



PRELIMINARY STORMWATER MANAGEMENT REPORT

Northwest Gateway Center

1400-1500 W. Dundee Rd.
Arlington Heights, IL 60004

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(To be provided in Final Stormwater Management Report)

SECTION 1: INTRODUCTION & SITE LOCATION

This report was prepared to evaluate the existing drainage conditions and proposed stormwater management design for the site redevelopment at the property located at 1400-1500 W. Dundee Road in Arlington Heights, Illinois. The onsite development area is approximately 33.58 acres and the offsite future development area is 2.38 acres. See location map in **Appendix A**.

A Watershed Management Permit is required as the proposed development property holdings are over 36 acres in size requiring stormwater requirements (site runoff, volume control and detention). In addition, the owner proposes a qualified sewer construction (sanitary sewer) for a non-residential use. The site has an existing detention vault located under a section of the parking lot along the north property line. The Village of Arlington Heights has a more restrictive allowable release rate than the MWRD allowable release rate, therefore, both calculations will be provided for comparison, and the more restrictive volume will be provided.

SECTION 2: EXISTING CONDITIONS

2.1 Site History

The existing property contains a Lexus dealership, a Nissan dealership and two industrial buildings connected by an aerial walkway. The development area contains the industrial buildings and portions of the parking areas, refer to the location map in **Appendix A** for the approximate boundary of the development area. Development at the site began in the early 1970s, the MWRD permits for the area are summarized below.

2.1.1 MWRD Permit History

- 1970-984
 - Initial Development of property, including main Honeywell building and a smaller building to the west
 - Detention not required prior to January 1, 1972
 - Compensatory storage provided by excavation
- 1978-649 PI
 - Addition to the west building
 - Added 3.39 acres of additional impervious area to site's existing 25 acres of impervious area for a total of 28.39
 - Detention volume required for new impervious area only
 - Allowable release rate $0.15 \times 3 \text{ yr rainfall intensity (1.21281 in/hr)} \times \text{site area (ac)} = 13.6441$
 - Compensatory storage required of 1.38 ac-ft
- 99-065
 - Development of Curtiss-Wright property (3602 Kennicott Ave.)
 - Site is 5.45 acres and includes detention pond that serves the property
 - MWRD Allowable release rate $0.15 \times 3\text{-year storm intensity (1.47 in/hr)} \times \text{site area (ac)} = 1.20 \text{ cfs}$
 - Arlington Heights allowable release rate = $0.18 \text{ cfs/acre} \times 5.45 \text{ acres} = 0.981 \text{ cfs}$ – More restrictive, therefore village release rate was used
- 06-291
 - Development of Nissan building

- Detention provided on west side of site using a detention pond
 - MWRD Allowable release rate $0.15 \times 3\text{-year storm intensity (1.49 in/hr)} \times \text{site area} = 11.84 \text{ cfs}$
 - Arlington Heights Allowable = 0.18 cfs/acre
 - Upstream area (Curtiss-Wright) = 5.45 acres (Curtiss-Wright property)
 - Interim detention facility on north side of site
 - Required 11.82 ac-ft of compensatory storage for filling BFE at a 1 to 1 ratio
 - LOMR submitted to FEMA, Village of Arlington Heights requested to maintain BFE of 713.0
- 09-217
 - Addition to west building (Lexus) and two proposed buildings in the northwest corner of the site.
 - Detention provided in underground vault
 - MWRD Allowable Release Rate = $0.15 \times 3\text{-year storm intensity (1.49 in/hr)} \times 52.98 \text{ acres} = 11.84 \text{ cfs}$
 - Outlet is controlled by 13.00-inch steel plate restrictor

Permit No	Size of Site (ac)	Project Area (ac)	Release Rate Information			Detention Volume Information		
			MWRD Allowable (cfs)	Arlington Heights Allowable (cfs)	Designed (cfs)	MWRD Required (ac-ft)	Arlington Heights Required (ac-ft)	Provided (ac-ft)
70-984	75	75	N/A	N/A	N/A	N/A	N/A	N/A
78-649	63	63	1.38	N/A	1.29	0.68	N/A	0.684
99-065	59.226	5.45	1.20	0.981	0.84	1.05	2.04	2.45
06-291	52.98	6.75	11.84 (Site)/ 1.44 (Proj. Area)	1.22 (Proj. Area)	5.63	19.05	--	19.24
09-217	52.98	36.037	11.84	9.54	9.46	10.888	29.33	29.57

2.2 MWRD Watershed

The site is within the Des Plaines River Watershed Planning area, which has an allowable runoffs of 0.20 cfs per acre.

2.3 Existing Drainage Conditions

Stormwater from the total site area, including the development area is captured in the existing detention tank, which was permitted under MWRD permit number 09-217.

In addition to the on-site area, drainage from the Curtiss-Wright detention basin is directed through the swale between the north edge of pavement and the north property line.

2.4 Soil Types

According to the United States Department of Agriculture – National Resources Conservation Service Web Soil Survey, the improvement area contains four soil types. The soil map symbols, descriptions, and hydrologic soil groups (HSG) are listed in **Table 1** below and the Web Soil Survey is in **Appendix D**.

Table 1 – Soil Types Present Onsite

Map Symbol	Map Unit Name	HSG
152A	Drummer silty clay loam	B/D
223B	Varna silt loam, 2 to 4 percent slopes	C
232A	Ashkum silty clay loam, 0 to 2 percent slopes	C/D
290B	Warsaw silt loam, 2 to 4 percent slopes	B
442A	Mundelein silt loam, 0 to 2 percent slopes	B/D
805B	Orthents, clayey, undulating	D

Note, these soil types were present prior to the original development.

2.5 Weighted Curve Number

The table below summarizes the weighted curve numbers for the existing onsite and offsite conditions.

A CN of 98 was used for all impervious surfaces and a CN of 80 (Open Space, Good Condition, hydrologic soil group D) was used for all open space turf grass.

Table 2 – Existing Conditions Weighted Curve Numbers

Area	Total Area (acres)	Impervious Area – CN 98 (acres)	Pervious Area – CN 80 (acres)	Weighted Curve Number
Development Area (onsite and offsite)	35.96	27.40	8.54	93.72

2.6 Wetlands

The National Wetlands Inventory (NWI) Map does not depict any wetlands on the development area, the NWI map does show a freshwater pond in the northwest corner of the development area and is possibly associated with the previously identified regulatory floodplain area. See **Appendix D** for the wetlands documentation.

2.7 Floodplain

Map Numbers 17031C0044J & 17031C0063J, effective Date 8/19/2008 show an area of Zone AE near the north property line that appears to be associated with a detention/retention basin north of the property. There is also a LOMR (09-05-1547P) for the property in question to remove floodplain from the grass area on the western part of the properties in question.

The north border of the site contains an area of “Zone AE” with a Base Flood Elevation of 713 which is determined to be a special flood hazard area and the remaining area is located in the Area of minimal flood hazard as shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Firm)ette created on 8/19/2008 and based on panel numbers 17031C0044J and 17031C0063J. See **Appendix F** for the firmette.

FLOOD PROTECTION AREA CERTIFICATION

THE PROPERTY IS PARTIALLY LOCATED IN ZONE AE (FLOOD HAZARD AREA) AND X MINIMAL FLOOD HAZARD) PER COOK COUNTY, ILLINOIS FLOOD INSURANCE RATE MAP NOS. 17031C0044J and 17031C0063J, EFFECTIVE DATE AUGUST 19, 2008.

DATED THIS 8th DAY OF April, 2021.


