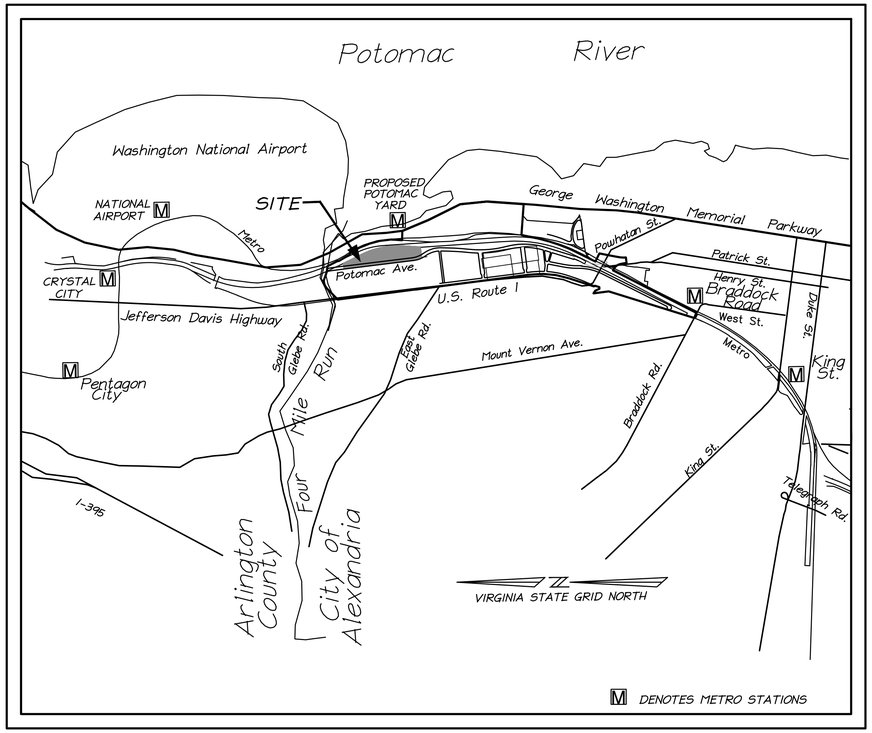
PROJECT NARRATIVE

THE PROPOSED REDEVELOPMENT IS AN URBAN, MIXED-USE DEVELOPMENT THAT WILL INCLUDE OFFICE, RESIDENTIAL, HOTEL, ENTERTAINMENT, RETAIL, ACADEMIC, AND RESTAURANT USES TO BE LOCATED WITHIN A NEW NETWORK OF STREETS AND OPEN SPACES. THE PROJECT WILL PROVIDE A NEW STREET NETWORK INCLUDING ENHANCED SIDEWALK AND STREETSCAPE, BICYCLE AND PEDESTRIAN INFRASTRUCTURE, AND OPEN SPACES THROUGHOUT THE PROJECT. THE REDEVELOPMENT WILL ALSO INCLUDE A WATER MANAGEMENT MASTER PLAN, ENVIRONMENTAL SUSTAINABILITY MASTER PLAN, AND A CONCEPTUAL DESIGN PLAN, TO BE SUBMITTED UNDER SEPARATE COVER. THIS DSP IS FOR THE DEVELOPMENT OF THE NEW STREET NETWORK.

PRELIMINARY DEVELOPMENT SITE PLAN
NORTH POTOMAC YARD
PHASE 1 INFRASTRUCTURE PLAN

ALEXANDRIA, VIRGINIA

VICINITY MAP
SCALE 1"= 2000'



DATE	REVISION
12-17-2020	FIRST SUBMISSION
03-17-2020	COMPLETENESS COMMENTS
04-06-2020	COMPLETENESS RESUBMISSION

PROFESSIONAL SEAL AND SIGNATURE

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

OWNER/APPLICANT
CPYR THEATER LLC
277 Park Avenue
36th Floor
New York. NY 10172
(212) 648-2129

DEVELOPMENT MANAGER
JBG SMITH
4747 Bethesda Avenue
Suite 200
Bethesda, MD 20814
(240) 333-3600

CIVIL ENGINEER
christopher consultants,ltd.
9900 Main Street
Fourth Floor
Fairfax, Virginia 22031
(703) 273-6820

MASTER PLANNER
Elkus Manfredi Architects
25 Drydock Avenue
Boston, Massachusetts 02210
(617) 426-1300

TRAFFIC ENGINEER
Kimley-Horn & Associates
11400 Commerce Park Drive
Suite 400
Reston, Virginia 22102
(703) 674-1300

ATTORNEY
Walsh, Colucci, Lubeley & Walsh
Courthouse Plaza
2200 Clarendon Boulevard
Suite 1300
Arlington, VA 22201-3359
(703) 528-4700

PUMP STATION ENGINEER
Gannett Fleming, Inc.
7133 Rutherford Road
Suite 300
Baltimore, Maryland 21244
(410) 907-2684

LIST OF EXISTING APPROVALS:

- MASTER PLAN AMENDMENT #2019-00008
- REZONING #2009-0001
- CDD CONCEPTUAL DESIGN PLAN #2009-0001
- TRANSPORTATION MANAGEMENT PLAN SUP #2009-0061

LIST OF REQUESTED SITE PLANS AND AMENDMENTS:

- CDD CONCEPTUAL DESIGN PLAN AMENDMENT
- DSUP WITH PRELIMINARY SITE PLAN FOR PUMP STATION
- DSP WITH PRELIMINARY INFRASTRUCTURE SITE PLAN

SHEET INDEX

C100	COVER SHEET
C101	NOTES & TABULATIONS
C102	CONTEXTUAL PLAN
C102.1-C102.2	PUBLIC VS. PRIVATE ROAD EXHIBIT
C103	CONTAMINATED SOILS EXHIBIT
C104	PHASING EXHIBIT
C200	OVERALL EXISTING CONDITIONS & KEY PLAN
C201-C203	EXISTING CONDITIONS PLAN
C300-C302	SITE PLAN
C400-C402	UTILITY PLAN
C500-C502	GRADING PLAN
C600	PRE VS. POST DEVELOPMENT IMPERVIOUS
C601	SWM COMPUTATIONS AND NARRATIVES
C602	BMP DETAILS AND NARRATIVES
C603 - C605	SWM-BMP PLAN
C606-C607	BMP COMPUTATIONS
C700	SANITARY SEWER PLAN
C701	ONSITE SANITARY SEWER COMPUTATIONS
C702	OFFSITE SANITARY SEWER COMPUTATIONS PHASE I
C703	EXISTING 30" SANITARY TRUNK SEWER EXHIBIT
C800 - C804	SIGHT DISTANCE PLAN & PROFILE
C900-C904	TURNING MOVEMENTS
A1	PHASE I OPEN SPACE PLAN
A2	PHASE I INTERIM TRANSPORTATION PLAN
P-1	PUMP STATION GRADE LEVEL PLAN
P-2	PUMP STATION LOWER LEVEL PLAN
P-3	PUMP STATION SECTION
P-4	PUMP STATION SECTION
E-1	POWER ONE LINE DIAGRAM

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ DIRECTOR _____ DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ DIRECTOR _____ DATE

_____ CHAIRMAN, PLANNING COMMISSION _____ DATE

DATE RECORDED _____

_____ INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO.

SHEET: C100

109639

ZONING TABULATIONS

SITE ADDRESSES & TAX MAP NUMBERS:	016.02-01-03 (3601 POTOMAC AVENUE)
EXISTING ZONE:	COORDINATED DEVELOPMENT DISTRICT #19 (CDD)
PROPOSED ZONE:	COORDINATED DEVELOPMENT DISTRICT #19 (CDD)
SMALL AREA PLAN DISTRICT:	NORTH POTOMAC YARD
EXISTING SITE AREA:	817,853 S.F. OR 18.77 AC.
EXISTING USE:	THEATER
PROPOSED USE:	OFFICE, RESIDENTIAL, HOTEL, ENTERTAINMENT, RETAIL, ACADEMIC AND RESTAURANT
PROPOSED SITE AREA:	818,057 S.F. OR 18.78 AC.
APPROXIMATE TOTAL AREA DISTURBED:	1,001,269 S.F. OR 22.99 AC.
EX. IMPERVIOUS AREA:	294,466 S.F. OR 6.76 AC.
PR. IMPERVIOUS AREA:	169,448 S.F. OR 3.89 AC.
EXISTING AVG. DAILY TRIPS:	1,335 TRIPS
PROPOSED AVG. DAILY TRIPS:	N/A
OPEN SPACE REQUIRED: (GROUND LEVEL)	15% GROUND LEVEL 2.81 AC. OR 122,678 SF
OPEN SPACE PROVIDED: (GROUND LEVEL)	6.73 AC. OR 293,100 SF (REFER TO SHEET A1 FOR LOCATION OF OPEN SPACE)

GENERAL NOTES

1. THE BOUNDARY SURVEY WAS PREPARED BY christopher consultants.
2. THE TOPOGRAPHIC SURVEY WAS OBTAINED FROM AN AERIAL SURVEY AND SUPPLEMENTED WITH FIELD TOPO DATED 10-11-19.
3. THE SITE IS CURRENTLY DEVELOPED AS THE POTOMAC YARD CENTER. THERE ARE NO NATURAL FEATURES ON THE SITE THAT NEED TO BE PRESERVED OR PROTECTED. THERE IS A RESOURCE PROTECTION AREA (RPA) BUFFER ADJACENT TO THE OFFSITE FOUR MILE RUN. AREAS OF THE RPA LINE ON THIS SITE ARE NOT IN THEIR NATURAL STATE. MODIFICATIONS TO THIS AREA WILL BE IN ACCORDANCE WITH CURRENT CITY OF ALEXANDRIA REQUIREMENTS FOR REDEVELOPMENT WITHIN THE RPA.
4. ANY POTENTIAL NEGATIVE IMPACT ON ADJOINING PROPERTIES BY THIS PROPOSED PROJECT WILL BE MITIGATED BY PROVIDING ADEQUATE PUBLIC INFRASTRUCTURE, MINIMIZING TRAFFIC IMPACTS AND PRESERVING THE RESOURCE PROTECTION AREA.
5. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO MARINE CLAYS ON SITE.
6. TO THE BEST OF OUR KNOWLEDGE CONTAMINATED SOIL MAY INCLUDE ARSENIC WITH ZONES OF ELEVATED PETROLEUM COMPOUNDS AND/OR LEAD. SEE SHEET C103 FOR CONTAMINATED SOILS EXHIBIT.
7. FINAL STREET LIGHT FIXTURES TO BE DETERMINED WITH THE FINAL INFRASTRUCTURE PLAN.

UTILITY CONTACTS:

WASHINGTON GAS

MR. PAT ESTRADA-PALMA
6801 INDUSTRIAL ROAD
SPRINGFIELD, VA 22151
(703) 750-4289

VERIZON

MR. STEVE H PURYEAR, SUPERVISOR-ENGINEERING
2980 FAIRVIEW PARK DRIVE, 6TH FLOOR
FALLS CHURCH, VA 22042
(703) 204-5072

DOMINION VIRGINIA POWER

MR. KEN HOLMES
907 WEST GLEBE ROAD.
ALEXANDRIA, VA 22305
(703) 838-2478

VIRGINIA AMERICAN WATER COMPANY

STEVEN CHEN
2225 DUKE STREET
ALEXANDRIA, VA 22314
(703) 706-3863

COMCAST CABLE

MR. GUSTAVO CATELLON
2707 WILSON BLVD.
ARLINGTON, VA 22201
(703) 926-0534

CITY OF ALEXANDRIA DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES

301 KING STREET, ROOM 4100
ALEXANDRIA, VA 22314
(703) 746-4025

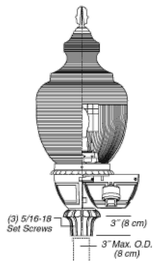
ARCHAEOLOGY NOTES

1. THE FINAL SITE PLAN, GRADING PLAN, OR ANY OTHER PERMITS INVOLVING GROUND-DISTURBING ACTIVITIES (SUCH AS CORING, GRADING, FILLING, VEGETATION REMOVAL, UNDERGROUNDING UTILITIES, PILE DRIVING, LANDSCAPING AND OTHER EXCAVATIONS AS DEFINED IN SECTION 2-151 OF THE ZONING ORDINANCE) SHALL NOT BE RELEASED UNTIL THE CITY ARCHAEOLOGIST CONFIRMS THAT ALL ARCHAEOLOGICAL FIELD WORK HAS BEEN COMPLETED OR THAT AN APPROVED RESOURCE MANAGEMENT PLAN IS IN PLACE TO RECOVER SIGNIFICANT RESOURCES IN CONCERT WITH CONSTRUCTION ACTIVITIES. TO CONFIRM, CALL ALEXANDRIA ARCHAEOLOGY AT (703) 746-4399.
2. CALL ALEXANDRIA ARCHAEOLOGY (703-746-4399) TWO WEEKS BEFORE THE STARTING DATE OF ANY GROUND DISTURBANCE SO THAT AN INSPECTION OR MONITORING SCHEDULE FOR THE CITY ARCHAEOLOGISTS CAN BE ARRANGED.
3. THE APPLICANT / DEVELOPER SHALL CALL ALEXANDRIA ARCHAEOLOGY IMMEDIATELY (703-746-4399) IF ANY BURIED STRUCTURAL REMAINS (WALL FOUNDATIONS, WELLS, PRIVIES, CISTERNS, ETC.) OR CONCENTRATIONS OF ARTIFACTS ARE DISCOVERED DURING DEVELOPMENT. WORK MUST CEASE IN THE AREA OF THE DISCOVERY UNTIL A CITY ARCHAEOLOGIST COMES TO THE SITE AND RECORDS THE FINDS.
4. THE APPLICANT / DEVELOPER SHALL NOT ALLOW ANY METAL DETECTION AND/OR ARTIFACT COLLECTION TO BE CONDUCTED ON THE PROPERTY, UNLESS AUTHORIZED BY ALEXANDRIA ARCHEOLOGY. FAILURE TO COMPLY SHALL RESULT IN PROJECT DELAYS.

Refractive (R54) Specification Sheet

Project Name: | Location: | MFG: Philips Hadco

Fixture Type: | Catalog No.: | Qty:



Ordering Guide

Example: R54 A A B A 1 A D B D 70H E

Product Code	R54	Refractive	
Fitter/Pod	A	Octagonal Style	
	B	Round fitter w/ scalloped petals	
	C	Fluted tapered hourglass	
	D	Smooth tapered hourglass	
	E	Tapered fluted w/ scalloped petals	
	F	Short round fluted	
	G	Tall round fluted	
	H	Round contemporary	
	J	Tapered Fluted w/ round stepped fitter	
	L	Round fluted long	
	T	Decorative Leaf w/ scalloped petals	
Roof	A	Victorian	
	B	Acorn	
	C	Tall	
	D	Short	
	G	Adams	
Cage / Band	B	Cage for Wide Body Globe	*1
	E	Band for Wide Body Globe	
	F	Band for Wide Body Globe	
	G	Cage for Wide Body Globe	*1
	I	Cage for Wide Body Globe	*1
	J	Cage for Wide Body Globe	*1
	N	None	
Finial	A	A Finial	
	B	B Finial	
	C	C Finial	*2
	D	D Finial	*2
	E	E Finial	*2
	F	F Finial	
	G	G Finial	
	H	H Finial	
	N	None	
Fasteners	1	Hex Head	
	2	Allen Head	
Finish	A	Black	
	B	White	
	G	Verde	
	H	Bronze	
	J	Green	
Reflector	D	Small Top Reflector	
	F	Small top reflector w/House-side shield	
	G	Full Top Reflector w/House-side shield	
	H	House Side Shield	
	L	Internal Louver Assembly	*3
	T	Full Top Reflector	
	N	None	
Photo Control	B	Button Eye Photo Control	
	H	Twist-lock Receptacle	*4
	N	None	
Socket	M	Medium	*5
	G	Mogul	*5
	R	Induction	*6
Wattage	70H	70W MH	
	100H	100W MH	
	150H	150W PMH	
	250H	250W PMH	*7
	320H	320W PMH	
	50S	50W HPS	
	70S	70W HPS	
	100S	100W HPS	
	150S	150W HPS	

TYPE IV

TYPE V

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Refractive (R54) Specification Sheet

Project Name: | Location: | MFG: Philips Hadco

Fixture Type: | Catalog No.: | Qty:

	200S	200W HPS	*7
	250S	250W HPS	*7
	310S	310W HPS	*7
	55R	55W Induction	*8
	85R	85W Induction	*8
	165R	165W Induction	*8
Voltage	E	120V	
	F	208V	
	G	240V	
	H	277V	
	K	347V	*8

*1 Not available with (A) pod.
*2 Cannot be used with (B) roof.
*3 Cannot be used with Induction Lamping.
*4 Twistlock photocell receptacle (R) is available in (A), (G), (H), and (J) pod up to 150W HPS and 200W MH. Pods (B), (L), and (T) available in all wattages. Not available in other pods.
*5 Medium base (D) socket available for 70W-175W MH, 50W-150W HPS. Mogul base (G) socket available for 150W-320W MH, 50W-310W HPS.
*6 Consult factory if ordering Induction socket (R) and wattages.
*7 Available in (A), (B), (E), (G), (H), (L), and (T) pods.
*8 347V (K) not available for (200S).

Specifications

HOUSING:

OPTIONAL PODS:

A: Octagonal style fitter is constructed of die-cast 360 aluminum alloy with bottom-hinged door providing 135o entry into the fitter assembly for easy access to the electrical components. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle (available for 200W MH max or 150W HPS max) or optional button eye photocell. Easy access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 10-3/4" and width is 10-1/4". Finish is polyester thermoset powdercoat.

B: Round fitter with scalloped petals is constructed of die-cast 360 aluminum alloy with side-hinged door providing 180o entry into the fitter assembly for easy access to the electrical components. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle or optional button eye photocell. Easy access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 12-1/4" and width is 11-1/2". Finish is polyester thermoset powdercoat.

C: Fluted tapered hourglass fitter is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Accepts standard HADCO Twistlock ballast assemblies up to 150W HPS or 200W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal button eye photocell. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 8" and width is 8-3/4". Finish is polyester thermoset powdercoat.

D: Smooth tapered hourglass fitter is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Accepts standard HADCO Twistlock ballast assemblies up to 150W HPS or 200W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal button eye photocell. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 8" and width is 9-1/4". Finish is polyester thermoset powdercoat.

E: Tapered fluted fitter with scalloped flower petals is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal button eye photocell. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 10" and width is 11-1/2". Finish is polyester thermoset powdercoat.

F: Short Round fluted fitter is constructed of die-cast 360 aluminum alloy. Accepts standard HADCO Twistlock ballast assemblies up to 150W HPS or 200W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal button eye photocell. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 7-1/2" and width is 9-1/4". Finish is polyester thermoset powdercoat.

G: Tall Round fluted fitter is constructed of die-cast 360 aluminum alloy with removable door providing entry into the fitter assembly for easy access to the electrical components. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal button eye photocell. Easy access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or

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Refractive (R54) Specification Sheet

Project Name: | Location: | MFG: Philips Hadco

Fixture Type: | Catalog No.: | Qty:

Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 9" and width is 9". Finish is polyester thermoset powdercoat.

H: Round contemporary fitter is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle (available for 200W MH max or 150W HPS max) or optional button eye photocell. Easy access to photocell through tool-less door on pod. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 10" and width is 10". Finish is polyester thermoset powdercoat.

J: Tapered fluted fitter with round stepped fitter is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Accepts standard HADCO Twistlock ballast assemblies up to 250W HPS or 250W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle. Tool-less access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes six 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 14" and width is 10". Finish is polyester thermoset powdercoat.

L: Round fluted long fitter is constructed of 356 HM High-Strength, Low-Copper cast aluminum with a side-hinged door providing entry into the fitter assembly for easy access to the electrical components. Accepts standard Hadco Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle or button eye photocell. Tool-less access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes three 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering the ballast compartment. Globe is attached using four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). Pod height is 12-1/2" and width is 10-3/4". Finish is polyester thermoset powdercoat.

T: Decorative Leaf fitter with scalloped petals is constructed of 356 HM High-Strength, Low-Copper cast aluminum with side-hinged door providing 180o entry into the fitter assembly for easy access to the electrical components. Accepts standard HADCO Twistlock ballast assemblies up to 310W HPS or 320W MH. Wiring block to accept three #8 solid or stranded wires. Optional internal twist-lock photo eye receptacle or optional button eye photocell. Easy access to photo eye through the door on the pod. Heavy cast aluminum post fitter utilizes four 5/16-18 black cadmium stainless steel set screws (Hex head or Allen head as specified) for mounting to 3" O.D. post tenon. Globe holder has an internal water trap to prevent water from entering ballast compartment. Globe is held by utilizing four 5/16-18 black cadmium stainless steel fasteners (Hex head or Allen head as specified). All hardware to be stainless steel and captive. Pod height is 15-1/4" and width is 11-1/2". Finish is polyester thermoset powdercoat.

ROOF:

A: Victorian style roof is clear injection molded U.V. stabilized acrylic with 99 horizontal prisms for a soft, even glow. 13" height and 16-1/2" width. The roof and bottom globe sections are secured in a slip-fit, 1/2" overlap design and use four #10-24 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock and enabling easy future replacement of either the roof or bottom globe section if required.

B: Acorn style roof is clear injection molded U.V. stabilized acrylic with 74 horizontal prisms for a soft, even glow. 9-1/2" height and 16-3/4" width. The roof and bottom globe sections are secured in a slip-fit, 1/2" overlap design and use four #10-24 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock and enabling easy future replacement of either the roof or bottom globe section if required.

C: Roof is 0.060" thick spun aluminum. 12" height and 17" width. The roof and bottom globe sections are secured in a slip-fit, 1/2" overlap design and use four #10-24 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock and enabling easy future replacement of either the roof or bottom globe section if required. Finish is polyester thermoset powdercoat.

D: Roof is 0.090" thick spun aluminum. 8-1/2" height and 16-1/2" width. The roof and bottom globe sections are secured in a slip-fit, 1/2" overlap design and use four #10-24 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock and enabling easy future replacement of either the roof or bottom globe section if required. Finish is polyester thermoset powdercoat.

G: Roof is 0.080" thick spun aluminum. 10-1/2" height and 16-3/4" width. The roof and bottom globe sections are secured in a slip-fit, 1/2" overlap design and use four #10-24 stainless steel pan head screws with four aluminum nutserts providing a mechanical lock and enabling easy future replacement of either the roof or bottom globe section if required. Finish is polyester thermoset powdercoat.

CAGES AND BANDS:

B: Cage for Wide body globes (16-1/2" dia.) is constructed of die-cast 360 aluminum alloy. Cage has 4 legs each with square decorative flower block. Solid rectangular band around top of cage. Height of cage is 15" and width of cage is 20". Finish is polyester thermoset powdercoat. (NOTE: Cannot be used with "A" Pod.)

E: Band for Wide body globes (16-1/2" dia.) is architectural slotted aluminum. Supported at 4 points by cast aluminum square flower blocks. Finish is polyester thermoset powdercoat.

F: Band for Wide body globes (16-1/2" dia.) is architectural slotted aluminum supported at 4 points by cast aluminum round flower blocks. Finish is polyester thermoset powdercoat.

G: Cage for Wide body globes (16-1/2" dia.) is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Arched, decorative legs are welded to form a one-piece unit. Height of cage is 13" and width of cage is 18-1/2". Finish is polyester thermoset powdercoat. (NOTE: Cannot be used with "A" Pod.)

I: Cage for Wide body globes (16-1/2" dia.) is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Cage has 2 curved legs. Solid fluted band around top of cage. Height of cage is 14-1/2" and width of cage is 19-3/4". Finish is polyester thermoset powdercoat. (NOTE: Cannot be used with "A" Pod.)

J: Cage for Wide body globes (16-1/2" dia.) is constructed of 356 HM High-Strength, Low-Copper cast aluminum. Cage has 4 curved legs. Solid fluted band around top of cage. Height of cage is 14-1/2" and width of cage is 19-3/4". Finish is polyester thermoset powdercoat. (NOTE: Cannot be used with "A" Pod.)

FINIALS:

All finials are cast aluminum mounted with 1/4-20 stainless steel threaded studs. Standard finial finish will match fixture finish as specified. Finish is thermoset powdercoat. (NOTE: C, D, and E finials are not available with "B" Roof.)

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Refractive (R54) Specification Sheet

Project Name: | Location: | MFG: Philips Hadco

Fixture Type: | Catalog No.: | Qty:

FASTENERS:
Used to secure post fitter to post tenon and globe to globe holder.
1: Hex Head Bolts: Black cadmium stainless steel.
2: Allen Head Bolts: Black cadmium stainless steel.

FINISH:
Thermoset polyester powdercoat is electrostatically applied after a five-stage conversion cleaning process and bonded by heat fusion thermosetting. Laboratory tested for superior weatherability and fade resistance in accordance with ASTM B117 specifications. For larger projects where a custom color is required, contact the factory for more information.

OPTICAL ASSEMBLY:
GLOBE AND OPTICAL ASSEMBLY:
Type V Wide body globe is constructed of clear injection-molded U.V. stabilized acrylic. A two-piece (Globe and Roof) slip-fit, 1/2" overlap, design utilizes nutserts and stainless steel fasteners, which eliminates a "butt-glue" seam appearance. The optical section of the globe has a neck opening of 7-3/8" and an outside neck diameter of 8". Globe (less the roof) has a 12-7/8" height and 16-3/4" width at the top with 98 horizontal prisms and 360 highly polished vertical prisms.

REFLECTORS AVAILABLE:

D: Small Top Reflector: Top reflector is 0.04" thick #3003 aluminum alloy. Diameter is 6-1/2" and Height is 3". Precision formed, highly polished specular aluminum finish. Mounted horizontally to control uplight. Tool-less attachment of reflector bracket to socket with stainless steel spring clip.

F: Small Top Reflector with House Side Shield: Top reflector is 0.04" thick #3003 aluminum alloy. Diameter is 6-1/2" and Height is 3". Side reflector is 0.02" thick. Precision formed, highly polished specular aluminum finish. Top is mounted horizontally to control uplight while house-side shield is mounted vertically to control backlight. Tool-less attachment of reflector bracket to socket with stainless steel spring clip. Rotatable 360 degrees.

G: Top Reflector with House Side Shield: Top reflector is 0.04" thick hydroformed aluminum with a clear anodized highly specular finish. Diameter is 14-1/4" and Height is 6-1/4". Reflector rests on top internal prism wall of the bottom globe section to control uplight. House-side reflector is 0.02" thick aluminum alloy. Presicion formed highly polished specular aluminum finish. Mounted vertically to control backlight. Tool-less attachment of reflector bracket to socket with stainless steel spring clip. Rotatable 360 degrees.

H: House-Side Shield: House-side reflector is 0.02" thick aluminum alloy. Presicion formed highly polished specular aluminum finish. Mounted vertically to control backlight. Tool-less attachment of reflector bracket to socket with stainless steel spring clip. Rotatable 360 degrees.

L: Internal Louver Assembly: Optically designed,0.05" thick highly polished, specular Alzak® aluminum, internal louvers. Tool-less attachment of reflector bracket to socket with stainless steel spring clip. Rotatable 360 degrees. (NOTE: cannot be used with Induction Lamping.)

T: Top Reflector: Top reflector is 0.04" thick hydroformed aluminum with a clear anodized highly specular finish. Diameter is 14-1/4" and Height is 6-1/4". Reflector rests on top internal prism wall of the bottom globe section to control uplight.

ELECTRICAL ASSEMBLY:
Twistlock Ballast Assembly with Quick Disconnects for easy maintenance. Ballasts are HPF core and coil. 4kv rated mogul base porcelain socket. Nickel-plated screw shell with center contact. 4kv rated porcelain mini-can base. Nickel-plated screw shell with center contact. Consult factory if ordering Induction Lamping and Power Coupler.

BALLAST:
All HID ballasts are core and coil and regulated with power factors better than 90% (HPF). Ballast provides +/- 5% lamp power regulation with +/- 10% input voltage regulation. Ballasts are factory pre-wired and tested. Metal halide ballasts are capable of starting at -20° F or -30° C and HPS at -40°F or -40°C. NOTE: All ballasts are EISA / Title 20 / Title 24 compliant where applicable.

CERTIFICATIONS:
ETL Listed to U.S. safety standards for wet locations. cETL listed to Canadian safety standards for wet locations. Manufactured to ISO 9001:2008 Standards.

WARRANTY:
Three-year limited warranty.

Max. EPA:
2.20 sq. Ft. (Varies depending on options selected

Max. Weight:
50 lbs

IESNA Classifications:
Semi Cutoff: with C and D roof and/or G or T refl

ISO 9001:2008 Registered — Page 4 of 4

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LEGEND

- :EX. INDEX CONTOUR MAJOR (260)
- :EX. INT. CONTOUR MINOR (258)
- :PROPOSED INDEX CONTOUR MAJOR (260)
- :PROPOSED INT. CONTOUR MINOR (258)
- :EX. PROPERTY LINE
- :PROP. RIGHT-OF-WAY
- :PROP. ROAD CENTERLINE
- :PROP. CURB
- :PROP. EDGE OF PAVEMENT
- :EX. ADJACENT PROPERTY LINE
- : EX. TREE LINE
- : EX. CURB & GUTTER
- : EX. FENCE
- : EX. LIGHT
- : EX. ELECTRIC (E)
- : EX. WATERLINE
- : EX. STORM SEWER
- : EX. TELECOM (T)
- : EX. SANITARY FORCE MAIN (FM)
- : EX. SANITARY SEWER
- : EX. STORM MANHOLE (D)
- : EX. SANITARY MANHOLE (S)
- :PROP. PARKING SPACES (4)
- : PROPOSED STORM SEWER
- : PROPOSED SANITARY SEWER
- : PROPOSED WATER LINE
- : PROPOSED GAS LINE (G)
- : PROPOSED ELECTRIC LINE
- *F.H.* : PROPOSED FIRE HYDRANT
- : PROPOSED STREET LIGHT
- :ACCESSIBLE CURB RAMP
- :PROPOSED STORM STRUCTURE NUMBER (5)
- *12" Concrete Pipe* :PROPOSED STORM LABEL
- :PROPOSED STORM MANHOLE
- :PROPOSED SANITARY SEWER STRUCTURE NUMBER (S 8)
- *8" PVC SDR-26* :PROPOSED SANITARY SEWER LABEL
- :PROPOSED SANITARY SEWER MANHOLE
- TBV :TO BE VACATED
- TBR :TO BE REMOVED
- :EX. TREE (1234 = 11.22) — 1234 = ID NUMBER, 11.22 = ELEVATION

NOTE

AN ALTERNATE LIGHT FIXTURE WILL BE DETERMINED AT FINAL SITE PLAN.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

DIRECTOR *DATE*

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

DIRECTOR *DATE*

CHAIRMAN, PLANNING COMMISSION *DATE*

DATE RECORDED _____

INSTRUMENT NO. *DEED BOOK NO.* *PAGE NO.*

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engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

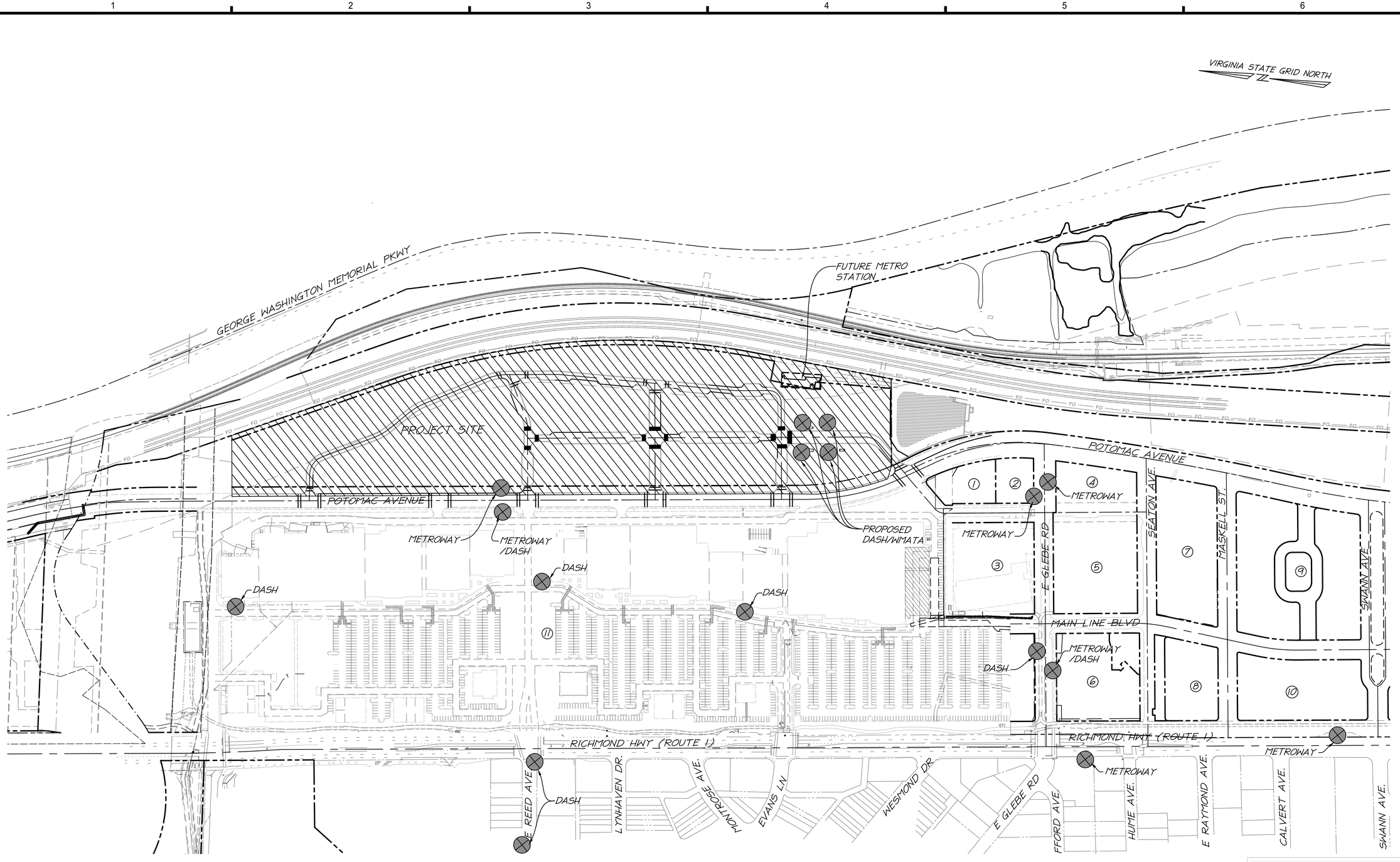
SHEET TITLE:

NOTES AND TABULATIONS

SHEET No.

C101

109639



NOTE:
ALL BUS STOPS SHOWN ARE EXISTING UNLESS OTHERWISE NOTED.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
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DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
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NORTH POTOMAC YARD
PHASE 1 INFRASTRUCTURE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

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1	12/17/2019	FIRST SUBMISSION
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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2019-12-17
DESIGN: JLH
DRAWN: MM
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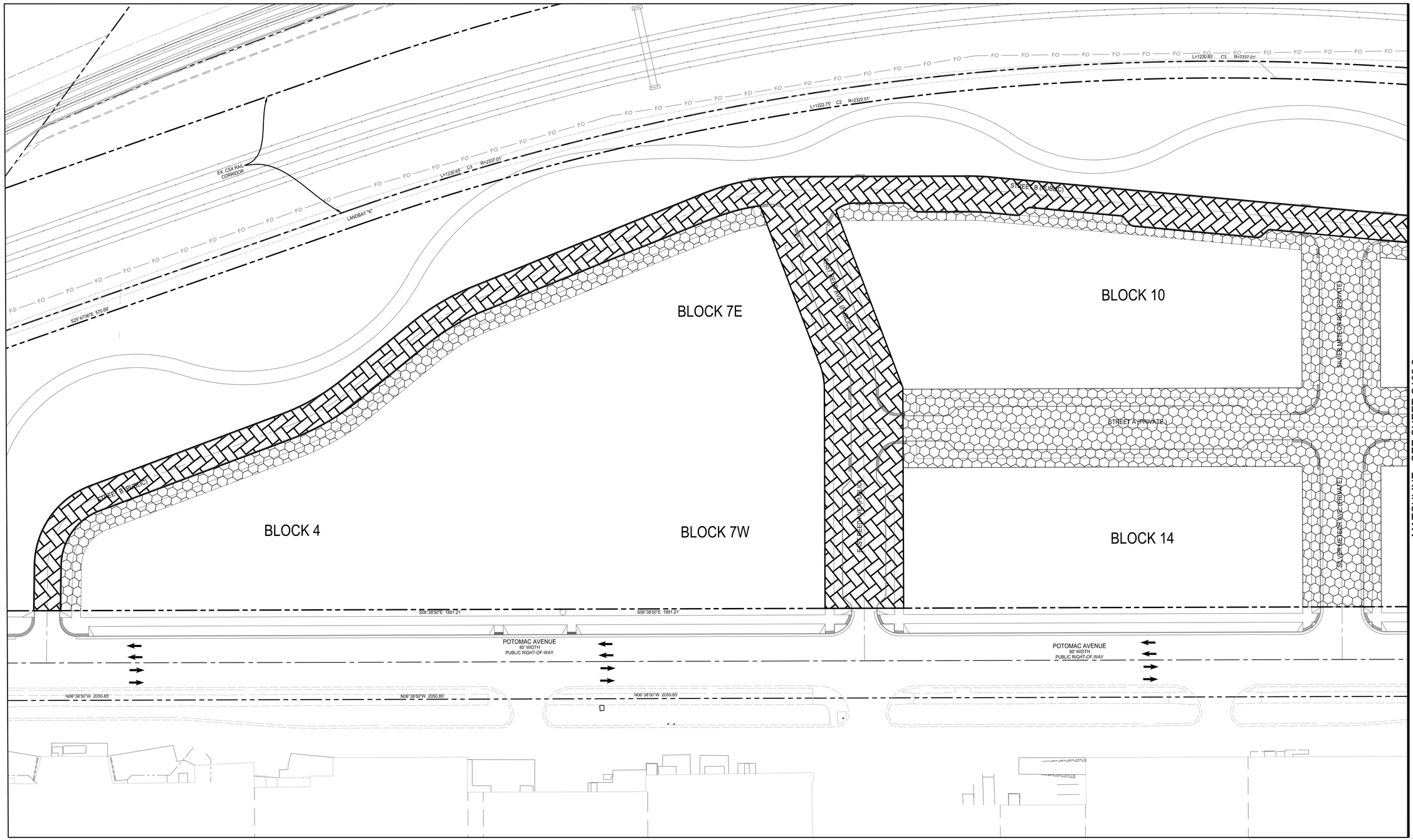
SHEET TITLE:
CONTEXTUAL PLAN

SHEET No.
C102

109639



MATCHLINE - SEE SHEET C102.2

PRIVATE ROAD/PUBLIC ACCESS EASEMENT

PUBLIC ROAD

VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
1"=40'

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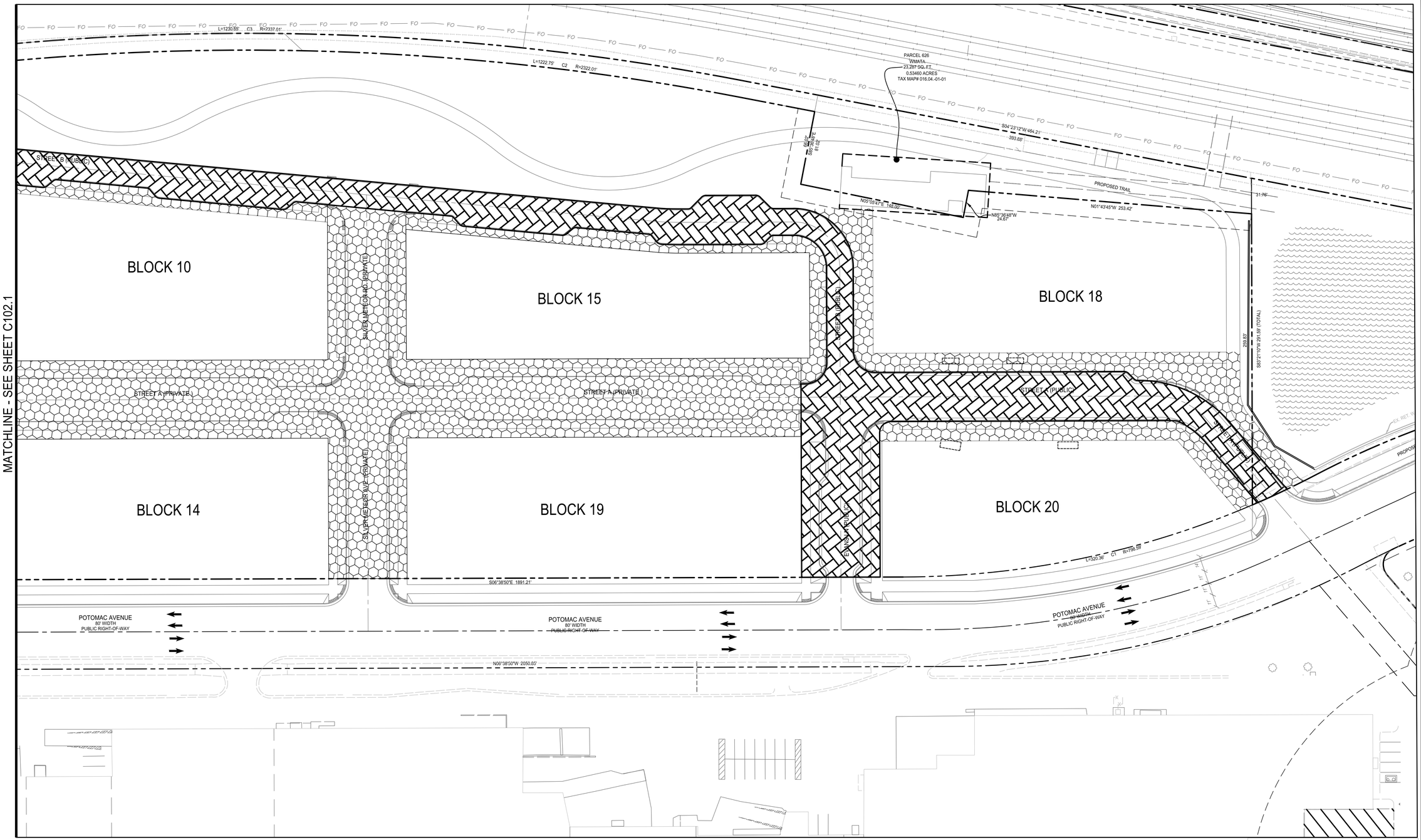
SHEET TITLE:

PUBLIC VS. PRIVATE ROAD EXHIBIT

SHEET No.

C102.1

109639



PRIVATE ROAD/PUBLIC ACCESS EASEMENT

PUBLIC ROAD

VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
1"=40'

APPROVED
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DRAWN: MM
CHECKED: KMW

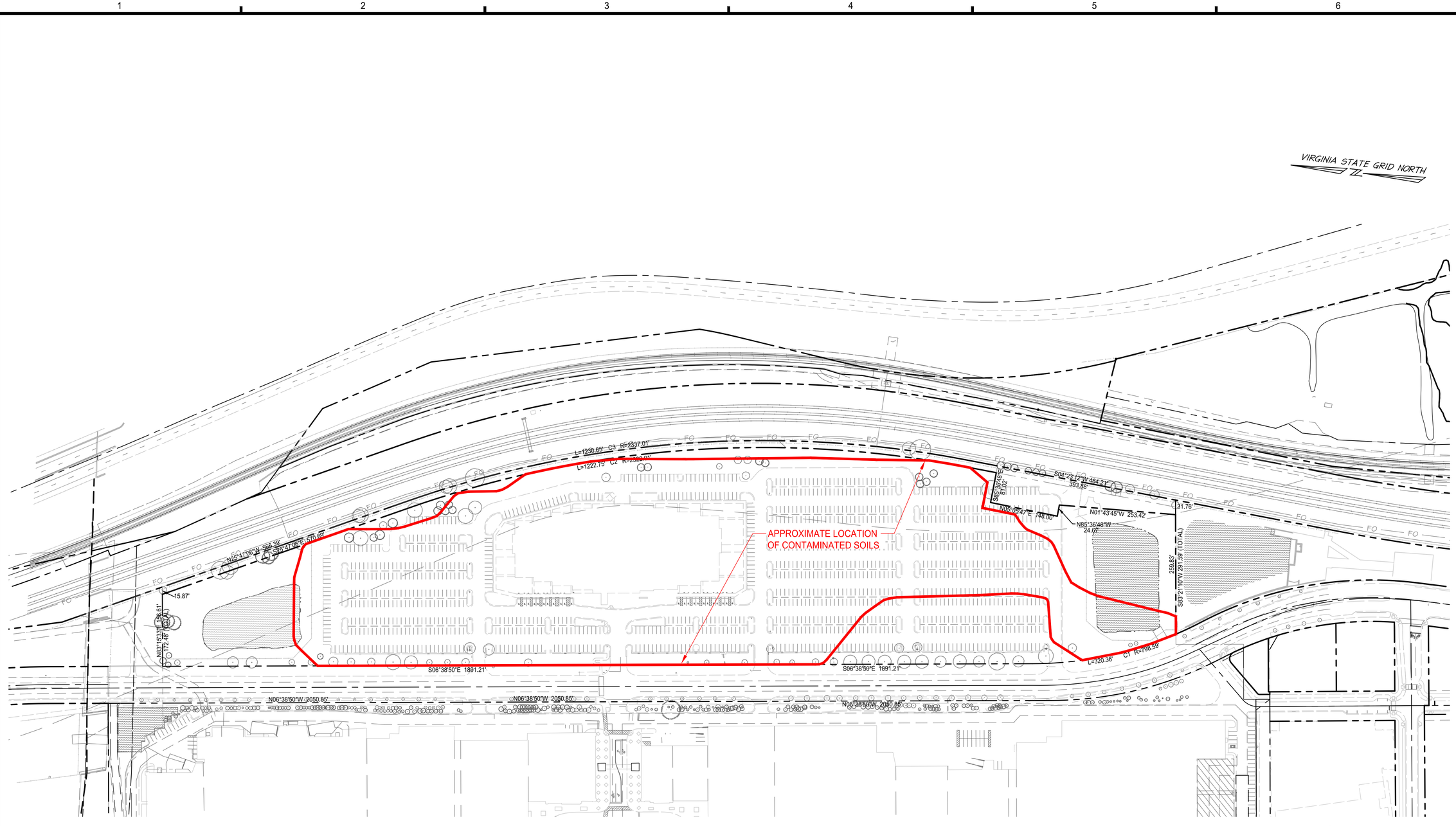
SHEET TITLE:

PUBLIC VS. PRIVATE ROAD EXHIBIT

SHEET No.

C102.2

109639



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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
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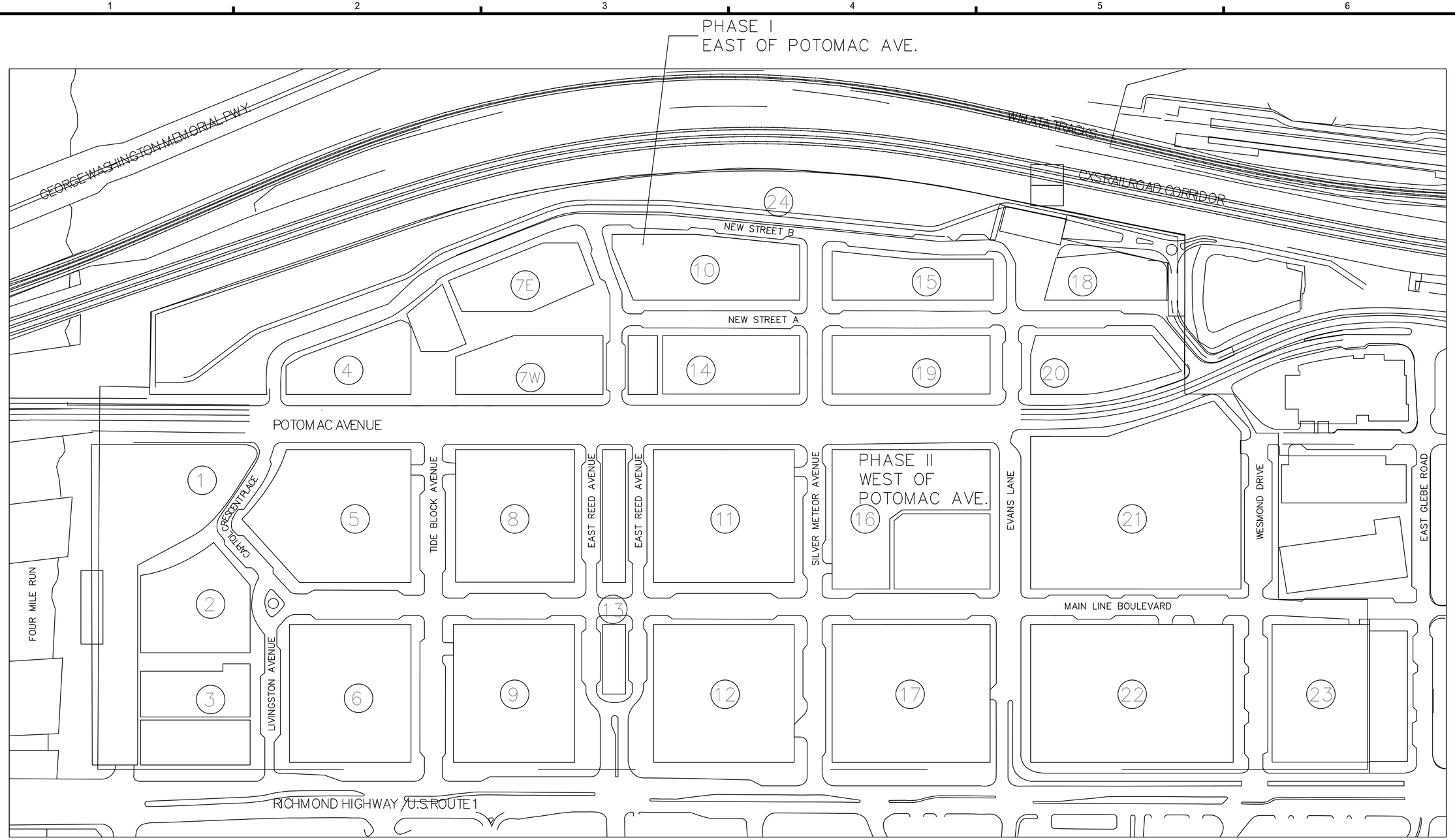
SHEET TITLE:

CONTAMINATED SOILS EXHIBIT

SHEET No.

