

Memo



SUBJECT
Buick City Bulkheading Summary

TO
Tianna Kilgore, EGLE

DATE
June 16, 2023

PROJECT NUMBER
30174223

DEPARTMENT
Environment

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The following bulkhead summary has been provided for EGLE based on questions and comments from the May 16, 2023 meeting. Bulkheading has been utilized as a measure to prevent contaminants of concern from migrating offsite through the existing storm sewer system even before RACER assumed responsibility for the Site. The existing storm sewer network is comprised of multiple material types and constructions. A total of 15 main storm sewers serve the Site and convey storm water to the Flint River. Due to their construction (mostly unsealed concrete or tile) and the fact that storm sewers intersect groundwater in a number of locations, groundwater and historically light aqueous phase liquid (LNAPL) has infiltrated the sewers and migrated to the Flint River. A total of 35 bulkheads, plugs, or pipe disconnects (collectively referred to as bulkheads for this memo) have been installed in the on-Site storm sewers to address migration of impacted groundwater and LNAPL from the Site (**Table 1**). Note that most of the sewers also service storm water flow from areas upgradient of the Site. Locations of the bulkheads are provided on the figures included in **Attachment 1**.

Initial Investigations

Boom studies and grab samples of the dry weather flow at various locations were utilized to identify the presence of LNAPL and exceedances of dissolved constituents of concern (COC), respectively, and additional sampling was completed to isolate and identify the areas where impacts were entering the system. Once isolated the section of sewer was evaluated for remedy type. In general, sections that conveyed offsite storm flow were evaluated for rerouting or lateral line bulkheading. Portions of two storm water lines were rerouted (003 and 004), Selected storm sewer lines that did not convey offsite flow were bulkheaded to eliminate the migration of the impacts.

Installation Procedure

Sewer pipe diameters up to 24 inches were bulkheaded using a concrete plug (no internal reinforcement). A reinforced bulkhead was used in sewer pipes over 24 inches. The general approach is that flow is stopped to allow the surfaces to be cleaned and prepared for the bulkheading. Forming and steel reinforcing dowels drilled into the existing pipe are installed as well as a preformed plastic adhesive waterstop applied to the full circumference of the pipe. Once the form is prepared the concrete is poured. Following the cure time, holes are drilled through the bulkhead and into the sewer pipe material for an injection of grout to further seal the bulkhead. A bypass pipe placed in the bulkhead to allow storm water or infiltration flow during the curing time, keeping pressure to a minimum, is then capped and grouted over.

Attachment 2 contains the figures showing what is provided to the contractor for installation, including the bypass pipe. **Attachment 3** provides photos of the installation process.

Any issues with the pipe condition, type, or excessive buildup on the interior of the pipe identified during the cleaning process are conveyed to the engineer to determine how to proceed.

Priority Locations

Over the course of the project sections of sewer have been abandoned or rerouted and as a result some installed bulkheads/plugs are no longer necessary in those sections. The current functioning bulkheads and plugs are identified in **Table 1**. The priority designation identifies 1) primary locations where the bulkhead remains actively preventing contamination from migrating downstream and 2) locations that are supporting the primary locations. **Table 1** also identifies the restrictions and conditions placed on the bulkheads based on their priority.

Inspection / Monitoring

Following installation of the bulkheads, monitoring of any downgradient flow was performed to confirm the effectiveness. Grab samples of dry weather flow downstream of the bulkheads are collected and analyzed for COC's or booms installed and inspected for visual indications of LNAPL depending on the reason for the bulkhead. Detections of constituents above criteria result in either sewer camera or confined space entry to complete a visual inspection. Based on the findings of these inspections, repairs or other measures are evaluated and implemented.

Monitoring and inspections have generally not found migration around the installed bulkheads back into the remaining storm sewer pipe. Continued monitoring and sampling will be performed to monitor and ensure this remains the case. If needed, repairs have been implemented such as excavation behind the bulkhead and physically disconnecting the pipe, drilling, and injecting a grout to prevent leakage.

Enclosures

Table 1 – Restrictive Covenant Storm Sewer Locations

Attachment 1 – Bulkhead Locations

Attachment 2 – Bulkhead Specifications

Attachment 3 – Bulkhead Installation Photographs

Table

Restrictive Covenant Bulkhead Storm Sewer Locations

Location ID	Restricted Area Corner Coordinates								Bulkhead Priority (see notes)	Manhole Identifier	Blocked Pipe location	Pipe size	Remedy Construction
	North East		North West		South East		South West						
	X	Y	X	Y	X	Y	X	Y					
Bulkhead 4	13306691.66	567085.995	13306661.68	567084.973	13306692.68	567056.01	13306662.70	567054.99	2	2-21	Bulkhead installed in southern, downgradient lateral connection within MH 2-21.	42"	Engineered concrete bulkhead
Bulkhead 5	13306692.38	566804.93	13306662.39	566805.74	13306691.57	566774.94	13306661.58	566775.75	2	2-20	Plug installed in west, upgradient lateral connection within MH 2-20 (old section of sewer, outfall 002 pre outfall 003 reroute).	12"	Concrete plug
Bulkhead 6	13306750.99	566671.04	13306721.00	566670.23	13306751.80	566641.05	13306721.81	566640.24	2	2-18	Northwest lateral connection of pre reroute MH 2-18 (removed manhole and line post reroute)	54"	Engineered concrete bulkhead
Bulkhead 7	13306185.88	565944.10	13306135.88	565944.10	13306185.88	565904.10	13306135.88	565904.10	2	3-22	Plug installed in northern, eastern, and southeastern upgradient lateral connections within MH 3-22.	18"	Concrete plug
Bulkhead 8	13305510.12	564821.50	13305460.12	564821.50	13305510.12	564771.50	13305460.12	564771.50	1	3-48-1	Concrete plug installed in northern and eastern, upgradient lateral connections within MH 3-48-1.	20"	Concrete plug
Bulkhead 9	13305549.60	563989.96	13305519.61	563989.22	13305550.34	563959.97	13305520.35	563959.23	2	5-19	Bulkhead installed in eastern, downgradient connection of MH 5-19.	30"	Engineered concrete bulkhead (installed by GM)
Bulkhead 10	13306376.73	564056.567	13306326.73	564056.567	13306376.73	564006.567	13306326.73	564006.567	1	3-10	Bulkhead installed in western 42" upgradient lateral and plug installed in southern 24" upgradient lateral connections within MH 3-10.	42", 24"	Engineered bulkhead (42") and concrete plug (24")
Bulkhead 11	13306261.89	563300.14	13306232.50	563306.13	13306255.90	563270.74	13306226.51	563276.73	1	4-12	Bulkhead installed in western, upgradient connection at MH 4-12.	54"	Engineered concrete bulkhead
Bulkhead 12	13305645.09	563164.55	13305627.73	563189.01	13305620.63	563147.18	13305603.26	563171.65	1	5-13A	Plug installed in southeastern, downgradient lateral connection within MH 5-13A.	24"	Concrete plug
Bulkhead 13	13305639.93	563131.86	13305611.10	563123.58	13305648.22	563103.03	13305619.39	563094.74	1	4-16	Bulkhead installed in eastern, downgradient connection within MH 4-16.	54"	Engineered concrete bulkhead
Bulkhead 14	13305707.40	563035.31	13305678.23	563028.30	13305714.41	563006.14	13305685.24	562999.13	2	5-12-1	Plug installed in northern, downgradient lateral connection within MH 5-12-1.	24"	Concrete plug
Bulkhead 15	13304989.78	563082.46	13304990.77	563052.47	13305020.75	563053.47	13304990.77	563052.47	1	4-21	Bulkhead installed in eastern, downgradient connection within MH 4-21.	54"	Engineered concrete bulkhead
Bulkhead 16	13306104.86	562435.97	13306075.59	562442.55	13306098.27	562406.70	13306069.00	562413.28	1	6-8	Disconnection at east, downgradient connection of main at property boundary.	30"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 17	13306995.36	561852.80	13306945.36	561852.80	13306995.36	561762.80	13306945.36	561762.80	1	6-2	Plug installed in western, upgradient lateral connection within MH 6-2.	12"	Concrete plug
Bulkhead 18	13306995.36	561852.80	13306945.36	561852.80	13306995.36	561762.80	13306945.36	561762.80	1	Unnamed MH south of 6-2	Plug in southern, upgradient lateral connection of MH. Location of MH is approximately 25' south of 6-2.	15"	Concrete plug
Bulkhead 19	13306786.25	561916.89	13306756.26	561916.17	13306786.97	561886.90	13306756.98	561886.18	1	Unnamed MH southwest of 5A-6	Disconnection at northern, downgradient lateral at property line. Section of line enters property from MH 5A-6.	12"	Physical disconnection of pipe with concrete plugs at disconnect.

