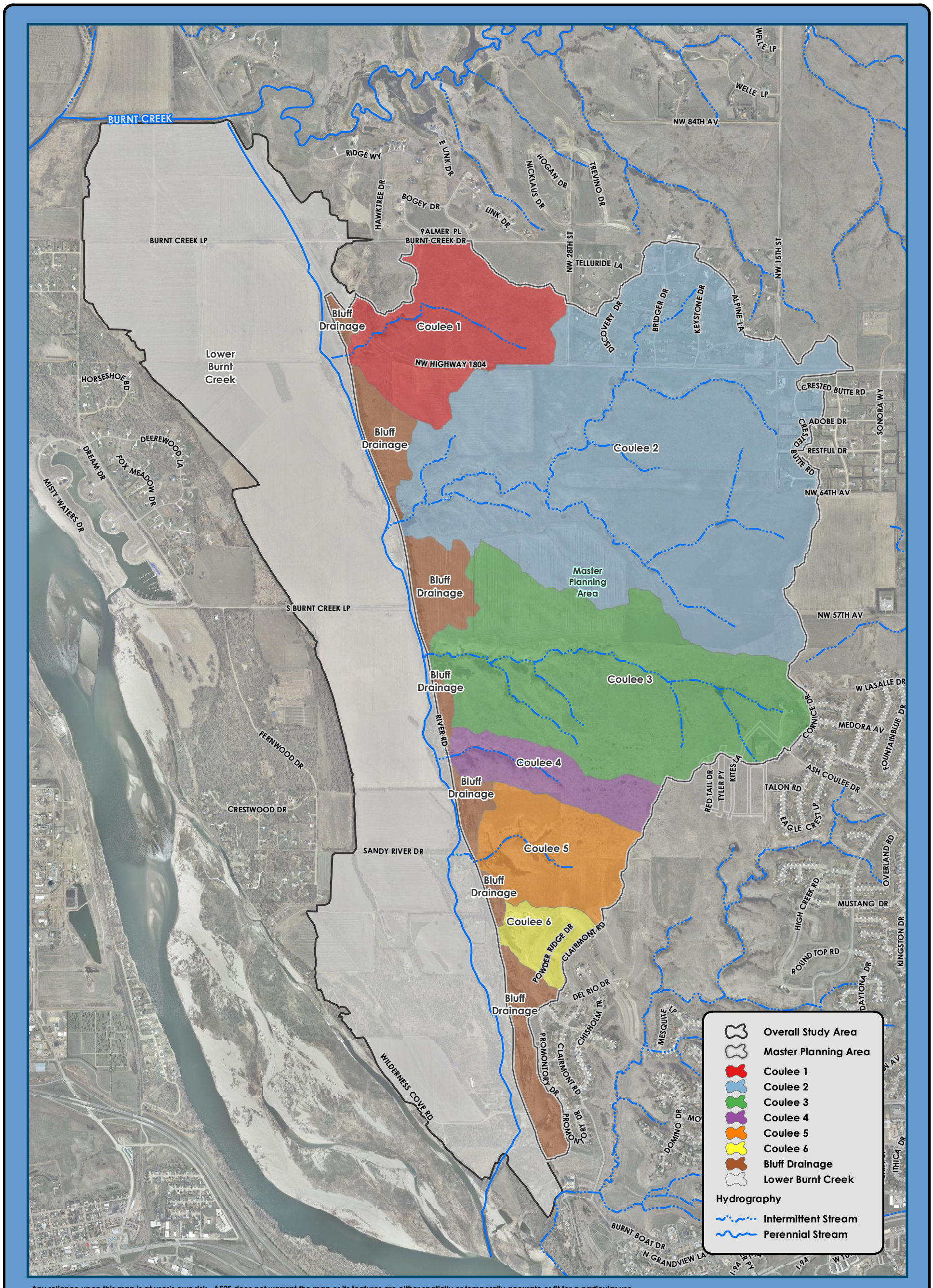
Figure ES-1:
(Figure 1-1 In Main Report)
Project Location Map

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

AE2S
Advanced Engineering and Environmental Services, Inc.

Date: 8/13/2015 | Coordinate System: North Dakota State Plane South

C:\Data\Projects\City of Bismarck\P00501-2013-06 Ash and Ward Coulees\Report Figure ES-1 Project Location Map.mxd | Edited by: DYL



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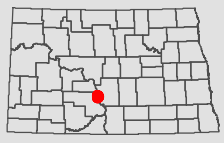

Locator Map Not to Scale

Figure ES-2:
(Figure 1-2 In Main Report)
Watershed Map

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

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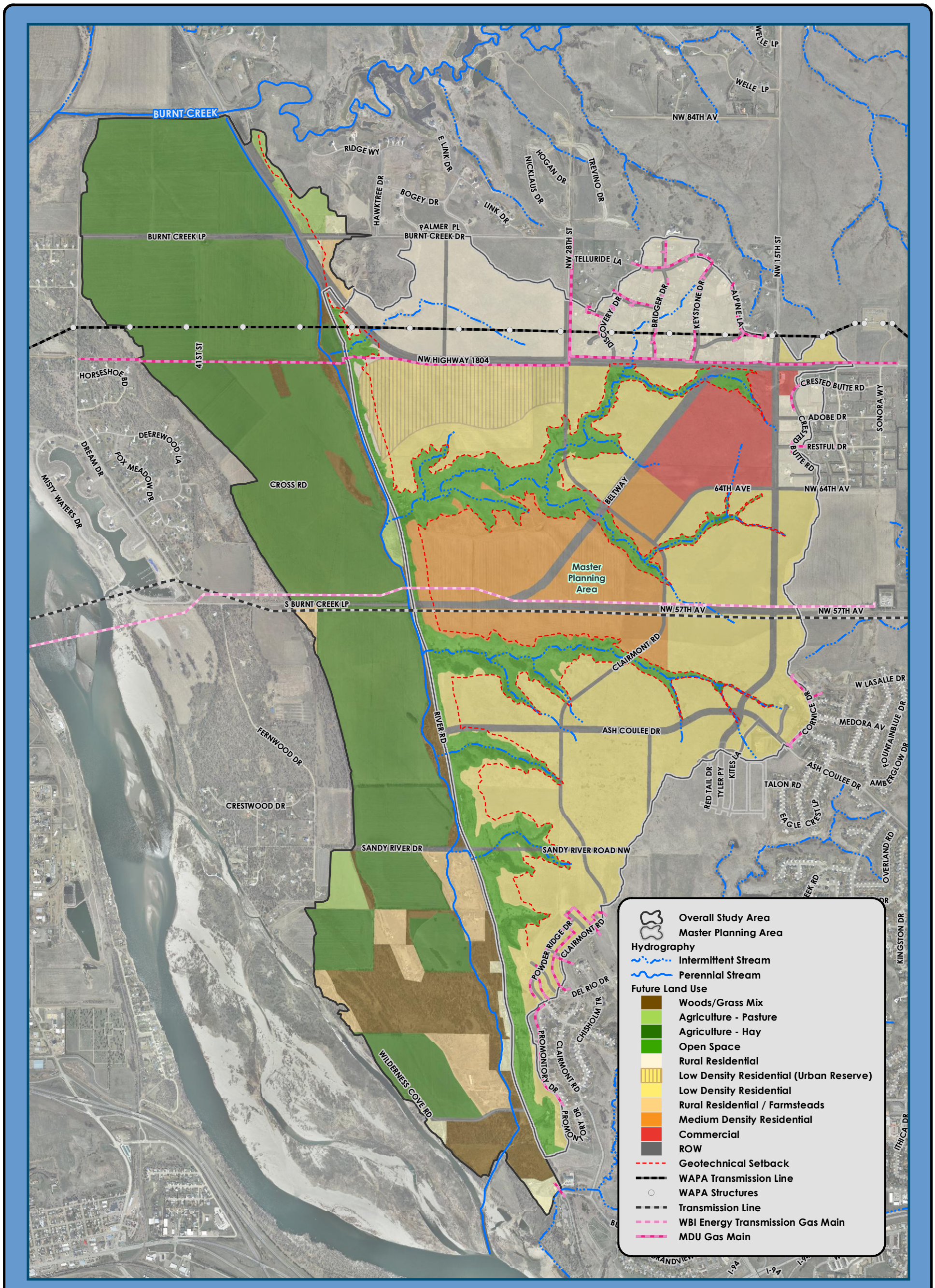

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Locator Map Not to Scale

Figure ES-3:
(Figure 2-2 In Main Report)
Future Land Use

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

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C:\Data\Projects\City of Bismarck\P00501-2013-06 Ash and Ward Coulees\Report Figure ES-3 Future Land Use.mxd | Edited by: DYL

Master Plan

Geotechnical Considerations

A preliminary Geotechnical Setback was established as part of this Stormwater Master Plan that is shown in ***Figure ES-3***. The Master Plan recommendation is that future development or stormwater facilities within the footprint of the geotechnical setback line should not be planned unless a detailed, site-specific geotechnical analysis has been conducted. Additional detail on the methods and analysis to support the preliminary Geotechnical Setback Line are contained in ***Section 3*** and ***Appendix A*** of the main report.

The coulee valleys are also susceptible to erosion caused by channelized flow and steep gradients. Shear stress potential was evaluated throughout the coulees and a Coulee Stability BMP Toolbox was developed (***Appendix C*** of the main report). This toolbox was developed to assist professionals working in the City of Bismarck in the selection of surface stabilization measures and represents a number of common components for inclusion in site designs. This information is not intended as a substitute for detailed site investigation, design and installation, nor is it meant to exclude other approaches that may be appropriate. Specific stabilization practices should be individually designed and selected by a professional after a thorough site investigation and analysis has been performed.

Stormwater Management

The City of Bismarck Code of Ordinances requires that increased stormwater runoff from development be controlled such that post-development runoff rates for the 2-year, 10-year, and 100-year rainfall events match existing runoff rates and that water quality treatment be provided such that the City's MS4 permit requirements are met. In addition, because of ongoing concerns about flooding along Lower Burnt Creek, the City instituted an additional goal that the Master Plan maintain or reduce flooding potential under full build-out land use conditions within the Ash & Ward Coulee watershed compared to the flooding potential under existing land use conditions.

The City typically utilizes a regional management approach for meeting these stormwater management requirements wherein stormwater management features are constructed, owned and maintained by the City and construction costs are assessed to benefited properties within the watershed. Two stormwater management approaches were evaluated for this study, which are summarized as the Master Plan and Alternative Plan in the main report. The City Work Group selected a stormwater master plan that meets the City's requirements described above through:

- Providing approximately 151 acre-feet total of new detention storage through the use of fifteen "valley storage" detention facilities distributed throughout Coulees 1 through 5 (***Table ES-1***, ***Table 7-1*** in main report):
- Incorporating an existing regional detention basin within the Ashwood Subdivision (immediately north of ND1804 between Discovery Drive and Bridger Drive);
- Maintaining coulee valley storage upstream of proposed road crossings that meet State Stream Crossing criteria;

- Requiring areas that cannot be feasibly drained to a regional detention facility, such as Coulee 6 and the areas along the Missouri River bluff, to provide on-site detention located outside of the geotechnical setback that meets the City ordinances for both peak discharge control and water quality treatmentIn,; and
- Providing minor culvert improvements at select locations along Lower Burnt Creek such that the Master Plan conditions create similar peak flood levels along Lower Burnt Creek compared to existing conditions.

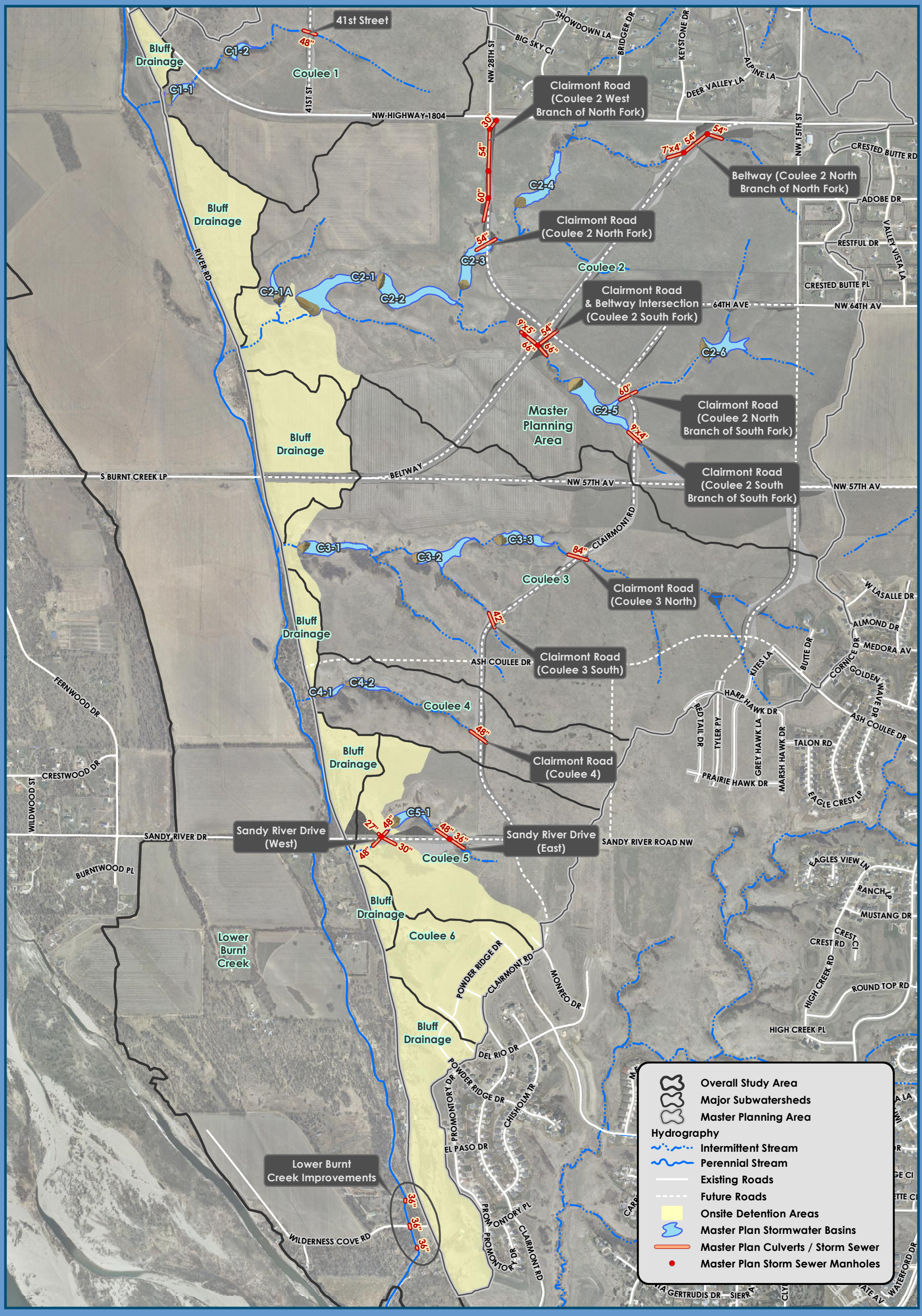
The Master Plan improvements are illustrated in ***Figure ES-4*** (***Figure 7-1*** in the main report).