C103

109639



THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY

100 75 50 0 100 200
GRAPHIC SCALE
1" = 100'

VIRGINIA STATE GRID NORTH

NOTE:
1. PHASE II MAY BE SUBSEQUENTLY PHASED INTO SMALLER PORTIONS IN THE FUTURE.

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DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

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SITE PLAN No. _____

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PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

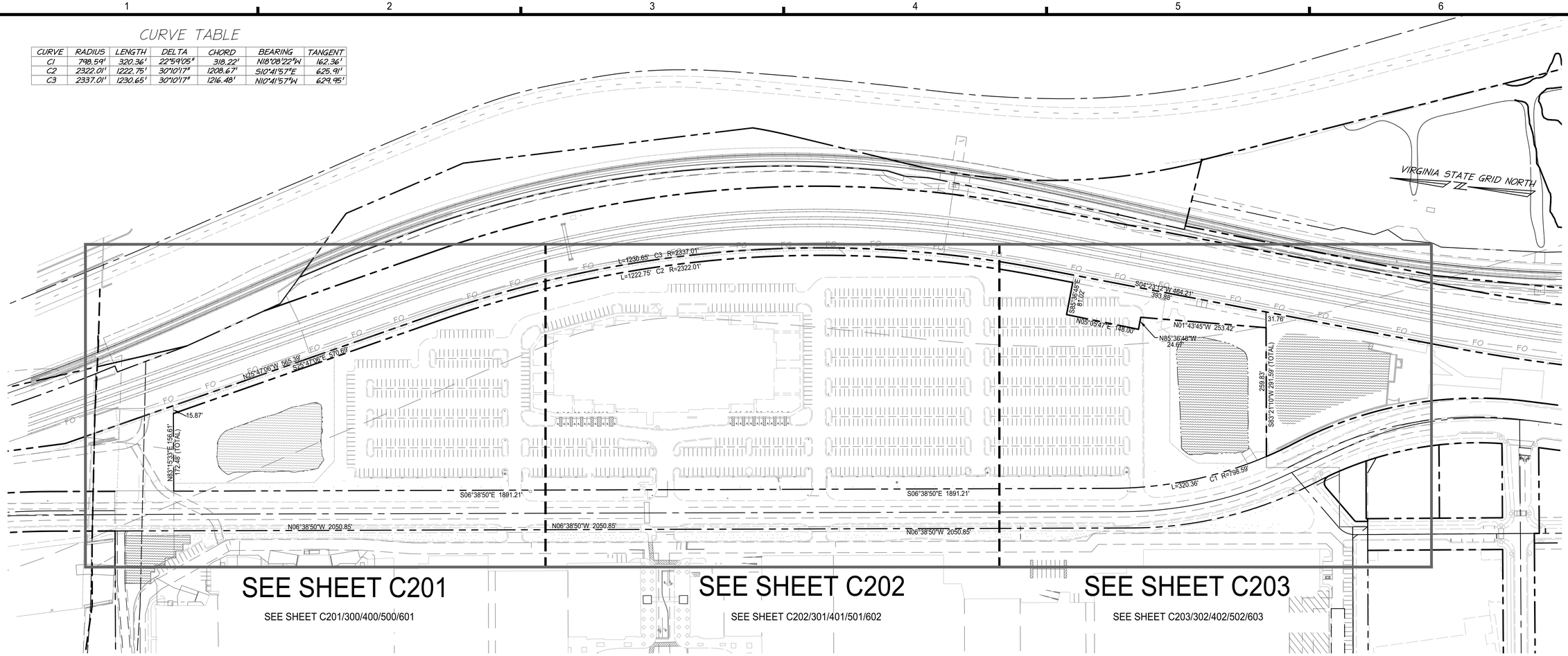
PHASING EXHIBIT

SHEET No.
C104

109639

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	CHORD	BEARING	TANGENT
C1	798.59'	320.36'	22°59'05"	318.22'	N18°08'22"W	162.36'
C2	2322.01'	1222.75'	30°10'17"	1208.67'	S10°41'57"E	625.91'
C3	2337.01'	1230.65'	30°10'17"	1216.48'	N10°41'57"W	629.95'



LIST OF EXISTING MAJOR TREES (6" OR MORE IN CALIPER).

TREE #	TREE TYPE	COMMON NAME	CROWN DIAMETER (FEET)	TRUNK DIAMETER (INCHES)	LOCATION	STATUS
2898	CT	SYCAMORE	14	6	EAST SIDE OF POTOMAC AVE	TBR
4976	CT	SYCAMORE	12	8	EAST SIDE OF POTOMAC AVE	TBR
2899	CT	SYCAMORE	12	7	EAST SIDE OF POTOMAC AVE	TBR
2900	CT	SYCAMORE	12	5	EAST SIDE OF POTOMAC AVE	TBR
2810	DT	SYCAMORE	24	8	EAST SIDE OF POTOMAC AVE	TBR
2808	DT	SYCAMORE	24	9	EAST SIDE OF POTOMAC AVE	TBR
2805	DT	SYCAMORE	12	6	EAST SIDE OF POTOMAC AVE	TBR
2803	DT	SYCAMORE	12	5	EAST SIDE OF POTOMAC AVE	TBR
2801	DT	SYCAMORE	12	6	EAST SIDE OF POTOMAC AVE	TBR
2798	DT	SYCAMORE	20	8	EAST SIDE OF POTOMAC AVE	TBR
2796	DT	SYCAMORE	16	6	EAST SIDE OF POTOMAC AVE	TBR
2794	DT	SYCAMORE	16	6	EAST SIDE OF POTOMAC AVE	TBR
2792	DT	SYCAMORE	32	12	EAST SIDE OF POTOMAC AVE	TBR
2790	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
2788	DT	SYCAMORE	12	6	EAST SIDE OF POTOMAC AVE	TBR
2786	DT	SYCAMORE	12	6	EAST SIDE OF POTOMAC AVE	TBR
2783	DT	SYCAMORE	16	7	EAST SIDE OF POTOMAC AVE	TBR
2869	DT	CHERRY	24	10	EAST SIDE OF POTOMAC AVE	TBR
3977	DT	CHERRY	24	10	EAST SIDE OF POTOMAC AVE	TBR
4046	DT	SYCAMORE	16	8	EAST SIDE OF POTOMAC AVE	TBR
3856	DT	SYCAMORE	12	5	EAST SIDE OF POTOMAC AVE	TBR
1873	DT	SYCAMORE	16	8	EAST SIDE OF POTOMAC AVE	TBR
1874	DT	MAPLE	12	6	EAST SIDE OF POTOMAC AVE	TBR
1877	DT	MAPLE	10	6	EAST SIDE OF POTOMAC AVE	TBR
1879	DT	MAPLE	14	7	EAST SIDE OF POTOMAC AVE	TBR
1881	DT	MAPLE	16	8	EAST SIDE OF POTOMAC AVE	TBR
1884	DT	MAPLE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1886	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1887	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1890	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1891	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1894	DT	SYCAMORE	24	10	EAST SIDE OF POTOMAC AVE	TBR
1897	DT	SYCAMORE	28	12	EAST SIDE OF POTOMAC AVE	TBR
1899	DT	SYCAMORE	24	10	EAST SIDE OF POTOMAC AVE	TBR
1907	DT	SYCAMORE	36	18	EAST SIDE OF POTOMAC AVE	TBR
1909	DT	SYCAMORE	24	10	EAST SIDE OF POTOMAC AVE	TBR
1917	DT	SYCAMORE	32	12	EAST SIDE OF POTOMAC AVE	TBR
3750	DT	SYCAMORE	18	9	EAST SIDE OF POTOMAC AVE	TBR
7952	DT	SYCAMORE	10	6	WEST SIDE OF POTOMAC AVE	TBS
7948	CT	SYCAMORE	10	6	WEST SIDE OF POTOMAC AVE	TBS
7945	CT	SYCAMORE	10	6	WEST SIDE OF POTOMAC AVE	TBS
7001	DT	SYCAMORE	24	10	ALONG EASTERN PROPERTY LINE	TBS
7002	CT	SYCAMORE	30	12	ALONG EASTERN PROPERTY LINE	TBS
7003	CT	SYCAMORE	26	10	ALONG EASTERN PROPERTY LINE	TBS
7004	CT	SYCAMORE	30	14	ALONG EASTERN PROPERTY LINE	TBS
7005	DT	SYCAMORE	34	12	ALONG EASTERN PROPERTY LINE	TBS
7006	DT	SYCAMORE	30	11	ALONG EASTERN PROPERTY LINE	TBS
7007	DT	SYCAMORE	38	13	ALONG EASTERN PROPERTY LINE	TBS
7008	DT	SYCAMORE	16	6	ALONG EASTERN PROPERTY LINE	TBS
7009	CT	SYCAMORE	30	15	NORTH OF EX. NORTHERN POND	TBR
7010	CT	SYCAMORE	28	15	NORTH OF EX. NORTHERN POND	TBR
7011	CT	SYCAMORE	32	16	NORTH OF EX. NORTHERN POND	TBR
6426	CT	CEDAR	20	10	ALONG EASTERN PROPERTY LINE	TBR
6427	DT	SYCAMORE	32	10	ALONG EASTERN PROPERTY LINE	TBR
6428	DT	LOCUST	28	10	ALONG EASTERN PROPERTY LINE	TBS
6429	DT	LOCUST	32	8	ALONG EASTERN PROPERTY LINE	TBS
2430	CT	CEDAR	16	8	ALONG EASTERN PROPERTY LINE	TBR
6431	CT	CEDAR	20	8	ALONG EASTERN PROPERTY LINE	TBR
6432	DT	POPLAR	16	8	ALONG EASTERN PROPERTY LINE	TBR
6433	DT	MAPLE	16	6	ALONG EASTERN PROPERTY LINE	TBR
6434	CT	CEDAR	20	10	ALONG EASTERN PROPERTY LINE	TBR
6435	DT	SYCAMORE	32	12	ALONG EASTERN PROPERTY LINE	TBR
6436	CT	CEDAR	18	8	ALONG EASTERN PROPERTY LINE	TBR
6437	CT	CEDAR	18	8	ALONG EASTERN PROPERTY LINE	TBR
6438	CT	CEDAR	16	6	ALONG EASTERN PROPERTY LINE	TBR
6439	CT	CEDAR	16	6	ALONG EASTERN PROPERTY LINE	TBR
6440	CT	CEDAR	16	8	ALONG EASTERN PROPERTY LINE	TBR
6441	DT	SYCAMORE	32	10	ALONG EASTERN PROPERTY LINE	TBR
6442	DT	SYCAMORE	28	10	ALONG EASTERN PROPERTY LINE	TBR
6443	DT	LOCUST	28	12	ALONG EASTERN PROPERTY LINE	TBS
6444	DT	LOCUST	32	12	ALONG EASTERN PROPERTY LINE	TBS
6445	DT	LOCUST	40	16	ALONG EASTERN PROPERTY LINE	TBS
6446	DT	POPLAR	18	9	ALONG EASTERN PROPERTY LINE	TBR
6447	CT	PINE	16	8	ALONG EASTERN PROPERTY LINE	TBR
6448	CT	PINE	16	8	ALONG EASTERN PROPERTY LINE	TBR
6449	DT	MAPLE	12	6	ALONG EASTERN PROPERTY LINE	TBR
6450	DT	SYCAMORE	16	6	ALONG EASTERN PROPERTY LINE	TBR
6451	DT	SYCAMORE	16	6	ALONG EASTERN PROPERTY LINE	TBR
6452	DT	MAPLE	17	8	ALONG EASTERN PROPERTY LINE	TBR
6453	CT	PINE	18	6	ALONG EASTERN PROPERTY LINE	TBR
6454	CT	PINE	19	6	ALONG EASTERN PROPERTY LINE	TBR
6455	CT	CEDAR	20	8	ALONG EASTERN PROPERTY LINE	TBR
6456	CT	CEDAR	21	8	ALONG EASTERN PROPERTY LINE	TBR
6457	CT	CEDAR	22	8	ALONG EASTERN PROPERTY LINE	TBR
6458	CT	CEDAR	23	8	ALONG EASTERN PROPERTY LINE	TBR
6459	DT	LOCUST	28	12	ALONG EASTERN PROPERTY LINE	TBS
6460	DT	LOCUST	44	18	ALONG EASTERN PROPERTY LINE	TBS
6461	DT	SYCAMORE	40	14	ALONG EASTERN PROPERTY LINE	TBR
6462	CT	CEDAR	16	8	ALONG EASTERN PROPERTY LINE	TBS
6463	CT	CEDAR	16	8	ALONG EASTERN PROPERTY LINE	TBS
6464	CT	CEDAR	16	8	ALONG EASTERN PROPERTY LINE	TBS
6465	CT	CEDAR	14	7	ALONG EASTERN PROPERTY LINE	TBS
6466	CT	CEDAR	15	7	ALONG EASTERN PROPERTY LINE	TBS
6467	CT	CEDAR	16	7	ALONG EASTERN PROPERTY LINE	TBS
6468	CT	CEDAR	22	11	ALONG EASTERN PROPERTY LINE	TBS
6469	CT	CEDAR	24	12	ALONG EASTERN PROPERTY LINE	TBS
6470	DT	CEDAR	20	6	ALONG EASTERN PROPERTY LINE	TBS
6471	DT	POPLAR	20	10	ALONG EASTERN PROPERTY LINE	TBS
6472	DT	SYCAMORE	16	6	ALONG EASTERN PROPERTY LINE	TBR

TBR: TO BE REMOVED
TBS: TO BE SAVED
CT: CONIFEROUS TREE
DT: DECIDUOUS TREE

100 50 0 100 200
GRAPHIC SCALE
SCALE: 1" = 100'

NOTE:
1. SEE SHEET C101 FOR LEGEND.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
_____ DIRECTOR DATE
_____ CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO. _____

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD
PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

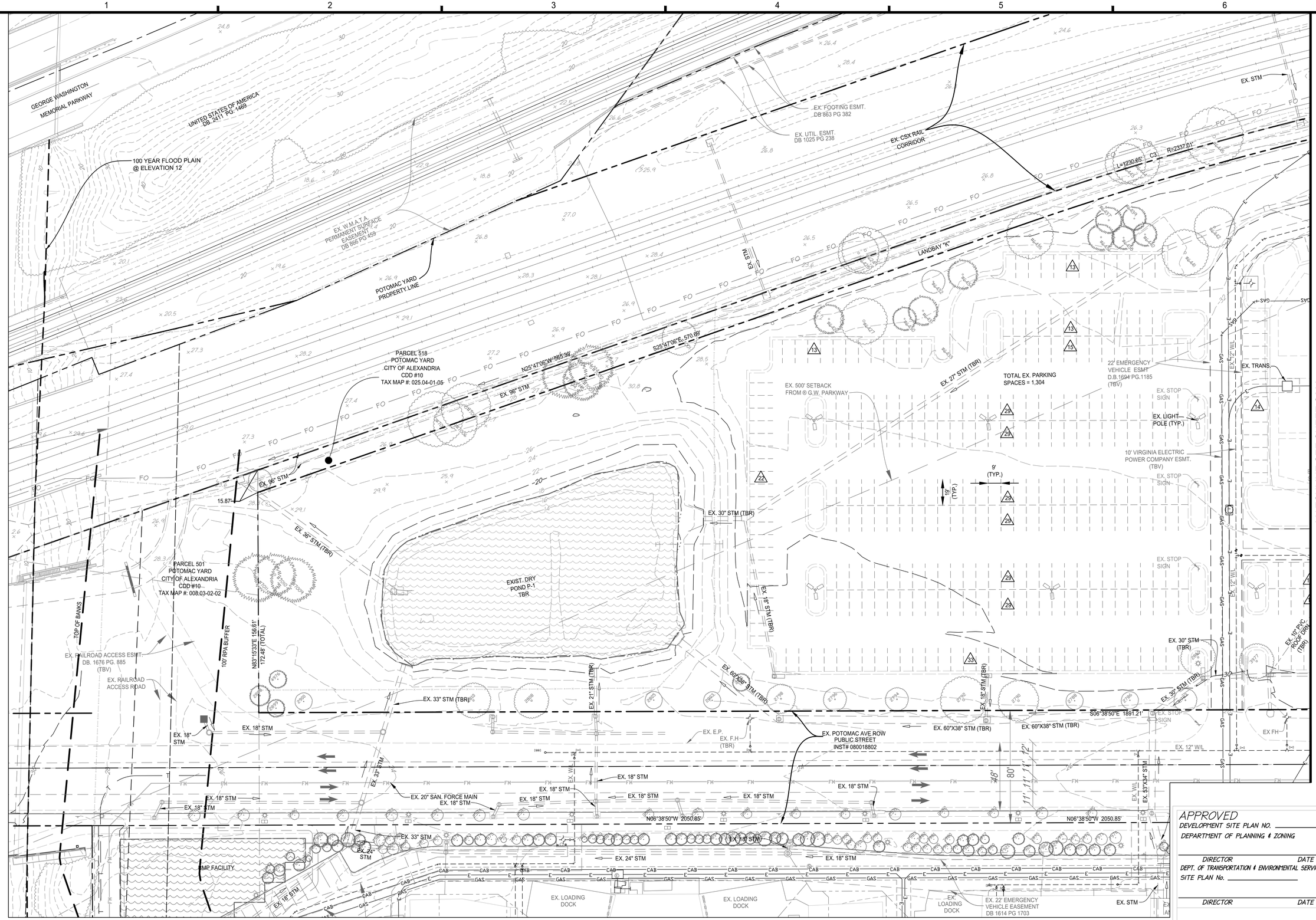
MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
OVERALL EXISTING CONDITIONS & KEY PLAN

SHEET No.
C200

109639



MATCHLINE SEE SHEET C202

30 15 0 30 60

GRAPHIC SCALE
SCALE: 1" = 30'

VIRGINIA STATE GRID NORTH

NOTE:

1. SEE SHEET C101 FOR LEGEND.
2. SEE SHEET C200 FOR CURVE TABLE.
3. SEE SHEET C200 FOR EX. TREES TABLE.
4. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO MARINE CLAYS ON SITE.
5. ALL EX. ON SITE SIGNAGE TO BE REMOVED.

APPROVED

DEVELOPMENT SITE PLAN NO. _____

DEPARTMENT OF PLANNING & ZONING

DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES

SITE PLAN No. _____

DIRECTOR DATE

CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

INSTRUMENT NO. DEED BOOK NO. PAGE NO.

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NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

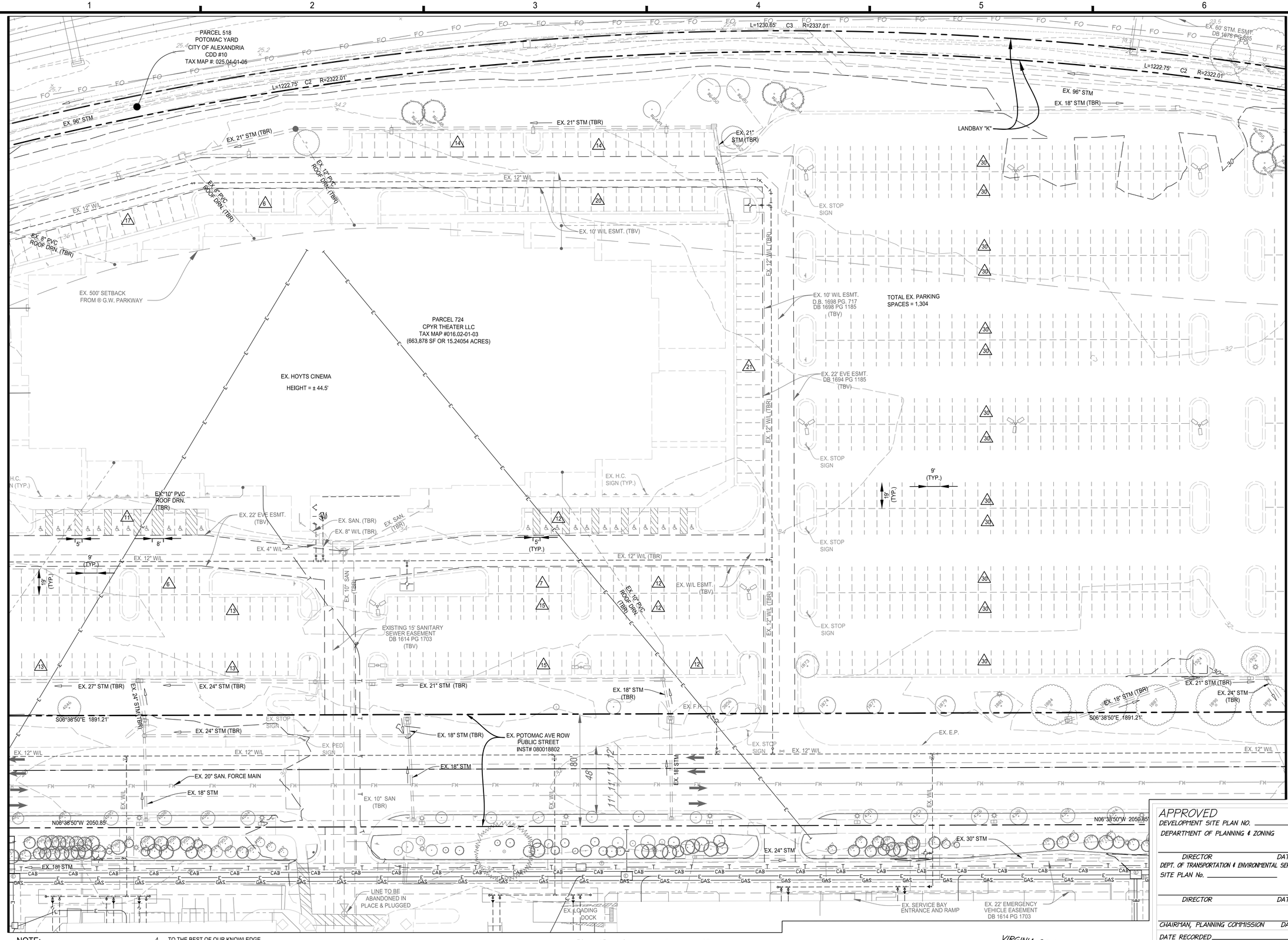
SHEET TITLE:

EXISTING CONDITIONS PLAN

SHEET No.

C201

109639



NOTE:

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2. SEE SHEET C200 FOR CURVE TABLE.
3. SEE SHEET C200 FOR EX. TREES TABLE.
4. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO MARINE CLAYS ON SITE.
5. ALL EX. ON SITE SIGNAGE TO BE REMOVED.

30 15 0 30 60

GRAPHIC SCALE
SCALE: 1" = 30'

VIRGINIA STATE GRID NORTH

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ DIRECTOR _____ DATE

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PHASE 1 INFRASTRUCUTE PLAN
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CITY OF ALEXANDRIA, VIRGINIA

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DESIGN: JLH
DRAWN: MM
CHECKED: KMW

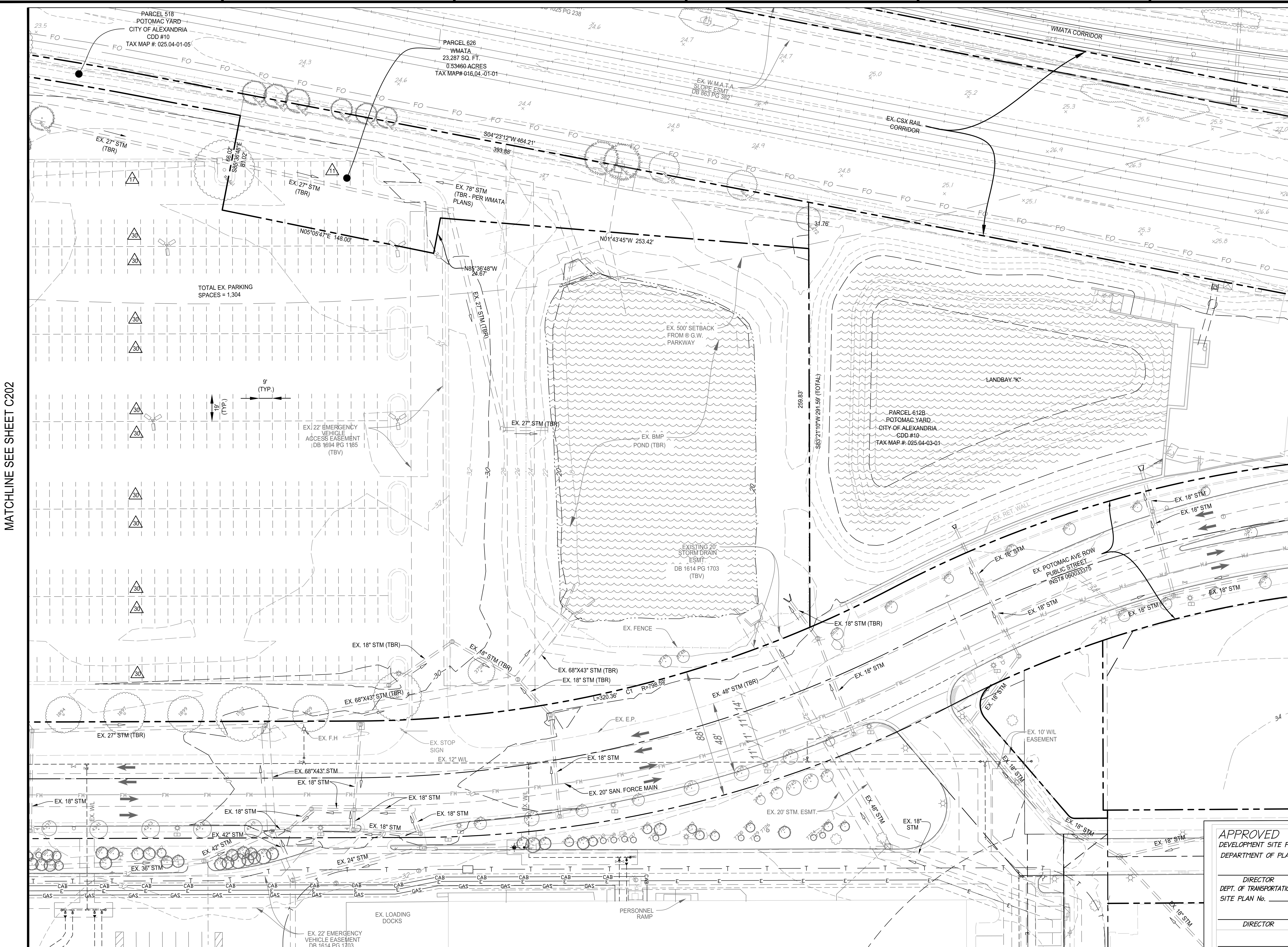
SHEET TITLE:

EXISTING CONDITIONS PLAN

SHEET No.

C202

109639



NOTE:
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3. SEE SHEET C200 FOR EX. TREES TABLE.
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5. ALL EX. ON SITE SIGNAGE TO BE REMOVED.

GRAPHIC SCALE
SCALE: 1" = 30'

VIRGINIA STATE GRID NORTH

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DEVELOPMENT SITE PLAN NO. ____
DEPARTMENT OF PLANNING & ZONING

DIRECTOR ____ DATE
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CHAIRMAN, PLANNING COMMISSION ____ DATE
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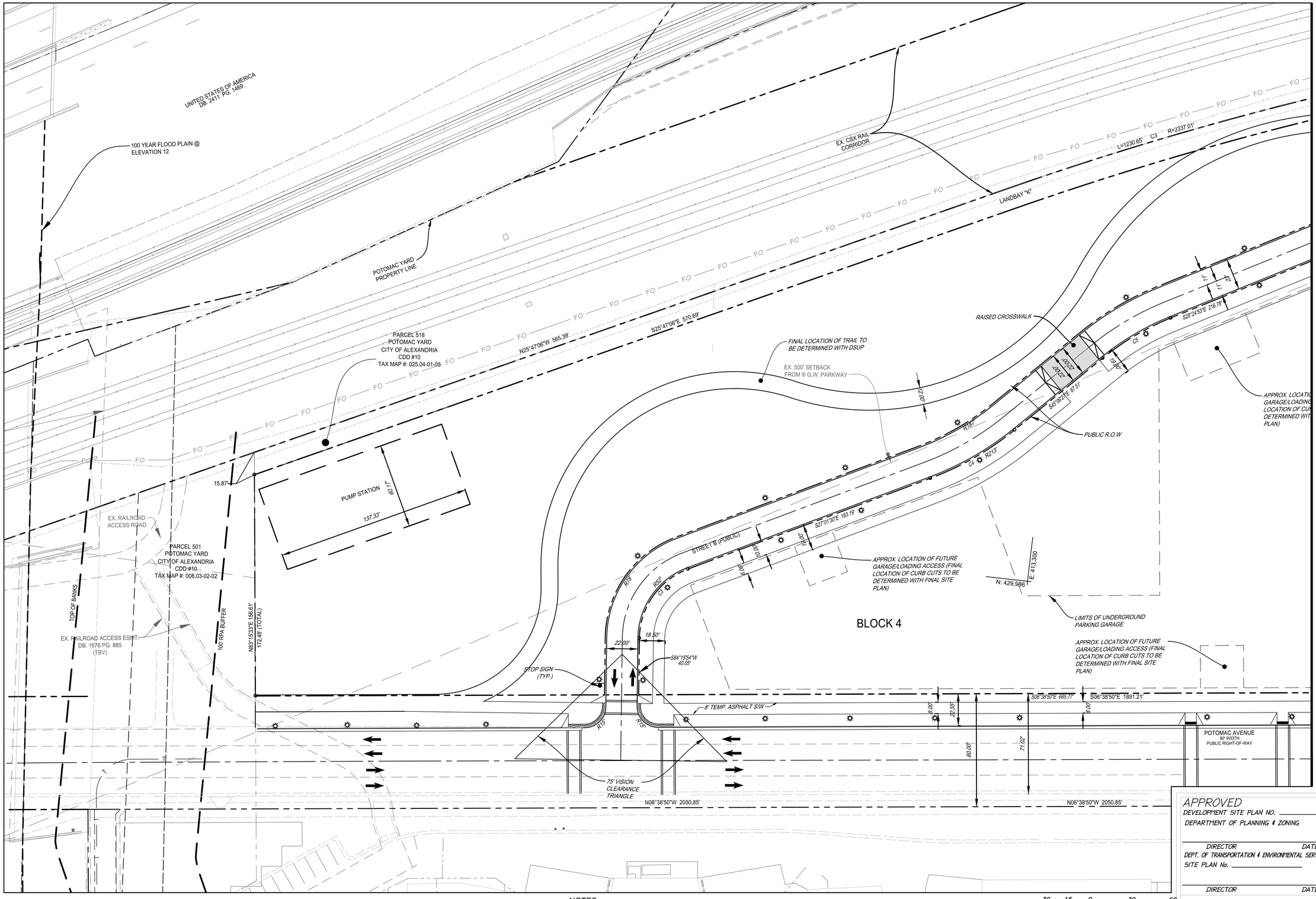
PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
EXISTING CONDITIONS PLAN

SHEET No.
C203

109639



CURVE	RADIUS	LENGTH	DELTA	CHORD	BEARING	TANGENT
C3	79.00'	94.80'	68°45'08"	89.21'	S61°24'03"E	54.04'
C4	186.00'	58.70'	18°04'57"	58.46'	S36°03'58"E	29.60'
C5	214.00'	62.35'	16°41'33"	62.13'	S36°45'40"E	31.40'

NOTES:
1. SEE SHEET C101 FOR LEGEND.
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3. ANY DEVELOPMENT IN THE RPA WILL BE PERVIOUS
4. SEE SHEETS C500-C502 FOR LIMITS OF CLEARING
5. STREET NAMES MAY CHANGE IN FUTURE AS PART OF FORTHCOMING DSUPS.
6. FINAL LOCATION OF STREETLIGHTS TO BE DETERMINED AND SHOWN WITH DSUPs/ON FINAL SITE PLAN.
7. DESIGNS AND COORDINATION OF SIGNALIZED INTERSECTIONS TO BE DONE WITH FINAL SITE PLANS.

VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
SCALE: 1" = 30'

FLUSH CURB CONDITION

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
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PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

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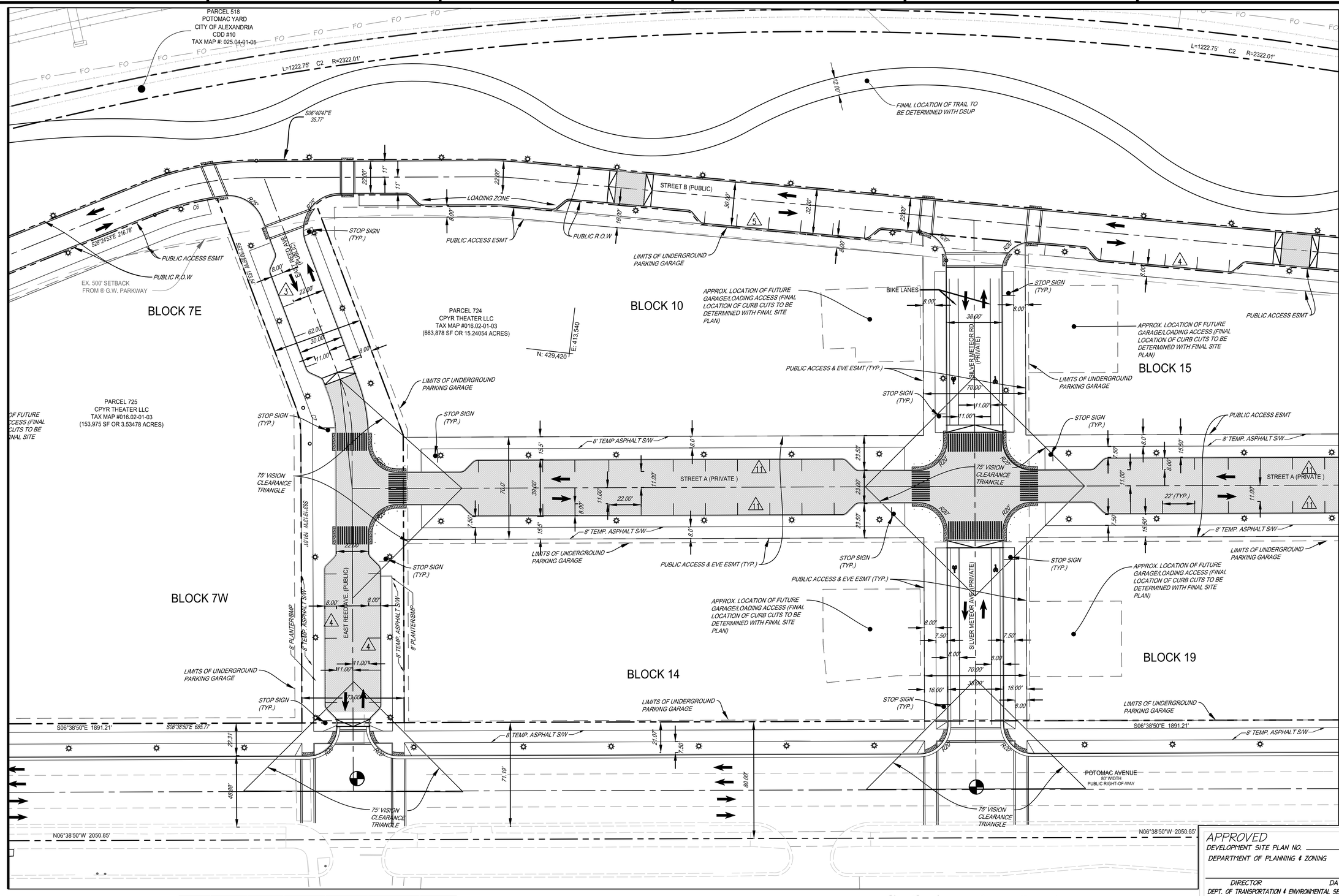
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
SITE PLAN

SHEET No.
C300

109639



CURVE	RADIUS	LENGTH	DELTA	CHORD	BEARING	TANGENT
C6	203.98'	77.38'	21°44'11"	76.92'	S17°32'50"E	39.16'
C8	178.00	18.25'	05°52'30"	18.24'	N09°37'02"W	9.13'
C7	70.00'	25.01'	20°28'14"	24.88'	S73°05'06"W	12.64'

NOTES:

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7. DESIGNS AND COORDINATION OF SIGNALIZED INTERSECTIONS TO BE DONE WITH FINAL SITE PLANS.

30 15 0 30 60
GRAPHIC SCALE
SCALE: 1" = 30'

VIRGINIA STATE GRID NORTH

FLUSH CURB CONDITION

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DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

SITE PLAN

SHEET No.

C301

109639

MATCHLINE SEE SHEET C301

CDD #10
TAX MAP #: 025.04-01-05

PARCEL 626
WMATA
23,287 SQ. FT.
0.53460 ACRES
TAX MAP# 016.04.-01-01

FINAL LOCATION OF TRAIL TO BE DETERMINED WITH DSUP

BLDG OVERHANG

S04°23'12"W 464.21'
393.88'

S85°36'48"E 8'

METRO NORTH PAVILION

N85°05'47"E 148.00'

N85°36'48"W 24.67'

N01°43'45"W 253.42'

PROPOSED TRAIL

31.76'

22.00'

8.00'

KISS & ROAD

15' MAINTENANCE ESMT.

LIMITS OF UNDERGROUND PARKING GARAGE

BLOCK 15

STREET B (PUBLIC)

PUBLIC ACCESS ESMT

LIMITS OF UNDERGROUND PARKING GARAGE

BLOCK 18

EX. 500' SETBACK FROM ® G.W. PARKWAY

E: 413,540

N: 428,470

APPROX. LOCATION OF FUTURE GARAGE/LOADING ACCESS (FINAL LOCATION OF CURB CUTS TO BE DETERMINED WITH FINAL SITE PLAN)

PUBLIC ACCESS ESMT

12.00'

259.83'

PROP. RET. WALL

S83°21'16"W 291.59' (TOTAL)

PARCEL 612B
POTOMAC YARD
CITY OF ALEXANDRIA
CDD #10
TAX MAP #: 025.04-03-01

STOP SIGN (TYP.)

BUS SHELTER

10' TEMP. ASPHALT S/W

STREET A (PUBLIC)

200.00'

BUS BAY

R75'

R52'

EX. RET. WALL

PROPOSED TRAIL

PUBLIC ACCESS & EVE ESMT (TYP.)

LIMITS OF UNDERGROUND PARKING GARAGE

75' VISION CLEARANCE TRIANGLE

70.00'

39.00'

23.00'

R20'

PUBLIC R.O.W

BUS SHELTER

PUBLIC ACCESS ESMT

26.00'

28.80'

STREET A (PUBLIC)

10.00'

SIGNALIZED INTERSECTION (TYP.)

R40'

STOP SIGN (TYP.)

BLOCK 19

BLOCK 20

8' TEMP. ASPHALT S/W

EVANS LN (PUBLIC)

38.00'

27.00'

APPROX. LOCATION OF FUTURE GARAGE/LOADING ACCESS (FINAL LOCATION OF CURB CUTS TO BE DETERMINED WITH FINAL SITE PLAN)

LIMITS OF UNDERGROUND PARKING GARAGE

L=320.36'

C1

R=799.59'

75' VISION CLEARANCE TRIANGLE

POTOMAC AVENUE
66' WIDTH
PUBLIC RIGHT-OF-WAY

69.20'

80.00'

44.30'

NOTES:

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2. FINAL LOCATION, SIZE AND DESIGN DETAILS OF PUMP STATION WILL BE UNDER SEPARATE PLANS.
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4. SEE SHEETS C500-C502 FOR LIMITS OF CLEARING
5. STREET NAMES MAY CHANGE IN FUTURE AS PART OF FORTHCOMING DSUPS.
6. FINAL LOCATION OF STREETLIGHTS TO BE DETERMINED AND SHOWN WITH DSUPs/ON FINAL SITE PLAN.
7. DESIGNS AND COORDINATION OF SIGNALIZED INTERSECTIONS TO BE DONE WITH FINAL SITE PLANS.

30 15 0 30 60
GRAPHIC SCALE
SCALE: 1" = 30'

VIRGINIA STATE GRID NORTH

FLUSH CURB CONDITION

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ DIRECTOR _____ DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ DIRECTOR _____ DATE

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DATE RECORDED _____
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COMMONWEALTH OF VIRGINIA
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04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

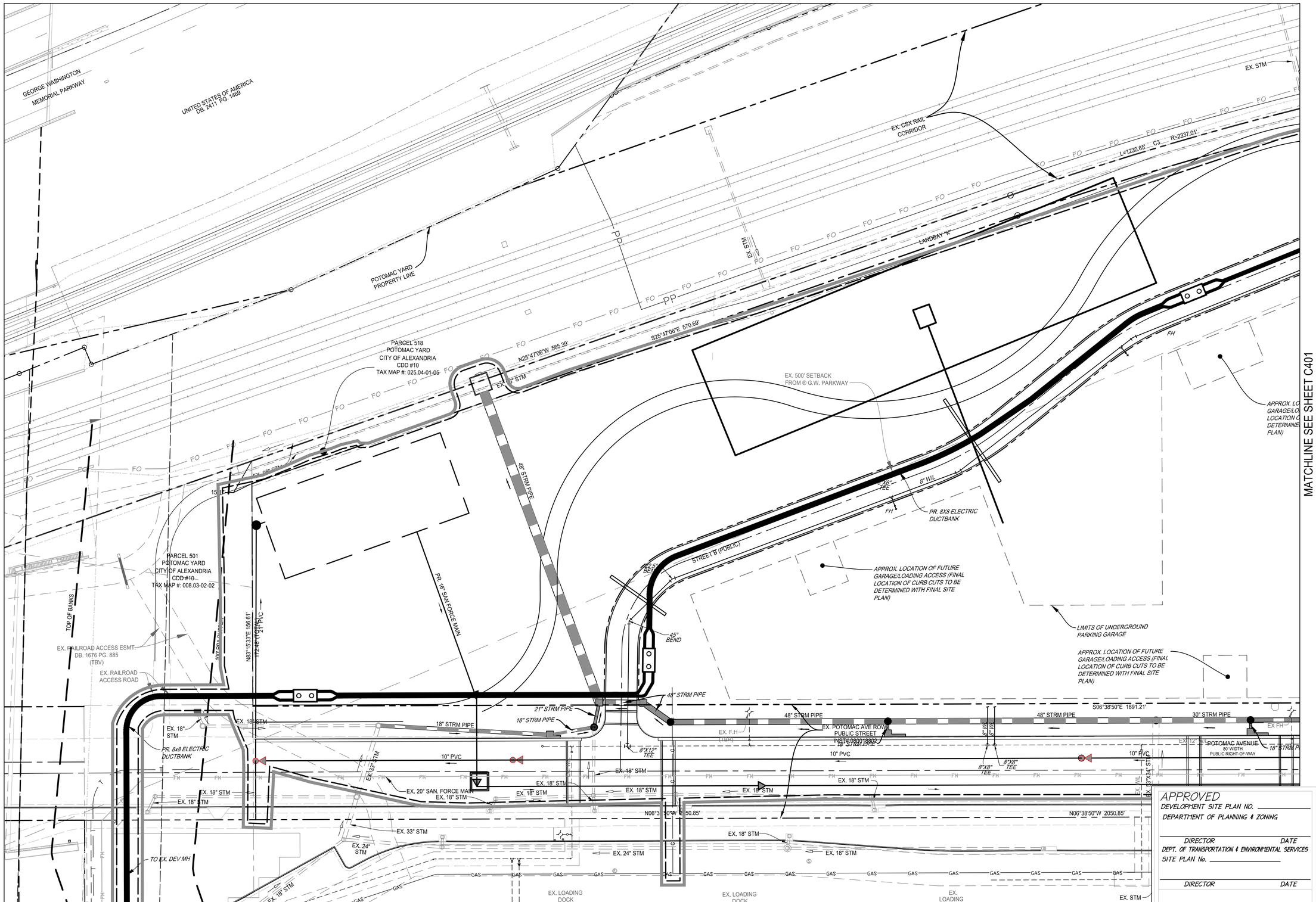
SHEET TITLE:

SITE PLAN

SHEET No.

C302

109639



MATCHLINE SEE SHEET C401

NOTES:
1. SEE SHEET C101 FOR LEGEND
2. ELECTRICAL VAULTS SHOWN ARE UNDERGROUND.
3. SEE SHEET C101 FOR ARCHAEOLOGY NOTES.
4. FINAL SIZE AND LOCATION OF VAULTS WILL BE DETERMINED WITH DSUP.

VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
1"=30'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
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DIRECTOR DATE
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DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
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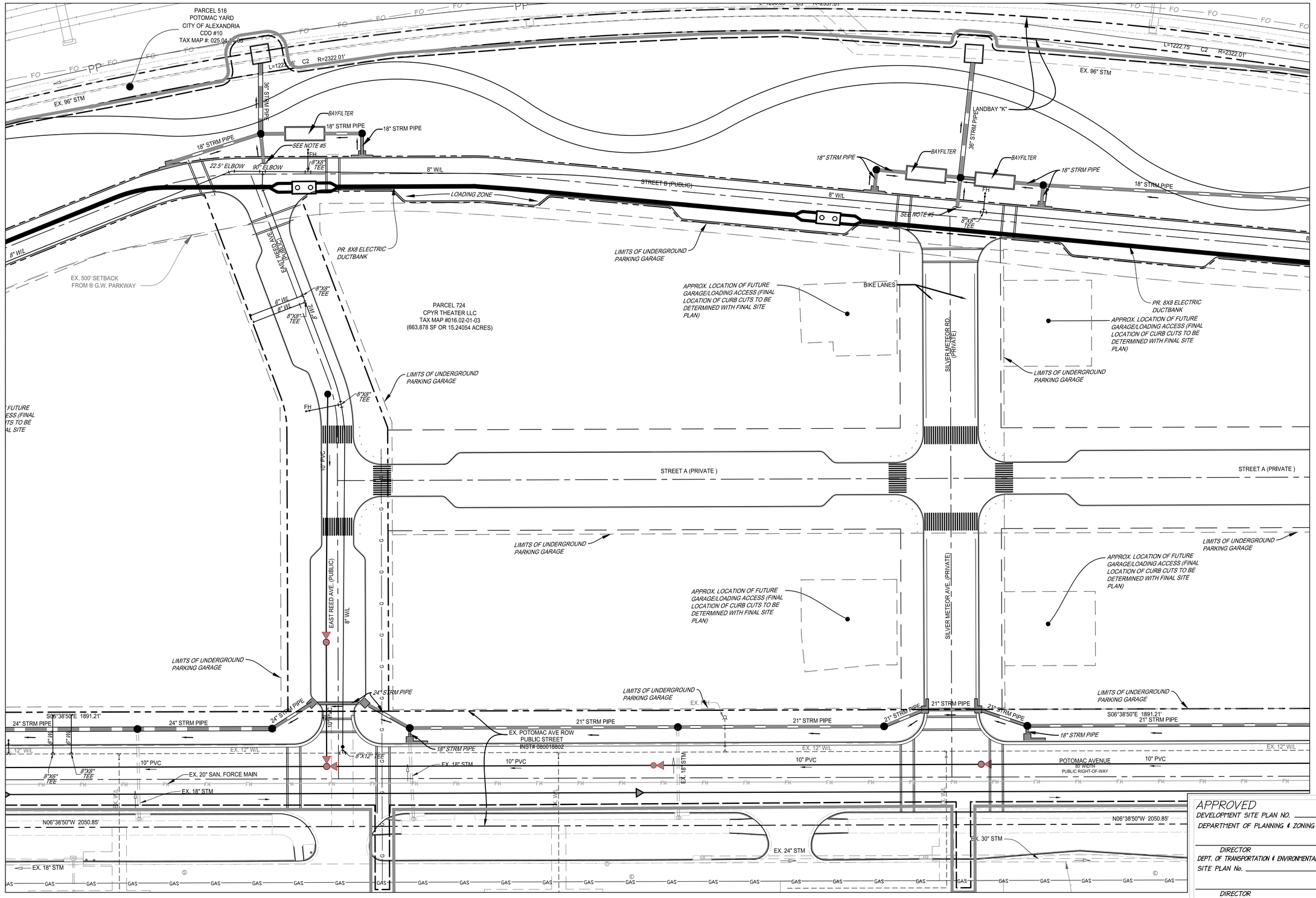
SHEET TITLE:
UTILITY PLAN

SHEET No.
C400

109639



NOTES:

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VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
1"=30'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
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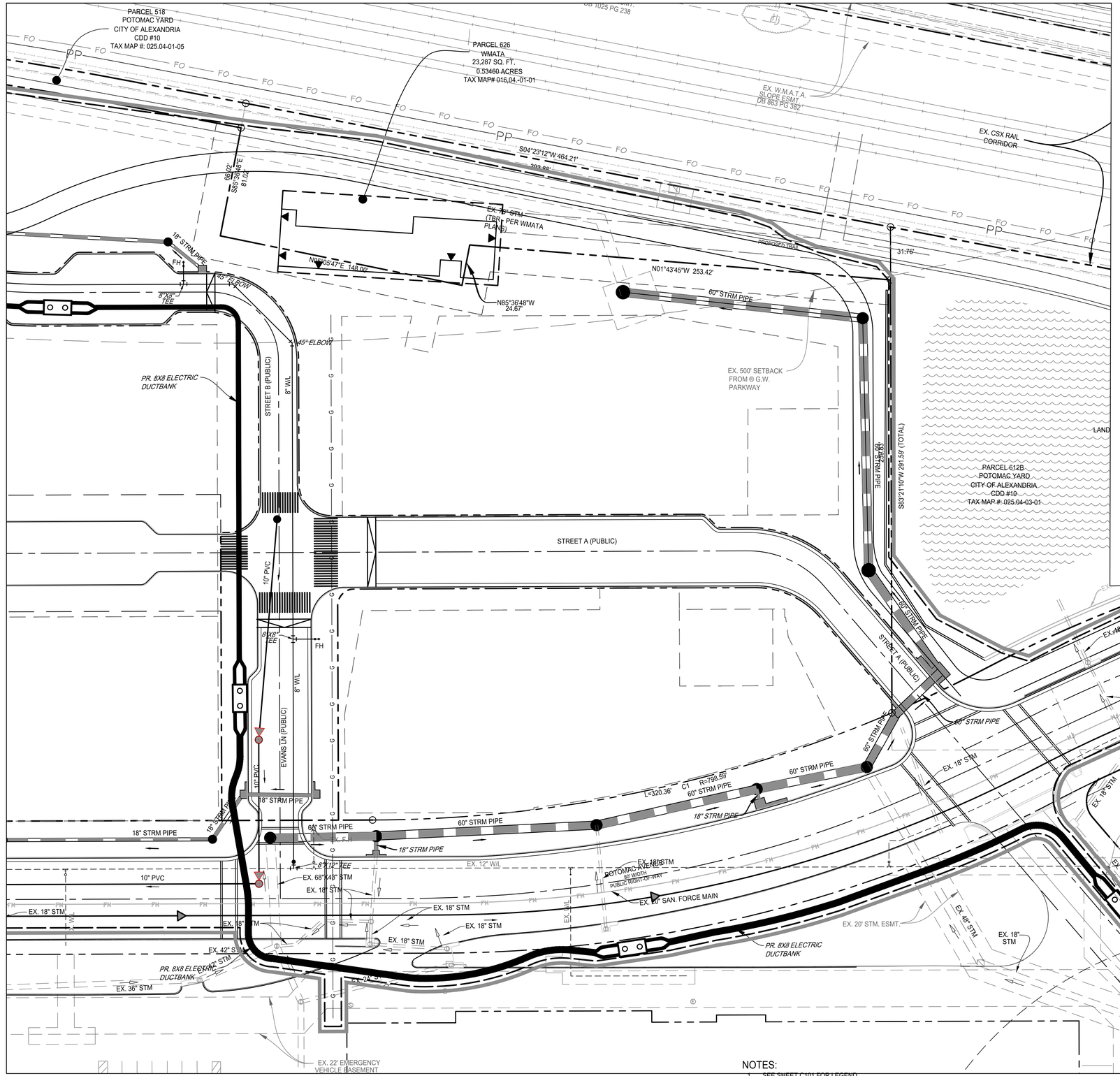
SHEET TITLE:

UTILITY PLAN

SHEET No.

