



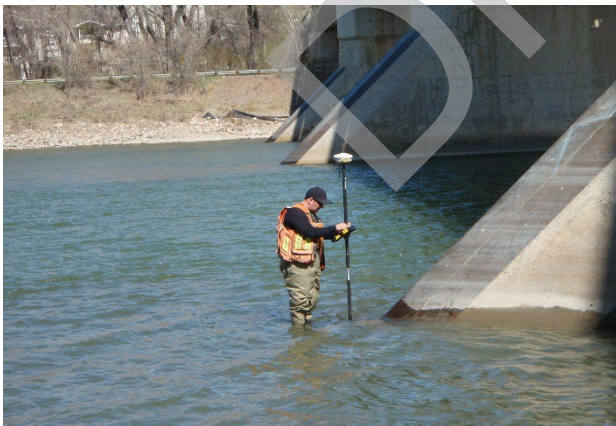
MEDICINE HAT RIVER HAZARD STUDY

OPEN WATER FLOOD HAZARD IDENTIFICATION

FINAL REPORT



Prepared for:



20 May 2022

NHC Ref. No. 1003094



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Prepared for:

Alberta Environment and Parks
Edmonton, Alberta

Prepared by:

Northwest Hydraulic Consultants Ltd.
Edmonton, Alberta

20 May 2022

NHC Ref No. 1003094

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DISCLAIMER

This report has been prepared by Northwest Hydraulic Consultants Ltd. (NHC) in accordance with generally accepted engineering practices, for the benefit of Alberta Environment and Parks for specific application to the Medicine Hat River Hazard Study in Alberta. The information and data contained herein represent the best professional judgment of NHC, based on the knowledge and information available to NHC at the time of preparation.

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EXECUTIVE SUMMARY

Alberta Environment and Parks retained Northwest Hydraulic Consultants Ltd. in August 2017 to complete a river hazard study for the City of Medicine Hat and surrounding areas of Cypress County, including the Town of Redcliff and the Hamlet of Desert Blume. The river hazard study area includes 26 km of the South Saskatchewan River below Ross Creek, 19 km of the South Saskatchewan River above Ross Creek, 24 km of Ross Creek above the confluence with the South Saskatchewan River, 24 km of Seven Persons Creek above the confluence with Ross Creek, and 9.6 km of Bullshead Creek above the confluence with Ross Creek.

The study is being conducted under the provincial Flood Hazard Identification Program. The overall objectives of the study are to enhance public safety and to reduce potential future flood damages and disaster assistance costs.

The Medicine Hat River Hazard Study is comprised of eight major project components. This report summarizes the work of the fifth component, **Open Water Flood Hazard Identification**. The open water floodway criteria maps are the key deliverable for this project component and are provided as an appendix to this report. Open water flood hazard identification involves defining the open water flood hazard area, which is comprised of floodway and flood fringe zones (including high hazard and protected areas). The methods used to develop the floodway criteria map follow the provincial Flood Hazard Identification Program guidelines, incorporating technical changes implemented in 2021 regarding how floodways are mapped in Alberta. The floodway determination criteria adopted for this study is detailed for each cross section.

CREDITS AND ACKNOWLEDGEMENTS

Northwest Hydraulic Consultants Ltd. would like to express appreciation to Alberta Environment and Parks for initiating this project, making extensive background information available, and providing the project team with valuable technical input throughout the project. James Choles, P.Eng., CFM managed and directed the Medicine Hat River Hazard Study on behalf of Alberta Environment and Parks.

The following NHC personnel were part of the study team and participated in the open water flood hazard identification component of the study:

- Robyn Andrishak (Project Manager) – reviewed this report and was responsible for the overall direction of the project and provided advice and senior review for open water flood hazard identification.
- Dan Healy (Hydraulic Modelling and Flood Hazard Identification Lead) – co-authored this report and was responsible for the determination of the floodway limits in consultation with AEP.
- Makamum Mahmood (Project Engineer) – co-authored this report and assisted in the determination of the floodway limits, and compiling results.
- Rebecca Himsl and Jerry Yan (GIS Analyst) – was responsible for creation of mapping and GIS deliverables.

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1 INTRODUCTION

1.1 Study Objectives

The overall objective of the Medicine Hat River Hazard Study is to identify and assess river and flood hazards along the South Saskatchewan River, Ross Creek, Seven Persons Creek, and Bullshead Creek within the City of Medicine Hat and surrounding areas of Cypress County, including the Town of Redcliff and the Hamlet of Desert Blume. Results from this study are designed to inform local land use planning decisions, flood mitigation projects, and emergency response planning. This study is being undertaken as part of the Flood Hazard Identification Program (FHIP) with the intent of enhancing public safety and reducing future flood damages within the Province of Alberta.

This river hazard study is comprised of the eight major study components listed below. A report and associated deliverables have been prepared for each individual study component.

- 1) Survey and Base Data Collection
- 2) Open Water Hydrology Assessment
- 3) Hydraulic Model Creation and Calibration
- 4) Open Water Flood Inundation Map Production
- 5) Open Water Flood Hazard Identification
- 6) Governing Flood Hazard Map Production
- 7) Flood Risk Assessment and Inventory
- 8) Channel Stability Investigation

This report summarizes the work of the fifth component: ***Open Water Flood Hazard Identification***. The primary tasks, services, and deliverables associated with this report are:

- Open water design flood selection;
- Floodway determination;
- Open water design flood levels and profile creation;
- Open water floodway criteria map production;
- Flood water surface TIN development; and
- Flood depth grid creation.

The open water floodway criteria maps are a key component of the overall study and support the flood hazard identification and the flood risk assessment and inventory.

1.2 Study Area and Reach

The City of Medicine Hat is located approximately 290 km southeast of Calgary and approximately 45 km west of the Alberta-Saskatchewan border. **Figure 1** shows the location and boundaries of the river hazard study area and contributing river basins. The river hazard study area includes the following reaches: 26 km of the South Saskatchewan River below Ross Creek; 19 km of the South Saskatchewan River above Ross Creek; 24 km of Ross Creek above the confluence with the South Saskatchewan River; 24 km of Seven Persons Creek above the confluence with Ross Creek; and 9.6 km of Bullshead Creek above the confluence with Ross Creek. Municipalities along these study reaches include the City of Medicine Hat, the Town of Redcliff, the Hamlet of Desert Blume, and Cypress County.

The contributing river basins cover an area of about 61,500 km², extending from the headwaters in the Rocky Mountains to the downstream boundary of the river hazard study area. Major upstream rivers include the Bow and Oldman rivers, which join together approximately 100 km upstream of Medicine Hat to form the South Saskatchewan River. The gross drainage areas of the Bow River and Oldman River basins are 25,600 km² and 28,300 km², respectively. The Bow and Oldman rivers generally flow southeast and east through the Foothills and Grassland natural regions. Most of the runoff from these two sub-basins is typically derived from spring snowmelt augmented by rainfall within the Rocky Mountain and Foothills portions of the basin. The Grassland Region is the largest region within the South Saskatchewan River basin in Alberta, extending from just west of Calgary to the Saskatchewan border. It is the warmest and driest region in Alberta.

The Ross Creek sub-basin has a gross drainage area of 4,790 km² and includes Ross Creek, Seven Persons Creek, and Bullshead Creek. The headwaters of the sub-basin are located in the Cypress Hills, southeast of Medicine Hat. While high flows in this sub-basin more commonly occur in the spring due to snowmelt runoff with or without rainfall, intense summer rainstorm events can often result in high annual peak flows.

A number of dams and flow diversion structures have been developed throughout the South Saskatchewan River basin for various purposes including: irrigation; low-flow augmentation; water supply for industrial, municipal, and domestic users; and hydropower. These developments have altered the natural flow regime in the South Saskatchewan River basin since the beginning of the twentieth century. It is important to note, however, that the existing system was not designed to mitigate floods.

2 AVAILABLE DATA

The open water floodway criteria maps were prepared using information compiled for previous components of the Medicine Hat River Hazard Study. Descriptions of the data used for this study component are provided below.

2.1 Flood Frequencies

Flood frequencies were determined for both regulated and natural conditions for a range of return periods. Details on the methodology and information supporting the open water hydrology assessment, are documented in the *Open Water Hydrology Assessment* study report (NHC, 2019a). **Table 1** summarizes the naturalized flood frequency discharges for the 2-year through 1000-year floods.

Table 1 Naturalized flood frequency discharge estimates for the South Saskatchewan River and its tributaries

Return Period (Years)	Probability of Exceedance in Any Given Year (%)	Naturalized Flood Frequency Discharge (m ³ /s)					
		South Saskatchewan River at Medicine Hat and below Ross Creek	Ross Creek at Highway 41	Ross Creek below Bullshead Creek	Ross Creek below Seven Persons Creek	Seven Persons Creek at Medicine Hat and at the mouth	Bullshead Creek at Black and White Trail
1,000	0.10	12,700	225	263	425	162	145
750	0.13	11,700	215	256	411	155	139
500	0.20	10,500	201	249	393	144	132
350	0.29	9,470	189	224	360	136	118
200	0.50	8,030	169	207	328	121	107
100	1.0	6,500	145	188	292	104	92.3
75	1.3	5,950	136	177	274	97	85.9
50	2.0	5,210	121	152	239	87	72.8
35	2.9	4,630	110	144	222	78	66.9
20	5.0	3,810	91	118	182	64	52.6
10	10	2,930	68	92.3	140	48	38.1
5	20	2,180	45	64.7	95.7	31	24.2
2	50	1,320	17	28.7	40.7	12	7.79

2.2 Survey & DTM Details

The majority of the survey program was carried out in October and November 2017, preceded by a site inspection at the end of September 2017. Follow-up cross section, hydraulic structure, and flood control structure survey work was completed in June 2018. A total of 610 cross sections were surveyed, including 120 on the South Saskatchewan River, 147 on Ross Creek, 240 on Seven Persons Creek, and 103 on Bullshead Creek. A digital terrain model (DTM) based on airborne LiDAR data was supplied by AEP for this study. The DTM was based on data collected by Airborne Imaging and provided to NHC by AEP in February 2018. Orthorectified aerial imagery was acquired for AEP by OGL Engineering Ltd. on 15 July 2018. Fully-processed, orthophoto mosaics were provided to NHC by AEP on 12 January 2019.

Details of the survey data, DTM, and aerial imagery are provided in the **Survey and Base Data Collection** study report (NHC, 2019b).

2.3 HEC-RAS Model

A calibrated HEC-RAS model was developed for the the following reaches: 26 km of the South Saskatchewan River below Ross Creek; 19 km of the South Saskatchewan River above Ross Creek; 24 km of Ross Creek above the confluence with the South Saskatchewan River; 24 km of Seven Persons Creek above the confluence with Ross Creek; and 9.6 km of Bullshead Creek above the confluence with Ross Creek. In total, 667 cross sections were specified in the model: 120 on the South Saskatchewan River, 157 on Ross Creek, 282 on Seven Persons Creek, and 108 on Bullshead Creek. Details on the modelling and flood inundation mapping are provided in the **Hydraulic Modelling and Flood Inundation Mapping** study report (NHC, 2022a).

The calibrated hydraulic model was used to compute water levels for the design flood.

3 FLOODWAY DETERMINATION

Flood hazard identification involves the delineation of floodway and flood fringe zones for a specified design flood under the FHIP Guidelines (Alberta Environment, 2011) and incorporates technical changes implemented in 2021 regarding how floodways are mapped in Alberta. The following describes relevant terminology from the FHIP Guidelines pertaining to this study.

3.1 Open Water Design Flood Selection

The design flood for open water flood hazard identification in Alberta is typically associated with a natural (non-regulated) peak instantaneous discharge that has a one percent chance of being equaled or exceeded in any given year. This is a flood with a statistical 100-year return period, also commonly referred to as the “one in one hundred year flood”.

The naturalized 100-year flood was selected as the open water design flood for the South Saskatchewan River, Ross Creek, Seven Persons Creek and Bullshead Creek. The discharge values used for the open water design flood correspond to the naturalized 100-year return period discharges listed in **Table 1**.

3.2 Floodway and Flood Fringe Terminology

Flood hazard area

The flood hazard area is the area of land that will be flooded during the design flood. It is composed of the floodway and the flood fringe zones, which are defined below.

Floodway

When a floodway is first defined on a flood hazard map, it typically represents the area of highest flood hazard where flows are deepest, fastest, and most destructive during the 100-year design flood. The floodway generally includes the main channel of a stream and a portion of the adjacent overbank area. Previously mapped floodways do not typically become larger when a flood hazard map is updated, even if the flood hazard area gets larger or design flood levels get higher.

Flood Fringe

The flood fringe is the portion of the flood hazard area outside of the floodway. The flood fringe typically represents areas with shallower, slower, and less destructive flooding during the 100-year design flood. However, areas with deep or fast moving water may also be identified as high hazard flood fringe within the flood fringe. Areas at risk behind flood berms may also be mapped as protected flood fringe areas.

Design Flood Levels

Design flood levels are the computed water levels associated with the design flood.

3.3 Open Water Floodway Determination Criteria

The floodway typically represents the area of highest hazard where flows are deepest, fastest, and most destructive during the design flood. The following criteria are based on the FHIP guidelines and were used to delineate the floodway.

- Areas in which the depth of water exceeds 1 m or the flow velocities are greater than 1 m/s.
- In no case should the floodway boundary extend into the main river channel area.
- Exceptions may be made for small backwater areas, ineffective flow areas, and to support creation of a hydraulically smooth floodway.
- For reaches of supercritical flow, the floodway boundary should correspond to the edge of inundation or the main channel, whichever is larger – there were no conditions of supercritical flow for this study and so this criterion did not apply.
- Where a previous floodway exists and a flood hazard map is updated, the existing floodway will not change in most circumstances.

The limits of the floodway are drawn in accordance with the aforementioned criteria. In some instances, the floodway limits are coincident with the inundation limits. This condition typically occurs when floodway limits are very close to the extent of inundation and there is no practical width of flood fringe. This is most evident along steep valley walls or high banks. The floodway limits are also coincident with the inundation limits, when the previous floodway limits are outside of the current extent of inundation. In some cases, the previous floodway limits were inside the main channel. Where these conditions were encountered, the floodway limit lines were moved to the edge of the main channel. The final floodway limits were determined in consultation with the AEP project team.

The location where the floodway limit lines intersect the model cross section lines are denoted as the floodway limit stations. The floodway limit stations and the determination criteria for each cross section are tabulated in Appendix A. Instances where the floodway limits were adjusted to the extent of inundation are annotated with notes.

The floodway limit lines extending between cross sections were delineated based on the adjacent floodway determination criteria and drawn such that the resulting lines followed a hydraulically-smooth path. In most instances, the lines followed along the previous floodway or 1 m depth contour. In some instances, the floodway limits extended into depths less than 1 m where velocities were high. In no case, the floodway limits extended into the main river channel area.

3.4 Open Water Design Flood Profile

The design flood profile levels were those calculated for the 100-year open water flood condition. The design flood level values are listed in Appendix A, and **Figure 2** through **Figure 5** depict the open water design flood level profile for the South Saskatchewan River and its tributaries.

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4 FLOODWAY CRITERIA MAPS

The floodway criteria maps depict the limits of the floodway and flood fringe for the design flood. The open water floodway criteria maps are provided in Appendix B. The information documented on the maps include:

- previous floodway;
- inundation extents for the open water design flood;
- areas where the depth of water is 1 m or greater and the corresponding 1 m depth contour;
- the portions of each cross section where the computed velocity is 1 m/s or faster;
- the floodway limit line;
- the floodway station locations;
- stranded areas of dry ground within the flood hazard area; and
- the location and extent of all cross sections used in the HEC-RAS model.

4.1 Flood Mapping Methodology

The following details the methods used to produce the floodway criteria maps. The mapping exercise began with the computed water surface elevations and flow velocities for the open water design flood. The extent of inundation was then mapped using the general procedure described in the **Hydraulic Modelling and Inundation Mapping** study report (NHC, 2022a). This procedure included generation of the corresponding water surface elevation (WSE) triangular irregular network (TIN), WSE grid, and flood depth grid.

Inundated areas where the depth of water is 1 m or greater and the 1 m depth contours were derived from the flood depth grid. The depth contours were then filtered and smoothed using the same parameters and procedures as those applied to the inundation extents, also described in the **Hydraulic Modelling and Inundation Mapping** report (NHC, 2022a).

Since a one-dimensional computational modelling approach was used for this study, flow velocities were only available at the cross section locations. HEC-RAS can apportion channel and overbank discharge into a maximum of 45 sub-sections at any cross section location. Discharge is apportioned based on the computed water level and a weighted flow area approach. This provides a convenient means to estimate the lateral variation in velocity across a section. For this study, the maximum number of velocity subsections were specified in the overbanks. The velocity values for each segment along the cross sections were symbolized on the floodway criteria maps to visualize the transverse variation in velocity along each cross section.

4.2 Areas in the Floodway

Developed areas or other areas of interest within the floodway included:

- buildings near the water treatment plant upstream of Highway 1;
- Kiwanis River Park;
- portions of Riverside area along 1st St NE behind the flood control structure;
- Police Point Park;
- portions of Desert Blume Golf Course; and
- buildings south of CP rail near Factory St SE.

4.3 Areas in the High Hazard Flood Fringe

Areas of interest within the high hazard flood fringe included:

- portions of Harlow behind the flood control structure;
- portions of Riverside area behind the flood control structure extended to 1 St NW;
- Athletic Park, River Park, Lions Park and adjacent areas behind Lions Park flood control structure;
- Strathcona Island Park;
- portions of Cottonwood Coulee Golf Course;
- portions of Kin Coulee Park;
- buildings around Mill St SE and Smelter Ave SE;
- portions of North Flats adjacent to Ross Creek; and,
- portions of the industrial areas within South Flats.

4.4 Areas in the Protected Flood Fringe

Following areas are within the protected flood fringe area:

- power plant natural area; and
- portions of North Flats.

4.5 Areas in the Flood Fringe

- Eco Dale Regional Park;
- portions of Harlow behind the flood control structure;

- portions of Riverside area behind the flood control structure extended beyond 2 St NE;
- portions of North Flats;
- portions of Desert Blume Golf Course;
- portions of Cottonwood Coulee Golf Course;
- portions of Paradise Valley Coulee Golf Course;
- portions of Kin Coulee Park;
- areas north of Kipling St SE; and,
- portions of South Flats.

Additional information pertaining to areas within the flood hazard area is summarized within the ***Flood Risk Inventory and Assessment*** study report (NHC, 2022b).

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5 DESIGN FLOOD GRIDS

Water surface elevation grid and flood depth grid were prepared for the open water design flood and provided with the GIS deliverables for this study component, along with the WSE TIN, polygons delineating the flood hazard area, floodway and flood fringes. All these GIS deliverables were generated for the open water design flood. A description of the water surface elevation grid and flood depth grid is provided below.

5.1 Water Surface Elevation Grid

First, a water surface elevation (WSE) triangular irregular network (TIN) was created, which represents the open water design flood level profile along the modelled river reaches. The adjusted WSE TINs then were converted to a tiled set of WSE grids matching the alignment, horizontal resolution, and tiling boundaries of the LiDAR-derived DTM supplied by AEP. Water surface elevations in meters are provided as 32-bit floating point grid cell values. The WSE grid at this stage were used to compute the flood depth grid, as described in the following section.

As a final step, the inundation extent polygon generated from the flood depth grid was used to clip the WSE grid such that a value of *NoData* is provided for all dry areas and the water surface elevation values are indicated only where inundation is shown.

WSE grid is provided for information only. Grid cell values are based on linear interpolation between cross sections in the hydraulic model, and as such, discrete cell values should be considered approximate.

5.2 Flood Depth Grid

For the open water design flood, each bare earth DTM grid tile was subtracted from the corresponding adjusted WSE grid tile (prior to clipping) to generate a set of flood depth grid tiles representing water depth in meters as 32-bit floating point values. All flood depth grids maintained the same alignment, horizontal resolution, and tiling boundaries as the LiDAR-derived bare earth DTM supplied by AEP. Grid cells with depth values less than 0 m, which represent dry areas, were assigned a value of *NoData*.

The flood depth grid is provided for information only. Grid values are based on linear interpolation of water surface elevations between cross sections in the hydraulic model, and as such, discrete cell values should be considered approximate.

Also, since the LiDAR-derived DTM indicates the approximate water surface elevation at the time of the LiDAR survey for submerged portions of river beds and other ground covered by water, depth values in those areas should not be considered accurate. Elsewhere, the depth grids may be used for many purposes, such as to identify areas in the floodplain that exceed a specified depth criteria.

6 CONCLUSIONS

The objectives of this study were to assess river flood-related hazards along the modelled reach of the South Saskatchewan River, Ross Creek, Seven Persons Creek and Bullshead Creek that includes the City of Medicine Hat, the Town of Redcliff, the Hamlet of Desert Blume, and Cypress County. The Medicine Hat River Hazard Study was divided into eight major project components. This report summarizes the work of the ***Open Water Flood Hazard Identification*** component, for which open water flood hazards were identified in accordance with the provincial FHIP guidelines. The reader is advised to reference the previous work components for additional context on the work summarized in this report.

The floodway criteria maps document the open water flood hazard identification criteria and resulting floodway boundaries. The floodway boundaries were mostly governed by the 1 m depth and previous floodway criterion. Along steep valley walls and high banks the 1 m depth contours and/or previous floodway followed closely along the full limit of inundation, which would have resulted in a very narrow, impractical, band of flood fringe (even imperceptible at the mapping scale). In these instances, the floodway limits were set to coincide with the water's edge.

Notable areas within the floodway included portions of portions of Riverside along 1st St NE behind the flood control structure , Desert Blume Golf Course and some low lying areas within North and South Flats. The floodway also includes portions of several river side parks including Kiwanis River Park and Police Point Park.

7 REFERENCES

Alberta Environment. 2011. Flood Hazard Identification Program Guidelines – July 2011.