Bulkhead 20	13306257.28	561946.22	13306227.80	561951.80	13306251.70	561916.74	13306222.23	561922.32	1	6-5	Disconnection of line at RACER property. Line originates at southern downgradient lateral in MH 6-5 offsite and continues south to disconnect point at RACER property line.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 21	13306152.41	561960.22	13306122.87	561965.47	13306147.16	561930.68	13306117.62	561935.93	1	6-5	Disconnection of line at RACER property. Line originates at southwestern downgradient lateral in MH 6-5 offsite and continues south to disconnect point at RACER property line.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 22	13306901.92	561287.285	13306859.97	561304.182	13306890.72	561259.457	13306848.76	561276.355	1	7-1	Plug in western, upgradient connection to main at MH 7-1. Plug is located inside RACER property.	24"	Concrete plug
Bulkhead 23	13306554.19	560484.00	13306525.45	560475.41	13306562.78	560455.25	13306534.04	560446.67	1	8-1	Plug in eastern, downgradient main from MH 8-1 at RACER property boundary.	18"	Concrete plug
Bulkhead 24	13305820.15	560335.97	13305790.16	560336.78	13305819.34	560305.98	13305789.35	560306.79	1	10-4	Plug in northern, upgradient lateral connection within MH 10-4.	18"	Concrete plug
Bulkhead 26	13305017.59	560413.92	13304987.60	560414.73	13305016.77	560383.93	13304986.78	560384.75	1	13-11	Northern, upgradient lateral connection	72"	Engineered concrete bulkhead
Bulkhead 27	13306099.14	566821.91	13306069.14	566821.89	13306099.17	566791.91	13306069.17	566791.89	2	3-31	Bulkheads in northwestern (27"), and northern (42") upgradient lateral connections within MH 3-31.	27", 42"	Engineered concrete bulkhead
Bulkhead 28	13305618.47	566767.55	13305588.47	566767.53	13305618.50	566737.55	13305588.50	566737.53	2	3-28	Bulkhead in southern, downgradient connection within MH 3-28.	48"	Engineered concrete bulkhead
Bulkhead 29	13306348.94	565500.89	13306318.94	565500.86	13306348.97	565470.89	13306318.97	565470.86	2	3-20-27	Plug in eastern, downgradient lateral connection within MH 3-28-1.	8"	Concrete plug
Bulkhead 30	13306289.11	564947.81	13306259.11	564947.78	13306289.13	564917.81	13306259.13	564917.78	2	3-18	Northwestern, upgradient on main	66"	Engineered concrete bulkhead (post reroute)
Bulkhead 50	13306995.36	561852.80	13306945.36	561852.80	13306995.36	561762.80	13306945.36	561762.80	1	6-2	Disconnection in northwestern upgradient lateral line from MH6-2, disconnect is in lateral not at MH6-2.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
BH 51	13306995.36	561852.80	13306945.36	561852.80	13306995.36	561762.80	13306945.36	561762.80	1	6-2	A concrete bulkhead inside upgradient SW 18" concrete lateral line in MH6-2, disconnect is in lateral not in MH6-2.	12"	Concrete plug
Bulkhead 52	13307051.97	561931.61	13307021.98	561930.90	13307052.68	561901.62	13307022.69	561900.91	1	5A-5	Disconnection in south upgradient line from MH5A-5, disconnected at RACER property boundary.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 53	13306939.72	561472.90	13306911.89	561484.11	13306928.51	561445.07	13306900.68	561456.28	1	Unnamed MH parking lot north of 7-1	Disconnection in western lateral line disconnected inside RACER property boundary.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 54	13306901.92	561287.285	13306859.97	561304.182	13306890.72	561259.457	13306848.76	561276.355	1	7-1	Disconnection at western, upgradient main connection, upgradient of BH 22.	24"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 55	13306339.50	560406.25	13306309.50	560406.25	13306339.50	560376.25	13306309.50	560376.25	1	Unnamed MH south of 8-1	Disconnection in southern upgradient lateral located in employee parking south of MH8-1. This lateral drains parking lot into MH8-1.	12"	Physical disconnection of pipe with concrete plugs at disconnect.
Bulkhead 56	13305510.12	564821.50	13305460.12	564821.50	13305510.12	564771.50	13305460.12	564771.50	1	3-48-1 to 3-48	Disconnection in northeast upgradient lateral line from MH3-48 to MH3-48-1, disconnect is in lateral not in either manhole.	20"	Physical disconnection of pipe with concrete plugs at disconnect.
BH-PROP-1	13306423.93	563304.47	13306393.96	563303.09	13306425.31	563274.50	13306395.34	563273.12	2	4-11	Bulkhead installed in southern, downgradient connection of main within MH 4-11.	60"	Engineered concrete bulkhead
BH-PROP-3	13305377.65	563155.04	13305347.67	563154.05	13305378.64	563125.06	13305348.66	563124.06	2	4-19-1	Plug installed in southern, downgradient lateral connection at MH 4-19-1.	15"	Concrete plug