C401

109639



NOTES:

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APPROVED
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DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

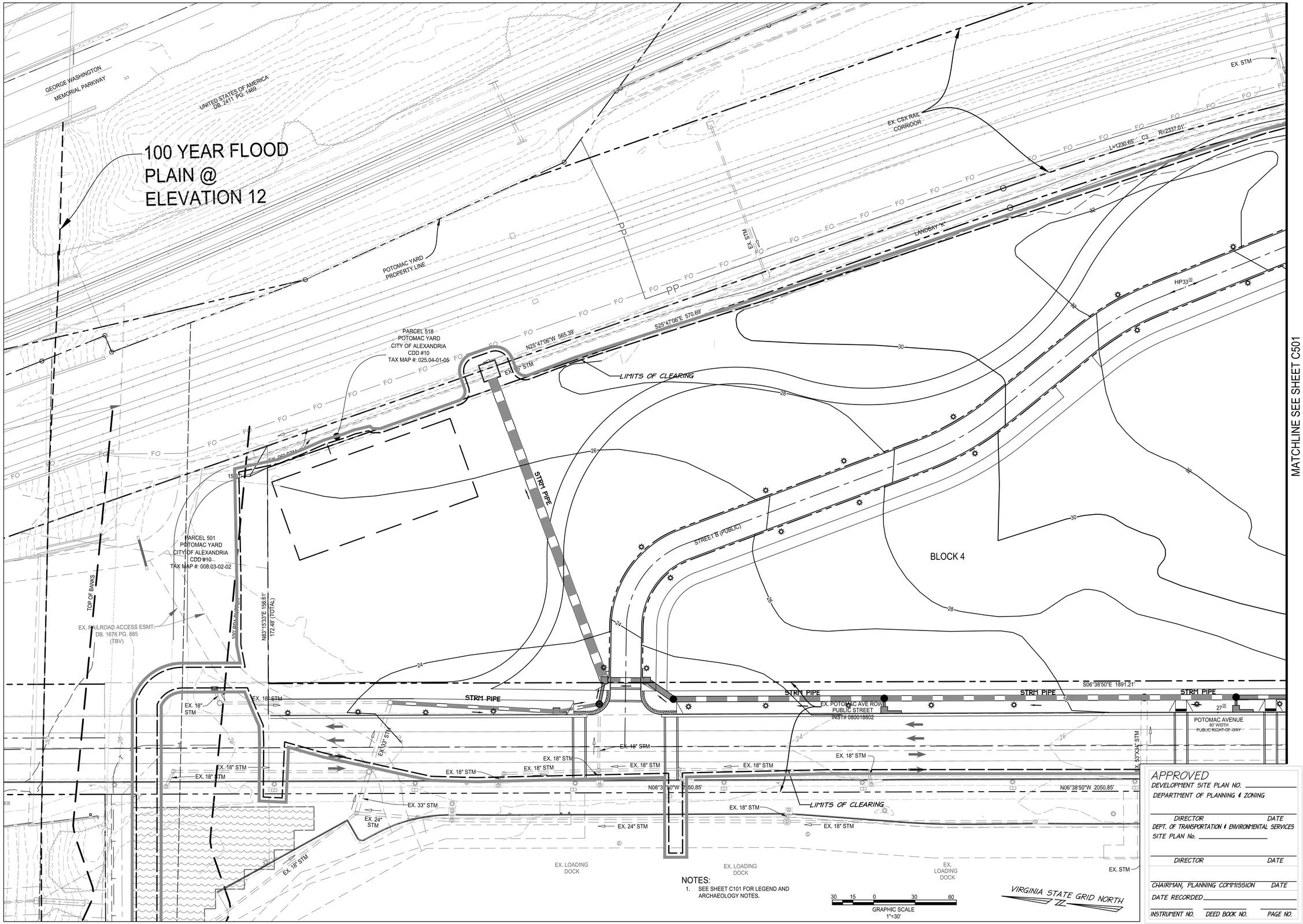
SHEET TITLE:

UTILITY PLAN

SHEET No.

C402

109639



MATCHLINE SEE SHEET C501

NOTES:
1. SEE SHEET C101 FOR LEGEND AND ARCHAEOLOGY NOTES.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
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DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
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3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

GRADING PLAN

SHEET No.

C500

109639

MATCHLINE SEE SHEET C500

MATCHLINE SEE SHEET C502

EX. 96" STM
LIMITS OF CLEARING
FILTERRA
STRM PIPE
L=1222.75' C2 R=2322.01'
EX. 500' SETBACK FROM ® G.W. PARKWAY
EXISTING PUBLIC
EAST REED AVE. (PUBLIC)
STREET B (PUBLIC)
HP33.00
LANDBAY "K"
LP30.00
SILVER METEOR AVE (PRIVATE)
BLOCK 7E
BLOCK 7W
BLOCK 10
BLOCK 14
BLOCK 15
BLOCK 19
HP35.00
HP37.00
STREET A (PRIVATE)
EX. POTOMAC AVE ROW
PUBLIC STREET
INST# 080018802
POTOMAC AVENUE
80' WIDTH
PUBLIC RIGHT-OF-WAY
S06°38'50"E 1891.21'
N06°38'50"W 2050.85'
EX. 18" STM
EX. 24" STM
EX. 30" STM
EX. LOADING DOCK
EX. SERVICE BAY ENTRANCE AND RAMP
GRAPHIC SCALE
1"=30'
VIRGINIA STATE GRID NORTH

NOTES:
1. SEE SHEET C101 FOR LEGEND AND ARCHAEOLOGY NOTES.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
_____ DIRECTOR DATE
_____ CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
_____ INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO.

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD
PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
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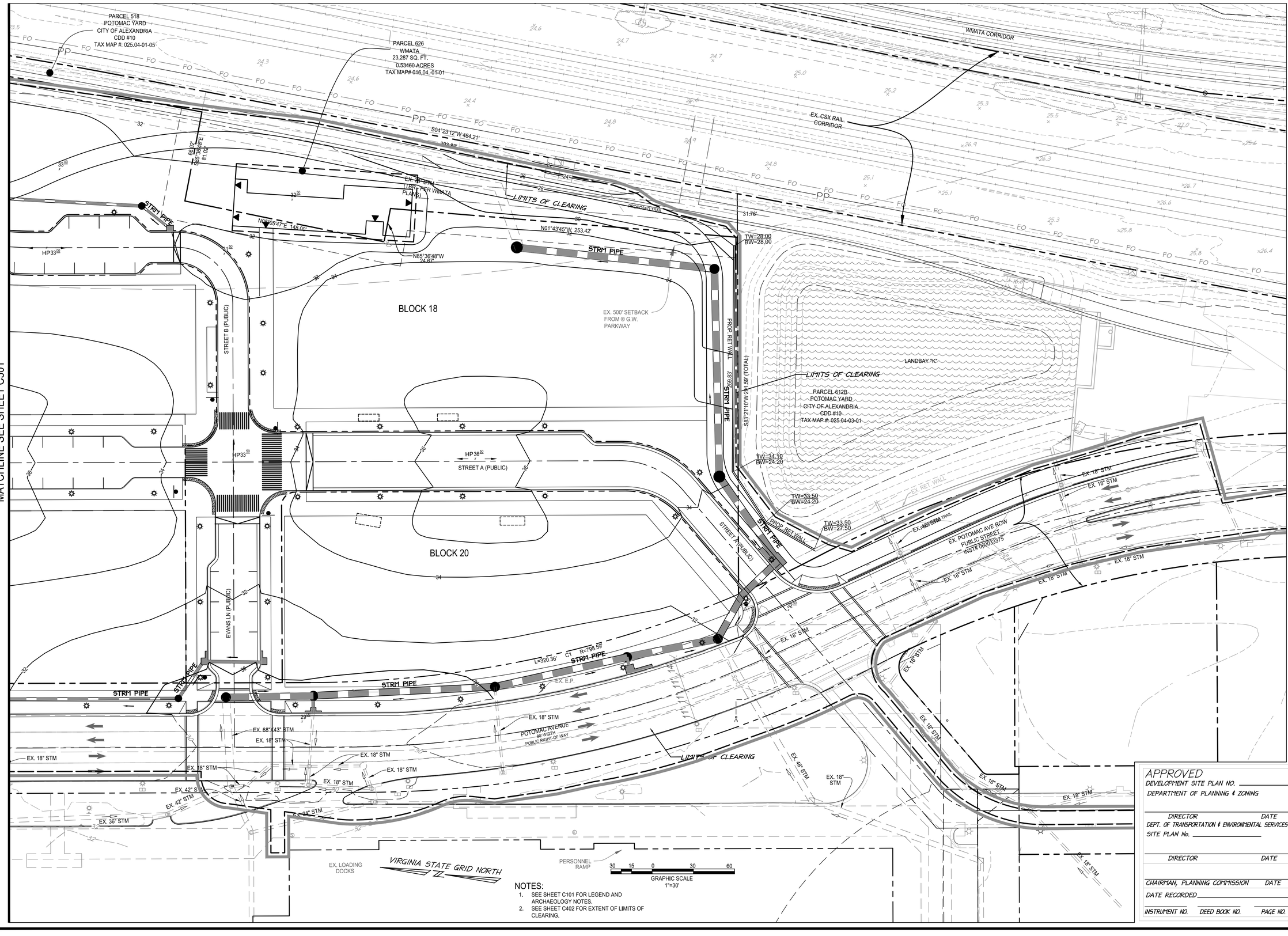
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
GRADING PLAN

SHEET No.
C501

109639



NOTES:

1. SEE SHEET C101 FOR LEGEND AND ARCHAEOLOGY NOTES.
2. SEE SHEET C402 FOR EXTENT OF LIMITS OF CLEARING.

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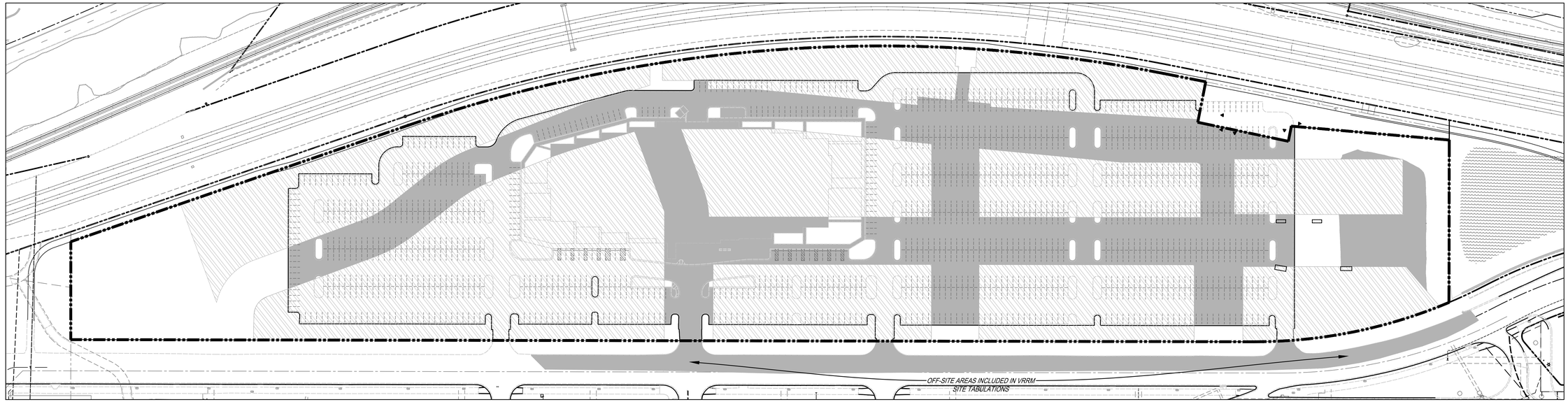
SHEET TITLE:

GRADING PLAN

SHEET No.
C502

109639



PRE-DEVELOPMENT IMPERVIOUS AREA MAP

BACK-OUT AREA (SEE NOTE #1)

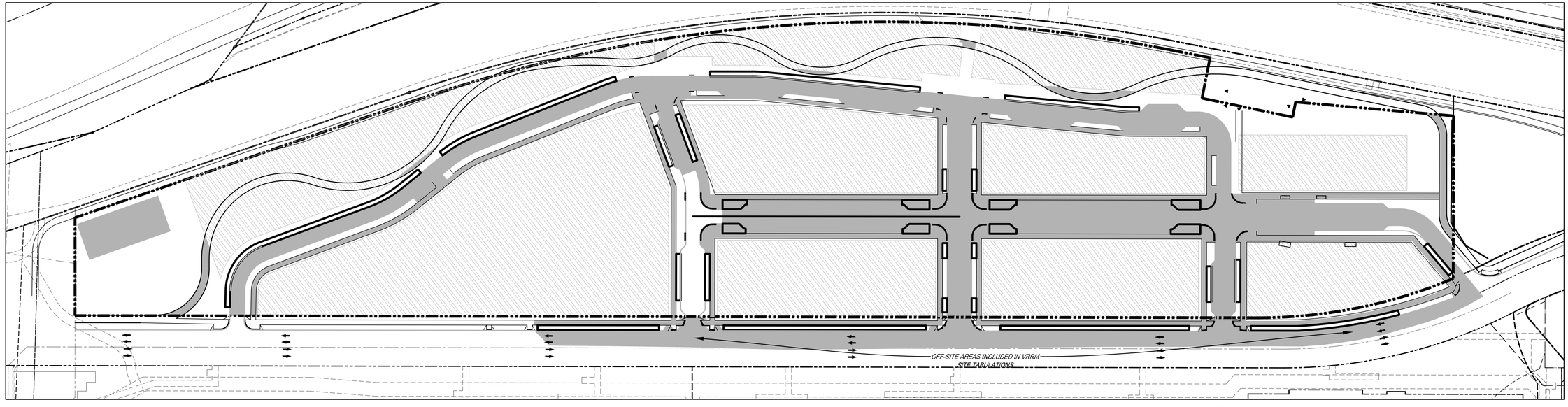
EXISTING IMPERVIOUS AREA (5.98 AC)

SITE BOUNDARY

80 40 0 80 160

GRAPHIC SCALE
SCALE: 1" = 80'

VIRGINIA STATE GRID NORTH



POST-DEVELOPMENT IMPERVIOUS AREA MAP

BACK-OUT AREA (SEE NOTE #1)

PROPOSED IMPERVIOUS AREA (6.22 AC)

SITE BOUNDARY

80 40 0 80 160

GRAPHIC SCALE
SCALE: 1" = 80'

VIRGINIA STATE GRID NORTH

NOTES:
1.) HATCHED AREAS DEPICT EXISTING SITE AREA TO BE TREATED WITH FULL DEVELOPMENT OF THE SITE AND HAVE NOT BEEN INCLUDED IN EXISTING OR PROPOSED SITE TABULATIONS IN THE VRRM TO DETERMINE REMOVAL REQUIREMENTS. THESE AREAS WILL BE NOTED AS THEIR EXISTING CONDITION FOR THE DSUP PHASE.

APPROVED
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SHEET TITLE:

PRE VS. POST DEVELOPMENT IMPERVIOUS

SHEET No.

C600

109639

ENVIRONMENTAL SITE ASSESSMENT

1. THERE ARE NO TIDAL WETLANDS, TIDAL SHORES, TRIBUTARY STREAMS, FLOODPLAINS, CONNECTED TIDAL WETLANDS, ISOLATED WETLANDS, HIGHLY ERODIBLE/PERMEABLE SOILS OR BUFFER AREAS ASSOCIATED WITH SHORES, STREAMS OR WETLANDS LOCATED ON THIS SITE. FURTHER, THERE ARE NO WETLAND PERMITS REQUIRED FOR THIS DEVELOPMENT PROJECT. ADDITIONALLY, THERE ARE NO KNOWN UNDERGROUND STORAGE TANKS OR AREAS OF SOIL OR GROUNDWATER CONTAMINATION ON THE SITE.

2. THE CITY OF ALEXANDRIA DEPARTMENT OF TRANSPORTATION AND ENVIRONMENTAL SERVICES, OFFICE OF ENVIRONMENTAL QUALITY MUST BE NOTIFIED IF UNUSUAL OR UNANTICIPATED CONTAMINATION OR UNDERGROUND STORAGE TANKS, DRUMS, AND CONTAINERS ARE ENCOUNTERED AT THE SITE. IF THERE IS ANY DOUBT ABOUT PUBLIC SAFETY OR A RELEASE TO THE ENVIRONMENT, THE ALEXANDRIA FIRE DEPARTMENT MUST BE CONTACTED IMMEDIATELY BY CALLING 911. THE TANK OR CONTAINER'S REMOVAL, ITS CONTENTS, ANY SOIL CONTAMINATION AND RELEASES TO THE ENVIRONMENT WILL BE HANDLED IN ACCORDANCE WITH THE FEDERAL, STATE, AND CITY REGULATIONS.

3. ALL WELLS TO BE DEMOLISHED IN THIS PROJECT, INCLUDING MONITORING WELLS MUST BE CLOSED IN ACCORDANCE WITH THE VIRGINIA STATE WATER CONTROL BOARD (VSWCB) REQUIREMENTS. CONTACT ENVIRONMENTAL HEALTH SPECIALIST AND COORDINATE WITH THE ALEXANDRIA HEALTH DEPARTMENT AT 703-838-4400 EXT 267/255.

4. ALL CONSTRUCTION ACTIVITIES MUST COMPLY WITH THE ALEXANDRIA NOISE CONTROL CODE TITLE 11, CHAPTER 5, WHICH PERMITS CONSTRUCTION ACTIVITIES TO OCCUR BETWEEN THE FOLLOWING HOURS:
   - MONDAY THROUGH FRIDAY FROM 7 AM TO 6 PM AND
   - SATURDAYS FROM 9 AM TO 6 PM,
   - NO CONSTRUCTION ACTIVITIES ARE PERMITTED ON SUNDAYS

   PILE DRIVING IS FURTHER RESTRICTED TO THE FOLLOWING HOURS:
   - MONDAY THROUGH FRIDAY FROM 9 AM TO 6 PM AND
   - SATURDAYS FROM 10 AM TO 4 PM.

STORMWATER BEST MANAGEMENT PRACTICES (BMP) NOTES

THE STORMWATER BEST MANAGEMENT PRACTICES (BMP) REQUIRED FOR THIS PROJECT SHALL BE CONSTRUCTED AND INSTALLED UNDER THE DIRECT SUPERVISION OF THE DESIGN ENGINEER OR HIS DESIGNATED REPRESENTATIVE. THE DESIGN ENGINEER SHALL MAKE A WRITTEN CERTIFICATION TO THE CITY THAT THE BMPs ARE CONSTRUCTED AND INSTALLED AS DESIGNED AND IN ACCORDANCE WITH THE APPROVED SITE PLAN. IN ADDITION, AGGREGATE LAYERS AND COLLECTOR PIPES MAY NOT BE INSTALLED UNLESS THE DESIGN ENGINEER OR HIS REPRESENTATIVE IS PRESENT.

THE CONTRACTOR SHALL FURNISH THE CITY WITH AN OPERATION AND MAINTENANCE MANUAL FOR ALL BMPs ON THE PROJECT. THE MANUAL SHALL INCLUDE AN EXPLANATION OF THE FUNCTIONS AND OPERATIONS OF EACH BMP AND ANY SUPPORTING UTILITIES, CATALOG CUTS ON ANY MECHANICAL OR ELECTRICAL EQUIPMENT AND A SCHEDULE OF ROUTINE MAINTENANCE FOR THE BMPs AND SUPPORTING EQUIPMENT.

UTILITIY WORKS

UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING MINIMUM STANDARDS DESCRIBED IN SECTION 4VAC50-30-40 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH) AND ADDITIONAL APPLICABLE PRACTICES FOLLOWED BY THE CITY OF ALEXANDRIA.

A. ALL PRIVATE UTILITIES SHALL BE LOCATED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY AND PUBLIC UTILITY EASEMENTS UNLESS THE UTILITY OWNERS HAVE FRANCHISE AGREEMENT WITH THE CITY OF ALEXANDRIA; HOWEVER, NO ELECTRIC TRANSFORMERS AND SWITCH GEARS/CONTROL BOXES SHALL BE PLACED IN THE PUBLIC RIGHT-OF-WAY.
B. ALL THE EXISTING AND PROPOSED PUBLIC AND PRIVATE UTILITIES AND EASEMENTS SHALL BE SHOWN AND A DESCRIPTIVE NARRATION OF VARIOUS UTILITIES SHALL BE PROVIDED ON THE PLAN.
C. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN UTILITY SERVICES AT ALL TIMES DURING CONNECTION AND/OR CONSTRUCTION.
D. NO MORE THAN 500 LINEAR FEET OF TRENCH MAY BE OPENED AT ONE TIME.
E. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
F. EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED.

WATER QUALITY NARRATIVE

WATER QUALITY REQUIREMENTS

THE WATER QUALITY REQUIREMENTS FOR THIS PROJECT ARE OUTLINED IN THE DEVELOPMENT CONDITIONS. THE PHOSPHOROUS REMOVAL REQUIREMENT FOR THIS APPLICATION IS A 40% REDUCTION OF THE TOTAL POST-DEVELOPMENT PHOSPHOROUS LOAD. SEVERAL TYPES OF BEST MANAGEMENT PRACTICES (BMP) HAVE BEEN PROPOSED TO REDUCE THE PHOSPHOROUS LOAD IN ORDER TO MEET THIS REQUIREMENT. PERMEABLE PAVEMENT (LEVEL 1), LINEAR BIORETENTION AREAS, AND BAYFILTERS HAVE BEEN PROPOSED WITH THIS APPLICATION; LOCATIONS CAN BE FOUND ON SHEETS C603 TO C605 WITH SUPPORTING COMPUTATIONS (VRRM SPREADSHEET) ON SHEET C606.

IN ORDER TO CALCULATE THE REMOVAL REQUIREMENT, THE VRRM WAS USED TO DETERMINE THE POST-DEVELOPMENT PHOSPHOROUS LOAD (16.50 LB/YR) AND HAS BEEN CALCULATED AS FOLLOWS.

(POST DEVELOPMENT LOAD) * 0.40 = REMOVAL REQUIRED

(14.62 LB/YR) * 0.40 = 5.848 LB/YR

AS DEMONSTRATED ON SHEET C606, THE PHOSPHOROUS REMOVAL REQUIREMENT HAS BEEN MET. PER THE REQUIREMENTS OF MEMO TO INDUSTRY 01-18, 65% OF REMOVAL REQUIREMENTS MUST BE MET THROUGH THE USE OF NON-PROPRIETARY DEVICES. AS DEMONSTRATED ON SHEET C606, 65% OF THE REMOVAL REQUIREMENT HAS BEEN MET THROUGH THE USE OF PERMEABLE PAVEMENT AND BIORETENTION FACILITIES.

WATER QUANTITY AND ADEQUATE OUTFALL NARRATIVE

WATER QUANTITY REQUIREMENTS

THE WATER QUANTITY REQUIREMENTS FOR THIS PROJECT HAVE BEEN MET BY REDUCING THE POST DEVELOPMENT 1-YEAR, 2-YEAR, 10-YEAR AND 100-YEAR PEAK FLOWS WHEN COMPARED TO PREDEVELOPMENT CONDITIONS THROUGH RUNOFF REDUCTION PRACTICES (PERMEABLE PAVEMENT AND BIORETENTION); PER THE REQUIREMENTS FOR THIS PLAN, ONLY THE 100-YEAR PEAK FLOW IS REQUIRED TO BE REDUCED. THE IMPERVIOUSNESS OF THE SITE HAS BEEN REDUCED FROM THE PRE-DEVELOPMENT CONDITION, RESULTING IN PEAK FLOW REDUCTION FOR EACH STORM EVENT. COMPUTATIONS SHOWN ON THIS SHEET. THE APPLICANT WILL WORK WITH CITY STAFF TO DETERMINE A FEE IN LIEU OF TREATING 100% OF IMPERVIOUS AREAS, IF REQUIRED WITH THIS INTERIM CONDITION.

ADEQUATE OUTFALL

ADEQUATE OUTFALL FOR THIS APPLICATION HAS BEEN MET THROUGH THE USE OF ADEQUATE EXISTING CLOSED CONDUIT SYSTEMS DRAINING TO FOUR MILE RUN. IN BOTH THE PRE-DEVELOPMENT AND POST-DEVELOPMENT CONDITIONS, THE RUNOFF FROM THE SITE IS DISCHARGED INTO A 96" EXISTING STORM SEWER SYSTEM WHICH OUTFALLS INTO FOUR MILE RUN. IT IS OUR OPINION THAT THE EXISTING 96" PIPE HAS ADEQUATE CAPACITY TO CONVEY POST-DEVELOPMENT RUNOFF CONDITIONS; THEREFORE, THE OUTFALL IS ADEQUATE.

EXISTING POND REMOVAL

THE SITE CURRENTLY DRAINS TO TWO PONDS THAT BOOKEND THE SITE TO THE NORTH AND SOUTH. THE SOUTH POND IS A WET POND AND THE NORTH POND IS A DRY POND. THE SOUTH AND NORTH PONDS OUTFALL TO FOUR MILE RUN VIA 78" AND 96" EXISTING STORM SEWER RUNS. POTOMAC AVENUE AND AREAS WEST OF POTOMAC AVENUE ALSO DRAIN TO THESE PONDS TO MEET WATER QUALITY REQUIREMENTS. IT IS OUR UNDERSTANDING THAT THERE IS A PROPOSED STATE REGULATION RELATED TO "NUTRIENT CREDIT EXCHANGE" PENDING FINAL APPROVAL BY THE STATE WATER BOARD (WCB). IF APPROVED THIS REGULATION WOULD ALLOW THE APPLICANT TO "BUY OUT" THE TREATMENT PROVIDED TO THESE PONDS FOR THE WESTERN SIDE OF POTOMAC AVENUE WHILE TREATING ONLY THE REQUIREMENTS FOR THE SITE DEPICTED WITH THIS APPLICATION. THE BUYOUT WOULD NEED TO OCCUR BEFORE THE PONDS CAN BE TAKEN OFFLINE, THE CITY HAS NUTRIENT CREDITS AVAILABLE FOR THE APPLICANT TO PURCHASE IF THE REGULATION HAS NOT BEEN APPROVED BY THE WCB AT THE TIME WHEN THE PONDS ARE REMOVED.. POND 1 CURRENTLY PROVIDES 35.4 POUNDS OF REMOVAL A YEAR, AND POND TWO PROVIDES FOR 93.39 POUNDS OF REMOVAL A YEAR. POND TWO PROVIDES TREATMENT FOR 4.59 OFFSITE ACRES. IT IS ANTICIPATED THAT POND 1 WILL BE REMOVED EARLY IN THE STAGE OF CONSTRUCTION AND POND 2 WILL BE REMOVED AS BLOCKS 18 AND 19 ARE DEVELOPED. ANY ENVIRONMENTAL CONSIDERATIONS WILL BE ADDRESSED WITH REMOVAL OF THE PONDS.

PRE-DEVELOPMENT VS. POST-DEVELOPMENT FLOW COMPUTATIONS

1

Hydrograph Report

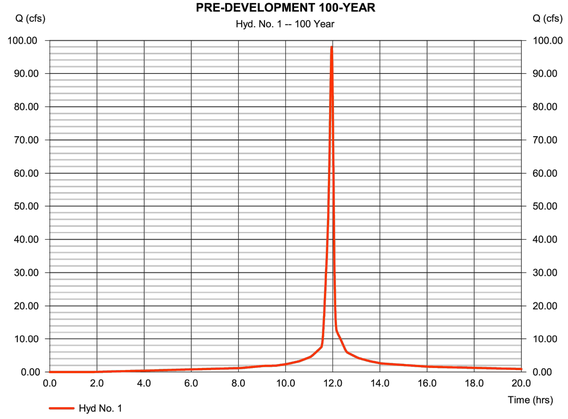
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Friday, 03 / 13 / 2020

Hyd. No. 1

PRE-DEVELOPMENT 100-YEAR

Hydrograph type	= SCS Runoff	Peak discharge	= 97.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.95 hrs
Time interval	= 1 min	Hyd. volume	= 226,785 cuft
Drainage area	= 8.230 ac → SEE NOTE #1	Curve number	= 93*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.250 x 80) + (5.980 x 98)] / 8.230 → SEE NOTE #2



1

Hydrograph Report

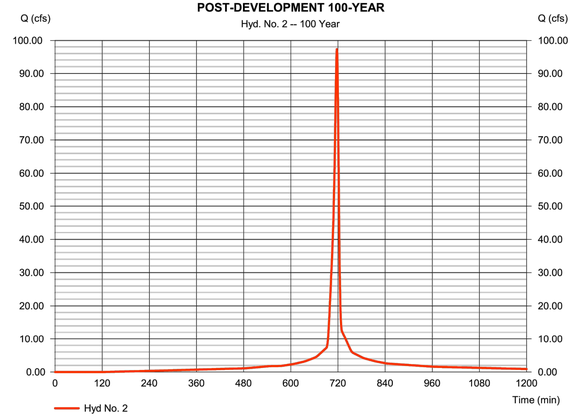
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Monday, 03 / 16 / 2020

Hyd. No. 2

POST-DEVELOPMENT 100-YEAR

Hydrograph type	= SCS Runoff	Peak discharge	= 97.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 223,100 cuft
Drainage area	= 8.230 ac → SEE NOTE #1	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.500 x 91) + (1.730 x 95)] / 8.230 → SEE NOTE #3



Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

100-YEAR STORM		
1-year storm	2-year storm	~~10-year storm~~
2.70	3.20	8.20

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.

Drainage Area A		A Soils	B Soils	C Soils	D Soils
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	1.82
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	4.68
	CN	98	98	98	98

Total Area (acres): 6.50
Runoff Reduction Volume (ft^3): 5,971

$CN_{(D.A. A)}$ = 93

100-YEAR STORM	1-year storm	2-year storm	~~10-year storm~~
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	1.97	2.45	7.36
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	1.72	2.19	7.11
Adjusted CN*	90	90	91

**See Notes above*

Drainage Area B		A Soils	B Soils	C Soils	D Soils
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.19
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	1.54
	CN	98	98	98	98

Total Area (acres): 1.73
Runoff Reduction Volume (ft^3): 954

$CN_{(D.A. B)}$ = 96

100-YEAR STORM	1-year storm	2-year storm	~~10-year storm~~
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	2.26	2.75	7.72
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	2.11	2.60	7.57
Adjusted CN*	94	94	95

**See Notes above*

INTENSITY VALUES USE FOR COMPUTATIONS	
1-YEAR 24 HOUR	2.70 IN/HR
2-YEAR 24 HOUR	3.20 IN/HR
10-YEAR 24 HOUR	5.20 IN/HR
100-YEAR 24 HOUR	8.20 IN/HR

NOTES:
1.) ONLY THE REDEVELOPED AREAS FOR THIS INFRASTRUCTURE PLAN HAVE BEEN ANALYZED TO SHOW 100-YEAR PEAK FLOW REDUCTION FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS.
2.) PRE-DEVELOPMENT CURVE NUMBER HAS BEEN CALCULATED FROM THE SITE TABULATIONS OF THE VRRM SPREADSHEET FOR IMPERVIOUS AND MANAGED TURF AREAS.
3.) POST-DEVELOPMENT CURVE NUMBER HAS BEEN CALCULATED USING THE VRRM RUNOFF REDUCTION ACHIEVED BY PERMEABLE PAVEMENT AND BIORETENTION AREAS WITH AN INTENSITY INPUT OF 8.20 IN/HR TO REFLECT THE 100-YEAR STORM EVENT, SEE CN TABLES ON THIS SHEET.

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COMMONWEALTH OF VIRGINIA
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NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

SWM COMPUTATIONS AND NARRATIVES

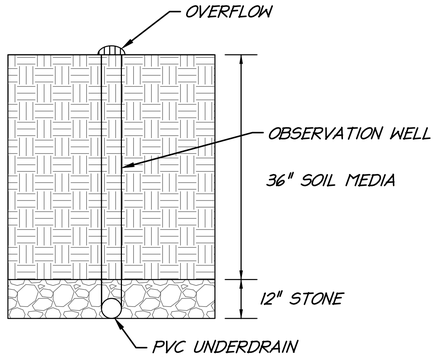
SHEET No.

C601

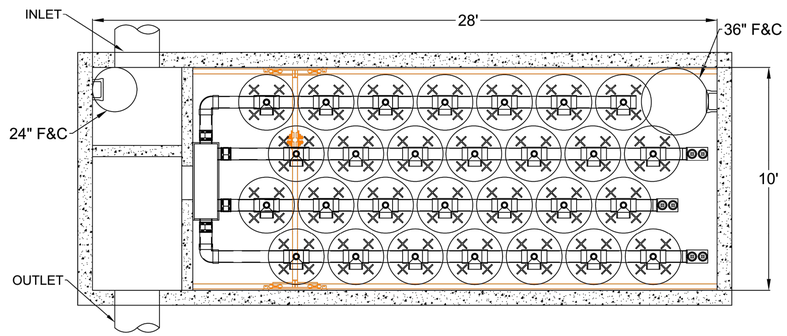
109639

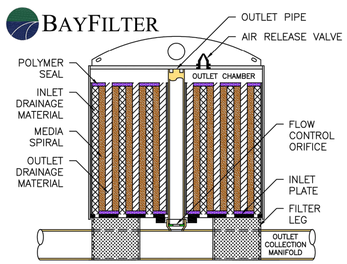
PRELIMINARY BAYFILTER DETAIL

BIORETENTION TYPICAL SECTION:
N.T.S.



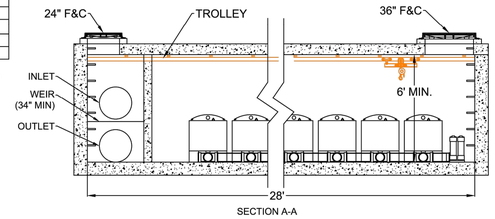
NOTE: ACTUAL BIORETENTION SECTION DEPTHS TO BE DETERMINED AT TIME OF FINAL SITE PLAN ON A CASE BY CASE BASIS. NO PONDING DEPTH ASSUMED IN STORAGE VOLUME CALCULATIONS.





BAYFILTER 545 10-28-28 VAULT	
PROJECT	
LOCATION	
WATER QUALITY FLOW	2.8 CFS
DRAINAGE AREA	
CARTRIDGE DESIGN FLOW RATE	45 GPM
# BAYFILTER CARTRIDGES	28
TREATED SEDIMENT CAPACITY	9,800 LBS

THE BAYFILTER STORMWATER MANAGEMENT SYSTEM IS A STORMWATER FILTRATION DEVICE DESIGNED TO REMOVE FINE SEDIMENTS, HEAVY METALS, AND PHOSPORUS. THE BAYFILTER SYSTEM RELIES ON A SPIRAL WOUND MEDIA FILTER CARTRIDGE WITH APPROXIMATELY 90 SQUARE FEET OF FILTRATION AREA. THE FILTER CARTRIDGES ARE HOUSED IN A CONCRETE STRUCTURE THAT EVENLY DISTRIBUTES THE FLOW BETWEEN CARTRIDGES. THE SYSTEM IS INLINE WITH AN INTERNAL BYPASS THAT ROUTES HIGH INTENSITY STORMS AROUND THE CARTRIDGES. THE FILTER CARTRIDGES REMOVE POLLUTANTS FROM RUNOFF BY FILTRATION (INTERCEPTION/ATTACHMENT) AND ADSORPTION.



SECTION A-A

NOTE: ACTUAL DESIGN DETAILS TO BE PROVIDED AT TIME OF FINAL SITE PLAN.

REV	DRW	CHK	DESCRIPTION
---	---	---	---

DATE: ---
DRAWN: ---
CHECKED: ---
PROJECT #: ---

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE AND SHALL REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES USED IN PERFORMING THE WORK AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION METHODS AND SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ALL PUBLIC AUTHORITIES BEARING ON THE PERFORMANCE OF THE WORK. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER IF THE CONTRACTOR OBSERVES THAT ANY OF THE CONTRACT DOCUMENTS ARE AT VARIANCE THEREWITH. THE CONTRACTOR SHALL BE LIABLE TO THE OWNER AND THE ENGINEER FOR ANY DAMAGES RESULTING FROM ANY SUCH VARIANCES OR CONFLICTS WHICH THE CONTRACTOR DID NOT PROMPTLY BRING TO THE ATTENTION OF THE ENGINEER. THE CONTRACTOR SHALL NOT BE ENTITLED TO ANY EXTRA COMPENSATION OR EXTENSION OF THE CONTRACT TIME RELATED TO THE CONTRACTOR'S FAILURE TO PROMPTLY NOTIFY THE ENGINEER. THE CONTRACTOR SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE CONTRACTOR TO CONSTRUCT THE PROJECT IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS.

BAYSAVER TECHNOLOGIES
1030 Deer Hollow Drive 1-800-BAYSAVER
Mount Airy, MD 21771 1-800-229-7283

4640 TRUEMAN BLVD
HILLIARD, OHIO 43026
1-800-733-7473

SHEET
--- OF ---

Project Description

Development (Redevelopment)

Drainage Area	Impervious	Pervious	Total
Site Area	6.22	5.30	11.52
On-Site Treated	4.24	0.65	4.89
Off-Site Treated	1.06	0.18	1.24
Total Treated	5.30	0.83	6.13
Any On-Site Disconnected by a Vegetated Buffer (25')	0.00		
Total On-Site Treated or Disconnected			4.89

Water Treatment On-Site

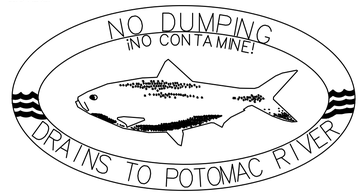
BMP Type	Area Treated by BMP (acres)	Impervious Area treated by BMP (acres)	BMP Efficiency (%)
Perv. Pvmt.	0.97	0.97	25%
Bioretention	4.53	3.7	25%
BayFilter	0.63	0.63	50%

TREATMENT NOTE:
PERVIOUS PAVEMENT REMAINING RUNOFF AFTER RUNOFF REDUCTION ROUTED TO TREE WELLS, THEN ROUTED TO SAND FILTER. TREE WELLS MODELED AS URBAN-BIORETENTION AND BIORETENTION. TREE WELLS DRAINING TO SAND FILTER WERE MODELED AS BIORETENTION, TREE WELLS NOT DRAINING TO SAND FILTER MODELED AS URBAN-BIORETENTION.

Miscellaneous Information

Total WQV treated yes (no)
Detention on Site yes (no)
Project is within which watershed? FOUR MILE RUN
Project Discharges to which body of water? POTOMAC RIVER

das
Curb Marker



CITY STANDARD
BMP/SWM MARKER
WATERSHED MARKER
TO BE PROVIDED ON STORM INLETS & STRUCTURES

das
Manufacturing Incorporated
Made In U.S.A.

(800) 541-4029
FAX (303) 691-4024
(303) 691-5907
P.N.# 53-ALX-HR
10/02/2002
www.dasmanufacturing.com

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DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ _____
DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ _____
DIRECTOR DATE

_____ _____
CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO. _____

christopher consultants
2920 w. broad st. p 804.389.9903
suite 222
richmond, va 23230
engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD
PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

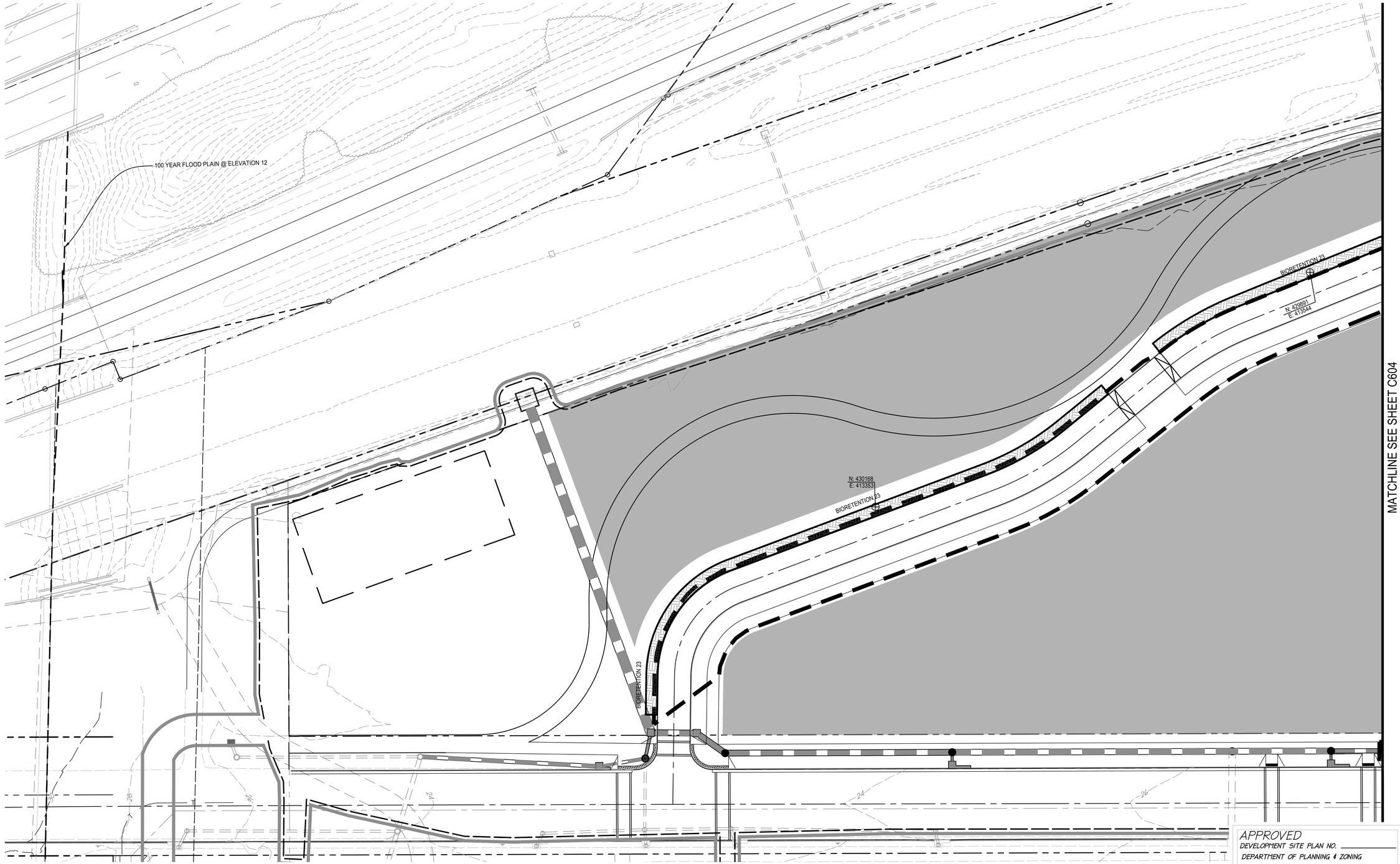
SHEET TITLE:

BMP DETAILS AND NARRATIVES

SHEET No.

C602

109639



LEGEND:

- BMP DRAINAGE DIVIDE
- LINEAR BIORETENTION AREA
- PERMEABLE PAVEMENT
- BACKOUT AREA (SEE NOTE #1)

NOTES:

1.) HATCHED AREAS DEPICT EXISTING SITE AREA TO BE TREATED WITH FULL DEVELOPMENT OF THE SITE AND HAVE NOT BEEN INCLUDED IN EXISTING OR PROPOSED SITE TABULATIONS IN THE VRRM TO DETERMINE REMOVAL REQUIREMENTS. THESE AREAS WILL BE NOTED AS THEIR EXISTING CONDITION FOR THE DSUP PHASE.

2.) SEE SHEET C606 FOR INDIVIDUAL DRAINAGE AREAS TO BIORETENTION AND BAYFILTER FACILITIES AND SIZING OF BIORETENTION BASINS.

VIRGINIA STATE GRID NORTH

30 15 0 30 60

GRAPHIC SCALE
1"=30'

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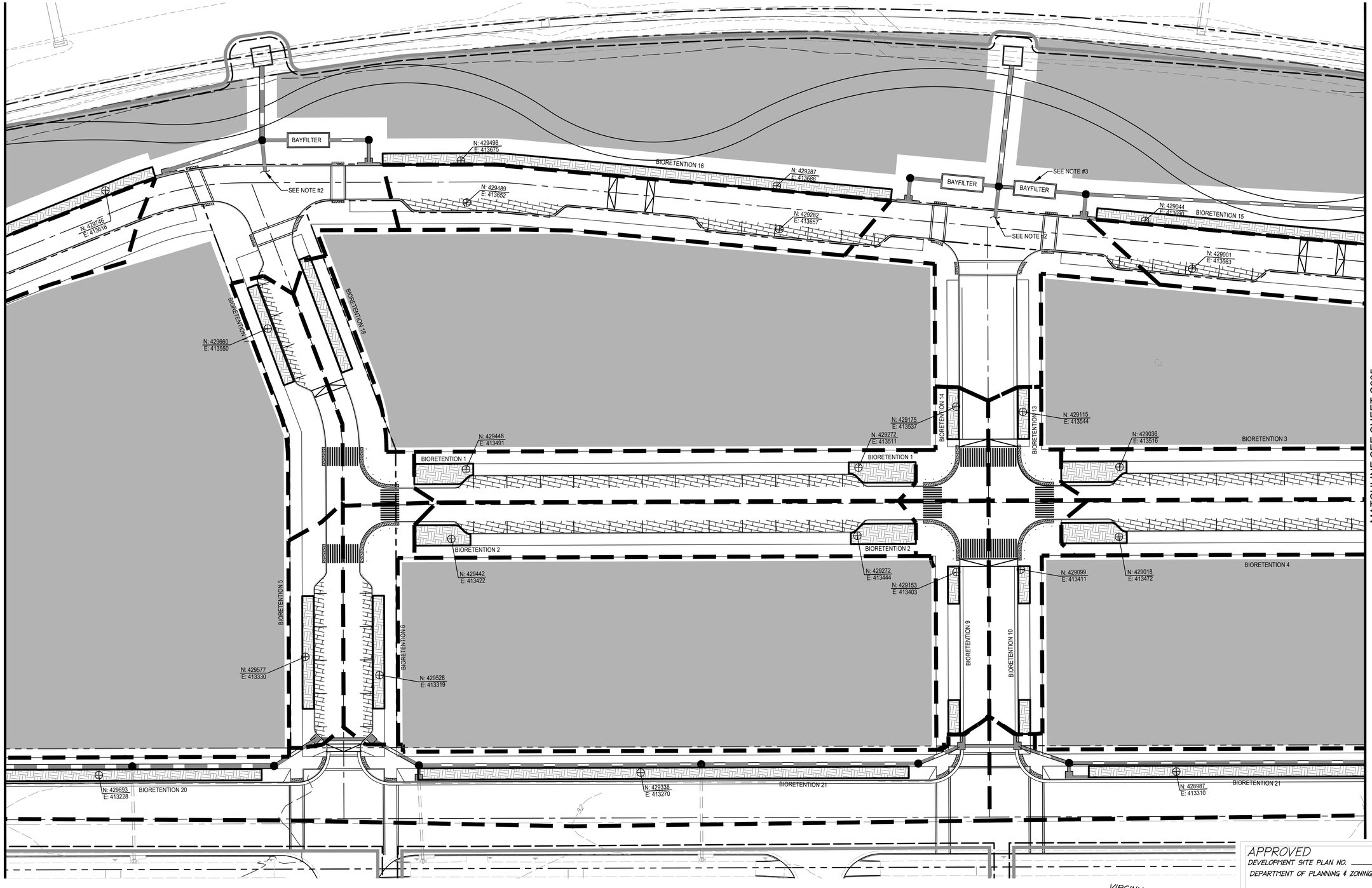
SHEET TITLE:

SWM-BMP PLAN

SHEET No.

