

DRAINAGE SERVICING REPORT

ST ANTHONY DEVELOPMENT

10425 84 AVE NW

LOTS 9-15 & 26-32

AND CLOSED LANE

BLOCK 80, PLAN I

AND

LOT 26A, BLOCK 80

PLAN 288 RS

PREPARED BY:

KM CIVIL CONSULTANTS LTD.

PREPARED FOR:

CITY OF EDMONTON

REV. MARCH, 2024

Drainage Servicing Report**SIGN-OFF SHEET**

This document entitled “Drainage Servicing Report” for 10425 84 Ave NW, has been prepared by KM Civil Consultants Ltd. on Behalf of Beljan Developments. This report only encompasses the development of lots that are legally described as Lots 9-15 & 26-32, Closed Lane Block 80, Plan I and Lot 26A, Block 80, Plan 288 RS. All reference material has been obtained and compiled from the City of Edmonton’s record drawings, and computations are based on current City of Edmonton Design Standards and Specifications. Analysis in this report reflects KM Civil Consultant’s best judgement in the production of this report, based on the available information.

Any use which a third party makes of the work, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Decisions made or actions taken as a result of our work shall be the responsibility of the parties directly involved in the decisions or actions.

KM Civil Consultants Ltd.

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Civil Manager

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1 PROJECT BACKGROUND AND PROPOSED DEVELOPMENT

KM Civil Consultants Ltd. have been retained to provide a Drainage Servicing Report to support rezoning of the development site from the existing Parks and Services Zone (PS), to *Mixed Use Zone (MU)*, located within the city of Edmonton Strathcona neighborhood. This Drainage Servicing report has been prepared on behalf of the developer Beljan Developments for the re-development of approximately 0.574 ha of land.

Currently within these lots sit the St Anthony District Archives and meeting Center along with surface parking. Records show that a lane used to be within the lots. Refer to **Figure 1** for an aerial image of the proposed area and the existing infrastructure.

The proposed development will consist of an 8 Story residential apartment complex (300+/- units).

This Drainage Servicing Report will analyze the impact of the proposed development to the existing municipal underground combined sewer system and assess the storm and sanitary flows anticipated to discharge from the subject site. A recommendation for site servicing (storm and sanitary) will be provided to support the development of a MU zoning. Required on-site stormwater detention volumes will also be calculated to facilitate attenuation of the 100-year rainfall event with an outflow rate of 35 L/s/ha to the existing storm sewer system.

Production of this report is based on reference material that has been obtained and compiled from the City of Edmonton record drawings, and all computations are based on current City of Edmonton Design Standards and Specifications. Refer to **Appendix A** for exiting City of Edmonton Record Drawings. To our knowledge the City of Edmonton has no further plans to improve/upgrade the existing combined sewer system in the near future.



Figure 1 – Aerial Image of Development

2 SERVICING DESIGN CRITERIA

This report is required to be approved and accepted by Planning Coordination (Drainage) prior to supporting the rezoning application. As this is a mature neighborhood, all the sewers adjacent to the block on 83rd Ave, 84th Ave, 104th street and 105th street are all combined sewers collecting storm and sanitary discharge from the surrounding lots as well as public catch basins. The site in question is currently serviced via a 200mm storm service connection (S-46814) and a 200mm sanitary service connection (S-22513). This report will determine if the existing service connections are sufficient for the proposed development; with the understanding that the existing combined sewer within 83rd Ave is able to handle the existing services (S-46814 and S-22513) at full capacity.

2.1 Storm Sewer Design Criteria

2.1.1 Minor Storm System

The following Rational Method has been used in estimating runoff flow rates for the design of storm sewers for the development area.

$$Q = \frac{CIA}{360}$$

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Where: Q = the design peak flow rate in cubic meters per second
 I = the intensity of rainfall is millimeters per hour
 A = the contributing area in hectares
 C = the runoff coefficient

A weighted runoff coefficient for current type of development has been calculated using the following formula:

$$C = \frac{(0.95 \times \text{Asphalt/Concrete}) + (0.95 \times \text{Building Roof}) + (0.625 \times \text{Gravel}) + (0.125 \times \text{Landscape})}{\text{Total Area}}$$

The design inlet time of 5 minutes has been used for this both commercial and residential areas with respect to catchment imperviousness and size.