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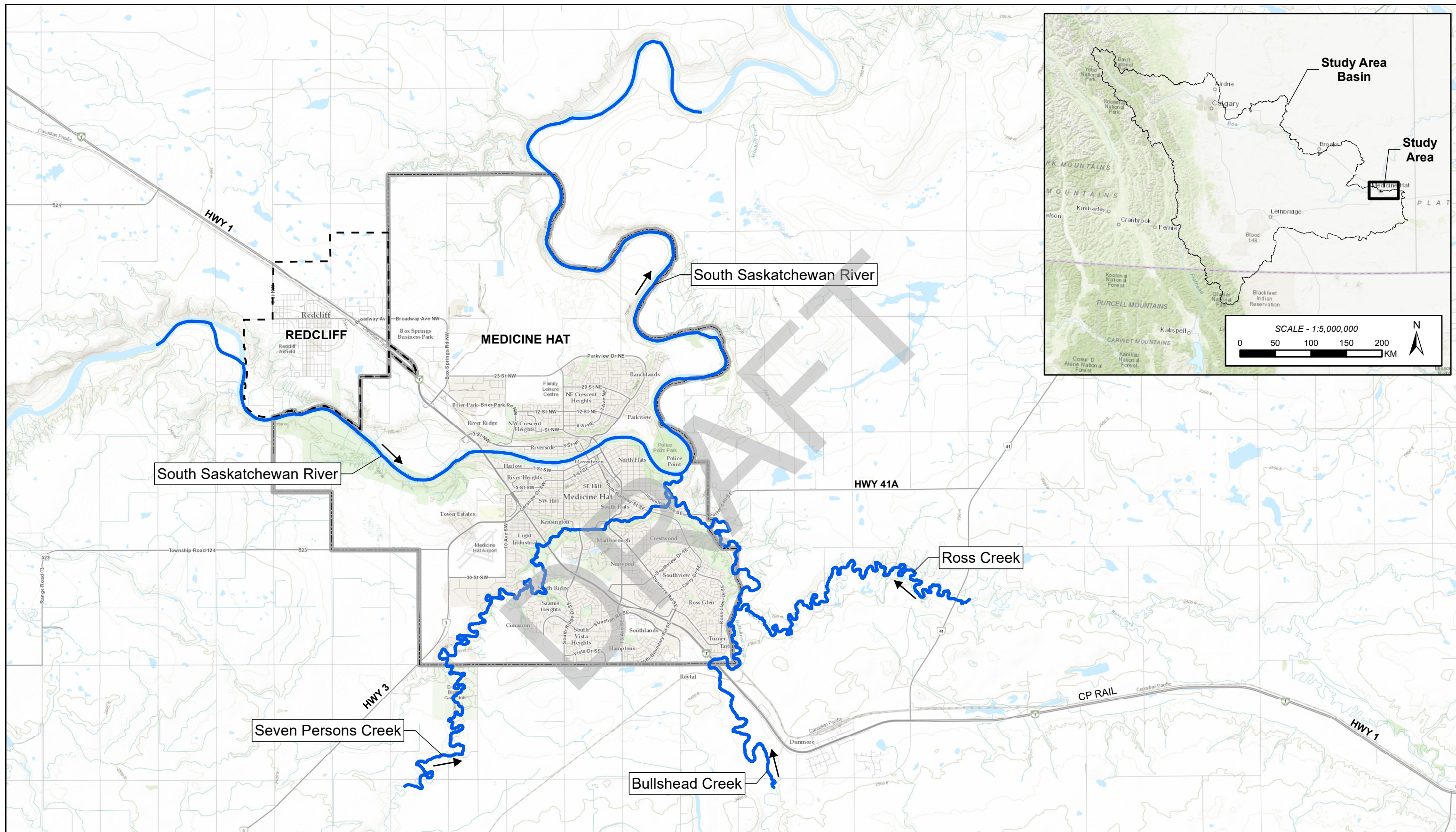
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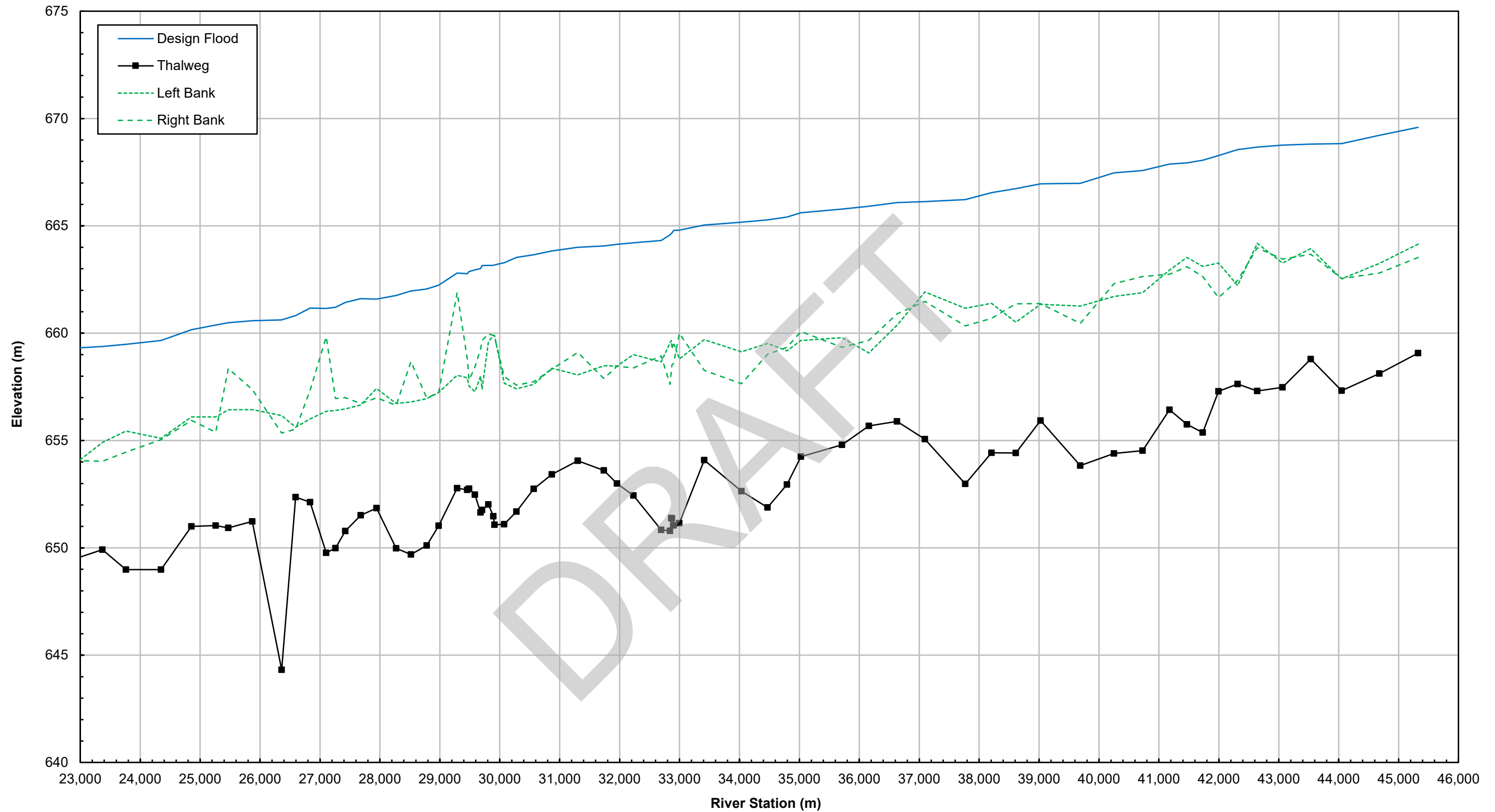
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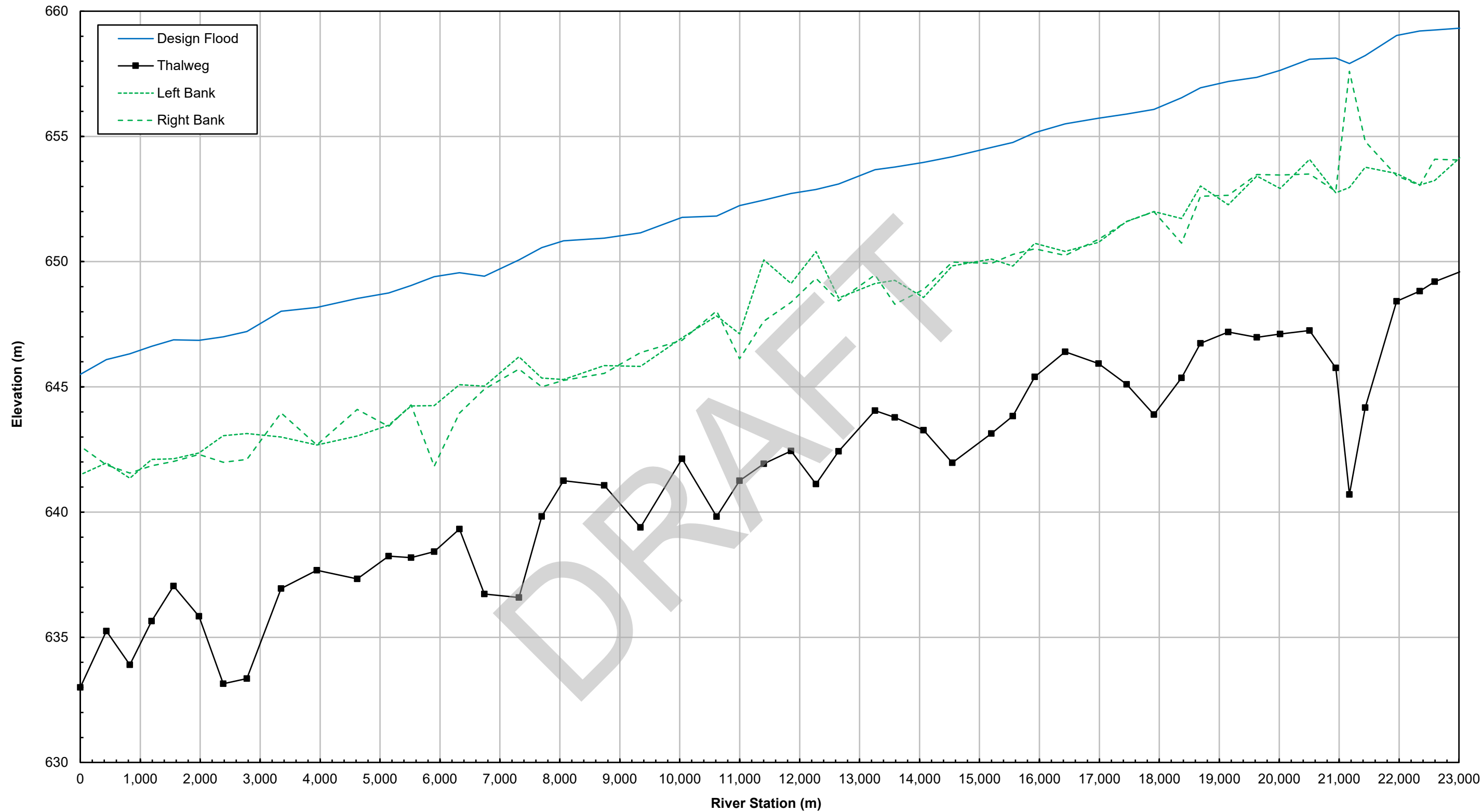
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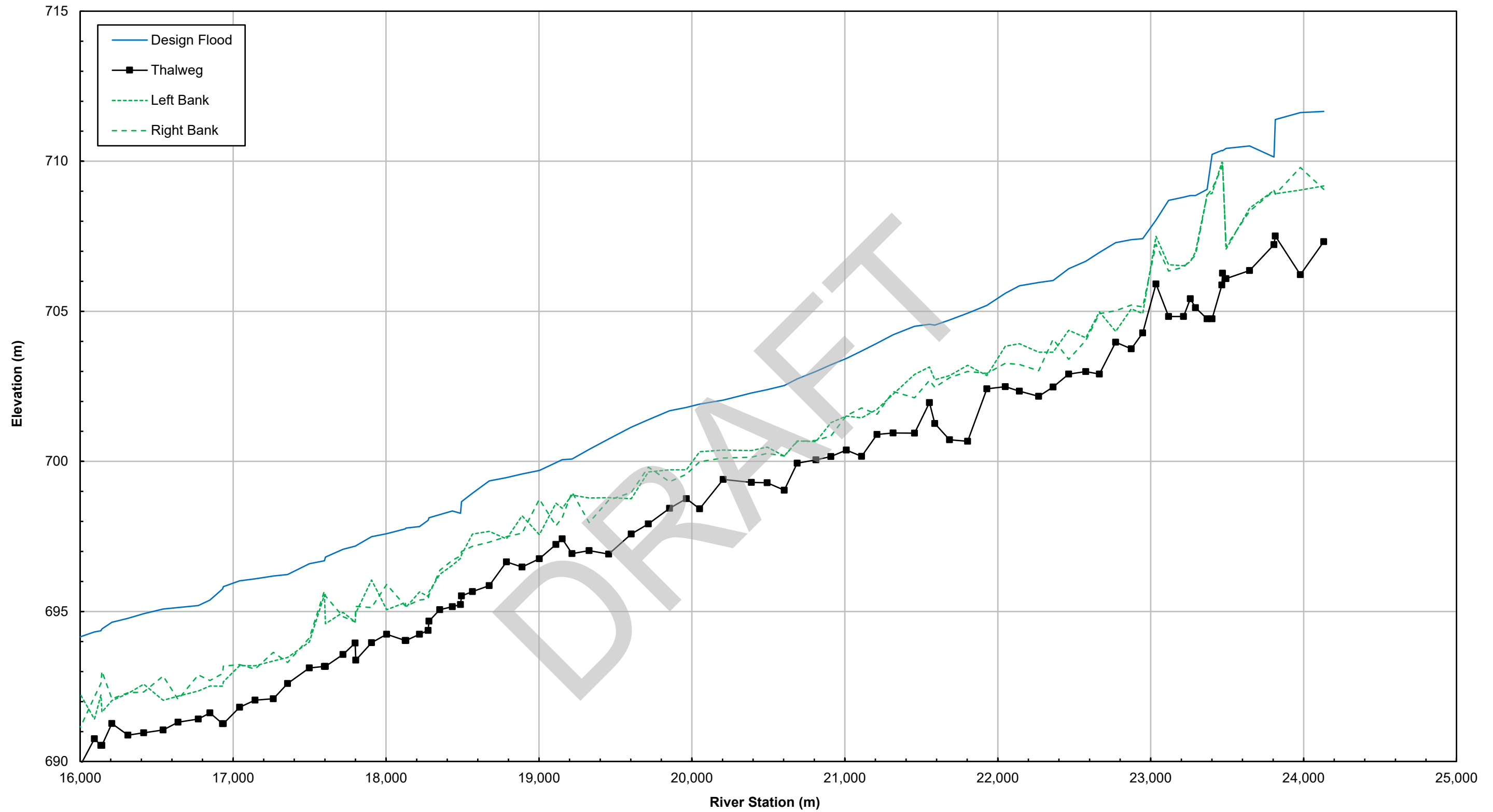
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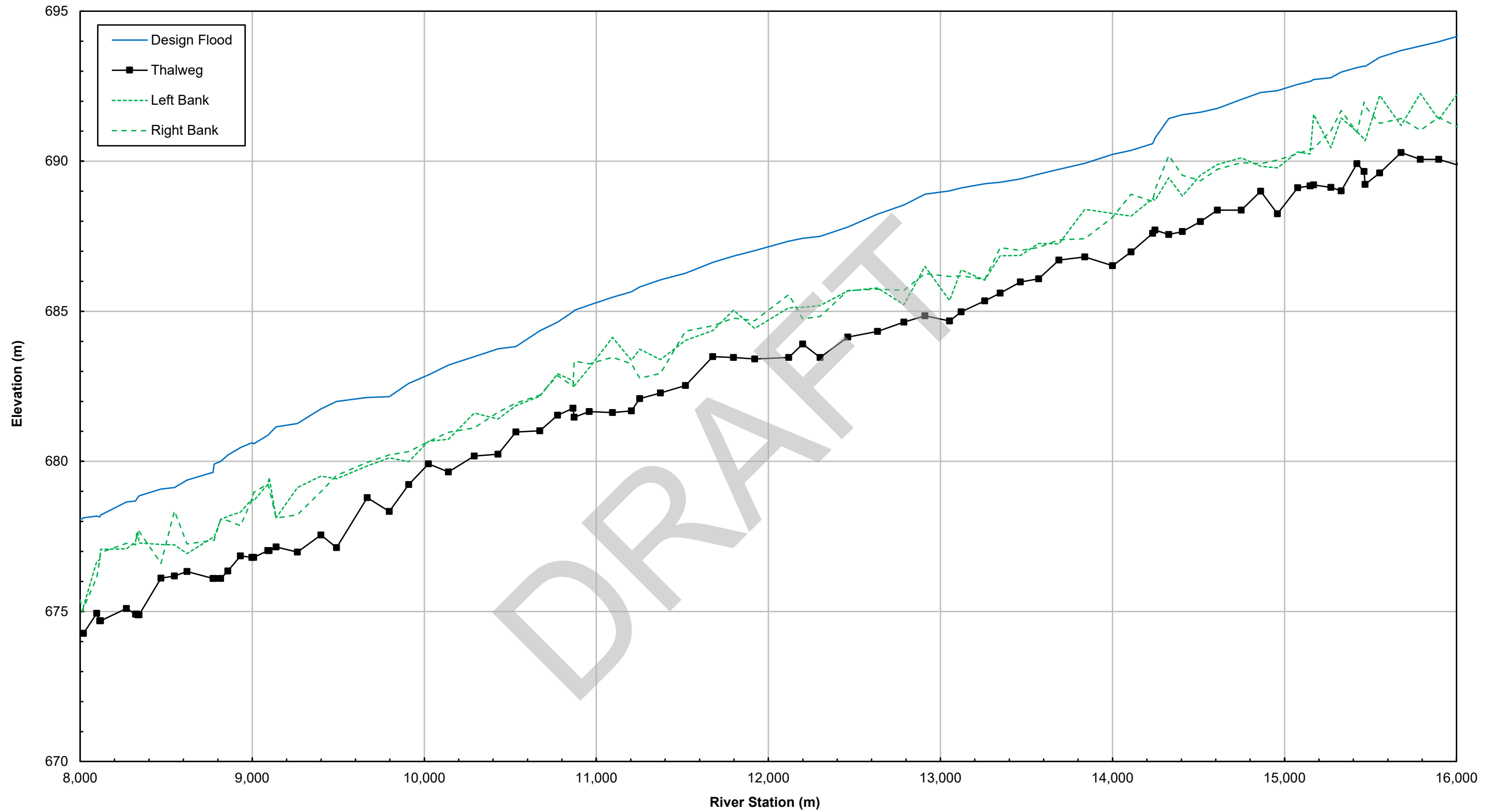
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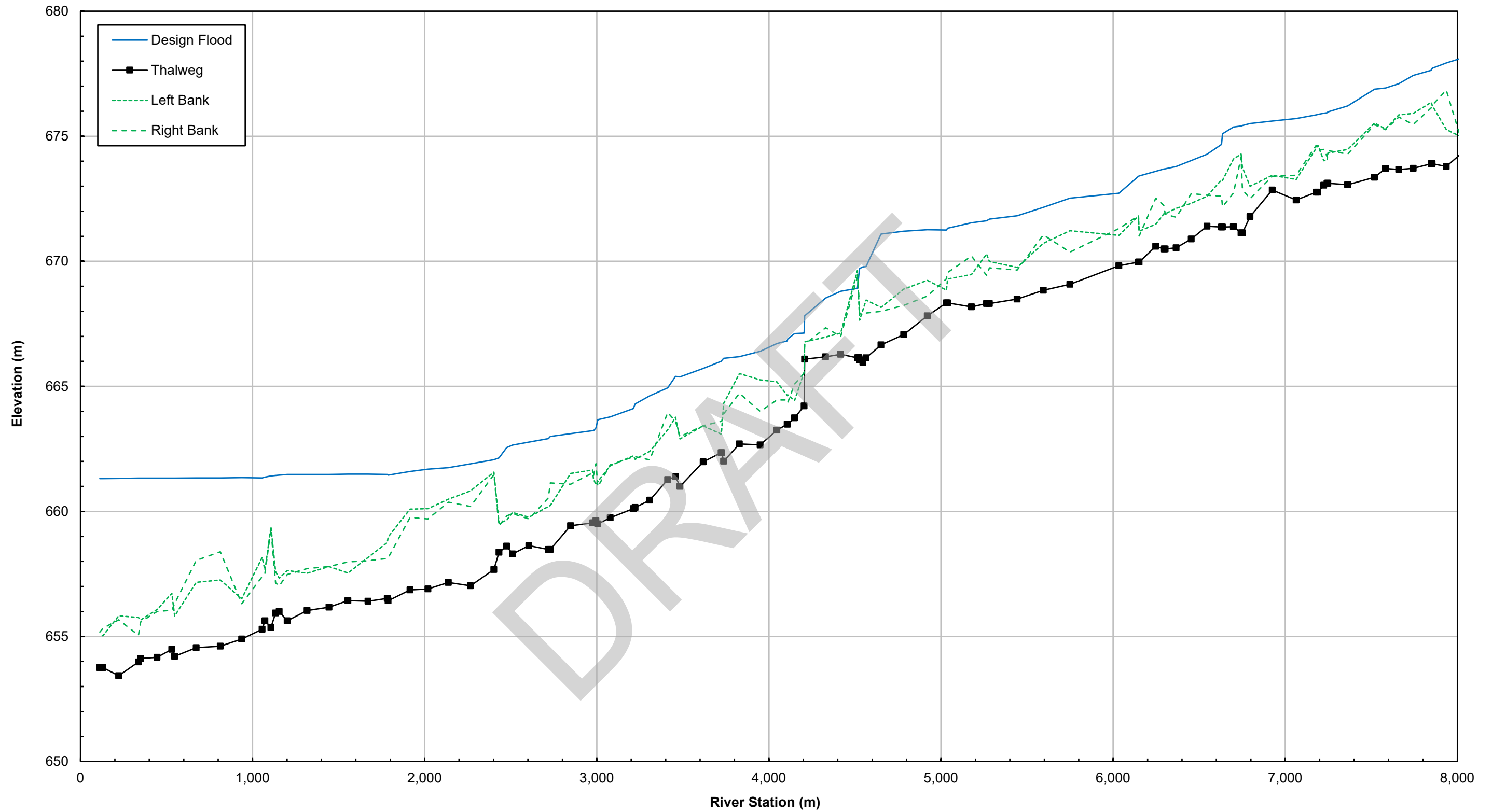


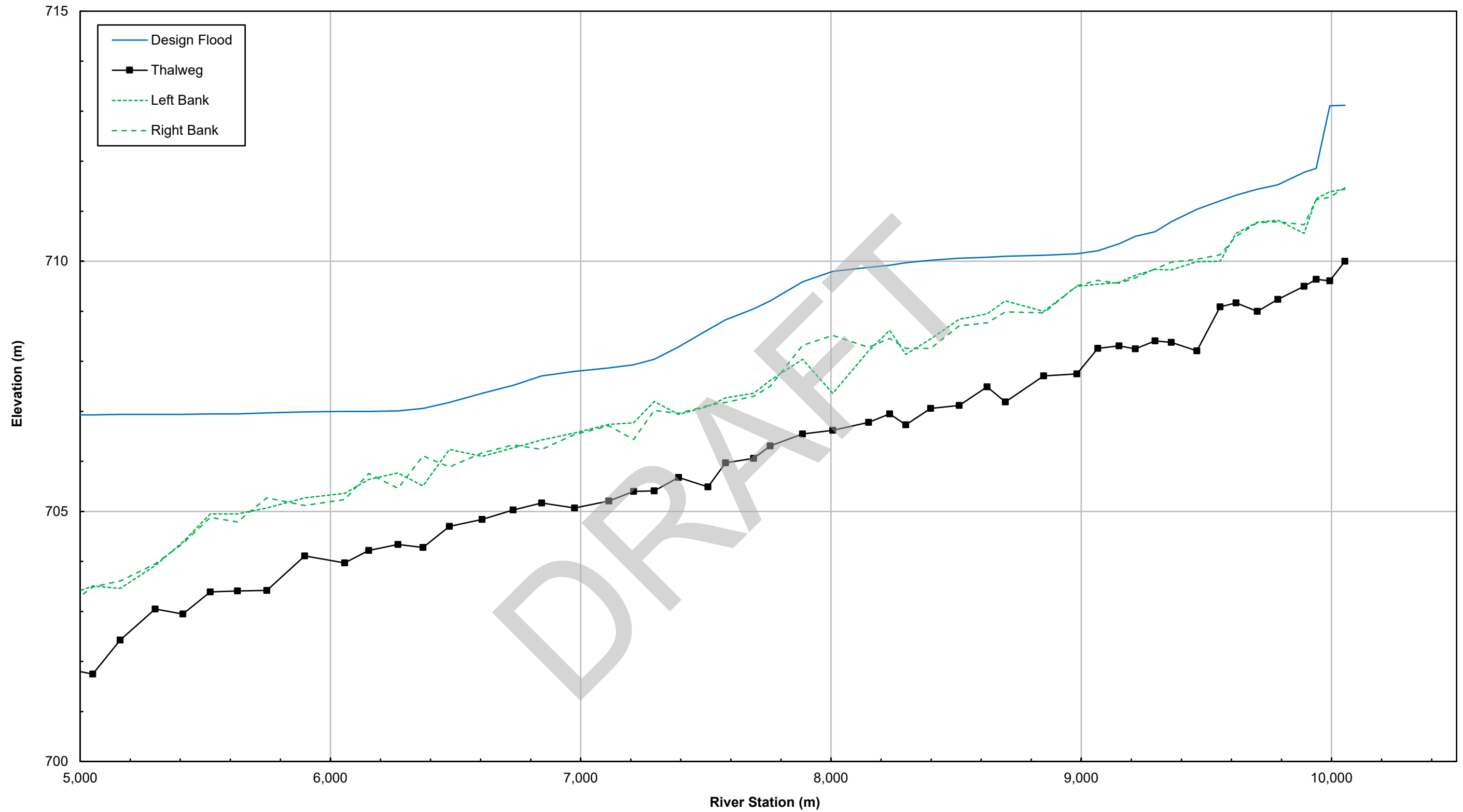


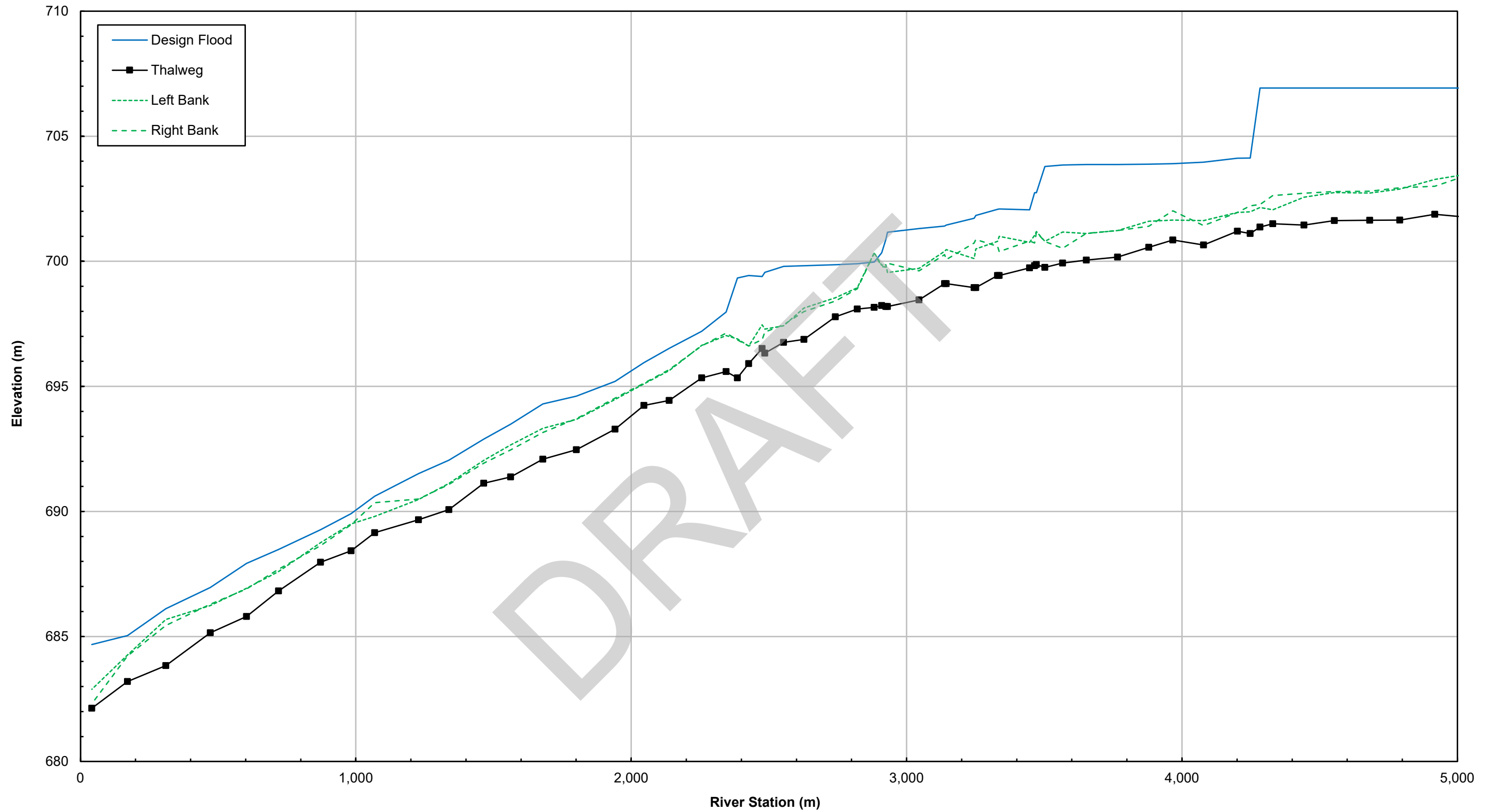




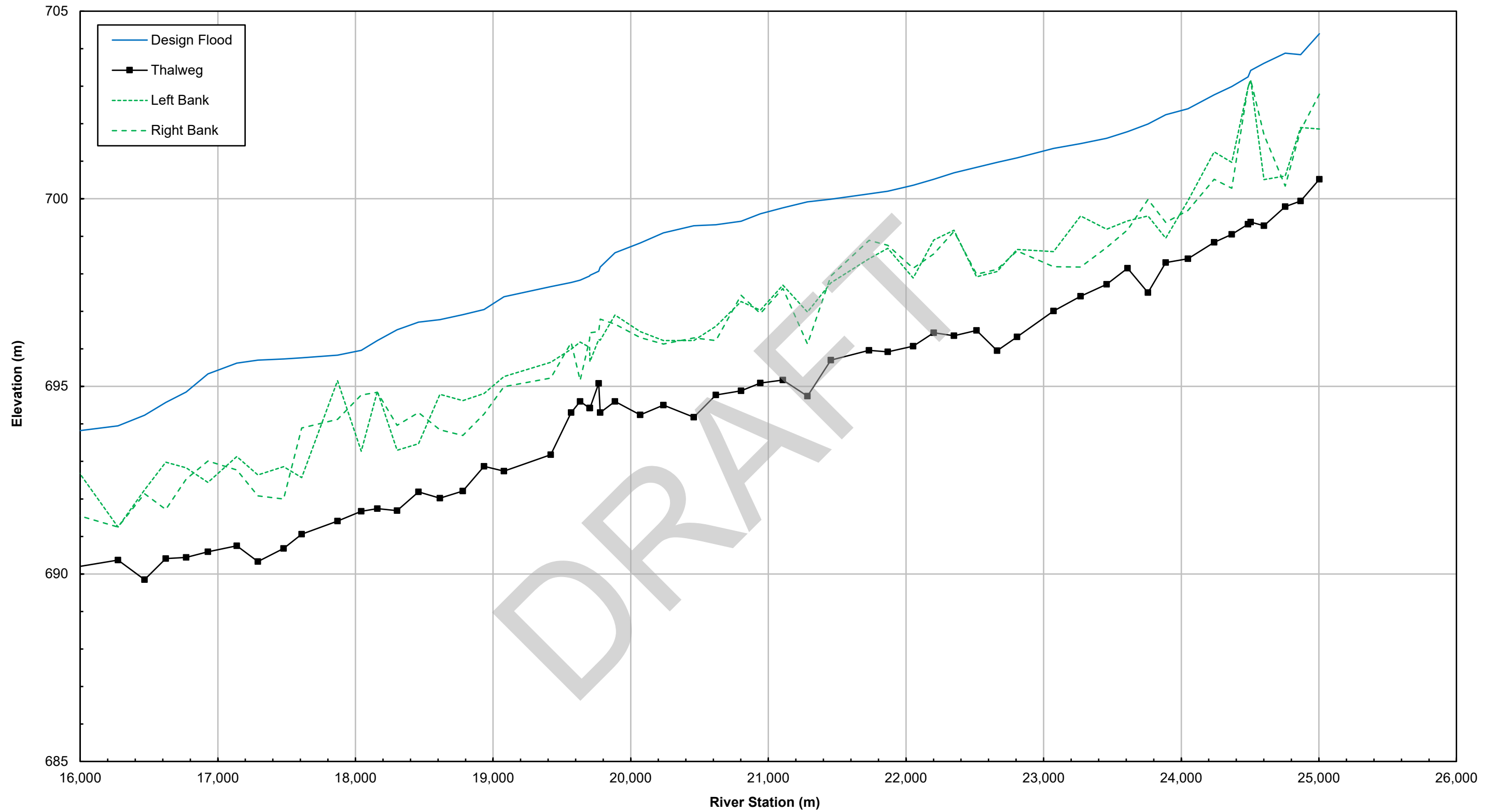
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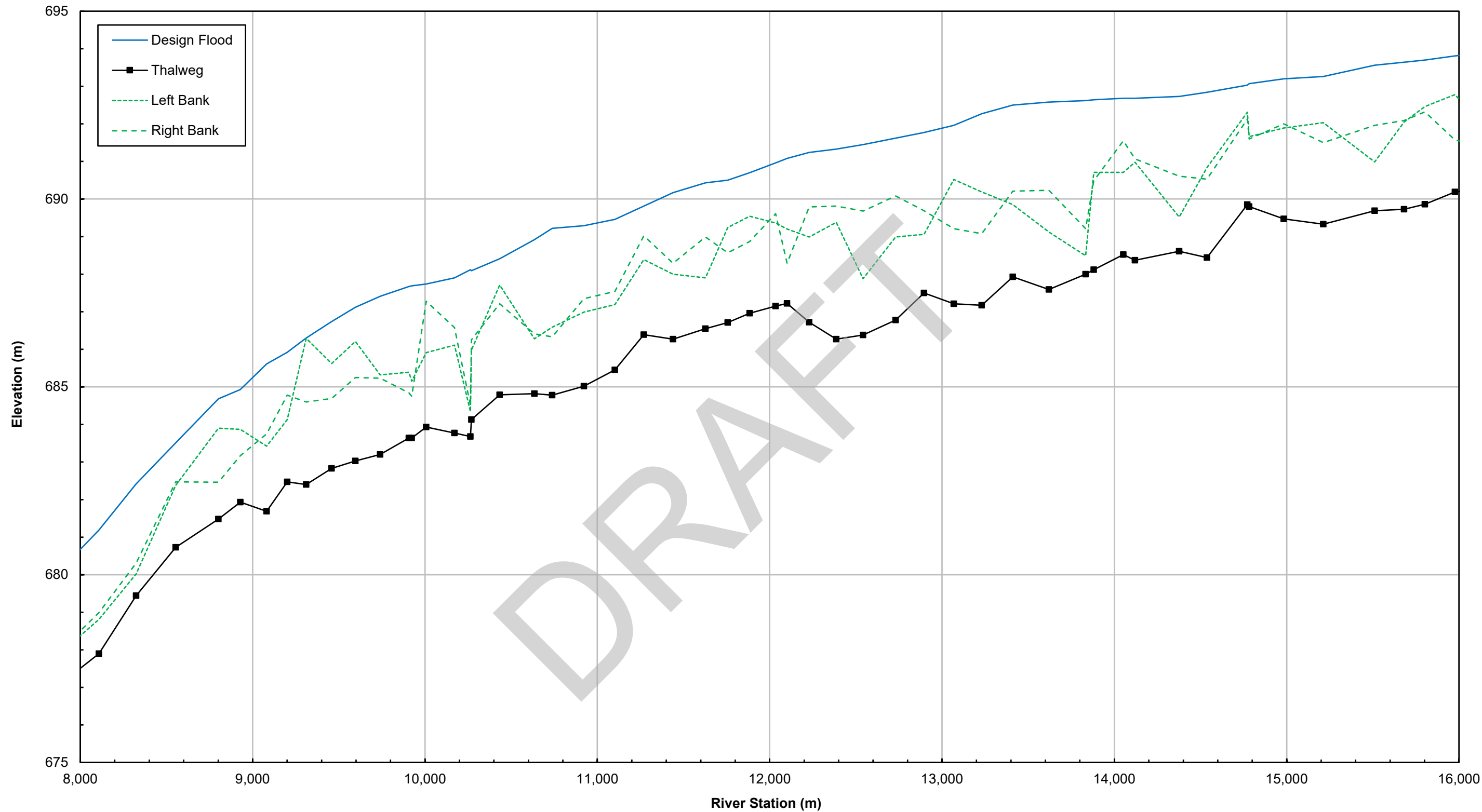




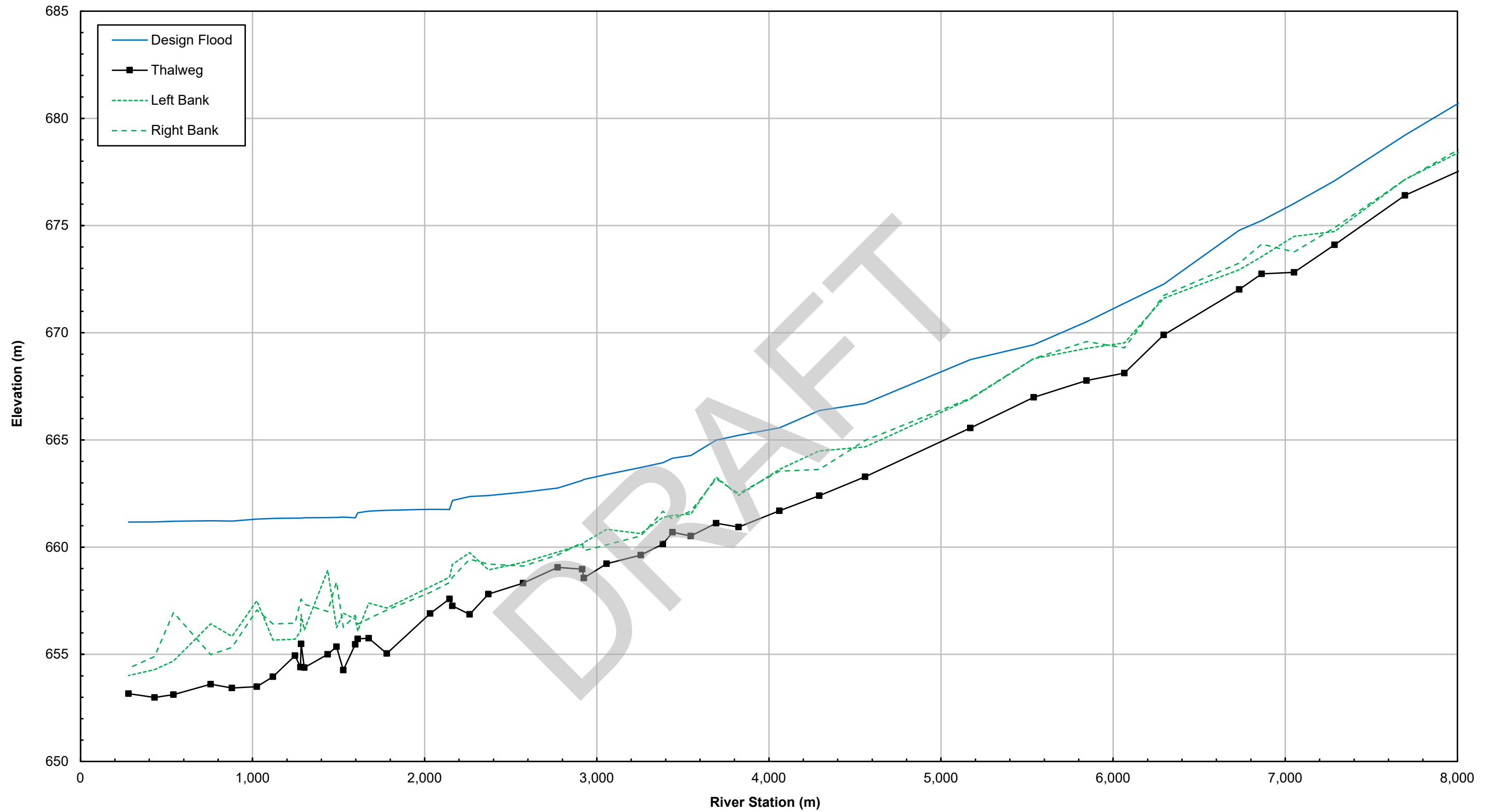
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Appendix A
Floodway Determination Criteria Summary and Design Flood Levels