C603

109639



LEGEND:

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- LINEAR BIORETENTION AREA
- PERMEABLE PAVEMENT
- BACKOUT AREA (SEE NOTE #1)

NOTES:

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2.) FUTURE CONNECTION FOR GROUNDWATER

3.) SEE SHEET C606 FOR INDIVIDUAL DRAINAGE AREAS TO BIORETENTION AND BAYFILTER FACILITIES AND SIZING OF BIORETENTION BASINS.

VIRGINIA STATE GRID NORTH

30 15 0 30 60

GRAPHIC SCALE
1"=30'

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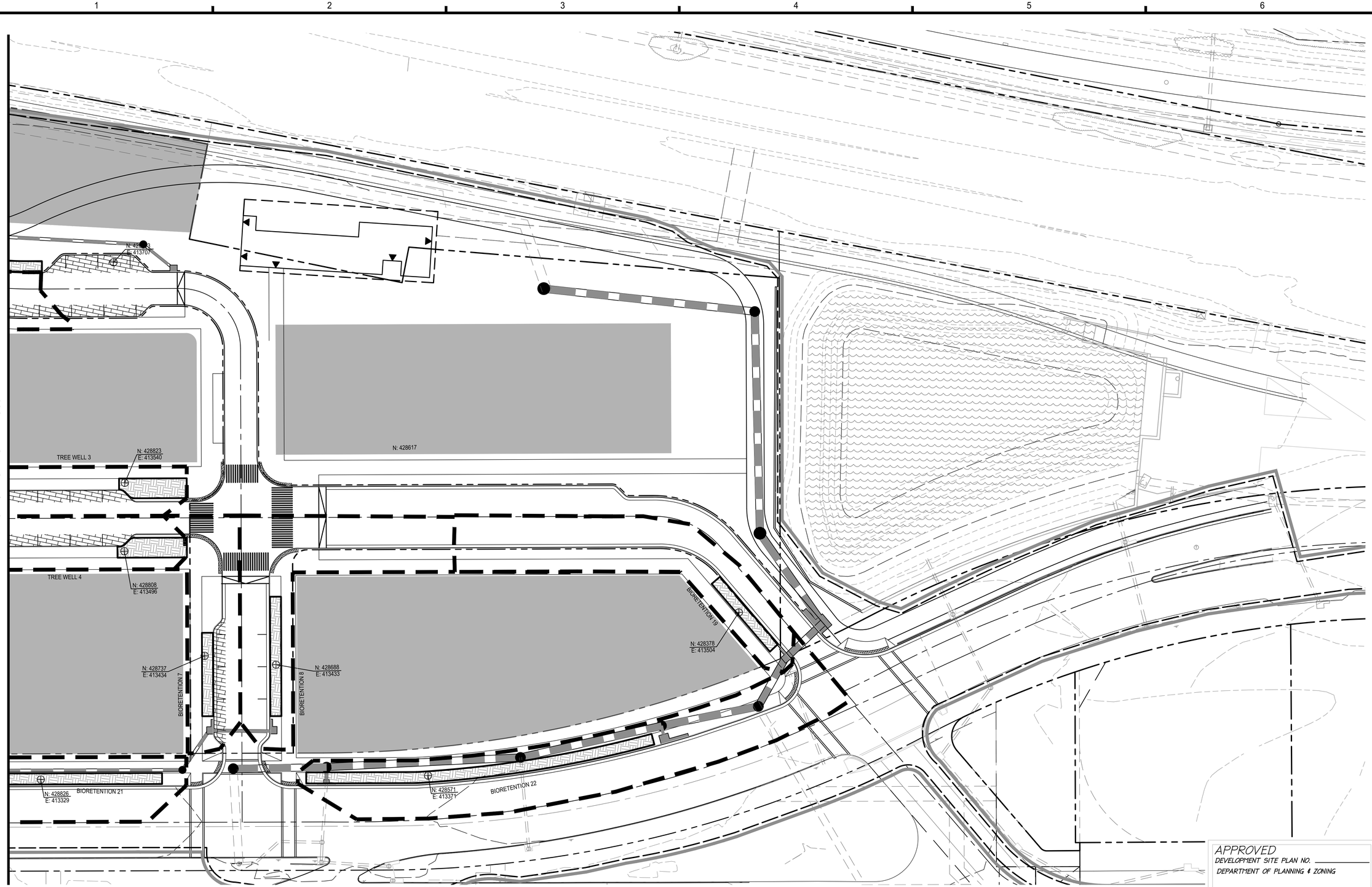
SWM-BMP PLAN

SHEET No.

C604

109639



LEGEND:

- BMP DRAINAGE DIVIDE
- LINEAR BIORETENTION AREA
- PERMEABLE PAVEMENT
- BACKOUT AREA (SEE NOTE #1)

NOTES:
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VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
1"=30'

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DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
SWM-BMP PLAN

SHEET No.
C605

109639

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

○ 2011 BMP Standards and Specifications ◉ 2013 Draft BMP Standards and Specifications

Project Name: POTOMAC YARD NORTH PHASE I
Date: 3/13/2020
Linear Development Project? No

CLEAR ALL (Ctrl+Shift+R)

data input cells | constant values | calculation cells | final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 22.99

Maximum reduction required:	*20%*
The site's net increase in impervious cover (acres) is:	*0.24*
Post-Development TP Load Reduction for Site (lb/yr):	*3.24*

Check:
BMP Design Specifications List: 2013 Draft Stds & Specs
Linear project? No
Land cover areas entered correctly? ✔
Total disturbed area entered? ✔ *Total disturbed area > Post-Development area!*

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				2.25	2.25
Impervious Cover (acres)				5.98	5.98
					8.23

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				2.01	2.01
Impervious Cover (acres)				6.22	6.22
Area Check	OK.	OK.	OK.	OK.	8.23

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre

Pre-ReDevelopment	Listed	Adjusted[1]
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	2.25	2.01
Weighted Rv(turf)	0.25	0.25
% Managed Turf	27%	25%
Impervious Cover (acres)	5.98	5.98
Rv(impervious)	0.95	0.95
% Impervious	73%	75%
Total Site Area (acres)	**8.23**	**7.99**
Site Rv	**0.76**	**0.77**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)

Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	2.01
Weighted Rv (turf)	0.25
% Managed Turf	24%
Impervious Cover (acres)	6.22
Rv(impervious)	0.95
% Impervious	76%
Final Site Area (acres)	**8.23**
Final Post Dev Site Rv	**0.78**

Land Cover Summary-Post

Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	2.01
Weighted Rv (turf)	0.25
% Managed Turf	25%
ReDev. Impervious Cover (acres)	5.98
Rv(impervious)	0.95
% Impervious	75%
Total ReDev. Site Area (acres)	**7.99**
ReDev Site Rv	**0.77**

Land Cover Summary-Post

Post-Development New Impervious	
New Impervious Cover (acres)	0.24
Rv(impervious)	0.95

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.5203	0.5153	
Pre-ReDevelopment Treatment Volume (cubic feet)	22,664	22,446	
Pre-ReDevelopment TP Load (lb/yr)	**14.24**	**14.10**	
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	1.73	1.77	
Baseline TP Load (lb/yr) (0.41 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*3.28*	
Final Post-Development Treatment Volume (acre-ft)	0.5343		
Final Post-Development Treatment Volume (cubic feet)	23,274		
Final Post-Development TP Load (lb/yr)	**14.62**		
Final Post-Development TP Load per acre (lb/acre/yr)	1.78		
Post-ReDevelopment Treatment Volume (acre-ft)	0.5153		
Post-ReDevelopment Treatment Volume (cubic feet)	22,446		
Post-ReDevelopment Load (TP) (lb/yr)*	**14.10**		
Post-ReDevelopment TP Load per acre (lb/acre/yr)	1.77		
Max. Reduction Required (Below Pre-ReDevelopment Load)	20%		
Post-Development Treatment Volume (acre-ft)	0.0190		
Post-Development Treatment Volume (cubic feet)	828		
Post-Development TP Load (lb/yr)	**0.52**		
TP Load Reduction Required for Redeveloped Area (lb/yr)	**2.82**		
TP Load Reduction Required for New Impervious Area (lb/yr)	**0.42**		

40% REMOVAL REQUIREMENT = 14.62 x 0.40 = 5.848 LB/YR

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	5.848 *

* 40% REMOVAL PER CDD CONDITIONS

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	101.87
Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	104.61

Drainage Area A

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				1.82	1.82	0.25
Impervious Cover (acres)				4.68	4.68	0.95
				Total	6.50	

Total Phosphorus Available for Removal in D.A. A (lb/yr) 11.18
Post Development Treatment Volume in D.A. A (ft³) 17,791

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists-

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft³)	Runoff Reduction (ft³)	Remaining Runoff Volume (ft³)	Total BMP Treatment Volume (ft³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45		0.97	0	1,505	1,840	3,345	25	0.00	2.10	1.23	0.87	None
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.56	3.09	0	4,466	6,698	11,164	25	0.00	7.01	3.85	3.15	None

TOTAL IMPERVIOUS COVER TREATED (ac) 4.06 AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac) 0.56 AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft³) 5,971

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr) 11.18
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) 5.09
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) 6.09

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

Drainage Area B

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.19	0.19	0.25
Impervious Cover (acres)				1.54	1.54	0.95
				Total	1.73	

Total Phosphorus Available for Removal in D.A. B (lb/yr) 3.45
Post Development Treatment Volume in D.A. B (ft³) 5,483

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists-

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft³)	Runoff Reduction (ft³)	Remaining Runoff Volume (ft³)	Total BMP Treatment Volume (ft³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.12	0.66	0	954	1,431	2,385	25	0.00	1.50	0.82	0.67	14.b. MTD - Filtering

TOTAL IMPERVIOUS COVER TREATED (ac) 0.66 AREA CHECK: OK.
TOTAL TURF AREA TREATED (ac) 0.12 AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. B (ft³) 954

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr) 3.45
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 0.82
TAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 2.62

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

14. Manufactured Treatment Devices (no RR)													
14.b. Manufactured Treatment Device-Filtering	0		0.63	1,431	0	3,604	3,604	50	0.67	1.36	1.02	1.02	

TOTAL IMPERVIOUS COVER TREATED (ac) 1.29 AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac) 0.12 AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr) 3.24

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr) 3.45
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 1.02
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 0.82
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr) 1.84
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr) 1.60

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 6.85
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 0.00
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr) 6.85

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%
Total Runoff Volume Reduction (ft³)	6,925
Total TP Load Reduction Achieved (lb/yr)	6.93
Total TN Load Reduction Achieved (lb/yr)	47.75
Remaining Post Development TP Load (lb/yr)	7.69
Remaining TP Load Reduction (lb/yr) Required	**0.00**

> 5.848 LBS/YR ; THEREFORE, CDD REQUIREMENT HAS BEEN MET

** TARGET TP REDUCTION EXCEEDED BY 3.69 LB/YEAR **

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CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____

INSTRUMENT NO. DEED BOOK NO. PAGE NO.

christopher consultants
2920 w. broad st. suite 222 richmond, va 23230 p 804.389.9903
engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD
PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
BMP COMPUTATIONS

SHEET No.
C606

109639

Storage Depth for Sizing	
36" MEDIA	3.0FT x 0.25Vr
12" STONE	1.0FT x 0.4Vr
Storage Depth	1.1S

Bioretention #1	
Impervious DA (AC)	0.15
Managed DA (AC)	0
Treatment Volume (CF)	441
Minimum Area (SF)	383
Actual Area (SF)	1,052
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #2	
Impervious DA (AC)	0.16
Managed DA (AC)	0.00
Treatment Volume (CF)	613
Minimum Area (SF)	533
Actual Area (SF)	1016
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #3	
Impervious DA (AC)	0.16
Managed DA (AC)	0.00
Treatment Volume (CF)	476
Minimum Area (SF)	414
Actual Area (SF)	1142
Upstream BMP	Permeable Pavement
Downstream BMP	Bayfilter

Bioretention #4	
Impervious DA (AC)	0.17
Managed DA (AC)	0.00
Treatment Volume (CF)	510
Minimum Area (SF)	443
Actual Area (SF)	1151
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #5	
Impervious DA (AC)	0.07
Managed DA (AC)	0.01
Treatment Volume (CF)	250
Minimum Area (SF)	217
Actual Area (SF)	558
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #6	
Impervious DA (AC)	0.09
Managed DA (AC)	0.01
Treatment Volume (CF)	319
Minimum Area (SF)	277
Actual Area (SF)	558
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #7	
Impervious DA (AC)	0.08
Managed DA (AC)	0.01
Treatment Volume (CF)	285
Minimum Area (SF)	248
Actual Area (SF)	426
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #8	
Impervious DA (AC)	0.2
Managed DA (AC)	0.01
Treatment Volume (CF)	699
Minimum Area (SF)	608
Actual Area (SF)	611
Upstream BMP	None
Downstream BMP	None

Bioretention #9	
Impervious DA (AC)	0.11
Managed DA (AC)	0.02
Treatment Volume (CF)	397
Minimum Area (SF)	345
Actual Area (SF)	755
Upstream BMP	None
Downstream BMP	None

Bioretention #10	
Impervious DA (AC)	0.11
Managed DA (AC)	0.02
Treatment Volume (CF)	397
Minimum Area (SF)	345
Actual Area (SF)	755
Upstream BMP	None
Downstream BMP	None

Bioretention #11
Removed From Plan and Computations

Bioretention #12
Removed From Plan and Computations

Bioretention #13	
Impervious DA (AC)	0.06
Managed DA (AC)	0.01
Treatment Volume (CF)	216
Minimum Area (SF)	188
Actual Area (SF)	256
Upstream BMP	None
Downstream BMP	Bayfilter

Bioretention #14	
Impervious DA (AC)	0.06
Managed DA (AC)	0.01
Treatment Volume (CF)	216
Minimum Area (SF)	188
Actual Area (SF)	256
Upstream BMP	None
Downstream BMP	Bayfilter

Bioretention #15	
Impervious DA (AC)	0.15
Managed DA (AC)	0.04
Treatment Volume (CF)	554
Minimum Area (SF)	482
Actual Area (SF)	1584
Upstream BMP	Permeable Pavement
Downstream BMP	Bayfilter

Bioretention #16	
Impervious DA (AC)	0.29
Managed DA (AC)	0.06
Treatment Volume (CF)	1055
Minimum Area (SF)	917
Actual Area (SF)	2525
Upstream BMP	Permeable Pavement
Downstream BMP	Bayfilter

Bioretention #17	
Impervious DA (AC)	0.09
Managed DA (AC)	0.01
Treatment Volume (CF)	319
Minimum Area (SF)	277
Actual Area (SF)	510
Upstream BMP	Permeable Pavement
Downstream BMP	None

Bioretention #18	
Impervious DA (AC)	0.1
Managed DA (AC)	0.01
Treatment Volume (CF)	354
Minimum Area (SF)	308
Actual Area (SF)	517
Upstream BMP	None
Downstream BMP	Bayfilter

Bioretention #19	
Impervious DA (AC)	0.12
Managed DA (AC)	0.01
Treatment Volume (CF)	423
Minimum Area (SF)	368
Actual Area (SF)	608
Upstream BMP	None
Downstream BMP	None

Bioretention #20	
Impervious DA (AC)	0.58
Managed DA (AC)	0.09
Treatment Volume (CF)	2082
Minimum Area (SF)	1810
Actual Area (SF)	3884
Upstream BMP	None
Downstream BMP	None

Bioretention #21	
Impervious DA (AC)	0.21
Managed DA (AC)	0.05
Treatment Volume (CF)	770
Minimum Area (SF)	670
Actual Area (SF)	2264
Upstream BMP	None
Downstream BMP	None

Bioretention #22	
Impervious DA (AC)	0.27
Managed DA (AC)	0.04
Treatment Volume (CF)	967
Minimum Area (SF)	841
Actual Area (SF)	1790
Upstream BMP	None
Downstream BMP	None

Bioretention #23	
Impervious DA (AC)	0.52
Managed DA (AC)	0.27
Treatment Volume (CF)	2038
Minimum Area (SF)	1772
Actual Area (SF)	5725
Upstream BMP	None
Downstream BMP	None

VRRM DRAINAGE AREA A	
BIORETENTION NOT ROUTED TO BAYFILTER	
TOTAL IMPERVIOUS	3.09
TOTAL MANAGED	0.56

VRRM DRAINAGE AREA B	
BIORETENTION ROUTED TO BAYFILTER	
TOTAL IMPERVIOUS	0.66
TOTAL MANAGED	0.12

IMPERVIOUS DIRECTLY TO BAYFILTER	0.63

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04/06/2020
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NORTH POTOMAC YARD

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CITY OF ALEXANDRIA, VIRGINIA

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APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____
DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____
DIRECTOR DATE

_____
CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

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DRAWN: MM
CHECKED: KMW

SHEET TITLE:

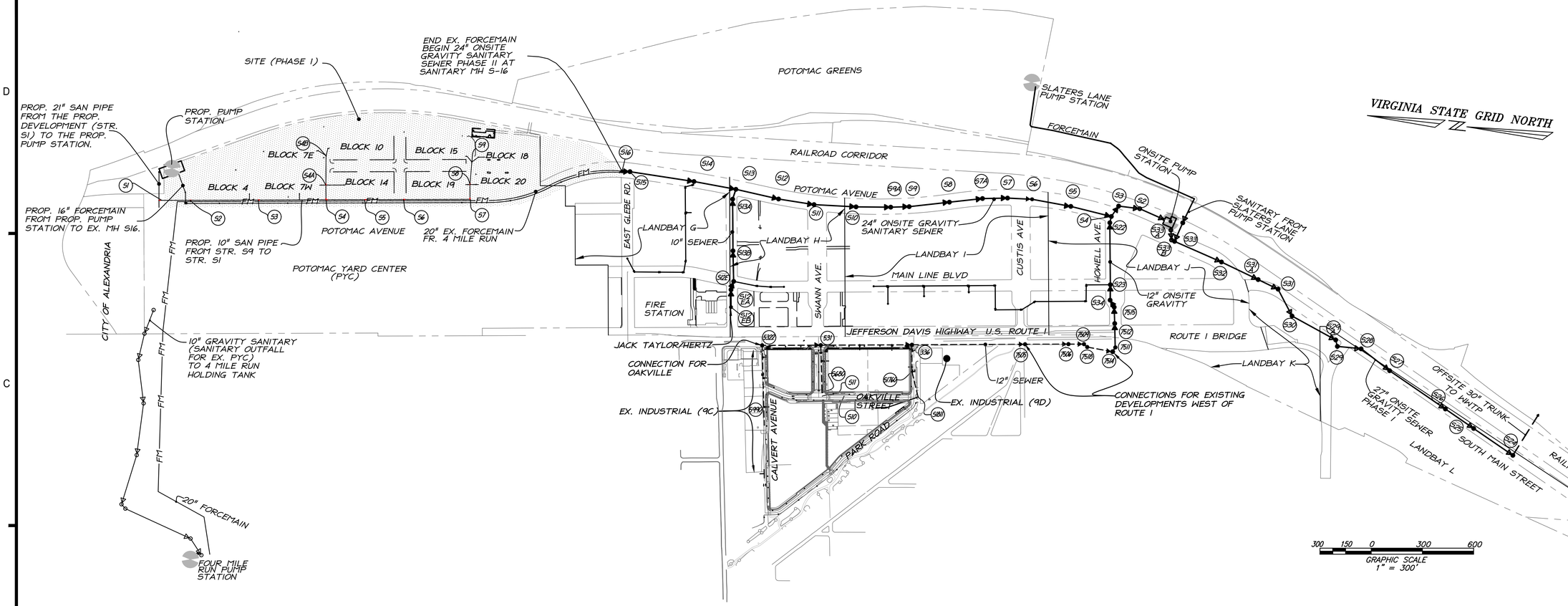
BMP COMPUTATIONS

SHEET No.

C607

109639

FOR INFORMATIONAL PURPOSES ONLY



APPROVED
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DEPARTMENT OF PLANNING & ZONING

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DIRECTOR DATE
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SITE PLAN No. _____

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SHEET TITLE:

SANITARY SEWER PLAN

SHEET No.

C700

109639

POTOMAC AVENUE REDEVELOPMENT
FLOW COMPUTATIONS

christopher consultants

NORTH POTOMAC YARD

SANITARY FLOW CALCULATIONS - DRAFT

Project Number: 88024.172.02
Prepared by: Mustafa Mahmoodzada, P.E., CFM
Checked by: Kevin Washington
Date Prepared: 2/6/2020

BLOCKS	BUILDING G.S.F	OFFICE SANITARY FLOW	OFFICE S.F. (GROSS)	UNIVERSITY SANITARY FLOW	UNIVERSITY STUDENTS	HOTEL SANITARY FLOW	HOTEL UNITS**	RETAIL SANITARY FLOW	RETAIL S.F. (GROSS)	MULTI-FAMILY HOUSING SANITARY FLOW	MULTI-FAMILY HOUSING UNITS***	TOTAL PROPOSED SANITARY FLOW (GPD)	
2	500,000	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	0	300 GPD/UNIT	667	200,100	
3	82,900	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	277	200 GPD/1,000 S.F.	0	300 GPD/UNIT	0	36,010	
4*	150,000	200 GPD/1,000 S.F.	120,000	15 GPD/STUDENT	666	130 GPD/UNIT	0	200 GPD/1,000 S.F.	0	300 GPD/UNIT	0	33,990	
5	600,000	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	0	300 GPD/UNIT	800	240,000	
6	395,000	200 GPD/1,000 S.F.	110,000	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	35,000	300 GPD/UNIT	334	129,200	
7E & 7W*	450,000	200 GPD/1,000 S.F.	360,000	15 GPD/STUDENT	1334	130 GPD/UNIT	0	200 GPD/1,000 S.F.	0	300 GPD/UNIT	0	92,010	
8	798,100	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	154,800	300 GPD/UNIT	858	288,360	
9	355,000	200 GPD/1,000 S.F.	55,000	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	40,000	300 GPD/UNIT	347	123,100	
10	262,900	200 GPD/1,000 S.F.	230,300	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	32,600	300 GPD/UNIT	0	52,580	
11	815,300	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	171,900	300 GPD/UNIT	858	291,780	
12	400,000	200 GPD/1,000 S.F.	55,000	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	50,000	300 GPD/UNIT	394	139,200	
14	284,500	200 GPD/1,000 S.F.	266,900	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	17,600	300 GPD/UNIT	0	56,900	
15	177,000	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	18,100	300 GPD/UNIT	212	67,220	
16****	738,750	200 GPD/1,000 S.F.	483,400	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	28,100	300 GPD/UNIT	672	303,900	
17	360,000	200 GPD/1,000 S.F.	60,000	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	50,000	300 GPD/UNIT	334	122,200	
18	133,200	200 GPD/1,000 S.F.	121,500	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	11,700	300 GPD/UNIT	0	26,640	
19	262,600	200 GPD/1,000 S.F.	11,700	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	22,300	300 GPD/UNIT	305	98,300	
20	185,300	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	18,600	300 GPD/UNIT	223	70,620	
21****	738,750	200 GPD/1,000 S.F.	483,400	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	28,100	300 GPD/UNIT	672	303,900	
22	435,000	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	0	130 GPD/UNIT	0	200 GPD/1,000 S.F.	65,000	300 GPD/UNIT	494	161,200	
23	300,000	200 GPD/1,000 S.F.	0	15 GPD/STUDENT	850	130 GPD/UNIT	0	200 GPD/1,000 S.F.	0	300 GPD/UNIT	150*****	57,750	
	1,905,500		1,110,400		2,000		0		120,900		740	498,260	PHASE I ADF
	6,518,800		1,246,800		850		277		622,900		6,580	2,396,700	PHASE II ADF
	8,424,300		2,357,200		2,850		277		743800		7,170	2,894,960	TOTAL ADF

PEAK FLOW CALCULATIONS BASED ON CITY'S MEMO TO INDUSTRY 06-14	
PEAKING FACTOR	2.5
PHASE I PEAK FLOW RATE (MGD)	1.25
PHASE II PEAK FLOW RATE (MGD)	5.99
TOTAL PEAK FLOW RATE (MGD)	7.24

LOW FLOW FIXTURES CALCULATIONS	
LFF FACTOR	35%
PHASE I PEAK FLOW REDUCTION (MGD)	0.17
PHASE II PEAK FLOW REDUCTION (MGD)	0.84
TOTAL PEAK FLOW REDUCTION (MGD)	1.01

ULTIMATE BUILD-OUT FLOWS	
PHASE I PEAK FLOW RATE (MGD)	1.07
PHASE II PEAK FLOW RATE (MGD)	5.15
TOTAL PEAK FLOW RATE (MGD)	6.22

*ASSUMES 2,000 STUDENTS & 80% TO BE OFFICE USE
**ASSUMES 300 S.F. PER UNIT
***ASSUMES 750 S.F. PER UNIT
****PHASE I FLEX SPACE USES HAVE BEEN EVENLY DIVIDED BETWEEN THESE BLOCKS
*****ASSUMES 1,000 S.F. PER UNIT (PER ZONING DEPARTMENT)

PHASE I
PHASE II

ONSITE SANITARY SEWER
HGL COMPUTATIONS

SANITARY - HYDRAULIC GRADE LINE COMPUTATIONS — **NORTH POTOMAC YARD PHASE I** — 03/06/20

Inlet Str.	Outlet Water Surf Elev (ft)	Do (in)	Qo (cfs)	Lo (ft)	Sfo (%)	Hf (ft)	JUNCTION LOSS Vo (fps)	Ho (ft)	Qi (cfs)	Vi (fps)	QiVi	Vi^2 2g	Hi (ft)	Angle (deg)	Ha (ft)	Ht (ft)	1.3Ht (ft)	0.5Ht (ft)	Final H (ft)	Inlet Water Surf Elev (ft)
HGL COMPUTATIONS FROM S0 TO S9																				
S1	3.55	21	2.81	119.07	0.02	0.02	9.1	0.32	2.81	12.7	35.77	2.51	0.88	90	1.69	2.89	0.00	1.44	1.47	5.02
S2	14.85	10	2.81	159.91	0.98	1.56	12.7	0.63	2.81	3.9	11.00	0.24	0.08	90	0.16	0.87	0.00	0.43	2.00	16.84
S3	17.17	10	2.81	396.00	0.98	3.86	3.9	0.06	2.62	3.8	10.01	0.23	0.08	180	0.15	0.29	0.00	0.15	4.01	21.18
S4	19.37	10	2.62	392.90	0.85	3.33	3.8	0.06	1.48	4.1	6.11	0.26	0.09	180	0.18	0.33	0.00	0.16	3.49	22.86
S5	20.65	10	1.48	223.00	0.27	0.61	4.1	0.07	1.48	4.1	6.15	0.27	0.09	180	0.18	0.34	0.00	0.17	0.77	21.42
S6	21.95	10	1.48	223.55	0.27	0.61	4.1	0.07	1.48	4.1	6.08	0.26	0.09	180	0.18	0.33	0.00	0.17	0.77	22.72
S7	24.07	10	1.48	384.86	0.27	1.04	4.1	0.07	1.48	4.3	6.40	0.29	0.10	90	0.19	0.36	0.00	0.18	1.22	25.29
S8	24.67	10	1.48	82.40	0.27	0.22	4.3	0.07	0.53	6.4	3.38	0.63	0.22	175	0.42	0.72	0.00	0.36	0.58	25.25
S9	29.84	10	0.53	128.81	0.03	0.04	6.4	0.16	0.00	0.0	0.00	0.00	0.00	0	0.00	0.16	0.00	0.08	0.12	29.96
HGL COMPUTATIONS FROM S4 TO S4B																				
S4	19.37	10	2.62	392.90	0.85	3.33	3.8	0.06	1.14	4.9	5.53	0.37	0.13	90	0.25	0.43	0.00	0.22	3.55	25.67
S4A	26.47	10	1.14	82.22	0.16	0.13	4.9	0.09	0.56	3.3	1.81	0.16	0.06	180	0.11	0.26	0.00	0.13	0.26	26.73
S4B	27.52	10	0.56	168.39	0.04	0.06	3.3	0.04	0.00	0.0	0.00	0.00	0.00	0	0.00	0.04	0.00	0.02	0.08	27.60

ONSITE SANITARY SEWER
PIPE COMPUTATIONS

PHASE I SANITARY SEWER COMPUTATIONS

FROM	TO	INVERTS (FT) UPPER INV	INVERTS (FT) LOWER INV	L (FT)	SLOPE (%)	DIA (IN)	MATERIAL	MANNINGS N VALUE	PIPE CAPACITY (CFS)	PIPE CAPACITY (MGD)	AVE. DAILY FLOW (ADF) INCREMENT (MGD)	AVE. DAILY FLOW (ADF) ACCUMULATED (MGD)	PEAK FACTOR	35% ADF REDUCTION	DESIGN FLOW (MGD)	DESIGN FLOW (CFS)	V_{FULL} (FT/S)	V (FT/S)	Q/Q_{FULL}	V/V_{FULL}	REMARKS
S9	S8	29.17	24.10	128.81	3.94	10	PVC	0.01	5.65	3.65	0.093860	0.093860	4.00	0.03	0.34	0.53	10.36	6.37	0.09	0.62	INCREMENT Q FROM BLOCKS 15 & 18.
S8	S7	24.00	23.50	82.40	0.61	10	PVC	0.01	2.22	1.43	0.168920	0.262780	4.00	0.09	0.96	1.48	4.07	4.31	0.67	1.06	INCREMENT Q FROM BLOCKS 19 & 20.
S7	S6	23.40	21.38	384.86	0.52	10	PVC	0.01	2.06	1.33	0.000000	0.262780	4.00	0.09	0.96	1.48	3.78	4.10	0.72	1.08	
S6	S5	21.28	20.08	223.55	0.54	10	PVC	0.01	2.09	1.35	0.000000	0.262780	4.00	0.09	0.96	1.48	3.82	4.15	0.71	1.08	
S5	S4	19.98	18.80	223.00	0.53	10	PVC	0.01	2.07	1.34	0.000000	0.262780	4.00	0.09	0.96	1.48	3.80	4.12	0.72	1.08	
S4B	S4A	26.85	25.90	168.39	0.56	10	PVC	0.01	2.14	1.38	0.098585	0.098585	4.00	0.03	0.36	0.56	3.92	3.26	0.26	0.83	INCREMENT Q FROM BLOCKS 7E & 10.
S4A	S4	25.80	25.00	82.22	0.97	10	PVC	0.01	2.81	1.82	0.102905	0.201490	4.00	0.07	0.74	1.14	5.15	4.86	0.41	0.94	INCREMENT Q FROM BLOCKS 7W & 14.
S4	S3	18.70	16.60	392.90	0.53	10	PVC	0.01	2.08	1.35	0.000000	0.464270	4.00	0.16	1.69	2.62	3.82	3.82	1.26	1.00	
S3	S2	16.50	14.28	396.00	0.56	10	PVC	0.01	2.13	1.38	0.033990	0.498260	4.00	0.17	1.82	2.81	3.91	3.91	1.32	1.00	INCREMENT Q FROM BLOCK 4.
S2	S1	14.18	3.07	159.91	0.95	10	PVC	0.01	7.50	4.85	0.000000	0.498260	4.00	0.17	1.82	2.81	13.76	12.71	0.37	0.92	
S1	P	2.15	-2.50	119.07	3.91	21	PVC	0.01	40.69	26.30	0.000000	0.498260	4.00	0.17	1.82	2.81	16.92	9.10	0.07	0.54	

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DEPARTMENT OF PLANNING & ZONING

DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
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CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

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engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

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PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

ON-SITE SANITARY SEWER COMPUTATIONS

SHEET No.

C701

109639

FOR INFORMATIONAL PURPOSES ONLY

EXISTING SANITARY SEWER PIPE COMPUTATIONS (PHASE I)

christopher consultants

ULTIMATE BUILD-OUT FLOWS

PHASE I - DRAFT

Project Number: 88024.172.02
Prepared by: Mustafa Mahmoodzada, P.E., CFM
Checked by: Kevin Washington
Date Prepared: 2/11/2020

24" Gravity Sewer - S16 to S33 (Potomac Ave)

Use Total Sanitary Sewer Flow Computations (Trunk Line)

	FROM	TO	UPPER INV	LOWER INV	L (FT)	SLOPE (%)	DIA (IN)	MATERIAL	N	CAPACITY (cfs)	CAPACITY (MGD)	DESIGN FLOW (cfs)	DESIGN FLOW (MGD)	AVAILABLE CAPACITY (CFS)	AVAILABLE CAPACITY (MGD)	V_{FULL} (ft/s)	Assumptions	Inc
design	S16	S15	27.74	27.15	14.30	4.13	24	PVC	0.011	54.31	35.10	7.85	5.07	46.46	30.03	17.29	4 mile run and North Potomac Yard Phase I	5.07
design	S15	S14	27.05	23.83	397.20	0.81	24	PVC	0.011	24.07	15.56	7.85	5.07	16.23	10.49	7.66		
design	S14	S13	23.58	22.75	251.80	0.33	24	PVC	0.011	15.35	9.92	9.60	6.21	5.75	3.71	4.89	Landbay G	1.14
design	S13	S12	22.65	21.81	254.20	0.33	24	PVC	0.011	15.37	9.93	11.15	7.21	4.22	2.73	4.89	Fire Station and Landbay H	1.00
design	S12	S11	21.71	21.02	210.10	0.33	24	PVC	0.011	15.32	9.90	11.15	7.21	4.17	2.70	4.88		
design	S11	S10	20.92	20.10	246.40	0.33	24	PVC	0.011	15.42	9.97	11.15	7.21	4.27	2.76	4.91		
design	S10	S9A	20.00	19.33	203.40	0.33	24	PVC	0.011	15.35	9.92	11.15	7.21	4.19	2.71	4.88		
design	S9A	S9	19.23	18.88	107.80	0.32	24	PVC	0.011	15.24	9.85	11.15	7.21	4.08	2.64	4.85		
design	S9	S8	18.78	17.99	237.00	0.33	24	PVC	0.011	15.44	9.98	11.15	7.21	4.29	2.77	4.91		
design	S8	S7A	17.89	17.25	195.00	0.33	24	PVC	0.011	15.32	9.90	11.52	7.45	3.79	2.45	4.88	Landbay I	0.24
design	S7A	S7	17.15	16.67	146.90	0.33	24	PVC	0.011	15.28	9.88	11.52	7.45	3.76	2.43	4.86		
design	S7	S6	16.57	16.09	144.00	0.33	24	PVC	0.011	15.44	9.98	11.52	7.45	3.91	2.53	4.91		
design	S6	S5	15.99	15.23	230.30	0.33	24	PVC	0.011	15.36	9.93	11.52	7.45	3.84	2.48	4.89		
design	S5	S4	15.13	14.32	244.40	0.33	24	PVC	0.011	15.39	9.95	11.52	7.45	3.87	2.50	4.90		
design/ as-built	S4	S3	14.22	13.83	74.40	0.52	24	PVC	0.011	19.36	12.51	14.17	9.16	5.19	3.35	6.16	Landbay J, Oakville Triangle, and River RD	1.71
as-built	S3	S2	13.73	13.29	124.20	0.35	24	PVC	0.011	15.91	10.29	14.17	9.16	1.75	1.13	5.07		
as-built/design slope	S2	S33A (PUMP)	13.19	12.70	151.90	0.32	24	PVC	0.011	15.19	9.81	14.17	9.16	1.02	0.66	4.83	On-site pump station, Calculated normal depth = 1.80', Max Flow = 17.89 cfs	
	S33A	S33B	--	--	--	--	24	PVC	0.011	-	-	14.17	9.16	-	-		Force Main	
	S33B	S33	--	--	--	--	24	PVC	0.011	-	-	14.17	9.16	-	-		Force Main	

27" Gravity Sewer - S33 to S24 (Potomac Ave)

	FROM	TO	UPPER INV	LOWER INV	L (FT)	SLOPE (%)	DIA (IN)	MATERIAL	N	CAPACITY (cfs)	CAPACITY (MGD)	DESIGN FLOW (cfs)	DESIGN FLOW (MGD)	AVAILABLE CAPACITY (CFS)	AVAILABLE CAPACITY (MGD)	V (ft/s)	Assumptions	Inc
as-built	S33	S32	27.23	26.37	300.50	0.29	27	PVC	0.011	19.58	12.66	15.34	9.92	4.24	2.74	4.92	Slater's lane pump station and Landbay C	0.76
as-built	S32	S31A	26.28	25.56	237.50	0.30	27	PVC	0.011	20.15	13.03	15.34	9.92	4.81	3.11	5.07		
as-built	S31A	S31	25.45	25.02	133.00	0.32	27	PVC	0.011	20.81	13.45	15.34	9.92	5.47	3.53	5.23		
as-built	S31	S30	24.89	24.41	173.00	0.28	27	PVC	0.011	19.28	12.46	15.34	9.92	3.94	2.54	4.85		
as-built	S30	S29A	24.30	23.34	295.00	0.33	27	PVC	0.011	20.88	13.50	15.34	9.92	5.54	3.58	5.25		
as-built	S29A	S29	23.29	22.60	39.50	1.75	27	PVC	0.011	48.38	31.27	15.34	9.92	33.03	21.35	12.17		
as-built	S29	S28	22.57	22.08	140.00	0.35	27	PVC	0.011	21.66	14.00	15.34	9.92	6.31	4.08	5.45		
as-built	S28	S27	21.93	21.14	209.50	0.38	27	PVC	0.011	22.48	14.53	15.34	9.92	7.13	4.61	5.65		
as-built	S27	S26	21.09	20.10	402.00	0.25	27	PVC	0.011	18.16	11.74	15.82	10.23	2.34	1.51	4.57	Landbay L	0.31
as-built	S26	S25	19.90	19.33	197.50	0.29	27	PVC	0.011	19.66	12.71	15.82	10.23	3.84	2.48	4.95		
as-built	S25	S24	19.21	18.28	276.00	0.34	27	PVC	0.011	21.25	13.73	15.82	10.23	5.42	3.51	5.34		

30" Gravity Sewer - Shaft 24 to Shaft 0 (Off-Site)

	FROM	TO	UPPER INV	LOWER INV	L (FT)	SLOPE (%)	DIA (IN)	MATERIAL	N	CAPACITY (cfs)	CAPACITY (MGD)	DESIGN FLOW (cfs)	DESIGN FLOW (MGD)	AVAILABLE CAPACITY (CFS)	AVAILABLE CAPACITY (MGD)	V (ft/s)	Contributing Flows	
as-built	24	23	18.26	17.7	281.2	0.20	30	CCFP	0.011	21.63	13.98	15.82	10.23	5.81	3.75	4.41		
as-built	23	22	17.51	16.97	221.8	0.24	30	CCFP	0.011	23.92	15.46	15.82	10.23	8.10	5.23	4.87		
as-built	22	21	16.83	15.94	253.2	0.35	30	CCFP	0.011	28.74	18.58	15.82	10.23	12.92	8.35	5.86		
as-built	21	20	15.85	14.84	376.3	0.27	30	CCFP	0.011	25.12	16.23	15.82	10.23	9.29	6.01	5.12		
as-built	20	19	14.67	13.73	394.3	0.24	30	CCFP	0.011	23.67	15.30	19.27	12.45	4.40	2.84	4.82	Braddock Metro Neighborhood Plan	2.23
as-built	19	18	13.46	12.47	427	0.23	30	CCFP	0.011	23.34	15.09	19.27	12.45	4.07	2.63	4.76		
as-built	18	17	12.12	11.01	424.4	0.26	30	CCFP	0.011	24.79	16.02	19.27	12.45	5.52	3.57	5.05		
as-built	17	16	10.75	10.06	410.9	0.17	30	CCFP	0.011	19.87	12.84	20.94	13.54	-1.08	-0.70	4.05	Existing Developments and Seperation Completed by December 2019	1.08
as-built	16	15	9.71	8.97	416.8	0.18	30	CCFP	0.011	20.43	13.20	20.94	13.54	-0.52	-0.33	4.16		
as-built	15	14	8.66	7.49	430.1	0.27	30	CCFP	0.011	25.28	16.34	20.94	13.54	4.34	2.81	5.15		
as-built	14	13	7.43	6.62	340.8	0.24	30	CCFP	0.011	23.63	15.28	20.94	13.54	2.69	1.74	4.81		
as-built	13	12	6.52	5.6	315.4	0.29	30	CCFP	0.011	26.18	16.92	22.65	14.64	3.53	2.28	5.33	Remaining Seperation	1.104
as-built	12	11	5.55	4.49	326.4	0.32	30	CCFP	0.011	27.63	17.86	22.65	14.64	4.97	3.22	5.63		
as-built	11	10	4.39	3.21	434.6	0.27	30	CCFP	0.011	25.26	16.33	22.65	14.64	2.61	1.69	5.15		
as-built	10	9	2.98	1.77	431.20	0.28	30	CCFP	0.011	25.68	16.60	22.65	14.64	3.03	1.96	5.23		
as-built	9	8	1.72	0.53	351.30	0.34	30	CCFP	0.011	28.22	18.24	22.65	14.64	5.56	3.60	5.75		
as-built	8	7	0.46	0.05	400.90	0.10	30	CCFP	0.011	15.50	10.02	22.65	14.64	-7.15	-4.62	3.16		
as-built	7	5	0.01	-2.17	587.20	0.37	30	CCFP	0.011	29.54	19.09	22.65	14.64	6.89	4.45	6.02		
as-built	5	4	-2.24	-3.78	561.10	0.27	30	CCFP	0.011	25.40	16.41	22.65	14.64	2.75	1.77	5.17		
as-built	4	3	-3.83	-4.64	399.00	0.20	30	CCFP	0.011	21.84	14.12	22.65	14.64	-0.81	-0.52	4.45		
as-built	3	2	-4.74	-5.89	408.70	0.28	30	CCFP	0.011	25.72	16.62	22.65	14.64	3.06	1.98	5.24		
as-built	2	1	-6.38	-7.14	326.60	0.23	30	CCFP	0.011	23.39	15.11	22.65	14.64	0.73	0.47	4.76		
as-built/design slope	1	0	-7.28	-7.50	80.30	0.27	30	CCFP	0.011	25.37	16.40	22.65	14.64	2.72	1.76	5.17		

Note: All calculated capacities are at full flow capacity, when the pipe is approximately 93% full.

NAD 83
USGS

xxx / yyy
xxx = Upper Inv
yyy = Lower Inv

Notes:
All elevation for the 30" and 27" sewer are from the USGS datum
n for all other sewers are from the NAD 83 datum (0.83' below the USGS datum'.
wn on the chart are full flow capacities, approximately 93% of the maximum capacity
on is from as-built plans, design information or GIS data and noted appropriately
'n' value of 0.010 was used for all smooth pipes per the ESI checklist.

EXISTING SANITARY SEWER HGL COMPUTATIONS (PHASE I)

christopher consultants

Ultimate Build-Out Flow - Phase I
Hydraulic Grade Line (HGL) Computations
VDOT Form LD-347

Project Number: 88024.172.02
Prepared by: Mustafa Mahmoodzada, P.E., CFM
Checked by: Kevin Washington
Date Prepared: 2/11/2020

Inlet Str.	Outlet Water Surf Elev (ft)	Do (in)	Qo (cfs)	Lo (ft)	Sfo (%)	Hf (ft)	JUNCTION LOSS Vo (fps)	Ho (ft)	Qi (cfs)	Vi (fps)	QiVi	ViV/2g	Hi (ft)	Angle (deg)	Ha (ft)	Ht (ft)	1.3 Ht. (ft)	0.5 Ht. (ft)	Final H (ft)	Inlet Water Surf Elev (ft)	Rim Elev (ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
30" Offsite Sewer																					
1	-5.50	30	22.65	80.30	0.18	0.14	6.4	0.16	22.65	5.9	133.65	0.54	0.19	90	0.38	0.73	0.00	0.36	0.51	-4.99	23.42
2	-4.99	30	22.65	326.60	0.18	0.59	5.9	0.14	22.65	6.6	148.37	0.67	0.23	0	0.00	0.37	0.00	0.18	0.77	-4.22	37.09
3	-3.89	30	22.65	408.70	0.18	0.74	6.6	0.17	22.65	5.5	124.59	0.47	0.16	0	0.00	0.37	0.00	0.17	0.90	-2.99	32.03
4	-2.64	30	22.65	399.00	0.18	0.72	5.5	0.12	22.65	6.4	144.97	0.64	0.22	0	0.00	0.34	0.00	0.17	0.89	-1.75	27.55
5	-1.75	30	22.65	561.10	0.18	1.01	6.4	0.16	22.65	7.5	168.76	0.86	0.30	0	0.00	0.46	0.00	0.23	1.24	-0.51	27.46
7	-0.17	30	22.65	587.20	0.18	1.06	7.5	0.22	22.65	3.9	88.34	0.24	0.08	0	0.00	0.30	0.00	0.15	1.21	1.04	32.23
8	2.05	30	22.65	400.90	0.18	0.72	3.9	0.06	22.65	7.1	160.38	0.78	0.27	5	0.05	0.38	0.00	0.19	0.91	2.96	28.83
9	2.96	30	22.65	351.30	0.18	0.63	7.1	0.19	22.65	6.5	147.24	0.66	0.23	5	0.04	0.46	0.00	0.23	0.87	3.83	31.61
10	3.83	30	22.65	431.20	0.18	0.78	6.5	0.16	22.65	6.4	144.97	0.64	0.22	5	0.04	0.42	0.00	0.21	0.99	4.82	29.73
11	5.21	30	22.65	434.60	0.18	0.78	6.4	0.16	22.65	6.9	156.30	0.74	0.26	5	0.04	0.46	0.00	0.23	1.02	6.23	29.95
12	6.49	30	22.65	326.40	0.18	0.59	6.9	0.18	22.65	6.6	149.50	0.68	0.24	70	0.41	0.83	0.00	0.42	1.01	7.50	33.02
13	7.60	30	22.65	315.40	0.18	0.57	6.6	0.17	20.94	6.1	127.13	0.57	0.20	70	0.35	0.72	0.00	0.36	0.93	8.53	40.87
14	8.62	30	20.94	340.80	0.15	0.53	6.1	0.14	20.94	6.4	134.04	0.64	0.22	0	0.00	0.37	0.00	0.18	0.71	9.33	43.98
15	9.49	30	20.94	430.10	0.15	0.66	6.4	0.16	20.94	5.3	109.96	0.43	0.15	0	0.00	0.31	0.00	0.15	0.82	10.31	45.62
16	10.97	30	20.94	416.80	0.15	0.64	5.3	0.11	20.94	5.1	106.81	0.40	0.14	0	0.00	0.25	0.00	0.12	0.77	11.74	44.15
17	12.06	30	20.94	410.90	0.15	0.63	5.1	0.10	19.27	6.2	119.27	0.59	0.21	0	0.00	0.31	0.00	0.15	0.79	12.85	42.81
18	13.01	30	19.27	424.40	0.13	0.55	6.2	0.15	19.27	5.8	111.76	0.52	0.18	0	0.00	0.33	0.00	0.17	0.72	13.73	44.41
19	14.47	30	19.27	427.00	0.13	0.56	5.8	0.13	19.27	5.9	113.68	0.54	0.19	0	0.00	0.32	0.00	0.16	0.72	15.19	43.96
20	15.73	30	19.27	394.30	0.13	0.51	5.9	0.14	15.82	6.1	96.53	0.58	0.20	0	0.00	0.34	0.00	0.17	0.68	16.41	45.92
21	16.84	30	15.82	376.30	0.09	0.33	6.1	0.14	15.82	6.8	106.97	0.71	0.25	25	0.21	0.61	0.00	0.30	0.63	17.47	47.03
22	17.94	30	15.82	253.20	0.09	0.22	6.8	0.18	15.82	5.8	91.78	0.52	0.18	70	0.32	0.68	0.00	0.34	0.56	18.50	45.23
23	18.97	30	15.82	221.80	0.09	0.20	5.8	0.13	15.82	5.4	85.45	0.45	0.16	15	0.09	0.38	0.00	0.19	0.38	19.35	42.51
24	19.70	30	15.82	281.20	0.09	0.25	5.4	0.11	0.00	0.0	0.00	0.00	0.00	90	0.00	0.11	0.00	0.06	0.30	20.00	41.38
27" Onsite Sewer																					
S25	20.00	27	15.82	276.00	0.15	0.43	6.6	0.17	15.82	6.2	97.63	0.59	0.21	0	0.00	0.38	0.00	0.19	0.61	20.62	39.96
S26	21.13	27	15.82	197.50	0.15	0.31	6.2	0.15	15.82	5.8	91.31	0.52	0.18	0	0.00	0.33	0.00	0.16	0.47	21.60	39.68
S27	21.90	27	15.82	402.00	0.15	0.62	5.8	0.13	15.34	6.9	105.42	0.73	0.26	0	0.00	0.39	0.00	0.19	0.81	22.71	39.51
S28	22.94	27	15.34	209.50	0.15	0.30	6.9	0.18	15.34	6.7	102.04	0.69	0.24	35	0.27	0.69	0.00	0.35	0.65	23.59	38.76
S29	23.88	27	15.34	140.00	0.15	0.20	6.7	0.17	15.34	12.3	188.12	2.33	0.82	70	1.42	2.41	0.00	1.21	1.41	25.29	39.35
S29A	25.29	27	15.34	39.50	0.15	0.06	12.3	0.58	15.34	6.5	99.59	0.65	0.23	45	0.30	1.12	0.00	0.56	0.62	25.91	38.02
S30	25.91	27	15.34	295.00	0.15	0.43	6.5	0.16	15.34	6.1	92.83	0.57	0.20	35	0.22	0.58	0.00	0.29	0.72	26.63	36.74
S31	26.63	27	15.34	173.00	0.15	0.25	6.1	0.14	15.34	6.4	98.20	0.64	0.22	40	0.27	0.64	0.00	0.32	0.57	27.20	37.70
S31A	27.20	27	15.34	133.00	0.15	0.19	6.4	0.16	15.34	6.2	95.14	0.60	0.21	0	0.00	0.37	0.00	0.18	0.38	27.57	37.05
S32	27.57	27	15.34	237.50	0.15	0.34	6.2	0.15	15.34	6.1	93.60	0.58	0.20	0	0.00	0.35	0.00	0.18	0.52	28.09	37.62
S33	28.17	27	15.34	300.50	0.15	0.44	6.1	0.14	0.00	0.0	0.00	0.00	0.00	90	0.00	0.14	0.00	0.07	0.51	28.68	33.90
24" Onsite Sewer (Scenario 2)																					
S2	14.30	24	14.17	151.90	0.23	0.35	6.0	0.14	14.17	6.3	89.26	0.62	0.22	15	0.12	0.47	0.00	0.24	0.59	14.89	46.29
S3	14.89	24	14.17	151.90	0.23	0.35	6.3	0.15	14.17	7.5	106.83	0.88	0.31	60	0.49	0.96	0.00	0.48	0.83	15.72	45.33
S4	15.72	24	14.17	124.20	0.23	0.29	7.5	0.22	14.17	6.1	86.57	0.58	0.20	70	0.35	0.78	0.00	0.39	0.68	16.40	44.75
S5	16.40	24	14.17	74.40	0.23	0.17	6.1	0.14	11.52	6.1	70.40	0.58	0.20	0	0.00	0.35	0.00	0.17	0.35	16.74	41.95
S6	16.83	24	11.52	244.40	0.15	0.38	6.1	0.14	11.52	6.1	70.40	0.58	0.20	5	0.03	0.38	0.00	0.19	0.57	17.40	43.11
S7	17.69	24	11.52	230.30	0.15	0.35	6.1	0.14	11.52	6.1	70.40	0.58	0.20	5	0.03	0.38	0.00	0.19	0.54	18.23	42.95
S7A	18.27	24	11.52	144.00	0.15	0.22	6.1	0.14	11.52	6.1	70.40	0.58	0.20	5	0.03	0.38	0.00	0.19	0.41	18.68	41.49
S8	18.85	24	11.52	146.90	0.15	0.23	6.1	0.14	11.52	6.1	70.40	0.58	0.20	0	0.00	0.35	0.00	0.17	0.40	19.25	39.54
S9	19.59	24	11.52	195.00	0.15	0.30	6.1	0.14	11.15	6.0	67.24	0.56	0.20	5	0.03	0.38	0.00	0.19	0.49	20.08	35.35
S9A	20.48	24	11.15	237.00	0.14	0.34	6.0	0.14	11.15	6.1	68.14	0.58	0.20	0	0.00	0.34	0.00	0.17	0.51	20.99	36.56
S10	20.99	24	11.15	107.80	0.14	0.15	6.1	0.14	11.15	6.1	68.14	0.58	0.20	5	0.03	0.38	0.00	0.19	0.35	21.34	35.97
S11	21.70	24	11.15	203.40	0.14	0.29	6.1	0.14	11.15	6.1	68.14	0.58	0.20	5	0.03	0.38	0.00	0.19	0.48	22.18	37.48
S12	22.62	24	11.15	246.40	0.14	0.35	6.1	0.14	11.15	6.1	68.14	0.58	0.20	5	0.03	0.38	0.00	0.19	0.55	23.17	36.49
S13	23.41	24	11.15	210.10	0.14	0.30	6.1	0.14	11.15	6.1	67.80	0.57	0.20	0	0.00	0.35	0.00	0.17	0.47	23.88	34.78
S14	24.35	24	11.15	254.20	0.14	0.37	6.1	0.14	9.60	8.7	83.65	1.18	0.41	0	0.00	0.56	0.00	0.28	0.64	24.99	33.90
S15	25.43	24	9.60	251.80	0.11	0.27	8.7	0.29	7.85	14.7	115.37	3.36	1.17	0	0.00	1.47	0.00	0.73	1.00	26.43	35.99
S16	28.75	24	7.85	397.20	0.07	0.28	14.7	0.84	0.00	0.0	0.00	0.00	0.00	0	0.00	0.84	0.00	0.42	0.70	29.45	35.99

Notes:
1. All elevation for the 30" and 27" sewer are from the USGS datum
2. All elevation for all other sewers are from the NAD 83 datum (0.83' below the USGS datum)
3. All capacities shown on the chart are full flow capacities, approximately 93% of the maximum capacity.
4. All information is from as-built plans, design information or GIS data and noted appropriately.
5. Velocity values assumed to be at maximum when the pipe is at full capacity.