2.1.2 Major Storm System

Parking lots, driving lanes and site accesses will be graded to provide a continuous surface drainage system to direct overland flows into underground minor drainage systems and also convey the runoff generated from a rainfall event in excess of 100 year storm event.

The maximum onsite ponding depth will not exceed 0.35m. An overflow will be provided from all sags or depressions such that the ponding levels will not rise to within 150mm from the finished ground elevation at the buildings.

2.1.3 Stormwater Management Plan

The proposed on-site Storm Water Management Plan (SWMP) will be designed to accommodate the 100-year return frequency, without surcharging in the minor drainage systems.

Onsite water storage will be provided by a combination of rooftop storage, surface storage and underground storage. A flow control system (orifice plate) will be utilized for flow control prior to tie-in to the city storm system.

2.2 Sanitary Sewer Design Criteria

The flow and factors listed below have been utilized as minimum requirements for the design of the on-site sanitary sewer system for the proposed development.

For detailed system design, the average sanitary sewage daily flows are computed using rates per unit floor area and/or unit flow generation factors for the specific land uses. The total design peak flow rates for a sanitary sewer shall be the sum of the peak dry weather flow rates

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as generated by population and land use for the design contributing area plus all extraneous flow allowances.

Peak dry weather flow rate (Q_{PDW} in L/s) for a residential population shall be determined by the following formula:

$$Q_{PDW} = \frac{G \times P \times PF}{86400}$$

Where: G = Per capita daily sewage flow generation = 220 L/day/person

P = Design contributing population

and: PF = Peaking factor determined as follows:

The peaking factor (PF) is the larger of 1.5 or:

$$PF = 2.6 P_{pf}^{-0.1}$$

Where: P_{pf} = the design contributing population in 1,000's

Peak dry weather flow rates for specific design for non-residential areas are to be determined by application of a peaking factor (PF), related to the average flow rate (Q_{AVG} in L/s) in accordance with the following expression to a maximum value of 25.0 and a minimum value of 2.5:

$$PF = 10 Q_{AVG}^{-0.45}$$

A general allowance of 0.28 L/s/ha shall be applied, irrespective of land use classification, to account for wet-weather inflow to manholes not located in street sags and for infiltration into pipes and manholes.

When sanitary sewer manholes are located low areas and are thus subject to inundation during major rainfall events, the sanitary design peak flow rate shall be increased by 0.4 L/s for each manhole.

3 STORM SERVICING

3.1 Existing Storm Drainage Flows

The existing PS zone lots are currently comprised of mostly impervious surfaces (rooftops, asphalt, concrete). Overland drainage adjacent to the building appears to flow east towards the existing lane and north towards 84th Avenue. A portion of the existing parking lot drains towards an onsite catch basin; from the information received it is assumed that this eventually ties into the storm service (S-46814) off of 83th Ave.

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Based on the most recent topographical survey. The site is currently composed of a building and existing asphalt and concrete, with very minimal landscape (3%+/-). The weighted average calculated pre-development runoff coefficient is 0.88 (0.9). Refer to **Appendix B** for runoff coefficient calculation. It can be observed that some of the existing roof drains splash to grade, and some appear to be directed underground to the storm system. It is assumed that currently there is no Storm water Management in place.

The calculate the pre-development flow for 1 in 5 year event, 91 mm/hr rainfall intensity at 5 minute time of concentration was used and was calculated to be 131.05L/s. To calculate the pre-development flow for 1 in 100 year event 188.4 mm/hr rainfall intensity at 5 minute time of concentration was used and was calculated to be 258.99L/s. Refer to **Table 1** for Existing Storm Drainage Flows and **Appendix B** for detailed calculations.