ENGINEER

SECTION 3: SECTION 3: PROPOSED CONDITIONS

This project is located in the Village of Arlington Heights, the site area is 52.98 acres, with 35.96 acres being developed (Development Area). The development area includes 33.58 acres of onsite area and 1.80 acres of offsite area. The 1.80-acre offsite area is planned to be developed as a parking lot in the future, with the detention and volume control being provided onsite within the eastern detention facility, as a condition of the selling agreement with the Lexus Dealership Property Owners. The 52.98-acres site has an existing underground detention system that was designed to provide detention for the site under the applicable regulations in 2009, which used TP-40 rainfall data. The current regulations require using Bulletin 75 (updated Bulletin 70) rainfall data. Due to the update in regulations, the required detention volume for the Development Area is greater than the provided detention volume. The difference between the required and provided detention volume for the Development Area will be provided for via two underground CMP detention systems.

3.1 Proposed Drainage Conditions

The proposed improvements include the demolition of one onsite building and development of two new buildings, along with required parking, utilities, and stormwater management systems. The existing Lexus and Nissan dealerships will not be disturbed as part of this development, except for the 2.38-acre future parking area that will be developed under a separate permit, and a small parking area adjustment to the west of the Lexus building.

3.2 Additional Tributary Areas

Please refer to the MWRD Drainage Exhibit that is provided with the project plan set for this information.

3.3 Proposed Conditions Weighted Curve Number

The calculation below summarizes the weighted curve numbers and the MWRD adjusted curve numbers for the proposed onsite and offsite conditions, based on the MWRD spreadsheet.

Table 3 – Proposed Conditions Weighted Curve Numbers

Drainage Area		Impervious Area – CN 98 (acre)	Pervious Area – CN 80 (acre)	Weighted Curve Number	Adjusted Curve Number
West Facility	West	7.08	1.95	94.11	87.60
East Facility	East	18.86	5.69	93.98	87.53
	Future Parking Lot	1.61	0.19		

See **Appendix H** for the associated calculations.

3.4 Site Rate Control

3.4.1 MWRD

The site is within the Des Plaines River Watershed Planning area, which has an allowable runoff of 0.20 cfs per acre. The development area, including the proposed future parking lot is 35.96 acres, therefore the allowable release rate under the MWRD regulations is 7.192 cfs.

3.4.2 Village of Arlington Heights

The Village of Arlington Heights allowable release rate is 0.18 cfs per acre.

The development area, including the proposed future parking lot is 35.96 acres, therefore the allowable release rate in under the Village of Arlington Heights regulations is 6.472 cfs.

See **Appendix H** for stormwater calculations.

3.5 Proposed Detention Basins

3.5.1 Introduction

In addition to the existing in-place detention vault on the north side of the site, two additional underground detention systems will be installed at the site. The systems will be made up of corrugated metal pipe and stone. The systems will be equipped with an outfall and an underdrain system. The bottom portion of the systems will provide the required MWRD volume control.

3.5.2 Existing Detention Tank

As mentioned in Section 2.1 above, detention was provided for the 52.98-acre site via an underground storage tank under MWRD permit No. 09-217. The existing underground tank is 29.57 acre-feet and uses a pump system to discharge the stormwater from the tank to an outfall structure that features a 13-inch orifice, which acts as a restrictor. The tank was designed to provide compensatory storage due to filling of the Base Flood Elevation of 11.82 acre-feet as well as the required storage to meet the Arlington Heights release rate of 0.18 cfs per acres, which is 9.54 cfs for the 52.98-acre site.

3.5.3 Provided Detention for Development Area

The calculations from the 2009-217 permit prepared by Condon Consulting were recreated to set a baseline, then revised to determine detention volume provided for the proposed 2021 site.

Both the Village of Arlington Heights and MWRD calculations were evaluated to determine the required detention volume. The MWRD regulations require greater detention volume, therefore the MWRD volume was used for comparison.

The development area, including the future parking lot is 35.38 acres and has three drainage areas, the West Drainage area is 9.03 acres, the East Drainage area is 24.55 acres, and the Future Parking Lot drainage area is 1.80 acres. The West drainage area is tributary to the West Detention Facility and the East and Future Parking areas are tributary to the East Detention Facility. Each drainage area was analyzed using the 2009 baseline calculations to determine the detention volume provided for each of the drainage areas under the 2009-217 permit.

3.5.3.1 MWRD Calculations

The total required detention for each of the drainage areas were determined using the MWRD Spreadsheets. Please refer to **Appendix H.2** for calculations.

Detention Facility	Trib Area (acres)	Composite Curve Number	Adjusted Curve Number	Allowable Release Rate		Total Required Detention (ac-ft)	Existing Detention Provided (ac-ft) ¹	New Required Detention (ac-ft)	Provided Detention at HWL (ac-ft)
				(cfs/acre)	(cfs)				
West	9.03	94.11	87.60	0.20	1.806	3.386	2.754	0.632	0.675
East	26.34	93.98	87.53	0.20	5.268	9.863	8.696	1.167	2.627
Total	35.96	--	--	0.20	7.191	13.479	11.641	1.838	3.302
Notes: Existing Detention Provided based on calculations in permit number 2009-217 and release rate of 0.18 cfs/acre									

3.5.3.2 Village of Arlington Heights Calculations

Detention Facility	Trib Area (acres)	Runoff Factor	Allowable Release Rate		Total Required Detention (ac-ft)	Existing Detention Provided (ac-ft)	New Required Detention (ac-ft)	Provided Detention (ac-ft)
			(cfs/acre)	(cfs)				
West	9.03	0.853	0.18	1.625	3.382	2.754	0.628	0.675
East	26.34	0.850	0.18	4.741	9.825	8.696	1.129	2.627
Total	35.96	--	0.18	6.472	13.438	11.641	1.797	3.302

See **Appendix H** for the associated calculations.

3.6 Site Runoff Requirements

The proposed development will have an on-site development area of 33.58 acres and an offsite area of 2.38 acres. The development will use two drainage facilities, which are referred to as the West Drainage Facility and the East Drainage Facility. The West Detention Facility serves the west drainage area and the East Detention Facility serves the east drainage area along with 2.38 acres of offsite area, which will be constructed under a separate development (Future Parking Lot). The 100-year, 24-hour runoff from the West Drainage Area will be directed to the West Underground Detention System, which is located on the northwest side of the site and the runoff from the East Drainage Area will be directed to the East Underground Detention System, which is located in the center of the site. Both the West and East Underground Detention Systems will outflow to the existing detention tank. The underground detention systems will also be equipped with underdrains, which are designed to drain the volume control portions of the systems. These underdrains will be connected to the outflow structure on the upstream end of the 13-inch restrictor.

3.7 Volume Control

MWRD standards dictate that volume control shall be provided based on a 1.0-inch rainfall event from the impervious area. Volume control for the site will be provided via the east and west underground detention systems.

Please refer to the table below for the project's volume control information.

Drainage Area	Impervious Area (acres)	Volume Control Required (ac-ft)	Volume Control Provided (ac-ft)
West	7.08	0.59	0.675
East	20.47	1.706	1.748

3.8 Storm Sewer Calculations

The storm sewer calculations will be provided in the Final Stormwater Management Report.

3.9 Regulatory Floodplain Fill/Compensatory Storage

As required in the 2006-291 MWRD permit, the site is required to provide 11.82 acre-feet of compensatory storage. This storage volume was originally provided in the existing underground detention tank and the volume will continue to be maintained as part of this development.

3.10 Qualified Sewer Construction PE Calculation

The West Building is 205,304 square feet, it is assumed that 10% of the building is designated as office (20,530 square feet) and 90% of the building is designated as warehouse (184,774 square feet). The estimated gallons per day from the West Building is 11,291.7 gallons per day, or 113 population equivalents (P.E.).