TOTAL SANITARY SEWER FLOW COMPUTATIONS

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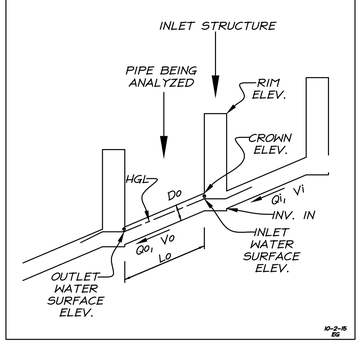
TOTAL SANITARY SEWER FLOW COMPUTATIONS

PHASE I - DRAFT

Project Number: 88024.172.02
Prepared by: Mustafa Mahmoodzada, P.E., CFM
Checked by: Kevin Washington
Date Prepared: 2/11/2020

		WITH STANDARD WASTEWATER FLOW RATES			ULTIMATE BUILD-OUT FLOWS	
	FLOWS FROM	TO MANHOLE NUMBER	AVERAGE DAILY FLOW RATE (MGD)	PEAK FLOW RATE (MGD)	35% ADF REDUCTION	ULTIMATE BUILD-OUT FLOWS (MGD)
1	FOUR MILE RUN PUMP STATION	S16	N/A	4.00	N/A	4.00
2	POTOMAC AVENUE REDEVELOPMENT - PHASE I PEAKED AT 2.5 -LLF ELIGIBLE	S16	0.50	1.25	0.17	1.07
3	LANDBAY G - PEAKED AT 2.5	S14	0.45	1.14	N/A	1.14
4	FIRE STATION - PEAKED AT 2.5	S12E/S13	0.02	0.06	N/A	0.06
5	LANDBAY H - PEAKED AT 2.5	S13	0.37	0.94	N/A	0.94
6	LANDBAY I - PEAKED AT 2.5	S8	0.10	0.24	N/A	0.24
7	LANDBAY J - PEAKED AT 2.5	S23/S4	0.10	0.24	N/A	0.24
8	OAKVILLE TRIANGLE (CDD #24) - PEAKED AT 2.5 - LLF ELIGIBLE	S322/S4	0.44	1.11	0.15	0.95
9	RIVER ROAD PUMPING STATION - PEAKED AT 3	7505/S4	0.17	0.52	N/A	0.52
10	SLATER LANE - PEAKED AT 3	S33	0.25	0.75	N/A	0.75
11	LANDBAY C - PEAKED AT 2.5	S33	0.003	0.01	N/A	0.01
12	LANDBAY L - PEAKED AT 2.5	S27	0.12	0.31	N/A	0.31
13	BRADDOCK METRO NEIGHBORHOOD PLAN - PEAKED AT 3 - LFF ELIGIBLE	SHAFT 20	0.84	2.52	0.29	2.23
14	EXISTING DEVELOPMENT - PEAKED AT 3 - LFF ELIGIBLE	SHAFT 17	0.18	0.53	N/A	0.53
15	SEPERATION COMPLETED BY DECEMBER 2019 - PEAKED AT 3	SHAFT 17	0.18	0.55	N/A	0.55
16	REMAINING SEPERATION - PEAKED AT 3	SHAFT 13	0.37	1.10	N/A	1.10
	TOTAL			**15.27**		**14.64**

HGL DIAGRAM
N.T.S.



APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____
DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____
DIRECTOR DATE

_____
CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

_____ _____ _____
INSTRUMENT NO. DEED BOOK NO. PAGE NO.

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richmond, va 23230
engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD
PHASE 1 INFRASTRUCTURE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

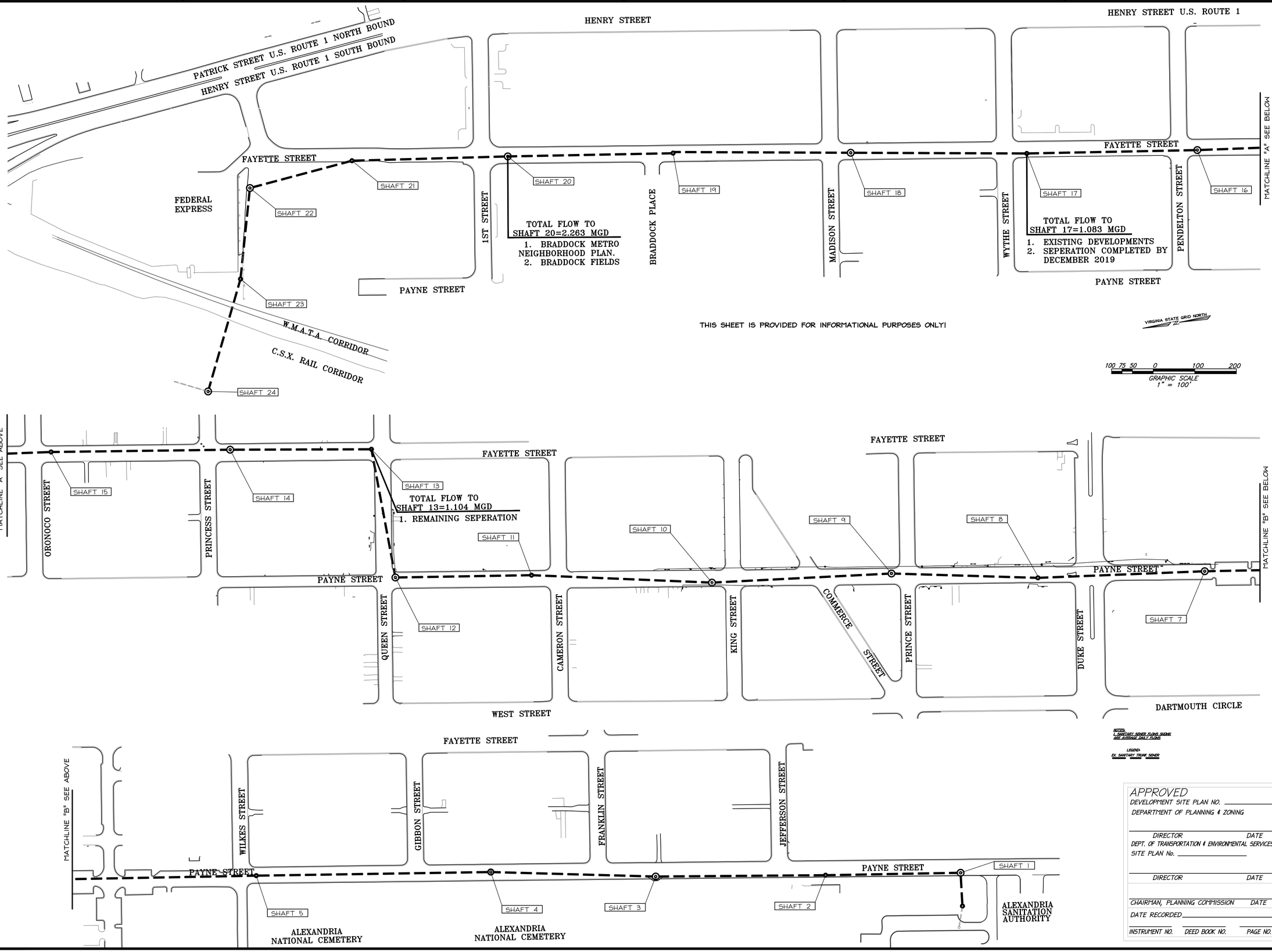
MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:
OFF-SITE SANITARY SEWER COMPUTATIONS PHASE I

SHEET No.
C702

109639



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NORTH POTOMAC YARD

PAHSE 1 INFRASTRUCTURE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

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DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ DIRECTOR DATE

_____ CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

_____ _____ _____
INSTRUMENT NO. DEED BOOK NO. PAGE NO.

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2019-12-17
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

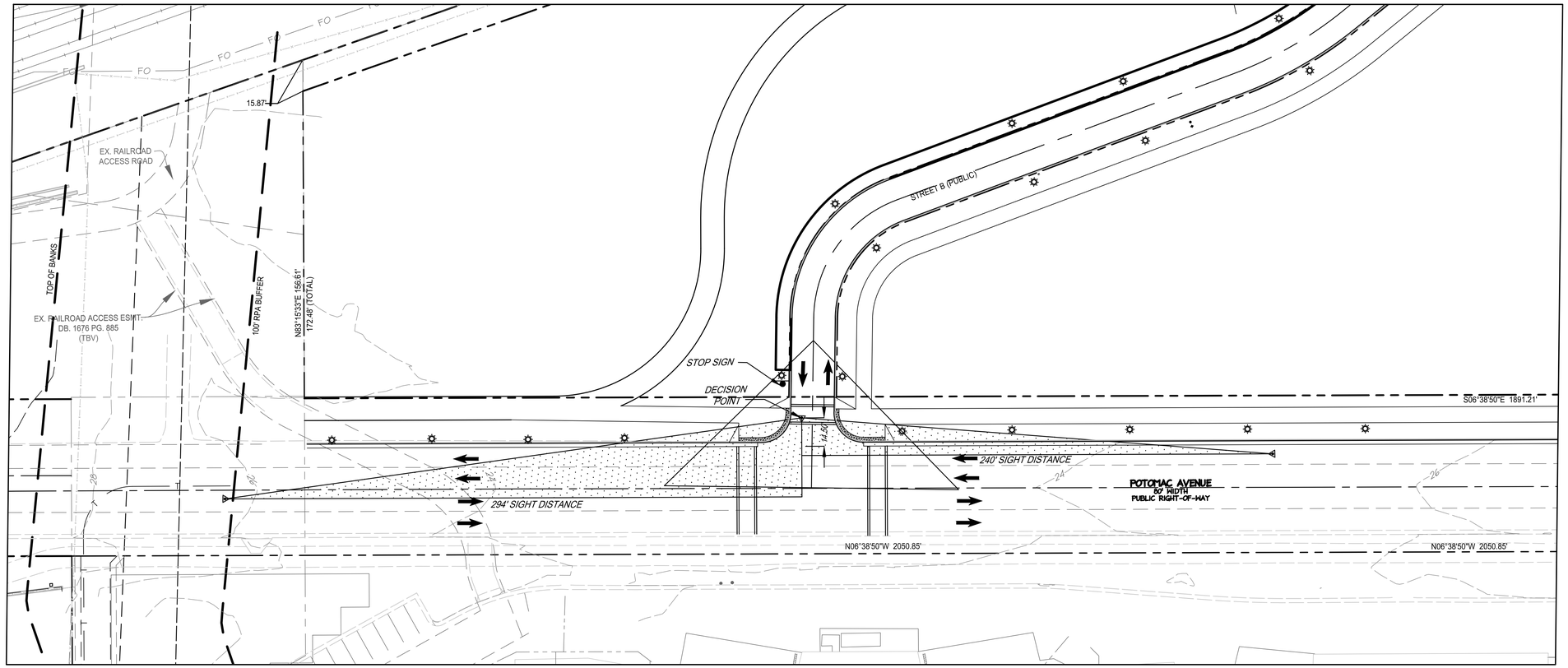
SHEET TITLE:

EX. 30" OFFSITE SAN. TRUNK SEWER

SHEET No.

C703

109639



NOTE:

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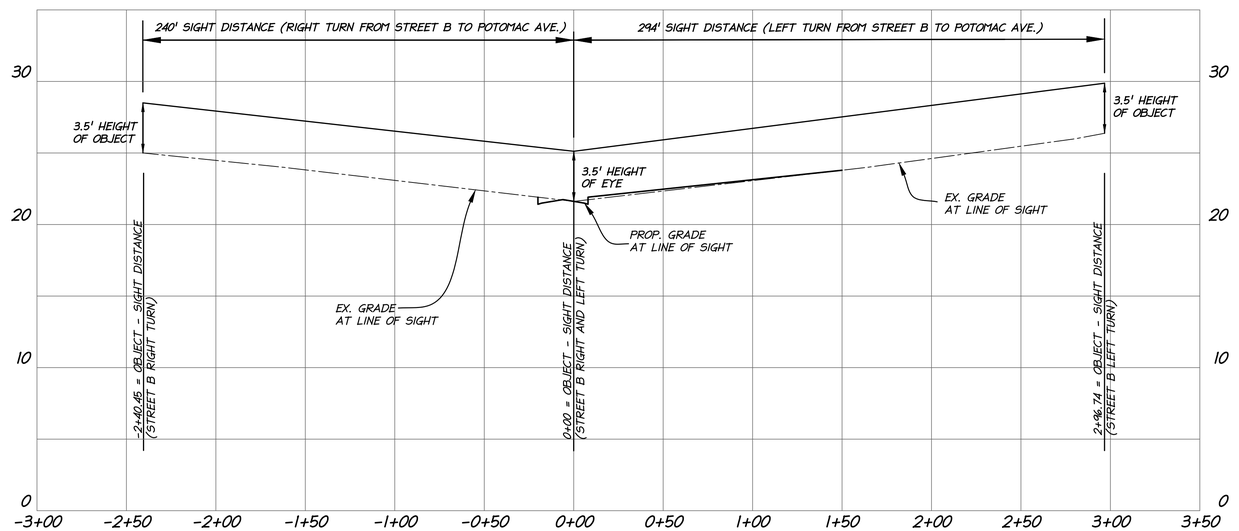
CASE E: AT INTERSECTIONS WITH ALL-WAY STOP CONTROL, THE FIRST STOPPED VEHICLE ON ONE APPROACH SHOULD BE VISIBLE TO THE DRIVERS OF THE FIRST STOPPED VEHICLES ON EACH OF THE OTHER APPROACHES.

SEE SITE PLAN SHEETS FOR "75' VISION TRIANGLES" WHICH MEET AND EXCEED THIS REQUIREMENT.

STREET B SIGHT DISTANCE

POTOMAC AVE. (MAJOR ROAD) POSTED SPEED: 25 MPH



SIGHT DISTANCE AT INTERSECTION OF POTOMACE AVE. AND STREET "B".

AASHTO GREEN BOOK
CASE B - INTERSECTION WITH STOP CONTROL ON THE MINOR ROAD

MAJOR ROAD:
POTOMAC AVENUE
EXISTING 4-LANE HIGHWAY
SPEED LIMIT = 25 MPH

MINOR ROAD:
PROP. STREET "B" WITH STOP CONTROL

5 2.5 0 5 10
VETICAL SCALE
1"=5'

40 20 0 40 80
HORIZONTAL SCALE
1"=40'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
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PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

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DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

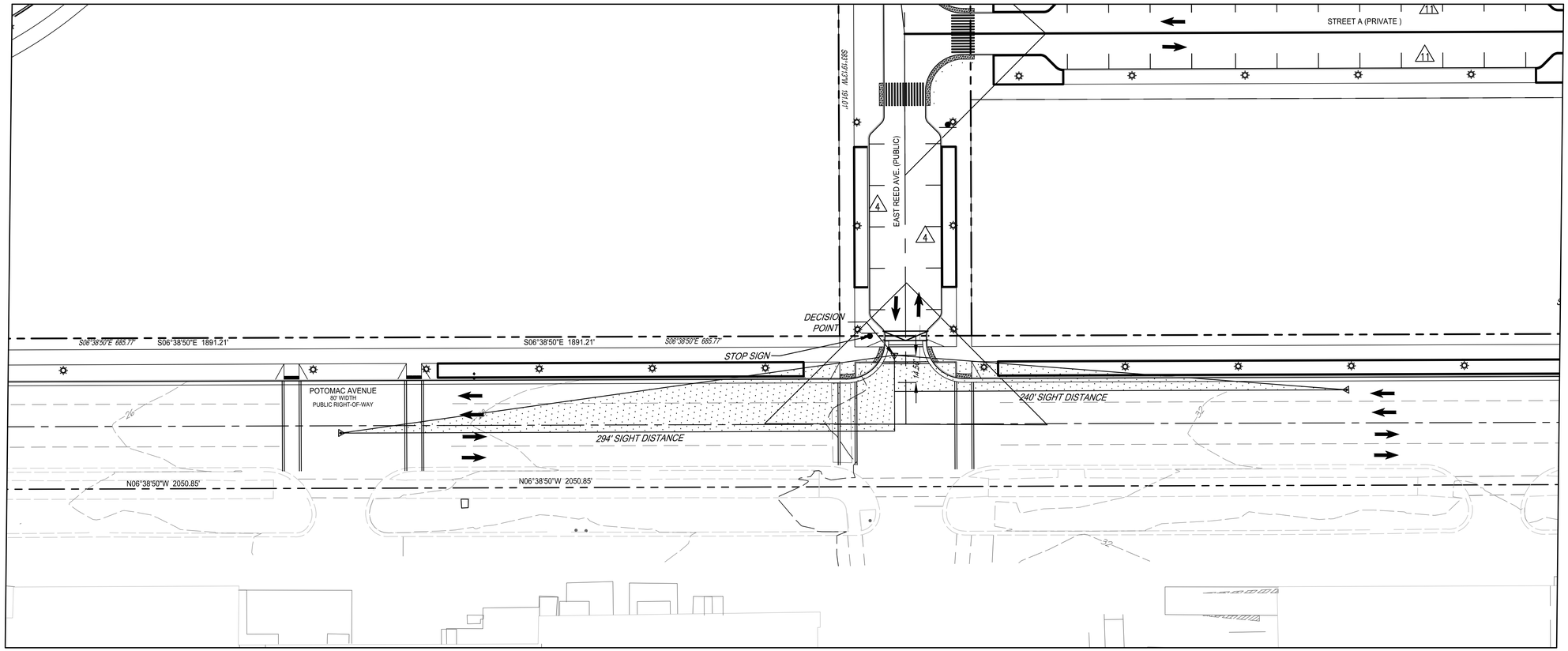
SHEET TITLE:

SIGHT DISTANCE PLAN & PROFILE

SHEET No.

C800

109639



VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
1"=30'

NOTE:

PROPOSED INTERSECTIONS IN THE SITE ARE "ALL-WAY STOP CONTROL". BASED ON AASHTO GREEN BOOK THEY ARE CATEGORIZED AS CASE E.

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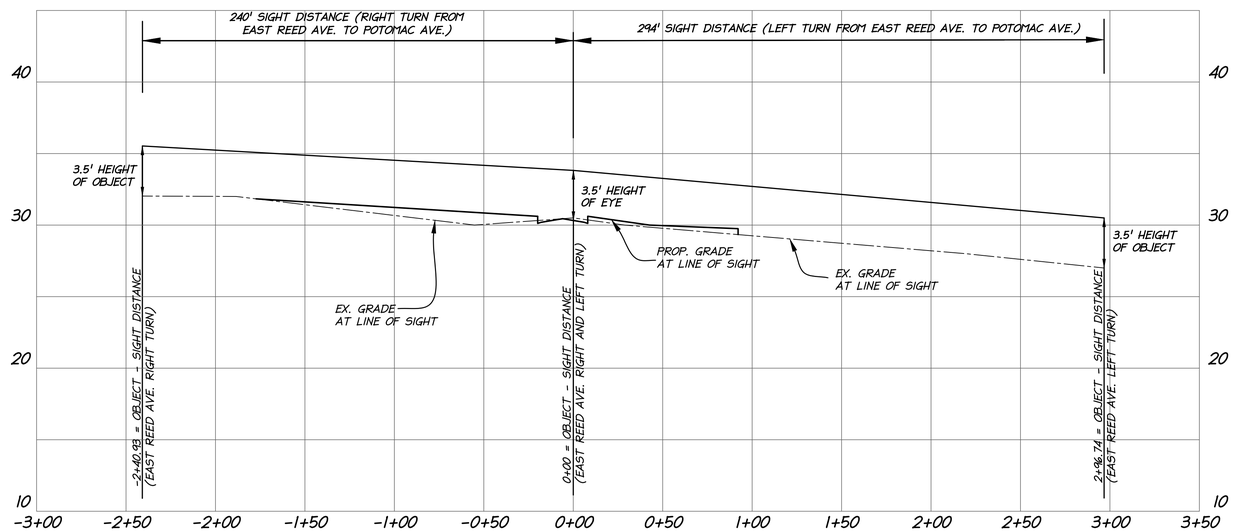
SEE SITE PLAN SHEETS FOR "75' VISION TRIANGLES" WHICH MEET AND EXCEED THIS REQUIREMENT.

EAST REED AVE. SIGHT DISTANCE

POTOMAC AVE. (MAJOR ROAD) POSTED SPEED: 25 MPH



SIGHT DISTANCE AT INTERSECTION OF POTOMACE AVE. AND EAST REED AVE.

AASHTO GREEN BOOK
CASE B - INTERSECTION WITH STOP CONTROL ON THE MINOR ROAD

MAJOR ROAD:
POTOMAC AVENUE
EXISTING 4-LANE HIGHWAY
SPEED LIMIT = 25 MPH

MINOR ROAD:
PROP. EAST REED AVE. WITH STOP CONTROL

5 2.5 0 5 10
VETICAL SCALE
1"=5'

40 20 0 40 80
HORIZONTAL SCALE
1"=40'

APPROVED
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DEPARTMENT OF PLANNING & ZONING

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04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

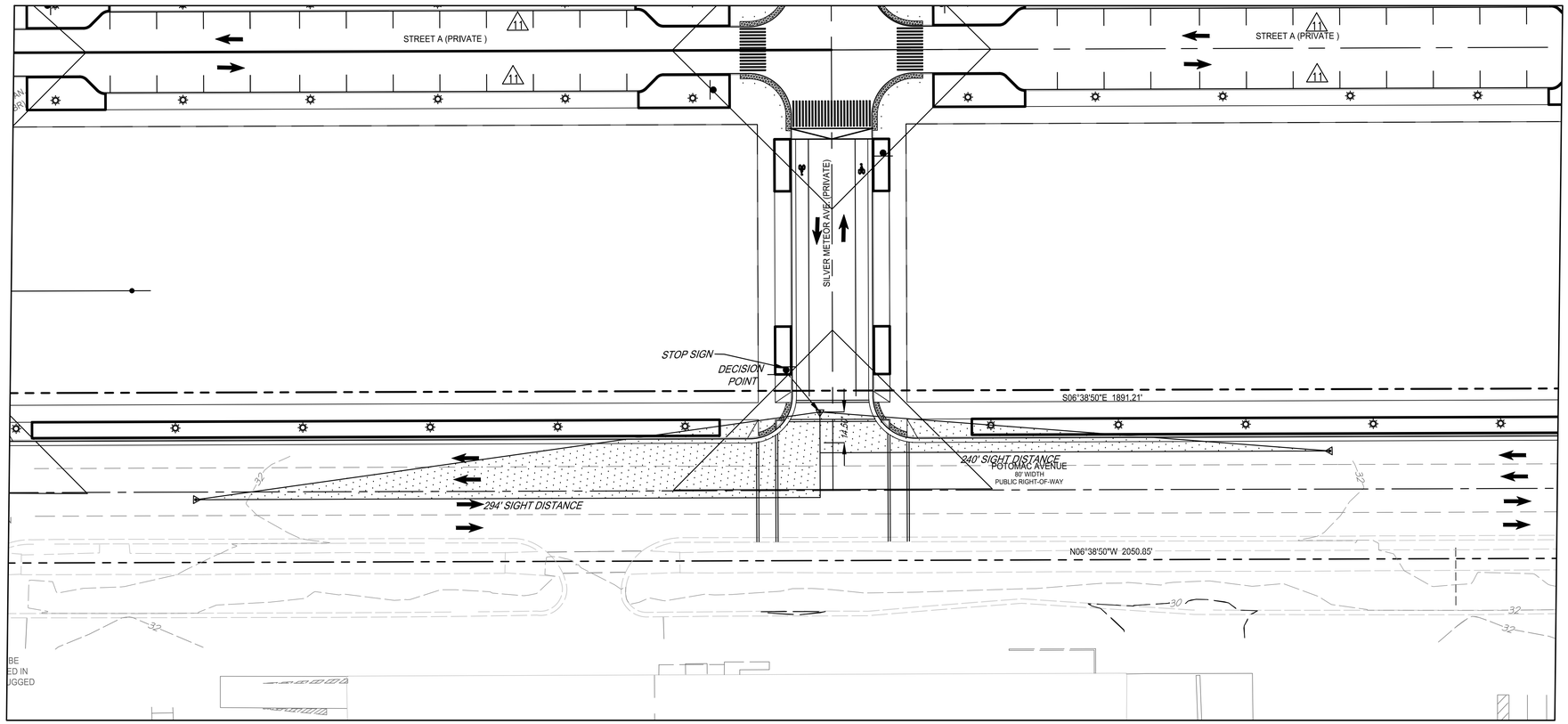
SHEET TITLE:

SIGHT DISTANCE PLAN & PROFILE

SHEET No.

C801

109639



VIRGINIA STATE GRID NORTH

30 15 0 30 60
GRAPHIC SCALE
1"=30'

NOTE:

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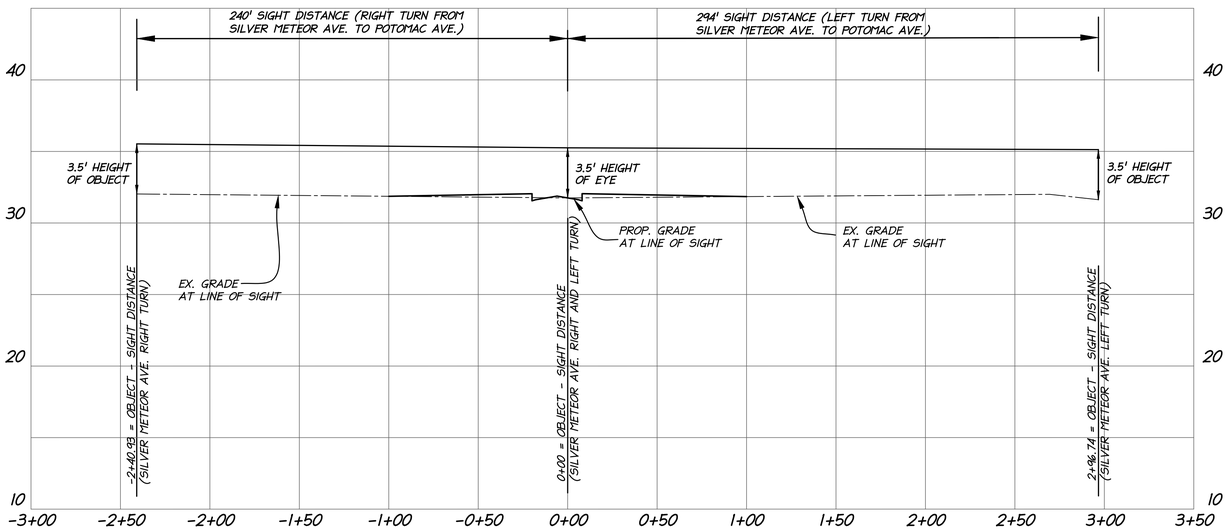
SEE SITE PLAN SHEETS FOR "75' VISION TRIANGLES" WHICH MEET AND EXCEED THIS REQUIREMENT.

SILVER METEOR AVE. SIGHT DISTANCE

POTOMAC AVE. (MAJOR ROAD) POSTED SPEED: 25 MPH



SIGHT DISTANCE AT INTERSECTION OF POTOMACE AVE. AND SILVER METEOR AVE.

AASHTO GREEN BOOK
CASE B - INTERSECTION WITH STOP CONTROL ON THE MINOR ROAD

MAJOR ROAD:
POTOMAC AVENUE
EXISTING 4-LANE HIGHWAY
SPEED LIMIT = 25 MPH

MINOR ROAD:
PROP. SILVER METEOR AVE. WITH STOP CONTROL

5 2.5 0 5 10
VETICAL SCALE
1"=5'

40 20 0 40 80
HORIZONTAL SCALE
1"=40'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
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PHASE 1 INFRASTRUCUTE PLAN

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CITY OF ALEXANDRIA, VIRGINIA

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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

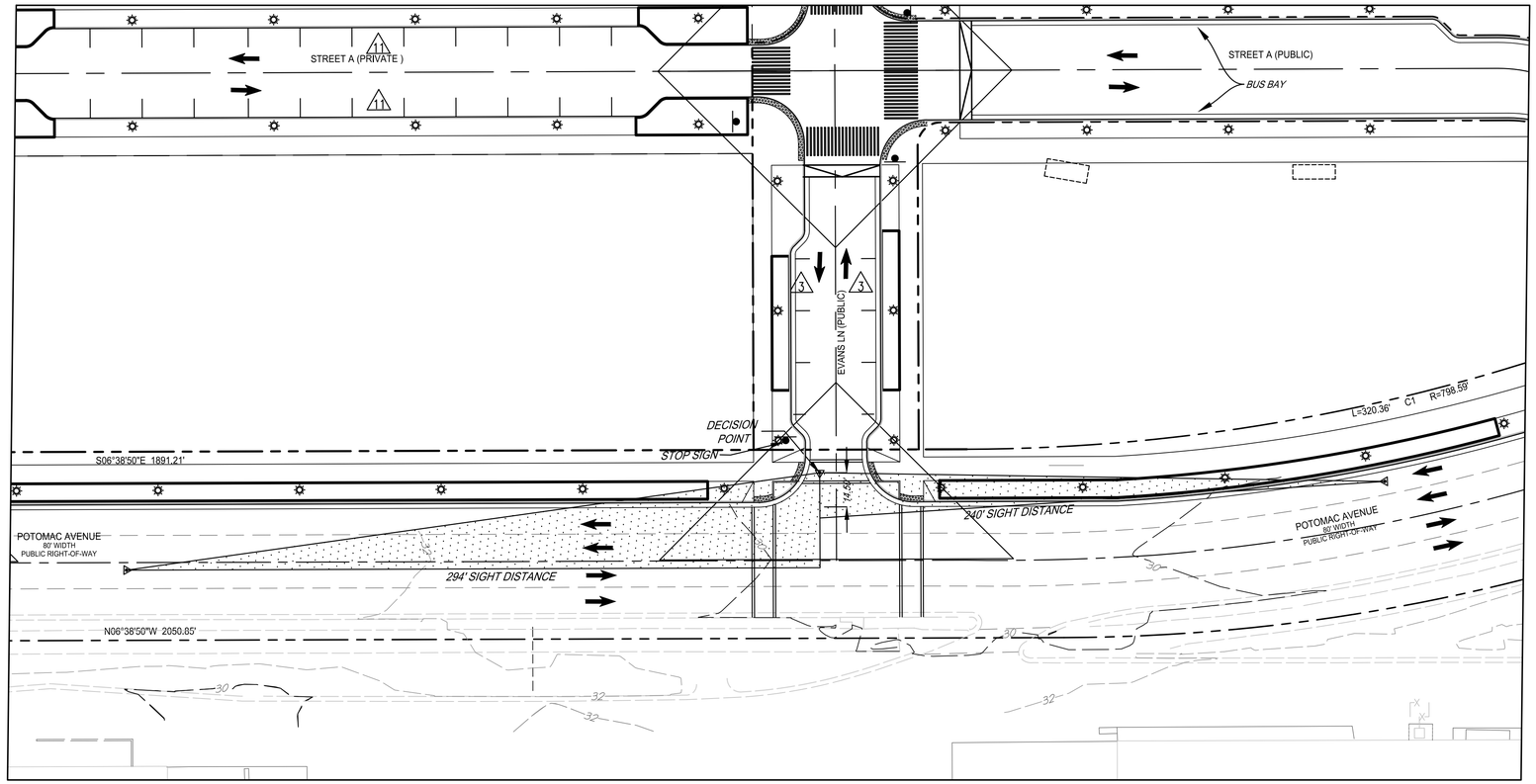
SHEET TITLE:

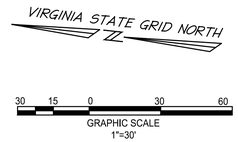
SIGHT DISTANCE PLAN & PROFILE

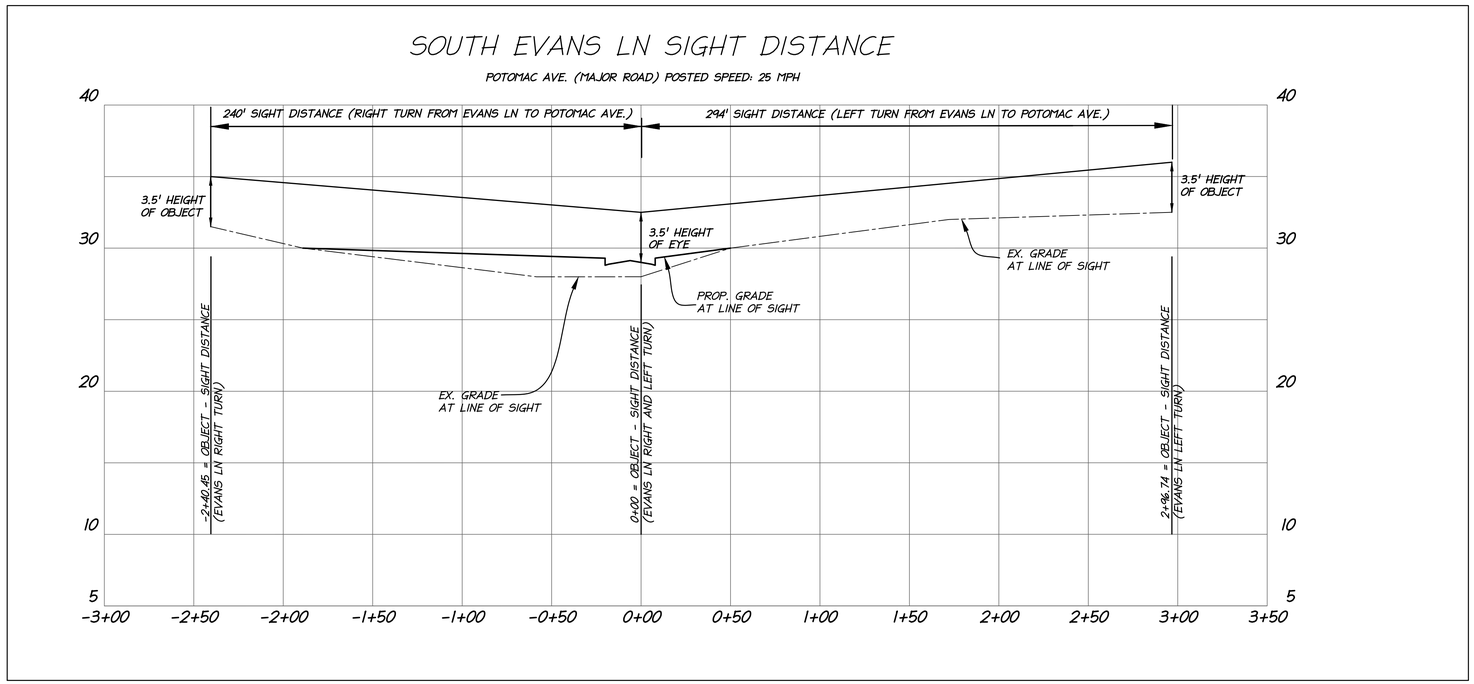
SHEET No.

C802

109639







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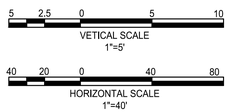
SIGHT DISTANCE AT INTERSECTION OF POTOMACE AVE. AND EVANS LN.

AASHTO GREEN BOOK
CASE B - INTERSECTION WITH STOP CONTROL ON THE MINOR ROAD

MAJOR ROAD:
POTOMAC AVENUE
EXISTING 4-LANE HIGHWAY
SPEED LIMIT = 25 MPH

MINOR ROAD:
PROP. EVANS LN WITH STOP CONTROL



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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

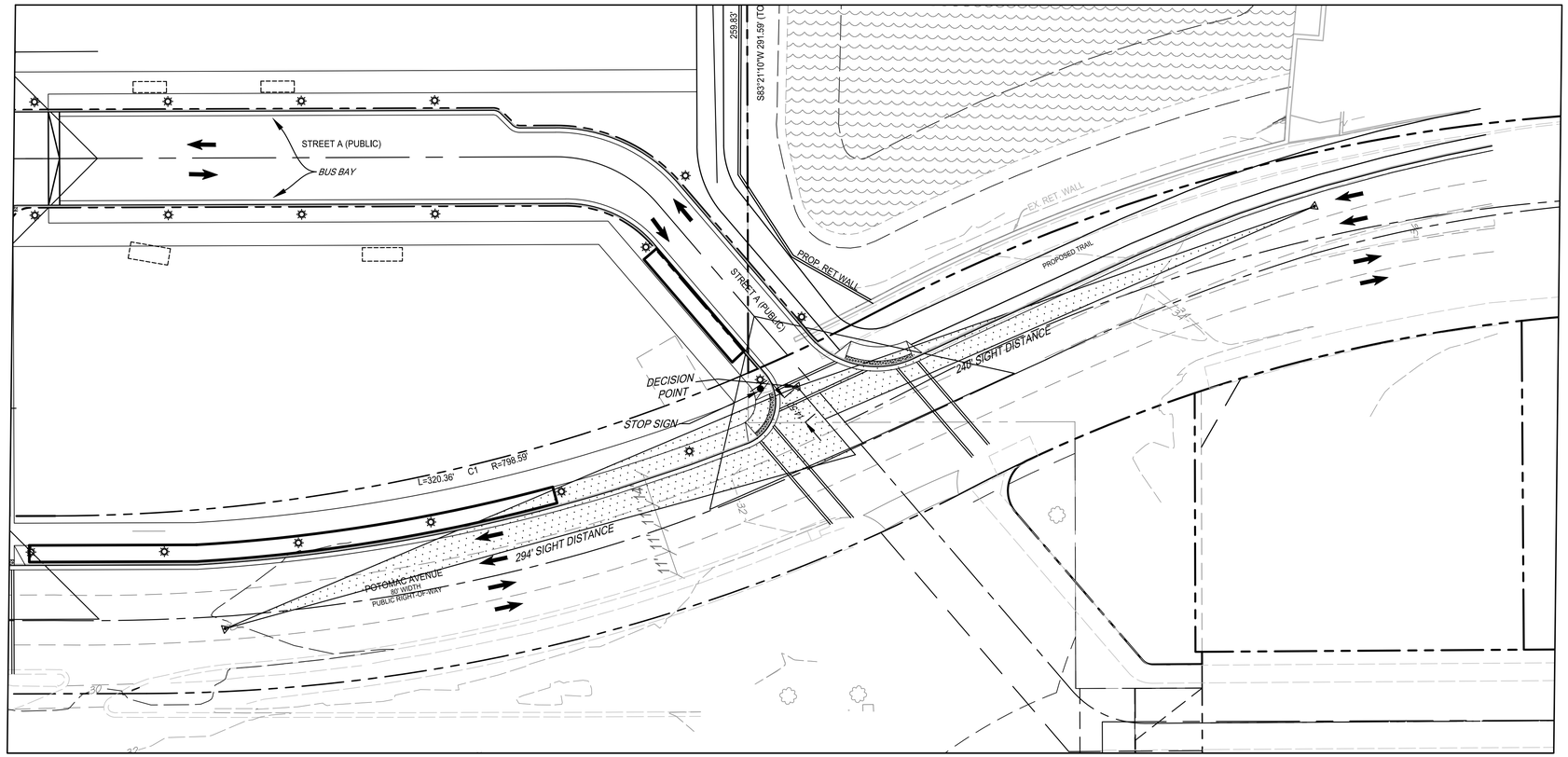
SHEET TITLE:

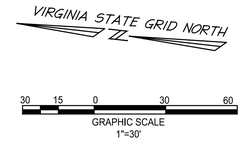
SIGHT DISTANCE PLAN & PROFILE

SHEET No.

C803

109639





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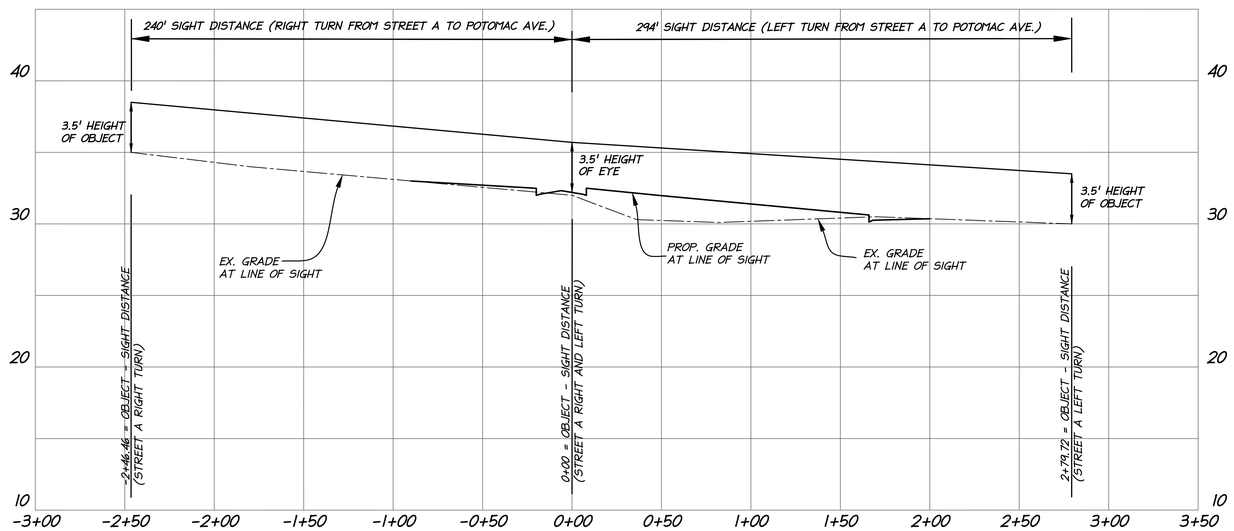
STREET A SIGHT DISTANCE

POTOMAC AVE. (MAJOR ROAD) POSTED SPEED: 25 MPH

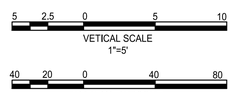


SIGHT DISTANCE AT INTERSECTION OF POTOMACE AVE. AND STREET "A".