In addition to the Master Plan improvements, the study also recommends that the County improve several of the River Road crossings in order to reduce the overtopping frequency to an acceptable level (***Section 7.2.2*** in the main report).

Table ES-1: Summary of Master Plan Detention Basin

Basin Name	Basin Type	Maximum Storage1 (acre-feet)	Maximum Area[1] / Easement Area[2] (acres)	Bottom Elevation (NAVD 88)	Overflow Elevation (NAVD 88)
C1-1	Valley	4.6	0.93 / 1.07	1647	1659
C1-2	Valley	2.9	0.62 / 0.7	1684	1694.5
C2-1	Valley	17.7	4.24 / 4.67	1664	1673
C2-1A	Valley	3.3	0.68 / 0.75	1668	1681
C2-2	Valley	13.5	3.71 / 4.13	1678	1688
C2-3	Valley	10.7	1.78 / 1.92	1697	1710.5
C2-4	Valley	17.4	2.54 / 2.78	1732	1750
C2-5	Valley	17.2	3.91 / 4.29	1752	1767
C2-6	Valley	12.2	2.12 / 2.33	1803	1817
C3-1	Valley	11.1	2.26 / 2.5	1644	1662.5
C3-2	Valley	10.8	2.44 / 2.7	1684	1698.5
C3-3	Valley	12.9	1.88 / 2.07	1714	1732.5
C4-1	Valley	3.2	0.5 / 0.54	1646	1663
C4-2	Valley	6.7	0.89 / 0.93	1671	1688.5
C5-1	Valley	6.7	1.07 / 1.17	1682	1699
Total	**N/A**	**150.9**	**29.57 / 32.55**	**N/A**	**N/A**

1 – Maximum Storage and Maximum Area are based on the overflow elevation.
2 – Easement Area is based on the higher of the 6-hr, 100-yr event elevation plus one foot or the emergency overflow elevation.



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Locator Map Not to Scale

Figure ES-4:
(Figure 7-1 In Main Report)
Master Plan

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

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C:\Data\Projects\City of Bismarck\P00501-2013-06 Ash and Ward Coulees\Report Figure ES-4 Master Plan.mxd | Edited by: DYL

Opinion of Probable Costs

Opinions of probable costs were developed for each of the regional facilities incorporated into the Master Plan (***Exhibits***, included in this Executive Summary and in main report). Unit rates were developed based on review of local bids, NDDOT bid data, and material costs obtained directly from suppliers. The opinion of probable costs shown in ***Table ES-2*** (***Table 8-1*** in main report) does not include land acquisition costs since all facilities are located in the coulee valleys within the geotechnical setback area. Additionally, there will be regional costs associated with stabilizing the main coulees that are not included in the opinions of probable cost. The exact costs are difficult to estimate since stabilization within specific areas is dependent on a detailed investigation of the local vegetation type and cover, soils, and hydraulic properties. A detailed analysis was not within the scope of this study so specific costs for coulee stabilization have not been developed.

Based on input from the City Work Group, the assessment costs for the Master Plan improvements were allocated by each coulee, as shown in ***Table ES-3*** (***Table 8-3*** in main report). Areas that are required to institute on-site detention were not included as assessable acreage. Actual assessment areas and costs will be based on final design and construction costs.

Conclusions

An implementation plan has been developed for this Master Plan to balance capital outlays with proposed development patterns. The key trigger for construction of a particular regional facility is when development within the direct contributing area for a regional facility occurs. The proposed implementation plan for the Master Plan is shown on ***Figure ES-5*** (***Figure 8-1*** in main report).

This Master Plan meets the City requirements for stormwater management given the proposed land use currently adopted by the City. Modifications of the proposed land use plan will necessitate review of this Master Plan.

Table ES-2: Summary of Opinion of Probable Costs

Coulee and Facility Name	Facility Type	Opinion of Probable Cost[1]
Coulee 1		***$1,126,545***
C1-1	Regional Detention	$598,650
C1-2	Regional Detention	$403,050
41st Street	Road Crossing	$124,845
Coulee 2		***$8,584,250***
C2-1	Regional Detention	$1,386,600
C2-1A	Regional Detention	$427,200
C2-2	Regional Detention	$567,750
C2-3	Regional Detention	$479,850
C2-4	Regional Detention	$550,050
C2-5	Regional Detention	$608,100
C2-6	Regional Detention	$986,100
Beltway - North Branch of North Fork	Road Crossing	$858,545
Clairmont Road - West Branch of North Fork	Road Crossing	$1,073,870
Clairmont Road - North Fork	Road Crossing	$220,110
Clairmont Road & Beltway Intersection - South Fork	Road Crossing	$796,775
Clairmont Road - North Branch of South Fork	Road Crossing	$203,145
Clairmont Road - South Branch of South Fork	Road Crossing	$426,155
Coulee 3		***$2,766,310***
C3-1	Regional Detention	$853,950
C3-2	Regional Detention	$610,650
C3-3	Regional Detention	$810,450
Clairmont Road - North	Road Crossing	$372,940
Clairmont Road - South	Road Crossing	$118,320
Coulee 4		***$1,108,895***
C4-1	Regional Detention	$508,950
C4-2	Regional Detention	$433,050
Clairmont Road	Road Crossing	$166,895
Coulee 5		***$1,250,585***
C5-1	Regional Detention	$642,600
Sandy River Drive - East	Road Crossing	$302,470
Sandy River Drive - West	Road Crossing	$305,515
Lower Burnt Creek		***$47,705***
Lower Burnt Creek Culvert Improvements	Culvert Improvements	$47,705
Grand Total		**$14,884,290**

[1] Includes a 15% estimating contingency and 30% for Engineering and Administration. Costs do not include any land or easement acquisition.

Table ES-3: Assessment for Master Plan Improvements

Land Use	Asseable Acres	Factor	Equivalent Residential Acres	% Total Equivalent Residential Acres	Master Plan Total Cost	Cost Per Assessable Acre
Coulee 1						
Residential	188	1	188	100%	$1,126,545	$5,992
Non-Residential	0	2	0	0%	$0	$0
Total	**188**		**188**	**100%**	**$1,126,545**	
Coulee 2						
Residential	739	1	739	76%	$6,497,817	$8,793
Non-Residential	119	2	237	24%	$2,086,433	$17,585
Total	**858**		**976**	**100%**	**$8,584,250**	
Coulee 3						
Residential	416	1	416	100%	$2,766,310	$6,653
Non-Residential	0	2	0	0%	$0	$0
Total	**416**		**416**	**100%**	**$2,766,310**	
Coulee 4						
Residential	77	1	77	100%	$1,108,895	$14,439
Non-Residential	0	2	0	0%	$0	$0
Total	**77**		**77**	**100%**	**$1,108,895**	
Coulee 5						
Residential	76	1	76	100%	$1,250,585	$16,520
Non-Residential	0	2	0	0%	$0	$0
Total	**76**		**76**	**100%**	**$1,250,585**	

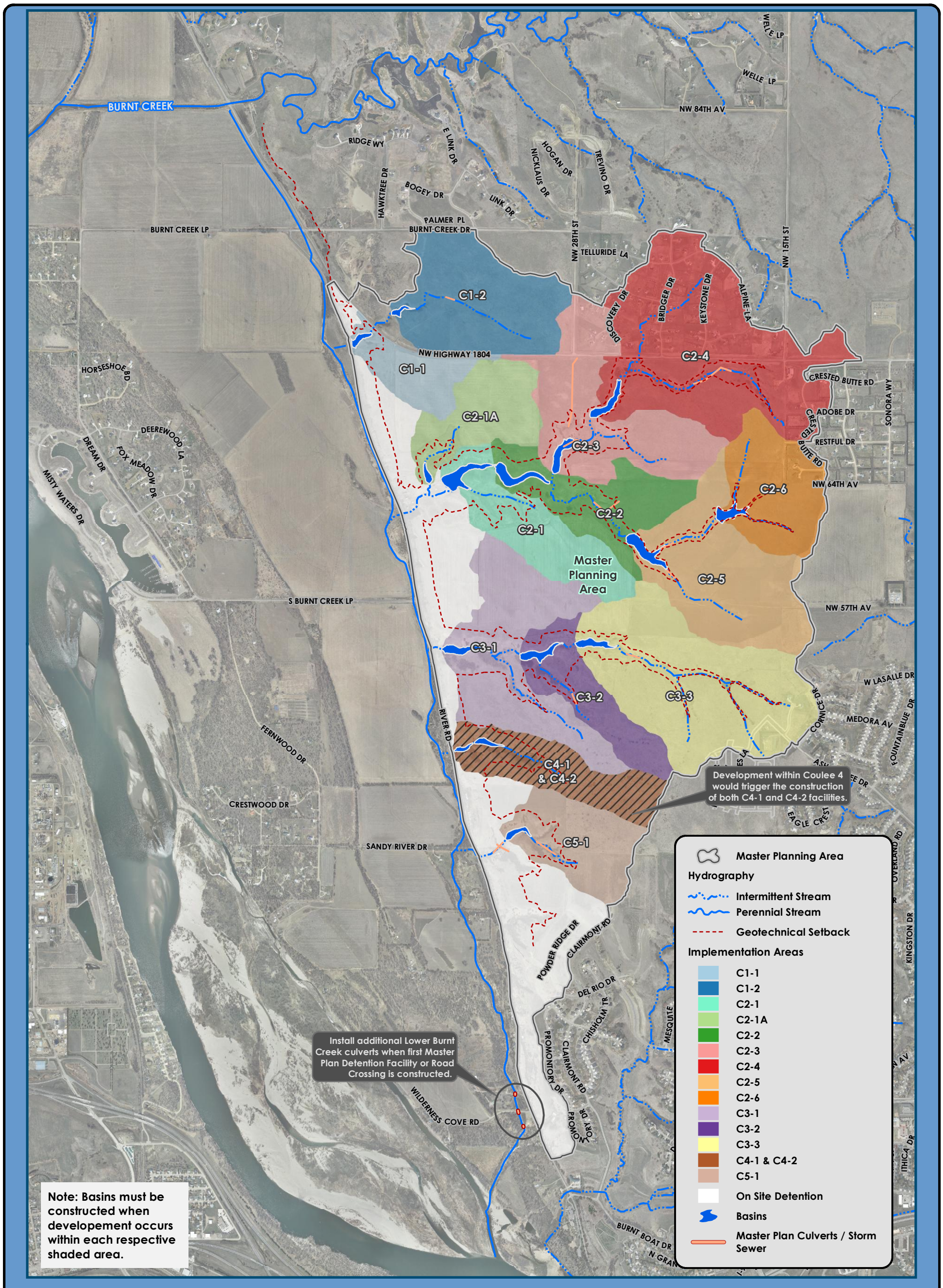

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Figure ES-5:
(Figure 8-1 In Main Report)
Implementation Plan

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

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Exhibits

Regional Detention Facility Exhibit Locator Map

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

C1-1 Basin See Drawing C1
C1-2 Basin See Drawing C2
C2-1 Basin See Drawing C3
C2-1A Basin See Drawing C4
C2-2 Basin See Drawing C5
C2-3 Basin See Drawing C6
C2-4 Basin See Drawing C7
C2-5 Basin See Drawing C8
C2-6 Basin See Drawing C9
C3-1 Basin See Drawing C10
C3-2 Basin See Drawing C11
C3-3 Basin See Drawing C12
C4-1 Basin See Drawing C13
C4-2 Basin See Drawing C14
C5-1 Basin See Drawing C15

Bluff Drainage
Coulee 1
Coulee 2
Coulee 3
Coulee 4
Coulee 5
Lower Burnt Creek
Master Planning Area

BURNT CREEK
GREEN SPRUCE LA
WELLE LP
NW 84TH AV
RIDGE CI
RIDGE WY
E LINK DR
TREVINO DR
HOGAN DR
HAWKTREE DR
BOGEY DR
LINK DR
NICKLAUS DR
NW 15TH ST
PALMER PL
BURNT CREEK LP
BURNT CREEK DR
NORDIC LA
ALTA DR
TELLURIDE LA
BRIDGER DR
KEYSTONE DR
SHOWDOWN LA
NW 28TH ST
41ST ST
DISCOVERY DR
ALPINE LA
BUCKBOARD LA
OLIVE TREE DR
HORSESHOE RD
DIETRICH PL
NW HIGHWAY 1804
BELTWAY
SONORA WY
CRESTED BUTTE RD
ADOBE DR
RESTFUL DR
64TH AVE
NW 64TH AV
DEEREWOOD LA
FOX MEADOW DR
DREAM DR
SERENE CI
CROSS RD
CAREFREE DR
FOX MEADOW PL
CLAIRMONT RD
MISTY WATERS DR
NW 57TH AV
FERNWOOD DR
SALMON ST
W LASALLE DR
CORNICE DR
MEDORA AV
BUTTE DR
MELLOWSUN DR
FOUNTAINBLUE DR
ASH COULEE DR
HARP HAWK DR
PARKERPLUM DR
AMBERGLOW DR
TYLER PY
KITES LA
TALON RD
ASH COULEE PL
PRAIRIE HAWK DR
EAGLE CREST LP
CRESTWOOD DR
SANDY RIVER DR
SANDY RIVER ROAD NW
EAGLES VIEW LN
RANCH LP
OVERLAND RD
MUSTANG DR
CREST RD
LONGHORN RD
HIGH CREEK RD
ROUND TOP RD
KINGSTON DR
POWDER RIDGE DR
CLAIRMONT RD
MONREO DR
DEL RIO DR
CHISHOLM TR
POWDER RIDGE CI
MESQUITE LP
VALLEY DR
TERRITORY DR
THUNDERBIRD LA
CODY DR
BARRACUDA DR
PROMONTORY DR
TONY DR
PROMON
WILDERNESS COVE RD
RIVER RD
ITHICA DR
I-94
GRIMSRUD DR

Overall Study Area
Major Subwatersheds
Master Planning Area
Hydrography
Intermittent Stream
Perennial Stream
Existing Roads
Future Roads
Master Plan Stormwater Basins
Master Plan Culverts / Storm Sewer
Master Plan Storm Sewer Manholes

See Sheet C16 for typical basin outlet control structure geometry.