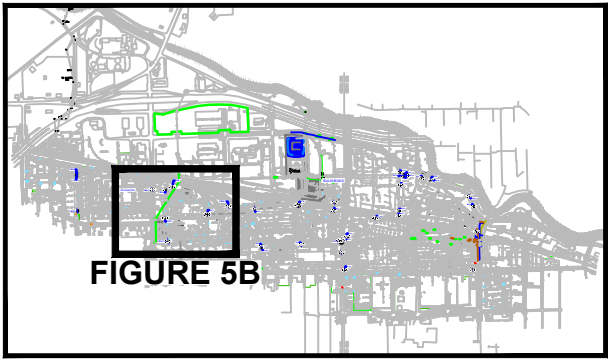
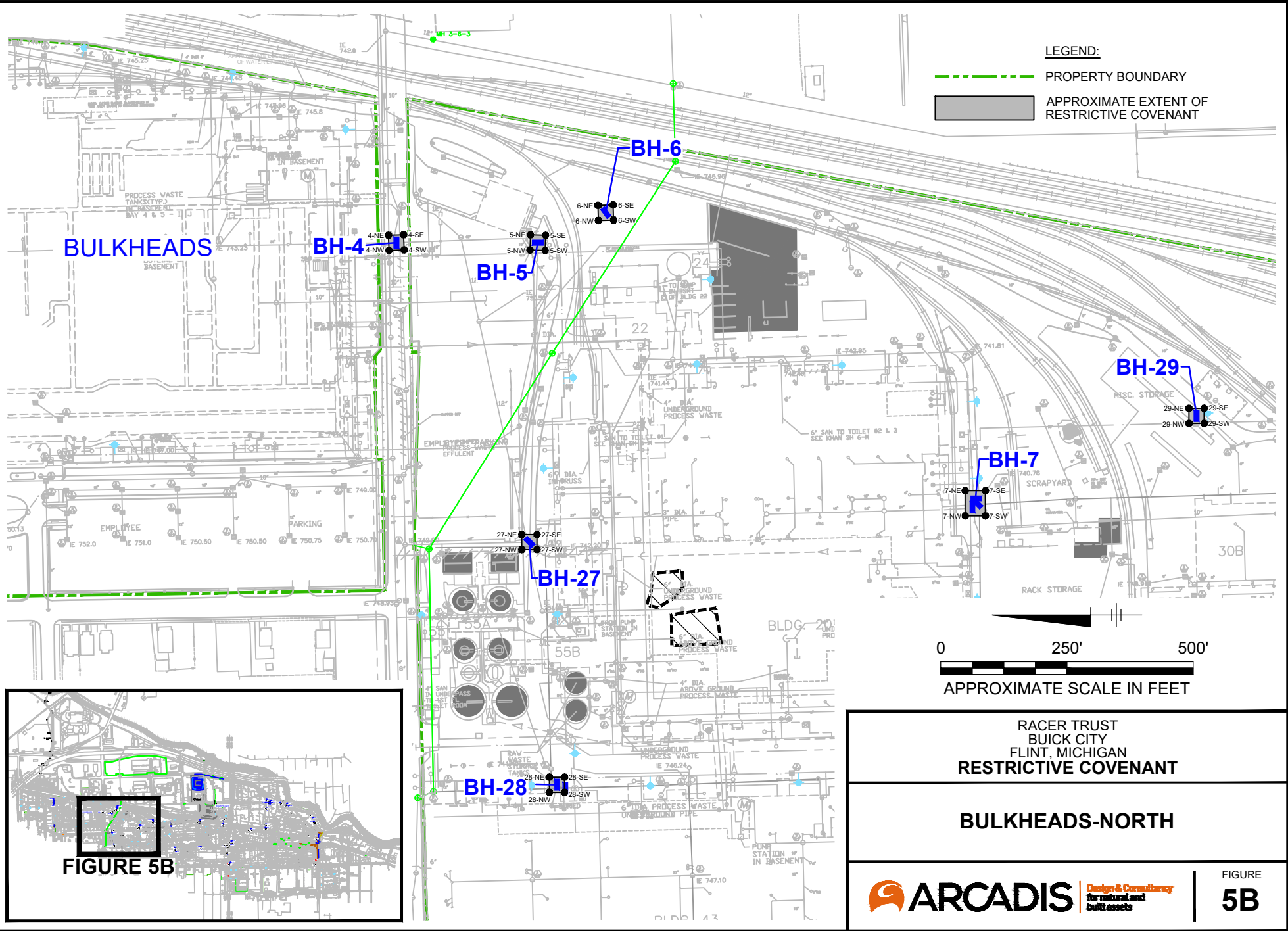
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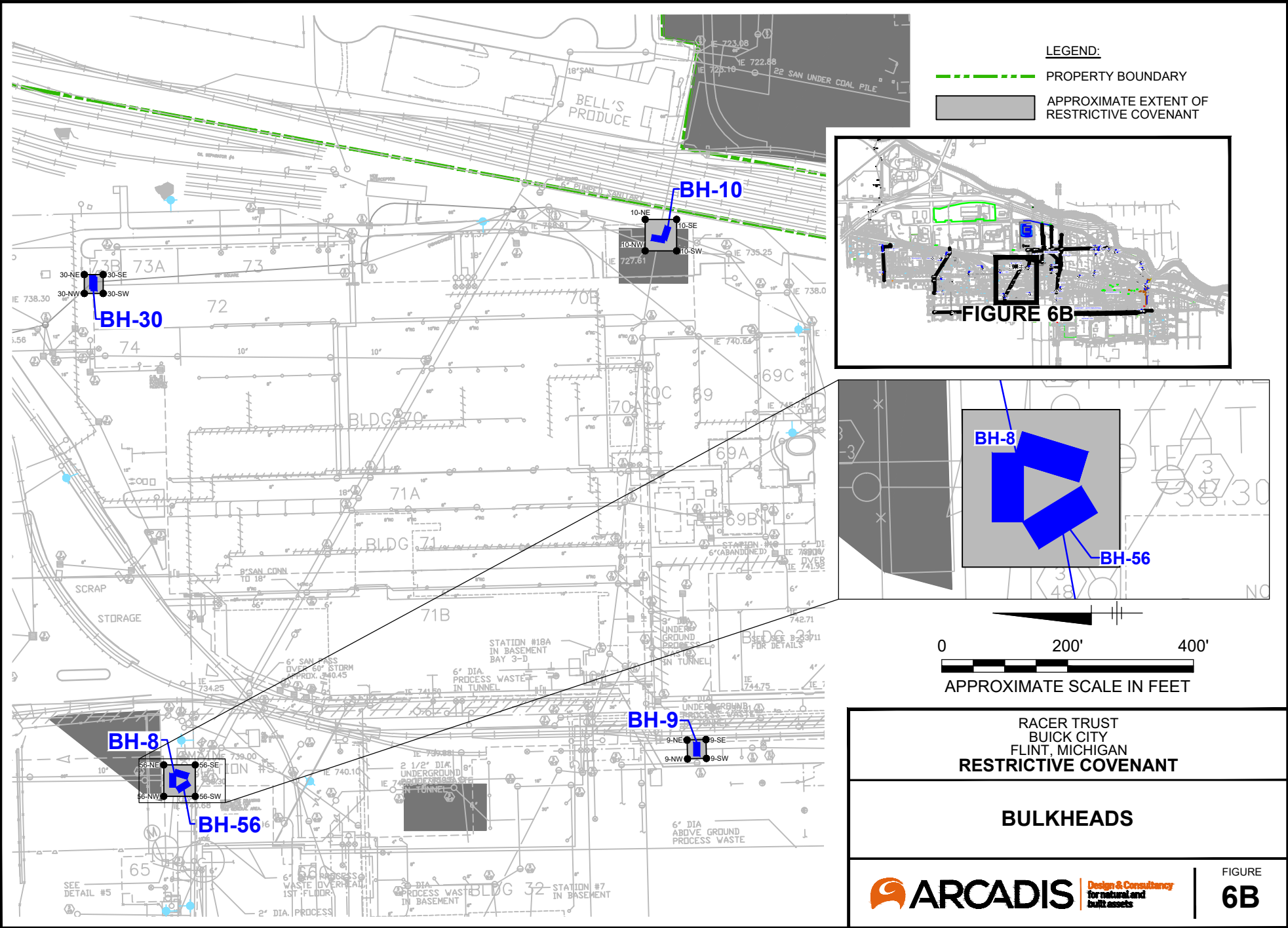
1 Bulkheads have been installed in the existing location to prevent impacted liquids from traveling downstream. These bulkheads need to remain unaltered unless approved by RACER.

2 These bulkheads/plugs are not vital to the management of impacted liquids at the site. If work needs to be conducted impacted liquid from the pipe will be encountered and will need to be managed appropriately. Prior to backfilling any remaining pipe will need to be bulkheaded at the edge of excavation.