COMPONENT	POINT OF DISCHARGE FLOW	Total (L/s)
EX BUILDING	Overland to 85 th Ave	Q _{5PRE} = 131.05
EX PARKING LOT	Under Ground Stm System	Q _{100PRE} = 258.99

Table 1 - Existing Drainage Flows

3.2 Post Development Storm Drainage Flows and Connection

After the lots have been consolidated the development area will be 0.57 hectares, which falls between 0.16 ha and 10 ha range. Sites with areas between 0.16 hectares and 10 hectares require on-site stormwater management including storage provisions to accommodate runoff from the 1:100-year design storm event with an outflow rate of 35 liters per second per hectare (as per Drainage Servicing Report – Terms of Reference).

As the existing combined sewer on both 83rd and 84th avenue are 200mm in diameter, the most feasible option would be to utilize the existing 200mm storm service connection from 83th Avenue (S-46814). The flow from the proposed development would be controlled and the discharge into the combined sewers would be significantly less than pre-development. Refer to **Figure 2** for location of S-46814.

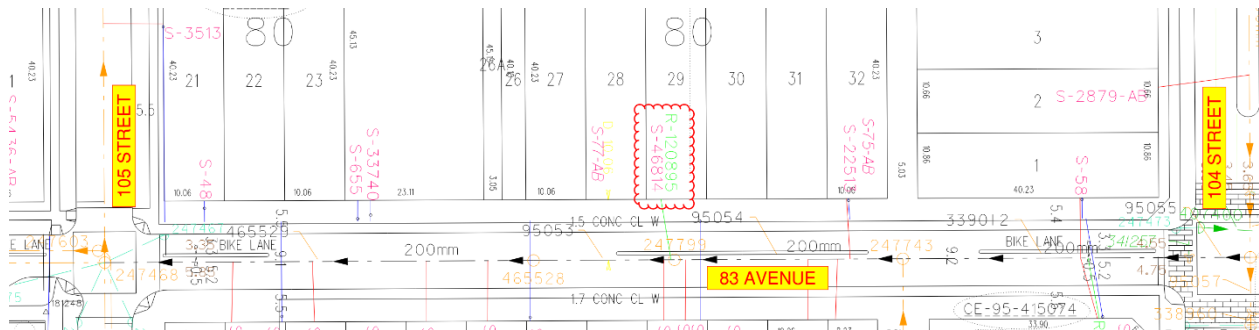


Figure 2 – Existing Storm Service (S-46814) Location

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The finished site surface for the new development will consist by a large percentage of impervious surface (building roof and hard surface). The average site runoff coefficient of 0.90 will be used for post development flows. The projected 1 in 100 year Peak Flow (Controlled) from site is calculated to be:

$$\begin{aligned} Q &= (35 \text{ L/s/ha}) (\text{Site Area}) \\ &= (35 \text{ L/s/ha}) (0.57 \text{ ha}) \\ &= 19.95 \text{ L/s} \end{aligned}$$

After stormwater management and storage is achieved, stormwater will discharge overland onto 83rd Avenue and into City Catch Basins.

3.3 Development Site Storage Volume

The proposed on-site Storm Water Management Plan (SWMP) will be designed to accommodate the 100-year return frequency, at a 35 L/s/ha allowable discharge rate.

Onsite water storage will be provided by a combination of rooftop storage, surface storage and underground storage. A flow control system (orifice plate) will be utilized for flow control prior to tie-in to the city storm system. The required onsite storage has been determined and calculated based on the 4 hour Chicago Distribution, referenced to "EPCOR Drainage Services: Guideline for Stormwater Management; Requirements for Individual Lot Development Areas Between 0.16 ha to 3.0 ha". Based on calculations to the above-mentioned reference, the onsite storage requirements are approximately 213.75m³. Data utilized and calculations are shown in **Appendix B**.

3.4 Impact to Existing Storm Service Connection

In reference to the City of Edmonton design specifications, the calculated allowable discharge for 1 in 5/100 year post development (controlled) rate would be = 19.95 L/s, compared to the 1 in 5 year pre-development discharge rate of 131.05L/s. Refer to **Appendix B** for detailed calculations.