AASHTO GREEN BOOK
CASE B - INTERSECTION WITH STOP CONTROL ON THE MINOR ROAD

MAJOR ROAD:
POTOMAC AVENUE
EXISTING 4-LANE HIGHWAY
SPEED LIMIT = 25 MPH

MINOR ROAD:
PROP. STREET "A" WITH STOP CONTROL



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1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

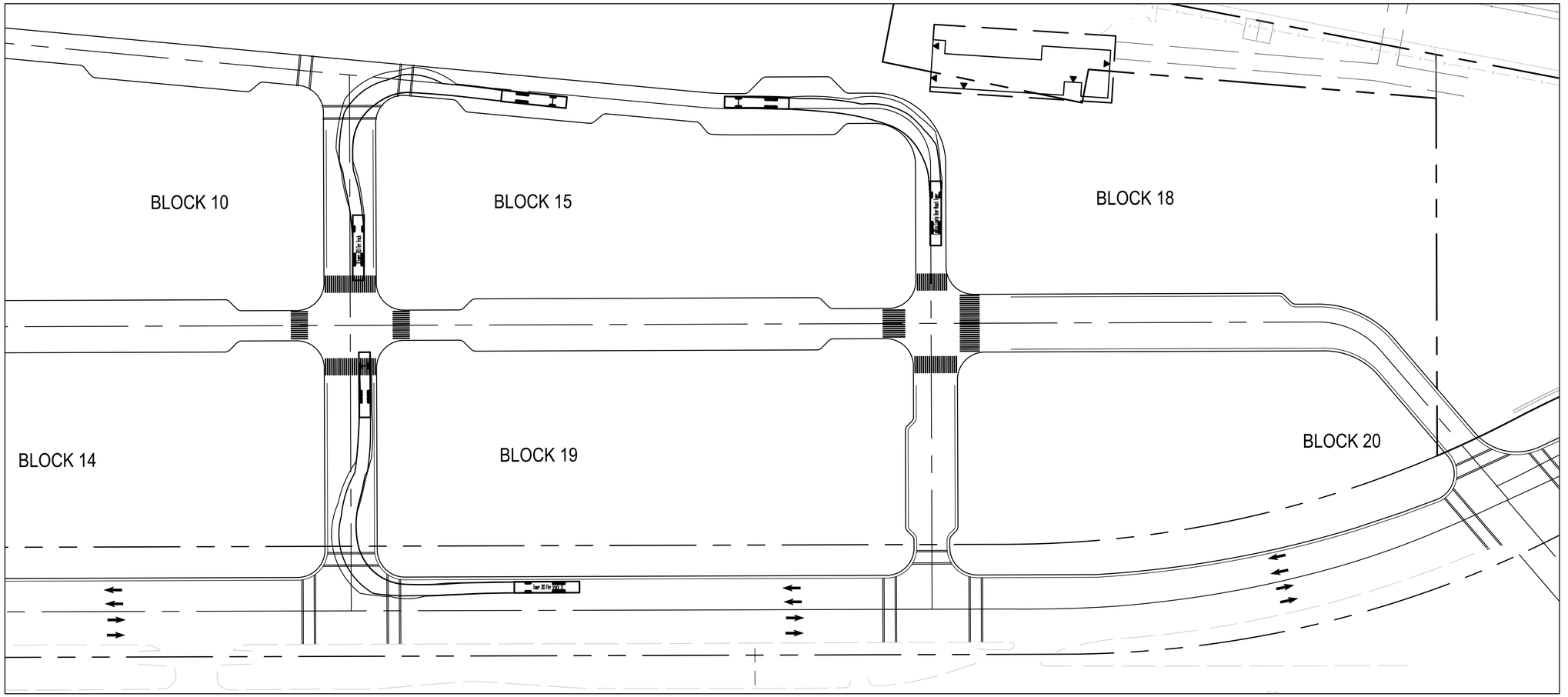
SHEET TITLE:

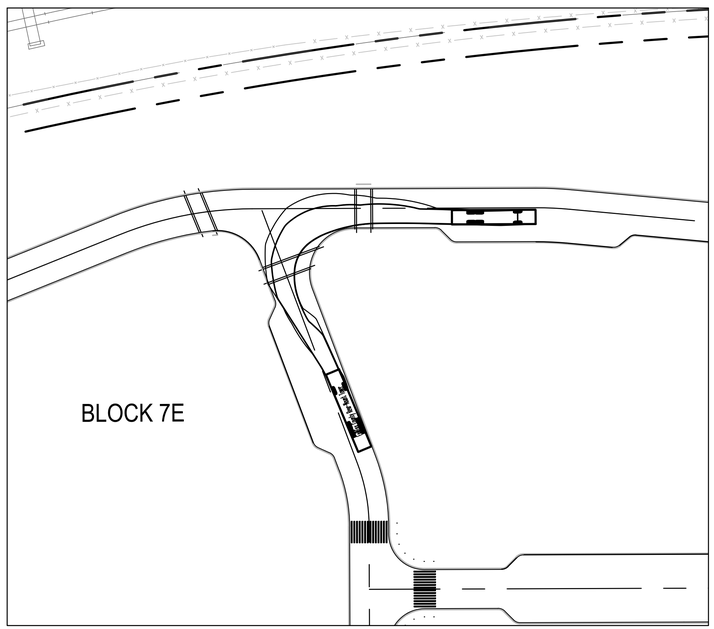
SIGHT DISTANCE PLAN & PROFILE

SHEET No.

C804

109639





VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
SCALE: 1" = 40'

NOTES:

1. VEHICLE DIMENSIONS SOURCED FROM 100' RSMP AERIAL LADDER AND BODY ASSEMBLY NO PUMP-NO TANK DETAIL FOR FAIRFAX COUNTY FIRE & RESCUE DEPARTMENT.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____
DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____
DIRECTOR DATE

_____
CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

_____ _____ _____
INSTRUMENT NO. DEED BOOK NO. PAGE NO.

christopher consultants
2920 w. broad st. suite 222 richmond, va 23230
p 804.389.9903
engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

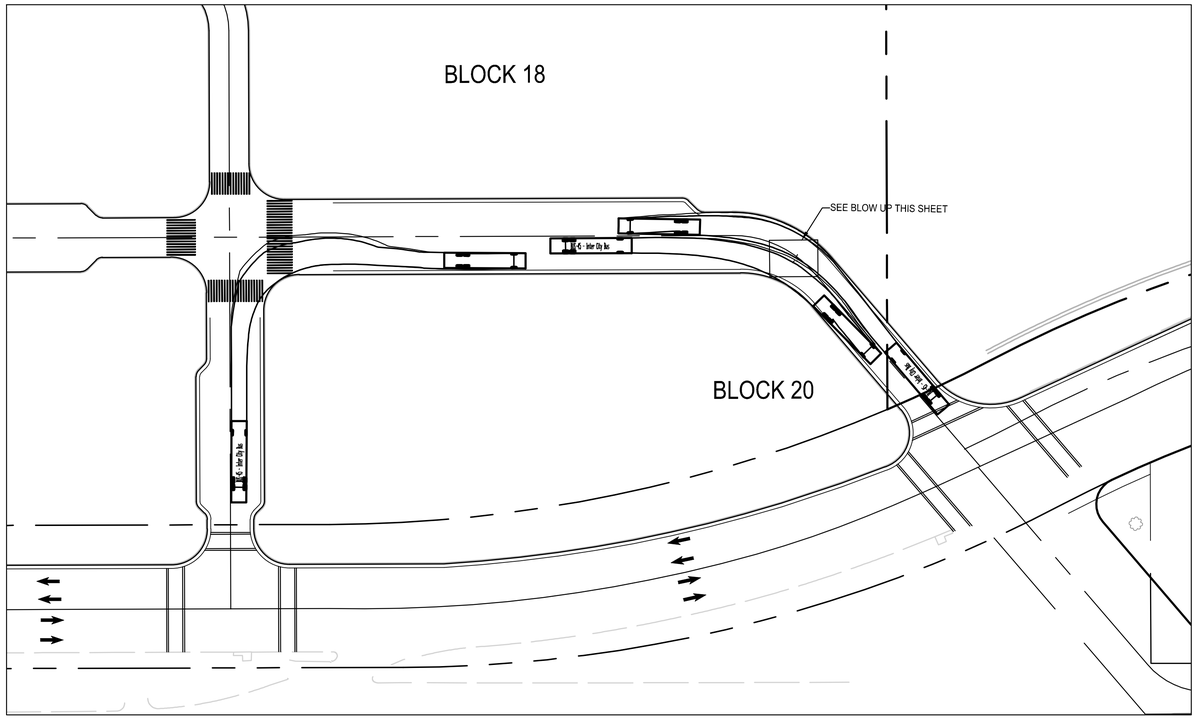
SHEET TITLE:

TURNING MOVEMENTS

SHEET No.

C900

109639

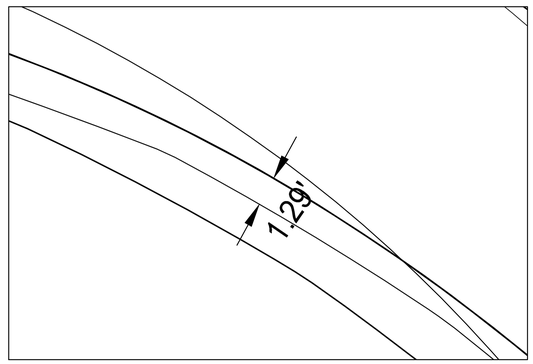


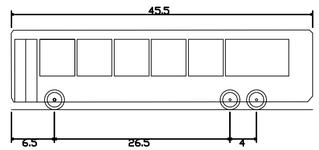
VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
SCALE: 1" = 40'

BUS CLEARANCE
NTS





BUS-45 - Inter City Bus	
Overall Length	45.500ft
Overall Width	8.500ft
Overall Body Height	12.008ft
Min Body Ground Clearance	1.158ft
Track Width	8.500ft
Lock-to-lock time	5.00s
Max Steering Angle (Virtual)	45.20°

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____
DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____
DIRECTOR DATE

_____
CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
INSTRUMENT NO. DEED BOOK NO. PAGE NO.

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
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04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
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3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

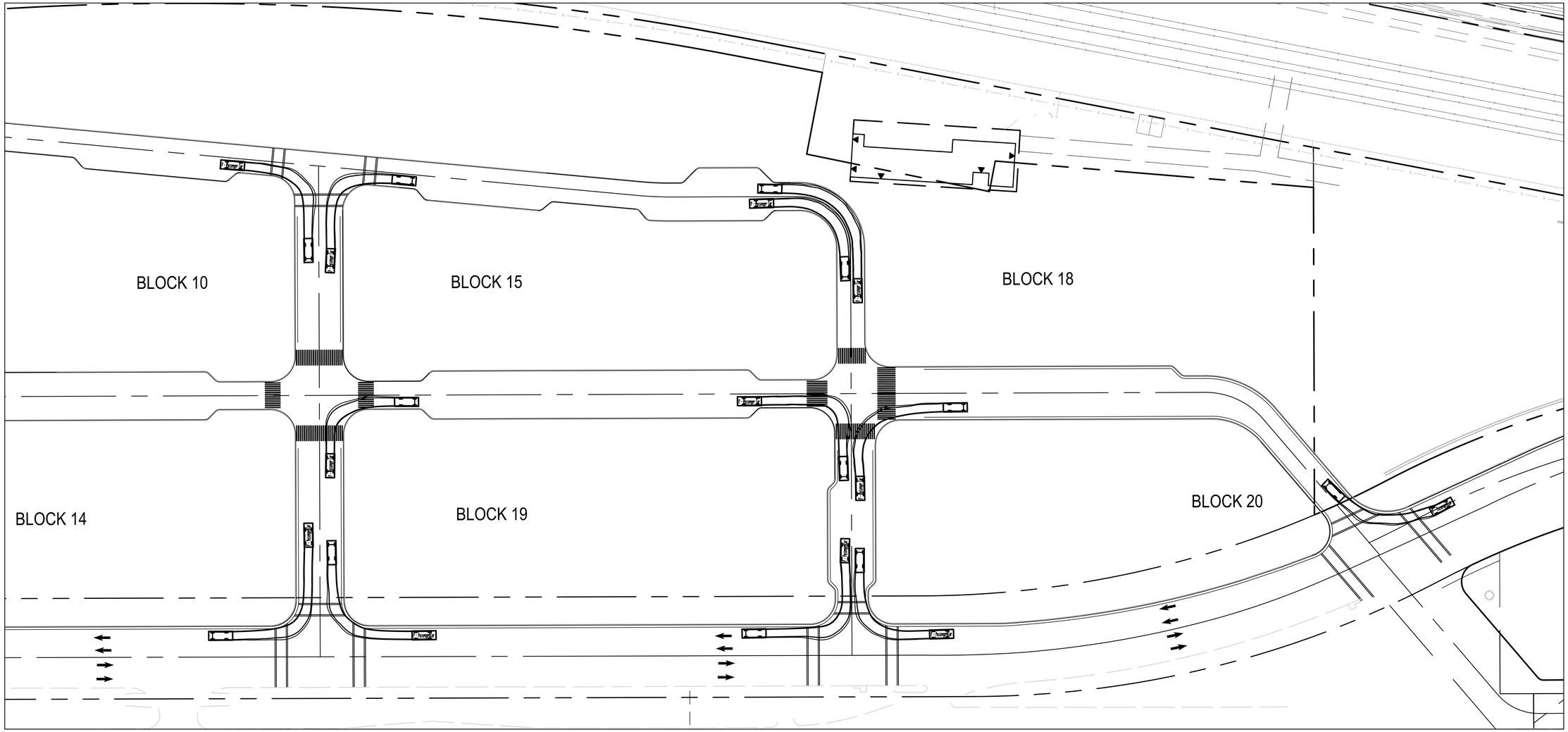
SHEET TITLE:

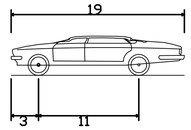
TURNING MOVEMENTS

SHEET No.

C901

109639





P - Passenger Car

Overall Length	19.000ft
Overall Width	7.000ft
Overall Body Height	4.300ft
Min Body Ground Clearance	1.115ft
Track Width	6.000ft
Lock-to-lock time	4.00s
Max Steering Angle (Virtual)	31.60°

VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
SCALE: 1" = 40'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ DIRECTOR DATE

_____ CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO. _____

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JOHN L. HELMS
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04/06/2020
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NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
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3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

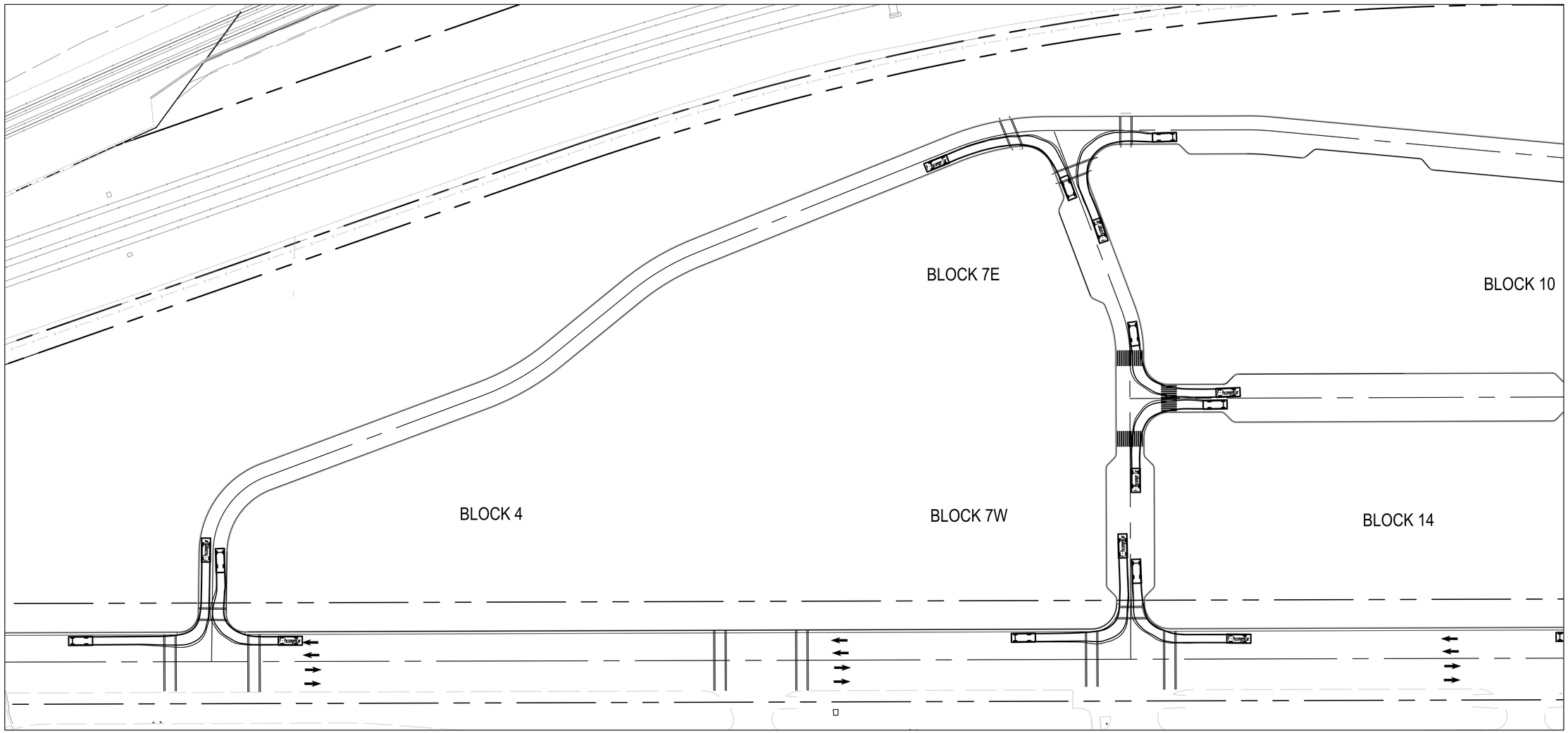
SHEET TITLE:

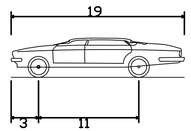
TURNING MOVEMENTS

SHEET No.

C902

109639





P - Passenger Car	
Overall Length	19.000ft
Overall Width	7.000ft
Overall Body Height	4.300ft
Min Body Ground Clearance	1.115ft
Track Width	6.000ft
Lock-to-lock time	4.00s
Max Steering Angle (Virtual)	31.60°

VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
SCALE: 1" = 40'

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

_____ _____
DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ _____
DIRECTOR DATE

_____ _____
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suite 222
richmond, va 23230
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JOHN L. HELMS
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04/06/2020
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NORTH POTOMAC YARD
PHASE 1 INFRASTRUCUTE PLAN
PRELIMINARY DEVELOPMENT SITE PLAN
CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
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PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

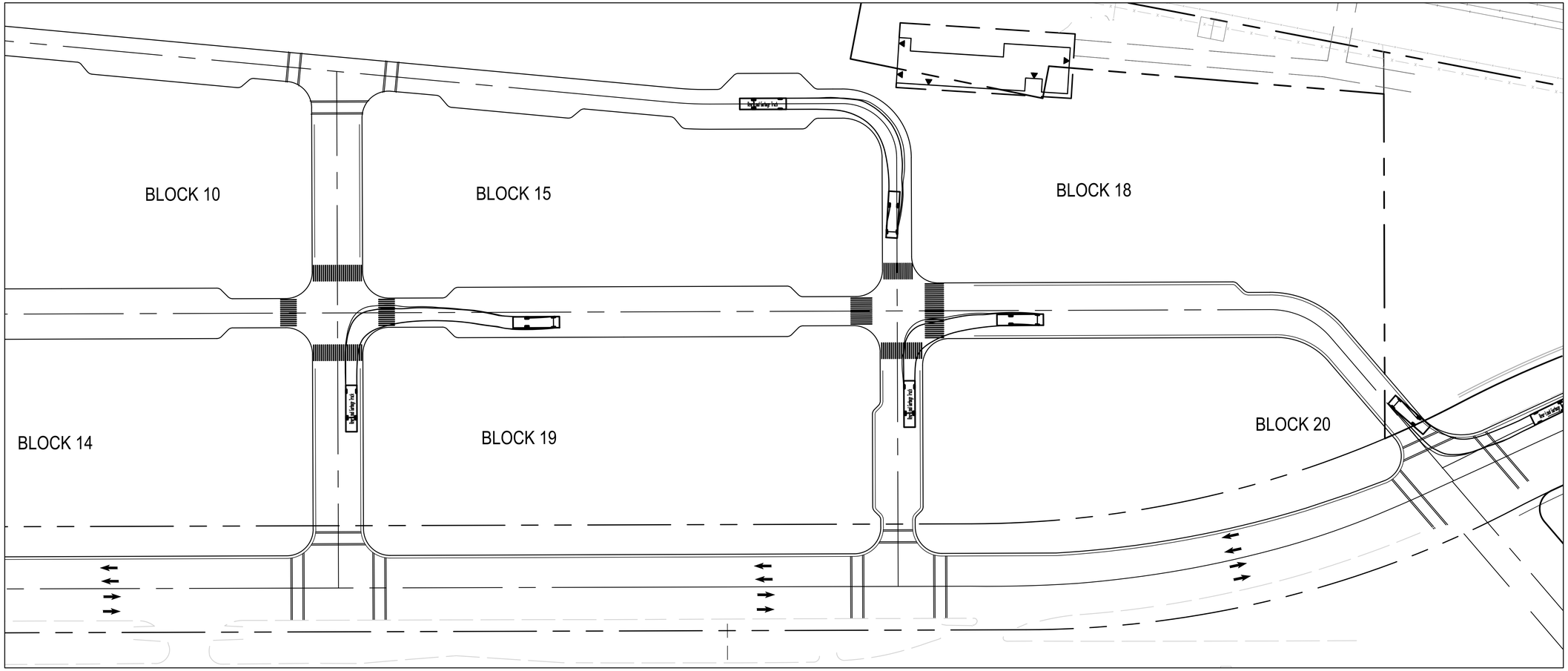
SHEET TITLE:

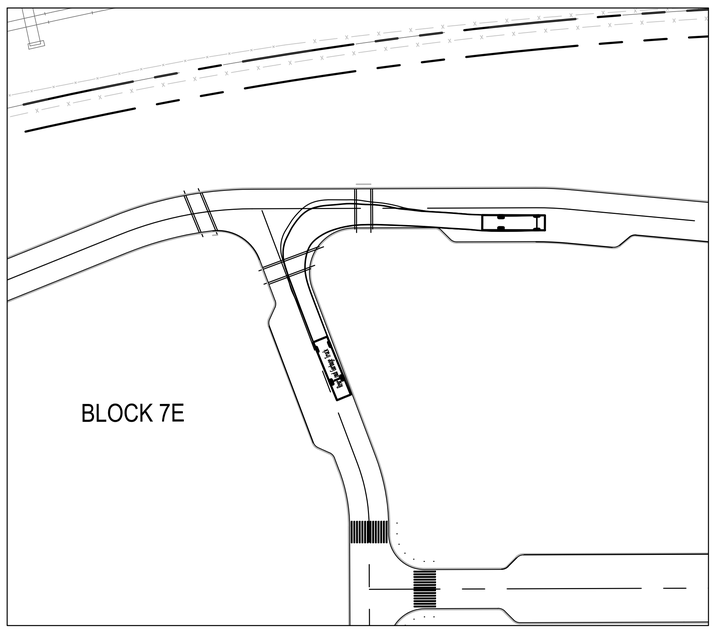
TURNING MOVEMENTS

SHEET No.

C903

109639

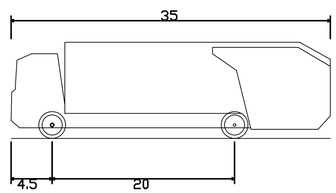




VIRGINIA STATE GRID NORTH

40 20 0 40 80

GRAPHIC SCALE
SCALE: 1" = 40'



Rear-Load Garbage Truck	
Overall Length	35.000ft
Overall Width	8.375ft
Overall Body Height	10.546ft
Min Body Ground Clearance	1.000ft
Track Width	8.375ft
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	29.300ft

NOTES:

1. VEHICLE DIMENSIONS SOURCED FROM 100' RSMP AERIAL LADDER AND BODY ASSEMBLY NO PUMP-NO TANK DETAIL FOR FAIRFAX COUNTY FIRE & RESCUE DEPARTMENT.

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

DIRECTOR DATE

DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

DIRECTOR DATE

CHAIRMAN, PLANNING COMMISSION DATE

DATE RECORDED _____

INSTRUMENT NO. DEED BOOK NO. PAGE NO.

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engineering surveying land planning

COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/06/2020
PROFESSIONAL ENGINEER

NORTH POTOMAC YARD

PHASE 1 INFRASTRUCUTE PLAN

PRELIMINARY DEVELOPMENT SITE PLAN

CITY OF ALEXANDRIA, VIRGINIA

MARK	DATE	DESCRIPTION
1	12/17/2019	FIRST SUBMISSION
2	03/17/2020	COMPLETENESS COMMENTS
3	04/06/2020	COMPLETENESS RESUBMISSION

PROJECT No.: 88024.172.02
DRAWING No.: 109639
DATE: 2020-04-06
DESIGN: JLH
DRAWN: MM
CHECKED: KMW

SHEET TITLE:

TURNING MOVEMENTS

SHEET No.

C904

109639

PROJECT NARRATIVE:

THE PROPOSED REDEVELOPMENT IS AN URBAN, MIXED-USE DEVELOPMENT THAT WILL INCLUDE OFFICE, RESIDENTIAL, HOTEL, ENTERTAINMENT, RETAIL, ACADEMIC, AND RESTAURANT USES TO BE LOCATED WITHIN A NEW NETWORK OF STREETS AND OPEN SPACES. THE PROJECT WILL PROVIDE A NEW STREET NETWORK INCLUDING ENHANCED SIDEWALK AND STREETSCAPE, BICYCLE AND PEDESTRIAN INFRASTRUCTURE, AND OPEN SPACES THROUGHOUT THE PROJECT. THE REDEVELOPMENT WILL ALSO INCLUDE A WATER MANAGEMENT MASTER PLAN, ENVIRONMENTAL SUSTAINABILITY MASTER PLAN, AND AN INFRASTRUCTURE DEVELOPMENT SITE PLAN, TO BE SUBMITTED UNDER SEPARATE COVER.

FOR INFORMATIONAL PURPOSES ONLY

NORTH POTOMAC YARD

Phase 1 - Open Space
Concept 1 Plan

Client
CPYR SHOPPING CENTER & CPYR THEATER LLC
712 Main Street, Suite 2500
Houston, Texas 77002

OJB Landscape Architecture
One Bowdoin Square, Suite 801
Boston, Massachusetts 02114
tel 857.233.5171

Development Manager
JBG Smith
4445 Willard Ave, Suite 400
Chevy Chase, Maryland 20815
tel 240.333.3600

Master Planner
Elkus Manfredi Architects
25 Drydock Avenue
Boston, Massachusetts 02210
tel 617.426.1300

Civil Engineer
Christopher Consultants, Ltd.
9900 Main Street, 4th Floor
Fairfax, Virginia 22031
tel 703.273.6820

Traffic Engineer
Kimley Horn
11400 Commerce Park Drive, Suite 400
Reston, Virginia 20191
tel 703.674.1300

Attorney
Walsh, Colucci, Lubely, & Walsh
Courthouse Plaza
2200 Clarendon Boulevard, Suite 1300
Arlington, VA 22201
tel 703.528.4700

COMMONWEALTH OF VIRGINIA
JAMES BURNETT
No. 001105
LANDSCAPE ARCHITECT

OJB | THE OFFICE OF JAMES BURNETT
LANDSCAPE ARCHITECTURE
ONE BOWDOIN SQUARE,
SUITE 801
BOSTON, MA 02114
T 857.233.5171
WWW.OJB.COM

KEY MAP

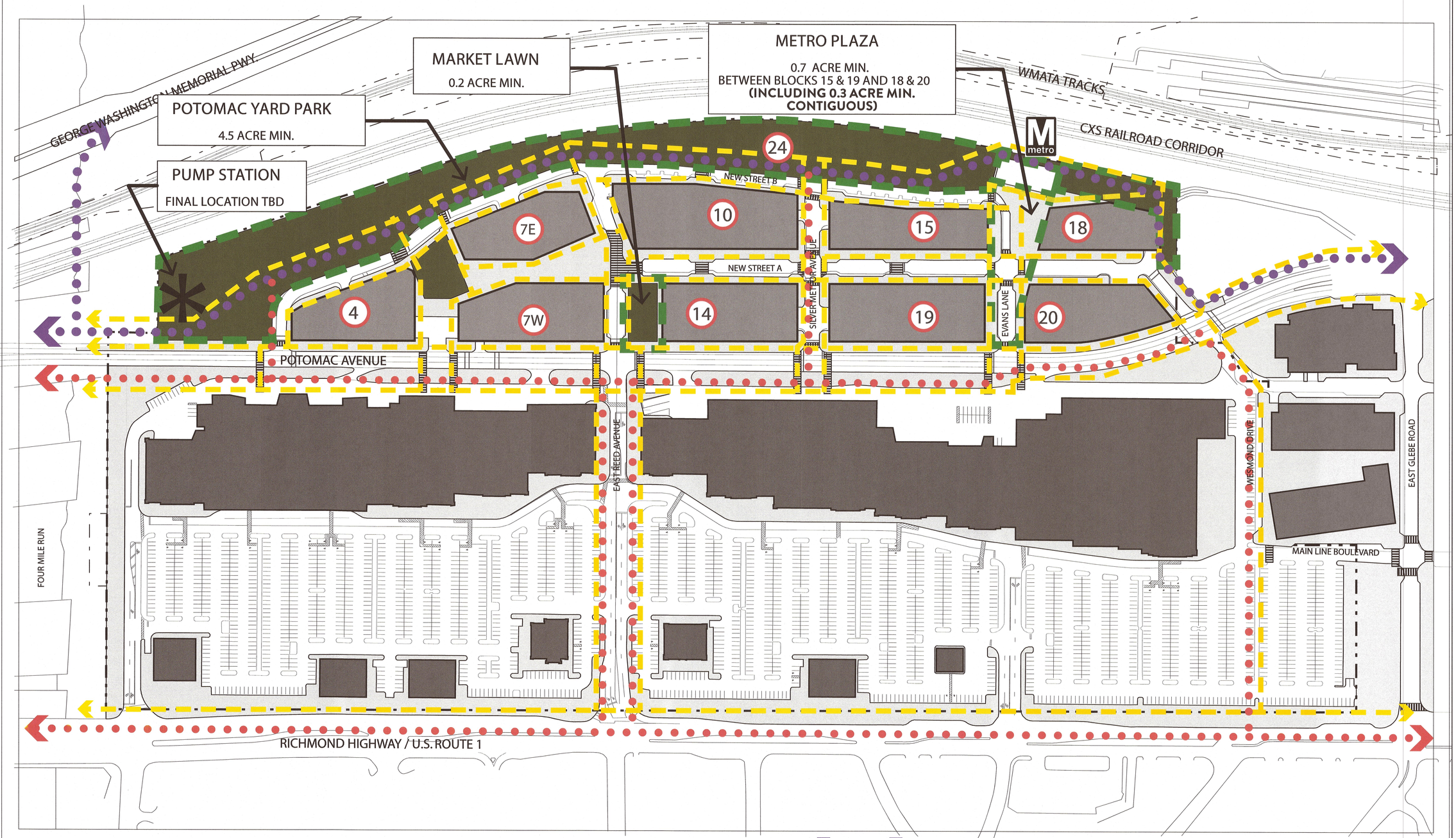
REV.	DATE	DESCRIPTION

Job Number: PT-YRD
Issue Date: 17 March 2020

Scale: 1" = 100'-0"

PHASE 1 OPEN SPACE PLAN

A1



NOTE: Street names are subject to change through the DSUP process with a street name application to be submitted at a later date.

ELKUS | MANFREDI
ARCHITECTS
[address] 25 DRYDOCK AVENUE
BOSTON MASSACHUSETTS 02210
[tel] 617.426.1300

OWNER / APPLICANT

CPYR SHOPPING CENTER LLC & CPYR THEATER LLC
100 WAUGHT DRIVE, SUITE 600
HOUSTON, TEXAS 77007

CONSULTANTS

DEVELOPMENT MANAGER

JBG SMITH
4445 WILLARD AVE, SUITE 400
CHEVY CHASE, MARYLAND 20815
240.333.3600

CIVIL ENGINEER

christopher consultants, ltd.
9900 MAIN STREET, 4TH FLOOR
FAIRFAX, VIRGINIA 22031
703.273.6820

TRAFFIC ENGINEER

KIMLEY-HORN
11400 COMMERCE PARK DRIVE, SUITE 400
RESTON, VIRGINIA 20191
703.674.1300

ATTORNEY

WALSH, COLUCCI, LUBELY & WALSH
COURTHOUSE PLAZA
2200 CLARENDON BOULEVARD, STE 1300
ARLINGTON, VA 22201
703.528.4700

ISSUANCES / REVISIONS

#	DESCRIPTION	DATE
	CONCEPTUAL DESIGN PLAN AMENDMENT	11/1/2019

PROFESSIONAL SEAL

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ARCHITECT UNDER THE LAWS OF THE STATE VIRGINIA

COMMONWEALTH OF VIRGINIA
DAVID PETER MANFREDI
No. 0401013798
ARCHITECT

LICENSE NO:0401013798 EXP:06/30/2020

POTOMAC YARD NORTH CONCEPTUAL DESIGN PLAN AMENDMENT

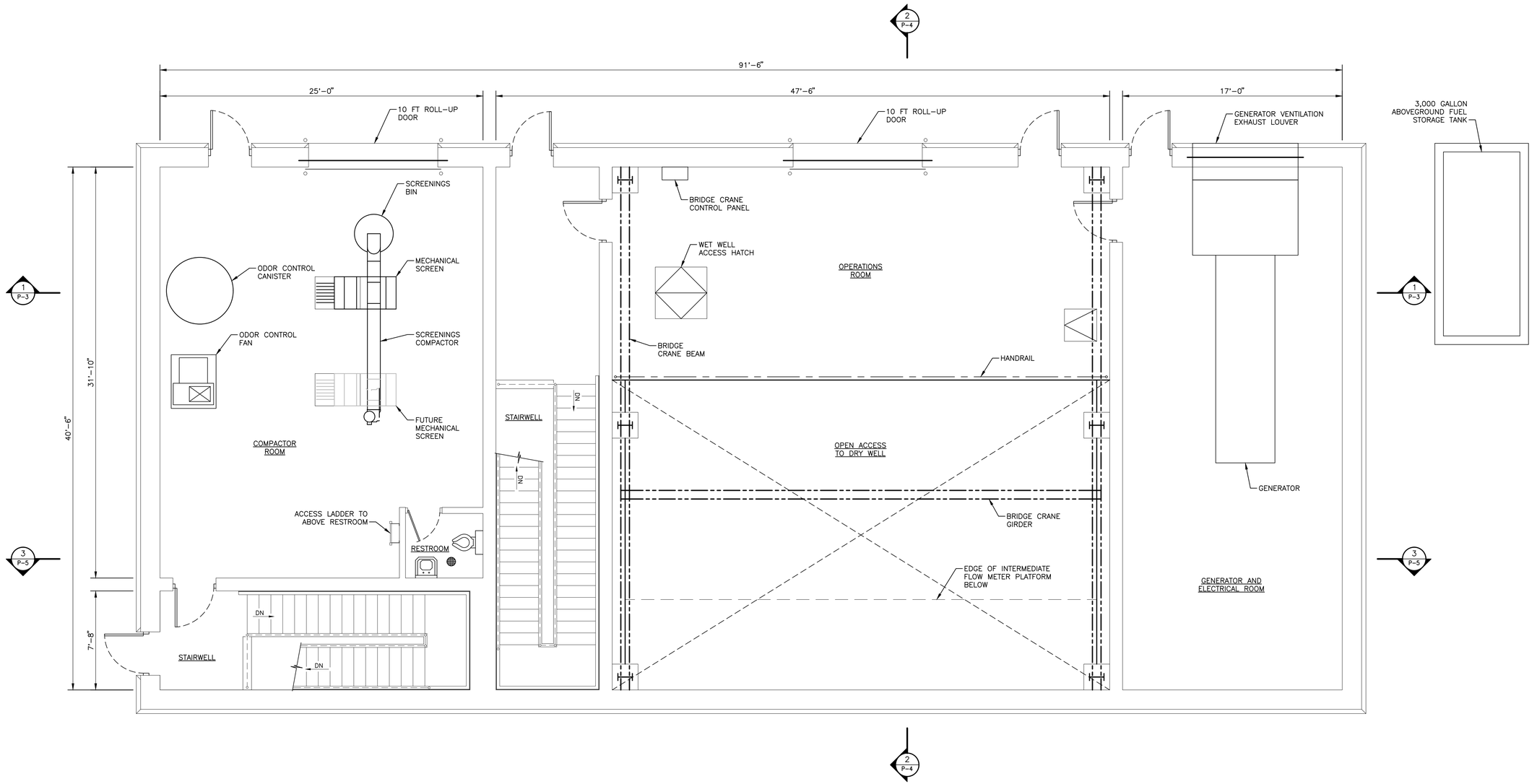
ALEXANDRIA, VIRGINIA

PHASE 1 INTERIM TRANSPORTATION PLAN

A2

PROJECT NUMBER	19-249
DATE	03/17/2020
MANAGED BY KMD	DRAWN BY HDS
SCALE	1" = 100'-0"

VIRGINIA STATE GRID NORTH



SYMBOLS AND ABBREVIATIONS:

- CUT NUMBER DESIGNATION / SECTION CUT SYMBOL / SHEET NUMBER WHERE SHOWN (1 / P-X)
- DETAIL DESIGNATION / DETAIL SYMBOL / SHEET NUMBER WHERE SHOWN (A / P-X)
- XXX-XXXX IDENTIFICATION NUMBER

	CONTINUATION SYMBOL
	DIRECTION OF FLOW
℄	CENTERLINE
DI	DUCTILE IRON
DIP	DUCTILE IRON PIPE
EL	ELEVATION
FLG	FLANGE
FF	FINISHED FLOOR
INV	INVERT
MIN	MINIMUM
TYP	TYPICAL

1' 0 2' 4' 8'
1/4" = 1'-0"

GRADE LEVEL PLAN

SCALE: 1/4" = 1'-0"

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
_____ DIRECTOR DATE
_____ CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
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30% Design
Not for Construction

Gannett Fleming
BALTIMORE, MARYLAND

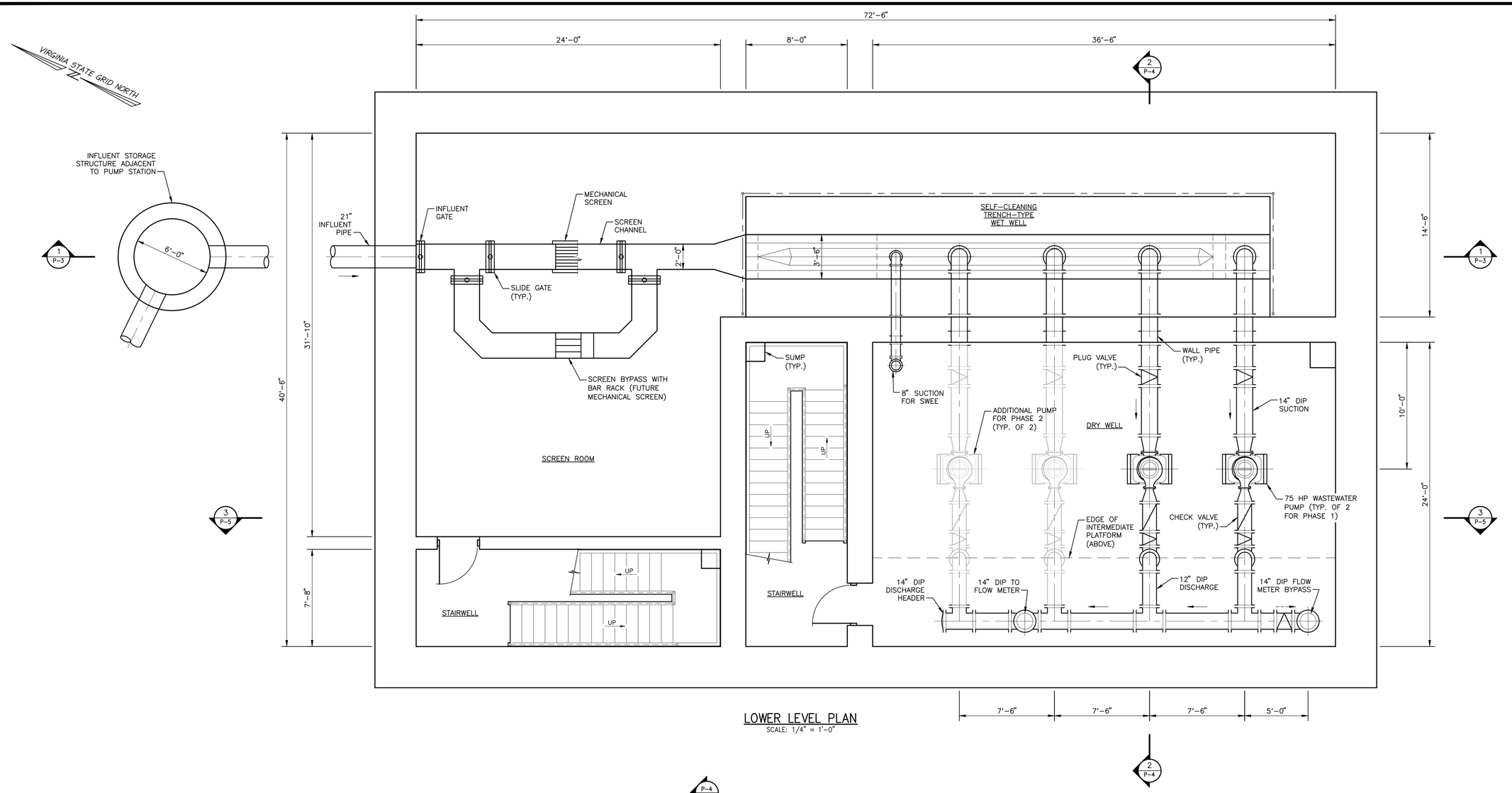
COMMONWEALTH OF VIRGINIA
ELIEZER LIVAY
Lic. No. 053949
DocuSigned by: Eliezer Livay
CERTIFIED PROFESSIONAL ENGINEER

PROCESS
PUMP STATION
GRADE LEVEL PLAN

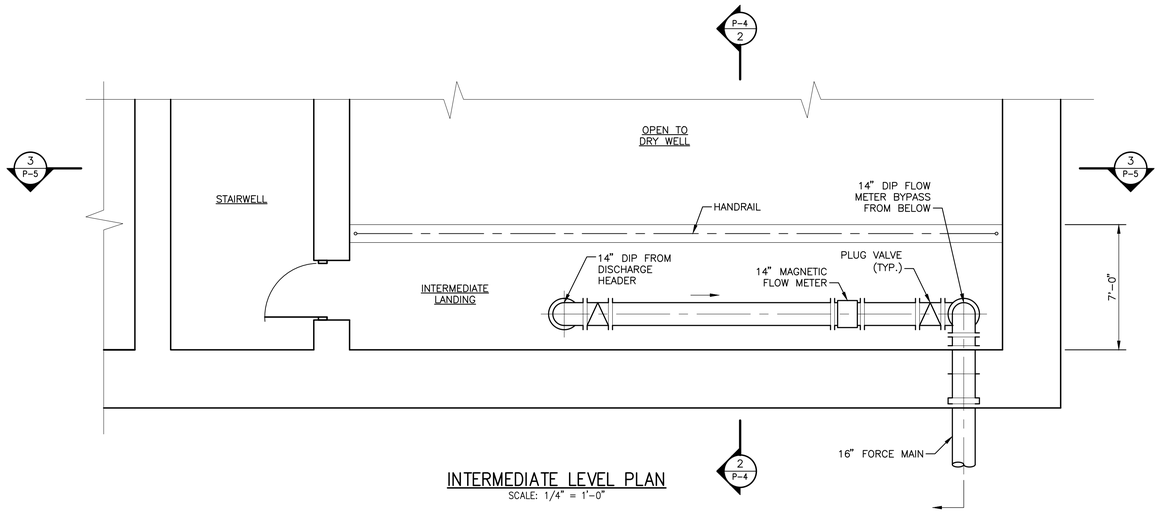
NORTH POTOMAC YARD
PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: BMJ
DRAWN: BMJ
CHECKED: EL
SHEET No. P-1
1 OF 6

H:\62171 N Potomac Yd PS\Process\Plansel\62171P-PROP.dwg, 3/16/2020 11:57:12 AM, bjoyne



LOWER LEVEL PLAN
SCALE: 1/4" = 1'-0"



INTERMEDIATE LEVEL PLAN
SCALE: 1/4" = 1'-0"

1' 0 2' 4' 8'
1/4" = 1'-0"

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DEPARTMENT OF PLANNING & ZONING
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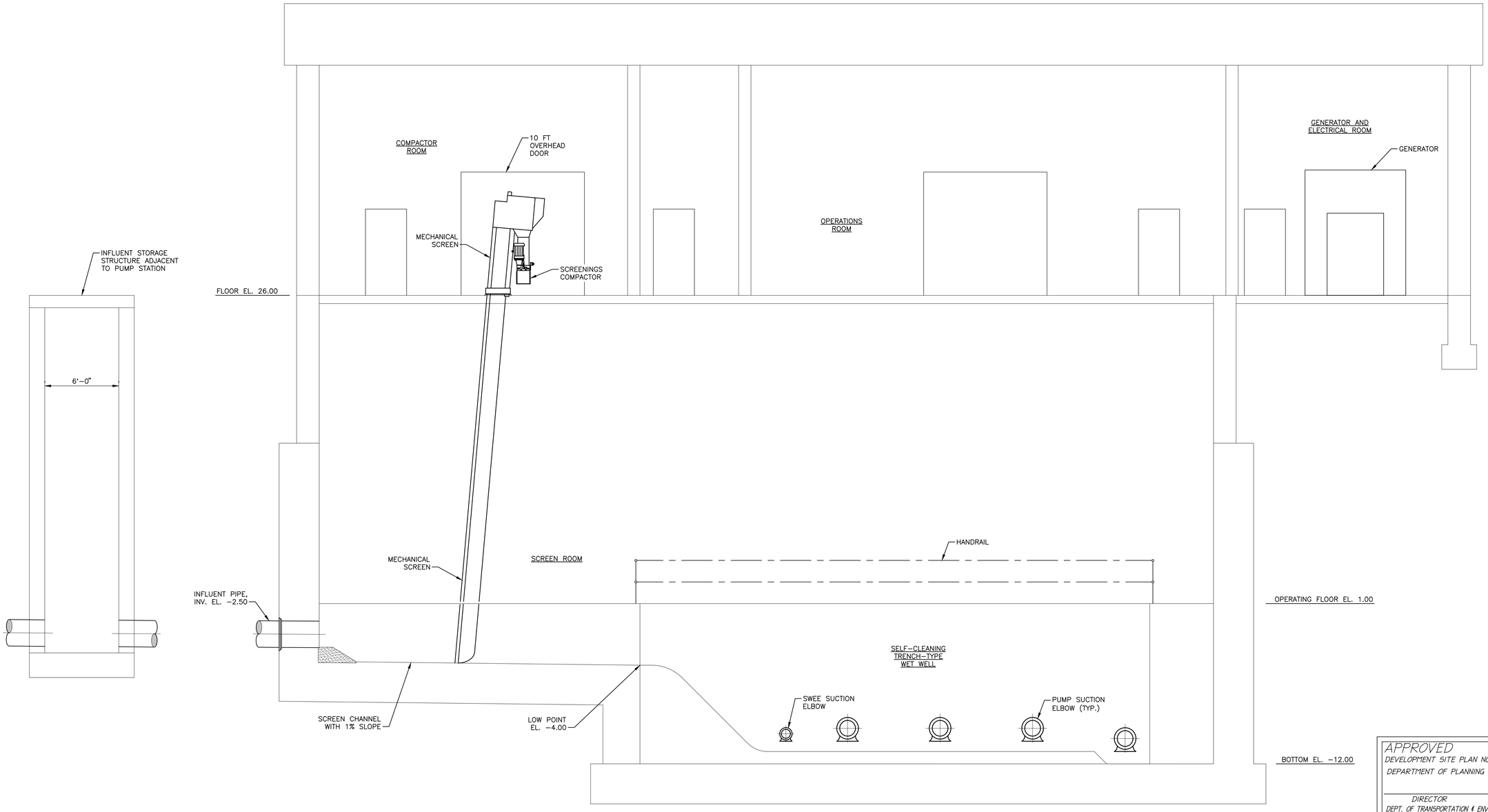
ELIEZER LIVAY
Lic. No. 053949
Docusigned by: Eliezer Livay
CERTIFIED PROFESSIONAL ENGINEER

PROCESS
PUMP STATION
LOWER LEVEL PLAN

NORTH POTOMAC YARD PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: BMJ
DRAWN: BMJ
CHECKED: EL
SHEET No. P-2
2 OF 6



1 P-3 PUMP STATION SECTION
SCALE: 1/4" = 1'-0"

1' 0 2' 4' 8'
1/4" = 1'-0"

30% Design
Not for Construction

APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
_____ DIRECTOR DATE
_____ CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
INSTRUMENT NO. DEED BOOK NO. PAGE NO.

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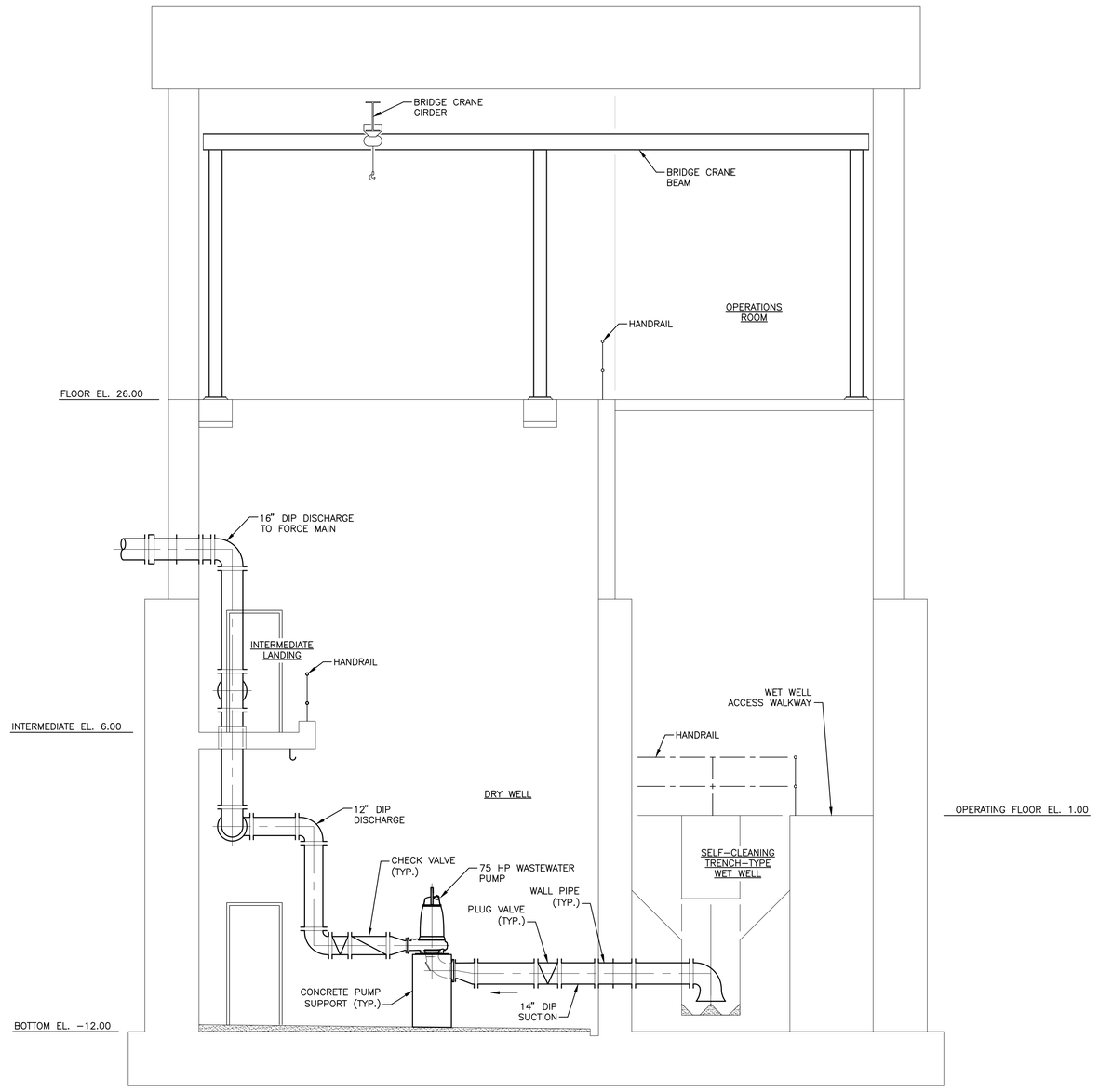
ELIEZER LIVAY
Lic. No. 053949
Docusigned by:
PROFESSIONAL ENGINEER

PROCESS
PUMP STATION SECTION

NORTH POTOMAC YARD
PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: BMJ
DRAWN: BMJ
CHECKED: EL
SHEET No. P-3
3 OF 6



2 / P-4 PUMP STATION SECTION
SCALE: 1/4" = 1'-0"

1' 0 2' 4' 8'
1/4" = 1'-0"

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APPROVED
DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING

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DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____

_____ DIRECTOR DATE

_____ CHAIRMAN, PLANNING COMMISSION DATE
DATE RECORDED _____
_____ INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO.