The East Building is 306,360 square feet, it is assumed that 10% of the building is designated as office (30,636 square feet) and 90% of the building is designated as warehouse (275,724 square feet). The estimated gallons per day from the West Building is 16,849.8 gallons per day, or 168 P.E.

SECTION 4: SUMMARY

The proposed stormwater management plan meets and/or exceeds the Arlington Heights and MWRD requirements. See the attached appendices for maps and calculations supporting the proposed development.

APPENDICES

Appendix A – Site Location Map

Appendix B – MWRD Stormwater Inundation Map

*Appendix C – Floods in Lake Zurich Quadrangle, IL (Hydrologic Investigations Atlas HA-208) and
Floods in Wheeling Quadrangle, IL (Hydrologic Investigations Atlas HA-71)*

Appendix D – NRCS Soil Survey

Appendix E – NWI Map and Kane County ADID

Appendix F – Flood Insurance Rate Map (No. 17031C0206J)

Appendix G – Stormwater Drainage Exhibit

Appendix H – Stormwater Calculations

Appendix H.1 – 2009-217 Stormwater Calculations: Total Area

Appendix H.2 – MWRD Stormwater Calculations

Appendix H.3 – Arlington Heights Stormwater Calculations

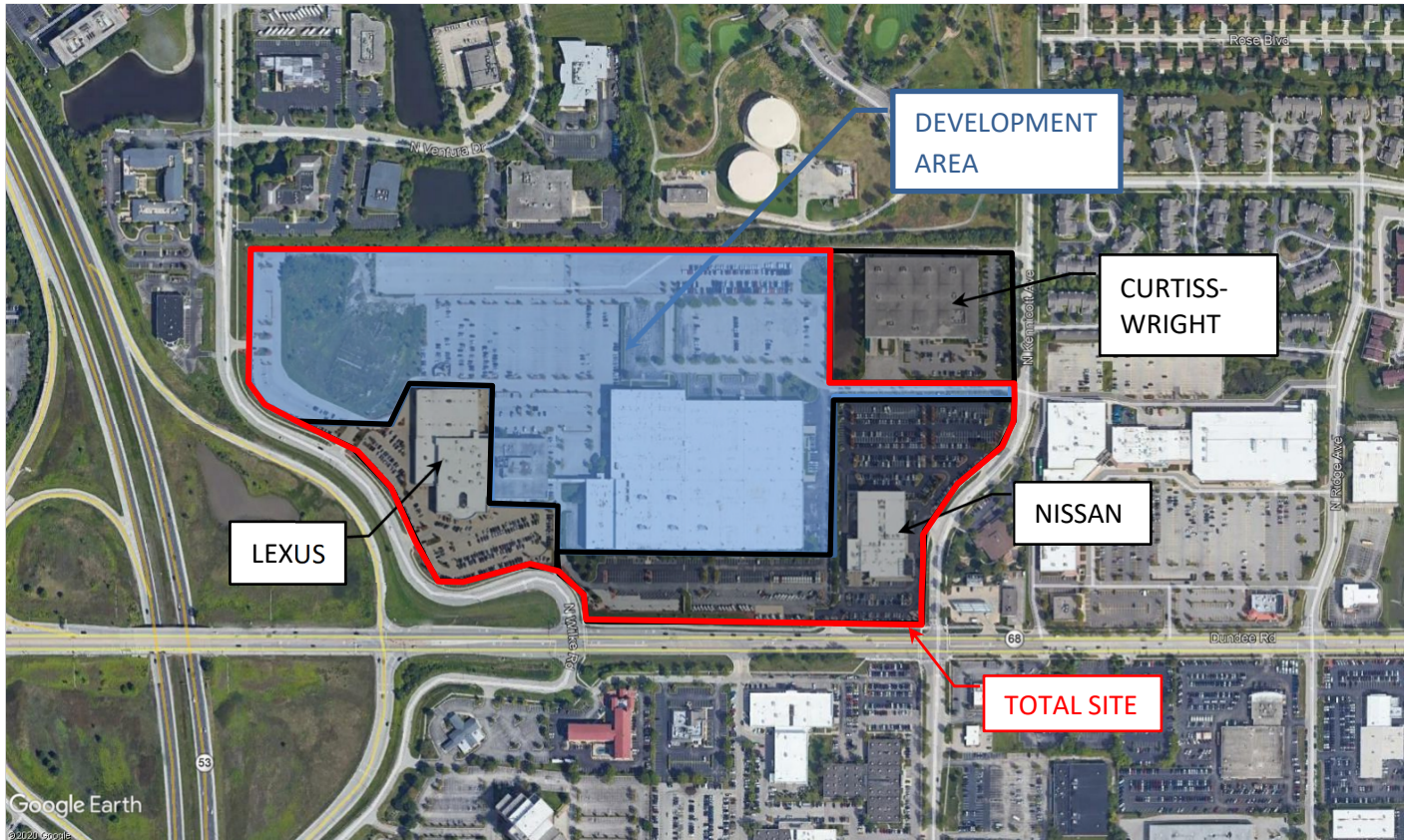
Appendix H.4 – Existing Tank Information

Appendix H.5 – HydroCAD Calculations

Appendix I – Storm Sewer Calculations

Appendix A – Site Location Map

(Source: Google Earth)

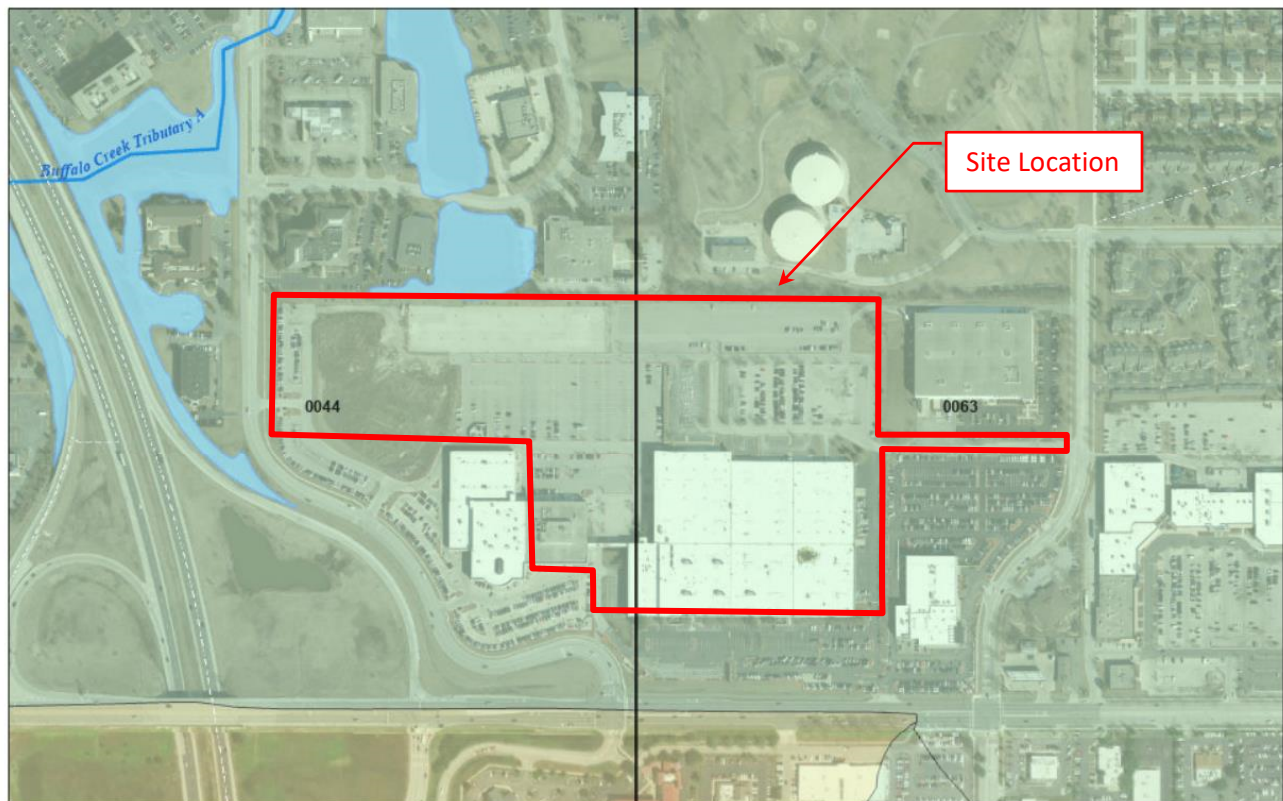


Appendix B – MWRD Stormwater Inundation Map

(Source: <https://gispub.mwr.org/swima/>)



