

STORMWATER REPORT



ENGINEERING | SURVEYING | CONSTRUCTION

Project:
Cleland Place
1925 Wilmette Avenue

Location:
Wilmette, Illinois

Prepared For:
Housing Opportunity Development Corporation
2001 Waukegan Road, P.O. Box 480
Techny, IL 60082

Date:
January 10, 2018

Prepared By:
Michael Anderson, P.E.
Haeger Project No.: 15-123

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EXECUTIVE SUMMARY

This report presents the results of the storm water analysis for the proposed three-story multi-family residential development on a 0.336-acre parcel located at 1925 Wilmette Avenue in Wilmette, Illinois. The property currently contains an existing building and bituminous parking lot and access drive. No storm water infrastructure currently exists on the site. The proposed site improvements will reduce the property impervious coverage by 12.3%, provide stormwater quality treatment and reduce the peak runoff into the receiving storm sewer system during high intensity storm events by 94%.

Existing Conditions

The existing 0.336-acre parcel contains a two-story brick and frame structure. The property is bounded on the north by Wilmette Avenue, west by Pin Oak Drive, and on the east and south by existing commercial properties. To the south of the structure, there is an existing bituminous parking lot with access drives connecting to Wilmette Avenue to the east and west of the building. No storm sewers are located on the site; all flow sheets off of the property. The rear parking lot general drains via sheet flow to the north and west, into the Wilmette Avenue and Pin Oak Drive rights-of-way, respectively. Once off-site, surface runoff is then captured and conveyed through public storm sewers.

The site currently contains approximately 12,571 sf of impervious (pavement/building) surface, resulting in 85.8% impervious coverage of the site. This corresponds to a composite runoff coefficient of 0.84. Using the Rational Method, and assuming a conservative time of concentration of five minutes, the peak discharge flow from the site is 3.08 cfs during a 1% probability storm event.

$$\begin{aligned} Q &= C * i * A \\ &= 0.84 * 10.92 \text{ in/hr} * 0.336 \text{ ac} \\ &= 3.08 \text{ cfs} \end{aligned}$$

Proposed Conditions

The new development proposes reconstruction of the entire site to facilitate the construction of a new three-story multi-family residential structure with ground-level parking in approximately the southern half of the parcel. The parking will be accessed by a new drive to Wilmette Avenue along the eastern property line.

In accordance with Village of Wilmette requirements, volume control and detention storage are being provided on-site. Based on the proposed site plan, there will be approximately 10,765 sf of impervious surface resulting in 73.5% impervious coverage. The required volume control storage is 1 inch over the impervious surface, or 0.021 ac-ft. Due to the reduction in impervious coverage in proposed conditions, a volume control credit of 25% reduction for every 5% reduction in impervious coverage, per §503 of the MWRD WMO, applies to this site. The volume control credit is 61.5%, based on a 12.3% impervious reduction. This corresponds to net reduction in the volume control requirement of 0.013 ac-ft, to 0.08 ac-ft required. A storage volume of 0.15 ac-ft will be provided in a bioretention swale located along the western property line. The bioretention swale will include 12 inches of surface storage, 18 inches of soil media mix and 12 inches of coarse aggregate.

The required detention storage volume is based off the developed curve number of 93.2 and a standard release rate of 0.30 cfs/ac, corresponding to an allowable release rate for this site of 0.10 cfs. Using the MWRD detention calculator and the reduced curve number, the required detention storage of 0.080 ac-ft. The proposed storage volume of 0.081 ac-ft is provided within two parallel runs of 62 feet of 72" diameter pipe, plus manifold, located beneath the access drive to the site. Due to the small size of the site and the limited head for an underground detention system, the calculated orifice restrictor diameter is 1.2" and therefore extremely prone to clogging. To limit the release rate and reduce the likelihood of clogging, a vortex restrictor is proposed within the outlet control structure instead of the 1.2" orifice. With the recommended opening size of 3" on the vortex restrictor and a head of 7', the peak discharge from the site will be 0.184 cfs.