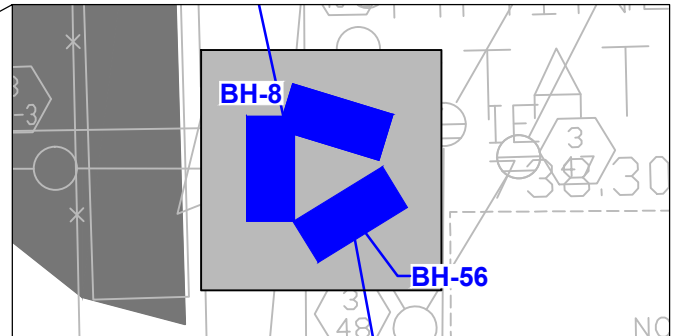
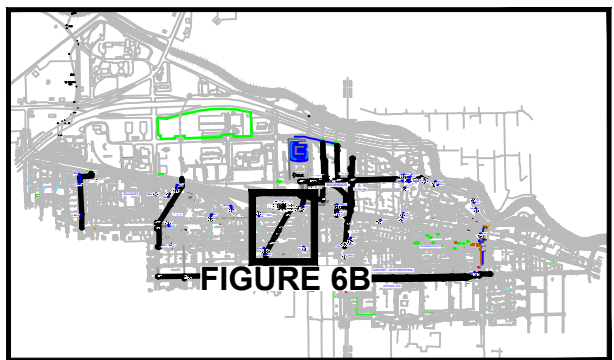
Attachment 1

Bulkhead Locations





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 [Grey Box] APPROXIMATE EXTENT OF RESTRICTIVE COVENANT



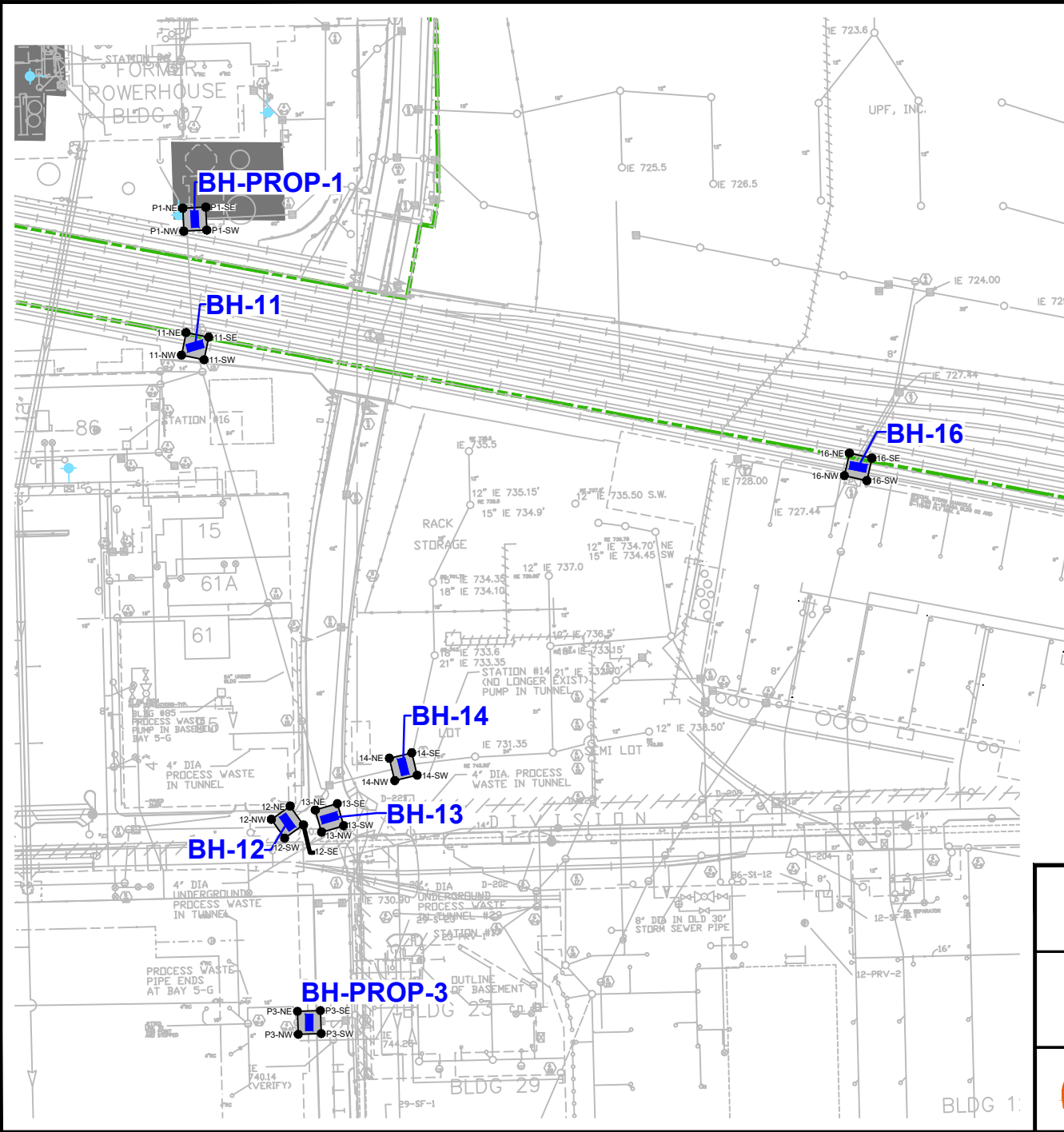
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 APPROXIMATE SCALE IN FEET

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 RESTRICTIVE COVENANT

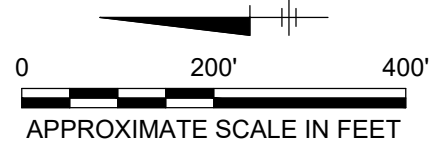
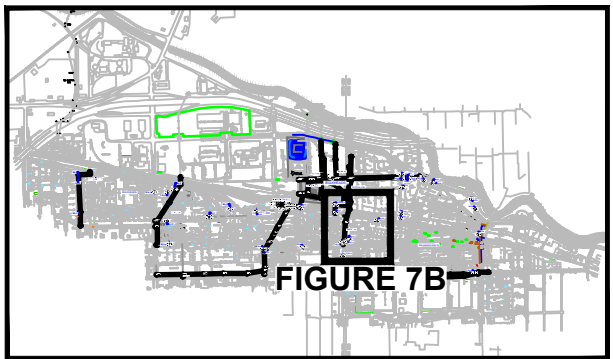
BULKHEADS