SIMA - A.H. Auto Mall Redev



February 8, 2021

- Available
- Subwatersheds
- Modeled Waterways
- MWRD 100-yr Inundation Area

1:6,470

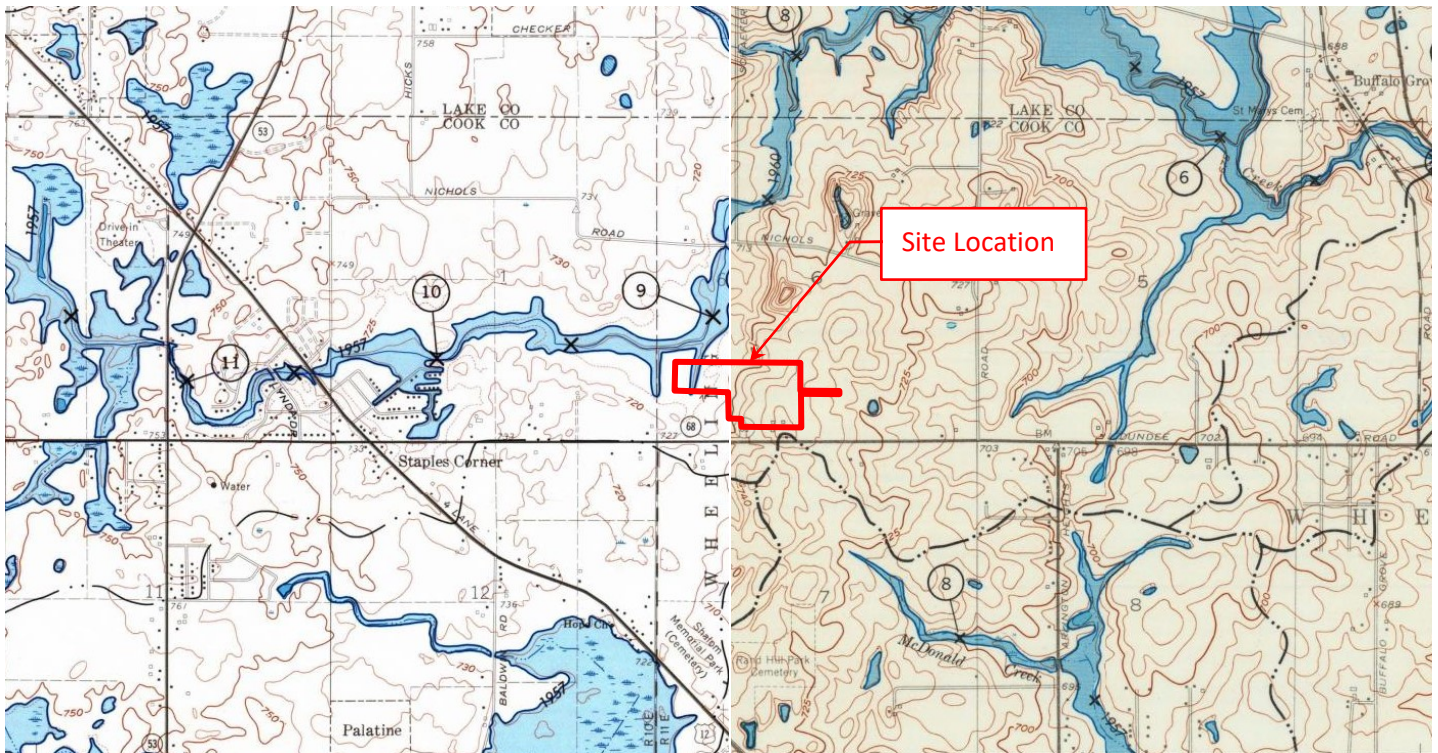
0 0.05 0.1 0.2 mi

0 0.075 0.15 0.3 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**Appendix C – Floods in Lake Zurich Quadrangle, IL (Hydrologic Investigations Atlas HA-208) and
Floods in Wheeling Quadrangle, IL (Hydrologic Investigations Atlas HA-71)**

(Source: United States Geological Survey)



Appendix D – NRCS Soil Survey

(Source: USDA & NRCS)



Appendix E - National Wetlands Inventory

(Source: U.S. Fish and Wildlife Service)



W Dundee Rd



November 16, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Appendix F – Flood Insurance Rate Map (FIRM)ette (Based on Panel No. 17031C0063J)

(Source: Federal Emergency Management Agency, <https://msc.fema.gov/portal/search?>) effective date 8/19/2008

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, X, AE, AH, VE, AR
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee. See Notes. Zone X
	Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X
	Effective LOMRs
GENERAL STRUCTURES	Area of Undetermined Flood Hazard Zone D
	Channel, Culvert, or Storm Sewer
OTHER FEATURES	Levee, Dike, or Floodwall
	Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS	Coastal Transect
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
OTHER FEATURES	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

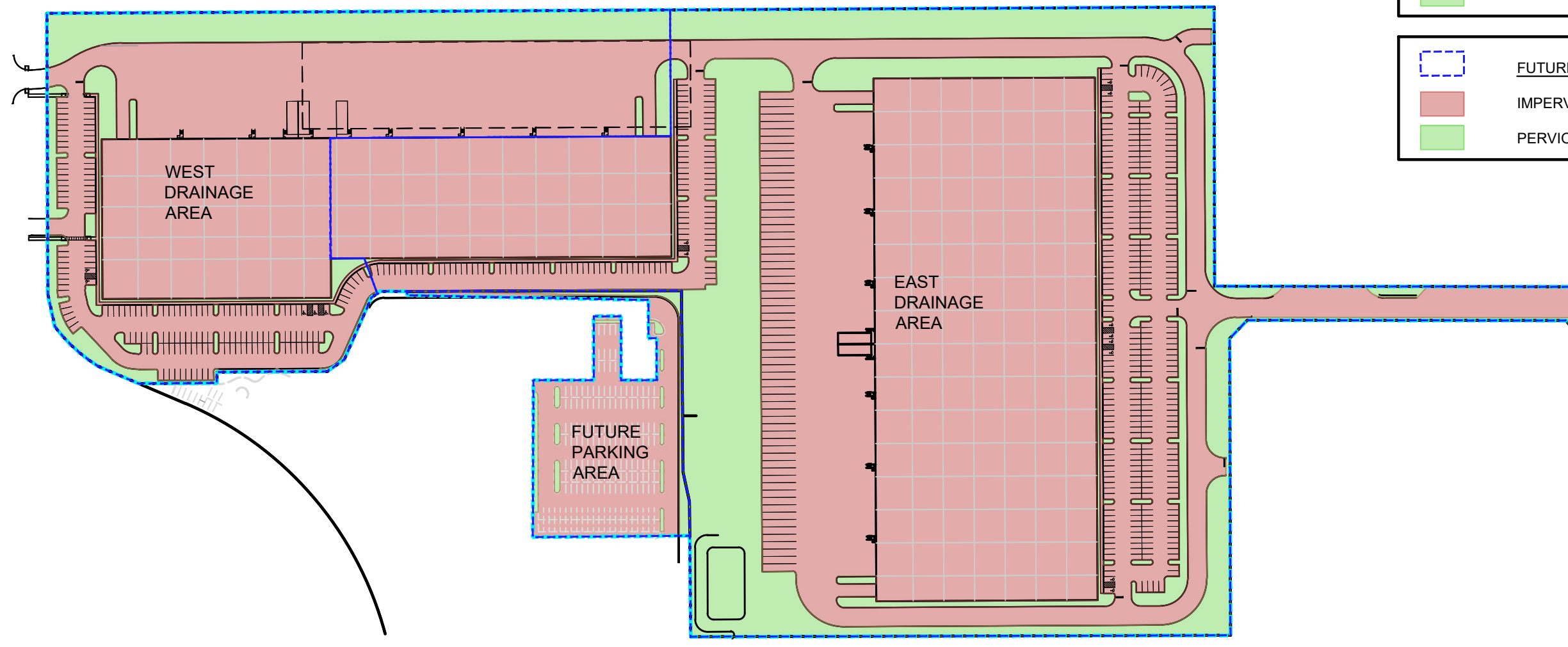
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/16/2020 at 5:09 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix G – Stormwater Drainage Exhibit