STORMWATER MANAGEMENT OVERVIEW

Project: Cleland Place
Location: Wilmette, IL
Project #: 15-123

Prepared: PAC
Reviewed: MLA
Date: 1/10/2018

A. Definitions and Constraints:

Development Area =	0.336	Acre
Standard Release Rate =	0.10	CFS
Allowable Release Rate =	0.10	CFS
Restrictor Size =	VORTEX	
Pond Bottom =	616.00	
Pond HWL (High Water Level) =	624.00	

B. Coverage Summary:

	Sq. Ft	Acre	Sq. Mi	CN
Impervious Area =	10,765	0.247	0.000386	98.0
Pervious Area =	3,883	0.089	0.000139	80.0
Development Area =	14,648	0.336	0.000525	93.2

C. Volume Control:

Required	Impervious Area (Acres)	Infiltration Rainfall	Infiltration Volume Req.(CF)	Infiltration Volume Req. (Ac-Ft)
Per MWRD WMO	0.247	0.083	897	0.021
Credit (Per WMO §503)				Net Volume (Ac-Ft)
Volume Control Reduction (25% Reduction per 5% Impervious Reduction)				61.5%
Volume Control Credit				0.013
Volume Control Requirement After Credit Reduction				0.008
Proposed			Net Volume (CF)	Net Volume (Ac-Ft)
Bioretention Swale			633	0.015

D. Storage

Required			Peak Storage (CF)	Peak Storage (Ac-Ft)
Using MWRD Graph			3,498	0.080
Proposed Storage	Dia. (ft)	Length (ft)	Volume (CF)	Volume (Ac-Ft)
Large Diameter Pipe	6	125.5	3,548	0.081

RUNOFF CURVE NUMBER ADJUSTMENT CALCULATOR

Site Information:

Total Site Area, A_w (ac) =

Total Impervious Area, A_i (ac) =

Runoff, R (in) =

P = rainfall depth (in) =

CN =

S =

Runoff Volume Over Watershed, V_w (ac-ft) =

Volume of GI Provided:

Volume Control Storage, V_R = ac-ft 1" of volume over impervious area

Additional Volume, V_{GI} = ac-ft Additional volume over the required 1"