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FIGURE
6B



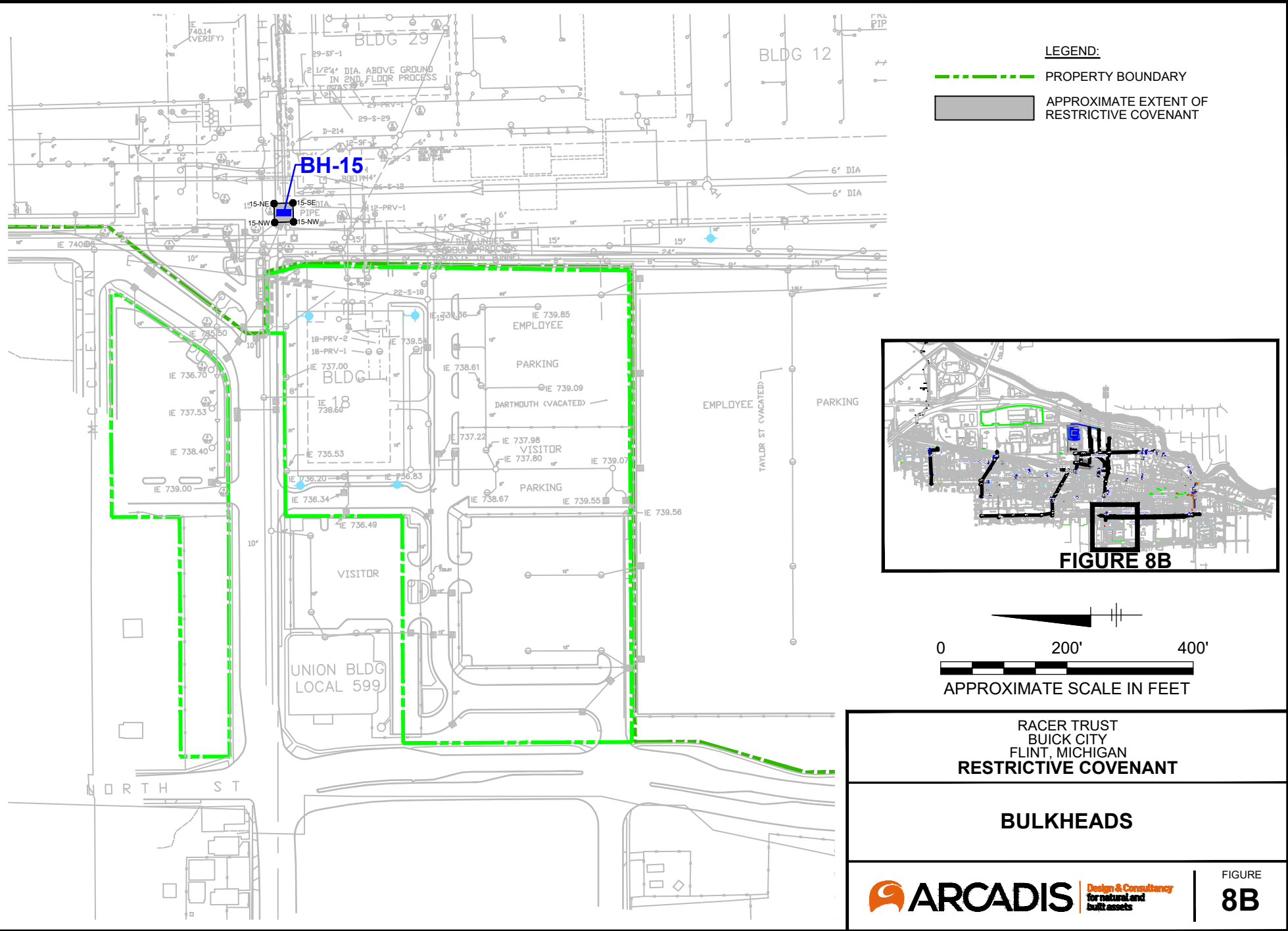
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- - - - - PROPERTY BOUNDARY
 - APPROXIMATE EXTENT OF RESTRICTIVE COVENANT

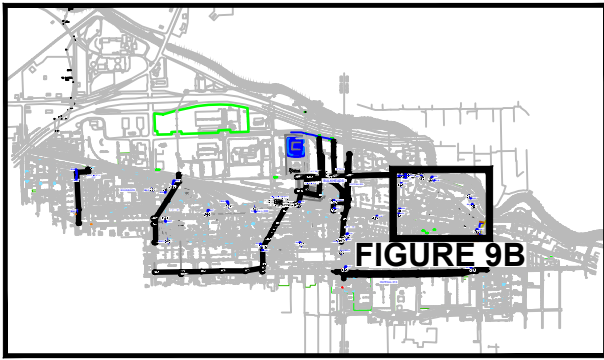
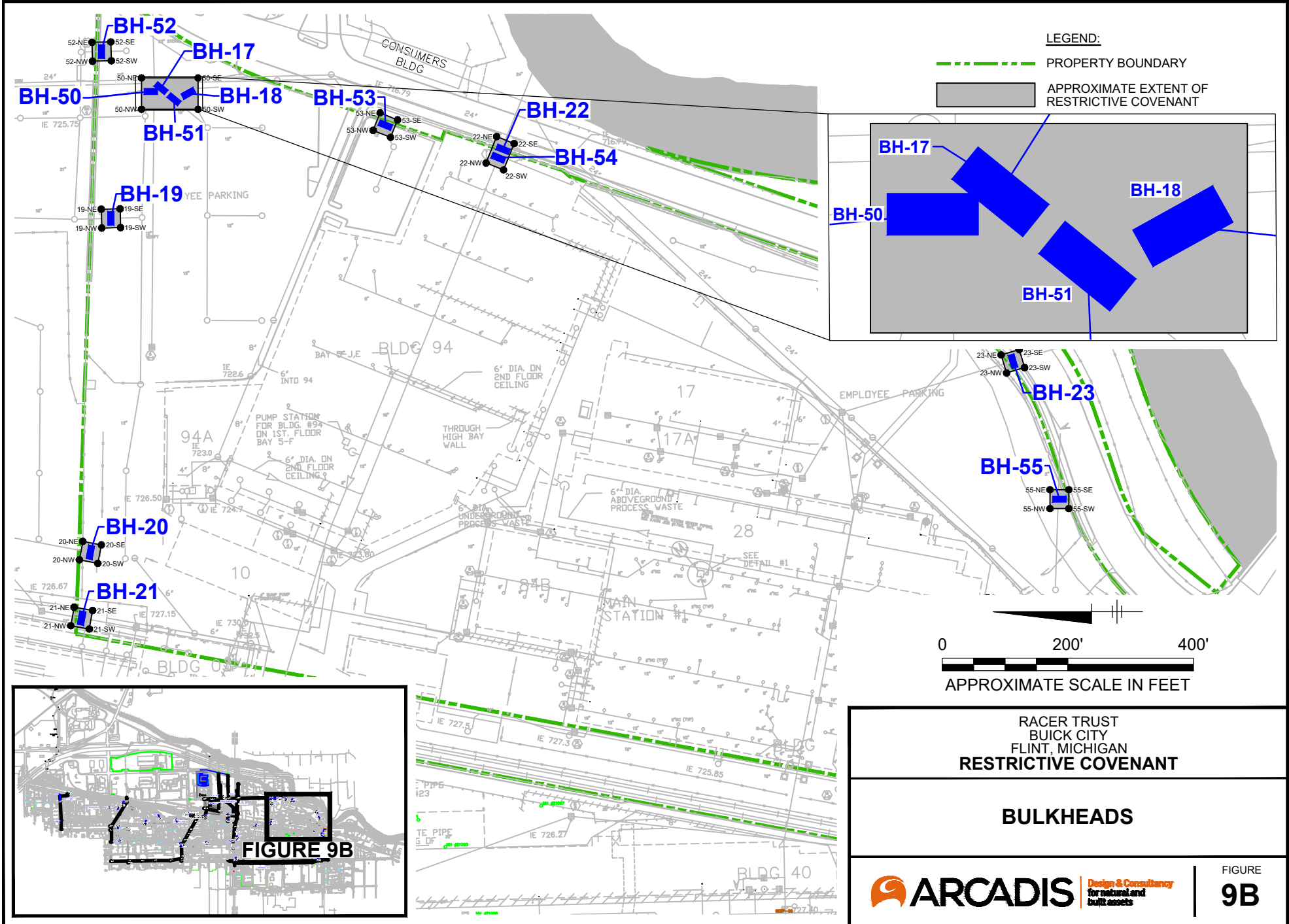