(Please refer to full size exhibit in the plan set)

4/8/2021 11:09 AM - Z:\Projects\2020\2283.00-IL\312 - ENGINEERING\FINAL\EXHIBITS\PROPOSED PERVIOUS-IMPERVIOUS AREA EXHIBIT2.dwg



	WEST DRAINAGE AREA	= 9.03 AC
	IMPERVIOUS AREA	=7.08 AC
	PERVIOUS AREA	= 1.95 AC

	EAST DRAINAGE AREA	= 24.55 AC
	IMPERVIOUS AREA	=18.86 AC
	PERVIOUS AREA	= 5.69 AC

	FUTURE PARKING AREA	= 1.80 AC
	IMPERVIOUS AREA	=1.61 AC
	PERVIOUS AREA	= 0.19 AC



SCALE: 1"=200'



PROPOSED PERVIOUS/IMPERVIOUS EXHIBIT - NORTHWEST GATEWAY CENTER

PINNACLE ENGINEERING GROUP

1051 E. MAIN STREET | SUITE 217 | EAST DUNDEE, IL 60118 | WWW.PINNACLE-ENGR.COM | CHICAGO@PINNACLE-ENGR.COM

JOB NO. 2283.00-IL

4/8/21

PLAN | DESIGN | DELIVER

Appendix H – Stormwater Calculations

Project: Arlington Heights Automall Redevelopment
 Project No.: 2283.00-IL
 Date: 4/5/2021

MWRD Requirements

Drainage Area Name	Area	Composite Curve Number	Adjusted Curve Number	Allowable Release Rate		Total Required Detention	Existing Detention Provided	New Required Detention		Volume Control Required	
	(acres)			(cfs/acre)	(cfs)	(ac-ft)	(ac-ft)	(CF)	(ac-ft)	CF	(ac-ft)
West	9.03	94.11	87.60	0.20	1.806	3.386	2.754	27,530	0.632	25,690	0.59
East	26.34	93.98	87.53	0.20	5.268	9.863	8.696	50,835	1.167	74,300	1.71
Total	35.37				7.074	13.249	11.45	78,364	1.799	99,990	2.30

Village of Arlington Heights Requirements (Spreadsheet)

Drainage Area Name	Area	Runoff Factor	Allowable Release Rate		Total Required Detention	Existing Detention Provided	New Required Detention	
	(acres)		(cfs/acre)	(cfs)	(ac-ft)	(ac-ft)	(CF)	(ac-ft)
West	9.03	0.853	0.18	1.625	3.382	2.754	27,356	0.628
East	26.34	0.85	0.18	4.741	9.825	8.696	49,179	1.129
Total	35.37			6.367	13.207	11.45	76,535	1.757

Appendix H.1 – 2009-217 Stormwater Calculations: Total Area & West and East Facility Tributary Areas

BOB ROHRMAN'S ARLINGTON HEIGHTS AUTOMALL				Condon Consulting Engineers, P.C.			
ROHR-07023-3				5415 Business Parkway			
DETENTION CALCULATIONS				Ringwood, IL 60072			
				7/5/2007		4/15/2008	
				1 of 1			
DETENTION TANK CALCULATIONS							
100-Year Modified Rational Method							
Proposed Runoff Coeff.(C)	Storm Duration Time	Rainfall Intensity I for 100yr	Area (A)	Inflow Rate Qi=CIA	Release Rate Qo	Storage Rate Qi-Qo	Storage Volume (Qi-Qo)T*60
	(hr)	(IN/HR)	(acres)	(CFS)	(CFS)	(CFS)	(AC-FT)
0.89	0.08	10.92	52.98	514.90	9.49	505.41	3.342
0.89	0.17	10.02	52.98	472.47	9.49	462.98	6.505
0.89	0.25	8.2	52.98	386.65	9.49	377.16	7.793
0.89	0.5	5.6	52.98	264.05	9.49	254.56	10.519
0.89	1	3.56	52.98	167.86	9.49	158.37	13.089
0.89	2	2.24	52.98	105.62	9.49	96.13	15.889
0.89	3	1.62	52.98	76.39	9.49	66.90	16.586
0.89	6	0.95	52.98	44.79	9.49	35.30	17.506
0.89	12	0.55	52.98	25.93	9.49	16.44	16.308
0.89	18	0.39	52.98	18.39	9.49	8.90	13.239
0.89	24	0.32	52.98	15.09	9.49	5.60	11.105
0.89	48	0.17	52.98	8.02	9.49	-1.47	-5.848
PEAK DETENTION VOLUME				17.51 AC-FT			
COMPENSATORY STORAGE REQUIRE*				11.82 AC-FT			
TOTAL REQUIRED STORAGE IN DETENTION VAULT				29.33 AC-FT			
TOTAL PROVIDED STORAGE IN DETENTION VAULT				29.57 AC-FT			
(*Per the Village of Arlington Heights)							

Required for Site (2009-217) - West

Proposed Runoff Coeff, C	Storm Duration Time (hr)	100-YR Rainfall Intensity, I (in/hr)	Area (ac)	Inflow Rate Qi=CIA (cfs)	Release Rate (cfs)*	Storage Rate Qi- Qo (cfs)	Storage Volume (Qi- Qo) T*60 (ac-ft)
0.89	0.08	10.92	9.03	87.76	2.08	85.68	0.566
0.89	0.17	10.02	9.03	80.53	2.08	78.45	1.102
0.89	0.25	8.2	9.03	65.90	2.08	63.82	1.319
0.89	0.5	5.6	9.03	45.01	2.08	42.93	1.774
0.89	1	3.56	9.03	28.61	2.08	26.53	2.193
0.89	2	2.24	9.03	18.00	2.08	15.92	2.632
0.89	3	1.62	9.03	13.02	2.08	10.94	2.712
0.89	6	0.95	9.03	7.63	2.08	5.55	2.754
0.89	12	0.55	9.03	4.42	2.08	2.34	2.321
0.89	18	0.39	9.03	3.13	2.08	1.05	1.568
0.89	24	0.32	9.03	2.57	2.08	0.49	0.975
0.89	48	0.17	9.03	1.37	2.08	-0.71	-2.831