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Table A-1 Selected floodway limit stations, determination criteria, and design flood levels – South Saskatchewan River

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-120	45,325	166.5	1 m Depth*	480.5	1 m Depth*	669.59
XS-119	44,679	61.7	1 m Depth*	347.3	1 m Depth*	669.22
XS-118	44,049	70.2	Previous Floodway*	308.0	Previous Floodway	668.83
XS-117	43,533	159.6	Previous Floodway*	515.4	Previous Floodway	668.81
XS-116	43,063	90.0	Previous Floodway*	723.4	Previous Floodway	668.76
XS-115	42,640	31.8	Previous Floodway*	811.7	Previous Floodway*	668.67
XS-114	42,313	32.4	Previous Floodway*	536.0	Previous Floodway	668.55
XS-113	41,994	58.5	Previous Floodway*	330.4	Previous Floodway	668.27
XS-112	41,730	75.8	Previous Floodway*	312.3	Previous Floodway	668.06
XS-111	41,467	44.6	Previous Floodway*	315.2	Previous Floodway	667.93
XS-110	41,176	249.2	Previous Floodway*	526.4	Previous Floodway	667.88
XS-109	40,727	466.3	Previous Floodway	724.8	Previous Floodway*	667.58
XS-108	40,250	469.9	Previous Floodway	749.6	Previous Floodway*	667.47
XS-107	39,686	338.1	Previous Floodway	575.7	Previous Floodway*	666.98
XS-106	39,026	82.6	Previous Floodway*	456.3	Previous Floodway*	666.96
XS-105	38,613	29.3	Previous Floodway*	378.7	Previous Floodway	666.73
XS-104	38,206	13.5	Previous Floodway*	260.1	Previous Floodway	666.55
XS-103	37,769	57.6	Previous Floodway*	300.0	Previous Floodway	666.22
XS-102	37,096	14.1	Main Channel	297.0	Previous Floodway	666.13
XS-101	36,628	32.9	Previous Floodway	339.6	Previous Floodway	666.08
XS-100	36,160	246.7	Previous Floodway	561.4	Previous Floodway*	665.91
XS-99	35,711	481.6	Previous Floodway	798.3	Previous Floodway*	665.78
XS-98	35,027	756.2	Previous Floodway	1098.3	Previous Floodway	665.61
XS-97	34,794	774.8	Previous Floodway	1099.9	Previous Floodway	665.41
XS-96	34,469	773.4	Previous Floodway	1107.7	Previous Floodway*	665.28
XS-95	34,035	658.9	Previous Floodway	944.9	Previous Floodway*	665.17
XS-94	33,412	129.9	Previous Floodway*	455.7	Previous Floodway*	665.04
XS-93	32,996	93.6	Previous Floodway*	343.5	Previous Floodway*	664.80
XS-92	32,901	117.4	Previous Floodway*	420.1	Previous Floodway*	664.79
XS-91	32,874	108.6	Previous Floodway*	396.6	Previous Floodway	664.67
XS-90	32,864	104.3	Previous Floodway*	376.6	Previous Floodway*	664.65
XS-89	32,841	118.1	Previous Floodway*	388.7	Previous Floodway*	664.58
XS-88	32,695	83.1	Previous Floodway*	328.2	Previous Floodway	664.32
XS-87	32,232	49.3	Previous Floodway*	316.2	1 m Depth*	664.21
XS-86	31,958	87.7	Previous Floodway*	390.9	1 m Depth*	664.14
XS-85	31,737	205.0	Previous Floodway*	485.9	1 m Depth*	664.06
XS-84	31,302	324.7	Previous Floodway	637.7	Previous Floodway	664.00
XS-83	30,870	445.1	Previous Floodway	748.0	Previous Floodway	663.83
XS-82	30,568	442.2	Previous Floodway	753.3	Previous Floodway*	663.65
XS-81	30,278	419.6	Previous Floodway	708.3	Previous Floodway*	663.53
XS-80	30,073	353.5	Previous Floodway	610.1	Previous Floodway	663.28

Table A-1 Selected floodway limit stations, determination criteria, and design flood levels – South Saskatchewan River (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-79	29,912	326.8	Previous Floodway	575.2	Previous Floodway	663.18
XS-78	29,893	320.2	Previous Floodway	571.4	Previous Floodway	663.16
XS-77	29,810	322.2	Previous Floodway	570.6	Previous Floodway	663.16
XS-76	29,705	327.5	Previous Floodway	592.6	Previous Floodway	663.15
XS-75	29,679	317.6	Previous Floodway	598.5	Previous Floodway	663.01
XS-74	29,586	215.1	Previous Floodway	498.4	Previous Floodway	662.95
XS-73	29,490	220.2	Previous Floodway	460.2	Previous Floodway	662.87
XS-72	29,458	221.8	Previous Floodway	462.2	Previous Floodway	662.77
XS-71	29,288	93.2	Previous Floodway	380.8	Previous Floodway	662.80
XS-70	28,982	12.3	Previous Floodway	206.0	1 m Depth*	662.24
XS-69	28,782	32.7	Previous Floodway	241.8	1 m Depth*	662.06
XS-68	28,518	123.3	Previous Floodway	350.3	1 m Depth*	661.97
XS-67	28,272	52.4	Previous Floodway	288.1	1 m Depth*	661.76
XS-66	27,944	23.7	Main Channel	295.8	1 m Depth*	661.59
XS-65	27,680	136.6	Previous Floodway	569.8	1 m Depth*	661.61
XS-64	27,421	277.5	Previous Floodway	795.7	1 m Depth*	661.43
XS-63	27,259	410.6	Previous Floodway	862.4	Previous Floodway	661.21
XS-62	27,103	514.0	Previous Floodway	957.1	Main Channel	661.15
XS-61	26,834	603.7	Previous Floodway	-	-	661.17
XS-60	26,592	656.3	Previous Floodway	1439.5	Previous Floodway	660.82
XS-59	26,362	626.8	Previous Floodway	1328.5	Previous Floodway*	660.62
XS-58	25,869	457.7	Previous Floodway	1259.3	Main Channel	660.58
XS-57	25,470	346.5	Previous Floodway	997.6	Main Channel	660.49
XS-56	25,260	278.5	Previous Floodway	828.1	Previous Floodway*	660.38
XS-55	24,856	72.2	Previous Floodway	434.7	Previous Floodway	660.16
XS-54	24,346	5.8	Previous Floodway*	333.4	Previous Floodway	659.66
XS-53	23,762	7.1	Previous Floodway*	411.9	Previous Floodway	659.48
XS-52	23,368	22.7	Previous Floodway*	425.6	Previous Floodway	659.38
XS-51	22,594	763.3	Previous Floodway	1224.5	Previous Floodway	659.25
XS-50	22,345	1069.8	Previous Floodway	1887.5	Previous Floodway	659.21
XS-49	21,960	1309.5	Previous Floodway	1924.2	Previous Floodway	659.03
XS-48	21,436	1409.8	Previous Floodway	1710.1	Main Channel	658.23
XS-47	21,170	1417.2	Previous Floodway	1728.5	Main Channel	657.91
XS-46	20,944	1303.3	Previous Floodway	1770.8	Main Channel	658.13
XS-45	20,505	1224.1	Previous Floodway	1748.7	Main Channel	658.08
XS-44	20,015	1120.4	Previous Floodway	1372.5	Main Channel	657.64
XS-43	19,627	657.8	Previous Floodway	963.0	Previous Floodway*	657.36
XS-42	19,151	141.5	Previous Floodway	516.6	Previous Floodway	657.19
XS-41	18,687	24.2	Previous Floodway*	372.9	Previous Floodway	656.94
XS-40	18,369	26.2	Previous Floodway*	321.4	Previous Floodway	656.54
XS-39	17,911	13.1	Previous Floodway*	245.9	Previous Floodway	656.08
XS-38	17,457	7.1	Previous Floodway*	253.9	Previous Floodway	655.89

Table A-1 Selected floodway limit stations, determination criteria, and design flood levels – South Saskatchewan River (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-37	16,987	3.3	Previous Floodway*	281.7	Previous Floodway	655.73
XS-36	16,430	245.7	Previous Floodway*	584.8	Previous Floodway	655.50
XS-35	15,922	698.0	Previous Floodway	1035.0	Main Channel	655.15
XS-34	15,557	945.8	Previous Floodway	1213.6	Main Channel	654.76
XS-33	15,200	995.4	Previous Floodway	1271.3	Main Channel	654.56
XS-32	14,548	860.7	Previous Floodway	1126.5	Previous Floodway*	654.19
XS-31	14,068	619.5	Previous Floodway	886.7	Previous Floodway*	653.96
XS-30	13,587	345.9	Previous Floodway*	748.6	Previous Floodway	653.78
XS-29	13,257	64.9	Previous Floodway*	407.6	Previous Floodway	653.67
XS-28	12,651	31.9	Previous Floodway*	294.2	Previous Floodway	653.10
XS-27	12,272	14.0	Previous Floodway*	249.7	Previous Floodway	652.88
XS-26	11,856	56.4	Previous Floodway*	339.6	Previous Floodway	652.72
XS-25	11,401	7.0	Main Channel	296.8	Previous Floodway	652.46
XS-24	10,997	10.5	Main Channel	302.6	Previous Floodway	652.24
XS-23	10,616	7.6	Previous Floodway*	241.9	Previous Floodway	651.82
XS-22	10,038	394.2	Previous Floodway	766.5	Previous Floodway	651.77
XS-21	9,344	685.7	Previous Floodway	951.6	Main Channel	651.15
XS-20	8,739	468.6	Previous Floodway	798.1	Main Channel	650.94
XS-19	8,061	28.8	Previous Floodway	473.7	Previous Floodway	650.83
XS-18	7,699	12.1	Previous Floodway*	361.7	Previous Floodway	650.56
XS-17	7,319	44.5	Previous Floodway*	254.4	Previous Floodway	650.07
XS-16	6,742	26.7	1 m Depth*	336.5	1 m Depth	649.42
XS-15	6,324	29.7	1 m Depth*	434.9	1 m Depth	649.56
XS-14	5,902	28.5	1 m Depth*	461.7	1 m Depth*	649.40
XS-13	5,517	227.3	1 m Depth*	517.8	1 m Depth*	649.05
XS-12	5,143	308.5	1 m Depth*	574.2	1 m Depth*	648.75
XS-11	4,620	406.0	1 m Depth*	717.2	1 m Depth*	648.53
XS-10	3,946	297.7	1 m Depth*	624.8	1 m Depth*	648.17
XS-9	3,351	45.2	1 m Depth*	464.8	1 m Depth	648.02
XS-8	2,779	51.6	1 m Depth*	401.2	1 m Depth	647.21
XS-7	2,385	8.0	1 m Depth*	326.1	1 m Depth	647.00
XS-6	1,981	54.6	1 m Depth*	383.9	1 m Depth*	646.86
XS-5	1,554	34.0	1 m Depth*	396.6	1 m Depth*	646.88
XS-4	1,188	101.7	1 m Depth*	447.6	1 m Depth	646.62
XS-3	826	368.6	1 m Depth*	692.2	1 m Depth*	646.32
XS-2	434	641.3	1 m Depth	937.4	1 m Depth*	646.09
XS-1	0	687.0	1 m Depth	1015.6	1 m Depth*	645.50

Notes:

*denotes those instances where the Floodway limit was adjusted to the extent of inundation.

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-559	24,132	94.2	1 m Depth*	140.0	1 m Depth*	711.66
XS-558	23,979	21.4	1 m Depth*	79.2	1 m Depth	711.62
XS-557	23,814	114.4	Hydraulic Smoothing	148.2	1 m Depth	711.39
XS-556	23,806	137.6	1 m Depth*	151.7	1 m Depth	710.14
XS-555	23,647	201.9	1 m Depth	288.5	1 m Depth*	710.51
XS-554	23,493	29.0	1 m Depth*	219.1	1 m Depth*	710.43
XS-553	23,470	32.6	1 m Depth*	214.8	1 m Depth*	710.35
XS-552	23,465	26.5	1 m Depth	213.3	1 m Depth*	710.36
XS-551	23,401	175.7	1 m Depth*	203.3	1 m Depth*	710.23
XS-550	23,369	174.6	1 m Depth*	193.6	1 m Depth*	709.06
XS-549	23,292	12.5	1 m Depth*	42.5	1 m Depth*	708.86
XS-548	23,260	14.5	1 m Depth*	69.6	1 m Depth*	708.86
XS-547	23,215	27.0	1 m Depth	64.6	1 m Depth*	708.80
XS-546	23,117	20.6	1 m Depth*	133.7	1 m Depth	708.70
XS-545	23,034	74.3	1 m Depth*	94.6	1 m Depth*	708.04
XS-544	22,948	38.6	1 m Depth*	57.3	1 m Depth*	707.42
XS-543	22,873	23.8	1 m Depth*	64.6	1 m Depth	707.39
XS-542	22,771	43.4	1 m Depth	88.8	1 m Depth*	707.29
XS-541	22,664	28.5	1 m Depth	55.6	1 m Depth*	706.96
XS-540	22,575	18.7	1 m Depth*	43.8	1 m Depth	706.67
XS-539	22,464	111.6	1 m Depth*	143.4	1 m Depth	706.42
XS-538	22,361	121.5	1 m Depth	142.1	1 m Depth*	706.03
XS-537	22,267	39.6	1 m Depth	125.5	1 m Depth*	705.96
XS-536	22,142	14.2	1 m Depth*	60.8	1 m Depth	705.85
XS-535	22,050	14.2	1 m Depth*	44.8	1 m Depth	705.60
XS-534	21,928	33.7	1 m Depth	72.2	1 m Depth*	705.20
XS-533	21,803	30.8	1 m Depth	58.1	1 m Depth*	704.94
XS-532	21,685	22.7	1 m Depth	46.6	1 m Depth	704.71
XS-531	21,588	196.8	1 m Depth*	230.4	1 m Depth	704.54
XS-530	21,553	172.9	1 m Depth	230.4	1 m Depth	704.57
XS-529	21,455	34.8	1 m Depth	157.1	1 m Depth*	704.50
XS-528	21,316	9.4	1 m Depth*	41.0	1 m Depth	704.22
XS-527	21,210	18.2	1 m Depth*	57.2	1 m Depth*	703.94
XS-526	21,109	10.7	1 m Depth*	50.4	1 m Depth*	703.68
XS-525	21,010	420.5	1 m Depth	445.0	1 m Depth*	703.43
XS-524	20,908	22.3	1 m Depth*	48.7	1 m Depth	703.22
XS-523	20,811	95.7	1 m Depth	118.9	1 m Depth	703.00
XS-522	20,688	118.8	1 m Depth	153.3	1 m Depth*	702.75
XS-521	20,604	93.6	Hydraulic Smoothing	140.7	1 m Depth*	702.53
XS-520	20,492	53.5	1 m Depth	156.4	1 m Depth*	702.39
XS-519	20,389	61.3	Hydraulic Smoothing	139.5	1 m Depth	702.28

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-518	20,205	25.2	1 m Depth	79.8	1 m Depth	702.04
XS-517	20,050	14.2	1 m Depth*	100.2	1 m Depth	701.91
XS-516	19,964	39.8	1 m Depth*	102.1	1 m Depth	701.80
XS-515	19,854	84.0	1 m Depth	129.6	1 m Depth	701.69
XS-514	19,715	7.5	1 m Depth*	46.2	1 m Depth	701.39
XS-513	19,604	8.2	1 m Depth*	51.3	1 m Depth	701.14
XS-512	19,456	35.7	1 m Depth	64.3	1 m Depth*	700.75
XS-511	19,328	122.6	1 m Depth	147.8	1 m Depth*	700.40
XS-510	19,216	118.6	1 m Depth	141.1	1 m Depth*	700.08
XS-509	19,152	98.9	1 m Depth	152.0	1 m Depth*	700.06
XS-508	19,111	66.9	1 m Depth	110.1	1 m Depth	699.96
XS-507	19,002	12.3	1 m Depth*	41.2	1 m Depth	699.70
XS-506	18,890	17.1	1 m Depth*	40.4	1 m Depth	699.58
XS-505	18,787	123.9	1 m Depth	156.9	1 m Depth	699.46
XS-504	18,675	81.7	1 m Depth	139.7	1 m Depth	699.35
XS-503	18,565	9.6	1 m Depth*	34.9	1 m Depth	698.94
XS-502	18,494	94.1	1 m Depth	110.0	1 m Depth	698.66
XS-501	18,486	99.3	1 m Depth	127.0	1 m Depth	698.27
XS-500	18,434	132.0	1 m Depth	170.4	1 m Depth*	698.35
XS-499	18,351	100.2	1 m Depth	151.6	1 m Depth*	698.23
XS-498	18,280	15.8	1 m Depth	65.4	1 m Depth	698.12
XS-497	18,275	14.8	1 m Depth	54.2	1 m Depth	698.04
XS-496	18,219	4.0	1 m Depth*	29.5	1 m Depth	697.83
XS-495	18,130	14.9	1 m Depth	63.4	1 m Depth	697.78
XS-494	18,126	18.0	1 m Depth	72.1	1 m Depth	697.75
XS-493	18,004	84.6	1 m Depth	129.7	1 m Depth*	697.59
XS-492	17,905	70.1	1 m Depth	141.4	1 m Depth*	697.49
XS-491	17,802	67.7	1 m Depth	105.7	1 m Depth*	697.19
XS-490	17,798	60.4	1 m Depth	94.1	1 m Depth*	697.18
XS-489	17,719	53.0	1 m Depth	98.7	1 m Depth*	697.07
XS-488	17,604	15.2	1 m Depth	40.4	1 m Depth	696.81
XS-487	17,598	28.0	1 m Depth	42.7	1 m Depth	696.69
XS-486	17,499	7.6	1 m Depth*	101.4	1 m Depth	696.59
XS-485	17,357	5.6	1 m Depth*	105.8	Hydraulic Smoothing	696.23
XS-484	17,263	6.7	1 m Depth*	72.7	1 m Depth	696.18
XS-483	17,143	5.1	1 m Depth*	83.8	1 m Depth	696.09
XS-482	17,043	6.4	1 m Depth*	53.8	1 m Depth	696.02
XS-481	16,936	113.6	1 m Depth	182.1	1 m Depth	695.83
XS-480	16,931	121.6	1 m Depth	181.8	1 m Depth	695.75
XS-479	16,848	101.9	1 m Depth	122.5	1 m Depth*	695.38
XS-478	16,772	68.3	1 m Depth	90.2	1 m Depth*	695.20
XS-477	16,640	25.5	1 m Depth	81.3	1 m Depth	695.13

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-476	16,542	14.1	1 m Depth*	99.5	1 m Depth	695.08
XS-475	16,415	14.5	1 m Depth*	58.3	1 m Depth	694.93
XS-474	16,312	6.4	1 m Depth*	40.3	1 m Depth*	694.77
XS-473	16,208	29.2	1 m Depth	69.2	1 m Depth	694.64
XS-472	16,142	19.5	1 m Depth	37.8	1 m Depth	694.42
XS-471	16,136	22.6	1 m Depth	41.0	1 m Depth	694.36
XS-470	16,093	28.5	1 m Depth	104.1	1 m Depth*	694.32
XS-469	16,003	21.8	1 m Depth	134.2	1 m Depth*	694.16
XS-468	15,897	36.0	1 m Depth	67.5	1 m Depth*	693.98
XS-467	15,790	62.7	1 m Depth	103.6	1 m Depth	693.84
XS-466	15,677	63.9	1 m Depth	113.6	1 m Depth	693.69
XS-465	15,553	5.6	1 m Depth*	43.3	1 m Depth	693.46
XS-464	15,468	29.0	1 m Depth	52.5	1 m Depth	693.16
XS-463	15,462	28.1	1 m Depth	55.9	1 m Depth	693.17
XS-462	15,421	55.5	1 m Depth	113.4	1 m Depth*	693.12
XS-461	15,330	91.0	1 m Depth	122.6	1 m Depth*	692.97
XS-460	15,270	68.5	1 m Depth	96.9	1 m Depth	692.78
XS-459	15,169	26.1	1 m Depth	89.4	1 m Depth	692.72
XS-458	15,148	18.1	1 m Depth*	69.4	1 m Depth	692.66
XS-457	15,076	18.4	1 m Depth*	83.1	1 m Depth	692.56
XS-456	14,959	50.5	1 m Depth	89.3	1 m Depth*	692.35
XS-455	14,861	17.1	1 m Depth	70.2	1 m Depth	692.29
XS-454	14,749	4.0	1 m Depth*	48.1	1 m Depth	692.06
XS-453	14,610	15.7	1 m Depth*	55.3	1 m Depth	691.76
XS-452	14,511	13.3	1 m Depth	50.6	1 m Depth	691.63
XS-451	14,406	7.3	1 m Depth*	72.9	1 m Depth	691.55
XS-450	14,327	6.2	1 m Depth*	57.9	1 m Depth	691.42
XS-449	14,247	91.4	1 m Depth*	110.4	1 m Depth*	690.77
XS-448	14,233	110.4	1 m Depth*	130.0	1 m Depth*	690.59
XS-447	14,108	104.5	Previous Floodway	131.8	Previous Floodway*	690.36
XS-446	14,000	123.3	Previous Floodway	156.3	Main Channel	690.23
XS-445	13,839	43.1	Previous Floodway	72.2	Previous Floodway	689.93
XS-444	13,689	7.1	Previous Floodway*	47.8	Previous Floodway	689.73
XS-443	13,570	6.7	Previous Floodway*	37.8	Previous Floodway	689.57
XS-442	13,465	120.1	Previous Floodway	154.6	Previous Floodway	689.41
XS-441	13,347	187.0	Previous Floodway	226.7	Previous Floodway	689.30
XS-440	13,258	203.6	Previous Floodway	257.8	Main Channel	689.25
XS-439	13,121	184.8	Previous Floodway	218.6	Previous Floodway*	689.11
XS-438	13,053	137.3	Previous Floodway	163.8	Previous Floodway*	689.01
XS-437	12,911	16.3	Previous Floodway*	54.7	Previous Floodway	688.90
XS-436	12,787	11.1	Main Channel	42.7	Previous Floodway	688.54
XS-435	12,635	11.6	Previous Floodway*	42.3	Previous Floodway*	688.24

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-434	12,461	55.9	Previous Floodway	85.9	Previous Floodway	687.81
XS-433	12,300	188.8	Previous Floodway	227.4	Previous Floodway*	687.50
XS-432	12,200	221.9	Previous Floodway	262.5	Previous Floodway*	687.43
XS-431	12,119	218.4	Previous Floodway	275.1	Main Channel	687.34
XS-430	11,921	80.2	Previous Floodway	111.7	Previous Floodway	687.02
XS-429	11,798	21.7	Previous Floodway*	77.4	Previous Floodway	686.84
XS-428	11,676	12.6	Previous Floodway	53.8	Previous Floodway	686.63
XS-427	11,519	20.3	Previous Floodway	56.9	Previous Floodway	686.27
XS-426	11,372	43.7	Previous Floodway	84.1	Previous Floodway	686.05
XS-425	11,253	89.5	Previous Floodway	132.1	Previous Floodway*	685.81
XS-424	11,204	52.7	Previous Floodway	90.5	Previous Floodway*	685.65
XS-423	11,095	22.1	Previous Floodway	56.3	Previous Floodway	685.47
XS-422	10,959	10.4	Previous Floodway*	75.8	Previous Floodway	685.21
XS-421	10,871	33.7	Main Channel	82.3	Previous Floodway*	685.03
XS-420	10,865	38.7	Main Channel	87.5	Previous Floodway*	684.99
XS-419	10,775	89.3	Previous Floodway	123.0	Previous Floodway*	684.64
XS-418	10,671	9.2	Previous Floodway*	47.1	Previous Floodway*	684.35
XS-417	10,533	34.3	Previous Floodway*	88.2	Previous Floodway	683.83
XS-416	10,429	58.1	Previous Floodway	113.4	Main Channel	683.75
XS-415	10,290	9.7	Previous Floodway*	55.0	Previous Floodway*	683.49
XS-414	10,140	13.6	Previous Floodway*	80.8	Previous Floodway	683.21
XS-413	10,024	11.0	Previous Floodway*	45.5	Previous Floodway*	682.88
XS-412	9,910	9.6	Previous Floodway*	42.2	Previous Floodway*	682.60
XS-411	9,797	10.3	Previous Floodway*	33.2	Previous Floodway*	682.16
XS-410	9,668	73.3	Previous Floodway*	135.0	Main Channel	682.13
XS-409	9,490	6.3	Previous Floodway*	64.8	Previous Floodway*	682.00
XS-408	9,399	10.3	Previous Floodway*	34.1	Previous Floodway*	681.75
XS-407	9,262	18.5	Previous Floodway*	39.0	Previous Floodway*	681.26
XS-406	9,139	16.8	Previous Floodway*	51.5	Hydraulic Smoothing	681.15
XS-405	9,099	21.4	Previous Floodway*	46.5	Previous Floodway	680.92
XS-404	9,091	20.8	Previous Floodway*	45.5	Previous Floodway	680.87
XS-403	9,009	21.2	Previous Floodway*	43.3	Previous Floodway*	680.59
XS-402	8,998	10.1	Previous Floodway*	40.6	Previous Floodway	680.62
XS-401	8,932	8.7	Previous Floodway	35.3	Previous Floodway	680.46
XS-400	8,858	74.2	Main Channel	122.6	Previous Floodway	680.21
XS-399	8,817	144.8	Main Channel	197.2	Previous Floodway	680.00
XS-398	8,778	162.1	Previous Floodway	213.7	Previous Floodway	679.91
XS-397	8,773	166.2	Previous Floodway	221.0	Previous Floodway	679.64
XS-396	8,621	139.7	Previous Floodway	189.6	Previous Floodway*	679.38
XS-395	8,548	134.7	Previous Floodway	179.4	Main Channel	679.13
XS-394	8,469	94.0	Previous Floodway	144.8	Previous Floodway	679.08
XS-393	8,342	117.8	Previous Floodway	176.4	Previous Floodway	678.85

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-392	8,336	119.0	Previous Floodway	177.7	Previous Floodway	678.80
XS-391	8,330	115.7	Previous Floodway	176.6	Previous Floodway	678.76
XS-390	8,322	114.4	Previous Floodway	177.5	Previous Floodway	678.68
XS-389	8,269	112.8	Previous Floodway	193.1	Previous Floodway	678.65
XS-388	8,118	64.4	Previous Floodway	129.1	Previous Floodway	678.21
XS-387	8,114	58.3	Previous Floodway*	121.2	Previous Floodway	678.15
XS-386	8,097	52.0	Previous Floodway*	116.6	Previous Floodway	678.18
XS-385	8,019	17.0	Previous Floodway*	66.8	Previous Floodway	678.12
XS-384	8,016	17.3	Previous Floodway*	68.7	Previous Floodway	678.10
XS-383	7,936	10.4	Previous Floodway*	49.2	Previous Floodway	677.93
XS-382	7,853	11.0	Previous Floodway*	64.3	Previous Floodway	677.72
XS-381	7,849	12.7	Previous Floodway*	68.2	Previous Floodway	677.64
XS-380	7,744	14.2	Previous Floodway*	79.7	Previous Floodway	677.43
XS-379	7,660	15.0	Previous Floodway	80.7	Previous Floodway	677.10
XS-378	7,583	10.3	Previous Floodway	69.2	Previous Floodway*	676.93
XS-377	7,519	18.3	Previous Floodway	89.2	Previous Floodway*	676.88
XS-376	7,363	42.1	Previous Floodway	107.5	Previous Floodway*	676.21
XS-375	7,248	14.1	Previous Floodway	69.9	Previous Floodway	675.97
XS-374	7,243	13.9	Previous Floodway	68.9	Previous Floodway	675.94
XS-373	7,224	13.1	Previous Floodway*	83.9	Previous Floodway	675.92
XS-372	7,190	46.6	Previous Floodway*	94.4	Previous Floodway	675.87
XS-371	7,180	41.7	Previous Floodway*	96.2	Previous Floodway	675.85
XS-370	7,064	37.9	Previous Floodway	107.8	Main Channel	675.71
XS-369	6,925	141.7	Previous Floodway	222.1	Previous Floodway*	675.61
XS-368	6,795	116.4	Previous Floodway	154.6	Previous Floodway*	675.51
XS-367	6,751	99.2	Previous Floodway	140.8	Previous Floodway	675.43
XS-366	6,744	98.8	Previous Floodway	141.8	Previous Floodway	675.41
XS-365	6,699	81.9	Previous Floodway	130.2	Previous Floodway	675.37
XS-364	6,635	54.6	Previous Floodway*	109.0	Previous Floodway	675.10
XS-363	6,630	53.7	Previous Floodway*	76.2	Previous Floodway*	674.67
XS-362	6,546	60.8	Previous Floodway*	103.0	Previous Floodway*	674.28
XS-361	6,454	64.9	Previous Floodway	106.0	Previous Floodway*	674.03
XS-360	6,366	80.9	Previous Floodway	139.0	Previous Floodway*	673.79
XS-359	6,303	116.3	Previous Floodway	181.1	Previous Floodway*	673.70
XS-358	6,295	122.5	Previous Floodway	182.2	Previous Floodway*	673.69
XS-357	6,248	138.4	Previous Floodway	208.8	Previous Floodway	673.60
XS-356	6,151	77.3	Previous Floodway	121.3	Previous Floodway	673.41
XS-355	6,147	76.0	Previous Floodway	119.5	Previous Floodway	673.40
XS-354	6,034	87.8	Previous Floodway	133.2	Previous Floodway*	672.72
XS-353	5,749	38.4	Previous Floodway	101.0	Previous Floodway	672.52
XS-352	5,594	15.4	Previous Floodway*	63.1	Previous Floodway	672.16
XS-351	5,443	34.8	Previous Floodway	93.0	Previous Floodway	671.82