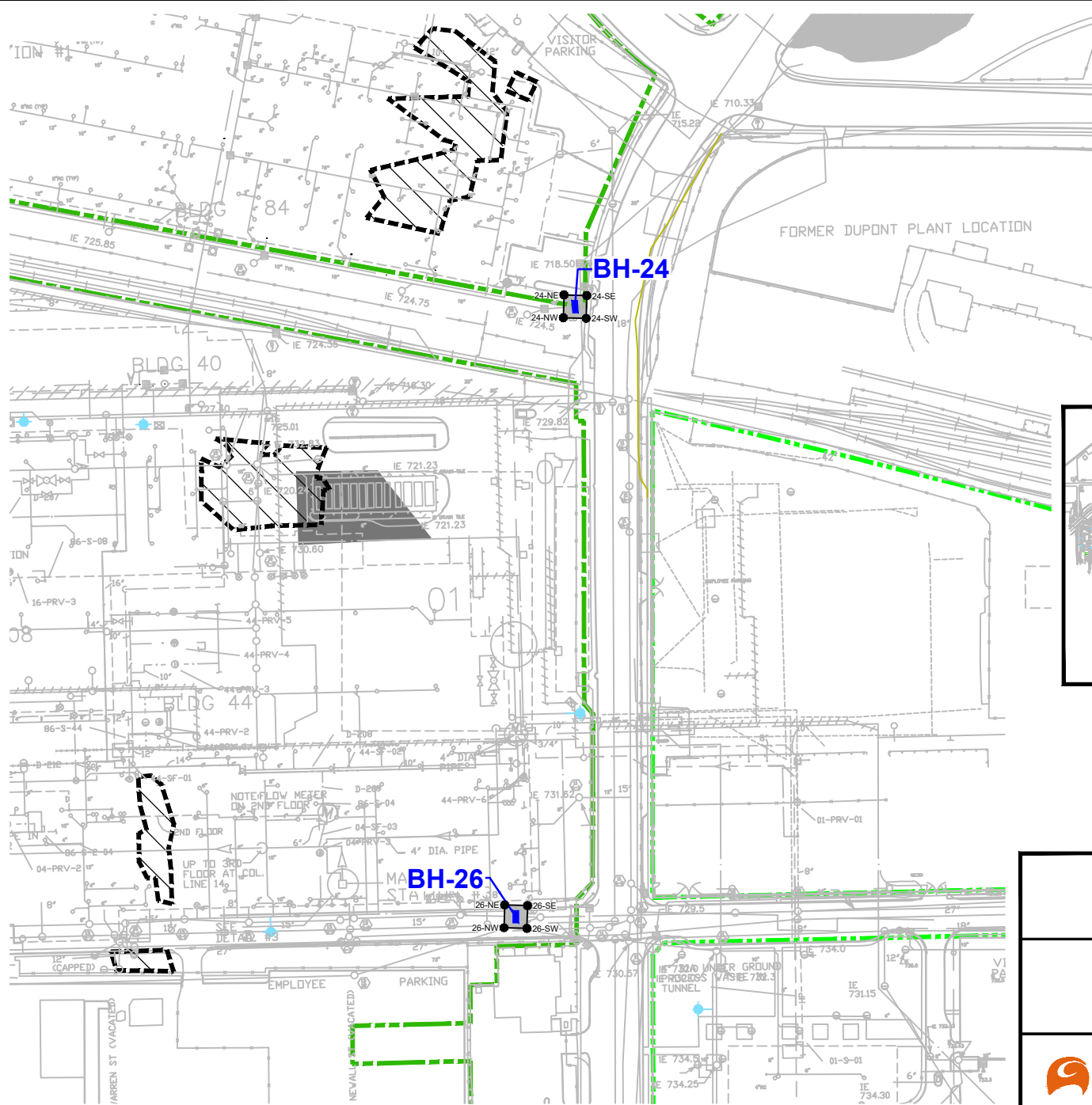
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RESTRICTIVE COVENANT



BULKHEADS

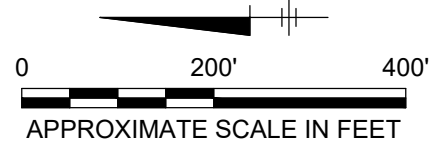
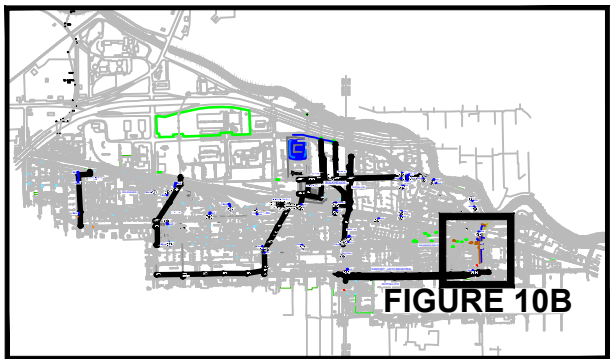
	Design & Consultancy for natural and built assets	FIGURE 7B
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LEGEND:
 PROPERTY BOUNDARY
 APPROXIMATE EXTENT OF RESTRICTIVE COVENANT



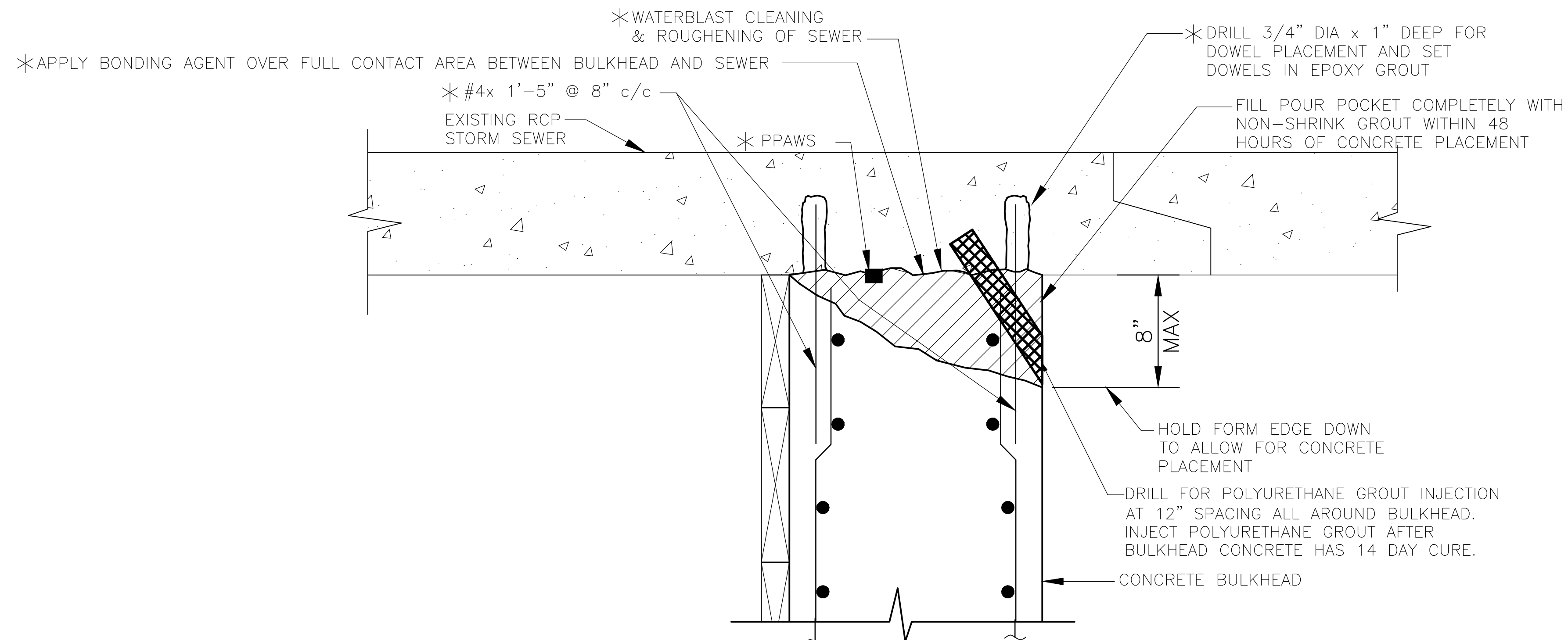
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BULKHEADS