Adjusted Volume Over Watershed, $V_{ADJ} = V_w - V_R - V_{GI}$

V_{ADJ} (ac-ft) =

Adjusted Runoff Over Watershed, $R_{ADJ} = \frac{V_{ADJ}}{A_w}$

R_{ADJ} (in) =

S_{ADJ} =

Adjusted CN for detention calcs, CN_{ADJ} =

*Blue values are entered by user

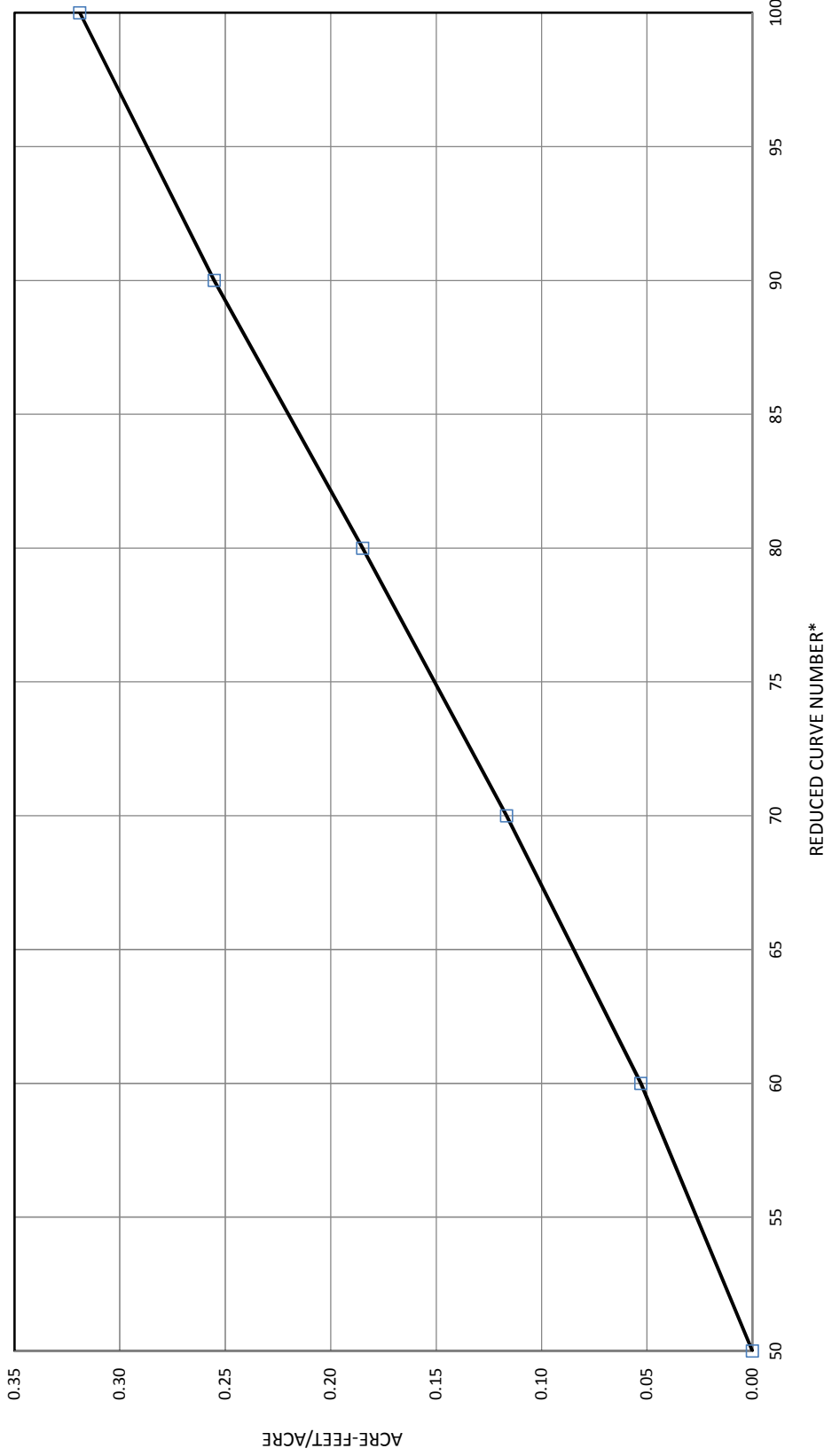
Enter Site Area: acres

* Blue Values are entered by user

Enter Reduced Curve Number for Site:

Estimated Required Detention Volume: acre-feet

DETENTION VOLUME VS REDUCED CURVE NUMBER*



* ADJUSTED FOR VOLUME CONTROL STORAGE PROVIDED, BASED ON RELEASE RATE OF 0.30 CFS/ACRE

VOLUME CONTROL SUMMARY

Project: Cleland Place
 Location: Wilmette, IL
 Project #: 15-123

Prepared: PAC
 Reviewed: MLA
 Date: 1/10/2018

Volume Control Area 1

Volume Type	Porosity	MWRD Factor	Area (SF)	Depth (FT)	Media Volumes (CY)	Storage Volumes (CY)	Storage Volumes (CF)
Surface Storage	1	1	559	1	14	14	378
Soil Media Mix	0.25	0.5	559	1.5	31	4	105
Coarse Agg. (Above Invert)	0.36	0.5	559	0.5	10	2	50
Coarse Agg. (Below Invert)	0.36	1	559	0.5	10	4	101
Total						23	633

PROPOSED CONDITIONS ORIFICE/WEIR STRUCTURE RATING ANALYSIS

OUTLET:

ORIFICE:	1.2 IN. DIA. @ ELEV	629
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ORIFICE FLOW EQUATION: $Q = C_d A (2gH)^{0.5}$