* Release rate based maximum allowable release rate per Arlington Heights (0.18 cfs/ac)

Required for Site (2009-217) - East 3.0

Proposed Runoff Coeff, C	Storm Duration Time (hr)	100-YR Rainfall Intensity, I (in/hr)	Area (ac)	Inflow Rate Qi=CI A (cfs)	Release Rate (cfs)*	Storage Rate Qi- Qo (cfs)	Storage Volume (Qi- Qo) T*60 (ac-ft)
0.89	0.08	10.92	26.35	256.09	4.743	251.35	1.662
0.89	0.17	10.02	26.35	234.98	4.743	230.24	3.235
0.89	0.25	8.2	26.35	192.30	4.743	187.56	3.875
0.89	0.5	5.6	26.35	131.33	4.743	126.59	5.231
0.89	1	3.56	26.35	83.49	4.743	78.74	6.508
0.89	2	2.24	26.35	52.53	4.743	47.79	7.899
0.89	3	1.62	26.35	37.99	4.743	33.25	8.243
0.89	6	0.95	26.35	22.28	4.743	17.54	8.696
0.89	12	0.55	26.35	12.90	4.743	8.16	8.088
0.89	18	0.39	26.35	9.15	4.743	4.40	6.550
0.89	24	0.32	26.35	7.50	4.743	2.76	5.477
0.89	48	0.17	26.35	3.99	4.743	-0.76	-3.000

* Release rate based maximum allowable release rate per Arlington Heights (0.18 cfs/ac)

Appendix H.2 – MWRD Stormwater Calculations

COMPOSITE RUNOFF CURVE NUMBER (CN)

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: West 2.0 Drainage Area

DATE: _____

TYPE OF AREA (SELECT WITH DROP-DOWN)

☐ DETAINED AREA

☐ MAJOR STORMWATER SYSTEM

☐ UNRESTRICTED AREA

☐ OTHER: _____

☐ UPSTREAM AREA

CONDITION (SELECT WITH DROP-DOWN)

☒ PROPOSED CONDITION

☐ EXISTING CONDITION

RUNOFF CURVE NUMBER

Surface Description	Hydrologic Soil Group (HSG)	CN	Area (acres)	Product (CN)(Area)
impervious	D	98	7.08	693.84
Pervious	D	80	1.95	156.00

TOTALS:

9.03

849.84

COMPOSITE RUNOFF CURVE NUMBER

$$\text{Composite CN} = \frac{\text{Total Product}}{\text{Total Area}} = \frac{849.84}{9.03} \rightarrow \text{Composite CN} = 94.11$$

ADJUSTED COMPOSITE RUNOFF CURVE NUMBER (CN_{ADJ})

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: West 2.0 Drainage Area

DATE: _____

DEVELOPMENT INFORMATION

1. Area Detained, A	9.030	acres
2. Total Impervious Area	7.080	acres
3. Composite CN	94.11	
4. Volume Control Storage Provided, VC_P	0.590	ac-ft
5. Depth of Rainfall, P	8.57	inches

RUNOFF VOLUME (NRCS EQUATIONS)

6. Maximum Retention, S	$S = \frac{1000}{CN} - 10$	0.63	inches
7. Runoff Depth, Q_D	$Q_D = \frac{(P - 0.2S)^2}{(P + 0.8S)}$	7.86	inches
8. Runoff Volume, V_R	$V_R = Q_D A \left(\frac{1}{12 \frac{in}{ft}} \right)$	5.92	ac-ft

VOLUME CONTROL STORAGE

9. Volume Control Storage Required, VC_R	0.590	ac-ft
10. Additional Volume Control Storage Provided	0.000	ac-ft

ADJUSTED RUNOFF VOLUME

11. Adjusted Runoff Volume, V_{ADJ}	$V_{ADJ} = V_R - VC_P$	5.326	ac-ft
12. Adjusted Runoff Depth, Q_{ADJ}		7.08	inches
13. Adjusted Maximum Retention, S_{ADJ}		1.42	inches

ADJUSTED COMPOSITE RUNOFF CURVE NUMBER

14. Adjusted Runoff Curve Number, CN_{ADJ}	87.60
--	-------

NOMOGRAPH: BULLETIN 70 RAINFALL DATA (2019)

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: West 2.0 Drainage Area

DATE: _____

DEVELOPMENT INFORMATION

1. Detained Area

9.030

acres

2. Curve Number

87.60

3. Actual Release Rate

1.806

cfs

REQUIRED DETENTION VOLUME

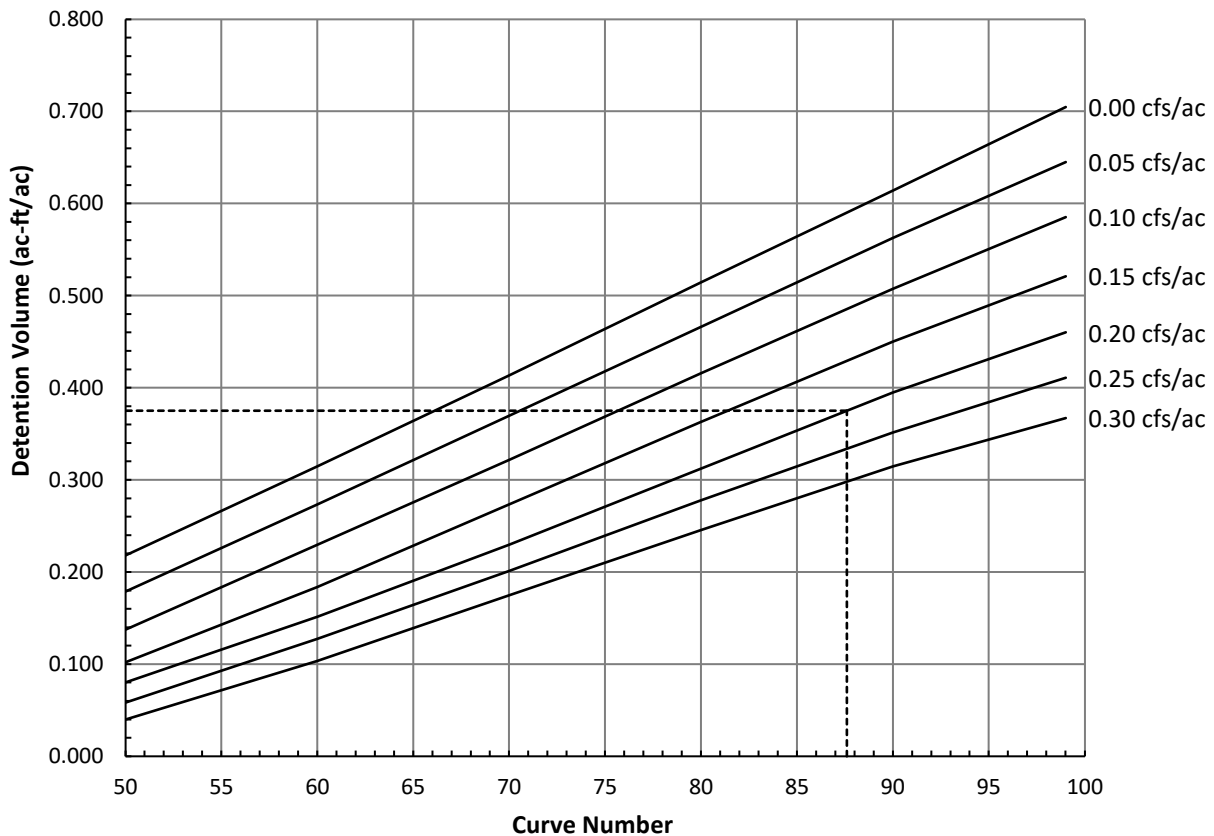
4. Required Detention Volume

3.386

ac-ft

NOMOGRAPH

NOMOGRAPH: BULLETIN 70 (2019)