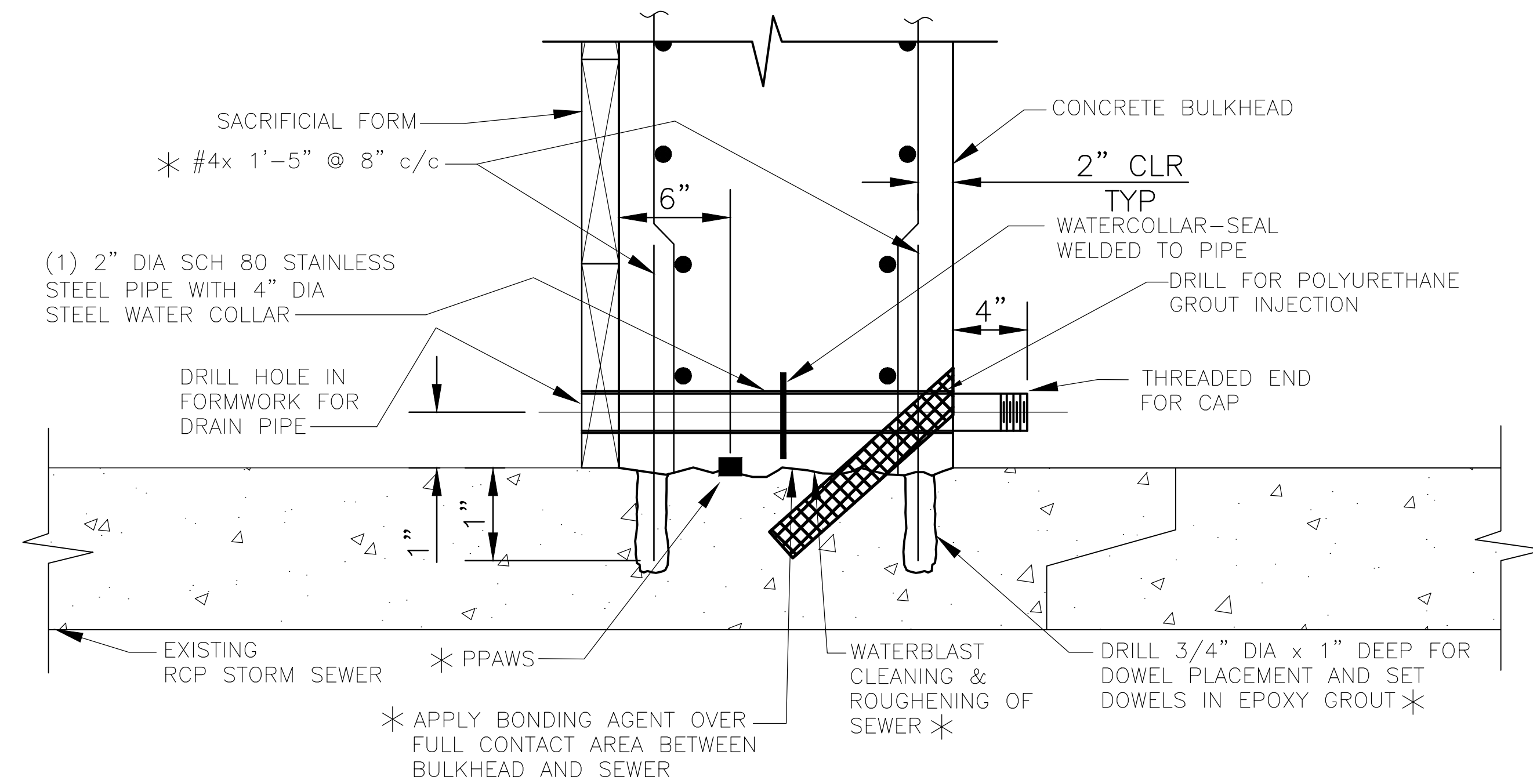
Attachment 2

Bulkhead Specifications

CITY: DIV/GRP: DB: LD: PIC: PM: TM: LYRON+;OFF=REF- Z:\ENVCAD\SYRACUSE\ACT\B0064410\2016\01901.dwg LAYOUT: 3B SAVED: 1/27/2017 1:01 PM ACADVER: 19.1 (LMS TECH) PAGES: 3B PLOTTED: 1/27/2017 1:09 PM BY: SANCHEZ, ADRIAN
 XREFS: IMAGES: PROJECTNAME: XBD-R-C-LD IMG: 0738.JPG



DETAIL B
1" = 1'-0"



DETAIL A
1" = 1'-0"

*FULL CIRCUMFERENCE OF BULKHEAD.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

NO.	DATE	REVISION	BY	CHKD

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Design Engineer	Client
Drawn	Checked
ELC	A.SANCHEZ
Project Manager	M. MAKI

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RCP BULKHEAD SECTION AND DETAILS