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-350	5,281	40.3	Previous Floodway	112.1	Previous Floodway	671.69
XS-349	5,265	44.0	Previous Floodway	111.0	Previous Floodway	671.62
XS-348	5,177	31.4	Previous Floodway	91.6	Previous Floodway	671.54
XS-347	5,038	25.2	Previous Floodway	88.5	Previous Floodway	671.32
XS-346	5,032	14.1	Previous Floodway	78.5	Previous Floodway	671.25
XS-345	4,920	12.9	Main Channel	107.1	Previous Floodway	671.26
XS-344	4,783	67.5	Previous Floodway	146.9	Previous Floodway	671.20
XS-343	4,651	158.5	Hydraulic Smoothing	235.4	Previous Floodway*	671.09
XS-342	4,565	151.5	Previous Floodway*	252.3	Previous Floodway	669.79
XS-341	4,546	146.2	Previous Floodway*	251.2	Previous Floodway	669.78
XS-340	4,527	135.4	Previous Floodway*	232.6	Previous Floodway	669.71
XS-339	4,522	155.9	Previous Floodway	196.5	Previous Floodway	669.44
XS-338	4,514	158.4	Previous Floodway*	177.3	Previous Floodway*	668.92
XS-337	4,417	109.6	Previous Floodway*	162.3	Previous Floodway	668.80
XS-336	4,329	132.3	Previous Floodway*	194.9	Previous Floodway	668.53
XS-335	4,207	125.3	Previous Floodway	178.2	Previous Floodway*	667.82
XS-334	4,205	127.8	Previous Floodway	184.7	Previous Floodway*	667.13
XS-333	4,149	123.7	Previous Floodway	203.4	Previous Floodway	667.11
XS-332	4,109	128.7	Previous Floodway	196.8	Previous Floodway*	666.90
XS-331	4,106	129.3	Previous Floodway	195.7	Previous Floodway*	666.82
XS-330	4,046	200.2	Previous Floodway*	239.2	Previous Floodway*	666.71
XS-329	3,949	165.0	Previous Floodway*	212.5	Previous Floodway*	666.40
XS-328	3,829	19.0	Previous Floodway*	90.8	Previous Floodway*	666.19
XS-327	3,737	33.0	Previous Floodway*	95.4	Previous Floodway*	666.12
XS-326	3,726	29.1	Previous Floodway*	91.6	Previous Floodway*	666.03
XS-325	3,723	29.1	Previous Floodway*	90.3	Previous Floodway*	666.00
XS-324	3,618	288.6	Previous Floodway*	347.8	Previous Floodway	665.72
XS-323	3,483	284.9	Previous Floodway	355.9	Previous Floodway*	665.38
XS-322	3,457	290.0	Previous Floodway	358.5	Previous Floodway*	665.40
XS-321	3,412	288.0	Previous Floodway	354.2	Previous Floodway*	664.94
XS-320	3,308	107.1	Previous Floodway	188.4	Hydraulic Smoothing	664.62
XS-319	3,223	53.3	Previous Floodway	140.0	Previous Floodway	664.30
XS-318	3,212	58.8	Previous Floodway*	119.9	Previous Floodway*	664.11
XS-317	3,079	217.6	Previous Floodway*	267.4	Previous Floodway	663.78
XS-316	3,006	289.4	Previous Floodway*	332.8	Previous Floodway	663.67
XS-315	2,995	270.8	Previous Floodway*	299.7	Previous Floodway*	663.34
XS-314	2,981	258.0	Previous Floodway*	284.8	Previous Floodway*	663.22
XS-313	2,975	256.7	Previous Floodway*	283.1	Previous Floodway*	663.23
XS-312	2,847	138.6	Previous Floodway	325.9	Previous Floodway*	663.11
XS-311	2,730	127.6	Previous Floodway	358.4	Previous Floodway*	663.00
XS-310	2,719	126.0	Previous Floodway	355.5	Previous Floodway*	662.91
XS-309	2,606	134.4	Previous Floodway	300.4	Main Channel	662.77

Table A-2 Selected floodway limit stations, determination criteria, and design flood levels – Seven Persons Creek (Continued)

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-308	2,510	192.9	Previous Floodway	254.1	Main Channel	662.65
XS-307	2,476	174.4	Previous Floodway	243.2	Main Channel	662.55
XS-306	2,432	129.7	Previous Floodway	206.2	Previous Floodway	662.14
XS-305	2,402	1175.6	Previous Floodway	1276.5	Previous Floodway*	662.07
XS-304	2,266	1077.6	Previous Floodway	1176.6	Previous Floodway*	661.90
XS-303	2,138	806.1	Previous Floodway	909.2	Previous Floodway*	661.75
XS-302	2,019	669.2	Previous Floodway	812.7	Previous Floodway*	661.69
XS-301	1,915	556.5	Previous Floodway	725.5	Previous Floodway*	661.60
XS-300	1,788	467.5	Previous Floodway	713.3	Previous Floodway*	661.45
XS-299	1,783	462.6	Previous Floodway	705.7	Previous Floodway	661.48
XS-298	1,671	346.4	Previous Floodway	556.6	Previous Floodway	661.49
XS-297	1,554	343.2	Previous Floodway	522.3	Previous Floodway	661.49
XS-296	1,444	345.0	Previous Floodway	536.7	Previous Floodway	661.48
XS-295	1,317	359.7	Previous Floodway	543.7	Previous Floodway	661.48
XS-294	1,201	385.3	Previous Floodway	518.6	Main Channel	661.48
XS-293	1,155	438.1	Previous Floodway	520.6	Previous Floodway	661.45
XS-292	1,134	460.2	Previous Floodway	519.1	Previous Floodway	661.44
XS-291	1,106	481.8	Previous Floodway	521.1	Previous Floodway	661.42
XS-290	1,072	494.3	Previous Floodway	522.6	Previous Floodway	661.37
XS-289	1,056	496.6	Previous Floodway	527.8	Previous Floodway	661.34
XS-288	937	134.0	Previous Floodway	179.4	Previous Floodway	661.35
XS-287	812	96.6	Previous Floodway	145.9	Previous Floodway	661.34
XS-286	673	168.3	Previous Floodway	229.8	Previous Floodway	661.34
XS-285	547	230.4	Previous Floodway	263.9	Previous Floodway	661.33
XS-284	531	218.0	Previous Floodway	252.3	Previous Floodway	661.33
XS-283	445	205.8	Previous Floodway	287.3	Previous Floodway	661.33
XS-282	350	184.0	Previous Floodway	-	-	661.33
XS-281	337	178.4	Previous Floodway	-	-	661.33
XS-280	222	150.0	Previous Floodway	-	-	661.32
XS-279	130	94.8	Previous Floodway	-	-	661.31
XS-278	112	90.6	Previous Floodway	-	-	661.31

Notes:

*denotes those instances where the Floodway limit was adjusted to the extent of inundation.

Table A-3 Selected floodway limit stations, determination criteria, and design flood levels – Bullshead Creek

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-667	10,054	38.3	1 m Depth*	830.3	1 m Depth*	713.12
XS-666	9,993	662.1	Hydraulic Smoothing	702.2	1 m Depth*	713.11
XS-665	9,939	668.9	1 m Depth*	684.0	1 m Depth*	711.86
XS-664	9,890	633.9	1 m Depth	649.9	1 m Depth*	711.78
XS-663	9,785	556.2	1 m Depth	566.1	1 m Depth	711.53
XS-662	9,704	549.6	1 m Depth	557.6	1 m Depth	711.44
XS-661	9,619	555.6	1 m Depth	573.1	Mixed	711.32
XS-660	9,555	565.3	1 m Depth	586.7	1 m Depth	711.21
XS-659	9,462	623.5	1 m Depth	636.6	1 m Depth*	711.04
XS-658	9,360	658.5	1 m Depth	679.0	1 m Depth*	710.79
XS-657	9,295	676.2	1 m Depth	700.3	1 m Depth*	710.59
XS-656	9,216	721.3	1 m Depth	734.5	1 m Depth*	710.50
XS-655	9,151	735.3	1 m Depth	748.4	1 m Depth*	710.35
XS-654	9,066	771.6	1 m Depth	777.7	1 m Depth	710.21
XS-653	8,983	769.4	1 m Depth	815.4	1 m Depth	710.15
XS-652	8,850	773.2	1 m Depth	863.8	1 m Depth*	710.12
XS-651	8,697	726.1	1 m Depth	822.5	1 m Depth	710.10
XS-650	8,624	674.3	1 m Depth	741.8	1 m Depth*	710.08
XS-649	8,512	627.4	1 m Depth	669.6	1 m Depth*	710.06
XS-648	8,398	22.7	1 m Depth	53.6	1 m Depth*	710.02
XS-647	8,299	107.4	1 m Depth	127.1	1 m Depth	709.97
XS-646	8,234	143.6	1 m Depth	174.0	1 m Depth	709.92
XS-645	8,150	159.9	1 m Depth	214.9	Mixed	709.88
XS-644	8,007	65.8	1 m Depth	136.9	1 m Depth	709.80
XS-643	7,886	24.8	1 m Depth*	52.9	1 m Depth	709.59
XS-642	7,757	24.1	1 m Depth*	47.1	1 m Depth	709.21
XS-641	7,691	40.8	1 m Depth*	65.1	1 m Depth	709.05
XS-640	7,579	104.3	1 m Depth	122.2	1 m Depth	708.83
XS-639	7,509	147.5	1 m Depth	162.6	1 m Depth	708.63
XS-638	7,391	235.4	1 m Depth	247.9	1 m Depth	708.29
XS-637	7,294	342.6	Main Channel	352.5	1 m Depth	708.04
XS-636	7,211	406.2	1 m Depth	423.2	1 m Depth*	707.93
XS-635	7,113	419.7	1 m Depth	434.4	1 m Depth*	707.87
XS-634	6,976	330.7	1 m Depth	342.4	1 m Depth	707.80
XS-633	6,844	212.8	1 m Depth	231.5	1 m Depth	707.71
XS-632	6,730	126.2	1 m Depth	144.4	1 m Depth	707.52
XS-631	6,606	39.6	1 m Depth*	79.1	1 m Depth	707.36
XS-630	6,475	138.4	1 m Depth	161.6	1 m Depth	707.18
XS-629	6,370	251.2	1 m Depth	262.5	1 m Depth	707.06
XS-628	6,270	349.0	1 m Depth	365.5	1 m Depth*	707.01
XS-627	6,153	248.5	1 m Depth	444.2	1 m Depth*	707.00

**Table A-3 Selected floodway limit stations, determination criteria, and design flood levels – Bullshead Creek
(Continued)**

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-626	6,057	247.5	1 m Depth	462.8	1 m Depth	707.00
XS-625	5,897	254.9	1 m Depth	388.2	1 m Depth	706.99
XS-624	5,746	185.0	1 m Depth	320.0	1 m Depth	706.97
XS-623	5,629	410.2	1 m Depth	524.9	1 m Depth	706.95
XS-622	5,520	51.1	1 m Depth*	419.1	1 m Depth	706.95
XS-621	5,410	84.6	1 m Depth*	407.8	1 m Depth	706.94
XS-620	5,300	42.5	1 m Depth	373.8	1 m Depth	706.94
XS-619	5,160	18.4	1 m Depth*	367.6	1 m Depth	706.94
XS-618	5,050	15.2	1 m Depth*	345.9	1 m Depth*	706.93
XS-617	4,918	21.5	1 m Depth*	289.5	1 m Depth*	706.93
XS-616	4,791	11.4	1 m Depth*	256.3	1 m Depth*	706.93
XS-615	4,682	11.7	1 m Depth*	309.1	1 m Depth	706.93
XS-614	4,554	10.5	1 m Depth*	266.3	1 m Depth	706.93
XS-613	4,443	11.7	1 m Depth*	249.0	1 m Depth	706.93
XS-612	4,330	18.6	1 m Depth*	269.1	1 m Depth	706.93
XS-611	4,283	23.4	1 m Depth*	265.0	1 m Depth	706.93
XS-610	4,248	50.9	1 m Depth*	221.3	1 m Depth	704.13
XS-609	4,201	61.4	1 m Depth*	210.5	1 m Depth	704.12
XS-608	4,078	147.1	1 m Depth	200.7	1 m Depth*	703.96
XS-607	3,967	195.3	1 m Depth	256.2	1 m Depth*	703.90
XS-606	3,879	230.7	1 m Depth	322.0	1 m Depth*	703.88
XS-605	3,766	120.6	1 m Depth*	283.3	1 m Depth	703.87
XS-604	3,653	75.7	1 m Depth*	236.9	1 m Depth	703.87
XS-603	3,567	40.3	1 m Depth*	163.9	1 m Depth	703.85
XS-602	3,502	82.5	1 m Depth*	182.9	Hydraulic Smoothing	703.79
XS-601	3,472	86.1	1 m Depth*	113.4	1 m Depth*	702.74
XS-600	3,465	86.1	1 m Depth*	107.3	1 m Depth*	702.74
XS-599	3,447	82.7	1 m Depth*	101.5	1 m Depth*	702.06
XS-598	3,336	99.6	1 m Depth	171.4	1 m Depth	702.09
XS-597	3,330	96.7	1 m Depth	170.1	1 m Depth	702.08
XS-596	3,252	92.9	1 m Depth	162.5	1 m/s Velocity	701.83
XS-595	3,245	89.6	1 m Depth	163.5	1 m/s Velocity	701.72
XS-594	3,144	81.4	1 m/s Velocity	117.7	1 m Depth	701.45
XS-593	3,138	73.7	1 m/s Velocity	113.6	Hydraulic Smoothing	701.41
XS-592	3,045	14.6	1 m Depth*	91.8	1 m Depth	701.31
XS-591	2,931	152.2	1 m Depth	232.1	1 m Depth	701.16
XS-590	2,925	161.9	1 m Depth	238.3	Hydraulic Smoothing	700.87
XS-589	2,910	171.3	Main Channel	231.3	Mixed	700.34
XS-588	2,882	192.4	Main Channel	224.7	Mixed	699.97
XS-587	2,821	197.3	1 m Depth	218.8	1 m Depth*	699.90
XS-586	2,741	9.6	1 m Depth*	208.8	1 m Depth*	699.86
XS-585	2,627	9.0	1 m Depth*	177.5	1 m Depth*	699.82

**Table A-3 Selected floodway limit stations, determination criteria, and design flood levels – Bullshead Creek
(Continued)**

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-584	2,553	9.5	1 m Depth*	132.9	1 m Depth*	699.80
XS-583	2,485	15.3	1 m Depth*	51.2	1 m Depth*	699.56
XS-582	2,476	18.5	1 m/s Velocity*	52.5	1 m/s Velocity*	699.39
XS-581	2,427	16.4	1 m Depth*	107.0	1 m Depth*	699.43
XS-580	2,386	16.5	1 m Depth*	123.7	1 m Depth	699.33
XS-579	2,345	23.7	Hydraulic Smoothing	128.7	Hydraulic Smoothing	697.97
XS-578	2,256	99.0	1 m/s Velocity	164.3	1 m Depth*	697.20
XS-577	2,138	89.6	1 m Depth	110.2	1 m/s Velocity	696.52
XS-576	2,046	35.1	1 m Depth*	60.8	Mixed	695.95
XS-575	1,941	194.9	Main Channel	212.9	Mixed	695.20
XS-574	1,801	350.5	1 m Depth	372.1	1 m Depth*	694.61
XS-573	1,679	361.9	1 m Depth	376.7	1 m Depth*	694.30
XS-572	1,562	234.3	1 m Depth	299.5	1 m/s Velocity*	693.49
XS-571	1,465	175.7	Mixed	237.4	1 m/s Velocity*	692.89
XS-570	1,338	139.6	1 m/s Velocity	182.2	Mixed	692.05
XS-569	1,227	99.4	1 m Depth	199.5	Mixed	691.51
XS-568	1,069	160.0	Mixed	343.7	1 m/s Velocity*	690.61
XS-567	983	175.4	1 m/s Velocity	316.6	1 m/s Velocity*	689.91
XS-566	872	119.0	1 m Depth*	284.9	1 m Depth*	689.27
XS-565	719	131.3	Mixed	281.2	Mixed	688.48
XS-564	603	80.7	1 m Depth*	188.6	1 m/s Velocity	687.92
XS-563	472	141.6	1 m/s Velocity	172.9	1 m/s Velocity*	686.96
XS-562	310	187.8	1 m/s Velocity	199.9	Main Channel	686.11
XS-561	171	231.0	1 m/s Velocity	302.9	1 m/s Velocity	685.04
XS-560	42	258.3	1 m Depth	417.3	Hydraulic Smoothing	684.68

Notes:

*denotes those instances where the Floodway limit was adjusted to the extent of inundation.

Table A-4 Selected floodway limit stations, determination criteria, and design flood levels – Ross Creek

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-277	25,004	15.9	1 m Depth*	40.2	1 m/s Velocity	704.40
XS-276	24,867	53.7	1 m Depth	84.5	1 m Depth	703.84
XS-275	24,755	14.1	Hydraulic Smoothing	137.3	1 m Depth*	703.88
XS-274	24,601	21.8	1 m Depth	51.0	1 m Depth*	703.61
XS-273	24,504	47.4	Main Channel*	76.9	Main Channel*	703.42
XS-272	24,485	50.8	Main Channel*	79.5	Main Channel*	703.25
XS-271	24,367	27.6	1 m Depth	73.8	1 m Depth*	702.99
XS-270	24,239	9.1	1 m Depth*	94.6	1 m Depth	702.77
XS-269	24,049	86.8	1 m Depth	158.6	1 m Depth*	702.40
XS-268	23,888	41.9	1 m Depth	136.8	1 m Depth*	702.24
XS-267	23,758	15.1	1 m Depth	47.9	1 m Depth	701.99
XS-266	23,609	5.4	1 m Depth*	54.5	1 m Depth	701.79
XS-265	23,458	38.4	1 m Depth	145.0	1 m Depth*	701.61
XS-264	23,269	22.5	1 m Depth	185.3	1 m Depth*	701.47
XS-263	23,072	7.5	1 m Depth*	177.2	1 m Depth*	701.34
XS-262	22,807	6.2	1 m Depth*	135.5	1 m Depth*	701.09
XS-261	22,662	23.5	1 m Depth	144.5	1 m Depth*	700.97
XS-260	22,513	7.5	1 m Depth*	109.1	1 m Depth	700.84
XS-259	22,349	6.3	1 m Depth*	118.7	1 m Depth	700.69
XS-258	22,202	11.4	1 m Depth*	100.7	1 m Depth	700.52
XS-257	22,052	11.4	1 m Depth*	133.1	1 m Depth	700.36
XS-256	21,868	97.0	1 m Depth*	198.5	1 m Depth	700.20
XS-255	21,732	62.9	1 m Depth*	237.7	Mixed	700.13
XS-254	21,455	3.6	1 m Depth*	130.9	1 m Depth*	699.99
XS-253	21,284	30.2	1 m Depth*	172.0	1 m Depth*	699.92
XS-252	21,105	92.1	1 m Depth	165.9	1 m Depth	699.76
XS-251	20,942	72.2	1 m Depth	150.1	1 m Depth*	699.60
XS-250	20,802	37.6	1 m Depth	110.4	1 m Depth*	699.40
XS-249	20,619	60.7	1 m Depth	192.1	1 m Depth	699.31
XS-248	20,459	8.5	1 m Depth*	187.3	1 m Depth	699.28
XS-247	20,238	6.0	1 m Depth*	58.9	1 m Depth	699.09
XS-246	20,069	80.0	1 m Depth	116.8	1 m Depth*	698.82
XS-245	19,885	18.9	1 m Depth*	62.0	1 m Depth	698.56
XS-244	19,778	35.9	1 m Depth	81.4	1 m Depth	698.18
XS-243	19,768	30.0	1 m/s Velocity	77.4	1 m Depth	698.07
XS-242	19,704	24.4	1 m Depth	86.0	1 m Depth	697.96
XS-241	19,701	23.9	1 m Depth	85.9	1 m Depth	697.94
XS-240	19,632	22.1	1 m Depth	85.0	1 m Depth	697.83
XS-239	19,567	14.5	1 m Depth	106.9	1 m Depth	697.77
XS-238	19,419	56.2	1 m Depth	129.0	1 m Depth	697.66
XS-237	19,079	557.0	1 m Depth	603.6	1 m Depth	697.39

**Table A-4 Selected floodway limit stations, determination criteria, and design flood levels – Ross Creek
(Continued)**

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-236	18,934	982.3	1 m Depth	1018.0	1 m Depth	697.05
XS-235	18,780	1137.0	1 m Depth	1265.3	1 m Depth*	696.91
XS-234	18,614	993.4	1 m Depth	1104.3	Mixed	696.78
XS-233	18,458	925.0	1 m Depth	1055.2	Mixed	696.71
XS-232	18,303	718.0	1 m Depth	779.9	1 m Depth	696.51
XS-231	18,159	770.3	1 m Depth	805.1	1 m Depth*	696.22
XS-230	18,042	694.5	1 m Depth	742.7	1 m Depth	695.96
XS-229	17,870	608.8	1 m Depth	656.4	Hydraulic Smoothing	695.83
XS-228	17,609	476.9	1 m Depth	835.9	1 m Depth	695.76
XS-227	17,478	37.1	1 m Depth*	471.9	1 m Depth	695.73
XS-226	17,291	20.0	1 m Depth*	425.1	1 m Depth	695.70
XS-225	17,138	63.4	1 m Depth	557.9	1 m Depth	695.62
XS-224	16,928	63.3	1 m Depth	588.7	1 m Depth*	695.33
XS-223	16,771	63.0	Hydraulic Smoothing	628.1	1 m Depth*	694.85
XS-222	16,622	76.0	1 m Depth	484.7	1 m Depth	694.57
XS-221	16,467	80.1	1 m Depth	473.9	1 m Depth*	694.23
XS-220	16,275	300.6	1 m Depth*	403.7	1 m Depth	693.95
XS-219	15,977	563.3	1 m Depth	667.9	1 m Depth*	693.81
XS-218	15,802	528.9	1 m Depth	607.5	1 m Depth*	693.70
XS-217	15,681	487.5	1 m Depth	562.2	1 m Depth*	693.64
XS-216	15,510	22.6	1 m Depth*	350.1	1 m Depth	693.56
XS-215	15,213	107.5	1 m Depth	199.4	1 m Depth	693.26
XS-214	14,983	16.4	1 m Depth*	335.2	1 m Depth	693.20
XS-213	14,783	64.9	1 m Depth*	92.7	1 m Depth	693.07
XS-212	14,771	70.0	Main Channel	93.4	1 m Depth	693.03
XS-211	14,537	76.7	1 m Depth	338.1	1 m Depth	692.84
XS-210	14,376	31.7	1 m Depth	224.5	1 m Depth	692.73
XS-209	14,120	28.7	1 m Depth	285.5	1 m Depth*	692.68
XS-208	14,052	28.6	1 m Depth	279.4	1 m Depth*	692.68
XS-207	13,881	27.2	1 m Depth	317.6	1 m Depth*	692.64
XS-206	13,834	24.9	1 m Depth	211.8	1 m Depth*	692.62
XS-205	13,620	20.6	1 m Depth*	263.9	1 m Depth	692.58
XS-204	13,411	222.9	1 m Depth	339.2	1 m Depth	692.50
XS-203	13,230	424.5	1 m Depth	491.8	1 m Depth*	692.27
XS-202	13,068	432.1	1 m Depth	491.8	1 m Depth*	691.96
XS-201	12,896	393.9	1 m Depth	450.9	1 m Depth*	691.77
XS-200	12,731	241.5	1 m Depth	333.3	1 m Depth	691.62
XS-199	12,542	89.5	1 m Depth*	222.7	1 m Depth	691.45
XS-198	12,386	203.3	1 m Depth*	344.7	1 m Depth	691.33
XS-197	12,229	204.5	1 m Depth*	338.3	1 m Depth*	691.24
XS-196	12,101	192.7	1 m Depth*	275.7	1 m Depth*	691.08
XS-195	12,034	182.1	1 m Depth	238.0	1 m Depth	690.96

**Table A-4 Selected floodway limit stations, determination criteria, and design flood levels – Ross Creek
(Continued)**

Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-194	11,884	239.8	1 m Depth	286.6	1 m Depth	690.70
XS-193	11,757	22.7	1 m Depth	90.7	1 m Depth	690.50
XS-192	11,627	17.3	1 m Depth*	150.9	1 m Depth	690.43
XS-191	11,439	10.8	1 m Depth	60.7	1 m Depth	690.17
XS-190	11,270	69.3	1 m Depth	148.3	Main Channel	689.81
XS-189	11,101	68.6	1 m Depth	99.3	1 m Depth	689.46
XS-188	10,922	162.4	1 m Depth	222.5	1 m Depth	689.29
XS-187	10,738	31.1	1 m Depth	122.9	1 m Depth	689.22
XS-186	10,635	10.0	1 m Depth*	49.5	1 m Depth	688.92
XS-185	10,434	5.5	1 m Depth*	34.2	1m Depth	688.41
XS-184	10,269	5.1	1 m Depth	80.7	1 m Depth	688.09
XS-183	10,264	3.8	1 m Depth	82.5	1 m Depth	688.12
XS-182	10,171	11.6	1 m Depth	41.7	1 m Depth	687.90
XS-181	10,007	158.5	1 m Depth	254.8	Main Channel	687.74
XS-180	9,923	176.4	1 m Depth	360.6	1 m Depth	687.69
XS-179	9,907	187.5	1 m Depth	365.3	1 m Depth	687.67
XS-178	9,740	281.2	1 m Depth	345.5	1 m Depth*	687.41
XS-177	9,597	202.3	1 m Depth	282.1	1 m Depth	687.12
XS-176	9,458	190.3	1 m Depth	262.2	1 m Depth	686.74
XS-175	9,311	215.9	1 m Depth	242.5	1 m Depth	686.30
XS-174	9,201	242.0	1 m Depth	275.7	1 m Depth*	685.92
XS-173	9,081	291.5	1 m Depth	316.6	1 m Depth*	685.61
XS-172	8,929	282.9	1 m Depth	307.3	1 m Depth*	684.93
XS-171	8,801	142.4	1 m Depth*	222.9	1 m Depth*	684.68
XS-170	8,553	253.9	1 m Depth	372.5	1 m Depth*	683.51
XS-169	8,324	167.5	1 m Depth*	212.0	1 m/s Velocity	682.42
XS-168	8,108	138.0	1 m Depth	168.5	1 m Depth	681.19
XS-167	7,695	145.3	1 m Depth	198.6	1 m Depth	679.22
XS-166	7,286	94.6	1 m Depth	131.7	1 m Depth*	677.09
XS-165	7,051	19.2	1 m Depth*	79.4	1 m Depth	676.03
XS-164	6,863	51.4	1 m Depth	93.1	1 m Depth	675.23
XS-163	6,733	35.4	1 m Depth	107.5	1 m Depth	674.78
XS-162	6,294	13.9	1 m Depth*	49.4	1 m Depth	672.27
XS-161	6,066	104.3	1 m Depth	185.9	1 m Depth*	671.38
XS-160	5,846	202.8	1 m Depth	223.3	1 m Depth*	670.51
XS-159	5,538	135.6	1 m Depth	342.2	Main Channel	669.44
XS-158	5,170	40.3	1 m Depth*	156.2	1 m Depth	668.75
XS-157	4,558	169.1	1 m Depth	195.8	1 m Depth	666.70
XS-156	4,293	24.0	1 m Depth*	207.9	1 m Depth	666.37
XS-155	4,061	146.3	1 m Depth	174.6	1 m Depth*	665.57
XS-154	3,824	255.4	1 m Depth	317.9	1 m Depth*	665.22
XS-153	3,693	169.2	1 m Depth	216.9	1 m Depth	664.99

**Table A-4 Selected floodway limit stations, determination criteria, and design flood levels – Ross Creek
(Continued)**

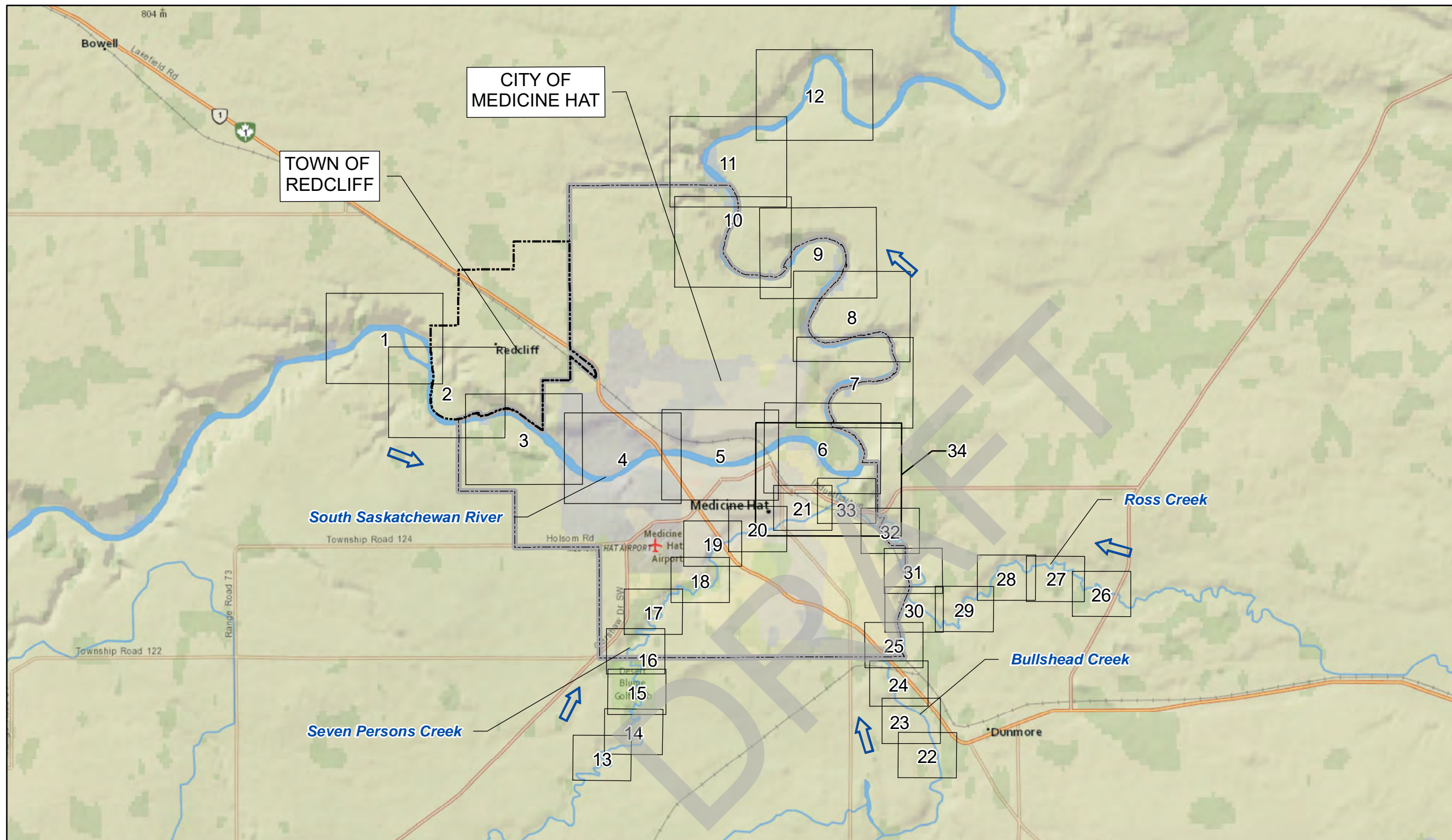
Cross Section	River Station (m)	Left		Right		Design Flood Level (m)
		Floodway Limit Station (m)	Floodway Determination Criteria	Floodway Limit Station (m)	Floodway Determination Criteria	
XS-152	3,546	102.4	1 m Depth	143.1	1 m Depth	664.27
XS-151	3,440	26.3	1 m Depth	97.4	1 m Depth	664.15
XS-150	3,384	41.2	1 m Depth*	103.3	1 m Depth	663.94
XS-149	3,256	69.8	1 m Depth	173.4	1 m Depth*	663.72
XS-148	3,057	46.8	Previous Floodway	110.1	Previous Floodway	663.39
XS-147	2,925	68.3	Previous Floodway	142.7	Previous Floodway	663.16
XS-146	2,915	63.7	Previous Floodway	147.5	Previous Floodway	663.11
XS-145	2,772	124.2	Previous Floodway*	163.3	Previous Floodway	662.76
XS-144	2,572	188.8	Previous Floodway*	256.8	Previous Floodway	662.56
XS-143	2,370	67.8	Previous Floodway*	142.9	Previous Floodway	662.41
XS-142	2,261	53.9	Previous Floodway	130.3	Previous Floodway	662.36
XS-141	2,161	206.0	Previous Floodway	241.5	Previous Floodway	662.18
XS-140	2,145	219.5	Previous Floodway	253.6	Previous Floodway	661.76
XS-139	2,032	301.4	Previous Floodway	345.3	Previous Floodway	661.77
XS-138	1,780	338.6	Previous Floodway	453.2	Previous Floodway*	661.72
XS-137	1,675	307.6	Previous Floodway	444.8	Previous Floodway	661.68
XS-136	1,611	278.6	Previous Floodway	325.4	Previous Floodway	661.60
XS-135	1,596	331.7	Previous Floodway	376.4	Previous Floodway	661.37
XS-134	1,527	112.2	Previous Floodway	180.7	Previous Floodway	661.40
XS-133	1,488	93.3	Previous Floodway	156.2	Previous Floodway	661.39
XS-132	1,437	77.7	Previous Floodway	121.8	Previous Floodway	661.38
XS-131	1,300	-	-	124.7	Previous Floodway	661.37
XS-130	1,282	-	-	111.5	Main Channel	661.36
XS-129	1,278	-	-	110.0	Main Channel	661.36
XS-128	1,247	-	-	126.6	Previous Floodway	661.36
XS-127	1,118	-	-	99.6	Previous Floodway	661.34
XS-126	1,025	-	-	75.9	Previous Floodway	661.31
XS-125	880	63.6	Previous Floodway	198.9	Previous Floodway	661.22
XS-124	757	-	-	236.1	Previous Floodway	661.23
XS-123	540	-	-	168.9	Previous Floodway	661.21
XS-122	431	-	-	126.0	Previous Floodway	661.18
XS-121	279	-	-	115.5	Previous Floodway	661.17

Notes:

*denotes those instances where the Floodway limit was adjusted to the extent of inundation.