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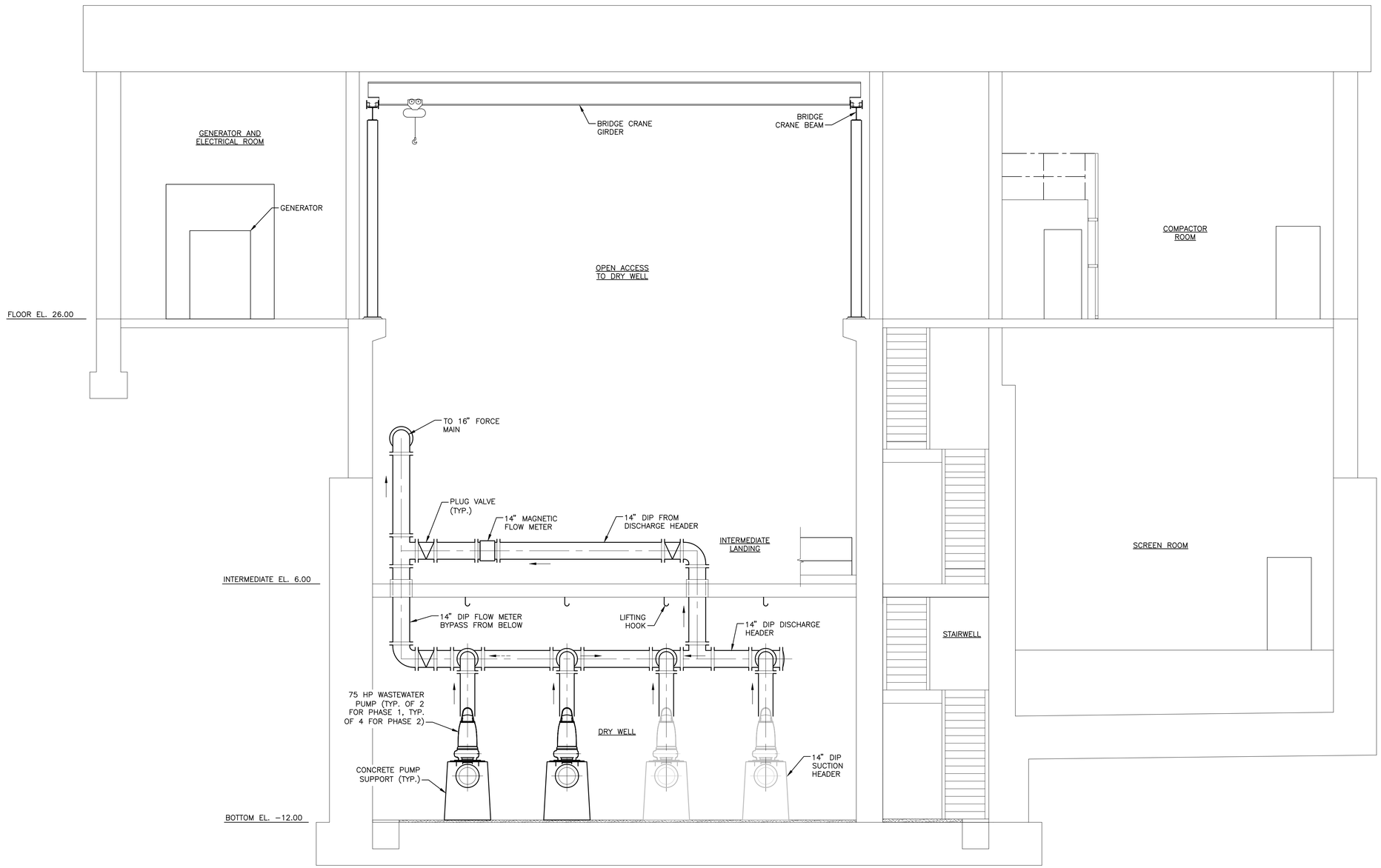
BALTIMORE, MARYLAND

COMMONWEALTH OF VIRGINIA
ELIEZER LIVAY
Lic. No. 053949
DocuSigned by: Eliezer Livay
CERTIFICATE NUMBER
PROFESSIONAL ENGINEER

PROCESS
PUMP STATION SECTION

NORTH POTOMAC YARD
PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: BMJ
DRAWN: BMJ
CHECKED: EL
SHEET No. P-4
4 OF 6



3 / P-5 PUMP STATION SECTION
SCALE: 1/4" = 1'-0"

1' 0 2' 4' 8'
1/4" = 1'-0"

30% Design
Not for Construction

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DEVELOPMENT SITE PLAN NO. _____
DEPARTMENT OF PLANNING & ZONING
_____ DIRECTOR DATE
DEPT. OF TRANSPORTATION & ENVIRONMENTAL SERVICES
SITE PLAN No. _____
_____ DIRECTOR DATE
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DATE RECORDED _____
INSTRUMENT NO. _____ DEED BOOK NO. _____ PAGE NO. _____

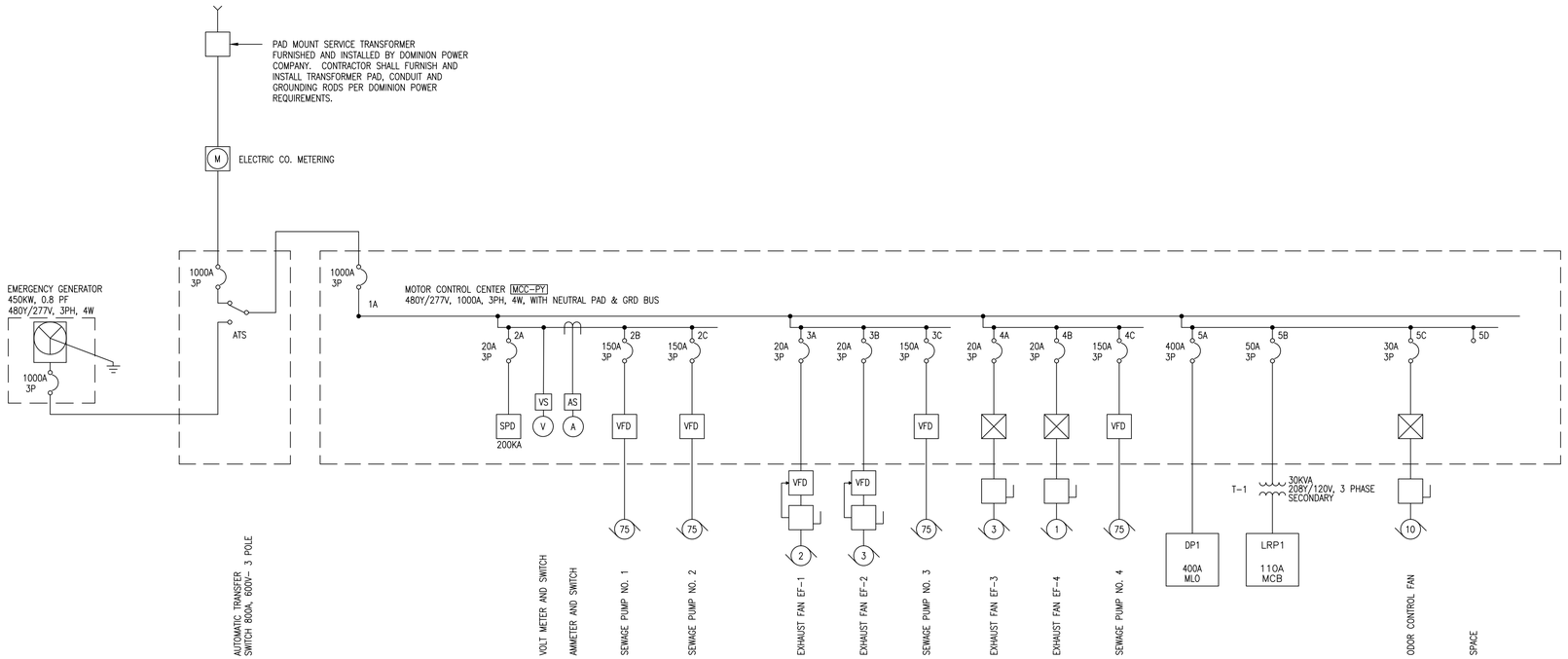
Gannett Fleming
BALTIMORE, MARYLAND

COMMONWEALTH OF VIRGINIA
ELIEZER LIVAY
Lic. No. 053949
DocuSigned by:
CERTIFIED PROFESSIONAL ENGINEER

PROCESS
PUMP STATION SECTION

NORTH POTOMAC YARD PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: BMJ
DRAWN: BMJ
CHECKED: EL
SHEET No. P-5
5 OF 6



ONE-LINE DIAGRAM
SCALE: NTS

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DIRECTOR DATE
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Gannett Fleming
BALTIMORE, MARYLAND

COMMONWEALTH OF VIRGINIA
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PROFESSIONAL ENGINEER

ELECTRICAL
POWER ONE LINE DIAGRAM

NORTH POTOMAC YARD
PUMP STATION
ALEXANDRIA, VIRGINA

SCALE: AS SHOWN
DATE: MARCH 16, 2019
DESIGN: QAM
DRAWN: BMJ
CHECKED: EL
SHEET No. E-1
6 **OF** 6

North Potomac Yard

Pump Station
Preliminary Engineering Report

Location

Potomac Avenue south of Four Mile Run
Potomac Yard, Alexandria, VA

Prepared For

City of Alexandria and AlexRenew

Prepared By

Gannett Fleming

March 16, 2020

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Executive Summary

Background and Purpose

A new mixed-use development for the VA Tech campus is proposed in the area of Potomac Avenue, south of Four Mile Run, in Alexandria, VA. The current development on the site will be removed to make way for the new development. Wastewater from the current development on the site flows to an existing pump station that will be unable to handle the flows from the proposed new development. Per the City of Alexandria, the existing pump station shall not be upgraded to accept the proposed flows, and a new pump station shall be provided by the developer to meet the demands of the future development. The new pump station will be designed to the satisfaction of VA Tech, the City of Alexandria, and Alexandria Renew Enterprises (AlexRenew), who will operate and maintain the new pump station.

Service Area

The existing site includes a single-story retail development of approximately 600,000 square feet. The proposed development will be a mixed-use development of 7,675,000 square feet. Phase 1 of the development will provide for 1,905,500 square feet. Site plan(s) and breakdown of the usage are included in Appendix C (to be provided later).

Hydraulic Design Requirements

Phase 1 design flow for the proposed pump station is 0.32 MGD average daily flow and 1.07 MGD peak flow. Build-out (Phase 1 and Phase 2) design flow is 2.29 MGD average and 7.10 MGD peak. The pump station will be designed to accommodate flow for all phases from Phase 1 through build-out, and operation sequence will be considered accordingly. A breakdown of the flows is included in Appendix C (to be provided later).

Recommendations

The new pump station will be rated for approximately 7.1 MGD peak flow. The pump station will be a self-cleaning type wet well and dry well configuration. The aboveground structure will be approximately 95 feet by 45 feet. The pump station will include an influent channel with a mechanically cleaned bar screen, a self-cleaning trench-type wet well, and four dry pit submersible pumps each rated for approximately 75 HP. To accommodate initial Phase 1 flow, only two of the pumps will be installed. One pump will handle the Phase 1 peak flow, and the second pump will be used as a backup. Motors with variable speed pump drives (VFDs) will adjust pump speed to accommodate the low initial flows. To accommodate build-out flow after Phase 2, the impellers will be upgraded on the first two pumps, and two additional pumps will be installed. Three pumps will be used to convey the peak flow (firm capacity) and one pump will be provided as a backup.

The interior depth of the wet well will be approximately 48 feet below final grade. The pump station structure will include a permanent emergency power generator fueled by diesel in a dedicated room. Ventilation and odor control will be provided for the pump station. Pump station access will be via exterior doors to the pump room, generator room, and bar screen room. Stairways will provide personnel access to the dry well and the wet well operating floors.

For Phase 1, the pump station will discharge via a proposed 16-inch force main that will extend from the pump station and run south in Potomac Avenue to an existing gravity sanitary system at a manhole (S16) near East Glebe Road. From there, the existing sanitary sewer will drain to the existing Potomac Yard Pump Station to the south of the site. The discharge from the existing pump station flows to the AlexRenew treatment plant. Options for handling the Phase 2 discharge from the proposed pump station will be further evaluated, but it is anticipated that a 20-inch force main will be used to convey the flows from the new pump station to existing manhole S33.

Project Schedule

In order to have the pump station completed by Spring 2023, the following design schedule has been proposed:

- PER and 30% design submittal – 3/16/2020
- 30% design review meeting – 3/31/2020
- 60% design submittal – 5/18/2020
- 60% design review meeting – 6/2/2020
- 90% design submittal – 8/31/2020
- 90% design review meeting – 9/15/2020
- Startup and commissioning plan – 10/12/2020
- 100% (Final) design submittal – 11/2/2020
- 100% (Final) design, startup and commissioning plan review meeting – 11/17/2020

A construction duration of 18 months is anticipated for the pump station.

Introduction

Purpose

The proposed North Potomac Yard mixed-use development will include residential, office, retail, and educational facilities totaling 7,675,000 square feet. This development will eventually replace the existing 600,000 square-foot single-story retail development currently located on the site.

Wastewater from the existing site currently flows to an existing pump station that will be unable to handle the flow from the future development. Per the City of Alexandria, the existing pump station shall not be upgraded to handle the proposed flows, and a new pump station shall be provided by the developer to meet the demands of the future development.

The site will be developed in two phases. Both phases will include the same mix of uses, but the first phase will only provide for 1,905,500 square feet. The new pump station will be needed by the first phase of development. Site plan(s) and breakdown of the usage are included in Appendix C (to be provided later).

Scope

This Preliminary Engineering Report (PER) has been developed in accordance with Virginia Department of Environmental Quality (VDEQ) Sewage Collection and Treatment Requirements and AlexRenew's Pump Station and Force Main Design Guidelines.

Project Background

The North Potomac Yard Pump Station (NPYPS) will be constructed to serve sanitary sewer flows from the proposed North Potomac Yard mixed-use development. The sanitary system will flow by gravity to the proposed pump station, which will be located at the north end of the site.

For Phase 1, the proposed pump station will discharge via a proposed 16-inch force main that will extend south along Potomac Avenue to an existing gravity sanitary system at a manhole (S16) near the intersection of Potomac Avenue and East Glebe Road. From there, it will flow by gravity to the existing Potomac Yard Pump Station near the intersection of Potomac Avenue and East Howell Avenue. It is not anticipated that the existing Potomac Yard Pump Station will need to be upgraded with Phase 1 of development. The existing pump station discharges to a gravity system that flows to the AlexRenew treatment plant located at 1800 Limerick St, Alexandria, VA. The AlexRenew plant discharges treated effluent into the Potomac River via Hunting Creek.

Additional options for the proposed pump station force main will be evaluated for Phase 2 flows.

Existing Facilities

Existing Site

The current site includes an existing single-story retail development with approximately 600,000 square feet and is zoned per the current CDD #19. The site is bordered to the west by Route 1, to the south by East Glebe Road, to the east by the CSX railway tracks, and to the north by the Four Mile Run tributary to the Potomac River. Per the FEMA flood maps, this site is located in an area of minimal flood hazard.

Impacts on Downstream Facilities

The proposed onsite pump station at the north end of the site will collect and convey the wastewater generated onsite from Phase 1 to the Potomac Yard Pump Station to the south. Upgrades to the existing pump station or the offsite trunk sewers will not be required with the first phase of development. Impacts to the downstream facilities and subsequent mitigations to accommodate Phase 2 of the development are currently under evaluation and will be determined in the near future. Sanitary sewer collection, conveyance, and treatment will be provided by the City of Alexandria and AlexRenew.

Proposed Facility

Service Area

The proposed development will be mixed-use, including residential, office, retail, and educational facilities that will total 7,675,000 square feet. The sewer flow from this development will not include any hazardous disposals. The sewer will only serve the proposed mixed-use development.

Project Phasing

The proposed 7,675,000 square-foot development will be developed in two phases. The first phase will include the same mix of uses but will only provide for 1,905,500 square feet. The first phase of development will still create the need for the new pump station.

The pump station will accommodate both initial Phase 1 flow as well as build-out flow from the completed development and will be designed to the satisfaction of all stakeholders.

Facility Layout

The North Potomac Yard Pump Station will be a self-cleaning type wet well and dry well configuration with an above-grade operation building. The pump station will be designed in accordance with AlexRenew Pump Station and Force Main Design Guidelines and Hydraulic Institute (HI) standards. The gravity sewer will enter the pump station at a below-grade screen room, where the wastewater will flow into an influent channel. A sluice gate will be provided to allow isolation of the station and accumulation of wastewater upstream of the self-cleaning wet well during Phase 1 to enable efficient cleaning of the wet well. A mechanically cleaned bar screen will remove large debris from the wastewater before it flows into the wet well. A 6-foot diameter manhole will be located adjacent to the pump station to be used as a connection point for Phase 2, and to provide the additional volume required during Phase 1 to self-clean the wet well.

The dry well will include two dry well submersible pumps and infrastructure to support two additional pumps to be installed with Phase 2. The pumps will have dedicated suction pipes to draw from the wet well. The pumps will discharge to a header pipe in the dry well. The discharge header will include a

magnetic flow meter to monitor discharge from the pump station. The discharge header will continue to the new force main at the exterior wall of the dry well.

The above-grade operation building will be divided into multiple rooms. The room above the screening room will include a compactor and receptacle for screenings. It will also include HVAC services, odor control systems, an operator restroom, and exterior and interior access. A stairwell will lead down to the screening room.

The area at grade-level above the dry well will be open to the dry well below and to the adjacent area above the wet well. The area above the wet well will include a solid floor with a railing at the edge of the open dry well. The area will include an overhead bridge crane for lifting pumping equipment from the dry well and moving it to the floor above the wet well. Exterior access for equipment service will be provided through the area above the wet well. A stairwell will lead down to the dry well.

A permanently installed emergency power generator with hospital grade silencer and transfer switch will be housed in a dedicated generator room in the operation building. The generator room will include ventilation and sound attenuation, as well as exterior and interior access. A 3,000-gallon aboveground fuel storage tank will be located outside the pump station building adjacent to the generator room to provide a generator fuel supply sufficient for 96 hours of operation.

The pump station site will include an access lane for service vehicles. Building access for equipment will be via roll-up doors on the north wall. The pump station building will be designed with architectural features appropriate for the proposed development.

Technical Design

The pump station will be designed in accordance with the VDEQ requirements as well as HI Standards, AlexRenew's Pump Station and Force Main Design Guidelines, National Fire Protection Association (NFPA) 820, National Electrical Code (NEC), Uniform Statewide Building Code (USBC), Occupational Safety and Health Administration (OSHA) requirements, and any other local and national applicable codes.

Pumps and Process Piping

The dry well will include four dry well submersible centrifugal wastewater pumps with approximately 75 HP motors each. The motors will include variable frequency drives (VFDs) to adjust the rotational speed and thus the flow rate from the pumps. To accommodate initial Phase 1 flow, only two of the pumps will be installed. One pump will handle the Phase 1 peak flow, and the second pump will be backup. The VFDs will adjust motor and pump speed to accommodate the low initial flow. To accommodate build-out flow after Phase 2, the impellers will be upgraded on the first two pumps, and two additional pumps will be installed. Three pumps will be used able to convey the peak flow (firm capacity) and one pump will be used provided as a backup.

The pumps have been sized and selected using a system curve analysis wherein the pump curves are superimposed upon the system curves of the discharge piping and force main. The static head for the system curves is based on the pumps off elevation in the wet well on the suction side and the force main end elevation where it will connect to the gravity system on the discharge side (existing manhole S16 for Phase 1 and existing manhole S33 for Phase 2). Pipe friction loss is based on the Hazen-Williams formula, and minor losses for bends are based on the K-factor method. For sensitivity analysis C-Factors of 110 and 130 were used to develop the system curves.

Phase 1 design flow for the proposed pump station is 0.32 MGD average daily flow and 1.07 MGD peak flow. Build-out (Phase 1 and Phase 2) design flow is 2.29 MGD average and 7.10 MGD peak. The pump station will be designed to accommodate flow for all phases from Phase 1 through build-out. To minimize disruptions and increase flexibility for future upgrades, the selected pump model will have the option to change impeller sizes and to operate at various speeds to adjust the output of the pump station. Flygt pump model NT 3231 will meet this need. The pump can be installed with small impellers down to 340 mm for Phase 1 flow conditions, and the VFDs can turn down the speed sufficiently to meet the design point. For Phase 2 when flows increase substantially, the impellers can be increased up to a maximum of 490 mm for significantly higher output, and the VFDs can adjust pump speed to match the incoming flow. As mentioned above, space in the dry well will be provided for two additional pumps to be added for the Phase 2 build-out condition.

System curve calculations and a figure including pump and system curves are included in Appendix A. The pump cut sheet is also included in Appendix A. As the design progresses, net Positive Suction Head (NPSH) will be evaluated to ensure that the required NPSH for the pump does not exceed 85% of the available NPSH.

Suction piping will be sized for a flow velocity between 2 and 5 feet per second (fps), and discharge piping will be sized for a flow velocity between 2 and 8 fps, over the range of operating conditions. Initial flush velocity will be a minimum of 3.5 fps. These requirements will be met with 14-inch suction

piping, 12-inch pump discharge piping, and 16-inch discharge header and force main. Process piping inside the pump station will be cement lined ductile iron pipe.

A magnetic flow meter will be included inside the pump station dry well on the discharge header before the wastewater flows into the force main. The flow meter will be used with the VFDs to regulate pump speed and flow rate.

An 8-inch bypass suction pipe and connection point will be provided from the wet well, and an 8-inch bypass discharge point will be provided to the force main. Exact locations for the bypass connections will be determined as the design progresses.

Force Main

The system curve figures for Phase 1 in the Appendix are based on a 16-inch proposed force main. The discharge location for the force main is approximately one-half mile away at an existing gravity manhole S16 near East Glebe Road with invert elevation 28.7 feet. The force main material will be cement lined ductile iron pipe.

The system curve figures for Phase 2 included in Appendix A are based on a 20-inch force main. This potential upgrade will transfer the flow from the 16-inch force main to be constructed in Phase 1 to an existing 20-inch force main, currently used to discharge flow from Four Mile Run pump station. (The new 16-inch force main will then be used to discharge flow from Four Mile Run pump station.) The force main will be extended an additional half mile to discharge to an existing gravity manhole (S33) immediately downstream of the existing Potomac Yard Pump Station south of the site near East Howell Avenue. This potential upgrade will be evaluated further as the design progresses to determine the design conditions for the pumps. The selected pump model has the flexibility to accommodate a wide range of design conditions for Phase 2 by varying the impeller size and motor size or speed.

Due to the length of the force main, AlexRenew guidelines require a permanent pig launch system in the pump station for cleaning of the force main. A hydraulic surge analysis will be completed as the design progresses to assess the potential for transient surge, and necessary surge relief equipment will be provided.

Wet Well

Wet Well Type

Per AlexRenew, the proposed pump station will include a self-cleaning trench-type wet well. The HI provides guidance for designing self-cleaning trench type wet wells. A trench type self-cleaning wet well consists of a long, narrow trough, an ogee weir ramp, and sequential pump intakes. During the self-cleaning cycle, the water level is drawn down such that a hydraulic jump forms and moves down the length of the wet well, thus stirring up solids and carrying them to the last pump. At the end of the cycle, the last pump breaks suction.

Wet Well Design

The influent gravity sewer will enter the pump station at approximate elevation -2.5 feet at the influent channel. Influent wastewater will flow through the screen channel and then enter the wet well with a smooth transition to prevent air entrainment. A PVC liner will be installed on all interior surfaces of the wet well, and fillets of at least 45 degrees will be included to minimize solids build-up.

Because the pumps will be provided with VFDs to regulate flow rate, the pumps will normally vary speed to match the influent flow rate. They will only need to cycle on and off when the influent flow rate falls below the minimum pumping rate required to maintain flushing velocity in the force main. This will occur during Phase 1. In this condition, the pumps will draw down the water in the wet well to the "pumps off" level. When the wet well again fills to the "lead pump on" level, the pump will start. The wet well will be designed with sufficient operating volume to avoid frequent pump motor starts (no more than 6 to 10 per hour), to avoid septic conditions, to provide a filling time not to exceed 30 minutes at design average or minimum flow, and to allow a pump run time of at least 5 minutes during a 30 minute period of low flow, all in accordance with AlexRenew Guidelines.

The self-cleaning cycle should be performed periodically, such as 2-3 times per week. The cycle is best performed when the incoming flow rate is about half of the pumping capacity of the last pump. This will lead to a suitable draw down time and hydraulic jump to lift solids and flush them to the last pump. The wet well must be designed for build-out flow. As a result, the incoming flow during Phase 1 will not be sufficient to perform a self-cleaning cycle. To remedy this problem, a gate will be installed at the influent pipe into the pump station. This gate can be closed to backup storage in the influent gravity pipe. The influent gravity system will be sized and designed to hold a sufficient storage volume for a self-cleaning cycle. A 6-foot diameter manhole will be included on the influent pipe close to the influent connection to the pump station to provide the necessary volume. Prior to the cleaning cycle, the gate will be closed to accumulate enough wastewater upstream of the wet well to provide the appropriate velocity. When operating the cleaning cycle, the pump station influent gate will be opened and regulated to provide the needed flow rate and velocity into the wet well. Wet well calculations are included in Appendix A.

Screening System

Bar screens will be included in the influent channels of the pump station. During a cleaning cycle in the wet well, the upstream screen channel must be aligned with the wet well channel due to flow requirements. A mechanically cleaned bar screen will be installed in this channel. A screen bypass channel will be provided, including a manual bar rack and gates for isolation. The pump station design will include provisions to replace the manual bar rack with a mechanically cleaned bar screen if needed in the future; however, the operators must always use the primary screen channel that is aligned with the wet well during a self-cleaning cycle.

The mechanical screens will rake debris from the channel up to the operating floor above where they will be compacted to remove excess water and save space and will be transferred into a collection bin. Minimum recommended bar screen clear openings will be 0.5 inches. Estimated screenings volume for 0.5-inch openings will be approximately 0.1 (average) to 0.33 (peak) cubic yards per day for Phase 1, and 0.67 (average) to 2.1 (peak) cubic yards per day for Phase 2. The screen drives will include VFDs to adjust the rotation rate according to pump station influent flow rate. Safety cages will be included around the moving parts of the screen. Gates will be operable from the below-grade Screen Room operating floor without the need to enter the channels or the wet well.

Civil and Site

The site for the pump station will be in the far northeast portion of the site, closest to the CSX rail corridor. The location will be screened from the proposed development with landscaping. Per the

FEMA flood maps, this site is located in an area of minimal flood hazard. The developed site will include access to the pump station for maintenance.

Architectural

The architecture of the pump station will be processed as a DSUP amendment to be reviewed by PYDAC in conjunction with the Group 1 DSUPs and heard by Planning Commission and City Council at their October public hearings. The concept for the pump station is to create an architectural folly that is carefully integrated into design of the surrounding park. This building will invite community engagement; which may include public art, educational components that explain the infrastructure, or viewing platforms giving access to vistas of the park and Potomac River. The pump station will fulfill its functional purpose while also being a contribution to the Potomac park-scape.

Structural

All design work will be performed in accordance with the Uniform Statewide Building Code (USBC 2015) which adopts and modifies the International Building Code (IBC 2015). Concrete design will be performed in accordance with ACI 318-14 and ACI 350-06 as appropriate. Masonry design will be performed in accordance with TMS 402-13/602-13. Structural steel design will conform to requirements provided in AISC 360-10. The structure will be designed for the following load conditions:

- Live Load Design Data:
  - Roof Live Load = 20psf
  - Floor Live Load = 125psf
  - Stairway Live Load = 100psf
- Snow Load Design Data:
  - Ground Snow Load = 25psf
  - Snow Exposure Factor = 0.9
  - Thermal Factor = 1.1
  - Snow Importance Factor = 1.1
- Wind Load Design Data:
  - Risk Category = III
  - Exposure Category = D
  - Basic Wind Speed = 115mph
  - Internal Pressure Coefficient = +/- 0.18
- Seismic Design Data:
  - Risk Category = III
  - Seismic Importance Factor = 1.25
  - Seismic Site Class = D
  - S_s = 0.118
  - S_1 = 0.051
  - S_{DS} = 0.126
  - S_{D1} = 0.082
  - Seismic Design Category = B
  - Seismic System = Ordinary Reinforced Masonry Shear Walls
  - Seismic Response Modification Factor = 2
  - Deflection Amplification Factor = 1.75

- Equivalent Lateral Force Procedure

The building will consist of three levels: Lower Level, Intermediate Level, and Grade Level. The Lower Level and Intermediate Level are located below grade and will house the dry well, wet wells, and Screen Room. The Compactor Room, Generator/Electrical Room, and Restroom will be located at Grade Level. Two stairwells will connect the three levels.

The structural system below grade will consist of reinforced concrete bearing walls. These walls will be designed to resist the loads from the level above as well as the lateral soil loads as recommended in the Geotechnical Report (to be provided in the near future). Above grade, the structural system will consist of ordinary reinforced masonry shear walls, or as coordinated with the approved architectural design. The walls will support a roof system to be coordinated with the approved architectural design.

A bridge crane system will be located above the dry well. A monorail beam system will be placed in the Compactor Room. These systems will be designed such that the heaviest equipment item does not exceed 75 percent of the system lifting capacity per AlexRenew's design guidelines. Eyehooks will also be provided on the underside of the intermediate level slab to assist with maintenance and repairs.

Odor Control

Provisions for odor control will be included in the pump station. Odor control systems will be designed to control hydrogen sulfide and odors generated from the wastewater. The odor control systems will be used in conjunction with the HVAC systems at the pump station. The proposed odor control system will be an activated carbon canister. This system will draw air from the wet well and screen room into the carbon canister to remove odors and will be ventilated to outside.

HVAC and Plumbing

Ventilation will be provided for the building and the wet well in accordance with NFPA Code 820, the VDH SCAT regulations, and Virginia Occupational Safety and Health (VOSH) requirements.

Per NFPA 820 Table 9.1.1.4, below grade or partially below grade dry wells require either: a) minimum 6 air changes per hour (ACH) to be Unclassified, or b) no ventilation or less than 6 ACH to receive Class I, Division 2 NEC classification. GF recommends declassifying the dry well. Ventilation air used for the declassification of a space requires flow detection devices to provide local and remote alarms for ventilation system failure or combustible gas detection, per NFPA 820. Since the airflow is continuous, a means to heat the air in the winter will be required. The dry well will also have electric unit heaters to maintain a minimum winter temperature of 54 deg. F (adjustable). GF recommends the supply air match the set point of the room. As an energy savings for unclassified spaces, NFPA 820 allows up to 75% recirculation of the exhaust airflow rate except when the space is occupied, or a combustible gas detector senses a lower flammable limit of 10 percent or greater.

The dry well and the wet well will be separately ventilated. Ventilation requirements per NFPA 820 for wet wells are as follows:

- Ventilation rate of less than 12 ACH: Space classified Class I, Group D, Division 1
- Ventilation rate of 12 ACH continuous: Space classified Class I, Group D, Division 2

Ventilation requirements for wet wells per 9VAC25-790-380 (Virginia Administrative Code) are as follows:

- Continuous Ventilation shall be 12 ACH
- Intermittent Ventilation shall be 30 ACH

Since the Compactor Room and Screen Room (lower level) are not physically separated, GF recommends a continuous ventilation of 12 ACH. This ventilation rate allows derating of the spaces to a space classification Class I Division 2 based on NFPA 820.

NFPA 820 allows dual ventilation rates in classified spaces when all of the following criteria are met:

1. The low ventilation rate is not less than 50 percent of that specified in Table 9.1.1.4 [12 ACH]
2. The low ventilation rate is in operation only when the supply air temperature is 10° C (50° F) or less.
3. The high ventilation rate is not less than that specified in Table 9.1.1.4. [12 ACH]
4. The high ventilation rate is in operation whenever the supply air temperature is above 10° C (50° F), whenever the ventilated space is occupied, or whenever the ventilation is activated by approved combustible has detectors set to function at 10 percent of the lower flammable limit (LFL).
5. The ventilation differential pressurization required in 9.2.5 and 9.2.6 [-0.1 in H_2O] is maintained.

Reducing the ventilation rate when allowed will generate significant energy savings. The ventilation will be accomplished with exhaust fans, supply fans, and electric duct heaters.

HVAC Description of Systems

Dry Well: A make-up air (MAU) unit will provide heated make-up air (no more than 50 deg. F.) The MAU unit will have electric heat and return air and outside air dampers. Due to the bridge crane, the MAU will have to be mounted on grade and ducted through the wall or on the roof over the generator room. If on the roof, Ductwork will drop into the generator room and run into the dry well through the wall (below the bridge crane). Some air will be ducted down to the pump room and some will supply the upper level. Exhaust fan(s) will exhaust the dry well and can be located on the roof or in the walls. One fan should have ductwork down to the lower level. Controls will be provided to allow dual ventilation rates as described previously.

Wet Well: The exhaust ductwork will draw air from both the upper and lower level. Two exhaust fans will be provided. During odor control operation, the odor control exhaust fan will pull air through the odor control unit before discharging it. When the odor control unit is offline, the normal exhaust fan will be energized. Gravity back draft dampers will be installed on the discharge of each fan so that air cannot be pulled back through the fan that is offline. Make-up air will be provided by explosion proof inline supply fans mounted overhead in the compactor room. Each fan system will have an explosion-proof electric duct heater. These will be ducted to both the compactor room and down to the screen room.

Plumbing

The pump station will also contain a restroom facility including a utility sink with water heater. Wash down hose bibbs with vacuum breakers will be provided for personnel at the exterior of the pump station, in the dry well and in the wet well. The hose bibbs will be handwheel-operated with appropriate

backflow prevention. The floors of all rooms (dry well, equipment room) will be sloped with floor drains. The dry well and stair wells will be provided with sump pumps.

Fire Protection

Fire protection will be provided in accordance with City, state, and federal requirements. At this point, it is anticipated that fire extinguishers will be provided in appropriate locations within the pump station.

Electrical

The electrical system will consist of a 1000A, 480Y/277V electrical service entrance and a rated automatic transfer switch with isolation bypass that will have a circuit breaker serving as the utility service entrance disconnect. The transfer switch will feed a motor control center (MCC) that will serve all the electrical loads. Surge protection and power monitoring will be installed on the main MCC. Variable Frequency Drives (VFDs) will be provided for the pumps and full-voltage starters for ventilation fans. VFDs will include a circuit breaker for input power, input line reactor, integral overload protection, Hand-Off-Auto selector switch and Bypass operation mode with input and output isolation contactors. Utilization equipment, lighting, and other general electrical loads and smaller process loads will be served by 208Y/120V panelboard fed through a dry-type transformer.

Generator

A diesel operated generator will be located in the generator room to back up all electrical loads through an automatic transfer switch. Based on preliminary load calculations, a generator size of 450kW is recommended for this project. The generator will have a 3,000-gallon aboveground double-walled fuel tank located outside the building to allow the generator to run for 96 hours at full load. AlexRenew design guidelines call for the fuel tank to be installed aboveground; however, due to the proposed location of the building within a publicly accessible area, it may be advisable to install the tank underground. The generator will be provided with a permanent, 100% rated, radiator mount load bank and a hospital grade silencer. Access will be designed so that the generator can be removed through a wall opening with double doors and a vent above. Eye bolts will be provided over the generator.

Instrumentation and Control

The SCADA system will include a Pump Control Panel (PCP) with an Allen Bradley CompactLogix Programmable Logic Controller (PLC) and include redundant DC power supplies, Uninterruptable Power Supply (UPS), and a graphical Operator Interface Terminal (OIT) Allen Bradley PanelView. The PCP power will be a 1-phase 120 VAC circuit and the UPS will include sizing to accommodate 24 hours of battery backup time. The telemetry system will be coordinated with the existing hardware and software used at the AlexRenew SCADA Control Center for communication compatibility. The control circuits and status indicators will follow the requirements outlined in the design guidelines including pump runtime hour meters on the front of the PCP.

The pump controls will be an alternating lead-lag operation in accordance with the operating sequence outlined in the guidelines. Pump controls will include automatic failover; if a lead pump fails the lag pump will move to the lead position. All controls will include a manual override for pump sequence selections and alternation. Normal pump alternation would be daily or as set by the operator.

The SCADA will include a weekly generator testing interlock and monitor the transfer switch and generator status. SCADA will monitor and control all major process equipment including pumps, valves, and odor control systems.

All hazardous areas will include monitoring and alarming in accordance with NFPA 820 and the AlexRenew guidelines.

A process and instrumentation diagram (P&ID) will be provided depicting the process flow including the pumps, instruments, and all other major equipment and a control narrative describing the function for each piece of process equipment.

The PCP will monitor all station alarms including, but not limited to, the following;

- Power failure,
- Dry well sump high level,
- Wet well high level,
- Wet well low level,
- Pump failure,
- Unauthorized station entry,
- Overflow level, and
- Loss of standby reserve capacity (All pumps running).

A local override to disable a "loss of reserve capacity" alarm will be provided as a switch on front of the PCP. As required all alarms will be required to be fail-safe. All alarms will be required to be annunciated to the Advanced Water Treatment Plant (AWTP) and to designated staff during off-duty hours.

Instrumentation will include magnetic flow meters for station flow measurement and radars for wet well level measurement. Placement of the level sensors will be such that turbulence will not affect the level readings. In addition to the radar level sensor a backup float level system will be provided in the event of a level sensor failure.

Construction Phasing

The pump station is new construction on an undeveloped site, which will not require phasing provisions to maintain existing service. Pump station construction will require deep excavation; support of excavation provisions will be needed. The pump station will need to be constructed prior to the sanitary sewer in the service area. The force main can be constructed concurrently with the pump station such that it is completed before or at the same time as the pump station. Utilities such as electrical power, municipal water, and communications, will need to be in place prior to startup of the pump station. A construction duration of 18 months is anticipated, and the pump station will be completed by Spring 2023.

Appendices

A. Calculations

- Preliminary system curve calculations and chart (C=110)
- Preliminary system curve calculations and chart (C=130)
- Preliminary wet well and storage calculation
- Preliminary self-cleaning wet well model for Phase 1
- Preliminary self-cleaning wet well model for Phase 2
- Generator sizing

B. Cut Sheets

- Pumps – Flygt NT 3231
- Screens – SUEZ Climber Screen
- Compactor – SUEZ Helico Compactor
- Generator – Cummins 400 KW

C. Influent Flow Calculations and Documentation

- (To be provided later)

APPENDIX A
Calculations

1. Preliminary system curve calculations and chart (C=110)
2. Preliminary system curve calculations and chart (C=130)
3. Preliminary wet well and storage calculation
4. Preliminary self-cleaning wet well model for Phase 1
5. Preliminary self-cleaning wet well model for Phase 2
6. Generator sizing

Gannett Fleming

Subject	System Curve for Sewage Pumps		
Job No.	62171	**Project**	North Potomac Yard PS
By	BMJ	**Date**	3/16/2020
Checked		**Date**	

C-Factor = 110

Phase 1 Input Values

Low WS (start)	-3.50		Suction side (Lead Pump On)
Low WS	-7.00		Suction side (Pumps Off)
Normal High WS	29.00		Discharge side (Gravity MH INV)
Max High WS	37.00		Discharge side (Surcharge MH)
Pump CL	-8.00		For NPSH calculation
$H_{s\text{-}normal}$	32.50	ft	static head
$H_{s\text{-}max}$	44.00	ft	max static head
$h_{s\text{-}pump}$	1.00	ft	pump suction static head

NPSH Constants

$NPSH_A = h_p - h_{vpa} + h_s - h_{fs}$

Barometric Pressure (h_p)	33.96	feet
Vapor Pres.of Water (h_{vpa})	0.78	feet (at 68°F)
Static Head on Pump ($h_{s\text{-}pump}$)	1.00	ft
Friction Losses in Suction (h_{fs})	(included in calc. below)	

C	Material	
120	PVC	Per AlexRenew 2.7.1.B
120	HDPE	Per AlexRenew 2.7.1.B
130	Cast Iron	
110	Ductile	Per AlexRenew 2.7.1.B
130	Special	Per Request

Pump Suction Piping

C	110	Ductile	
L_{s1}	25	ft	
D Nominal	14	inches	
D_{s1}	14.52	inches	
Flow Area	1.150	ft^2	
K_{ts1}	5.71		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	50%	(if pipe splits and flow is divided)	
Flow %	33%	(if pipe splits and flow is divided)	

Pump Discharge Piping

C	110	Ductile	
L_{d1}	25	ft	
D Nominal	12	inches	
D_{d1}	12.46	inches	
Flow Area	0.847	ft^2	
K_{td1}	6.22		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	50%	(if pipe splits and flow is divided)	
Flow %	33%	(if pipe splits and flow is divided)	

Pump Discharge Header

C	110	Ductile	
L_{d1}	38	ft	
D Nominal	16	inches	
D_{d1}	16.6	inches	
Flow Area	1.503	ft^2	
K_{td1}	5.4		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	

Force Main Spur to Road

C	110	Ductile	
L_{d1}	150	ft	
D Nominal	16	inches	
D_{d1}	16.6	inches	
Flow Area	1.503	ft^2	
K_{td1}	1.8		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	

Suction Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	3	0.9	2.7
Tee, Branch	1	1.8	1.8
Tee, Run	1	0.2	0.2
Wye	0	0.5	0
Reducer	1	0.13	0.13
Gate Valve	2	0.19	0.38
Check Valve	0	2.3	0
Outlet	0	1	0
Inlet	1	0.5	0.5
	K_{ts1}		5.71

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branch	1	1.8	1.8
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	1	0.13	0.13
Gate Valve	1	0.19	0.19
Check Valve	1	2.3	2.3
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		6.22

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branch	2	1.8	3.6
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valve	0	2.3	0
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		5.4

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		1.8

			Pump Suction Piping					Pump Discharge Piping					Pump Discharge Header					Force Main Spur to Road				
	Q_t	Q_t	Q_{s1}	h_{Ls1}	V_{s1}	$V_{s1}^2/2g$	h_{lms1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}
	MGD	gpm	gpm	ft	fps		ft	gpm	ft	fps		ft	gpm	ft	fps		ft	gpm	ft	fps		ft
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 1 Avg	0.32	225.00	225.00	0.00	0.44	0.00	0.02	225.00	0.00	0.59	0.01	0.03	225.00	0.00	0.33	0.00	0.01	225.00	0.01	0.33	0.00	0.00
Phase 1 Peak	1.08	750.00	750.00	0.02	1.45	0.03	0.19	750.00	0.04	1.97	0.06	0.38	750.00	0.02	1.11	0.02	0.10	750.00	0.06	1.11	0.02	0.03
Phase 1 2.0 fps	**2.02**	**1400.00**	1400.00	0.06	**2.71**	0.11	0.65	1400.00	0.13	**3.68**	0.21	1.31	1400.00	0.05	**2.08**	0.07	0.36	1400.00	0.20	**2.08**	0.07	0.12
Phase 2 2.0 fps	3.02	2100.00	2100.00	0.13	4.07	0.26	1.47	2100.00	0.28	5.53	0.47	2.95	2100.00	0.11	3.11	0.15	0.81	2100.00	0.42	3.11	0.15	0.27
Phase 2 Avg	3.31	2300.00	2300.00	0.16	4.46	0.31	1.76	2300.00	0.34	6.05	0.57	3.54	2300.00	0.13	3.41	0.18	0.97	2300.00	0.50	3.41	0.18	0.32
Phase 1 3.5 fps	3.46	2400.00	2400.00	0.17	**4.65**	0.34	1.92	2400.00	0.36	**6.32**	0.62	3.85	2400.00	0.14	**3.56**	0.20	1.06	2400.00	0.54	**3.56**	0.20	0.35
	4.32	3000.00	3000.00	0.26	5.81	0.52	3.00	3000.00	0.55	7.89	0.97	6.02	3000.00	0.21	4.45	0.31	1.66	3000.00	0.82	4.45	0.31	0.55
	4.03	2800.00	1400.00	0.06	2.71	0.11	0.65	1400.00	0.13	3.68	0.21	1.31	2800.00	0.18	4.15	0.27	1.44	2800.00	0.72	4.15	0.27	0.48
	4.75	3300.00	1650.00	0.09	3.20	0.16	0.91	1650.00	0.18	4.34	0.29	1.82	3300.00	0.25	4.89	0.37	2.01	3300.00	0.97	4.89	0.37	0.67
Phase 2 3.5 fps	5.33	3700.00	1850.00	0.11	3.58	0.20	1.14	1850.00	0.22	4.87	0.37	2.29	3700.00	0.30	5.49	0.47	2.52	3700.00	1.20	5.49	0.47	0.84
	6.48	4500.00	2250.00	0.15	4.36	0.30	1.69	2250.00	0.32	5.92	0.54	3.39	4500.00	0.44	6.67	0.69	3.73	4500.00	1.73	6.67	0.69	1.24
	6.05	4200.00	1400.00	0.06	2.71	0.11	0.65	1400.00	0.13	3.68	0.21	1.31	4200.00	0.39	6.23	0.60	3.25	4200.00	1.52	6.23	0.60	1.08
	6.48	4500.00	1500.00	0.07	2.91	0.13	0.75	1500.00	0.15	3.95	0.24	1.50	4500.00	0.44	6.67	0.69	3.73	4500.00	1.73	6.67	0.69	1.24
	6.77	4700.00	1566.67	0.08	3.04	0.14	0.82	1566.67	0.17	4.12	0.26	1.64	4700.00	0.47	6.97	0.75	4.07	4700.00	1.87	6.97	0.75	1.36
Phase 2 Peak	**7.09**	**4925.00**	1641.67	0.09	**3.18**	0.16	0.90	1641.67	0.18	**4.32**	0.29	1.80	4925.00	0.52	**7.30**	0.83	4.47	4925.00	2.04	**7.30**	0.83	1.49
	7.78	5400.00	1800.00	0.10	3.49	0.19	1.08	1800.00	0.21	4.74	0.35	2.17	5400.00	0.61	8.01	1.00	5.37	5400.00	2.42	8.01	1.00	1.79

Velocity 3.5 fps at beginning of each cycle, maintain 2 fps after flush. (AlexRenew 2.7.3.K)
Velocity 2-5 fps for suction. (AlexRenew 2.7.4.C)
Velocity 2-8 fps for discharge. (AlexRenew 2.7.4.D)

C-Factor = 110

Phase 2 Input Values

Low WS (start)	-3.50		Suction side (Lead Pump On)
Low WS	-7.00		Suction side (Pumps Off)
Normal High WS	43.00		Discharge side (Force Main High Point)
Max High WS	43.00		Discharge side (Force Main High Point)
Pump CL	-8.00		For NPSH calculation
$H_{s\text{-}normal}$	46.50	ft	static head
$H_{s\text{-}max}$	50.00	ft	max static head
$h_{s\text{-}pump}$	1.00	ft	pump suction static head

Force Main Phase 1

C	110	Ductile
L_{d1}	2660	ft
D Nominal	16	inches
D_{d1}	16.6	inches
Flow Area	1.503	ft^2
K_{td1}	4.06	
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	3	0.42	1.26
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	1	1	1
Inlet	0	0.5	0
	K_{td1}		**4.06**