WEIR FLOW EQUATION: $Q = 3.0L(H)^{1.5}$

HYDRAULIC DIMENSIONS

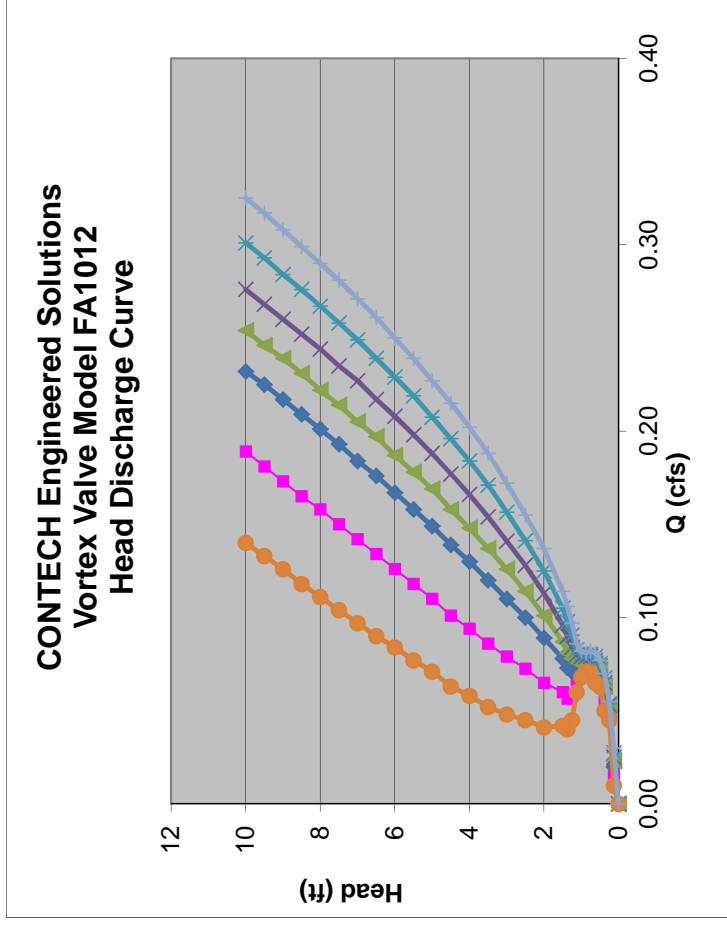
	# 1	
ORIFICE AREA (ft ²)	0.0079	
ORIFICE DIAMETER (in)	1.200	[<4", Use Vortex]
ORIFICE DISCHARGE COEFFICIENT	0.61	
ORIFICE ELEV. (ft-NAVD88)	629.00	
TAILWATER OR CENTROID (ft-NAVD88)	629.050	

ELEVATION-DISCHARGE RELATIONSHIP

Elevation (feet)	Q-Orifice (cfs)	Q-Weir (cfs)	Q-Total (cfs)
630.00	0.037	0.000	0.037
631.00	0.054	0.000	0.054
632.00	0.066	0.000	0.066
633.00	0.076	0.000	0.076
634.00	0.086	0.000	0.086
635.00	0.094	0.000	0.094
636.00	0.101	0.000	0.101