Appendix B
Open Water Floodway Criteria Map

DRAFT



Notes to Users:

1. Please refer to the accompanying **Medicine Hat River Hazard Study - Open Water Flood Hazard Identification Report** for important information concerning the floodway criteria map.
2. Within the flood inundation areas shown on this map, there may be isolated pockets of high ground. To determine whether or not a particular site is subject to flooding, reference should be made to the computed flood levels in conjunction with site-specific surveys where detailed definition is required.
3. Non-riverine and local sources of water have not been considered, and structures such as roads and railways can restrict water flow and affect local flood levels. Channel obstruction, local stormwater inflow, groundwater seepage or other land drainage can cause flood levels to exceed those indicated on the map. Lands adjacent to a flooded area may be subject to flooding from tributary streams not indicated on the maps.
4. The flood inundation area is shown above the linework for bridges and flood control structures that are below flood levels.

Definitions:

Flood Hazard Map - A flood hazard map is a specific type of flood map that identifies the area flooded for the 1:100 design flood, and divides that flood hazard area into floodway and flood fringe zones. Flood hazard maps can also show additional flood hazard information, including the incremental areas at risk for more severe floods like the 1:200 and 1:500 floods. Flood hazard maps are typically used for long-term flood hazard area management and land-use planning.

Design Flood - The design flood standard in Alberta is the 1:100 flood, which is a flood that has a 1% chance of being equaled or exceeded in any given year. The design flood is typically based on the 1:100 open water flood, but it can also reflect 1:100 ice jam flood levels or be based on a historical flood event. Different sized floods have different chances of occurring – for example, a 1:200 flood has a 0.5% chance of occurring in any given year and a 1:500 flood has a 0.2% chance of occurring in any given year – but only the 1:100 design flood is used to define the floodway and flood fringe zones on flood hazard maps.

Floodway - When a floodway is first defined on a flood hazard map, it typically represents the area of highest flood hazard where flows are deepest, fastest, and most destructive during the 1:100 design flood. When a flood hazard map is updated, the floodway will not get larger in most circumstances to maintain long-term regulatory certainty, even if the flood hazard area gets larger or design flood levels get higher.

Flood Fringe - The flood fringe is the area outside of the floodway that is flooded or could be flooded during the 1:100 design flood. The flood fringe typically represents areas with

Definitions (continued):

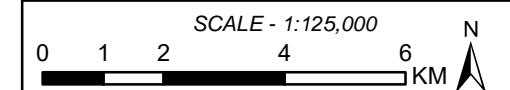
shallower, slower, and less destructive flooding, but it may also include “high hazard flood fringe” areas. Areas at risk of flooding behind flood berms may also be mapped as “protected flood fringe” areas.

High Hazard Flood Fringe - The high hazard flood fringe identifies areas within the flood fringe with deeper or faster moving water than the rest of the flood fringe. High hazard flood fringe areas are likely to be most significant for flood maps that are being updated, but they may also be included in new flood maps.

Protected Flood Fringe - The protected flood fringe identifies areas that could be flooded if dedicated flood berms fail or do not work as designed during the 1:100 design flood, even if they are not overtopped. Protected flood fringe areas are part of the flood fringe and do not differentiate between areas with deeper or faster moving water and shallower or slower moving water.

Data Sources and References:

1. Orthophoto imagery acquired by OGL Engineering for Alberta Environment and Parks: *OGL Engineering (2018). Medicine Hat aerial imagery acquisition memorandum, project number 2018-502, submitted to Alberta Environment and Parks, 4 pp.*
2. Base data from City of Medicine Hat, Alberta Environment and Parks, Altalis, and Natural Resources Canada.
3. Additional base mapping from Esri.



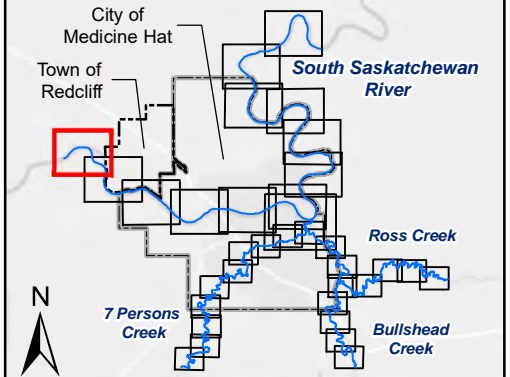
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Vertical Datum: CGVD28 HTv2.0; Units: Metres

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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Job: 1003094 Date: 25-APR-2022

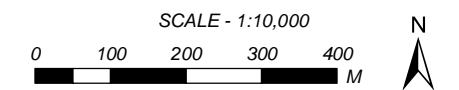
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA INDEX MAP**

INDEX MAP



- FLOW DIRECTION
- MODEL BANK STATION
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DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

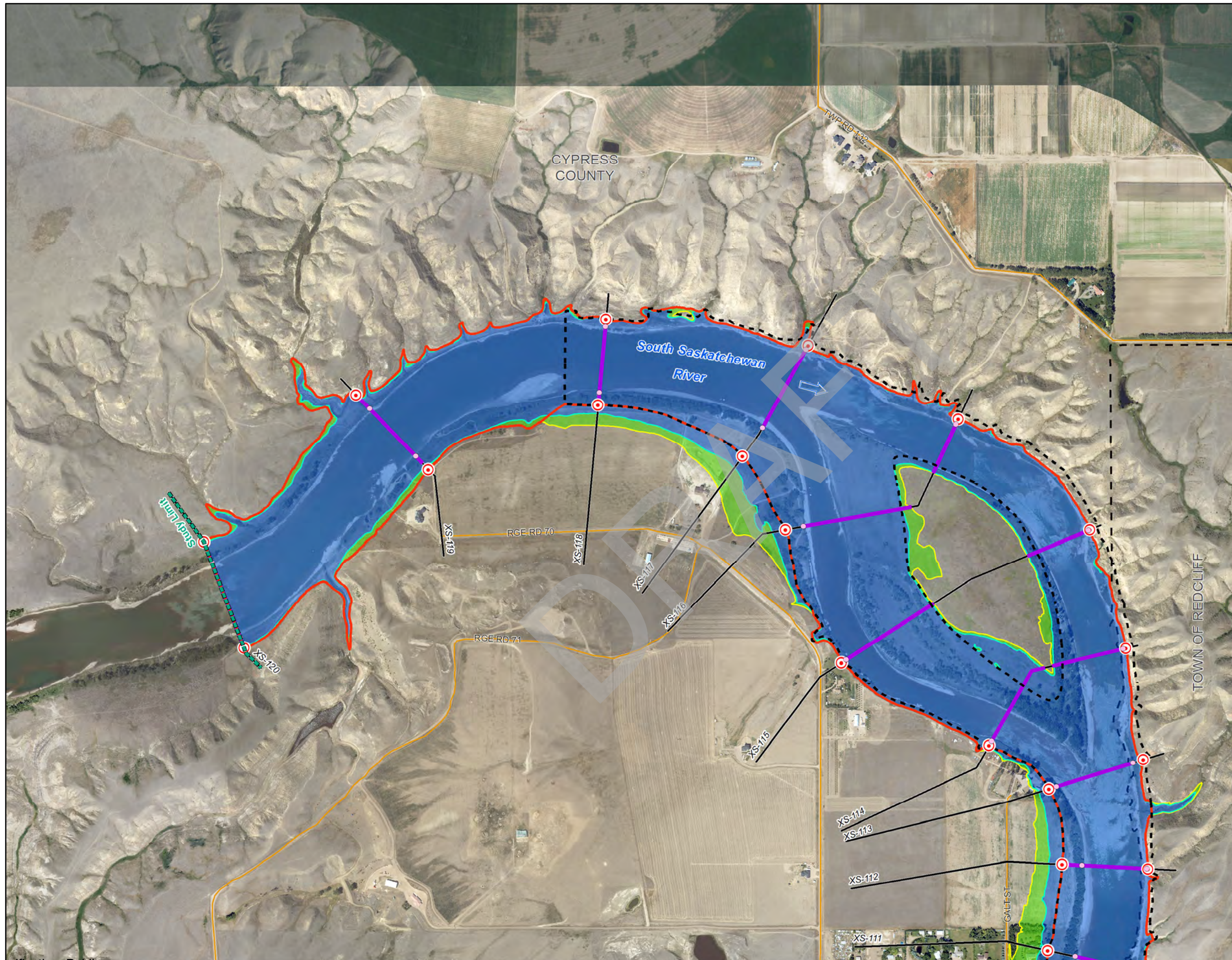


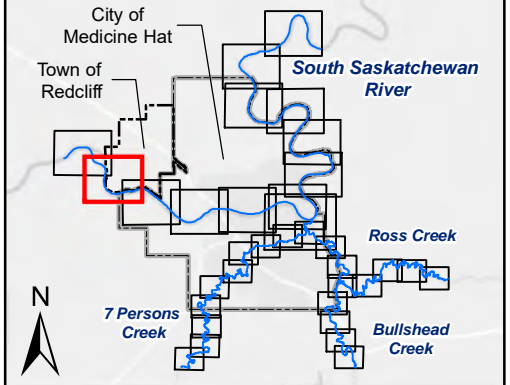
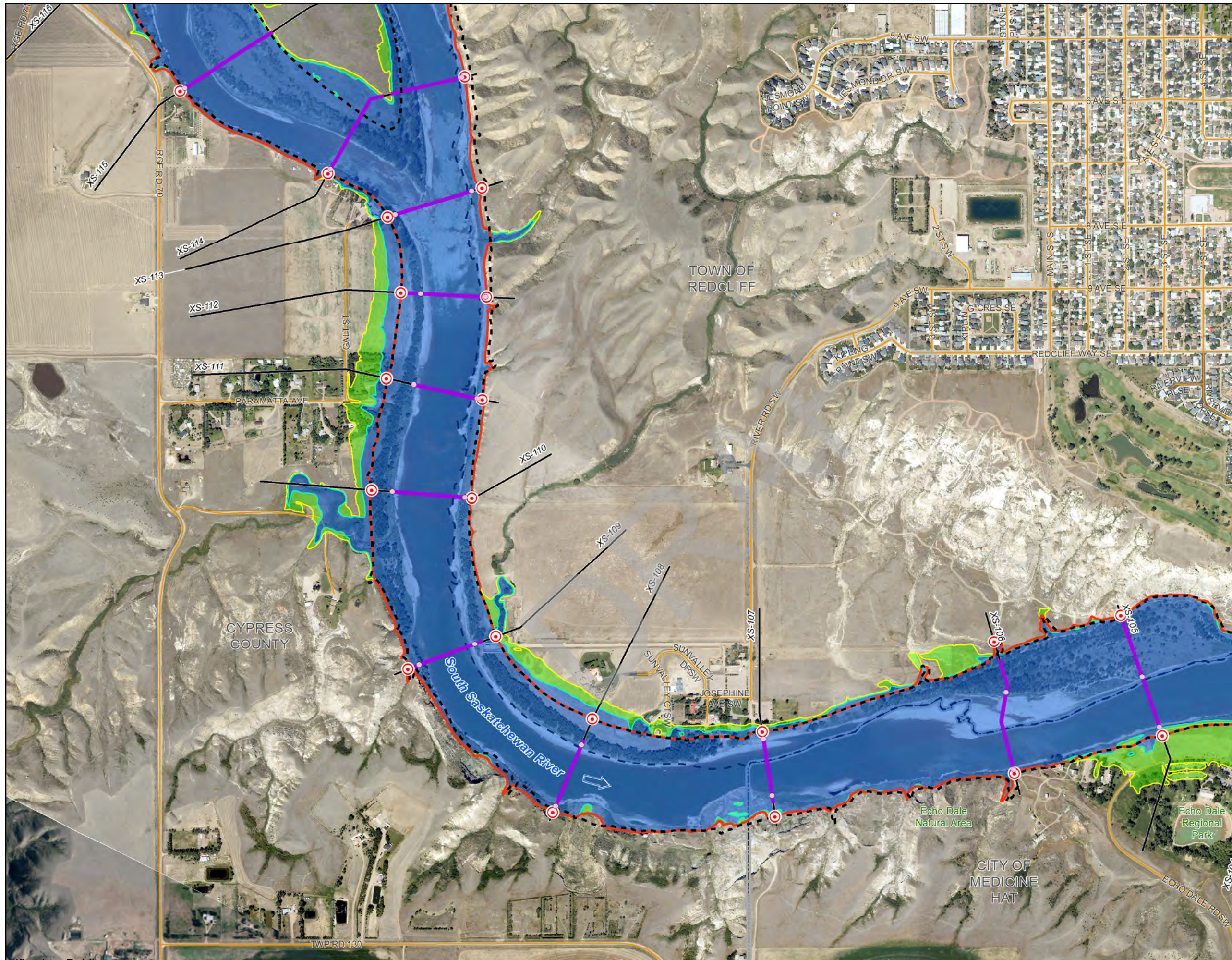
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Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA

Job: 1003094 Date: 25-APR-2022

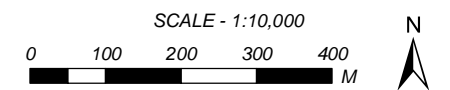
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**





- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
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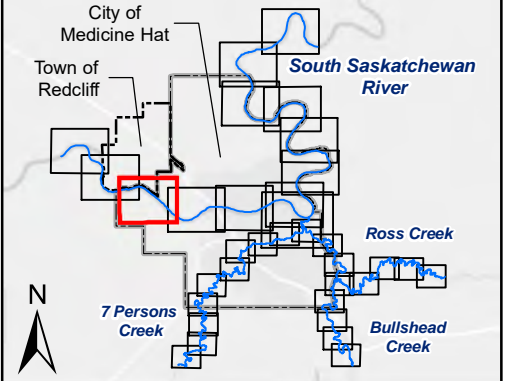
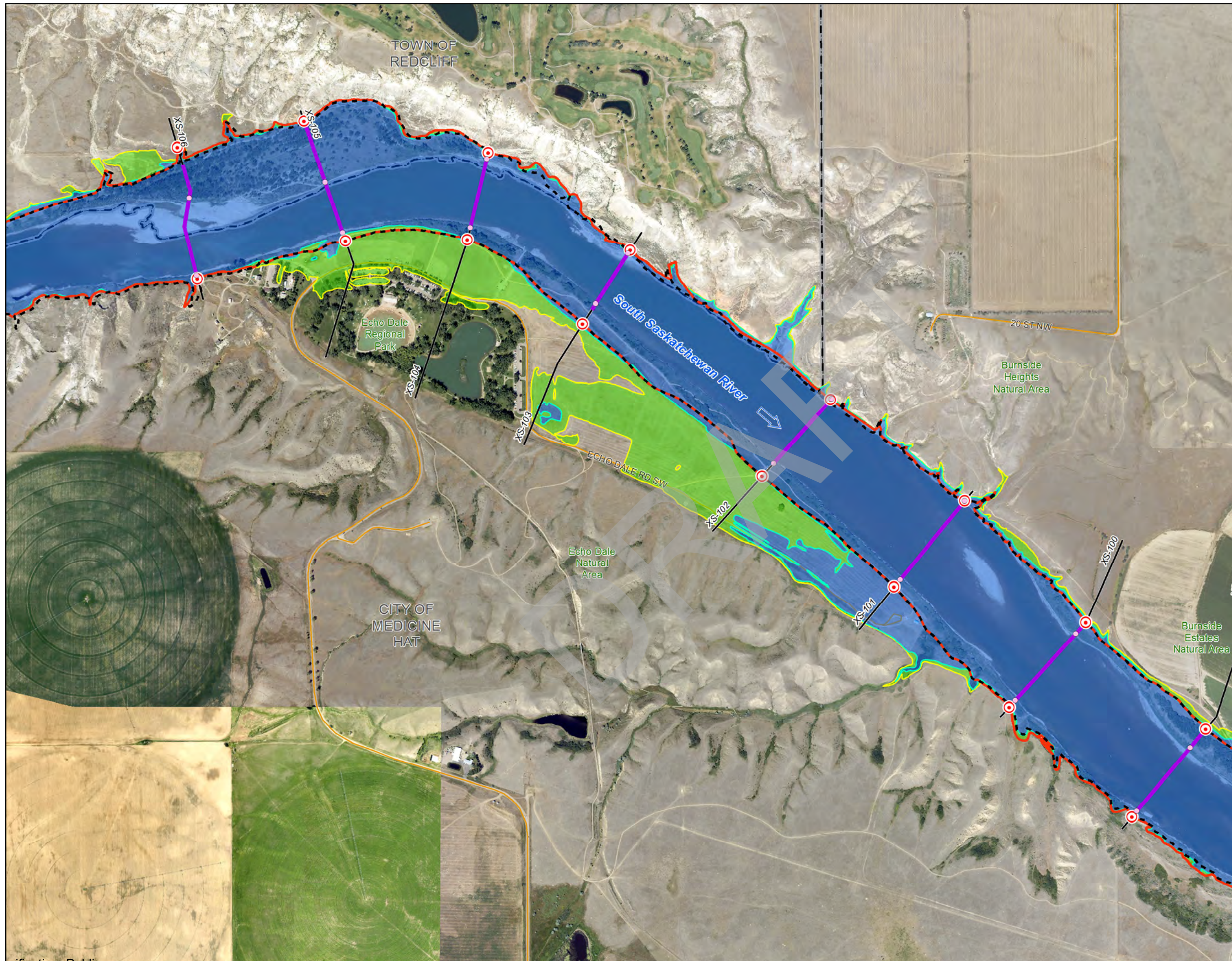
DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

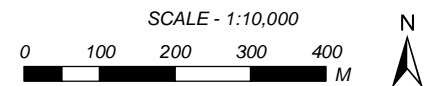
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Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
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- FLOW DIRECTION
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- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

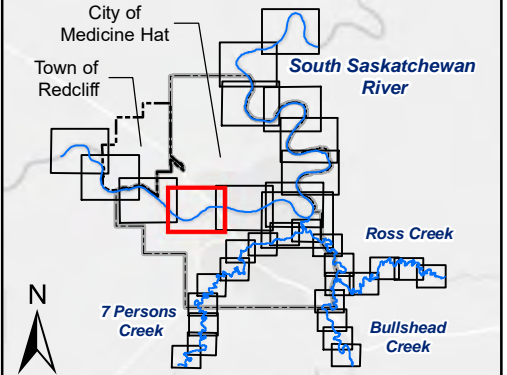
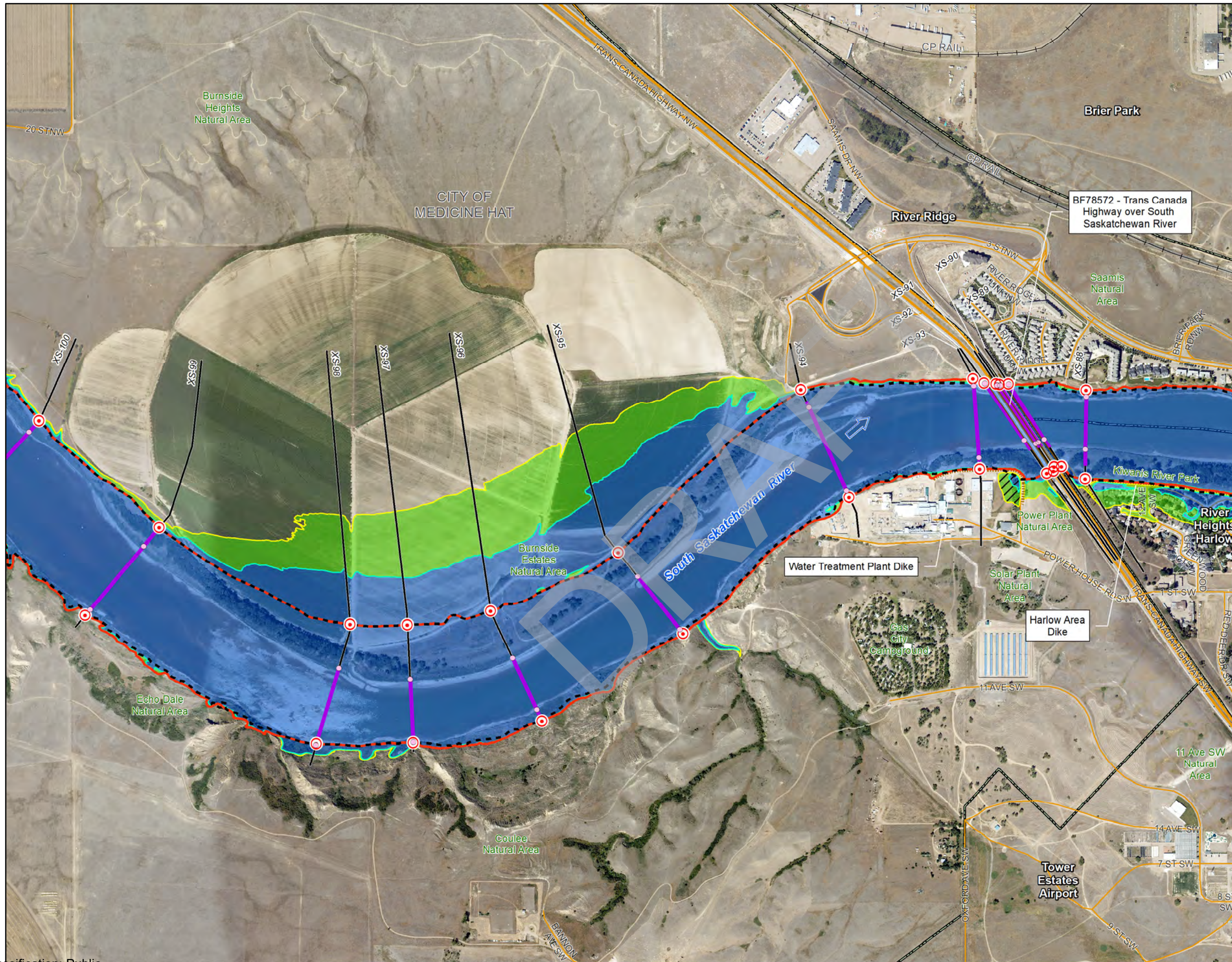


Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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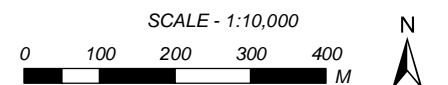
Job: 1003094 | Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
- PROPOSED FLOODWAY BOUNDARY
- BRIDGE
- CROSS SECTION
- CULVERT
- WEIR
- STUDY LIMIT
- FLOOD CONTROL STRUCTURE
- FLOOD WALL
- PREVIOUS FLOODWAY
- 100-YEAR DESIGN FLOOD EXTENT
- DEPTH ≥ 1 M
- PROTECTED FLOOD AREA
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

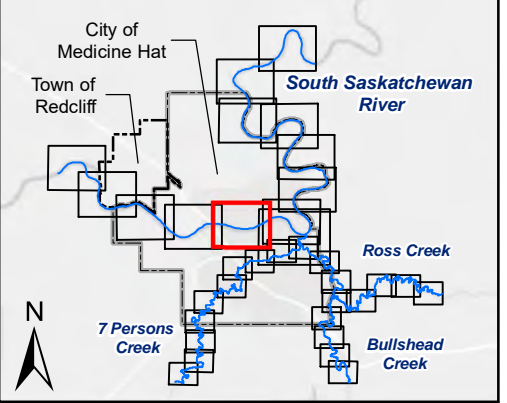
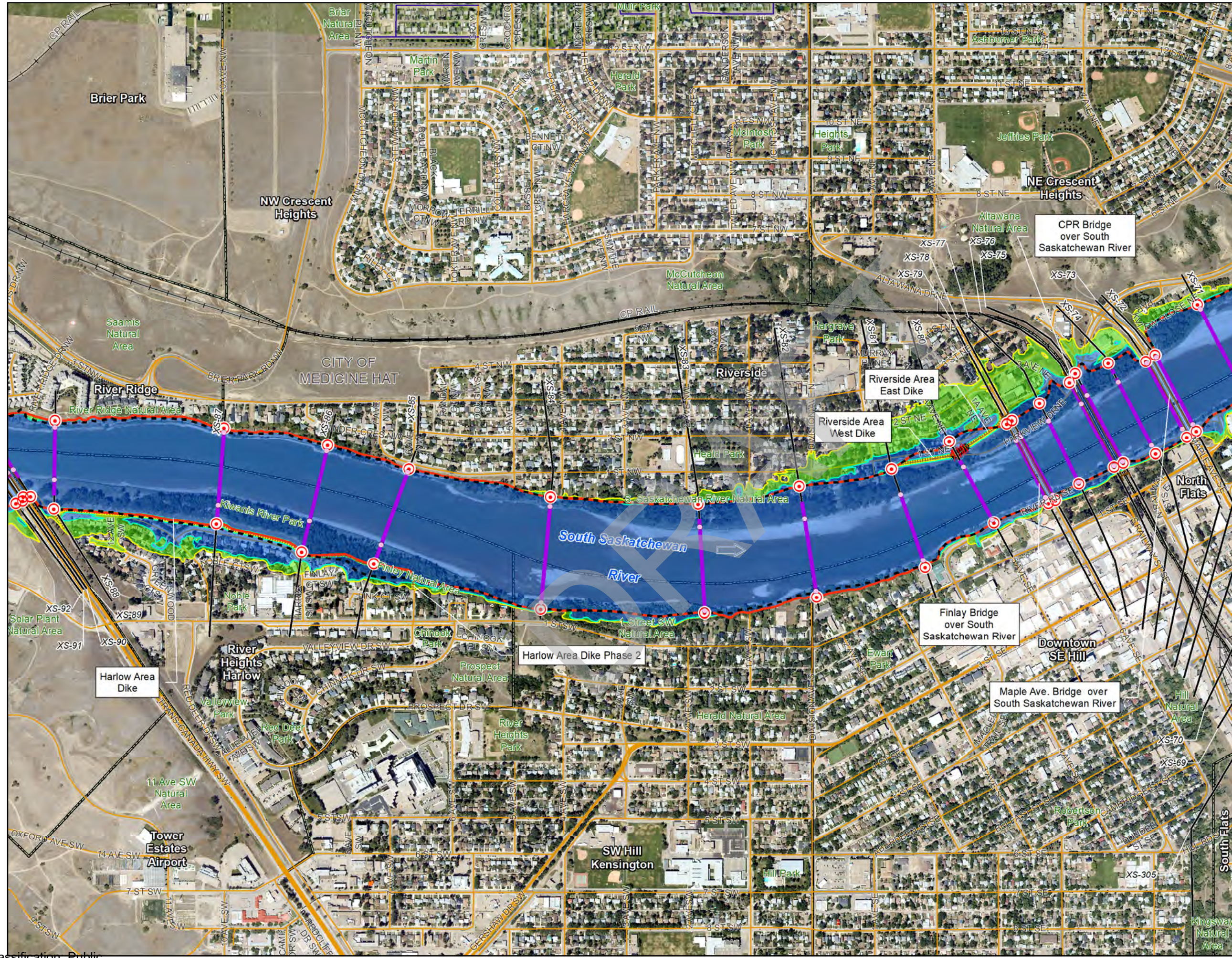


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Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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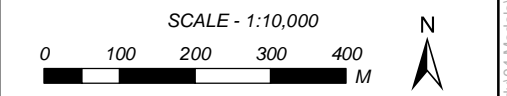
Job: 1003094 Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



- FLOW DIRECTION
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- FLOODWALL
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- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

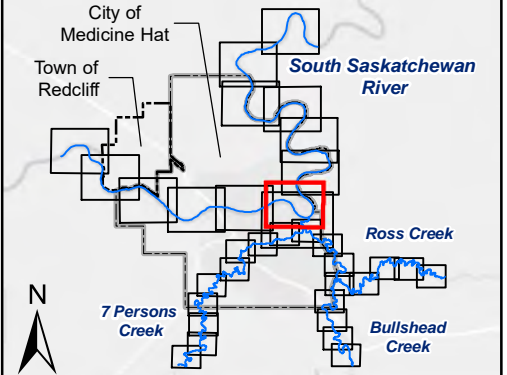
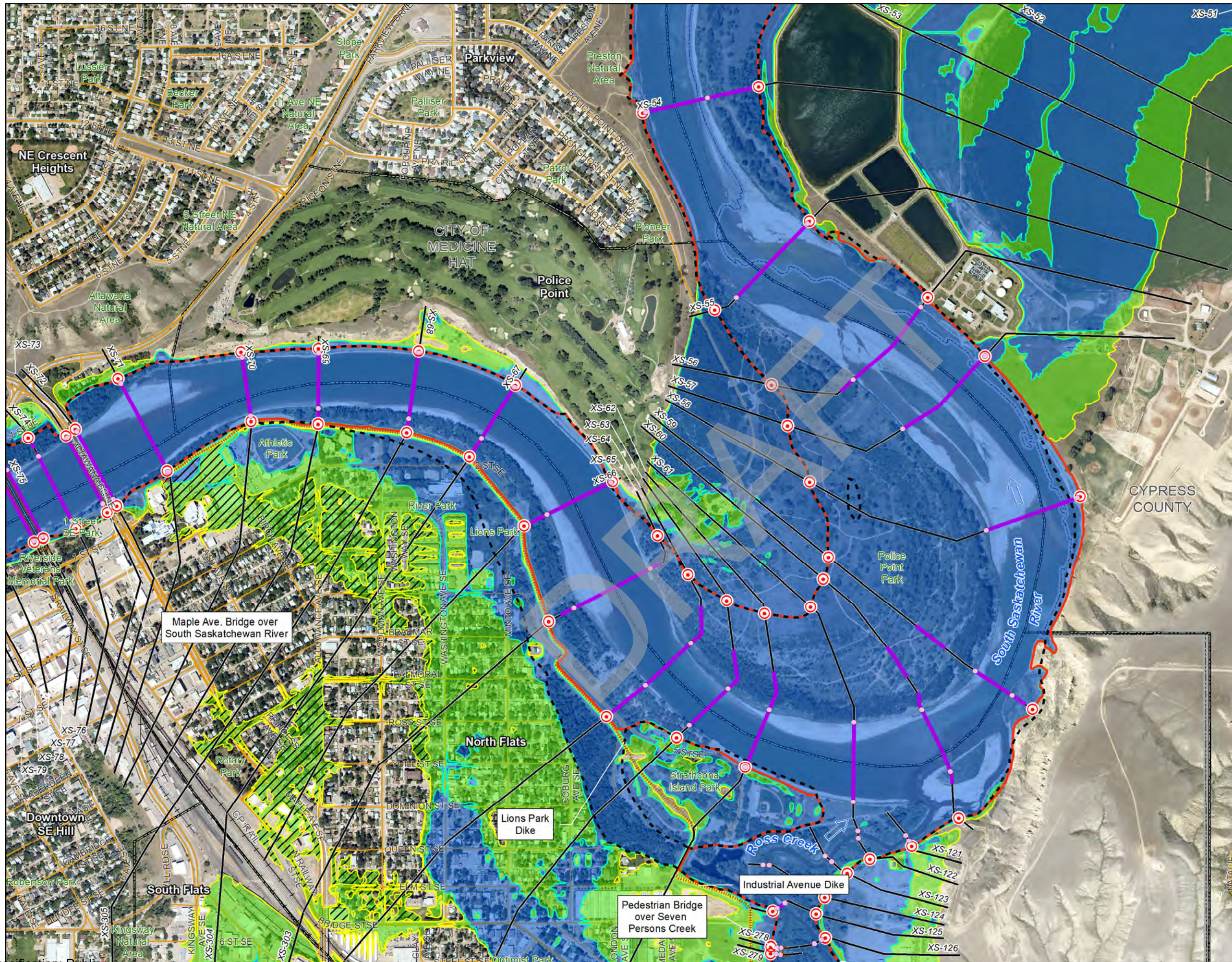
DISCHARGE
 SOUTH SASKATCHEWAN RIVER = 6,500 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
 Units: METRES; Vertical Datum: CGVD28 HTv2.0