COMPOSITE RUNOFF CURVE NUMBER (CN)

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: East 3.0 Drainage Area

DATE: _____

TYPE OF AREA (SELECT WITH DROP-DOWN)

☐ DETAINED AREA

☐ MAJOR STORMWATER SYSTEM

☐ UNRESTRICTED AREA

☐ OTHER: _____

☐ UPSTREAM AREA

CONDITION (SELECT WITH DROP-DOWN)

☒ PROPOSED CONDITION

☐ EXISTING CONDITION

RUNOFF CURVE NUMBER

Surface Description	Hydrologic Soil Group (HSG)	CN	Area (acres)	Product (CN)(Area)
Impervious	D	98	20.47	2006.06
Pervious	D	80	5.88	470.40

TOTALS:

26.35

2476.46

COMPOSITE RUNOFF CURVE NUMBER

$$\text{Composite CN} = \frac{\text{Total Product}}{\text{Total Area}} = \frac{2476.46}{26.35} \rightarrow \text{Composite CN} = 93.98$$

ADJUSTED COMPOSITE RUNOFF CURVE NUMBER (CN_{ADJ})

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: East 3.0 Drainage Area

DATE: _____

DEVELOPMENT INFORMATION

1. Area Detained, A	26.340	acres
2. Total Impervious Area	20.470	acres
3. Composite CN	93.98	
4. Volume Control Storage Provided, VC_P	1.706	ac-ft
5. Depth of Rainfall, P	8.57	inches

RUNOFF VOLUME (NRCS EQUATIONS)

6. Maximum Retention, S	$S = \frac{1000}{CN} - 10$	0.64	inches
7. Runoff Depth, Q_D	$Q_D = \frac{(P - 0.2S)^2}{(P + 0.8S)}$	7.85	inches
8. Runoff Volume, V_R	$V_R = Q_D A \left(\frac{1}{12 \frac{in}{ft}} \right)$	17.22	ac-ft

VOLUME CONTROL STORAGE

9. Volume Control Storage Required, VC_R	1.706	ac-ft
10. Additional Volume Control Storage Provided	0.000	ac-ft

ADJUSTED RUNOFF VOLUME

11. Adjusted Runoff Volume, V_{ADJ}	$V_{ADJ} = V_R - VC_P$	15.517	ac-ft
12. Adjusted Runoff Depth, Q_{ADJ}		7.07	inches
13. Adjusted Maximum Retention, S_{ADJ}		1.42	inches

ADJUSTED COMPOSITE RUNOFF CURVE NUMBER

14. Adjusted Runoff Curve Number, CN_{ADJ}	87.53
--	-------

NOMOGRAPH: BULLETIN 70 RAINFALL DATA (2019)

PROJECT: Arlington Heights Automall Redevelopment

PERMIT NUMBER: _____

LOCATION: East 3.0 Drainage Area

DATE: _____

DEVELOPMENT INFORMATION

1. Detained Area

26.340

acres

2. Curve Number

87.53

3. Actual Release Rate

5.268

cfs

REQUIRED DETENTION VOLUME

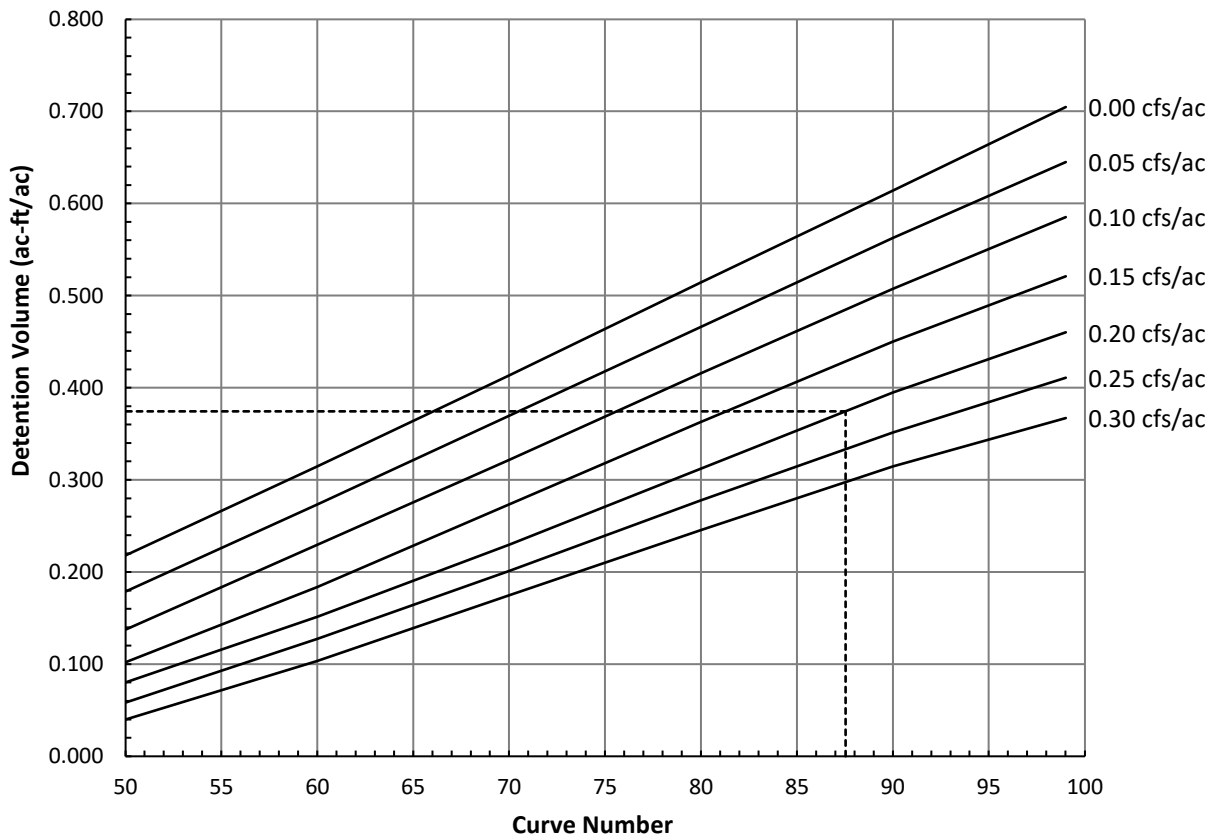
4. Required Detention Volume

9.863

ac-ft

NOMOGRAPH

NOMOGRAPH: BULLETIN 70 (2019)



Appendix H.3 –Arlington Heights Stormwater Calculations

4/8/2021

Site Area =	9.030 Acres	Pervious=	1.950 Acres
Allowed Release Rate (Area x 0.18cfs/Ac) =	1.625 cfs	Impervious=	7.080 Acres
Weighted "C" Factor =	0.853	Water=	0.000 Acres
		Synth Turf=	0.000 Acres

Max Volume = 3.382 Acre-Ft
= 147,332 cu-ft

1) Allowed Release Rate, Q(cfs)	1.625			<u>Free Flow</u>	<u>Submerged Flow</u>
2) High Water Elevation					0.00
3) Outfall Water Elevation	-		-		0.00
4) Invert Elevation					0.00
5) Diameter of Restrictor (inch)					0
6) Cross Section Area (sq ft)	-		0.000	0.000	
7) Head (ft) h =	0.00		0.00	0.00	
8) Discharge Coefficient					0.00
Square Edge 0.79 - 0.82					
Round Edge 0.93 - 0.98					
Sharp Edge 0.58 - 0.64		<-- Most common=0.61			
Projecting 0.50					
				Q = C*a*(sqrt 2*g*h)	

Q (cfs) = 0.00 0.000

a(sq ft) = #DIV/0! dia(in) = #DIV/0!