The capacity of the existing 200mm storm service (S-46814) is approximately 32.8 L/s. The allowable discharge from site is 19.95 L/s, with which the new development will only be using $((19.95 \text{ L/s}) / (32.8 \text{ L/s}))$ 60.8% of the available capacity. Assuming the existing storm service is un-orificed and storm discharge from site uncontrolled, this is a 39.2% reduction in flow to the existing combined sewer main.

Upstream (PL)	Downstream MH247799	Pipe Length (m)	Pipe Diameter (mm)	Pipe Slope (%)	EX Capacity (L/s)
669.345	667.859	10.06	200	14.7 (Assumed 1.0%)	32.8

Table 2 -Impacts to Existing Storm Service Connection

4 SANITARY SERVICING

4.1 Existing Sanitary Drainage Flows

The existing PS zoned lots are currently being serviced with a 200mm Sanitary Service, branched from a 200mm combined sewer main in 83th Ave. The 200mm combined sewer main on 83rd Ave continues West towards 105 St NW. From City of Edmonton provided profiles, the invert of the sanitary service at pipe 95054 is about 667.867; the invert at the property line is unknown. It is assumed that the sanitary is installed with minimum cover and the invert at the property line is 669.20+/-, which yields an existing slope of 14%+/- . As a conservative estimate, and calculation purposes, the capacity is established based on a 200mm pipe at 2% (City of Edmonton Standard).

The existing building on the property is considered a “place of assembly” with an average flow generation of 24L/day/m². Including infiltration of 0.28L/s/ha, the calculated peak flow contributing to the existing sanitary service (S-22513) is 0.45L/s. **Table 3** summarizes existing sanitary flows contributing to the system. Refer to **Figure 3** for location of existing sanitary service.

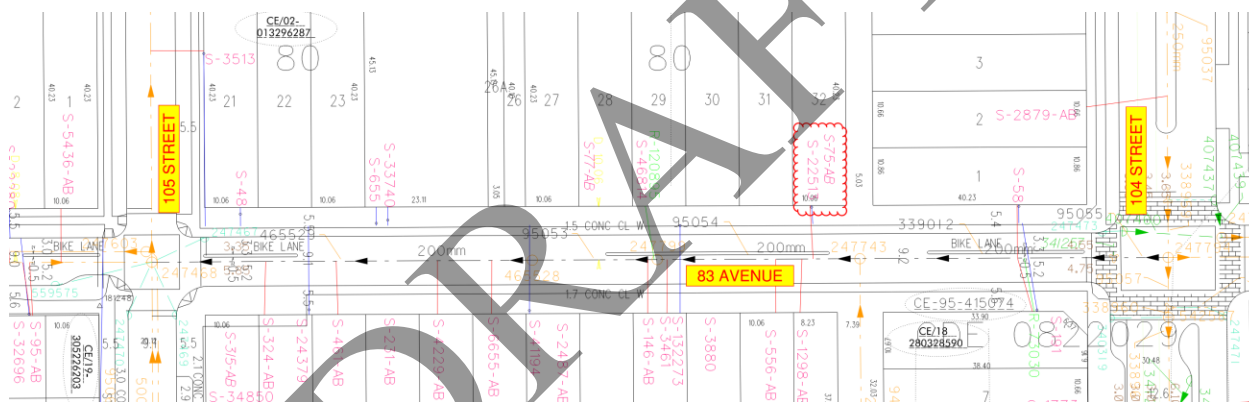


Figure 3 – Existing Sanitary Service (S-22513) Location

Site Zone	Point of Discharge Flow	Total Peak Flow (L/s)
St Anthony District Archives and Meeting Center	200mm Sanitary Sewer line	0.29
Infiltration (0.57ha x 0.28L/s/ha)	200mm Sanitary Sewer line	0.16
Total Pre Development Flow		0.45

Table 3 –Existing Sanitary Flows

4.2 Post Development Sanitary Flows and Connection

The new 0.57 ha development will be MU zoned, stationing a 8 Storey High rise residential apartment complex 300 (+/-) suites. Based on City of Edmonton Design Standards and Specifications, medium rise apartment has 1.89 people/unit; which equates to a total of 567 people for 300 units, at 220L/day/capita. The new sanitary flow from the 8 storey apartment building is 5.56L/s. **Table 4** summarizes post development sanitary flows, refer to **Appendix C** for detailed calculations.