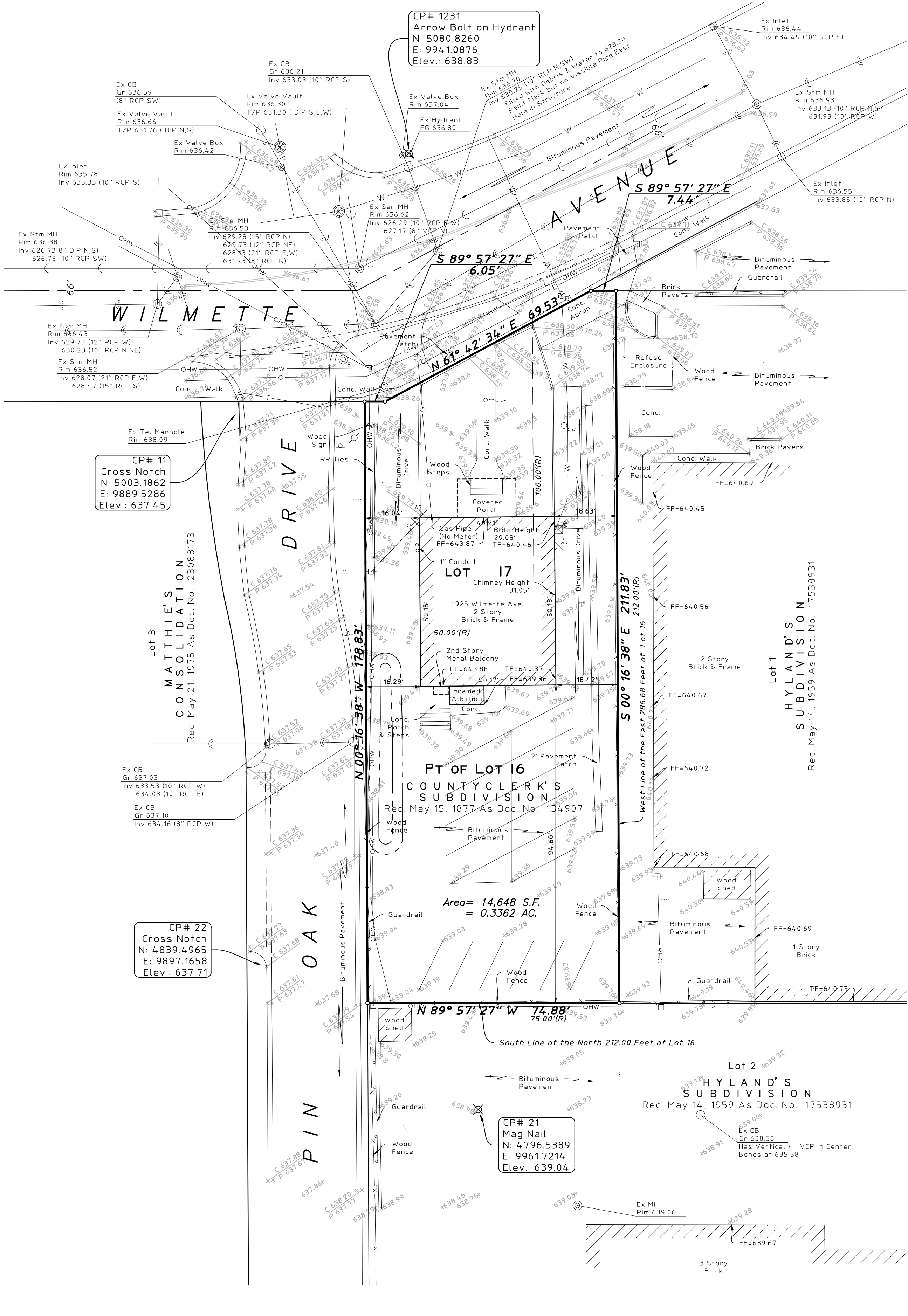
Vortex Valve Fluidic Amp Model FA1012

FA1012 Head (ft)	2"	2.5"	3"	3.25"	3.5"	3.75"	4"
	Opening Flow (cfs)	Opening Flow (cfs)	Opening Flow (cfs)	Opening Flow (cfs)	Opening Flow (cfs)	Opening Flow (cfs)	Opening Flow (cfs)
0	0	0	0	0	0	0	0
0.125	0.010	0.015	0.020	0.023	0.025	0.028	0.030
0.25	0.045	0.048	0.050	0.051	0.053	0.054	0.055
0.375	0.050	0.055	0.060	0.063	0.065	0.068	0.070
0.50	0.063	0.067	0.070	0.072	0.074	0.075	0.077
0.625	0.065	0.069	0.073	0.075	0.077	0.079	0.081
0.75	0.071	0.073	0.076	0.077	0.079	0.080	0.082
0.875	0.071	0.074	0.076	0.077	0.079	0.080	0.081
1.0	0.068	0.072	0.075	0.077	0.079	0.080	0.082
1.125	0.060	0.067	0.073	0.076	0.080	0.083	0.086
1.25	0.045	0.058	0.071	0.078	0.084	0.091	0.097
1.375	0.040	0.057	0.073	0.081	0.090	0.098	0.106
1.5	0.042	0.060	0.078	0.087	0.096	0.105	0.114
2.0	0.041	0.065	0.089	0.101	0.113	0.125	0.137
2.5	0.045	0.073	0.100	0.114	0.128	0.141	0.155
3.0	0.048	0.079	0.110	0.126	0.141	0.157	0.172
3.5	0.052	0.086	0.120	0.137	0.154	0.171	0.188
4.0	0.058	0.094	0.130	0.148	0.166	0.184	0.202
4.5	0.063	0.101	0.139	0.158	0.177	0.196	0.215
5.0	0.071	0.110	0.149	0.169	0.188	0.208	0.227
5.5	0.077	0.118	0.158	0.178	0.198	0.219	0.239
6.0	0.084	0.126	0.167	0.187	0.208	0.229	0.250
6.5	0.090	0.134	0.176	0.197	0.217	0.239	0.261
7.0	0.097	0.142	0.184	0.205	0.227	0.249	0.271
7.5	0.104	0.150	0.193	0.214	0.235	0.258	0.281
8.0	0.111	0.158	0.201	0.222	0.244	0.267	0.290
8.5	0.118	0.165	0.209	0.231	0.252	0.276	0.299
9.0	0.126	0.173	0.217	0.239	0.260	0.284	0.308
9.5	0.133	0.181	0.225	0.246	0.268	0.293	0.317
10.0	0.140	0.189	0.232	0.254	0.276	0.301	0.325