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Locator Map Not to Scale

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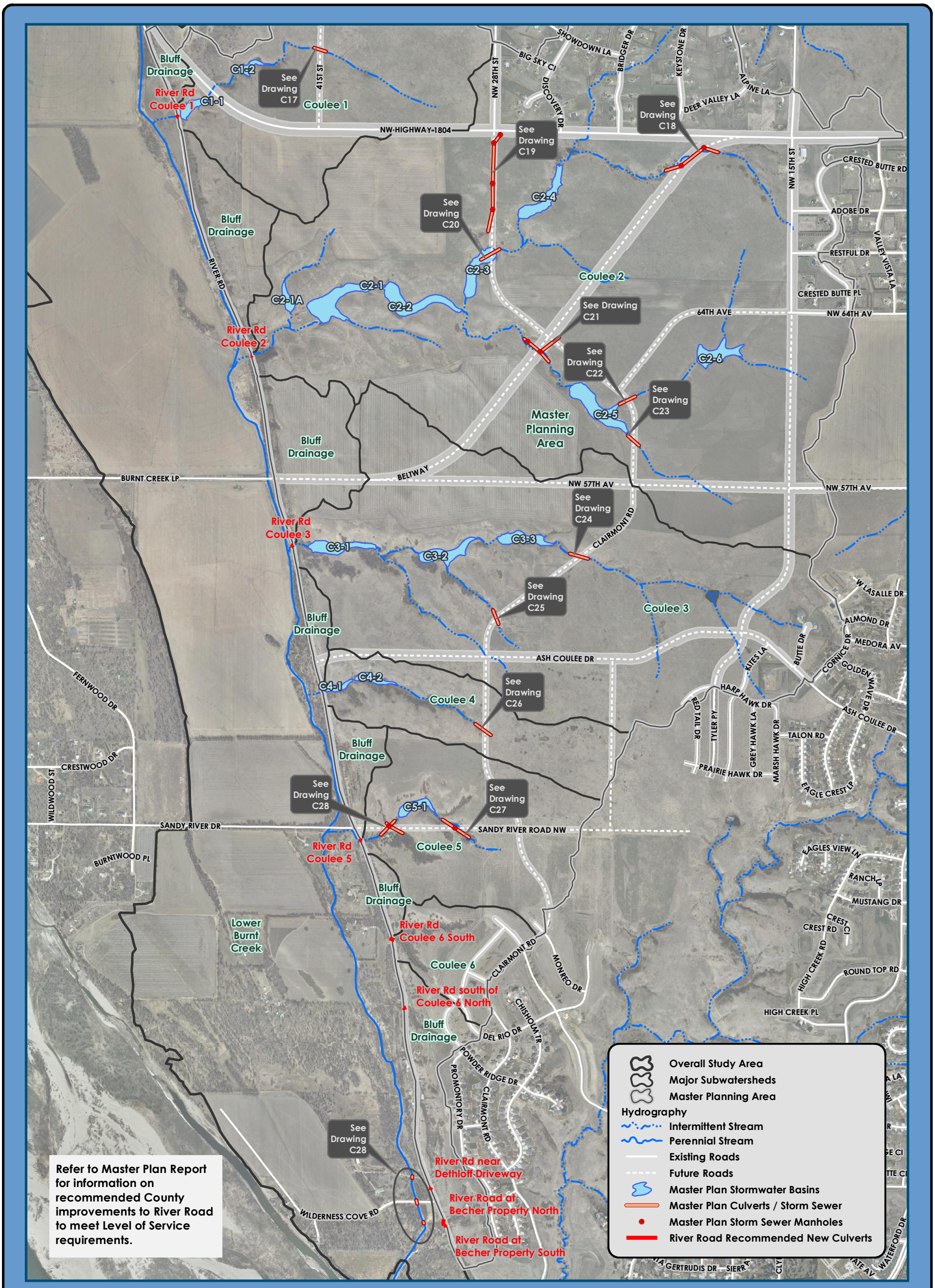

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Locator Map Not to Scale

Road Crossing Exhibit Locator Map

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

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Advanced Engineering and Environmental Services, Inc.

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STAGE STORAGE	
ELEVATION	AREA (AC)
1647.00	0.01
1648.00	0.07
1650.00	0.15
1652.00	0.26
1654.00	0.41
1656.00	0.61
1658.00	0.82
1659.00	0.93

C1-1 BASIN:
BOTTOM ELEV: 1648.00
OVERFLOW: 1659.00
STORAGE: 4.60 AC-FT
SEE TABLE FOR STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT BOUNDARY (1.27 AC)

48" DIAMETER MANHOLE (SOLID LID) WITH 4" ORIFICE HOLE DRILLED. INVERT ELEV: 1648.00

80 LF 18" RCP OUTLET PIPE

18' WIDE SPILLWAY ELEVATION: 1659.00

CONCRETE SILL OVERFLOW AND TURF REINFORCEMENT APPLIED TO EMBANKMENT SLOPE

8'x4' BOX MANHOLE WITH HAALA BCTM 8'x4' GRATE
RIM ELEV: 1656.50
PIPE INVERT ELEV: 1646.50

78" RCP FES INVERT ELEV: 1644.10

RIPRAP PROTECTION ON OUTFALL

90 LF 78" RCP OUTLET PIPE

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

20 0 20 40
Scale in Feet

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Date: Tuesday, July 14, 2015
Plotted By: Jason Gerving
Last Saved By: Jason Gerving

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C1-1 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	1 of 29

C1

STAGE STORAGE	
ELEVATION	AREA (AC)
1684.00	0.01
1685.00	0.05
1687.00	0.14
1689.00	0.26
1691.00	0.37
1693.00	0.49
1694.50	0.60

C1-2 BASIN:
BOTTOM ELEV: 1685.00 OVERFLOW: 1694.50
STORAGE: 2.90 AC-FT
SEE TABLE FOR STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT BOUNDARY (0.95 AC)

20' WIDE SPILLWAY ELEVATION: 1694.50

CONCRETE SILL OVERFLOW AND TURF REINFORCEMENT APPLIED TO EMBANKMENT SLOPE

48" DIAMETER MANHOLE (SOLID LID) WITH 4" ORIFICE HOLE DRILLED. INVERT ELEV: 1685.00

78" RCP FES INVERT ELEV:1681.00

RIPRAP PROTECTION ON OUTFALL

35 LF 18" RCP OUTLET PIPE

10'x5' BOX MANHOLE WITH HAALA BCTM10x5 GRATE RIM ELEV: 1691.50 PIPE INVERT ELEV: 1682.00

95 LF 78" RCP OUTLET PIPE

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60
Scale in Feet

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DATE	REVISION	APPROVED

AES

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C1-2 BASIN

Bismarck

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	2 of 29

C2

STAGE STORAGE	
ELEVATION	AREA (AC)
1660	0.30
1662	0.65
1664	0.90
1666	1.23
1668	1.71
1670	2.76
1673	3.50

CONCEPT DRAINAGE EASEMENT BOUNDARY (5.37 AC)

C2-1 BASIN:
BOTTOM ELEV: 1660.00
OVERFLOW: 1673.00
STORAGE: 17.70 AC-FT
SEE TABLE FOR STAGE-AREA RELATIONSHIP

GRADE TO DRAIN

48" DIAMETER MANHOLE (SOLID LID) WITH 6" ORIFICE HOLE DRILLED
INVERT ELEV: 1664.00

42 LF 18" RCP OUTLET PIPE

12'x10' BOX MANHOLE WITH HAALA BCTM12x10 GRATE
RIM ELEV: 1670.50
INV ELEV: 1662.00

120 LF 8'x6' RCB OUTLET BOX CULVERT

20' WIDE SPILLWAY
ELEVATION: 1673.00

8'x6' RCB TYPE 1 SLOPED END SECTION
INVERT ELEV:1654.30

RIPRAP PROTECTION ON OUTFALL

CONCRETE SILL OVERFLOW AND TURF REINFORCEMENT APPLIED TO EMBANKMENT SLOPE

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

File: L:\City of Bismarck\P00501-2013-06 Bismarck Ash and Ward Coulee Watershed Master Plan\030 Preliminary Engineering\Drawings\01-Civil\Coulee2Alt1_Figure.dwg
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ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-1 BASIN

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 3 of 29

C3

STAGE STORAGE	
ELEVATION	AREA (AC)
1668	0.01
1670	0.05
1672	0.13
1674	0.22
1676	0.32
1678	0.42
1680	0.51
1682	0.64

C2-1A BASIN:
BOTTOM ELEV: 1668.00
OVERFLOW: 1681.00
STORAGE: 3.30 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT BOUNDARY (1.05 AC)

48" DIAMETER MANHOLE (SOLID LID) WITH 4" ORIFICE HOLE DRILLED
INVERT ELEV: 1668.00

46 LF 18" RCP OUTLET PIPE

8'x4' BOX MANHOLE WITH HAALA BCTM8x4 GRATE
RIM ELEV: 1679.50
INV ELEV: 1668.00

12' WIDE SPILLWAY
ELEVATION: 1681.00

CONCRETE SILL OVERFLOW AND TURF REINFORCEMENT APPLIED TO EMBANKMENT SLOPE

130 LF 54" RCP OUTLET PIPE

54" RCP FES
INVERT ELEV: 1660.00

RIPRAP PROTECTION ON OUTFALL

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60
Scale in Feet

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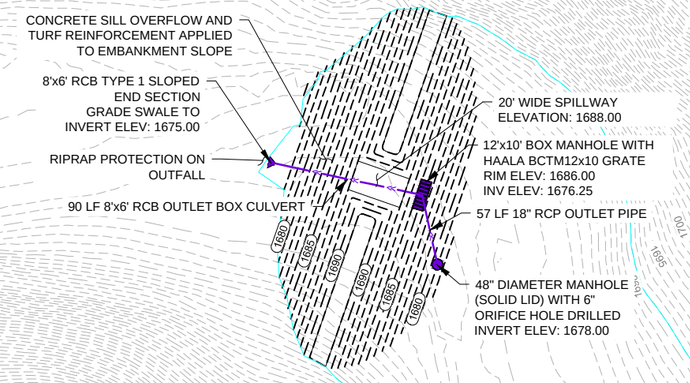
ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-1A BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	4 of 29

C4

STAGE STORAGE	
ELEVATION	AREA (AC)
1678	0.03
1680	0.29
1682	1.00
1684	1.62
1686	2.36
1688	3.05



CONCEPT DRAINAGE EASEMENT BOUNDARY (4.63 AC)

C2-2 BASIN:
BOTTOM ELEV: 1678.00
OVERFLOW: 1688.00
STORAGE: 13.50 AC-FT
SEE TABLE FOR STAGE-AREA RELATIONSHIP

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

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ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-2 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	5 of 29

C5

STAGE STORAGE	
ELEVATION	AREA (AC)
1697.00	0.01
1698.00	0.08
1700.00	0.29
1702.00	0.47
1704.00	0.80
1706.00	1.12
1708.00	1.53
1710.50	1.70

C2-3 BASIN:
BOTTOM ELEV: 1698.00
OVERFLOW: 1710.50
STORAGE: 10.65 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT BOUNDARY (3.18 AC)

48" DIAMETER MANHOLE (SOLID LID)
WITH 6" ORIFICE HOLE DRILLED
INVERT ELEV: 1698.00

47 LF 18" RCP OUTLET PIPE

10'x6' BOX MANHOLE WITH
HAALA BCTM10x6 GRATE
RIM ELEV: 1708.50
INV ELEV: 1696.00

20' WIDE SPILLWAY
ELEVATION: 1710.50

110 LF 72" RCP OUTLET PIPE

CONCRETE SILL OVERFLOW AND
TURF REINFORCEMENT APPLIED
TO EMBANKMENT SLOPE

72" RCP FES
INVERT ELEV: 1693.00

RIPRAP PROTECTION ON OUTFALL

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

40 0 40 80
Scale in Feet

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ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA

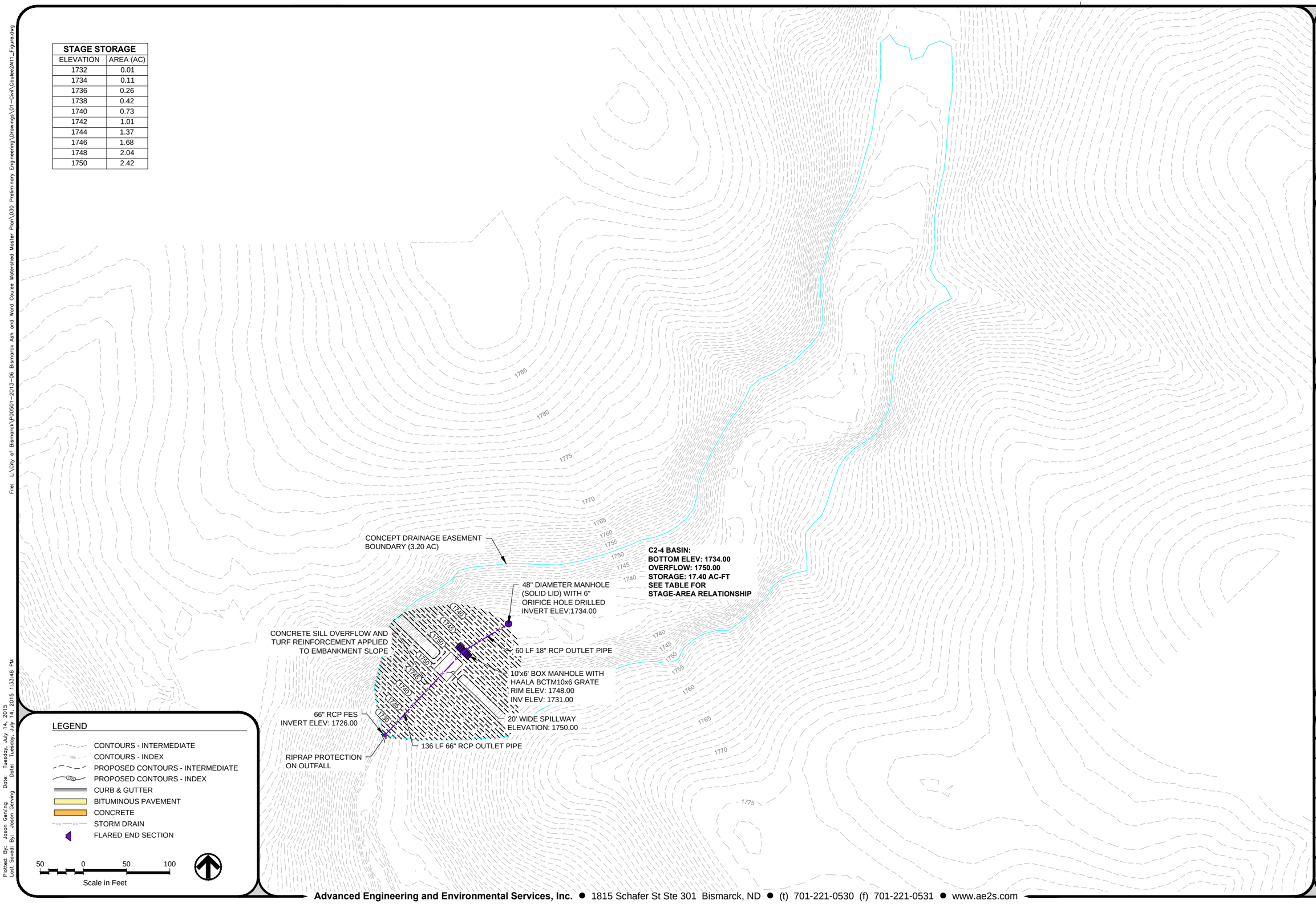
C2-3 BASIN

Bismarck

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	6 of 29

C6

STAGE STORAGE	
ELEVATION	AREA (AC)
1732	0.01
1734	0.11
1736	0.26
1738	0.42
1740	0.73
1742	1.01
1744	1.37
1746	1.68
1748	2.04
1750	2.42



LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-4 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	7 of 29

C7

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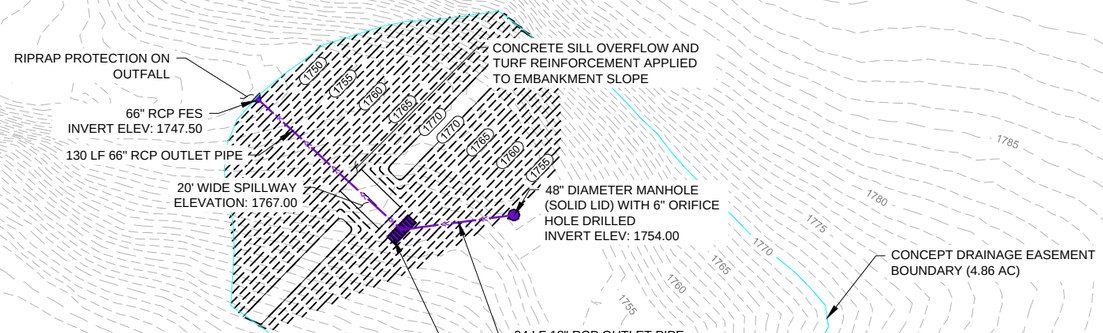
STAGE STORAGE	
ELEVATION	AREA (AC)
1752	0.01
1754	0.12
1756	0.42
1758	0.76
1760	1.24
1762	1.49
1764	2.03
1767	3.01



CONCEPT DRAINAGE EASEMENT BOUNDARY (4.86 AC)

C2-5 BASIN:
BOTTOM ELEV: 1754.00
OVERFLOW: 1767.00
STORAGE: 17.20 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

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ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-5 BASIN

Bismarck

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 8 of #29

C8

STAGE STORAGE	
ELEVATION	AREA (AC)
1803	0.18
1805	0.33
1807	0.49
1809	0.67
1811	0.86
1813	1.21
1815	1.55
1817	1.89

C2-6 BASIN:
BOTTOM ELEV: 1803.00
OVERFLOW: 1817.00
STORAGE: 12.20 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

20' WIDE SPILLWAY
ELEVATION: 1817.00

CONCRETE SILL OVERFLOW AND
TURF REINFORCEMENT APPLIED
TO EMBANKMENT SLOPE

125 LF 78" RCP OUTLET PIPE

78" RCP FES
INVERT ELEV: 1797.80

RIPRAP PROTECTION ON
OUTFALL

48" DIAMETER MANHOLE
(SOLID LID) WITH 6"
ORIFICE HOLE DRILLED
INVERT ELEV: 1803.00

ASSUMED BOTTOM OF
EXISTING STOCK DAM POND

46 LF 18" RCP OUTLET PIPE

11'x6' BOX MANHOLE WITH
HAALA BCTM11x6 GRATE
RIM ELEV: 1815.00
INV ELEV: 1800.00

CONCEPT DRAINAGE EASEMENT
BOUNDARY (3.09 AC)

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60
Scale in Feet

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ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C2-6 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	9 of 29

C9

STAGE STORAGE	
ELEVATION	AREA (AC)
1644	0.01
1646	0.05
1648	0.13
1650	0.19
1652	0.31
1654	0.49
1656	0.75
1658	1.06
1660	1.37
1661.5	1.60

35' WIDE SPILLWAY
ELEVATION: 1662.50

CONCRETE SILL OVERFLOW AND
TURF REINFORCEMENT APPLIED
TO EMBANKMENT SLOPE

125 LF 8'x6' RCB OUTLET BOX CULVERT

RIPRAP PROTECTION
ON OUTFALL

8'x6' RCB TYPE 1 SLOPED
END SECTION
INVERT ELEV: 1642.70

48" DIAMETER MANHOLE
(SOLID LID) WITH 4"
ORIFICE HOLE DRILLED
INVERT ELEV: 1644.00

95 LF 18" RCP OUTLET PIPE

10'x6' BOX MANHOLE WITH HAALA
BCTM 10x6 GRATE
RIM ELEV: 1660.30
6' WIDE WEIR NOTCH INV ELEV: 1659.30
INV ELEV: 1643.90

CONCEPT DRAINAGE EASEMENT
BOUNDARY (2.83 AC)

C3-1 BASIN:
BOTTOM ELEV: 1644.00
OVERFLOW: 1662.50
STORAGE: 11.10 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

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DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C3-1 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	10 of 29

C10

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STAGE STORAGE	
ELEVATION	AREA (AC)
1684	0.03
1686	0.1
1688	0.19
1690	0.40
1692	0.66
1694	1.09
1696	1.49
1697.50	1.80

CONCRETE SILL OVERFLOW AND TURF REINFORCEMENT APPLIED TO EMBANKMENT SLOPE

108 LF 8'x6' RCB OUTLET BOX CULVERT

RIPRAP PROTECTION ON OUTFALL

40' WIDE SPILLWAY ELEVATION: 1698.50

12'x10' BOX MANHOLE WITH HAALA BCTM 12x10 GRATE RIM ELEV: 1697.00 8' WIDE WEIR NOTCH INVERT: 1695.00 INV ELEV: 1683.00

49 LF 18" RCP OUTLET PIPE

8'x6' RCB TYPE 1 SLOPED END SECTION INVERT ELEV:1681.50

48" DIAMETER MANHOLE (SOLID LID) WITH 4" ORIFICE HOLE DRILLED INVERT ELEV: 1684.00

C3-2 BASIN:
BOTTOM ELEV: 1684.00
OVERFLOW: 1698.50
STORAGE: 10.75 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT BOUNDARY (3.00 AC)

1760 1755 1750 1745 1740 1735 1730 1725 1720 1715 1710 1705 1700 1695 1690 1685

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

40 0 40 80
Scale in Feet

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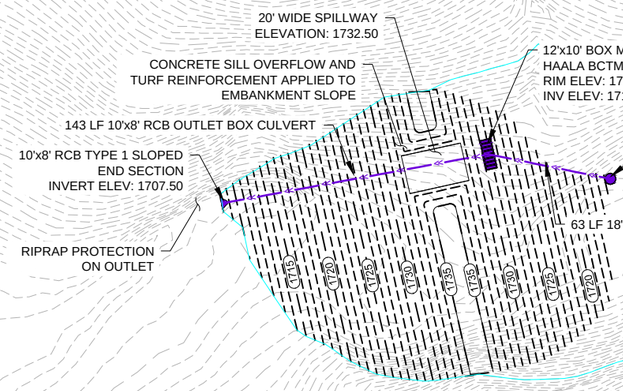
ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C3-2 BASIN

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 11 of 29

C11

STAGE STORAGE	
ELEVATION	AREA (AC)
1714	0.01
1716	0.08
1718	0.17
1720	0.32
1722	0.57
1724	0.75
1726	0.90
1728	1.09
1730	1.27
1732.50	1.75



C3-3 BASIN:
BOTTOM ELEV: 1714.00
OVERFLOW: 1732.50
STORAGE: 12.90 AC-FT
SEE TABLE FOR
STAGE-AREA RELATIONSHIP

CONCEPT DRAINAGE EASEMENT
BOUNDARY (2.44 AC)

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

40 0 40 80
Scale in Feet

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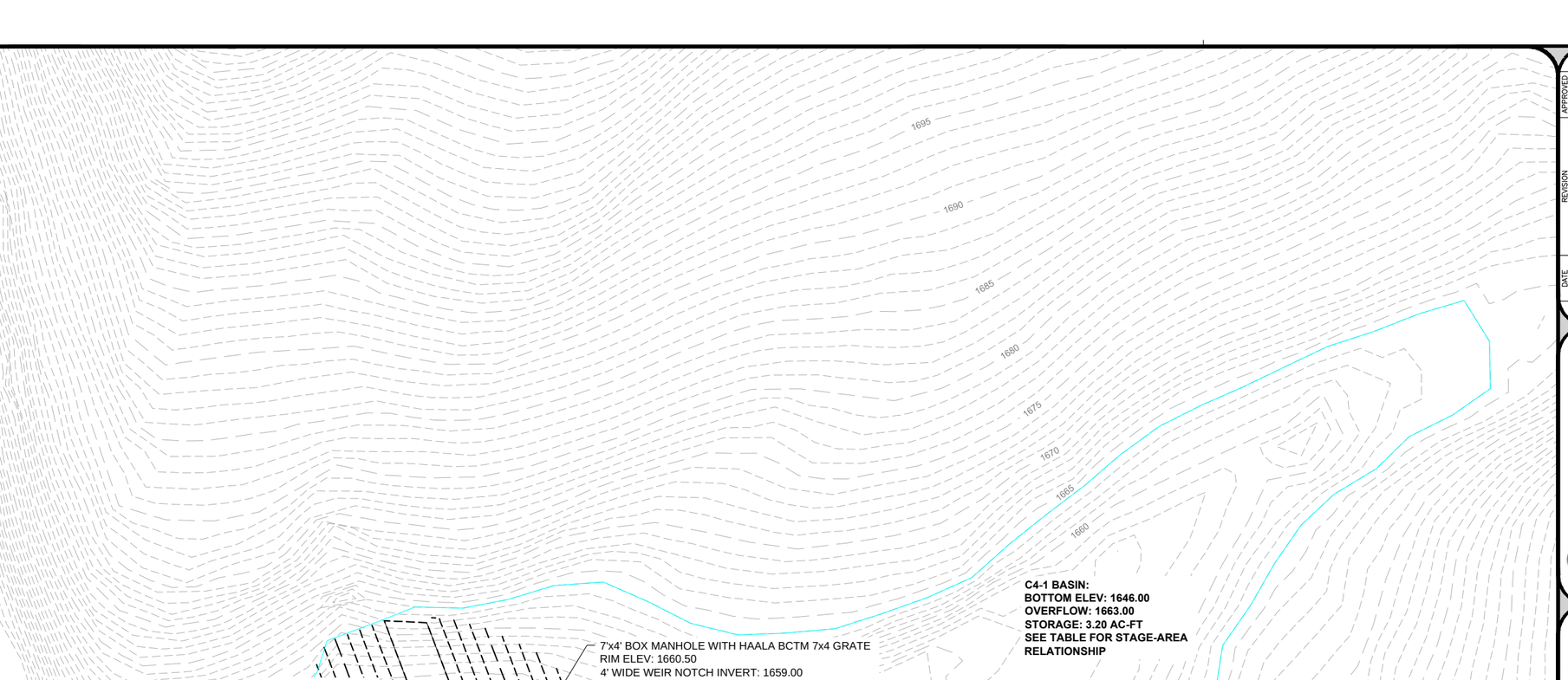
ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C3-3 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	12 of 29

C12

STAGE STORAGE	
ELEVATION	AREA (AC)
1646	0.01
1648	0.04
1650	0.06
1652	0.08
1654	0.13
1656	0.19
1658	0.29
1660	0.38



LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

20 0 20 40
Scale in Feet

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C4-1 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	13 of 29