Development Area (ha)	Point of Discharge Flow	Peak Flow (L/s)
0.57ha	200mm Sanitary Connection from 83 rd Ave	5.86

Table 4 –Post Development Sanitary Flows

4.3 Impact to Existing Sanitary Service Connection

In reference to the City of Edmonton design specifications, the calculated post development sanitary flows would be = 5.86L/s, compared to the pre-development discharge rate of 0.45L/s. Refer to **Appendix C** for detailed calculations. The total sanitary peak flow from the development area has increased by (5.98L/s – 0.45L/s) 5.41L/s. The existing capacity of sanitary service 46.7L/s. Refer to **Table 5** for summary of the existing sanitary service capacity. The additional 5.41L/s of inflow in the sanitary service, the Sanitary service is at 12.5% capacity during peak flow vs a pre development of 1.0%.

Upstream (PL)	Downstream MH247743	Pipe Length (m)	Pipe Diameter (mm)	Pipe Slope (%)	EX Capacity (L/s)
669.200	667.867	10.00	200	13.0% (Assumed 2.0%)	46.7

Table 5 -Impacts to Existing Sanitary Service Connection

Note: Manning's 'n' = 0.013

5 CONCLUSION

The Drainage Servicing Report has been completed to support rezoning of the development site from the existing Parks and Services Zone (PS), to *Mixed Use Zone (MU)*.

The existing 200mm storm service is sufficient for this development, with stormwater management, limiting site release to 19.95L/s against available pipe capacity of 32.8L/s (60.8%).

Onsite storage requirements are approximately 213.75m³; storage will be provided by a combination of rooftop storage, surface storage and underground storage.

The existing 200mm sanitary service is sufficient for this development, peak flow is anticipated to be about 5.56L/s against available pipe capacity of 46.7/s (12.8%).

We trust this Drainage Servicing Report meets City of Edmonton's requirements and will support the new MU development.

Should any questions arise in regards to this report, please do not hesitate to contact our office.