Note: release rates provided for orifice openings smaller than 3" are estimated based on extrapolation of lab testing data from units with outlet diameters of 3" to 4" diameter. Contech Engineered Solutions does not recommend the use of vortex restrictors with orifices smaller than 3" due to their tendency to clog just like any other orifice with a small diameter, but can provide these if requested to meet required release rates.

EXISTING CONDITIONS

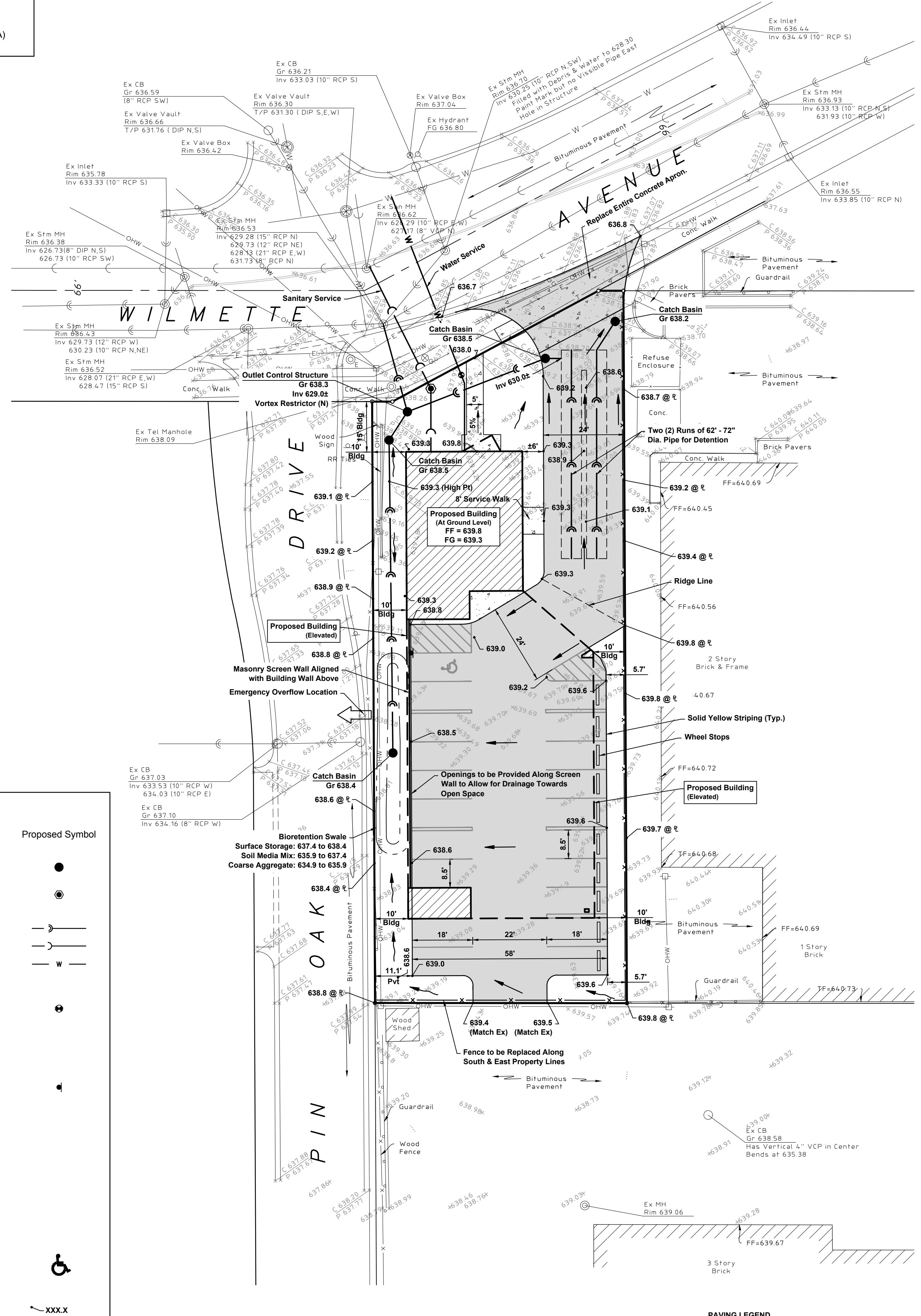


EXISTING IMPERVIOUS AREA SUMMARY

BUILDING	=	2,073 sf
PAVEMENT	=	10,498 sf
TOTAL	=	12,571 sf
PARCEL AREA	=	14,648 sf
IMPERVIOUS COVERAGE	=	85.8%

Benchmark
 Site Benchmark
 CP # 11 (See Survey)
 Description: Cross Notch
 Elevation: 637.45 NAVD 88 (Geoid 12A)

PROPOSED CONDITIONS



PROPOSED IMPERVIOUS AREA SUMMARY

BUILDING FOOTPRINT	=	6,662 sf
PARKING / DRIVE AISLES	=	3,881 sf **
SIDEWALKS	=	222 sf
TOTAL	=	10,765 sf
PARCEL AREA	=	14,648 sf
IMPERVIOUS COVERAGE	=	73.5%

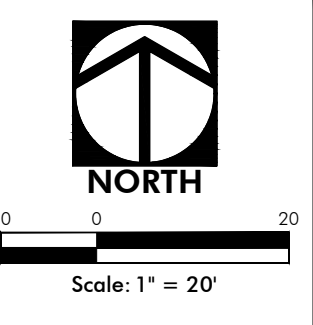
** Parking / Drive Aisles' square footage does not include portion beneath elevated portion of building.

PAVING LEGEND