C13

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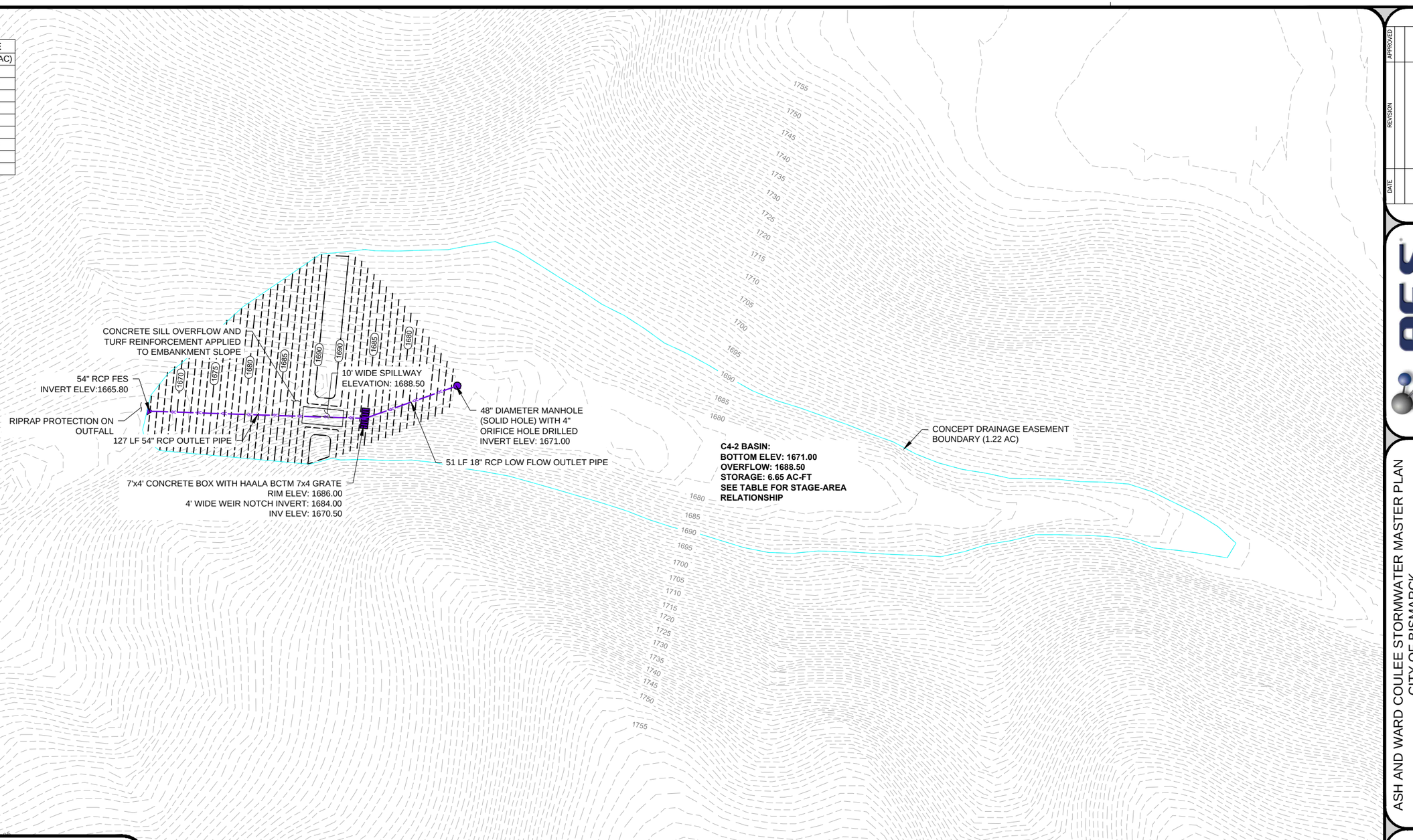
Date: Tuesday, July 14, 2015
Plotted By: Jason Gerving
Last Saved By: Jason Gerving

STAGE STORAGE	
ELEVATION	AREA (AC)
1671	0.01
1673	0.06
1675	0.11
1677	0.19
1679	0.29
1681	0.42
1683	0.53
1685	0.66
1686	0.79



LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60

Scale in Feet

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DATE		

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C4-2 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	14 of 29

C14

STAGE STORAGE	
ELEVATION	AREA (AC)
1682	0.01
1684	0.08
1686	0.14
1688	0.23
1690	0.33
1692	0.44
1694	0.56
1696	0.71

CONCEPT DRAINAGE EASEMENT BOUNDARY (1.44 AC)

C5-1 BASIN:
BOTTOM ELEV: 1682.00
OVERFLOW: 1699.00
STORAGE: 6.70 AC-FT
SEE TABLE FOR STAGE-AREA RELATIONSHIP

48" DIAMETER MANHOLE (SOLID LID)
WITH 6" ORIFICE HOLE DRILLED
INVERT ELEV: 1682.00

58 LF 18" RCP OUTLET PIPE

8'x4' BOX MANHOLE WITH HAALA BCTM 8x4 GRATE
RIM ELEV: 1697.50
5' WIDE WEIR NOTCH INVERT: 1694.00
INV ELEV: 1681.50

125 LF 54" RCP OUTLET PIPE

20' WIDE SPILLWAY
ELEVATION: 1699.00

54" RCP FES
INVERT ELEV: 1677.50

CONCRETE SILL OVERFLOW AND
TURF REINFORCEMENT APPLIED TO
EMBANKMENT SLOPE

RIPRAP PROTECTION
ON OUTFALL

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60
Scale in Feet

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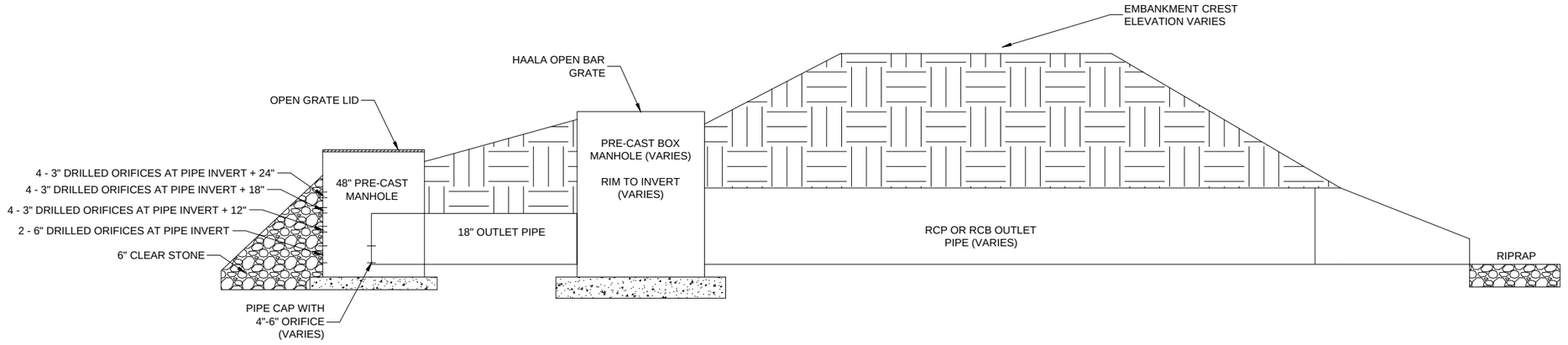
Plotted By: Jason Gerving
Last Saved By: Jason Gerving

APPROVED		
REVISION		
DATE		

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
C5-1 BASIN

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	15 of 29

C15



1 / C16 TYPICAL OUTLET STRUCTURE
SCALE: NONE

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Plotted By: Jason Gerving Date: Tuesday, July 14, 2015
Last Saved By: Jason Gerving Date: Monday, July 13, 2015 5:46:44 PM

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
TYPICAL OUTLET STRUCTURE

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	16 of 29

C16

48" FES
INVERT ELEV: 1730.50

41ST STREET

184 LF 48" RCP
EMBANKMENT OVERFLOW ELEV: 1746.40

48" FES
INVERT ELEV: 1735.00

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

20 0 20 40
Scale in Feet

NORTH

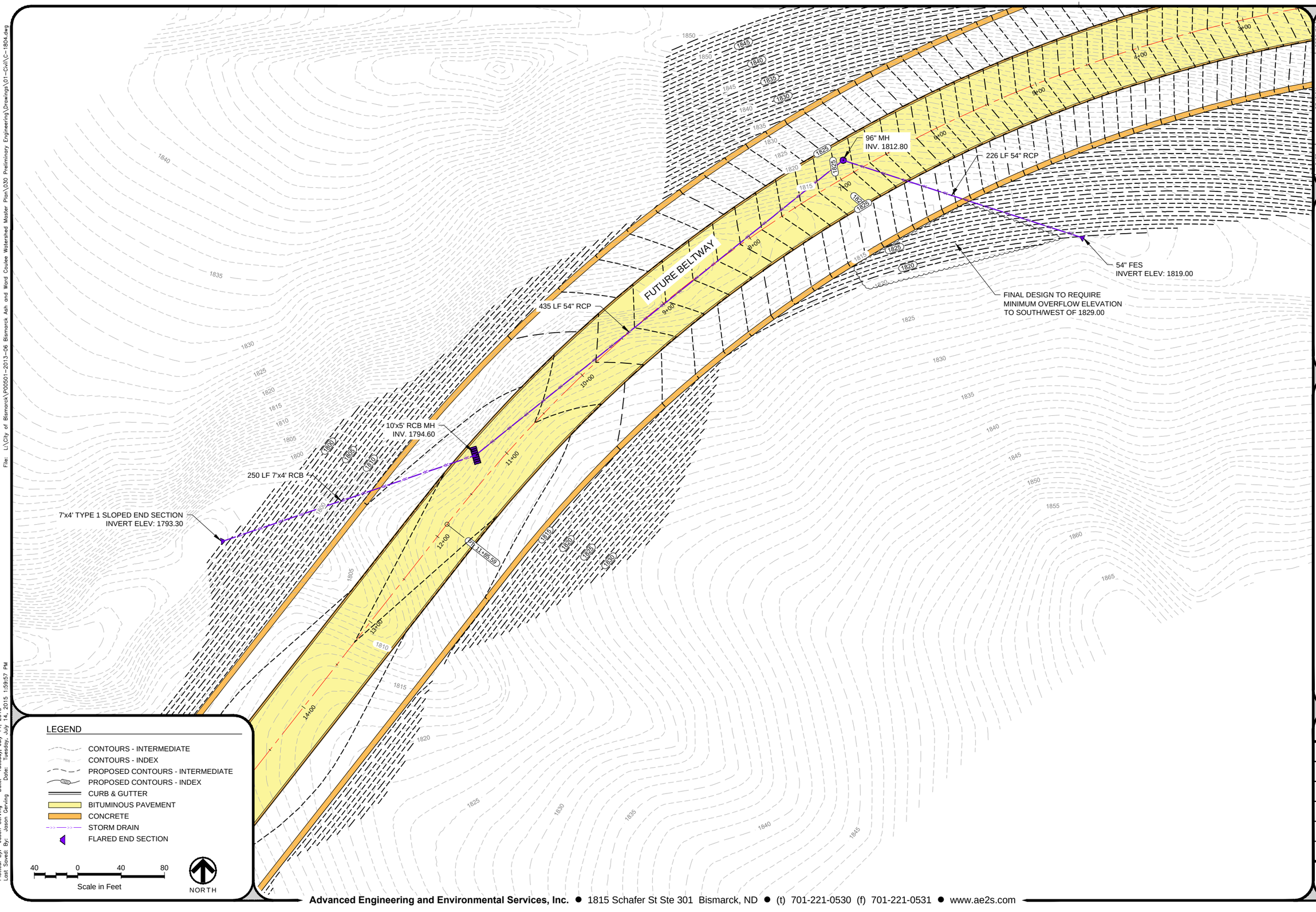
DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
41ST STREET - COULEE 1

Bismarck

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	17 of 29

C17



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Last Saved By: Jason Gerving

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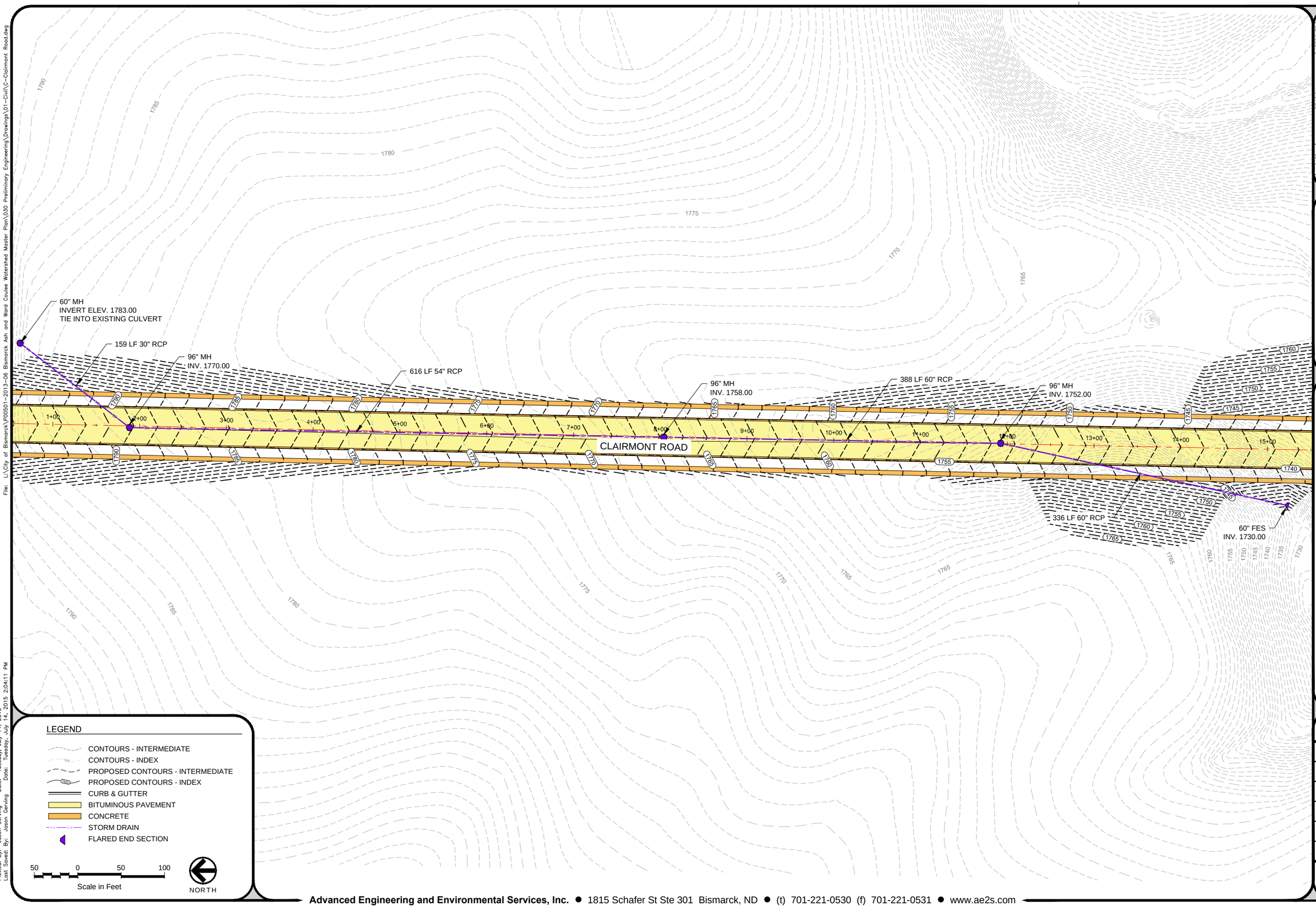
REVISION
DATE