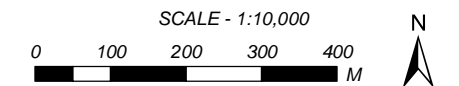
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094	Date: 25-APR-2022	

**MEDICINE HAT
 RIVER HAZARD STUDY
 OPEN WATER FLOODWAY
 CRITERIA MAP**



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- LOCAL ROAD
- RAILWAY
- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

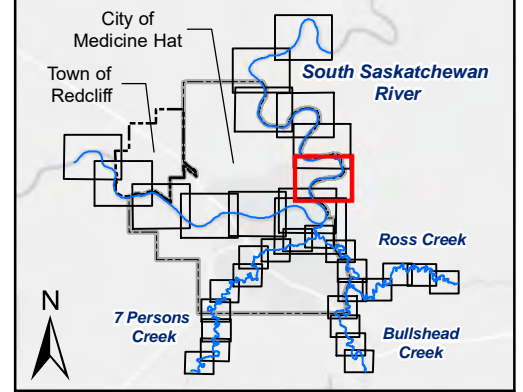
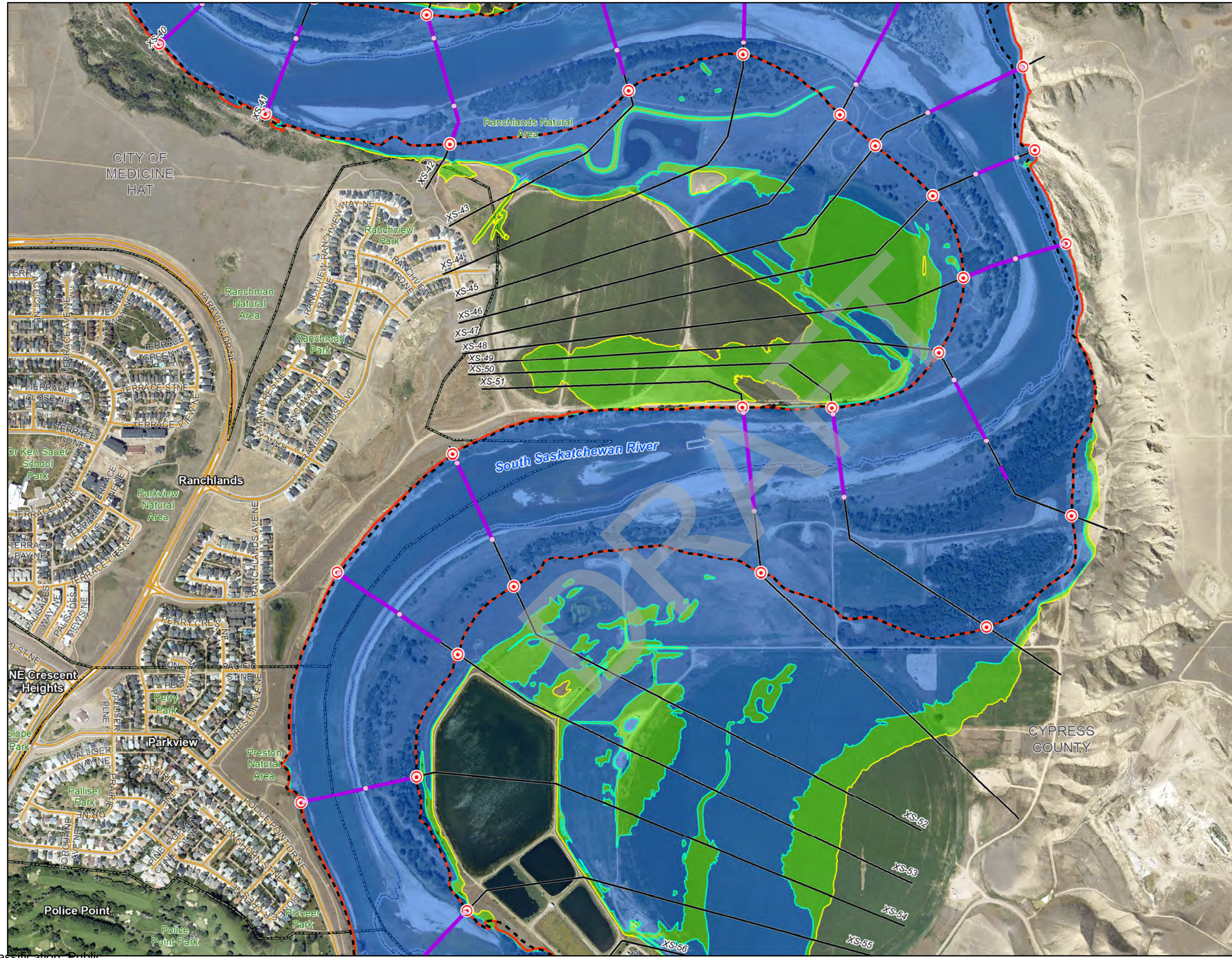
DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s
ROSS CREEK above XS-121 = 292 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

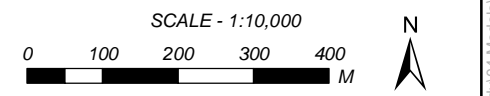
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

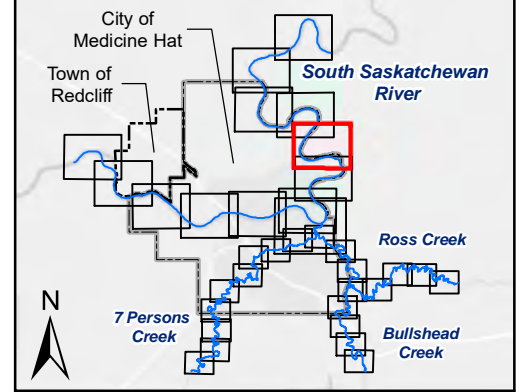
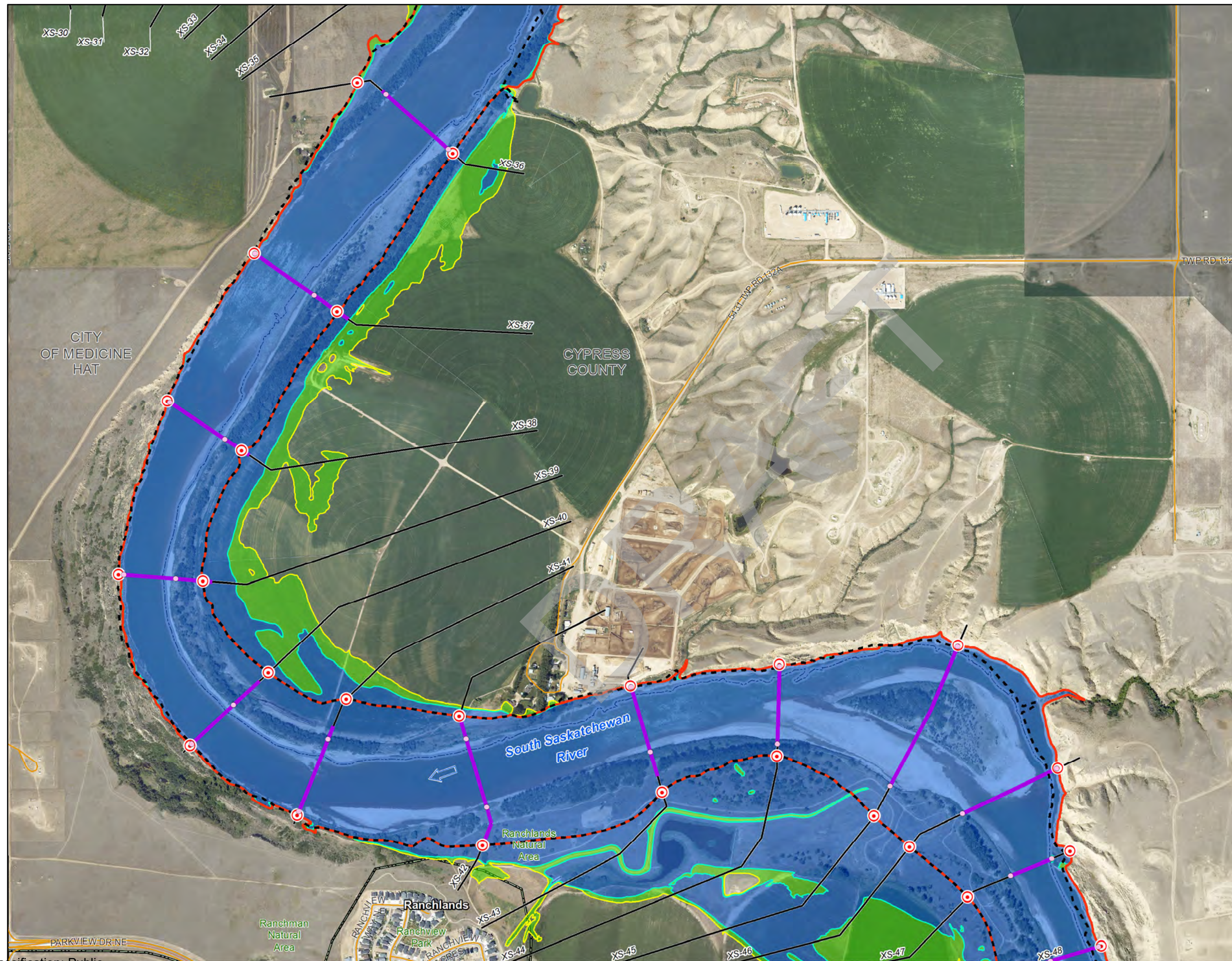


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Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

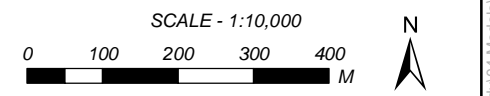
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

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- FLOW DIRECTION
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- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
- PROPOSED FLOODWAY BOUNDARY
- BRIDGE
- CROSS SECTION
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- STUDY LIMIT
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- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

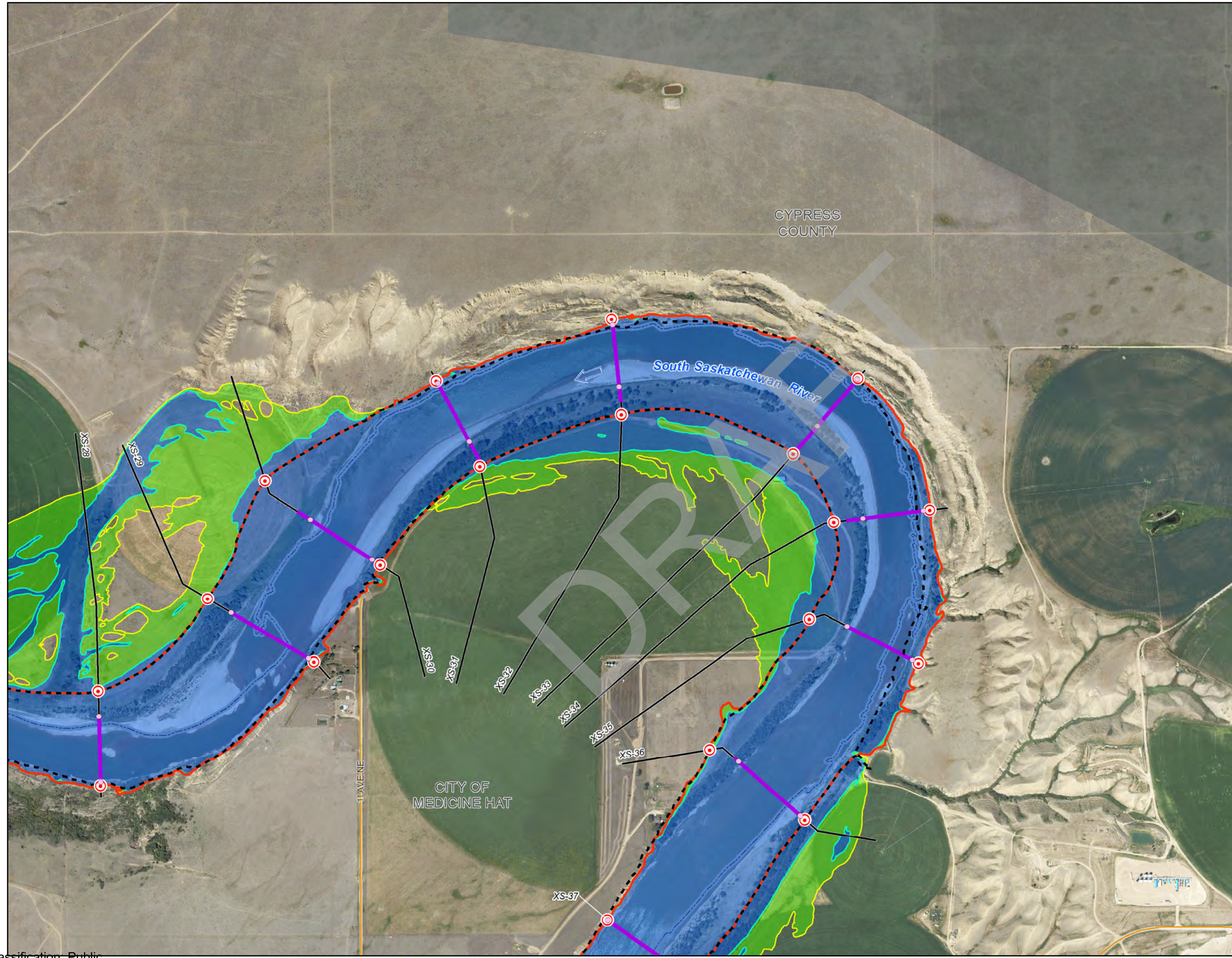
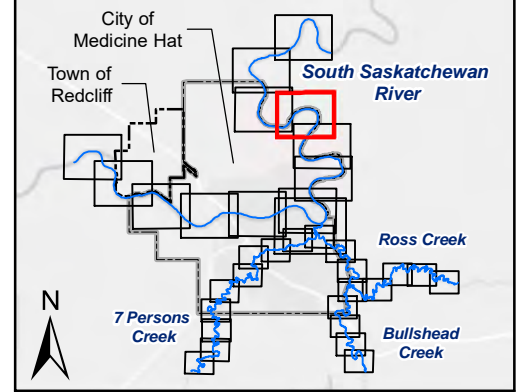


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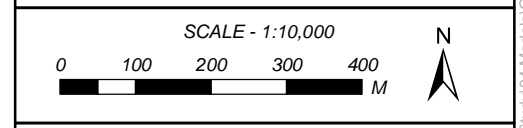
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Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

P:\Projects (Active)\1003094_Medicine Hat River Hazard Study\04_Models\GIS\T1006302_REH_Map_T1500_FloodwayCriteria.mxd



- FLOW DIRECTION
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 - PROPOSED FLOODWAY LIMIT
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 - PROPOSED FLOODWAY BOUNDARY
 - BRIDGE
 - CROSS SECTION
 - CULVERT
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 - NEIGHBOURHOOD
 - MEDICINE HAT CITY BOUNDARY
 - REDCLIFF TOWN BOUNDARY
- DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

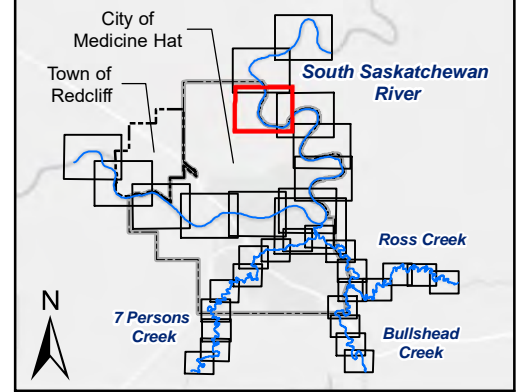


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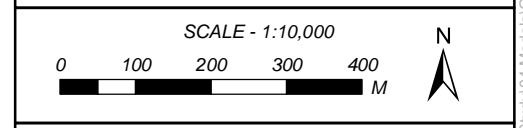
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Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

SHEET 9 OF 34



- FLOW DIRECTION
 - MODEL BANK STATION
 - PROPOSED FLOODWAY LIMIT
 - VELOCITY ≥ 1 M/S
 - PROPOSED FLOODWAY BOUNDARY
 - BRIDGE
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 - REDCLIFF TOWN BOUNDARY
- DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

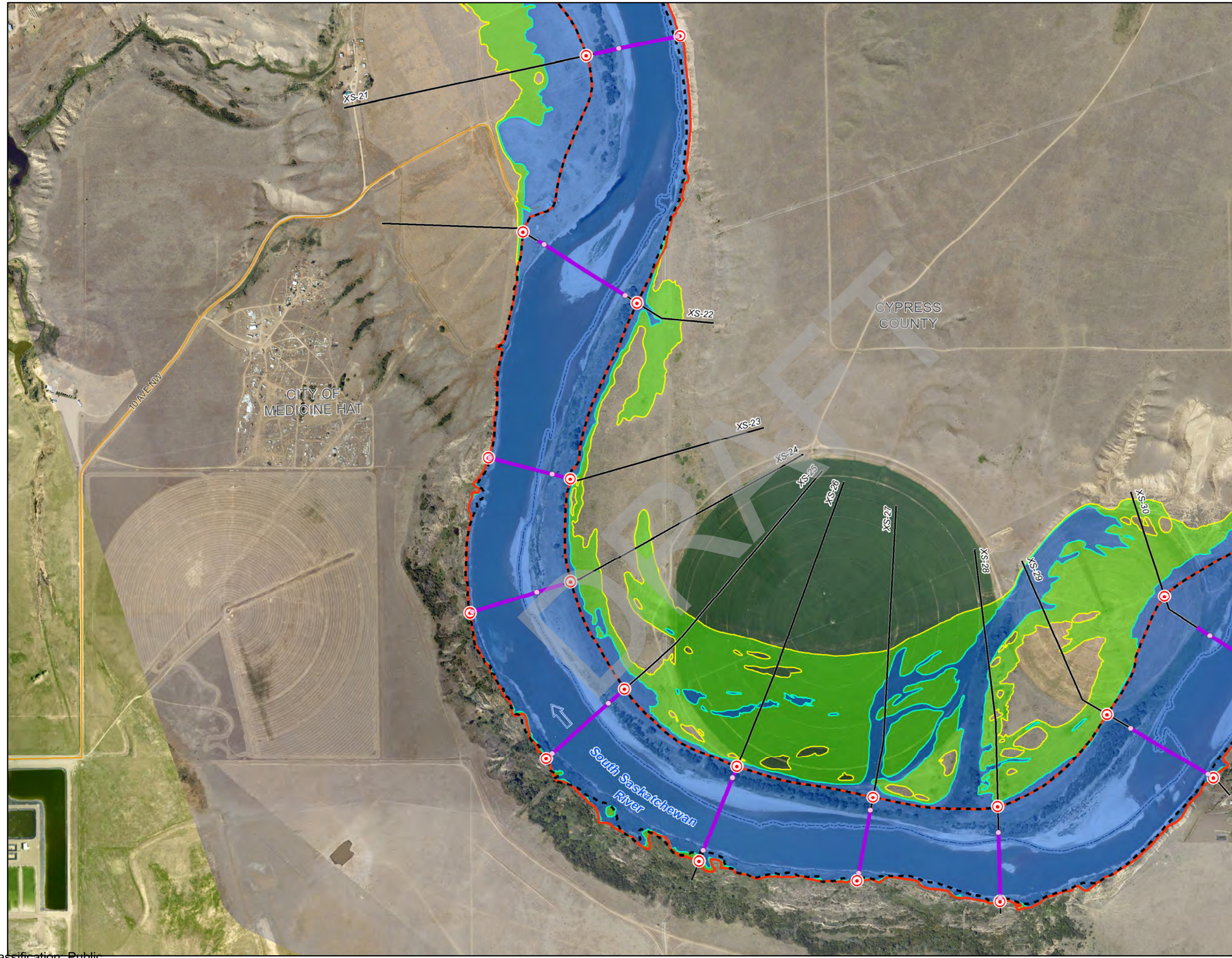


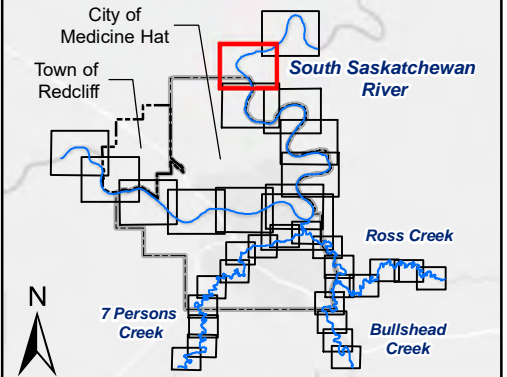
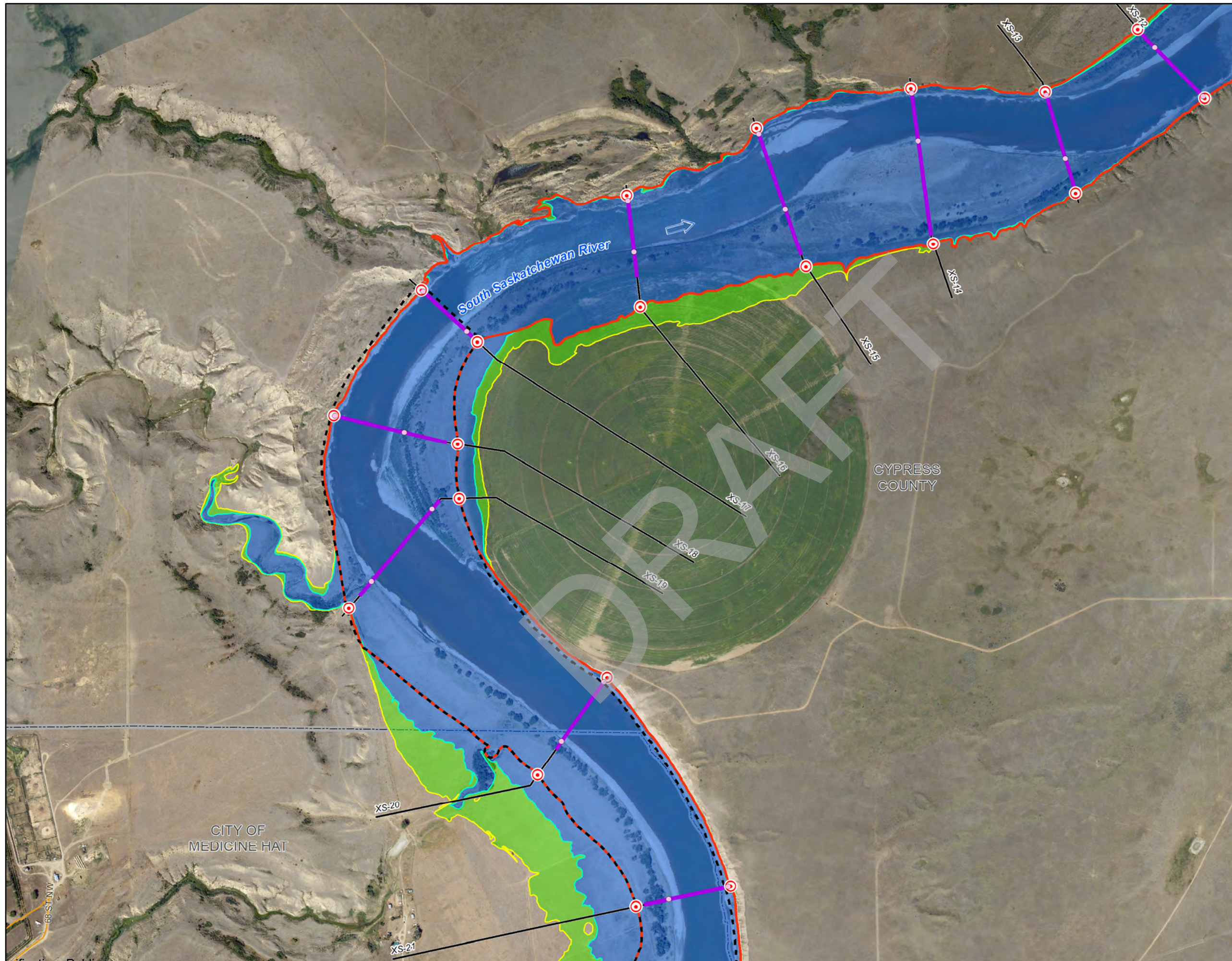
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Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

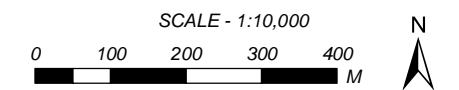
SHEET 10 OF 34





- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
- PROPOSED FLOODWAY BOUNDARY
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- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s

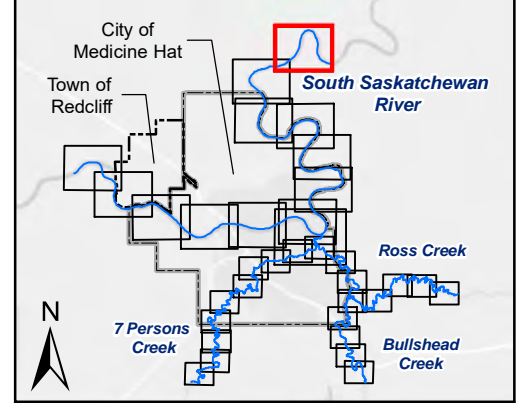


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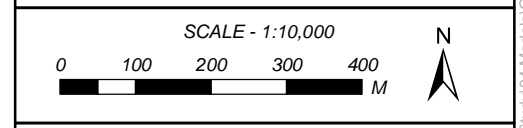
Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA

Job: 1003094	Date: 25-APR-2022
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**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



- FLOW DIRECTION
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- DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

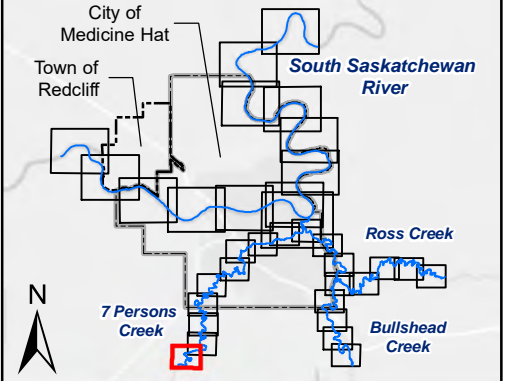
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

SHEET 12 OF 34



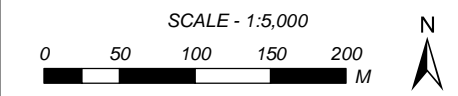
BF2164 - Twp. Rd. 120
over Seven Persons Creek
4km S of Medicine Hat

Private Road 1 over
Seven Persons Creek



- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
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- RAILWAY
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- REDCLIFF TOWN BOUNDARY

DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



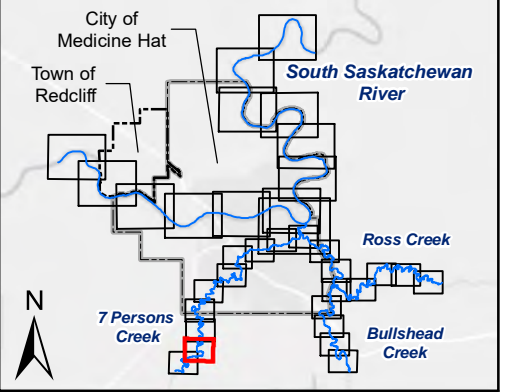
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Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

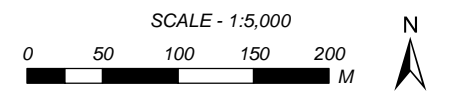
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Desert Blume Golf Course Bridge 1 over Seven Persons Creek



- FLOW DIRECTION
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DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

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Desert Blume Golf Course Bridge 7
over Seven Persons Creek

Desert Blume Golf Course Bridge 6
over Seven Persons Creek

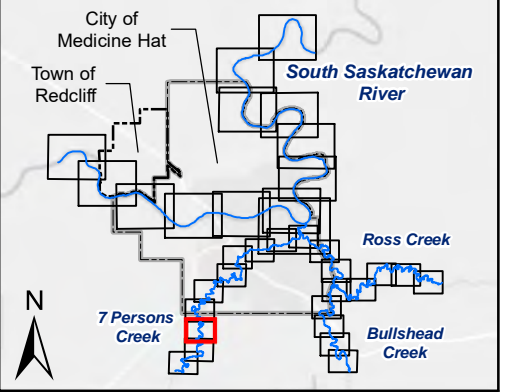
Desert Blume Golf Course Bridge 5
over Seven Persons Creek

Desert Blume Golf Course Bridge 4
over Seven Persons Creek

Desert Blume Golf Course Bridge 3
over Seven Persons Creek

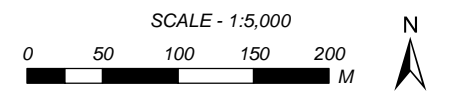
Desert Blume Golf Course Bridge 2
over Seven Persons Creek

Desert Blume Golf Course Bridge 1
over Seven Persons Creek



- FLOW DIRECTION
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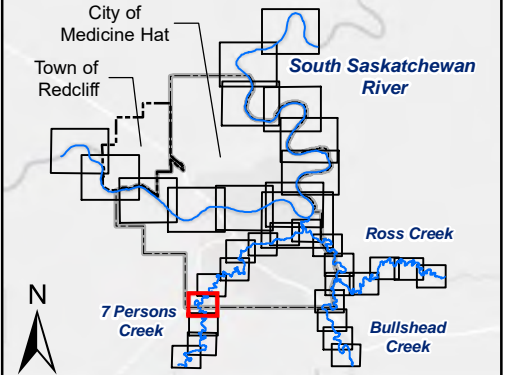
DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

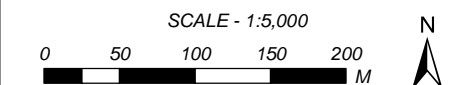
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Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
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DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s