	Bituminous Pavement
	Concrete Apron
	Concrete Sidewalk
	Offsite Pavement (Resurface)

LEGEND

Existing Symbol	Description	Proposed Symbol
	Storm Sewer Manhole	
	Catch Basin	
	Inlet	
	Sanitary Sewer Manhole	
	Clean Out	
	Storm Sewer	
	Sanitary Sewer	
	Water Main	
	Fire Hydrant	
	Valve Vault	
	Valve Box	
	B-Box	
	Light Pole	
	Hand Hole	
	Fence	
	Sign	
	Gas Valve	
	Gas Line	
	Electric Line	
	Overhead Utility Line	
	Electrical Pedestal	
	Electric Manhole	
	Guy Wire	
	Utility Pole	
	Telephone Pedestal	
	Telephone Manhole	
	Telephone Line	
	Flagpole	
	Handicapped Parking Stall	
	Curb Elevation and Gutter/Pavement Elevation	
	Spot Elevation	
	Spot Elevation @ Prop. Line	
	Open Lid Frame & Grate	
	Closed Lid Frame & Lid	
	Dimension to Building	
	Dimension to Pavement	
	Hardscape Flow	
	Softscape Flow	
	Contour Line	



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CONCEPT ENGINEERING PLAN
CLELAND PLACE
1925 WILMETTE AVENUE
 WILMETTE, ILLINOIS

Project Manager: M.L.A.
 Engineer: J.A.C.
 Date: 09/11/2015
 Project No.: 15-123
 Sheet: 1