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
BELTWAY - COULEE 2 (NORTH BRANCH OF NORTH FORK)

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 18 of 29

C18



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- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

50 0 50 100
Scale in Feet

NORTH

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - WEST BRANCH OF NORTH FORK

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 19 of 29

C19

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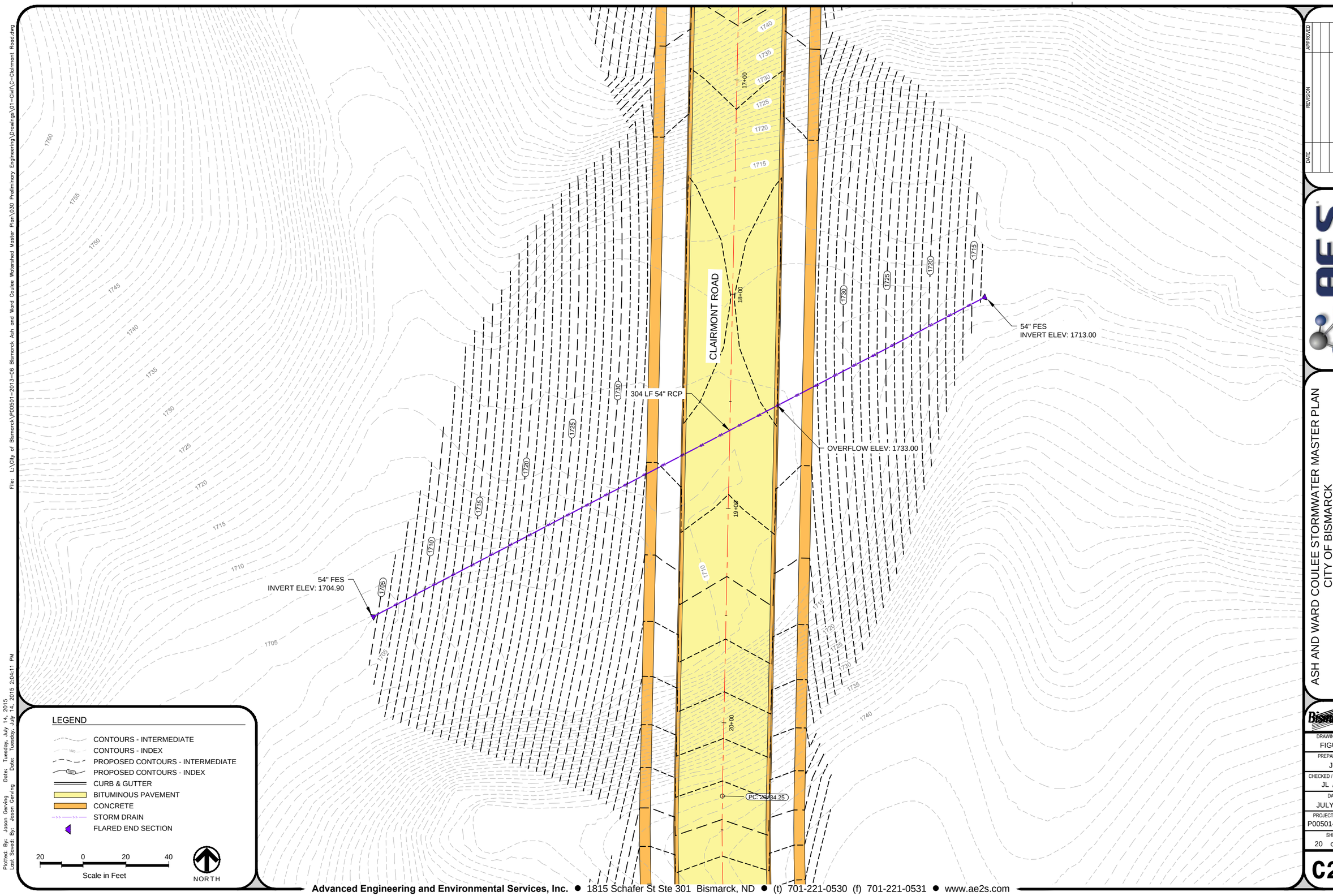

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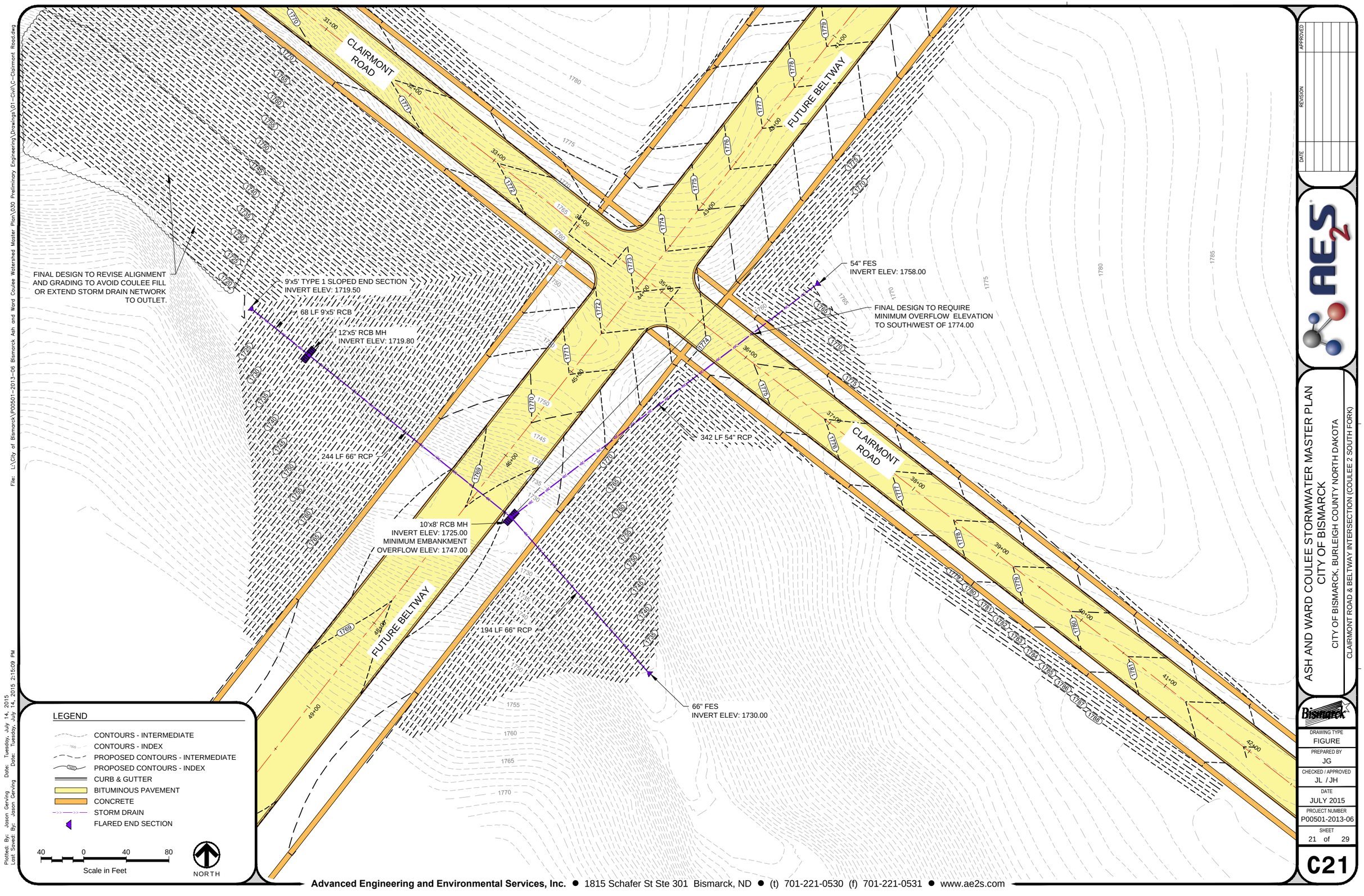
DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 2 (NORTH FORK)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	20 of 29

C20



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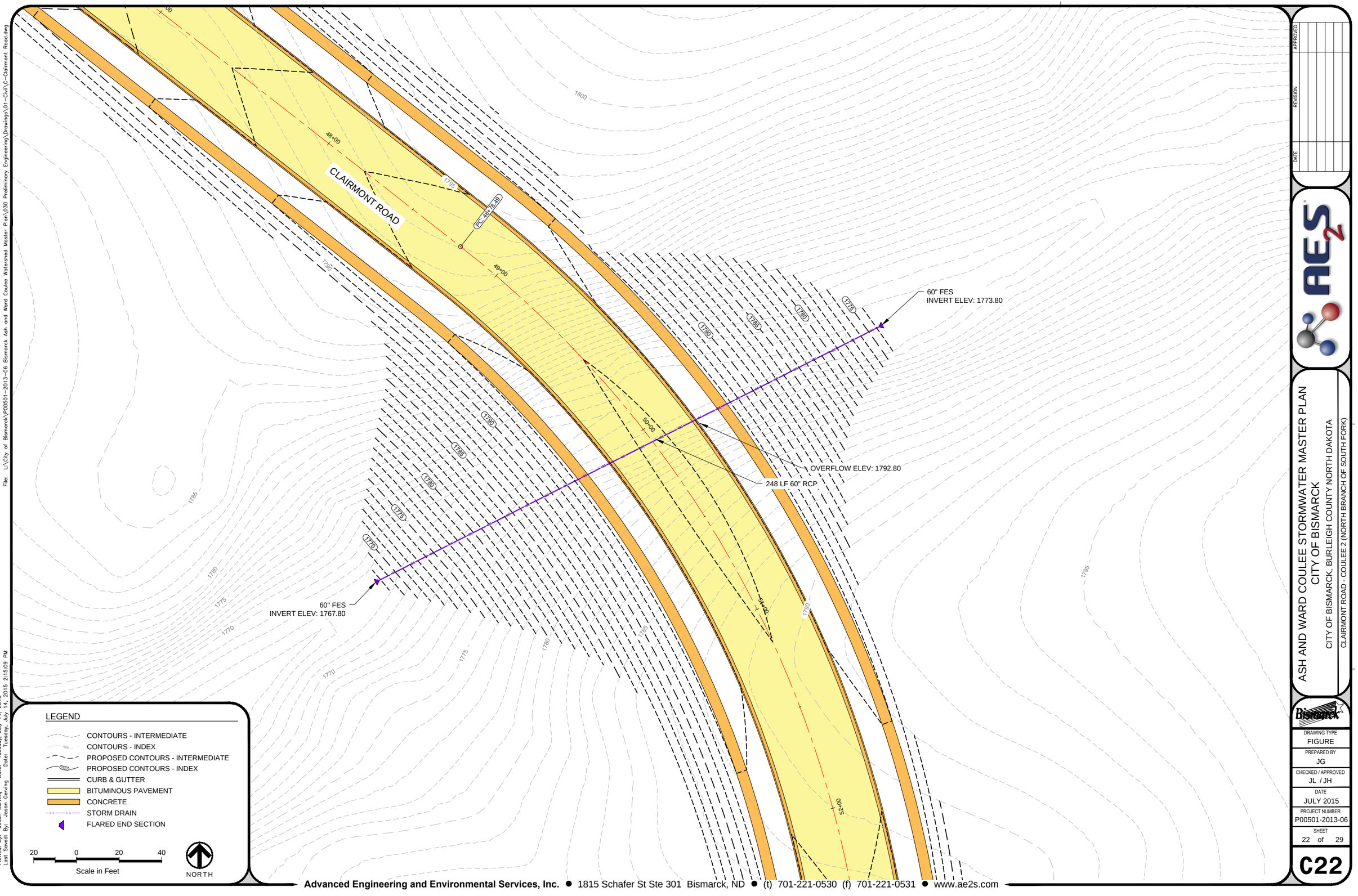
DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD & BELTWAY INTERSECTION (COULEE 2 SOUTH FORK)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	21 of 29