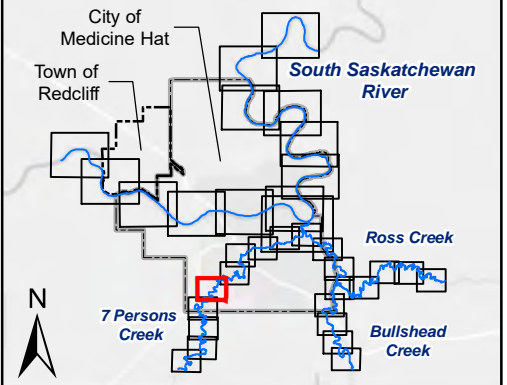
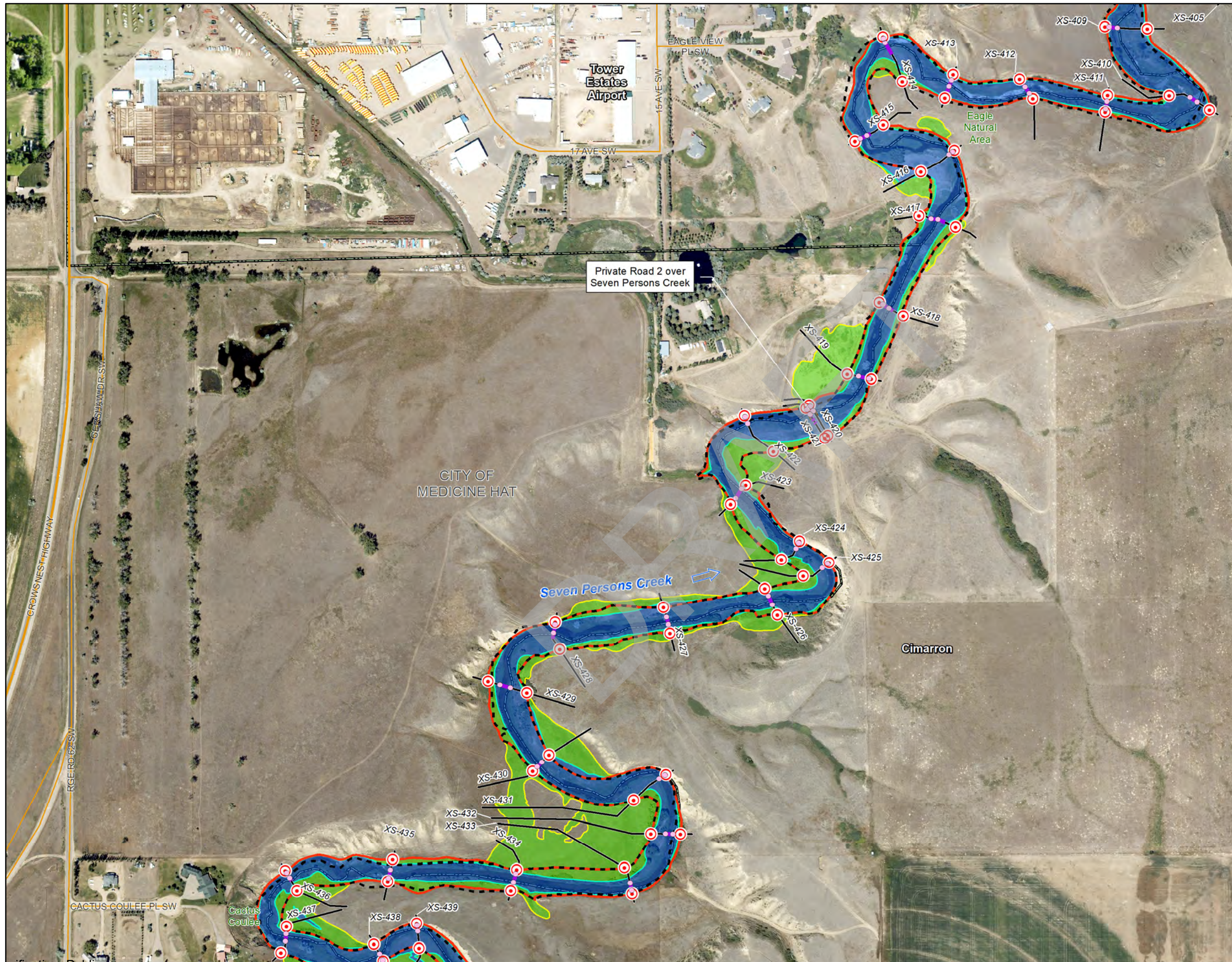


Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA

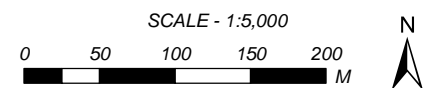
Job: 1003094 Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

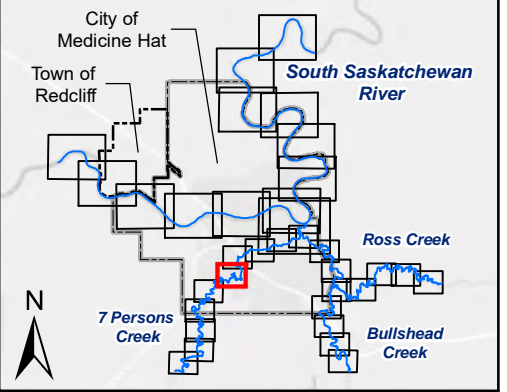
DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

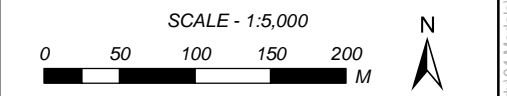
Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
- PROPOSED FLOODWAY BOUNDARY
- BRIDGE
- CROSS SECTION
- CULVERT
- WEIR
- STUDY LIMIT
- FLOOD CONTROL STRUCTURE
- FLOODWALL
- PREVIOUS FLOODWAY
- 100-YEAR DESIGN FLOOD EXTENT
- DEPTH ≥ 1 M
- PROTECTED FLOOD AREA
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

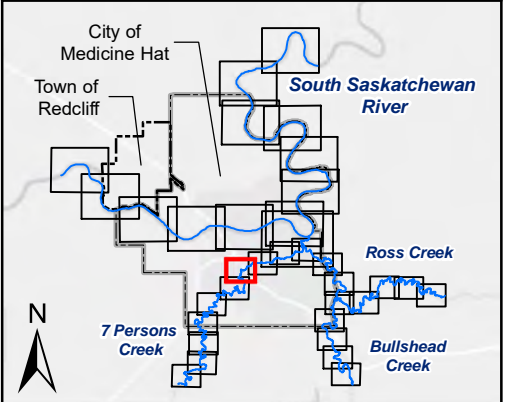
DISCHARGE
 SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
 Units: METRES; Vertical Datum: CGVD28 HTv2.0

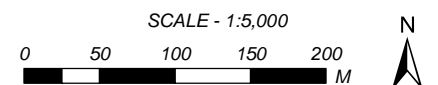
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
 RIVER HAZARD STUDY
 OPEN WATER FLOODWAY
 CRITERIA MAP**



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- NEIGHBOURHOOD
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- REDCLIFF TOWN BOUNDARY

DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



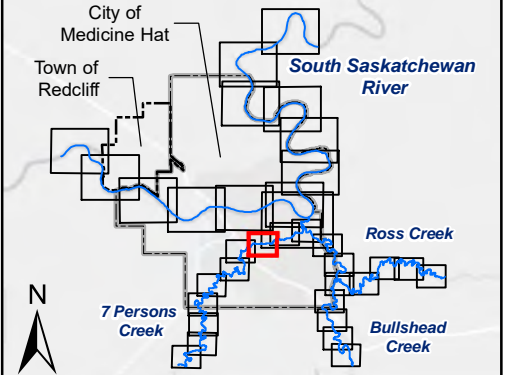
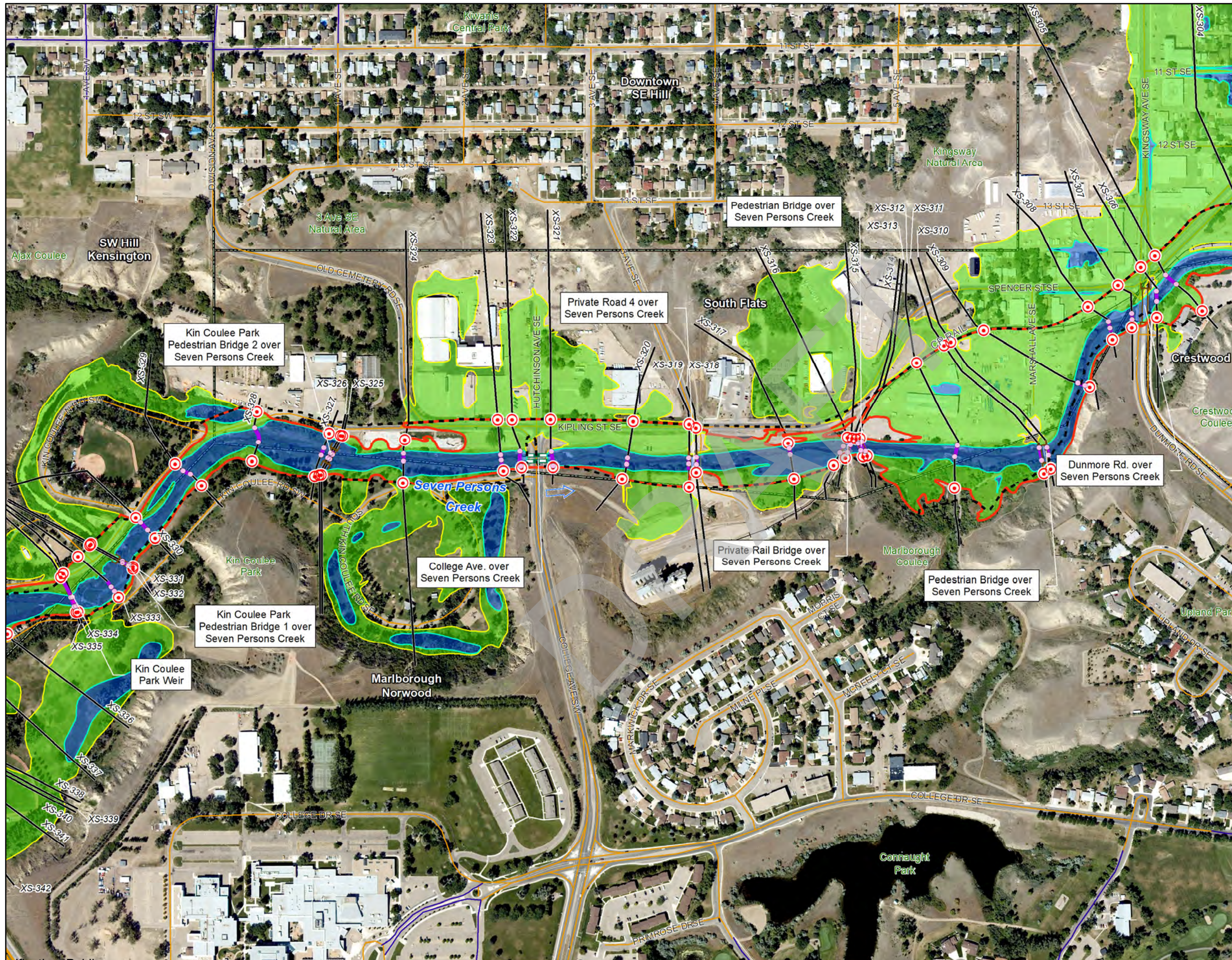
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Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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Job: 1003094 Date: 25-APR-2022

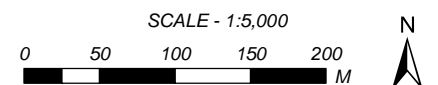
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

P:\Projects (Active)\1003094_Medicine Hat River Hazard Study\04_Models\GIS\GIS_1006302_REH_Map_1500_FloodwayCriteria.mxd



- FLOW DIRECTION
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- REDCLIFF TOWN BOUNDARY

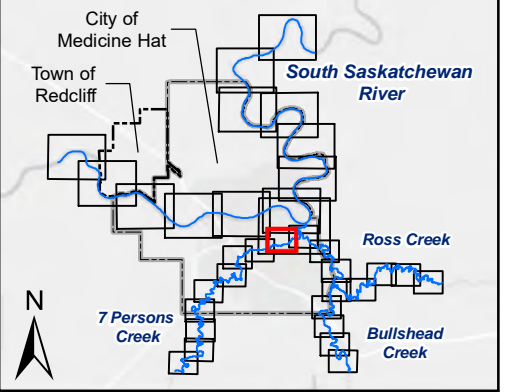
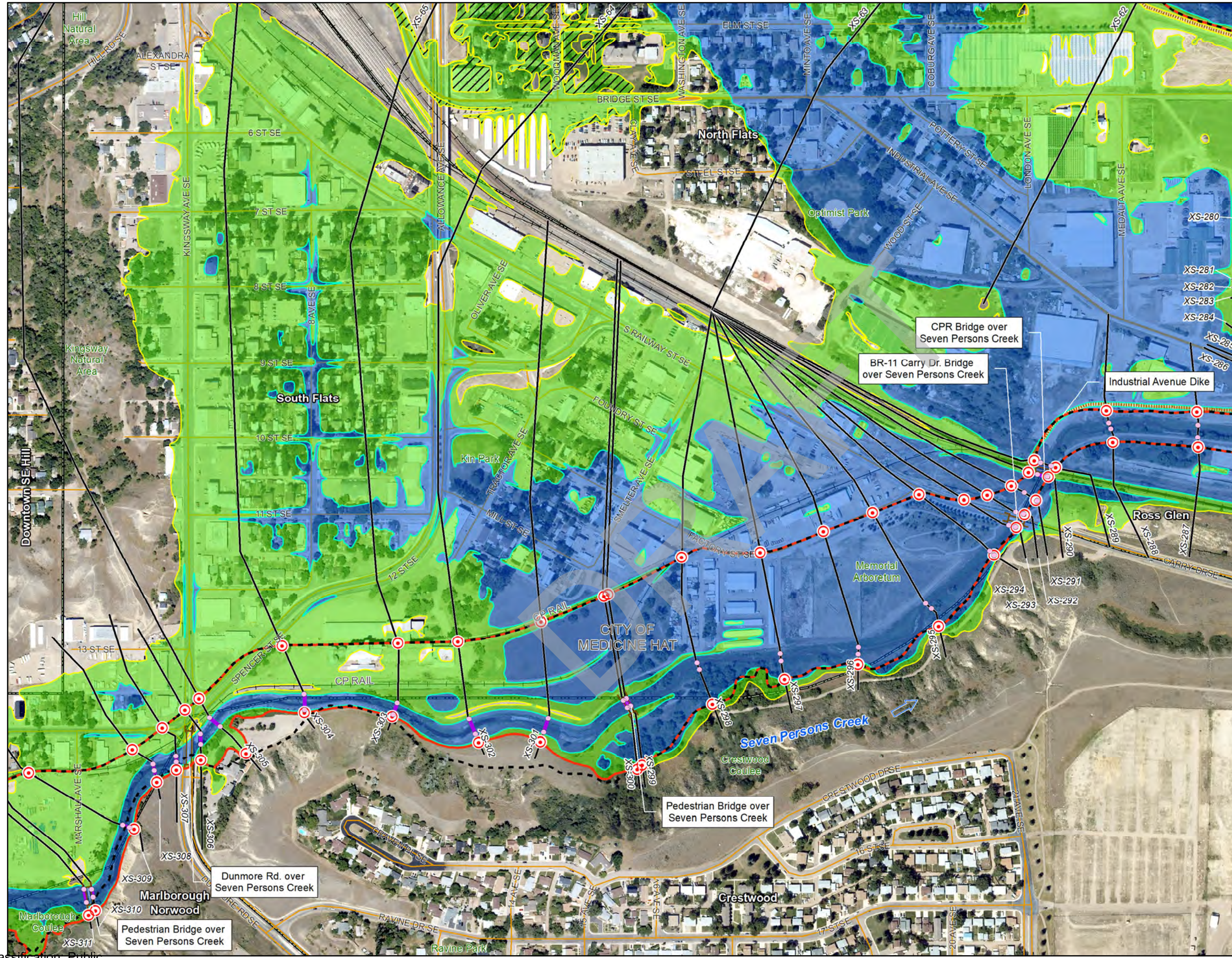
DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

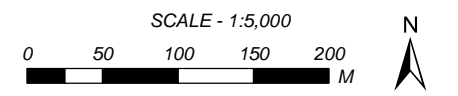
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094	Date: 25-APR-2022	

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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DISCHARGE
SEVEN PERSONS CREEK = 104 m³/s

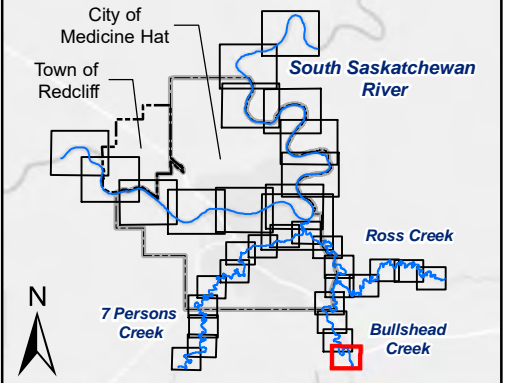


Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA
Job: 1003094	Date: 25-APR-2022	

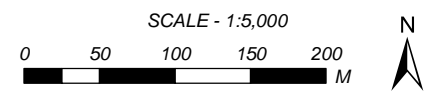
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

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DISCHARGE
BULLSHEAD CREEK = 92.3 m³/s

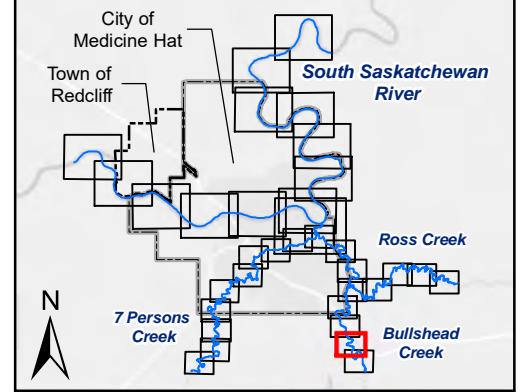


Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA

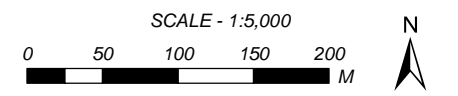
Job: 1003094 Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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DISCHARGE
BULLSHEAD CREEK = 92.3 m³/s

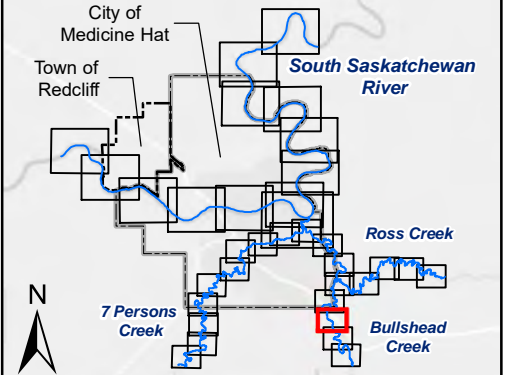
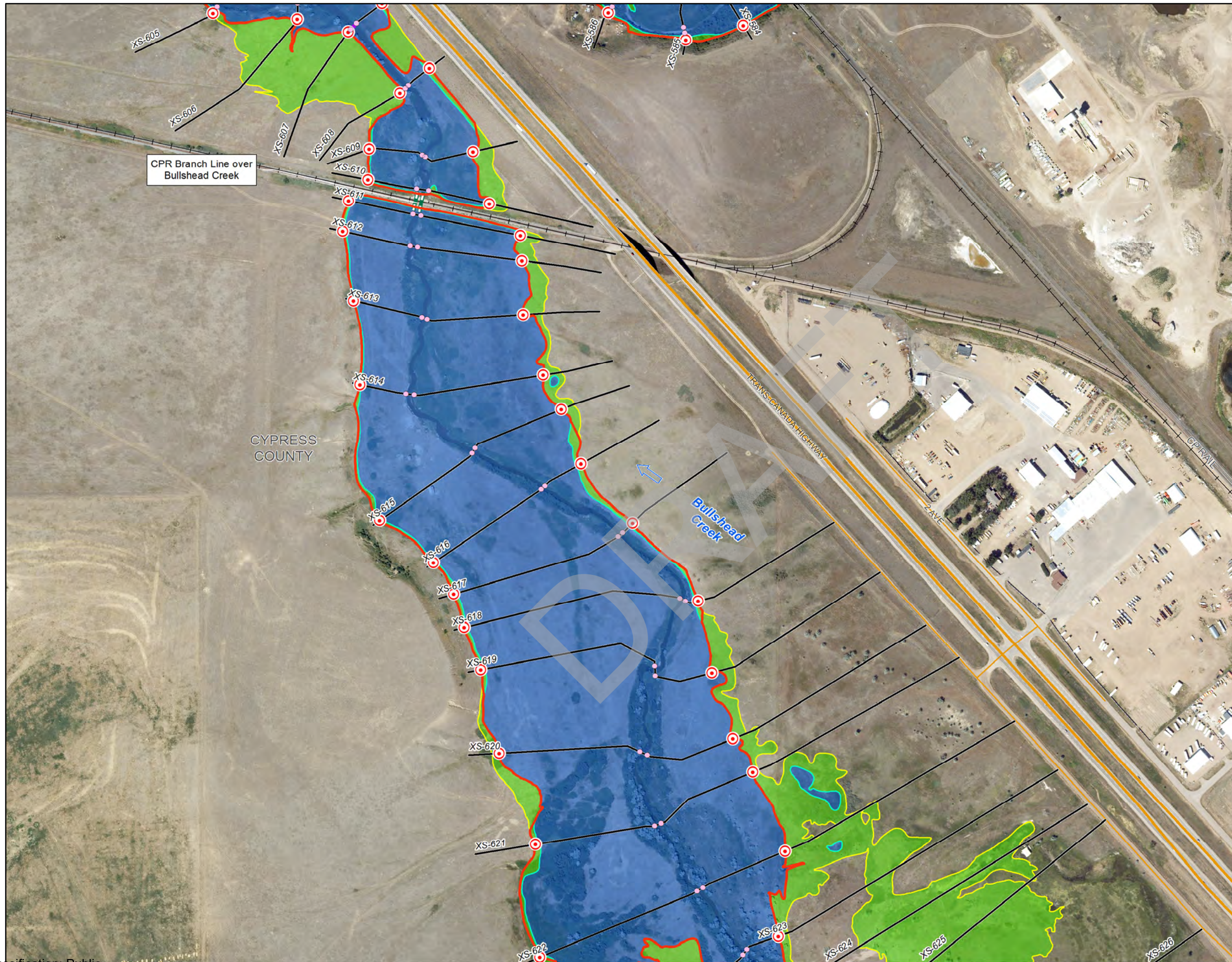


Coordinate System: NAD 1983 CSRS 3TM 111
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Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

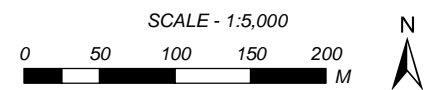
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**





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DISCHARGE
BULLSHEAD CREEK = 92.3 m³/s

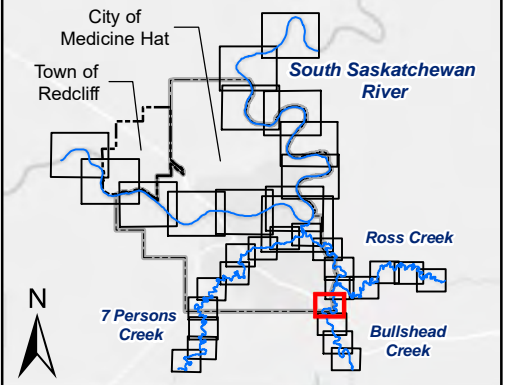


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Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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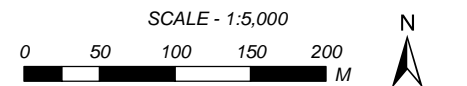
Job: 1003094 | Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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DISCHARGE
BULLSHEAD CREEK = 92.3 m³/s

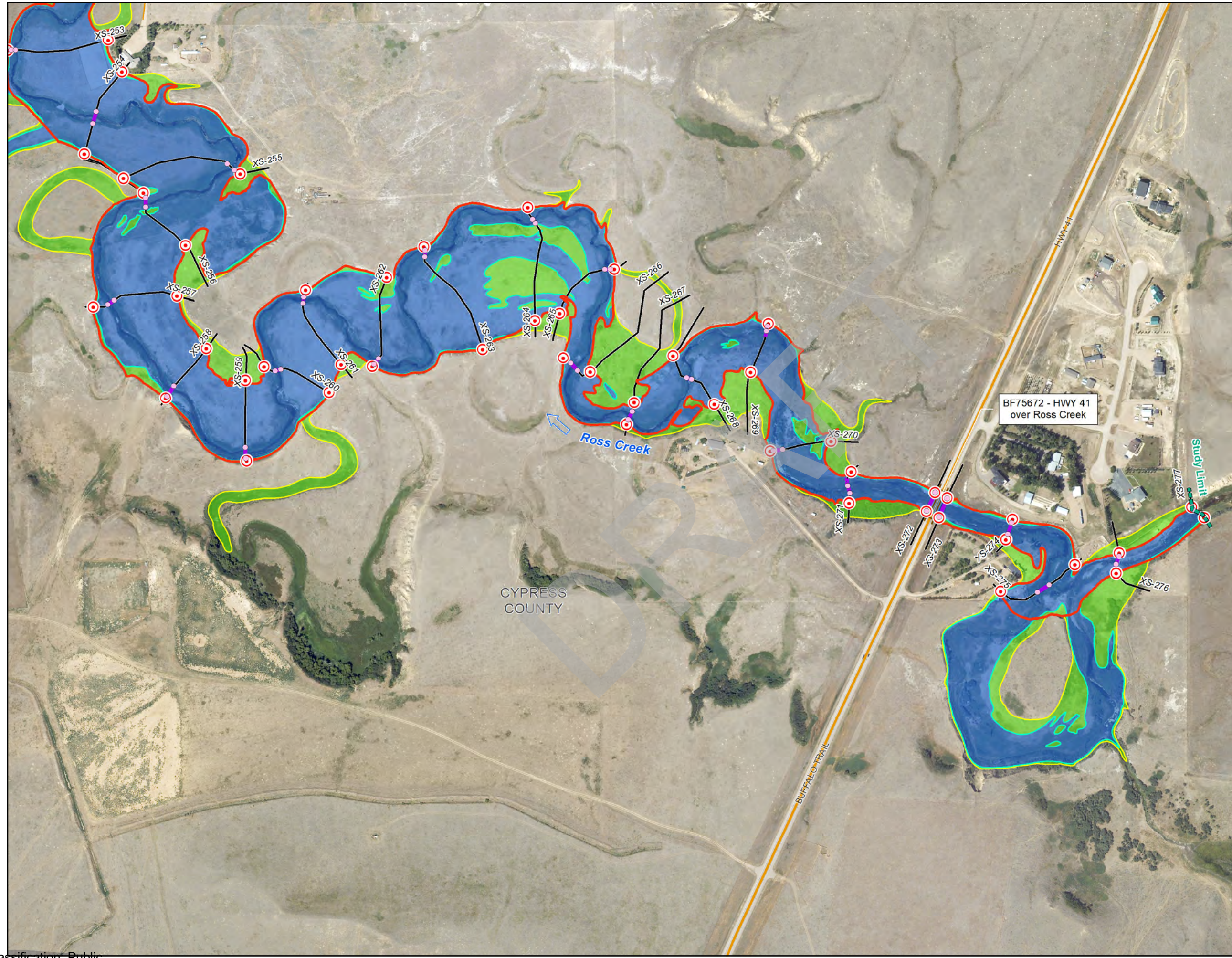
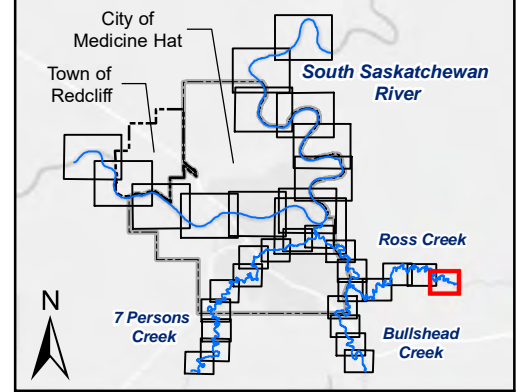


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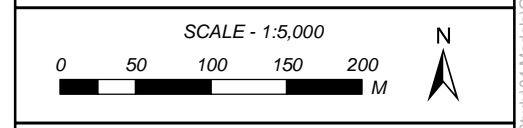
Engineer	GIS	Reviewer
DJH/MMM	REH/JY	RBA

Job: 1003094 | Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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 - NEIGHBOURHOOD
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- DISCHARGE
ROSS CREEK = 145 m³/s

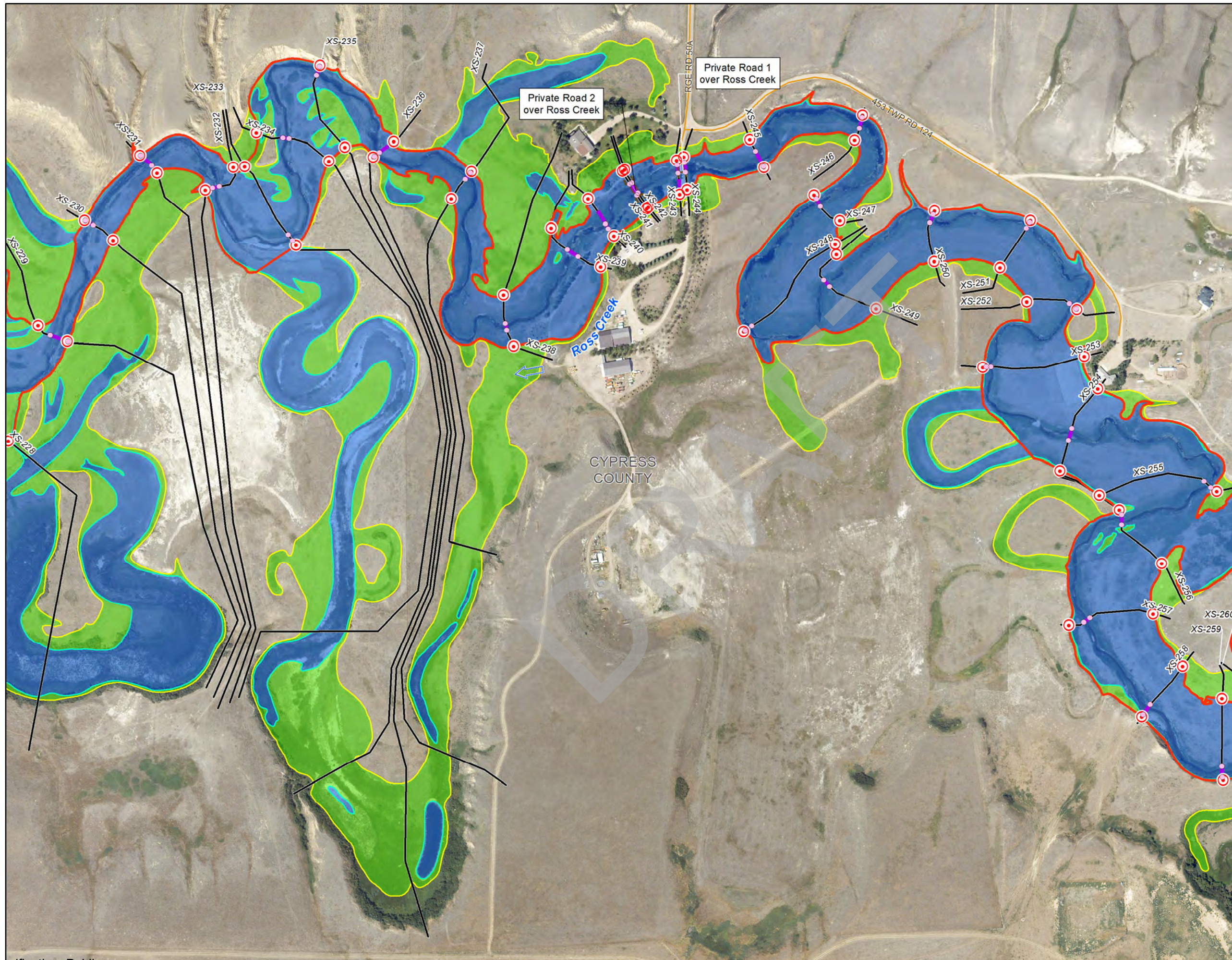
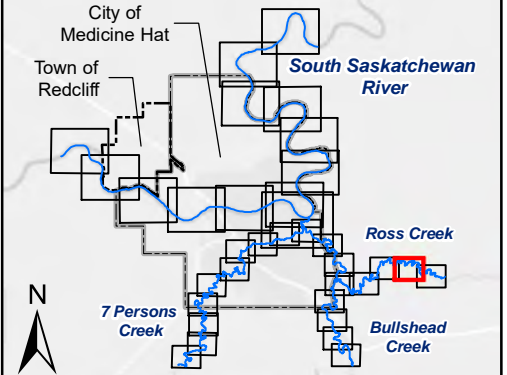