4/8/2021

Site Area =	26.350 Acres	Pervious=	5.880 Acres
Allowed Release Rate (Area x 0.18cfs/Ac) =	4.743 cfs	Impervious=	20.470 Acres
Weighted "C" Factor =	0.850	Water=	0.000 Acres
		Synth Turf=	0.000 Acres

Max Volume = 9.825 Acre-Ft
= 427,961 cu-ft

1) Allowed Release Rate, Q(cfs)	4.743	Free Flow	Submerged Flow
2) High Water Elevation			0.00
3) Outfall Water Elevation	-	-	0.00
4) Invert Elevation			0.00
5) Diameter of Restrictor (inch)			0
6) Cross Section Area (sq ft)	-	0.000	0.000
7) Head (ft) h =	0.00	0.00	0.00
8) Discharge Coefficient			0.00
Square Edge	0.79 - 0.82		
Round Edge	0.93 - 0.98		
Sharp Edge	0.58 - 0.64		
Projecting	0.50		

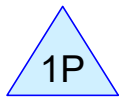
<-- Most common=0.61

$Q = C^*a^*(\text{sqrt } 2^*g^*h)$

a(sq ft) = #DIV/0! dia(in) = #DIV/0!

Appendix H.4 – Existing Tank Information

Appendix H.5 – HydroCAD Calculations



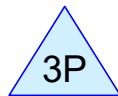
West Pond



West Drainage Area



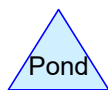
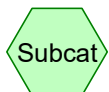
Future Parking Lot



East Pond



East Drainage Area



Routing Diagram for 2283.00 - Proposed Conditions new systems

Prepared by Pinnacle Engineering Group, Printed 4/8/2021

HydroCAD® 10.00-21 s/n 07894 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 4S: East Drainage Area

Runoff = 18.66 cfs @ 14.99 hrs, Volume= 16.055 af, Depth= 7.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.01-360.00 hrs, dt= 0.01 hrs
 Huff B75 0-10sm 3Q 24.00 hrs 100-YR, 24-HR Rainfall=8.57", Smoothing=Off

Area (sf)	CN	Description
821,472	98	Paved parking, HSG D
247,756	80	>75% Grass cover, Good, HSG D
1,069,228	94	Weighted Average
247,756		23.17% Pervious Area
821,472		76.83% Impervious Area

Summary for Subcatchment 5S: FutureParking Lot

Runoff = 1.38 cfs @ 14.99 hrs, Volume= 1.212 af, Depth= 8.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.01-360.00 hrs, dt= 0.01 hrs
 Huff B75 0-10sm 3Q 24.00 hrs 100-YR, 24-HR Rainfall=8.57", Smoothing=Off

Area (sf)	CN	Description
70,123	98	Paved parking, HSG D
8,215	80	>75% Grass cover, Good, HSG D
78,338	96	Weighted Average
8,215		10.49% Pervious Area
70,123		89.51% Impervious Area

Summary for Subcatchment PR1: West Drainage Area

Runoff = 6.87 cfs @ 15.05 hrs, Volume= 5.907 af, Depth= 7.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.01-360.00 hrs, dt= 0.01 hrs
 Huff B75 0-10sm 3Q 24.00 hrs 100-YR, 24-HR Rainfall=8.57", Smoothing=Off

Area (sf)	CN	Description
308,285	98	Paved parking, HSG D
85,084	80	>75% Grass cover, Good, HSG D
393,369	94	Weighted Average
85,084		21.63% Pervious Area
308,285		78.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Pond 1P: West Pond

Inflow Area = 9.0305 ac, 78.37% Impervious, Inflow Depth = 7.85" for 100-YR, 24-HR event
 Inflow = 6.87 cfs @ 15.05 hrs, Volume= 5.907 af
 Outflow = 6.38 cfs @ 17.09 hrs, Volume= 5.907 af, Atten= 7%, Lag= 122.2 min
 Primary = 6.38 cfs @ 17.09 hrs, Volume= 5.907 af

Routing by Dyn-Stor-Ind method, Time Span= 0.01-360.00 hrs, dt= 0.01 hrs
 Starting Elev= 711.00' Surf.Area= 0.1977 ac Storage= 0.040 af
 Peak Elev= 715.49' @ 17.09 hrs Surf.Area= 0.1977 ac Storage= 0.675 af (0.635 af above start)

Plug-Flow detention time= 66.8 min calculated for 5.867 af (99% of inflow)
 Center-of-Mass det. time= 57.5 min (889.0 - 831.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	710.50'	0.248 af	26.75'W x 322.00'L x 5.50'H Field A 1.088 af Overall - 0.467 af Embedded = 0.620 af x 40.0% Voids
#2A	711.00'	0.467 af	CMP Round 54 x 4 Inside #1 Effective Size= 54.0"W x 54.0"H => 15.90 sf x 20.00'L = 318.1 cf Overall Size= 54.0"W x 54.0"H x 20.00'L Row Length Adjustment= +300.00' x 15.90 sf x 4 rows
0.715 af			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	711.00'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 711.00' / 710.75' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	711.00'	11.0" Vert. Orifice/Grate C= 0.600
#3	Primary	715.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=6.38 cfs @ 17.09 hrs HW=715.49' (Free Discharge)

1=Culvert (Passes 6.38 cfs of 28.24 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 6.38 cfs @ 9.66 fps)
 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3P: East Pond

Inflow Area = 26.3445 ac, 77.69% Impervious, Inflow Depth = 7.87" for 100-YR, 24-HR event
 Inflow = 20.04 cfs @ 14.99 hrs, Volume= 17.267 af
 Outflow = 18.84 cfs @ 16.01 hrs, Volume= 17.265 af, Atten= 6%, Lag= 61.3 min
 Primary = 18.84 cfs @ 16.01 hrs, Volume= 17.265 af

Routing by Dyn-Stor-Ind method, Time Span= 0.01-360.00 hrs, dt= 0.01 hrs
 Starting Elev= 712.00' Surf.Area= 0.7191 ac Storage= 0.560 af
 Peak Elev= 715.99' @ 16.01 hrs Surf.Area= 0.7191 ac Storage= 2.627 af (2.067 af above start)

Plug-Flow detention time= 126.6 min calculated for 16.705 af (97% of inflow)
 Center-of-Mass det. time= 85.0 min (901.7 - 816.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	710.50'	0.875 af	82.00'W x 382.00'L x 6.00'H Field A 4.315 af Overall - 1.884 af Embedded = 2.430 af x 36.0% Voids
#2A	711.00'	1.884 af	CMP Round 60 x 11 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +360.00' x 19.63 sf x 11 rows
		2.759 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	712.00'	24.0" Round Culvert L= 310.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 712.00' / 709.45' S= 0.0082 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	712.00'	20.1" Vert. Orifice/Grate C= 0.600
#3	Primary	716.00'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=18.84 cfs @ 16.01 hrs HW=715.99' (Free Discharge)

- 1=Culvert (Passes 18.84 cfs of 24.54 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 18.84 cfs @ 8.55 fps)
- 3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Appendix I – Storm Sewer Calculations

Appendix I – Storm Sewer Calculations

(To be provided in Final Stormwater Management Report)