C21



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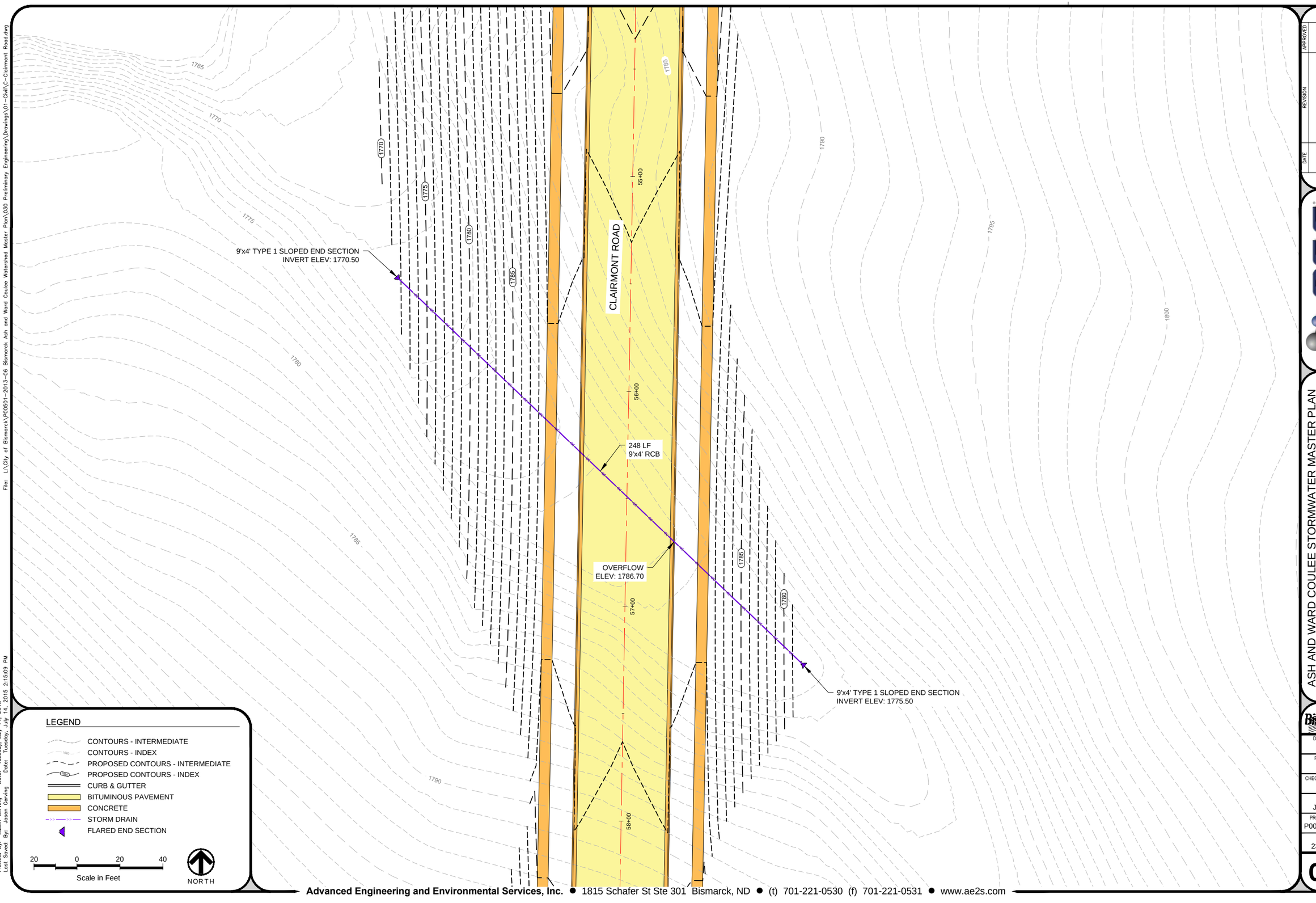
Plotted By: Jason Gerving
Last Saved By: Jason Gerving Date: Tuesday, July 14, 2015

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 2 (NORTH BRANCH OF SOUTH FORK)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	22 of 29

C22



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- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

20 0 20 40
Scale in Feet

NORTH

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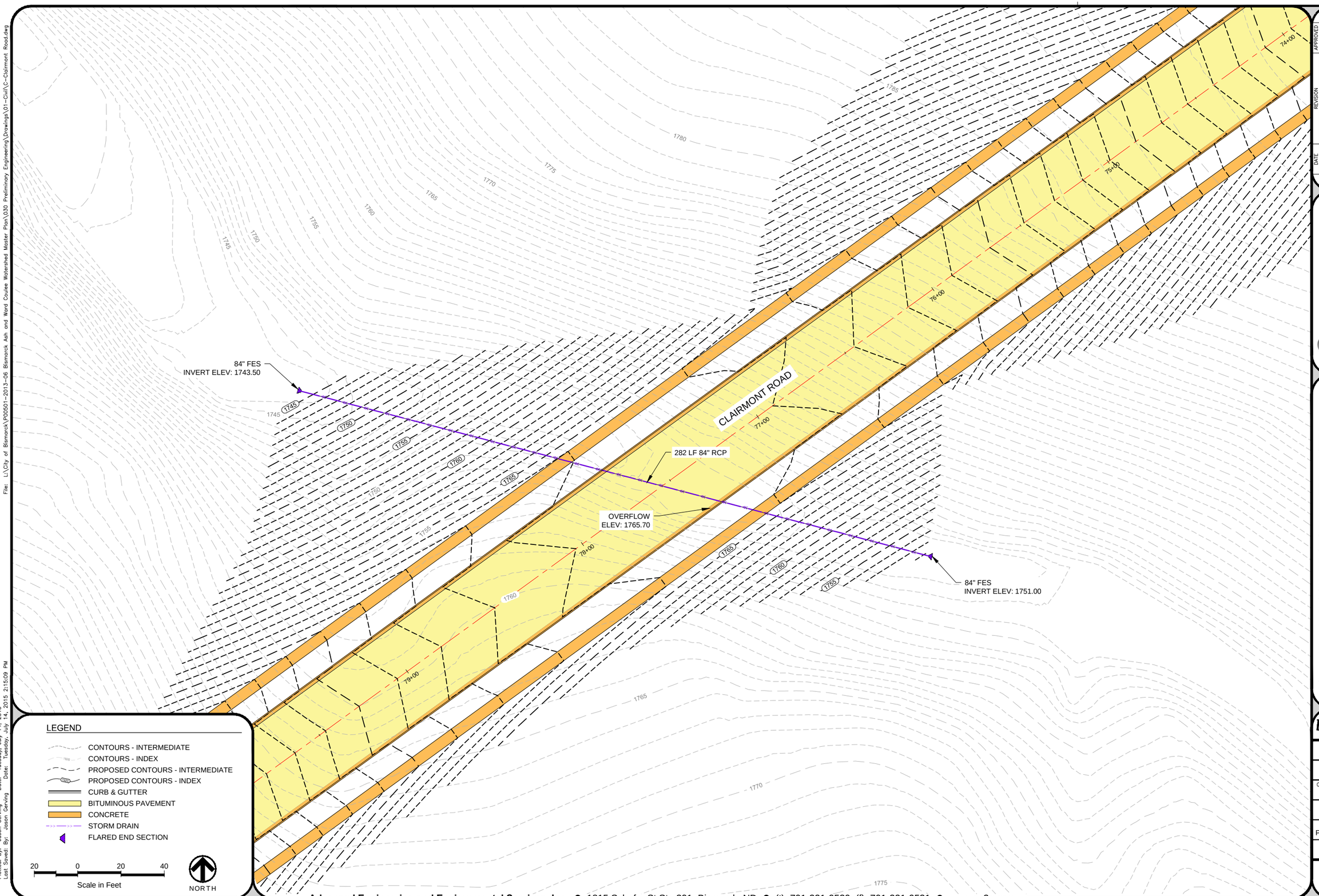
DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 2 (SOUTH BRANCH OF SOUTH FORK)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	23 of 29

C23



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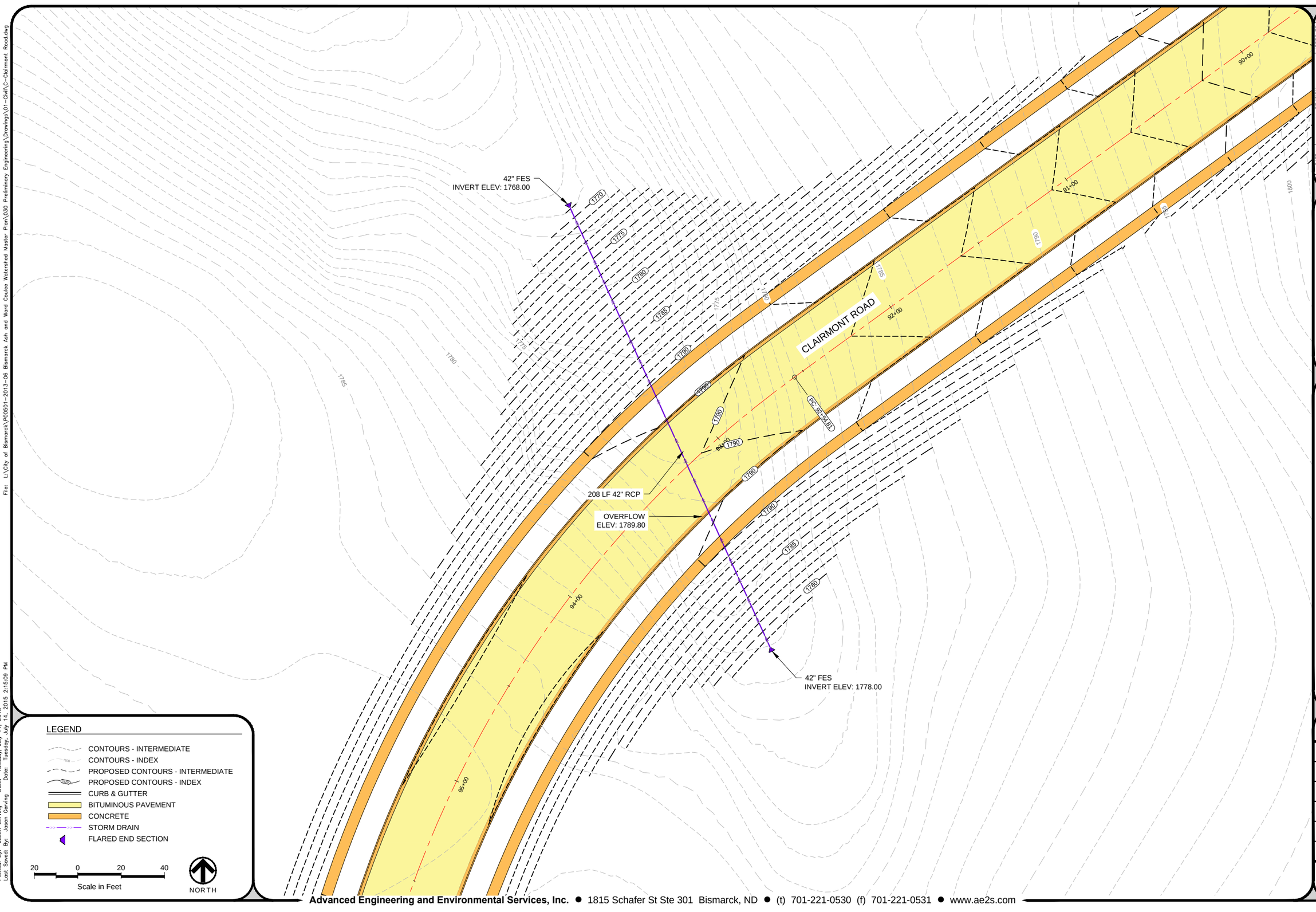
Last Saved By: Jason Gerving

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 3 (NORTH)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	24 of 29

C24



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Last Saved By: Jason Gerving

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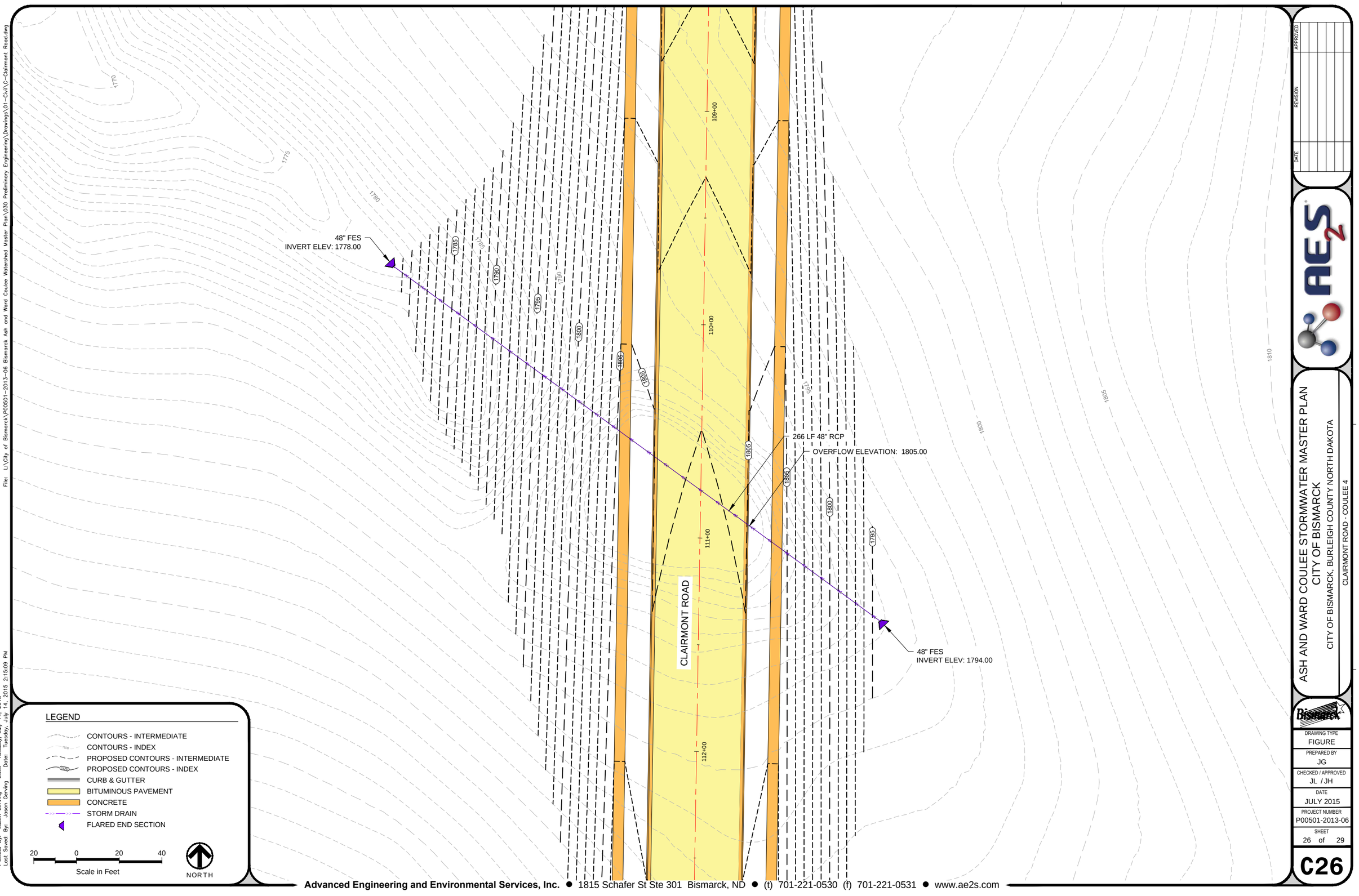
ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 3 (SOUTH)