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6 APPENDIX

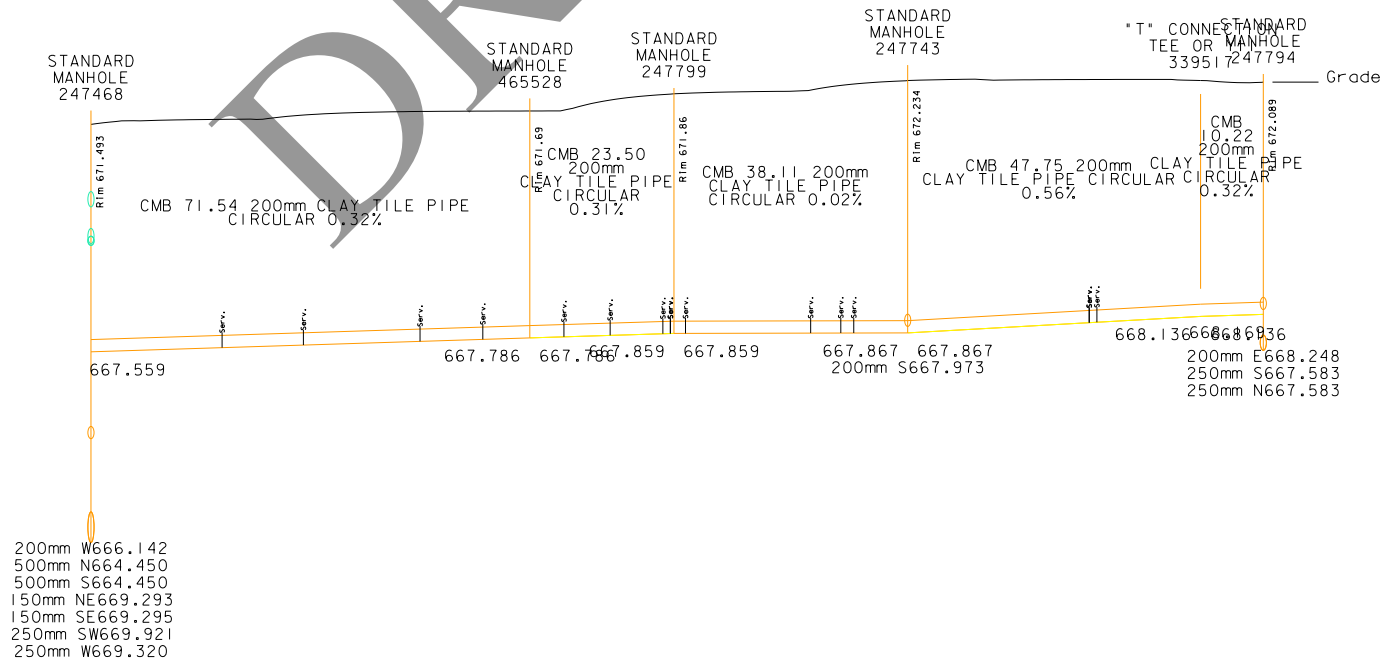
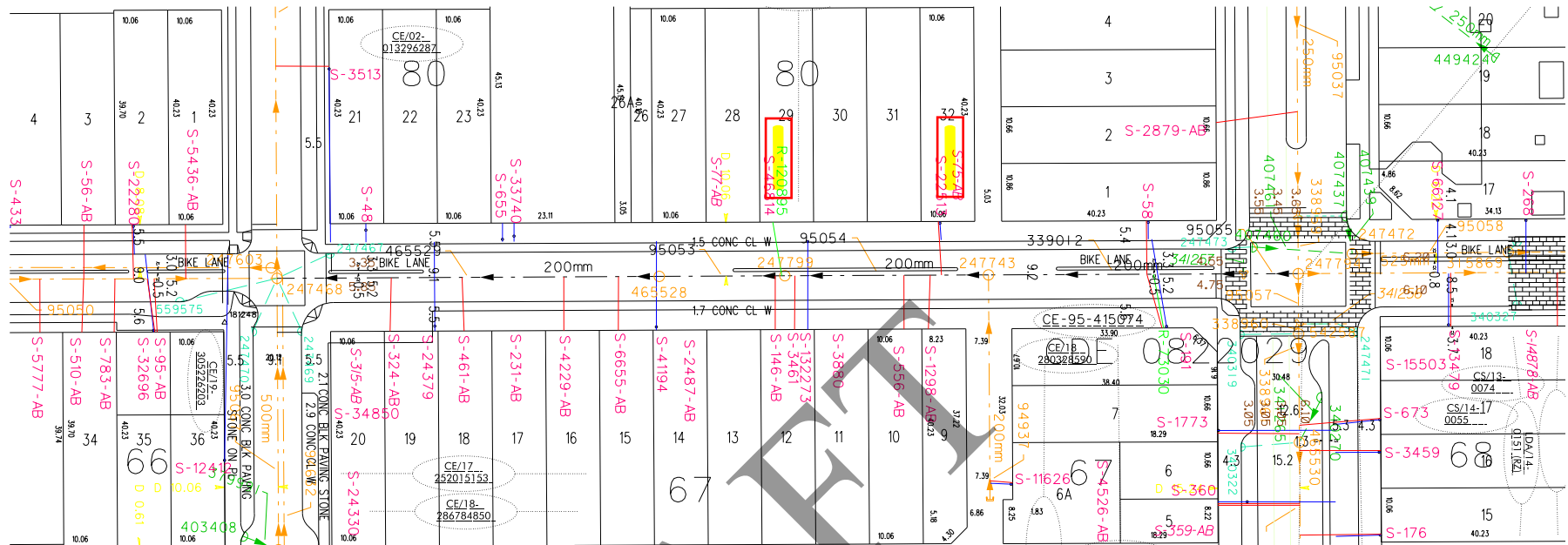
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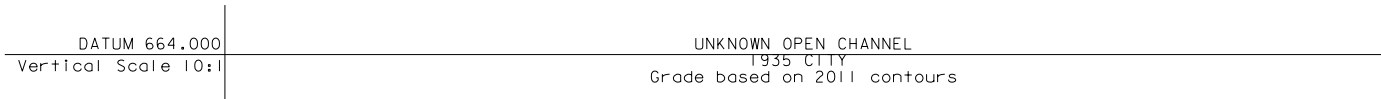
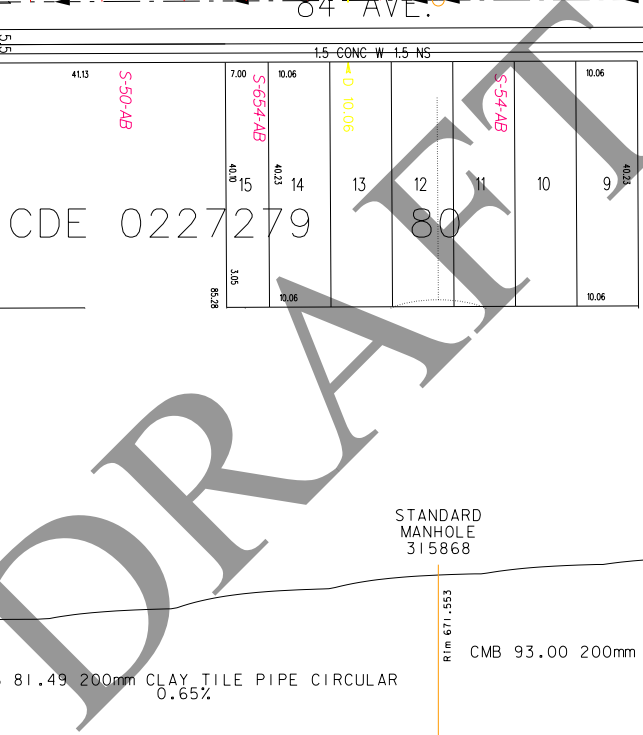
APPENDIX A