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Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

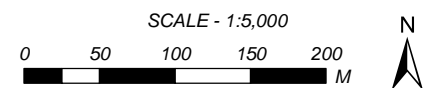
**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

SHEET 26 OF 34



- FLOW DIRECTION
- MODEL BANK STATION
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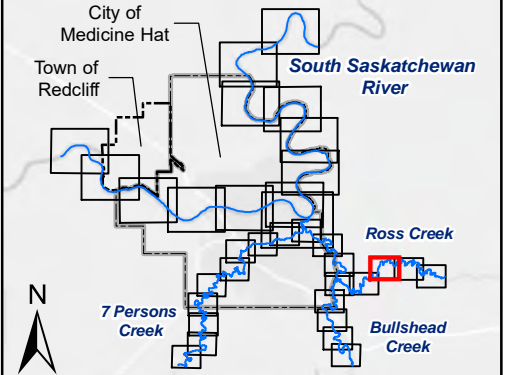
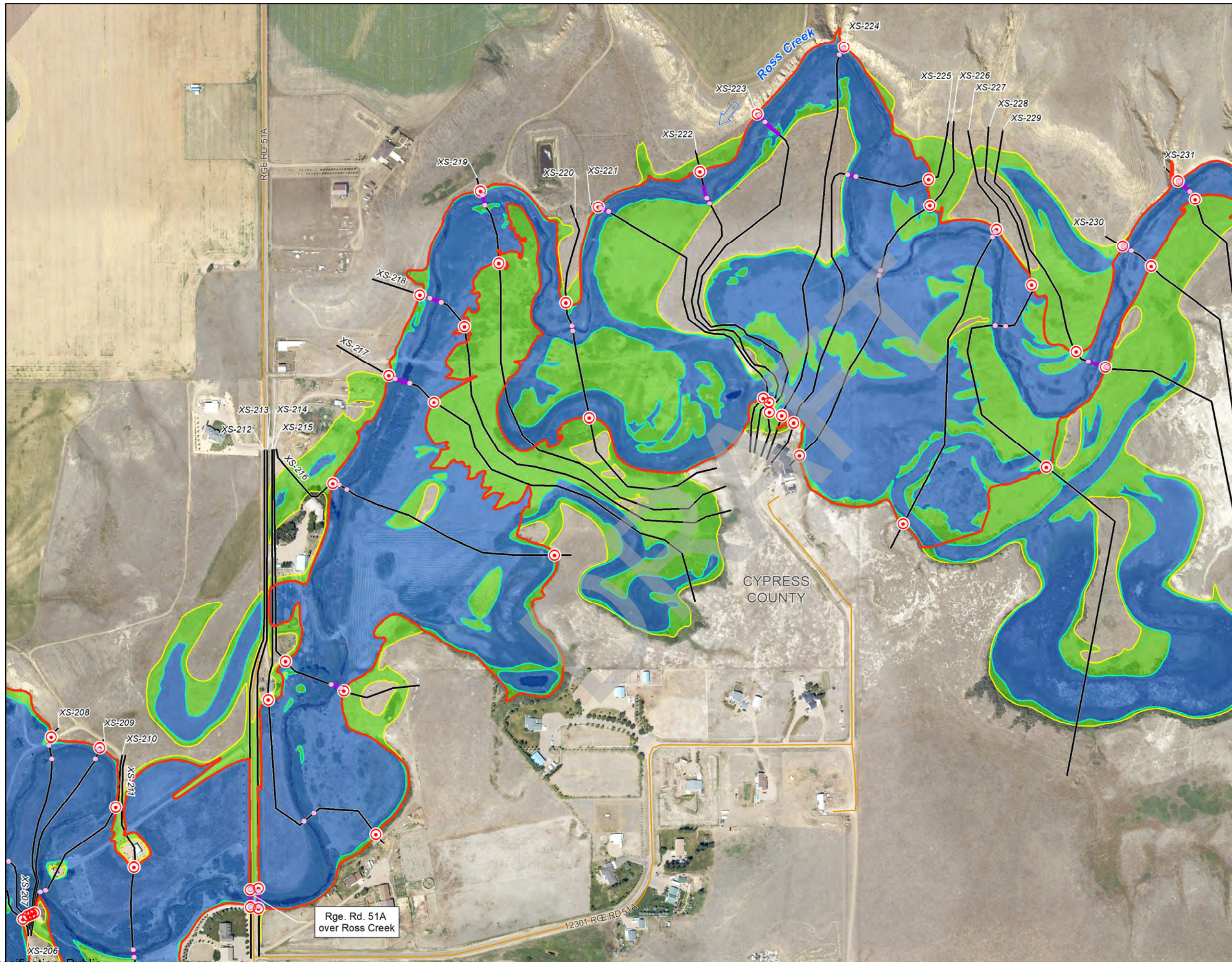
DISCHARGE
ROSS CREEK = 145 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

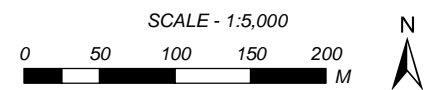
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**



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DISCHARGE
ROSS CREEK = 145 m³/s

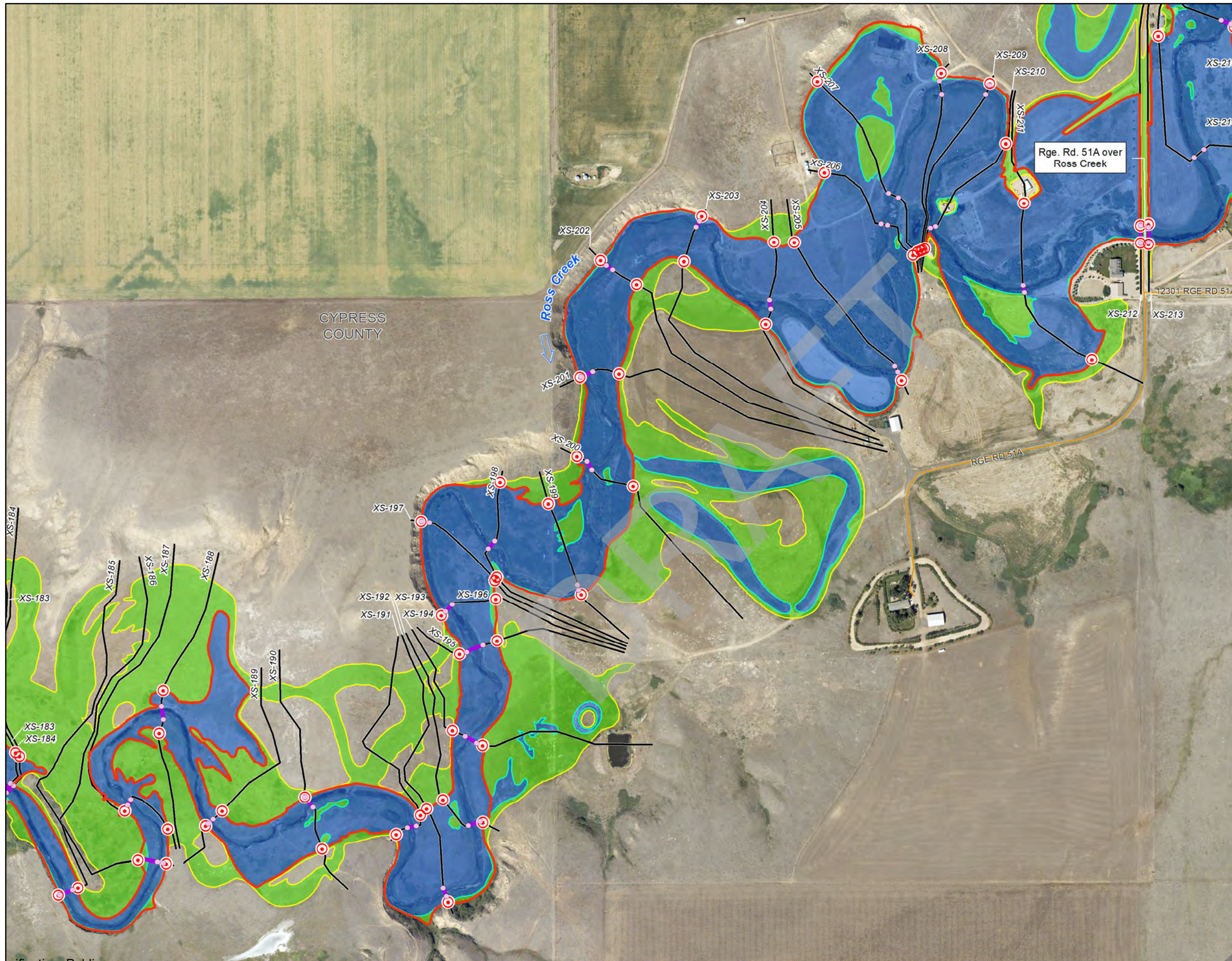


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Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
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Job: 1003094 | Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

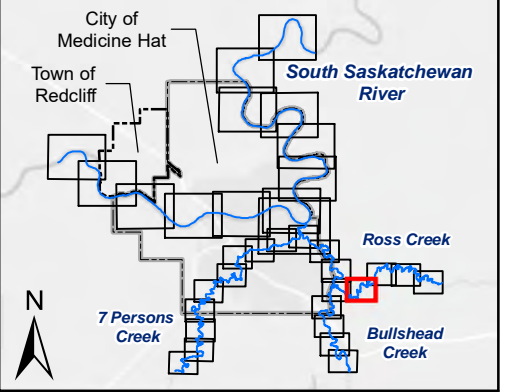


CYPRESS COUNTY

Rge. Rd. 51A over Ross Creek

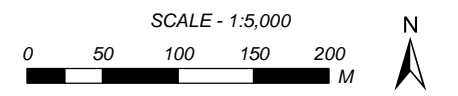
RGE RD 51A

12301 RGE RD 51A



- FLOW DIRECTION
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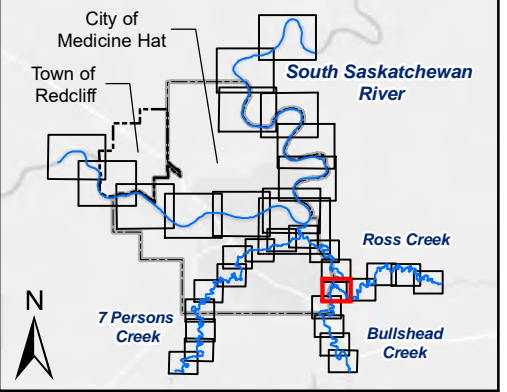
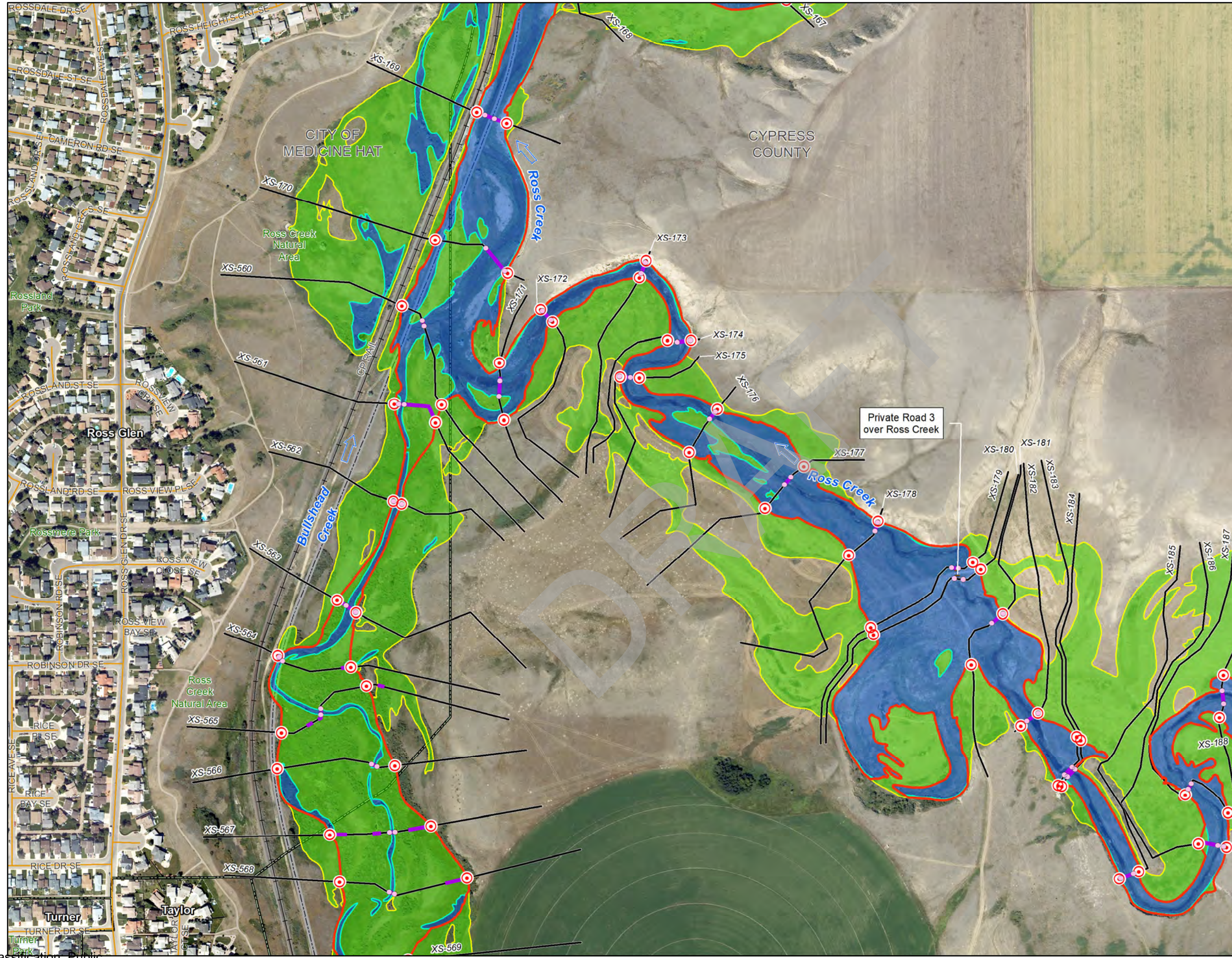
DISCHARGE
ROSS CREEK = 145 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

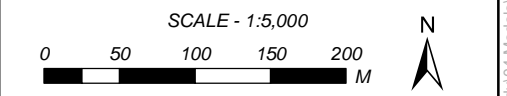
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
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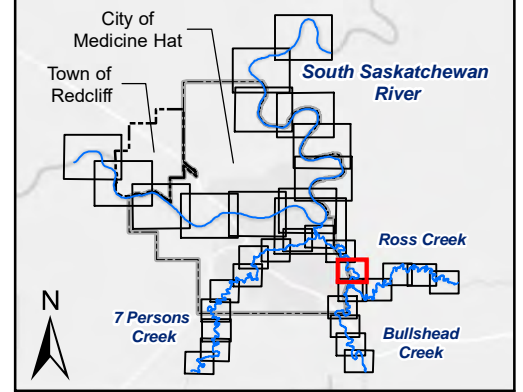
DISCHARGE
 BULLSHAD CREEK above XS-560 = 92.3 m³/s
 ROSS CREEK above XS-171 = 145 m³/s
 ROSS CREEK below XS-170 = 188 m³/s



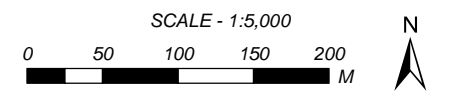
Coordinate System: NAD 1983 CSRS 3TM 111
 Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
 RIVER HAZARD STUDY
 OPEN WATER FLOODWAY
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- DISCHARGE
ROSS CREEK = 188 m³/s



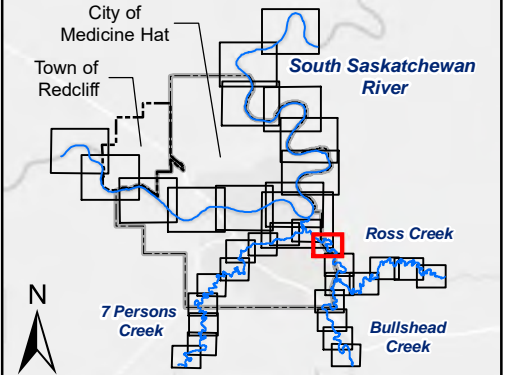
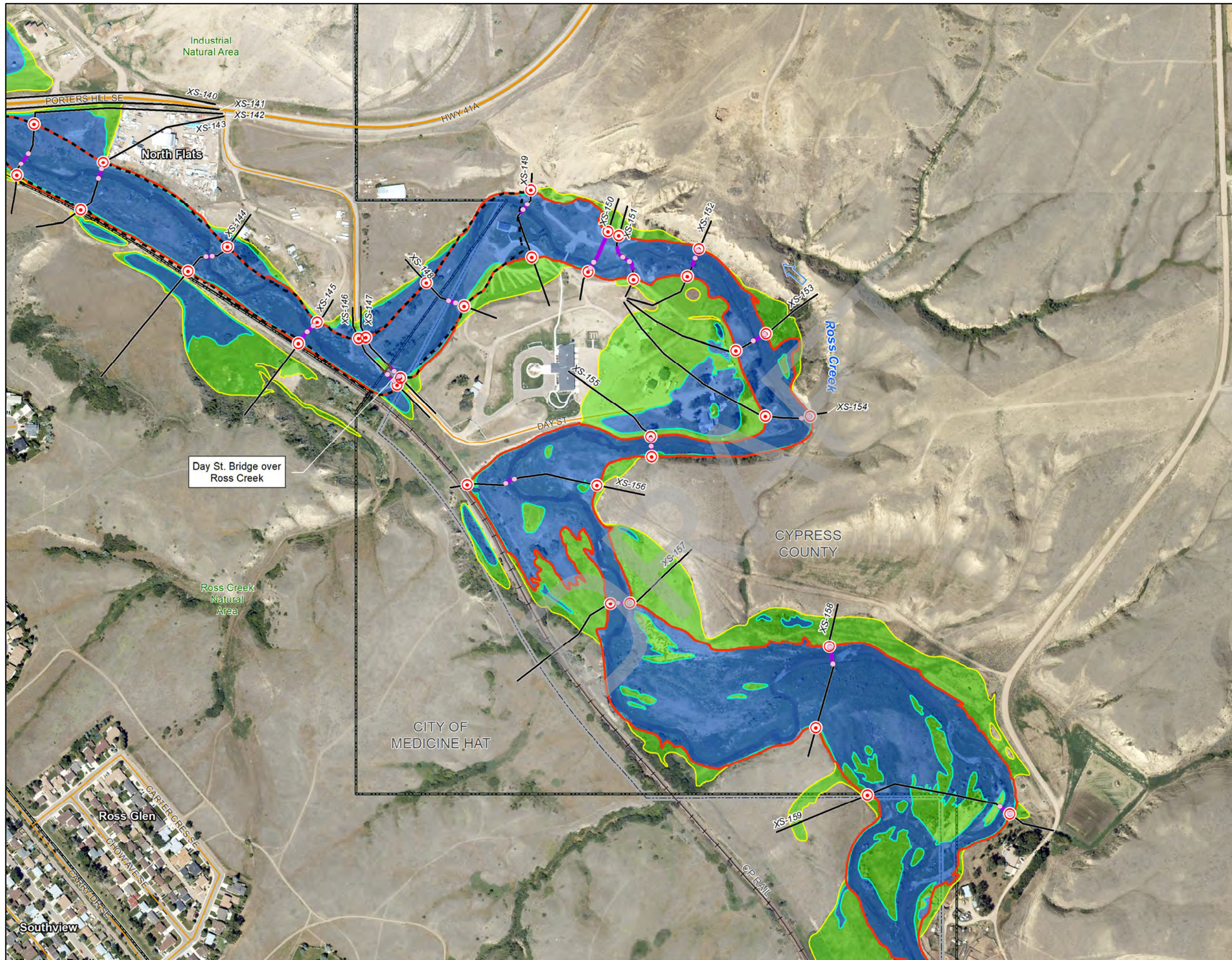
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Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

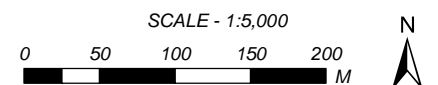


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- FLOW DIRECTION
- MODEL BANK STATION
- PROPOSED FLOODWAY LIMIT
- VELOCITY ≥ 1 M/S
- PROPOSED FLOODWAY BOUNDARY
- BRIDGE
- CROSS SECTION
- CULVERT
- WEIR
- STUDY LIMIT
- FLOOD CONTROL STRUCTURE
- FLOODWALL
- PREVIOUS FLOODWAY
- 100-YEAR DESIGN FLOOD EXTENT
- DEPTH ≥ 1 M
- PROTECTED FLOOD AREA
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- NEIGHBOURHOOD
- MEDICINE HAT CITY BOUNDARY
- REDCLIFF TOWN BOUNDARY

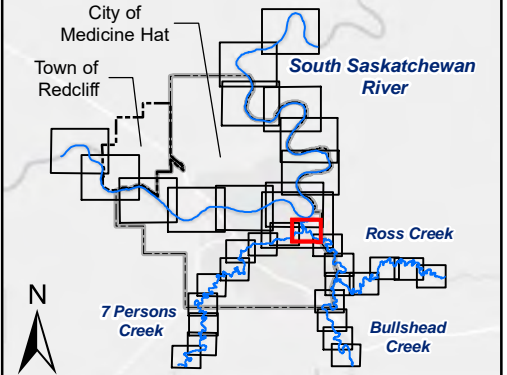
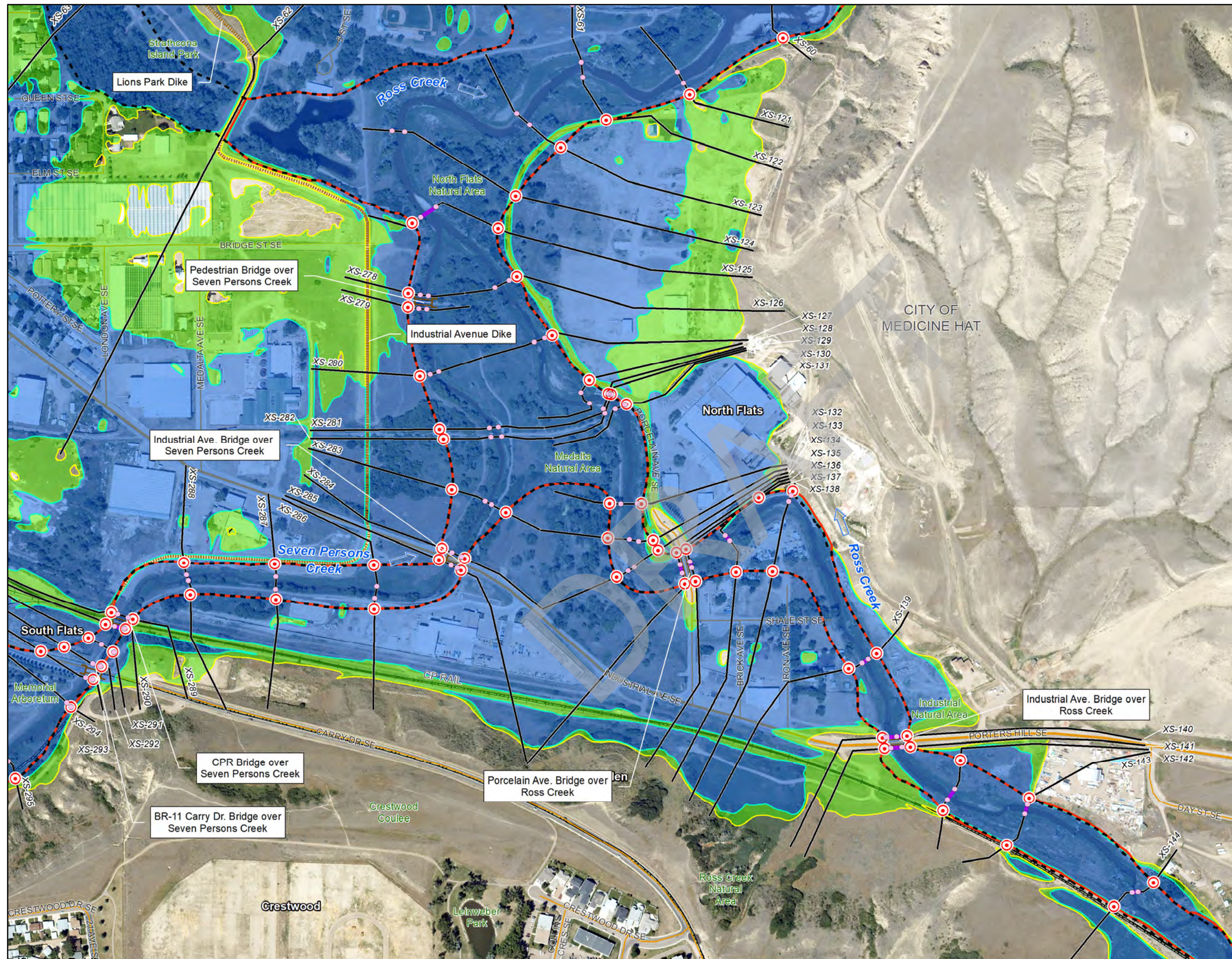
DISCHARGE
ROSS CREEK = 188 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

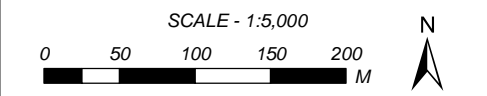
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
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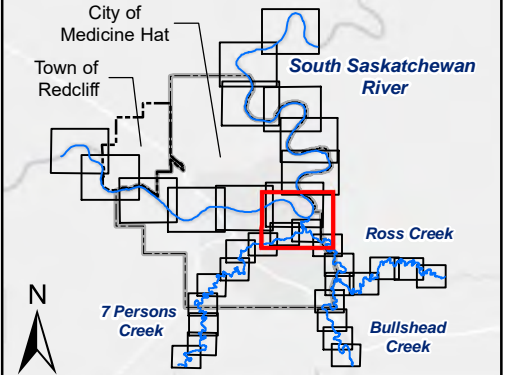
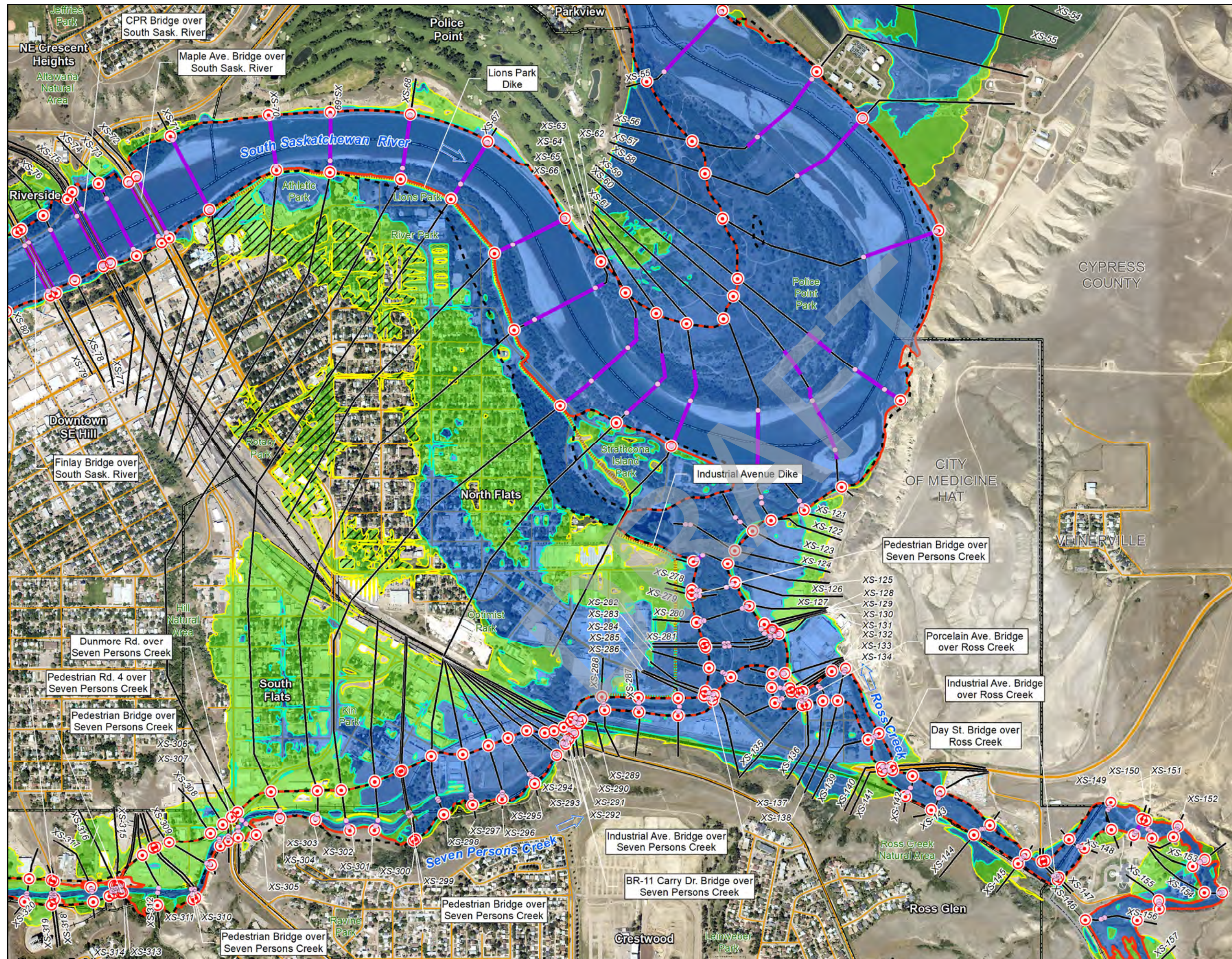
DISCHARGE
 SEVEN PERSONS CREEK above XS-278 = 104 m³/s
 ROSS CREEK above XS-126 = 188 m³/s
 ROSS CREEK below XS-125 = 292 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
 Units: METRES; Vertical Datum: CGVD28 HTv2.0

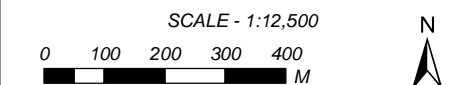
Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094	Date: 25-APR-2022	

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 OPEN WATER FLOODWAY
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DISCHARGE
SOUTH SASKATCHEWAN RIVER = 6,500 m³/s
ROSS CREEK above XS-121 = 292 m³/s
SEVEN PERSONS CREEK = 104 m³/s



Coordinate System: NAD 1983 CSRS 3TM 111
Units: METRES; Vertical Datum: CGVD28 HTv2.0

Engineer DJH/MMM	GIS REH/JY	Reviewer RBA
Job: 1003094		Date: 25-APR-2022

**MEDICINE HAT
RIVER HAZARD STUDY
OPEN WATER FLOODWAY
CRITERIA MAP**

DRAFT

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water resource specialists