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	25 of 29

C25



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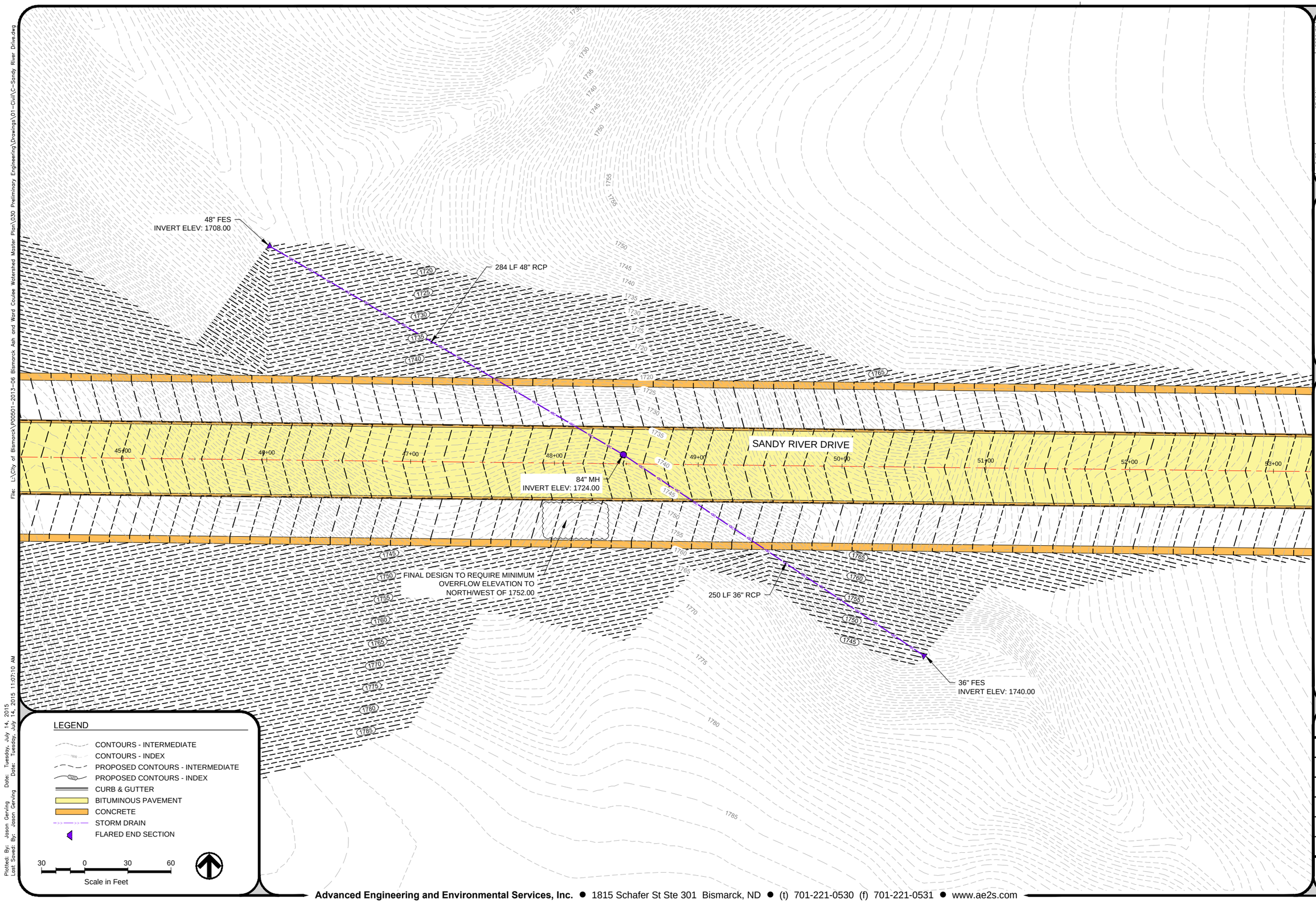
Last Saved By: Jason Gerving

DATE	REVISION	APPROVED

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
CLAIRMONT ROAD - COULEE 4

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	26 of 29

C26



DATE | REVISION | APPROVED

AES

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
SANDY RIVER DRIVE - COULEE 5 (EAST CROSSING)

Bismarck

DRAWING TYPE	FIGURE
PREPARED BY	JG
CHECKED / APPROVED	JL / JH
DATE	JULY 2015
PROJECT NUMBER	P00501-2013-06
SHEET	27 of 29

C27

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File: L:\City of Bismarck\P00501-2013-06 Bismarck Ash and Ward Coulee Watershed Master Plan\030 Preliminary Engineering\Drawings\01-Civil\C-Sandy River Drive.dwg
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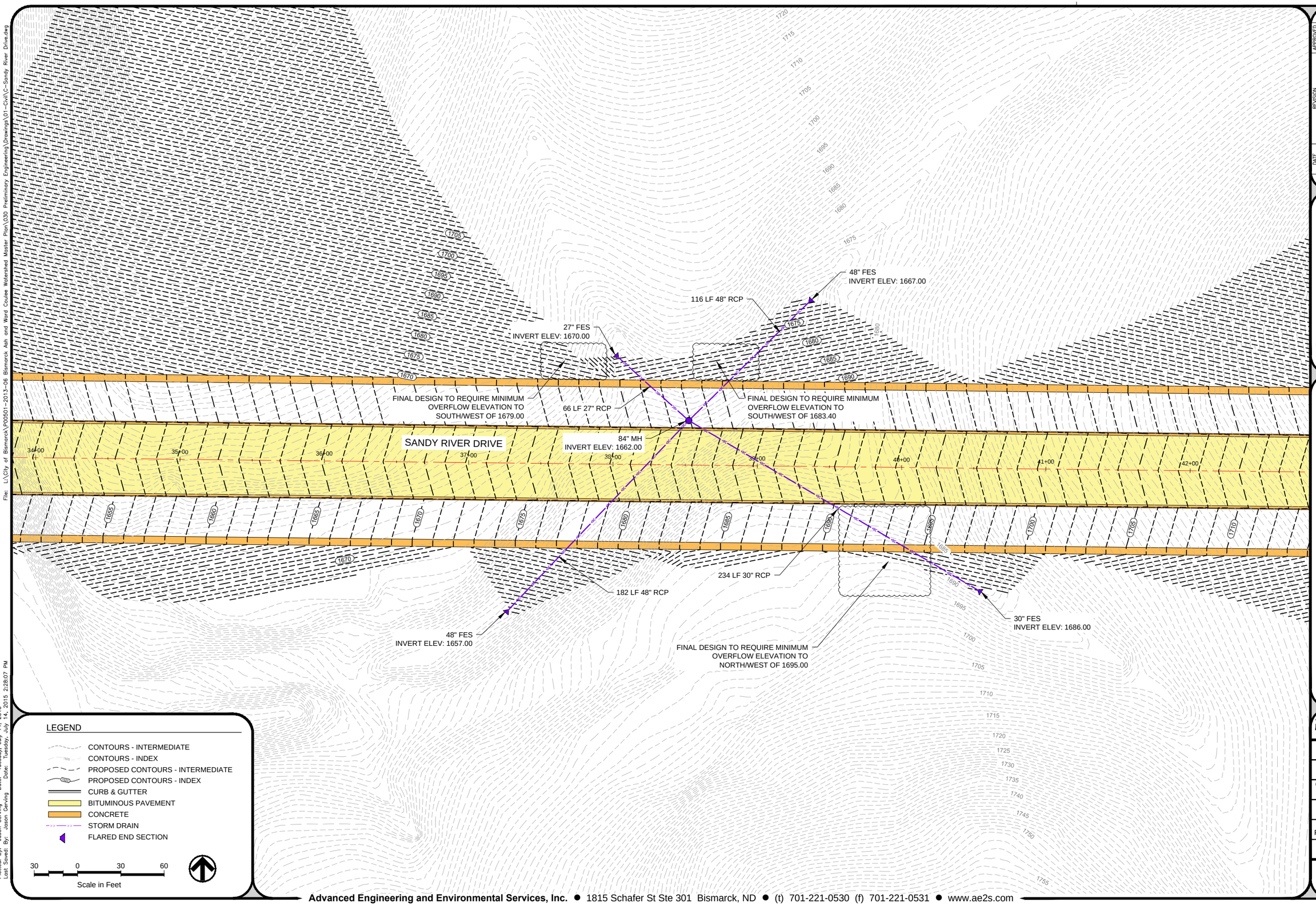

LEGEND

- CONTOURS - INTERMEDIATE
- CONTOURS - INDEX
- PROPOSED CONTOURS - INTERMEDIATE
- PROPOSED CONTOURS - INDEX
- CURB & GUTTER
- BITUMINOUS PAVEMENT
- CONCRETE
- STORM DRAIN
- FLARED END SECTION

30 0 30 60
Scale in Feet

APPROVED | REVISION | DATE

AES

ASH AND WARD COULEE STORMWATER MASTER PLAN
CITY OF BISMARCK
CITY OF BISMARCK, BURLEIGH COUNTY NORTH DAKOTA
SANDY RIVER DRIVE - COULEE 5 (WEST CROSSING)

Bismarck

DRAWING TYPE: FIGURE
PREPARED BY: JG
CHECKED / APPROVED: JL / JH
DATE: JULY 2015
PROJECT NUMBER: P00501-2013-06
SHEET: 28 of 29

C28

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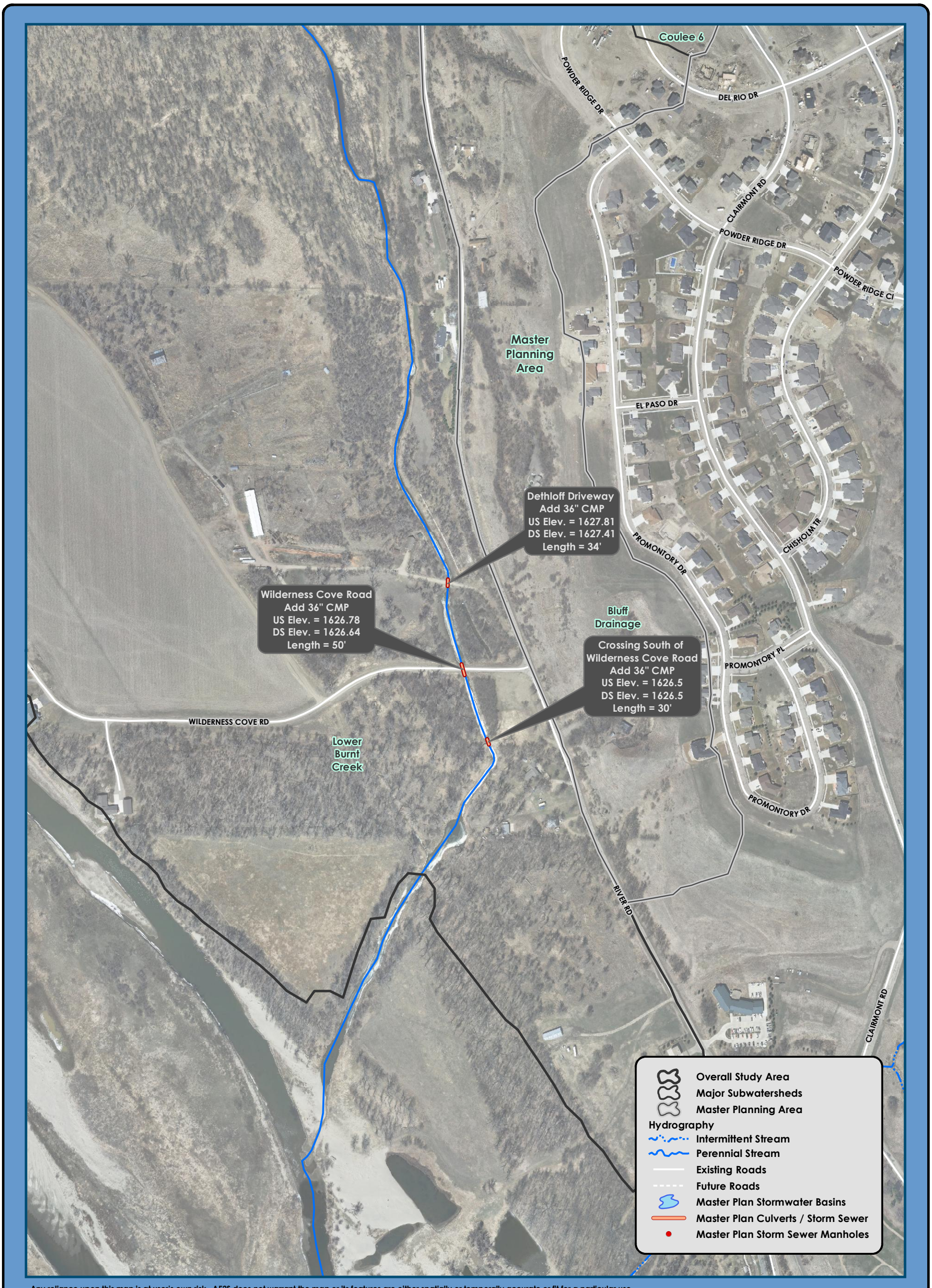

Any reliance upon this map is at user's own risk. AE2S does not warrant the map or its features are either spatially or temporally accurate or fit for a particular use.

N

0 200 400 Feet

1 inch = 400 feet

Locator Map Not to Scale

Drawing C29:
Lower Burnt Creek Improvements

City of Bismarck
Ash and Ward Coulee Stormwater Master Plan

AE2S
Advanced Engineering and Environmental Services, Inc.

Date: 7/9/2015 | Coordinate System: North Dakota State Plane South

C:\Data\Projects\City of Bismarck\P00501-2013-06 Ash and Ward Coulees\Drawing C29 Lower Burnt Creek Improvements.mxd | Edited by: DYL