- Overall Servicing Site Map
- 200mm Combined Sewer Main on 83rd and 84th Street

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[illegible]





Vertical Scale 10:1

1935 CITY

Grade based on 2011 contours

APPENDIX B

- 1 in 5 year Predevelopment Calculation
- 1 in 100 year Predevelopment Calculation
- 1 in 5/100 year Post Development Calculation
- Site Storage Volume

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1:5 year Predevelopment Calculation

Surface Area Breakdown

SURFACE	% of 0.57ha Area	Area (ha)	RUNOFF COEFFICIENT
Grass	3	0.0155	0.1
Hard Surfaces (Bldg/Conc/Asph)	97	0.5584	0.9

Total Site Area: 0.57ha

$$C = \frac{(0.9 \times \text{Bldg/Asphalt/Concrete}) + (0.1 \times \text{Landscape})}{\text{Total Area}}$$

$$C = \frac{(0.9 \times 0.5584 \text{ ha}) + (0.1 \times 0.0155 \text{ ha})}{0.57 \text{ ha}}$$

$$C = 0.88 \sim 0.90$$

Peak Flow Rate

$$Q = \frac{CIA}{360}$$

$$C = 0.50$$

$$I = 91\text{mm/hr}$$

$$A = 0.57\text{ha}$$

$$Q = \frac{(0.90)(91\text{mm/hr})(0.57 \text{ ha})}{360} \times 1000$$

$$Q = 131 \text{ L/s}$$

1:100 year Predevelopment Calculation

Peak Flow Rate

$$Q = \frac{CIA}{360}$$

$$C = 0.90$$

$$I = 180 \text{ mm/hr}$$

$$A = 0.57 \text{ ha}$$

$$Q = \frac{(0.50)(180 \text{ mm/hr})(0.57 \text{ ha})}{360} \times 1000$$

$$Q = 258.99 \text{ L/s}$$

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1:5/100 year Post development Calculation

Peak Flow Rate (Controlled)

$$Q = ((35 \text{ L/s})/\text{ha})(A)$$

$$A = 0.57 \text{ ha}$$

$$Q = (35 \text{ L/s})/\text{ha})(0.57\text{ha})$$

$$\underline{\underline{Q = 19.95 \text{ L/s}}}$$

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Site Storage Volume

Calculation for Required Storage Volumes

The following table can be used to estimate required storage

- Outflow rate is constant 0.035cms/ha
- Area of basin drained is 1ha
- The 2 year, 5 year, 10 year, 25 year, 50 year, 100 year and 200 year storms are based on a 4 hour Chicago Distribution.