ARCADIS PROJECT NO. B0064410.2016.01901

DATE: JANUARY 2017

ARCADIS 28550 CABOT DRIVE SUITE 500 NOVI, MICHIGAN 48377 TEL: 248.994.2240

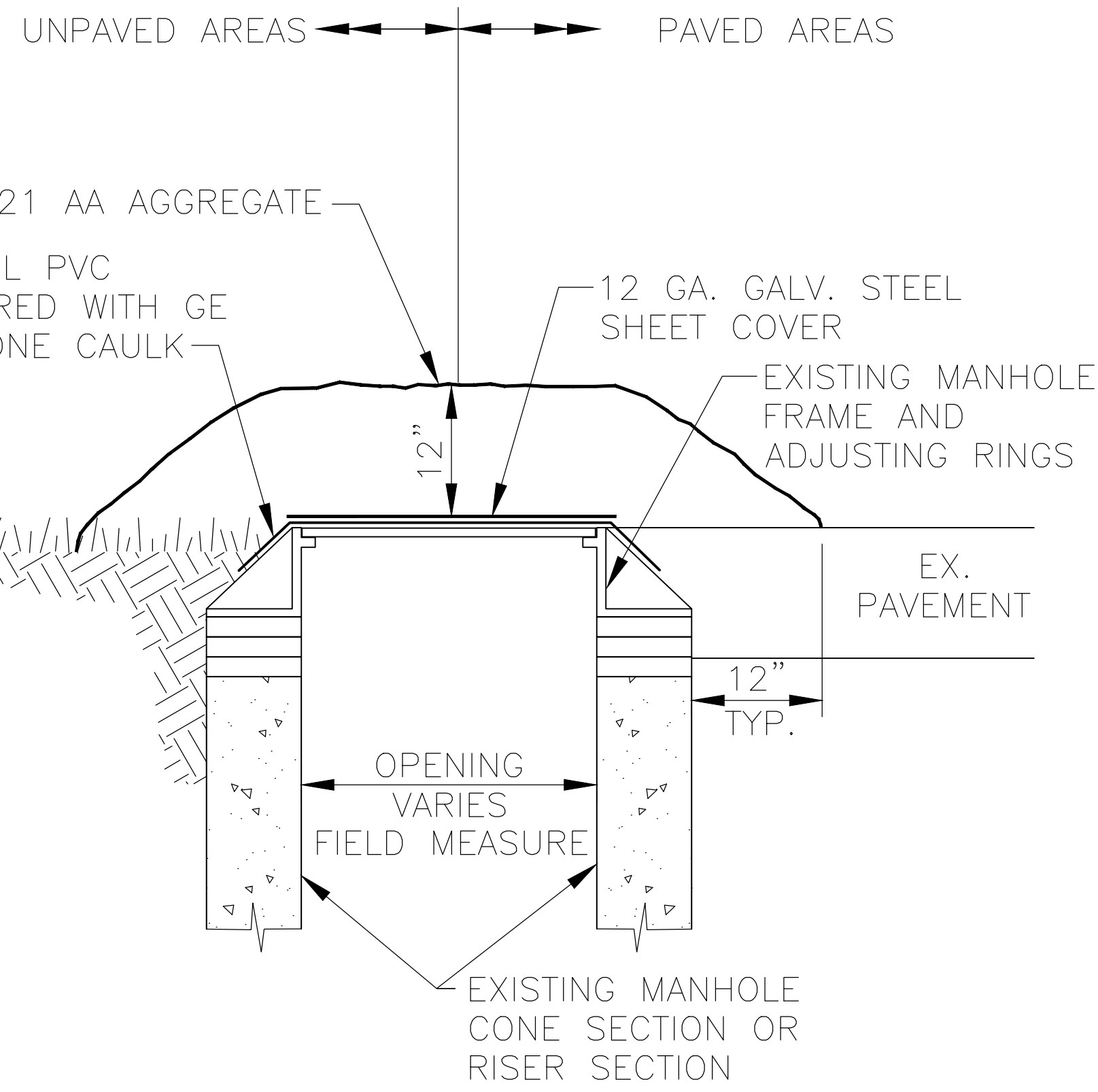
3B

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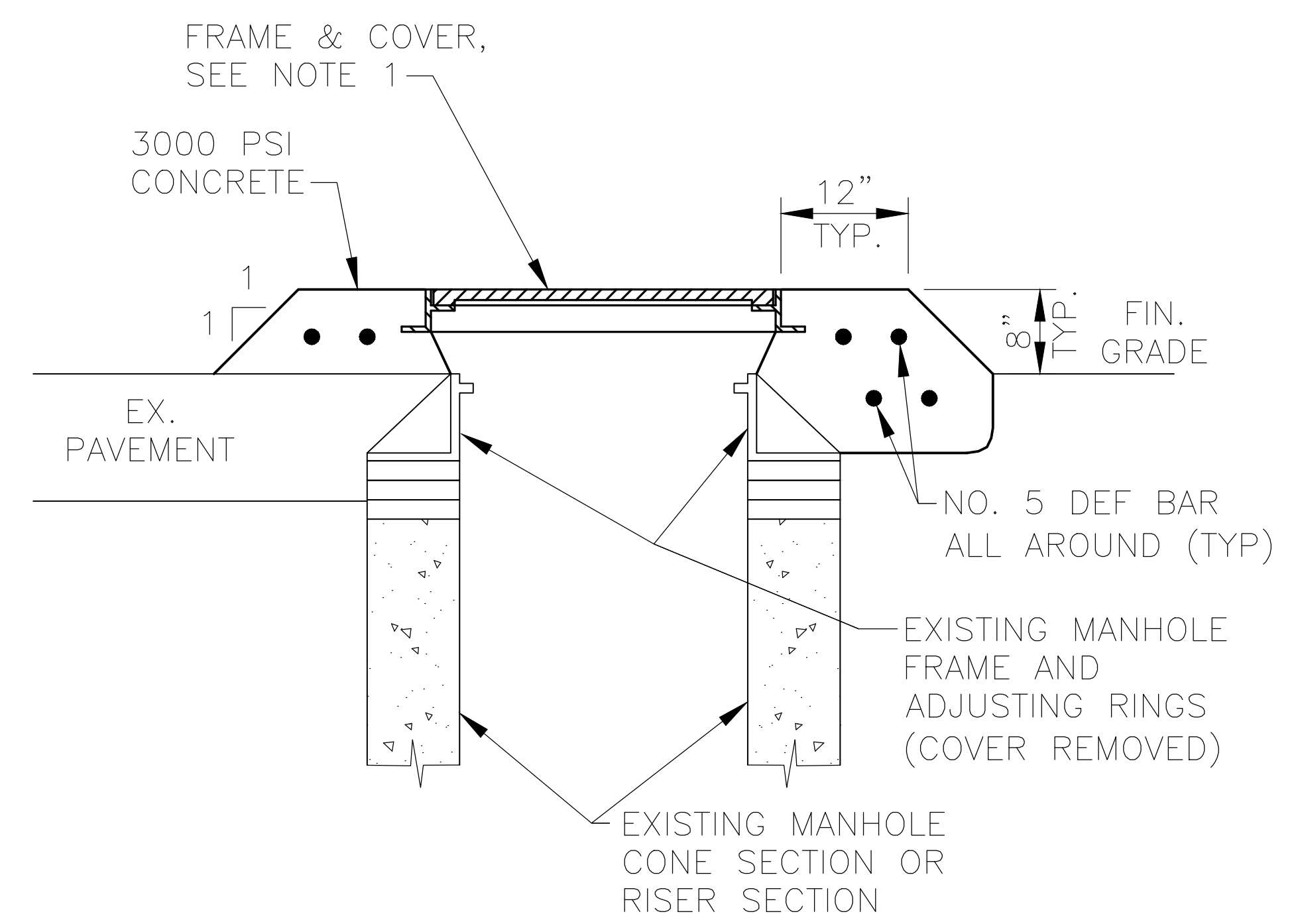


PROPOSED

1/2" = 1'-0"

MANHOLE CAP DETAIL "A"

NOTE 1:
EAST JORDAN IRON WORKS CAST IRON
FRAME W/ COMPOSITE COVER, 32" OPENING,
COM 1480 ASY



PROPOSED

1/2" = 1'-0"

MANHOLE CAP DETAIL "B"

REV.	ISSUED	DATE	DESCRIPTION

KEYPLAN

ARCADIS

ARCADIS G&M OF MICHIGAN, LLC
28550 CABOT DRIVE SUITE 500
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Tel: 248-994-2240 Fax: 248-994-2241
www.arcadis-us.com

RACER TRUST
BUICK CITY SITE
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PROJECT MANAGER
MICKI MAKI

DEPARTMENT MANAGER
-

LEAD DESIGN PROF.
ELC

CHECKED
ELC

SHEET TITLE
MANHOLE CAP DETAILS

TASK/PHASE NUMBER
01301

DRAWN BY
JAM

PROJECT NUMBER
B0064410.2013

DRAWING NUMBER
4

Attachment 3

Bulkhead Installation Photographs

Elimination of Catch Basin Drainage and Storm Sewer Connections



Example of lining installed under manhole cover, secured with silicone. Manhole cover reinstalled over lining.



Example of additional silicone applied over manhole, another liner installed, then covered with steel plate.



Example of steel plate then covered in gravel mound and marked for visibility.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Example of rebar support preparation with bulkhead back form frame to left.



Example of sealed back form and rebar supports installed.



Viewing form, rebar with water stop and flow through pipe from the front. Front side of form to be installed.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Example of grouted, sealed concrete with form removed. Flow through pipe still in place while additional curing occurs.



Example of sealed front form exterior with supports.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Example of plug on 24" line with flow through pipe still in place



Two sealed lateral plug locations prior to a disconnect.



Example of disconnect in line. Sewer line excavated, disconnected, temporarily plugged prior to sealing.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Sandbags installed inside pipe to block flow while bonding agent cures.



Water stop and adhesive added to back side of plug



Plug with additional bonding agent applied after adding grout and water stop

Elimination of Catch Basin Drainage and Storm Sewer Connections



Filled remaining section of pipe and disconnect void with concrete prior to backfilling.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Manhole with bentonite prior to pour



Partially full manhole with concrete, small pours conducted to streamline elimination of voids at smaller increments.

Elimination of Catch Basin Drainage and Storm Sewer Connections



Filled manhole (on left) to grade, prior to finishing, catch basin cover (on right).
Covers stored onsite at trailer.