STORAGE VOLUME IN CUBIC METERS/Ha

Runoff Coefficient	2-Year	5-Year	10 Year	25 Year	50 Year	100 Year	200 Year	1937 Storm	1978 Storm	1988 Storm
0.10	0	0	0	0	0	3	7	0	0	0
0.15	0	0	0	5	10	15	23	0	3	0
0.20	0	1	6	14	20	30	42	0	11	0
0.25	0	6	13	23	33	45	64	0	23	0
0.30	3	12	19	34	46	64	90	0	38	0
0.35	6	17	28	45	61	84	117	0	53	1
0.40	10	23	36	57	78	105	146	0	71	2
0.45	14	30	45	71	95	128	176	0	89	4
0.50	18	36	54	85	113	152	208	0	112	6
0.55	22	43	63	99	132	177	242	0	136	8
0.60	26	50	74	114	152	203	276	0	161	12
0.65	31	57	84	130	172	229	312	0	186	18
0.70	36	65	96	146	193	257	349	4	219	23
0.75	41	74	107	162	214	285	387	13	255	28
0.80	46	82	118	180	236	314	426	22	292	34
0.85	51	91	130	197	259	344	466	43	331	39
0.90	55	100	142	214	282	375	507	68	369	45
0.95	61	109	155	232	306	406	549	92	408	50
1.00	66	118	168	251	330	438	592	117	447	56

Calculation Data:

Runoff Coefficient: 0.90

Storage Volume 100 Year: 375 m³/ha

Site Area: 0.57ha

Required Storage:

Storage = (Storage volume 100 year) (site area)
= (375m³/ha) (0.57ha)

APPENDIX C

- Existing Sanitary Flow
- Proposed Sanitary Flow

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Existing Sanitary Flow

Average Flow Based On Type Of Establishment:

Type of Establishment	Future Average Flow Generation L/day/m ² of Floor Area
Office Buildings	8
Restaurants	20
Bars and Lounges	12
Hotels and Motels	14
Neighbourhood Stores	8
Department Stores	8
Shopping Centres	4
Laundries and Dry Cleaning	41
Banks & Financial Buildings	12
Medical Buildings & Clinics	12
Warehouses	4
Meat & Food Processing Plants	115
Car Washes	77
Service Stations	8
Auto Dealers, Repair & Service	6
Super Market	8
Trade Businesses – e.g. Plumbers, Exterminators.	8
Mobile Home Dealer, Lumber Co., Drive-In Movies, Flea Market	7
Places of Assembly - Churches, Schools, Libraries, Theatres	24
Factories - Manufacturing raw products into finished products	33
Hospitals	1700 L/bed/day

Ex Building

Area = 1058m²

Ex Flow = 1058m² X 24L/day/m² /86400 = 0.29L/s

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Proposed Sanitary Flow

SANITARY SYSTEM DESIGN CALCULATION TABLE									
Population Generated For Residential									
Project Number: 240091				$Q = \frac{G \times P \times PF}{86400}$	$PF = 1 + \frac{14}{4 + \sqrt{P}}$				
Project Location: Edmonton, Alberta									
Date: February, 2024				1.89 Person/Unit for High Rise					
Area	Use	Residential Units	(P) Population	(G) Residential Generation L/Capita/Day	Peaking Factor	Flow	Flow	Infiltration 0.28L/s/ha	Total Flow
						(cms)	(L/s)	(L/s)	(L/s)
New Development	Residential	300	567	220	3.9	0.00570	5.70	0.16	5.86

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