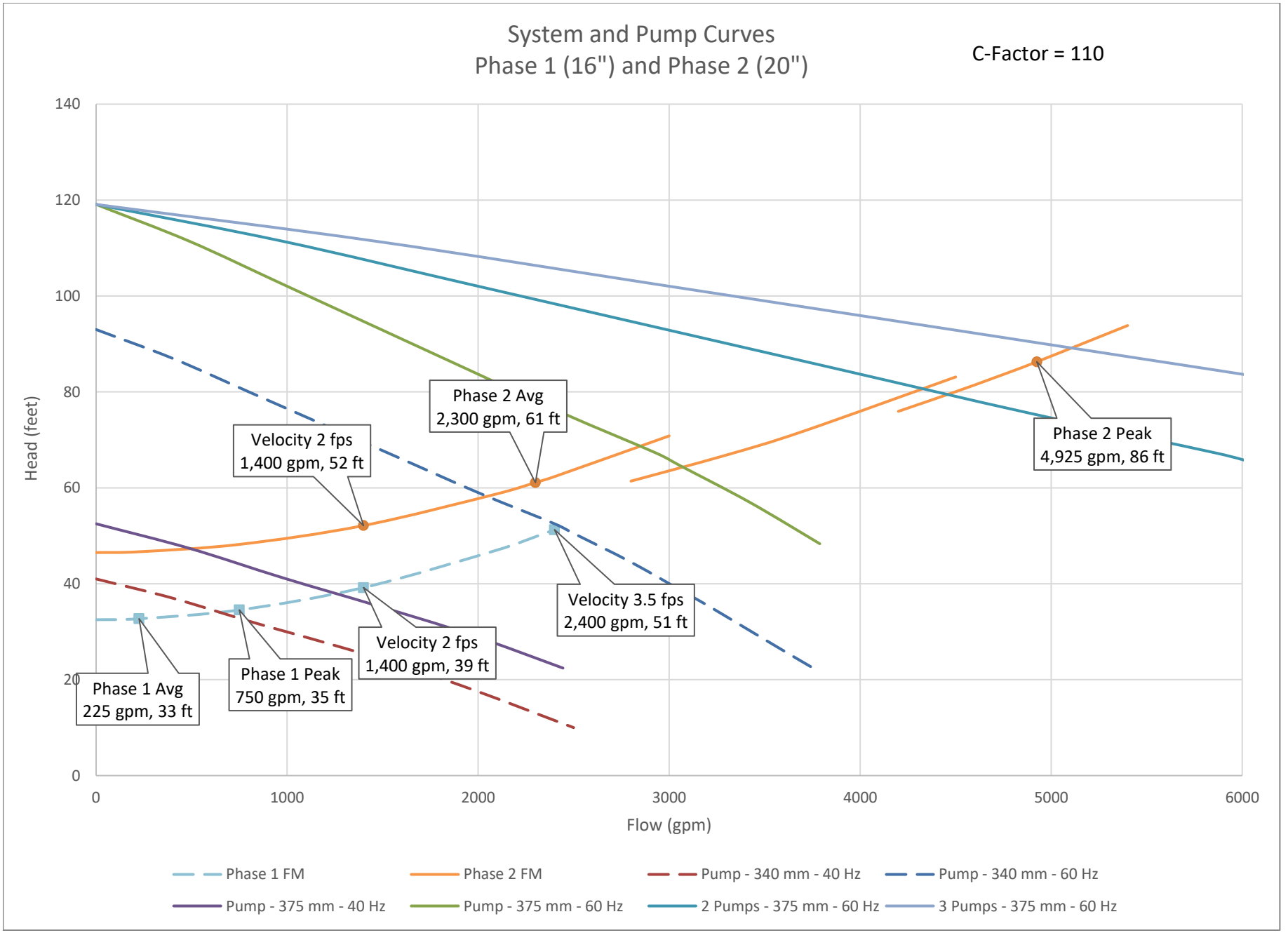
Force Main Phase 2

C	110	Ductile
L_{d1}	5850	ft
D Nominal	20	inches
D_{d1}	20.76	inches
Flow Area	2.351	ft^2
K_{td1}	4.48	
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	4	0.42	1.68
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	1	1	1
Inlet	0	0.5	0
	K_{td1}		**4.48**

	Force Main Phase 1					Normal High WS		Max High WS			Force Main Phase 2					Normal High WS		Max High WS		
	Q_{d1} gpm	h_{Ld1} ft	V_{d1} fps	$V_{d1}^2/2g$	h_{lmd1} ft	H_s ft	TDH ft	H_s ft	TDH ft		Q_{d1} gpm	h_{Ld1} ft	V_{d1} fps	$V_{d1}^2/2g$	h_{lmd1} ft	H_s ft	TDH ft	H_s ft	TDH ft	$NPSH_A$ ft
+	0.00	0.00	0.00	0.00	0.00	32.50	**32.50**	44.00	***44.00***	or +	0.00	0.00	0.00	0.00	0.00	46.50	**46.50**	50.00	***50.00***	34.17
+	225.00	0.12	0.33	0.00	0.01	32.50	**32.71**	44.00	***44.21***	or +	225.00	0.09	0.21	0.00	0.00	46.50	**46.67**	50.00	***50.17***	34.15
+	750.00	1.11	1.11	0.02	0.08	32.50	**34.53**	44.00	***46.03***	or +	750.00	0.82	0.71	0.01	0.04	46.50	**48.20**	50.00	***51.70***	33.97
+	1400.00	3.53	**2.08**	0.07	0.27	32.50	**39.19**	44.00	***50.69***	or +	1400.00	2.61	**1.33**	0.03	0.12	46.50	**52.13**	50.00	***55.63***	33.46
+	2100.00	7.48	3.11	0.15	0.61	32.50	**47.04**	44.00	***58.54***	or +	2100.00	5.53	1.99	0.06	0.28	46.50	**58.76**	50.00	***62.26***	32.57
+	2300.00	8.85	3.41	0.18	0.73	32.50	**49.80**	44.00	***61.30***	or +	2300.00	6.55	2.18	0.07	0.33	46.50	**61.10**	50.00	***64.60***	32.25
+	2400.00	9.57	**3.56**	0.20	0.80	32.50	**51.27**	44.00	***62.77***	or +	2400.00	7.08	**2.27**	0.08	0.36	46.50	**62.34**	50.00	***65.84***	32.08
+	3000.00	14.46	4.45	0.31	1.25	32.50	**61.27**	44.00	***72.77***	or +	3000.00	10.70	2.84	0.13	0.56	46.50	**70.83**	50.00	***74.33***	30.92
+	2800.00	12.73	4.15	0.27	1.09	32.50	**51.30**	44.00	*62.80*	or +	2800.00	9.42	2.65	0.11	0.49	46.50	**61.40**	50.00	***64.90***	33.46
+	3300.00	17.25	4.89	0.37	1.51	32.50	**58.15**	44.00	***69.65***	or +	3300.00	12.77	3.13	0.15	0.68	46.50	**66.84**	50.00	***70.34***	33.18
+	3700.00	21.32	5.49	0.47	1.90	32.50	**64.34**	44.00	***75.84***	or +	3700.00	15.78	3.51	0.19	0.86	46.50	**71.76**	50.00	***75.26***	32.93
+	4500.00	30.62	6.67	0.69	2.81	32.50	**78.61**	44.00	***90.11***	or +	4500.00	22.66	4.27	0.28	1.27	46.50	**83.12**	50.00	***86.62***	32.34
+	4200.00	26.95	6.23	0.60	2.44	32.50	**70.30**	44.00	***81.80***	or +	4200.00	19.95	3.98	0.25	1.10	46.50	**75.95**	50.00	***79.45***	33.46
+	4500.00	30.62	6.67	0.69	2.81	32.50	**75.55**	44.00	***87.05***	or +	4500.00	22.66	4.27	0.28	1.27	46.50	**80.05**	50.00	***83.55***	33.35
+	4700.00	33.19	6.97	0.75	3.06	32.50	**79.22**	44.00	***90.72***	or +	4700.00	24.56	4.46	0.31	1.38	46.50	**82.92**	50.00	***86.42***	33.28
+	4925.00	36.18	**7.30**	0.83	3.36	32.50	**83.53**	44.00	***95.03***	or +	4925.00	26.78	**4.67**	0.34	1.52	46.50	**86.28**	50.00	***89.78***	33.19
+	5400.00	42.90	8.01	1.00	4.04	32.50	**93.20**	44.00	***104.70***	or +	5400.00	31.75	5.12	0.41	1.82	46.50	**93.83**	50.00	***97.33***	32.99


System and Pump Curves
Phase 1 (16") and Phase 2 (20")
C-Factor = 110
Head (feet)
Flow (gpm)
0
20
40
60
80
100
120
140
0
1000
2000
3000
4000
5000
6000
Phase 2 Avg
2,300 gpm, 61 ft
Velocity 2 fps
1,400 gpm, 52 ft
Phase 2 Peak
4,925 gpm, 86 ft
Velocity 3.5 fps
2,400 gpm, 51 ft
Velocity 2 fps
1,400 gpm, 39 ft
Phase 1 Peak
750 gpm, 35 ft
Phase 1 Avg
225 gpm, 33 ft
Phase 1 FM
Phase 2 FM
Pump - 340 mm - 40 Hz
Pump - 340 mm - 60 Hz
Pump - 375 mm - 40 Hz
Pump - 375 mm - 60 Hz
2 Pumps - 375 mm - 60 Hz
3 Pumps - 375 mm - 60 Hz

Gannett Fleming

Subject	System Curve for Sewage Pumps		
Job No.	62171	**Project**	North Potomac Yard PS
By	BMJ	**Date**	3/16/2020
Checked		**Date**	

C-Factor = 130

Phase 1 Input Values

Low WS (start)	-3.50		Suction side (Lead Pump On)
Low WS	-7.00		Suction side (Pumps Off)
Normal High WS	29.00		Discharge side (Gravity MH INV)
Max High WS	37.00		Discharge side (Surcharge MH)
Pump CL	-8.00		For NPSH calculation
$H_{s\text{-}normal}$	32.50	ft	static head
$H_{s\text{-}max}$	44.00	ft	max static head
$h_{s\text{-}pump}$	1.00	ft	pump suction static head

NPSH Constants

$NPSH_A = h_p - h_{vpa} + h_s - h_{fs}$

Barometric Pressure (h_p)	33.96	feet
Vapor Pres.of Water (h_{vpa})	0.78	feet (at 68°F)
Static Head on Pump ($h_{s\text{-}pump}$)	1.00	ft
Friction Losses in Suction (h_{fs})	(included in calc. below)	

C	Material	
120	PVC	Per AlexRenew 2.7.1.B
120	HDPE	Per AlexRenew 2.7.1.B
130	Cast Iron	
110	Ductile	Per AlexRenew 2.7.1.B
130	Special	Per Request

Pump Suction Piping

C	130	Special	
L_{s1}	25	ft	
D Nominal	14	inches	
D_{s1}	14.52	inches	
Flow Area	1.150	ft^2	
K_{ts1}	5.71		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	50%	(if pipe splits and flow is divided)	
Flow %	33%	(if pipe splits and flow is divided)	

Pump Discharge Piping

C	130	Special	
L_{d1}	25	ft	
D Nominal	12	inches	
D_{d1}	12.46	inches	
Flow Area	0.847	ft^2	
K_{td1}	6.22		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	50%	(if pipe splits and flow is divided)	
Flow %	33%	(if pipe splits and flow is divided)	

Pump Discharge Header

C	130	Special	
L_{d1}	38	ft	
D Nominal	16	inches	
D_{d1}	16.6	inches	
Flow Area	1.503	ft^2	
K_{td1}	5.4		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	

Force Main Spur to Road

C	130	Special	
L_{d1}	150	ft	
D Nominal	16	inches	
D_{d1}	16.6	inches	
Flow Area	1.503	ft^2	
K_{td1}	1.8		
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	
Flow %	100%	(if pipe splits and flow is divided)	

Suction Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	3	0.9	2.7
Tee, Branch	1	1.8	1.8
Tee, Run	1	0.2	0.2
Wye	0	0.5	0
Reducer	1	0.13	0.13
Gate Valve	2	0.19	0.38
Check Valve	0	2.3	0
Outlet	0	1	0
Inlet	1	0.5	0.5
	K_{ts1}		**5.71**

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branch	1	1.8	1.8
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	1	0.13	0.13
Gate Valve	1	0.19	0.19
Check Valve	1	2.3	2.3
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		**6.22**

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branch	2	1.8	3.6
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valve	0	2.3	0
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		**5.4**

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	0	0.42	0
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	0	1	0
Inlet	0	0.5	0
	K_{td1}		**1.8**

			Pump Suction Piping					Pump Discharge Piping					Pump Discharge Header					Force Main Spur to Road				
	Q_t	Q_t	Q_{s1}	h_{Ls1}	V_{s1}	$V_{s1}^2/2g$	h_{lms1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}	Q_{d1}	h_{Ld1}	V_{d1}	$V_{d1}^2/2g$	h_{lmd1}
	MGD	gpm	gpm	ft	fps		ft	gpm	ft	fps		ft	gpm	ft	fps		ft	gpm	ft	fps		ft
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 1 Avg	0.32	225.00	225.00	0.00	0.44	0.00	0.02	225.00	0.00	0.59	0.01	0.03	225.00	0.00	0.33	0.00	0.01	225.00	0.00	0.33	0.00	0.00
Phase 1 Peak	1.08	750.00	750.00	0.01	1.45	0.03	0.19	750.00	0.03	1.97	0.06	0.38	750.00	0.01	1.11	0.02	0.10	750.00	0.05	1.11	0.02	0.03
Phase 1 2.0 fps	**2.02**	**1400.00**	1400.00	0.05	**2.71**	0.11	0.65	1400.00	0.10	**3.68**	0.21	1.31	1400.00	0.04	**2.08**	0.07	0.36	1400.00	0.15	**2.08**	0.07	0.12
Phase 2 2.0 fps	3.02	2100.00	2100.00	0.10	4.07	0.26	1.47	2100.00	0.21	5.53	0.47	2.95	2100.00	0.08	3.11	0.15	0.81	2100.00	0.31	3.11	0.15	0.27
Phase 2 Avg	3.31	2300.00	2300.00	0.12	4.46	0.31	1.76	2300.00	0.25	6.05	0.57	3.54	2300.00	0.09	3.41	0.18	0.97	2300.00	0.37	3.41	0.18	0.32
Phase 1 3.5 fps	3.46	2400.00	2400.00	0.13	**4.65**	0.34	1.92	2400.00	0.27	**6.32**	0.62	3.85	2400.00	0.10	**3.56**	0.20	1.06	2400.00	0.40	**3.56**	0.20	0.35
	4.32	3000.00	3000.00	0.19	5.81	0.52	3.00	3000.00	0.40	7.89	0.97	6.02	3000.00	0.15	4.45	0.31	1.66	3000.00	0.60	4.45	0.31	0.55
	4.03	2800.00	1400.00	0.05	2.71	0.11	0.65	1400.00	0.10	3.68	0.21	1.31	2800.00	0.13	4.15	0.27	1.44	2800.00	0.53	4.15	0.27	0.48
	4.75	3300.00	1650.00	0.06	3.20	0.16	0.91	1650.00	0.13	4.34	0.29	1.82	3300.00	0.18	4.89	0.37	2.01	3300.00	0.71	4.89	0.37	0.67
Phase 2 3.5 fps	5.33	3700.00	1850.00	0.08	3.58	0.20	1.14	1850.00	0.16	4.87	0.37	2.29	3700.00	0.22	5.49	0.47	2.52	3700.00	0.88	5.49	0.47	0.84
	6.48	4500.00	2250.00	0.11	4.36	0.30	1.69	2250.00	0.24	5.92	0.54	3.39	4500.00	0.32	6.67	0.69	3.73	4500.00	1.27	6.67	0.69	1.24
	6.05	4200.00	1400.00	0.05	2.71	0.11	0.65	1400.00	0.10	3.68	0.21	1.31	4200.00	0.28	6.23	0.60	3.25	4200.00	1.12	6.23	0.60	1.08
	6.48	4500.00	1500.00	0.05	2.91	0.13	0.75	1500.00	0.11	3.95	0.24	1.50	4500.00	0.32	6.67	0.69	3.73	4500.00	1.27	6.67	0.69	1.24
	6.77	4700.00	1566.67	0.06	3.04	0.14	0.82	1566.67	0.12	4.12	0.26	1.64	4700.00	0.35	6.97	0.75	4.07	4700.00	1.37	6.97	0.75	1.36
Phase 2 Peak	**7.09**	**4925.00**	1641.67	0.06	**3.18**	0.16	0.90	1641.67	0.13	**4.32**	0.29	1.80	4925.00	0.38	**7.30**	0.83	4.47	4925.00	1.50	**7.30**	0.83	1.49
	7.78	5400.00	1800.00	0.07	3.49	0.19	1.08	1800.00	0.16	4.74	0.35	2.17	5400.00	0.45	8.01	1.00	5.37	5400.00	1.78	8.01	1.00	1.79

Velocity 3.5 fps at beginning of each cycle, maintain 2 fps after flush. (AlexRenew 2.7.3.K)
Velocity 2-5 fps for suction. (AlexRenew 2.7.4.C)
Velocity 2-8 fps for discharge. (AlexRenew 2.7.4.D)

C-Factor = 130

Phase 2 Input Values

Low WS (start)	-3.50		Suction side (Lead Pump On)
Low WS	-7.00		Suction side (Pumps Off)
Normal High WS	43.00		Discharge side (Force Main High Point)
Max High WS	43.00		Discharge side (Force Main High Point)
Pump CL	-8.00		For NPSH calculation
$H_{s\text{-}normal}$	46.50	ft	static head
$H_{s\text{-}max}$	50.00	ft	max static head
$h_{s\text{-}pump}$	1.00	ft	pump suction static head

Force Main Phase 1

C	130	Special
L_{d1}	2660	ft
D Nominal	16	inches
D_{d1}	16.6	inches
Flow Area	1.503	ft^2
K_{td1}	4.06	
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	3	0.42	1.26
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	1	1	1
Inlet	0	0.5	0
	K_{td1}		**4.06**

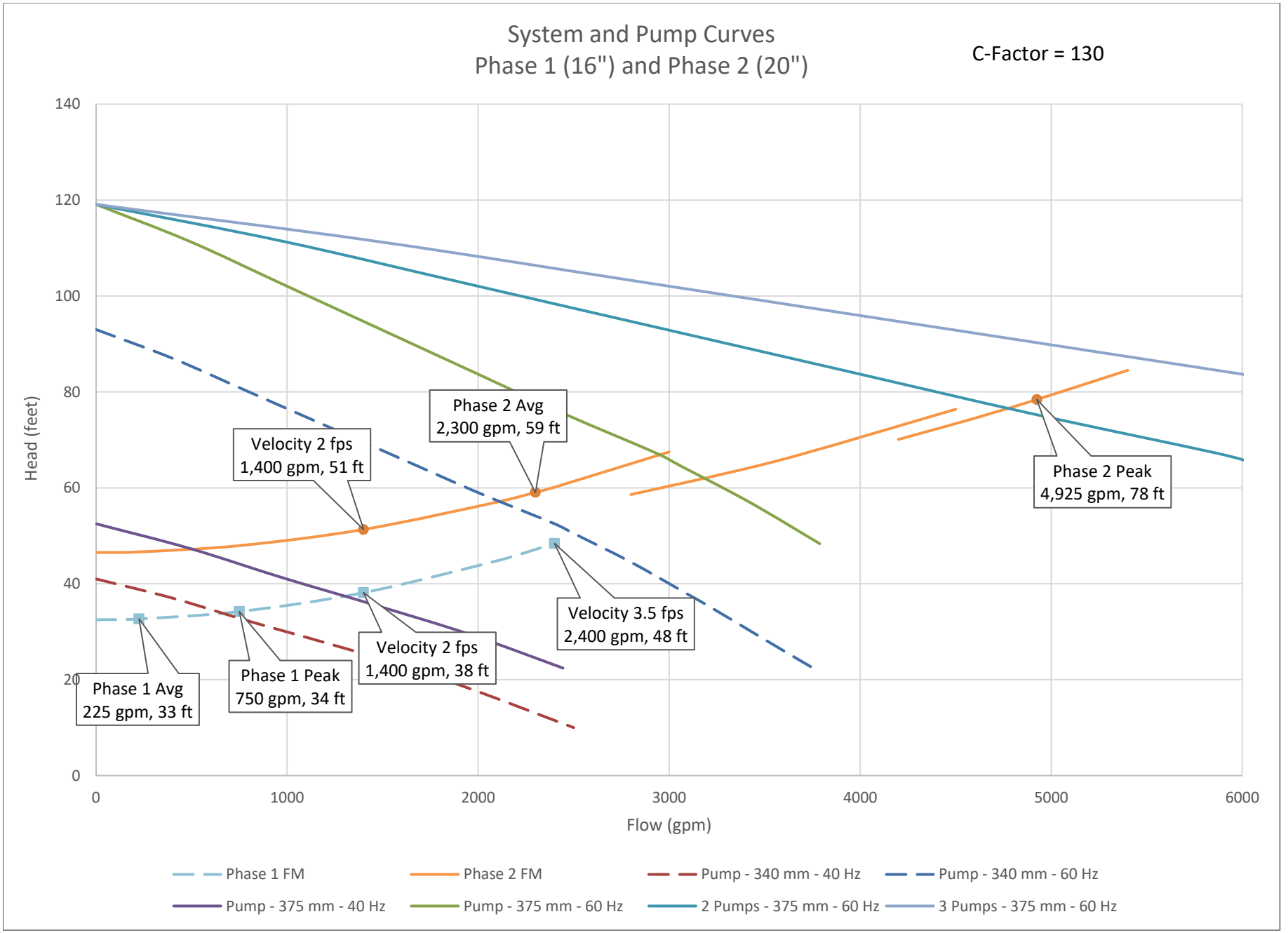
Force Main Phase 2

C	130	Special
L_{d1}	5850	ft
D Nominal	20	inches
D_{d1}	20.76	inches
Flow Area	2.351	ft^2
K_{td1}	4.48	
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)
Flow %	100%	(if pipe splits and flow is divided)

Discharge Minor Losses

Fitting	Number	K factor	Total K
45 Bend	4	0.42	1.68
90 Bend	2	0.9	1.8
Tee, Branc	0	1.8	0
Tee, Run	0	0.2	0
Wye	0	0.5	0
Reducer	0	0.13	0
Gate Valve	0	0.19	0
Check Valv	0	2.3	0
Outlet	1	1	1
Inlet	0	0.5	0
	K_{td1}		**4.48**

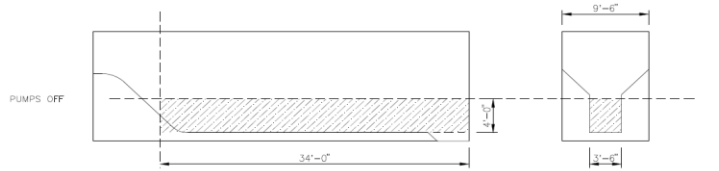
	Force Main Phase 1					Normal High WS		Max High WS			Force Main Phase 2					Normal High WS		Max High WS		
	Q_{d1} gpm	h_{Ld1} ft	V_{d1} fps	$V_{d1}^2/2g$	h_{lmd1} ft	H_s ft	TDH ft	H_s ft	TDH ft		Q_{d1} gpm	h_{Ld1} ft	V_{d1} fps	$V_{d1}^2/2g$	h_{lmd1} ft	H_s ft	TDH ft	H_s ft	TDH ft	$NPSH_A$ ft
+	0.00	0.00	0.00	0.00	0.00	32.50	**32.50**	44.00	***44.00***	or +	0.00	0.00	0.00	0.00	0.00	46.50	**46.50**	50.00	***50.00***	34.17
+	225.00	0.09	0.33	0.00	0.01	32.50	**32.67**	44.00	***44.17***	or +	225.00	0.07	0.21	0.00	0.00	46.50	**46.64**	50.00	***50.14***	34.16
+	750.00	0.82	1.11	0.02	0.08	32.50	**34.20**	44.00	***45.70***	or +	750.00	0.60	0.71	0.01	0.04	46.50	**47.95**	50.00	***51.45***	33.97
+	1400.00	2.59	**2.08**	0.07	0.27	32.50	**38.14**	44.00	***49.64***	or +	1400.00	1.92	**1.33**	0.03	0.12	46.50	**51.31**	50.00	***54.81***	33.47
+	2100.00	5.49	3.11	0.15	0.61	32.50	**44.80**	44.00	***56.30***	or +	2100.00	4.06	1.99	0.06	0.28	46.50	**57.03**	50.00	***60.53***	32.61
+	2300.00	6.49	3.41	0.18	0.73	32.50	**47.15**	44.00	***58.65***	or +	2300.00	4.81	2.18	0.07	0.33	46.50	**59.06**	50.00	***62.56***	32.30
+	2400.00	7.03	**3.56**	0.20	0.80	32.50	**48.40**	44.00	***59.90***	or +	2400.00	5.20	**2.27**	0.08	0.36	46.50	**60.14**	50.00	***63.64***	32.13
+	3000.00	10.62	4.45	0.31	1.25	32.50	**56.94**	44.00	***68.44***	or +	3000.00	7.86	2.84	0.13	0.56	46.50	**67.49**	50.00	***70.99***	30.99
+	2800.00	9.35	4.15	0.27	1.09	32.50	**47.63**	44.00	*59.13*	or +	2800.00	6.92	2.65	0.11	0.49	46.50	**58.60**	50.00	***62.10***	33.47
+	3300.00	12.66	4.89	0.37	1.51	32.50	**53.17**	44.00	***64.67***	or +	3300.00	9.37	3.13	0.15	0.68	46.50	**63.05**	50.00	***66.55***	33.20
+	3700.00	15.65	5.49	0.47	1.90	32.50	**58.19**	44.00	***69.69***	or +	3700.00	11.58	3.51	0.19	0.86	46.50	**67.08**	50.00	***70.58***	32.96
+	4500.00	22.48	6.67	0.69	2.81	32.50	**69.77**	44.00	***81.27***	or +	4500.00	16.64	4.27	0.28	1.27	46.50	**76.39**	50.00	***79.89***	32.38
+	4200.00	19.79	6.23	0.60	2.44	32.50	**62.57**	44.00	***74.07***	or +	4200.00	14.64	3.98	0.25	1.10	46.50	**70.09**	50.00	***73.59***	33.47
+	4500.00	22.48	6.67	0.69	2.81	32.50	**66.77**	44.00	***78.27***	or +	4500.00	16.64	4.27	0.28	1.27	46.50	**73.39**	50.00	***76.89***	33.37
+	4700.00	24.36	6.97	0.75	3.06	32.50	**69.71**	44.00	***81.21***	or +	4700.00	18.03	4.46	0.31	1.38	46.50	**75.70**	50.00	***79.20***	33.30
+	4925.00	26.56	**7.30**	0.83	3.36	32.50	**73.16**	44.00	***84.66***	or +	4925.00	19.66	**4.67**	0.34	1.52	46.50	**78.41**	50.00	***81.91***	33.21
+	5400.00	31.50	8.01	1.00	4.04	32.50	**80.91**	44.00	***92.41***	or +	5400.00	23.31	5.12	0.41	1.82	46.50	**84.50**	50.00	***88.00***	33.02


System and Pump Curves
Phase 1 (16") and Phase 2 (20")
C-Factor = 130
Head (feet)
Flow (gpm)
0
20
40
60
80
100
120
140
0
1000
2000
3000
4000
5000
6000
Phase 1 Avg
225 gpm, 33 ft
Phase 1 Peak
750 gpm, 34 ft
Velocity 2 fps
1,400 gpm, 38 ft
Velocity 2 fps
1,400 gpm, 51 ft
Phase 2 Avg
2,300 gpm, 59 ft
Velocity 3.5 fps
2,400 gpm, 48 ft
Phase 2 Peak
4,925 gpm, 78 ft
Phase 1 FM
Phase 2 FM
Pump - 340 mm - 40 Hz
Pump - 340 mm - 60 Hz
Pump - 375 mm - 40 Hz
Pump - 375 mm - 60 Hz
2 Pumps - 375 mm - 60 Hz
3 Pumps - 375 mm - 60 Hz

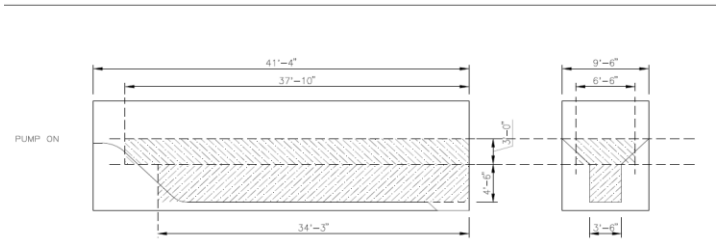
Gannett Fleming

Subject	Wetwell Calculations		
Job No.	62171	**Project**	North Potomac Yard PS
By	BMJ	**Date**	3/16/2020
Checked		**Date**	

		Value	Units	Comments
Influent Flow Rate Calculations				
Phase 2 Average Flow		2,894,960	GPD	from CCL 2020-02-06
Low Flow Reduction		35%		
Low Flow Reduction		1,013,236		
		1.88	MGD	
Jack Taylor, Average	+	0.20		
North Oakville, Average	+	0.21		
Phase 2 Average Flow		**2.29**	**MGD**	
Phase 2 Average Flow		**1,591**	**gpm**	
Peaking Factor		2.5		AlexRenew Guidelines, 2.5.B: 2.5 peak factor minimum
Phase 2 Peak Flow		6,224,164	GPD	
		6.22	MGD	
Jack Taylor, Peak	+	0.43		
North Oakville, Peak	+	0.45		
Phase 2 Peak Flow Rating		**7.10**	**MGD**	
Phase 2 Peak Flow Rating		**4,933**	**gpm**	
Phase I Average Flow		498,260	GPD	from CCL 2020-02-06
Low Flow Reduction		35%		
Low Flow Reduction		174,391		
Phase I Average Flow		**0.32**	**MGD**	
Phase I Average Flow		**225**	**gpm**	
Peaking Factor		2.5		AlexRenew Guidelines, 2.5.B: 2.5 peak factor minimum
Phase I Peak Flow		1,071,259	GPD	
Phase I Peak Flow Rating		**1.07**	**MGD**	
Phase I Peak Flow Rating		**744**	**gpm**	
Pump and Wet Well Calculations				
Pumping Rate at Peak, 3 Pumps		4925	gpm	Peak Flow for Phase 2 (Build-Out)
Pumping Rate, 1 Pump at Max		2400	gpm	Max Flow per Pump (Phase 2)
Pumping Rate, 1 Pump at Min		**1400**	**gpm**	**Minimum flow for 2 fps velocity in force main**
Theoretical Pump Cycles Per Hour		6	cyc/hr	Max 10 per hour (6 conservative) generally accepted
Theoretical Operating Volume (1 Pump at Min)		**468**	**cft**	depth = (15 * Pump Rate) / (Cycles per Hour * Wet Well Area) [derived from formulas below]
Wet Well Operating Volume		3500	gallons	
Minimum Pump Runtime at Average, Phase 1		**5**	**min.**	**AlexRenew Guidelines, 2.6.1.E: one pump run continuously at least 5 minutes at minimum flow**
Influent Flow Rate		225	gpm	Assume Phase 1 Average
Theoretical Operating Volume (1 Pump at Min)		**785**	**cft**	
Wet Well Operating Volume		5875	gallons	
Design Operating Volume Required		**785**	**cft**	Maximum of cycle volume vs. runtime volume
		5875	gallons	
Wet Well Minimum Depth		**4.00**	**ft**	Minimum submergence for suction bell
Approximate Length		34.00	ft	From CAD Graphic
Approximate Width		3.50	ft	From CAD Graphic
Wet Well Volume at Minimum Depth		**476**	**cft**	
	+	785	cft	
Wet Well Volume Required at Pump On Level		**1261**	**cft**	Volume at min depth + Operating volume required



Select Wet Well Pump On Level (from bottom)		**7.50**	**ft**		***Iterate until achieve needed volume in following calc***
Lower Section, Approx. Length		34.25	ft		From CAD Graphic
Lower Section, Approx. Width		3.50	ft		From CAD Graphic
Lower Section, Approx. Depth		4.50	ft		From CAD Graphic
Lower Section Volume		539	cft		
Middle Section, Approx. Length		37.83	ft		From CAD Graphic
Middle Section, Approx. Width		6.50	ft		From CAD Graphic
Middle Section, Approx. Depth		3.00	ft		From CAD Graphic
Middle Section Volume		738	cft		
Upper Section, Approx. Length		41.33	ft		From CAD Graphic
Upper Section, Approx. Width		9.50	ft		From CAD Graphic
Upper Section, Approx. Depth		0.00	ft		From CAD Graphic
Upper Section Volume		0	cft		
Total Volume		***1277***	***cft***	***Yes***	***Make sure matches/exceeds required volume***
Normal Operating Depth		**3.50**	**ft**		Difference between Pump On and Minimum Depth



Pump Cycle Checks

Minimum Pump Cycle	16.79	min		Shortest Pump Cycle = 4 * Volume / Pumping Rate
Maximum Pump Cycles per Hour	**3.57**	**cyc/hr**		Max 10 per hour (6 conservative) generally accepted
Min. Pump Runtime per Cycle (Phase I Avg)	**5.00**	**min.**		**AlexRenew Guidelines, 2.6.1.E: one pump run continuously at least 5 minutes at minimum flow**
Maximum Fill Time (Phase 1 Average)	**26.12**	**min.**		AlexRenew Guidelines, 2.6.1.C: fill time not to exceed 30 minutes at average and initial flows
Maximum Fill Time (Phase 2 Average)	**3.69**	**min.**		AlexRenew Guidelines, 2.6.1.C: fill time not to exceed 30 minutes at average and initial flows

Alternate Scenario - Pump Runtime at Startup

Minimum Pump Runtime at Low Flow, Phase 1		5	min.		AlexRenew Guidelines, 2.6.1.E: one pump run continuously at least 5 minutes at minimum flow
Influent Flow Rate		**112**	**gpm**		**Assume HALF of Phase 1 Average**
Theoretical Operating Volume (1 Pump at Min)		861	cft		
Wet Well Volume at Minimum Depth	+	476	cft		
Wet Well Volume Required at Pump On Level		**1337**	**cft**		Volume at min depth + Operating volume required
Select Wet Well Pump On Level (from bottom)		**7.75**	**ft**		***Iterate until achieve needed volume in following calc***
Total Volume		***1375***	***cft***	***Yes***	***Make sure matches/exceeds required volume***
Normal Operating Depth		**3.75**	**ft**		Difference between Pump On and Minimum Depth

Conclusion: Wet well can accommodate startup flow by raising "Pump On" level by 0.25 feet

Alternate Scenario - Pump Runtime at Minimal/Intermittent Flow

Minimum Pump Runtime at Low Flow, Phase 1		5	min.		AlexRenew Guidelines, 2.6.1.E: one pump run continuously at least 5 minutes at minimum flow
Influent Flow Rate		**0**	**gpm**		**Assume minimal/intermittent flow**
Theoretical Operating Volume (1 Pump at Min)		936	cft		
Wet Well Volume at Minimum Depth	+	476	cft		
Wet Well Volume Required at Pump On Level		**1412**	**cft**		Volume at min depth + Operating volume required
Select Wet Well Pump On Level (from bottom)		**8.00**	**ft**		***Iterate until achieve needed volume in following calc***
Total Volume		***1474***	***cft***	***Yes***	***Make sure matches/exceeds required volume***
Normal Operating Depth		**4.00**	**ft**		Difference between Pump On and Minimum Depth

Conclusion: Wet well can accommodate minimal/intermittent flow by raising "Pump On" level by 0.5 feet

Operating Elevations

Top of Wet Well	26.50	ft	from CCL dwg 2019-11-15
Grade Elevation	26.00	ft	from CCL dwg 2019-11-15
Lowest Influent Pipe Invert	**-2.50**	**ft**	-2.5 from CCL dwg 2020-02-19
Influent Channel Low Point	-4.00	ft	Approximate based on Old Potomac Yard
High Water Alarm	-1.50	ft	1 ft above lag pump on
Lag Pump On	-2.50	ft	1 ft above lead pump on
Lead Pump On	**-3.50**	**ft**	based on operating depth
Pumps Off	**-7.00**	**ft**	based on minimum depth
Low Water Alarm	-8.00	ft	1 ft below pumps off
Inside Bottom of Wet Well	-11.00	ft	From Wet Well Geometry Calc
Total Interior Depth of Wet Well	*37.50*	ft	*Placeholder*
Total Interior Depth from Grade	*37.00*	ft	*Placeholder*

Cleaning Cycle (Phase 2)

Pumping Rate (max of last pump)	**2400**	**gpm**	
Cleaning Influent Rate (entering trench)	**1200**	**gpm**	Typically about half of last pump capacity, if possible
Net Dewatering Rate	1200	gpm	
Volume to be Dewatered	9436	gallons	Start with water above top of ramp
Cleaning Cycle Duration (time to dewater)	**7.86**	**minutes**	Typically 1 to 4 minutes
Pump Station Influent Rate Available (ADF)	2300	gpm	Phase 2 Average
Net Cleaning Flow Rate Shortage	0	gpm	
Required Storage Volume	**0**	**gallons**	

Cleaning Cycle (Phase 1)

Pumping Rate (max of last pump)	**2400**	**gpm**	
Cleaning Influent Rate (entering trench)	**1000**	**gpm**	Typically about half of last pump capacity, if possible
Net Dewatering Rate	1400	gpm	
Volume to be Dewatered	9436	gallons	Start with water above top of ramp
Cleaning Cycle Duration (time to dewater)	**6.74**	**minutes**	Typically 1 to 4 minutes
Pump Station Influent Rate Available (ADF)	225	gpm	HALF of Phase 1 Average
Net Cleaning Flow Rate Shortage	775	gpm	
Required Storage Volume	**5224**	**gallons**	**Additional Volume Needed to Perform Cleaning Cycle**
Required Storage Volume	**698**	**cft**	**Additional Volume Needed to Perform Cleaning Cycle**

Cleaning Cycle (Start-up)

Pumping Rate (max of last pump)	**2400**	**gpm**	
Cleaning Influent Rate (entering trench)	**1000**	**gpm**	Typically about half of last pump capacity, if possible
Net Dewatering Rate	1400	gpm	
Volume to be Dewatered	9436	gallons	Start with water above top of ramp
Cleaning Cycle Duration (time to dewater)	**6.74**	**minutes**	Typically 1 to 4 minutes
Pump Station Influent Rate Available (startup)	**0**	**gpm**	**Assume minimal/intermittent influent flow**
Net Cleaning Flow Rate Shortage	1000	gpm	
Required Storage Volume	**6740**	**gallons**	**Additional Volume Needed to Perform Cleaning Cycle**
Required Storage Volume	**901**	**cft**	**Additional Volume Needed to Perform Cleaning Cycle**

Storage Volume in Collection System

Goal Phase 1 Avg: 698 cft
Goal Phase 1 Startup: 901 cft

Based on profile and data from CCL rec'd 3/3/2020

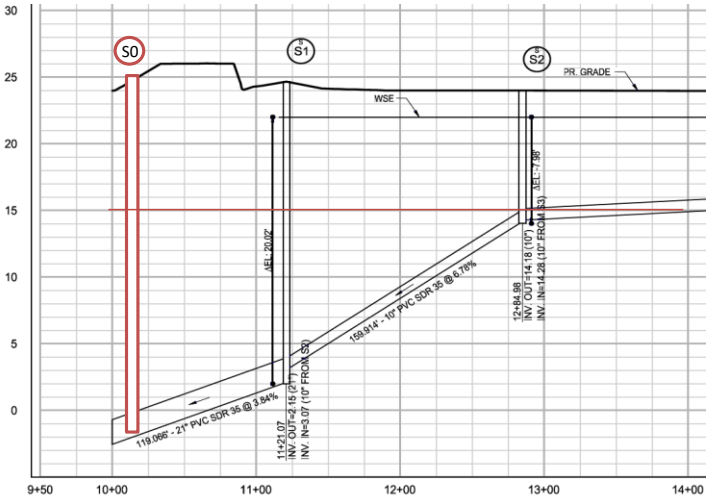
OPTION 2

WS Elev. = **14.18** (Invert of Manhole S2, assume pipe full, but no surcharge behind S2)

	Desc.	Dia. (in)	Dia. (ft)	L or H (ft)	Area (sqft)	V (cft)
Pipe	PS-S1	21	1.75	119.07	2.41	**286.4**
Manhole	S1	48	4.00	12.03	12.57	**151.2**
Pipe	S1-S2	10	0.83	159.91	0.55	**87.2**
Manhole	S2	48	4.00	0.00	12.57	**0.0**

Total: 524.8 cft

This is NOT enough volume.



Additional Structure for Storage Volume

Add structure for storage immediately upstream of pump station influent

Goal Phase 1 Avg: 698 cft
Goal Phase 1 Startup: 901 cft

Assume invert at approx. -1.5

Manhole S2 filled to top of pipe out

PROPOSED

WS Elev. = **15.00** (Invert of Manhole S2, assume pipe full, but no surcharge behind S2)

	Desc.	Dia. (in)	Dia. (ft)	L or H (ft)	Area (sqft)	V (cft)
Storage	**S0**	**72**	**6.00**	**16.50**	28.27	**466.5**
Pipe	PS-S1	21	1.75	119.07	2.41	**286.4**
Manhole	S1	48	4.00	12.85	12.57	**161.5**
Pipe	S1-S2	10	0.83	159.91	0.55	**87.2**
Manhole	S2	48	4.00	0.82	12.57	**10.3**

Total: 1011.9 cft

This IS enough volume.

Conclusion: Provide 6 ft diameter structure for storage.

Author…	Details…	Assumptions…	Web Address…	The Spreadsheet…

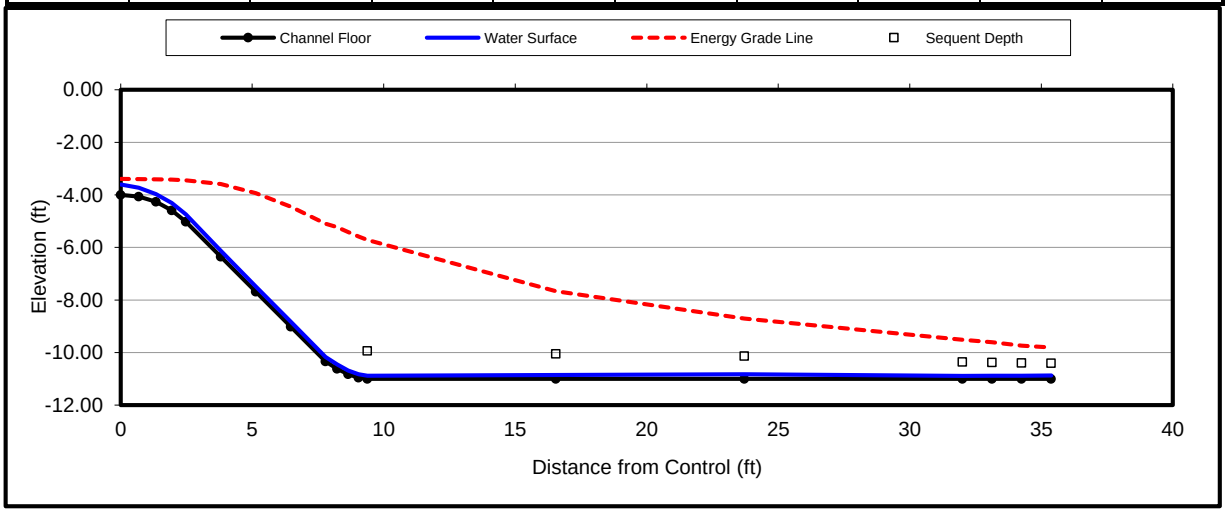
Version 2.0 Posted on web January 3, 2003.

Date:	**3/16/2020**	**Project Title:**	**North Potomac Yard Pump Station**
Client:	**CCL**	**Location:**	**Alexandria, VA**
Job No.:	**62171**	**Calculation by:**	**BMJ**
Remarks:	**For Phase 1 at 1000 gpm influent**		

Program developed by Dr. Joel Cahoon, Montana State University. Access: http://www.coe.montana.edu/ce/joelc/wetwell/

Section A - B		Section B - C		Uniform Flow Depth in the Circular Inlet Channel	
b =	**3.50** ft	b =	**3.50** ft	Flow Rate =	**2.23** cfs
b_f =	**2.17** ft	b_f =	**2.17** ft	Slope =	**0.0100** ft/ft
b_s =	**1.33** ft	z_f =	**1.00**	Diameter =	**2.50** ft
z_f =	**1.00**	y_f =	0.67 ft	Manning's n =	**0.013**
z_s =	**1.00**	$n_{concrete}$ =	**0.011**	Flow Depth =	**0.40** ft
y_f =	0.67 ft	Ramp Height (ft) =	**7.00**	Flow Area =	0.50 ft^2
y_s =	0.67 ft	Upper Radius (ft) =	**3.50**	Wetted Perimeter =	2.05 ft
$n_{splitter}$ =	**0.009**	Lower Radius (ft) =	**2.25**	Hydraulic Radius =	0.24 ft
$n_{concrete}$ =	**0.011**	Length 1 (ft) =	**21.50**	Velocity =	4.46 ft/sec
		Length 2 (ft) =	**4.50**	r.h.s. =	**0.0000** cfs

Run Node	Distance from Control x, (ft)	Elevation Head z, (ft)	Vertical Flow Depth y_v, (ft)	Normal Flow Depth y, (ft)	Water Surface Elevation y, (ft)	Mean Velocity V, (ft/sec)	Froude Number F	Energy E, (ft)	Sequent Depth y_2, (ft)
1	0.00	-4.00	0.40	0.40	-3.60	3.45	1.18	-3.39	
2	0.68	-4.07	0.34	0.34	-3.72	4.37	1.59	-3.40	
3	1.34	-4.27	0.30	0.27	-3.97	5.83	2.32	-3.40	
4	1.94	-4.59	0.28	0.23	-4.31	7.39	3.15	-3.42	
5	2.47	-5.03	0.28	0.20	-4.74	8.97	4.06	-3.45	
6	3.80	-6.35	0.22	0.16	-6.13	12.20	6.10	-3.59	
7	5.13	-7.68	0.20	0.14	-7.49	14.29	7.54	-3.94	
8	6.46	-9.01	0.18	0.13	-8.83	15.83	8.65	-4.45	
9	7.79	-10.34	0.17	0.12	-10.17	16.99	9.52	-5.10	
10	8.23	-10.62	0.17	0.12	-10.45	17.24	9.71	-5.23	
11	8.65	-10.83	0.14	0.12	-10.68	17.25	9.71	-5.42	
12	9.04	-10.96	0.13	0.12	-10.83	17.17	9.65	-5.58	
13	9.38	-11.00	0.12	0.12	-10.88	17.01	9.53	-5.71	1.07
14	16.55	-11.00	0.15	0.15	-10.85	13.35	6.88	-7.67	0.95
15	23.72	-11.00	0.17	0.17	-10.83	10.90	5.25	-8.71	0.86
16	32.01	-11.00	0.11	0.11	-10.89	8.76	4.74	-9.52	0.64
17	33.13	-11.00	0.12	0.12	-10.88	8.44	4.49	-9.61	0.63
18	34.26	-11.00	0.12	0.12	-10.88	7.99	4.14	-9.74	0.61
19	35.38	-11.00	0.13	0.13	-10.87	7.73	3.95	-9.81	0.60



Author…	Details…	Assumptions…	Web Address…	The Spreadsheet…

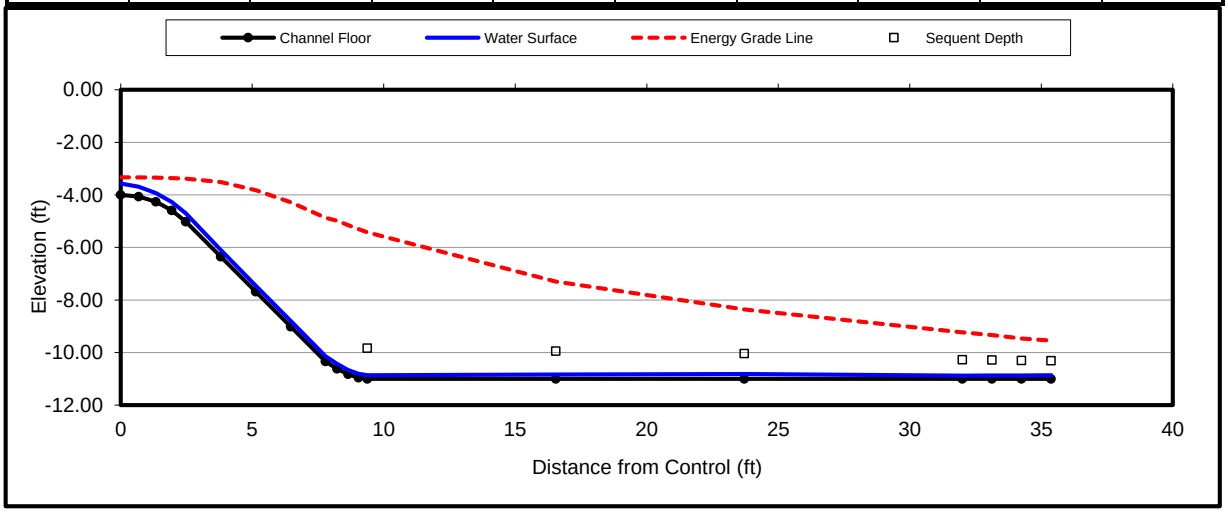
Version 2.0 Posted on web January 3, 2003.

Date:	**3/16/2020**	**Project Title:**	**North Potomac Yard Pump Station**
Client:	**CCL**	**Location:**	**Alexandria, VA**
Job No.:	**62171**	**Calculation by:**	**BMJ**
Remarks:	**For Phase 2 at 1200 gpm influent.**		

Program developed by Dr. Joel Cahoon, Montana State University. Access: http://www.coe.montana.edu/ce/joelc/wetwell/

Section A - B		Section B - C		Uniform Flow Depth in the Circular Inlet Channel	
b =	**3.50** ft	b =	**3.50** ft	Flow Rate =	**2.67** cfs
b_f =	**2.17** ft	b_f =	**2.17** ft	Slope =	**0.0100** ft/ft
b_s =	**1.33** ft	z_f =	**1.00**	Diameter =	**2.50** ft
z_f =	**1.00**	y_f =	0.67 ft	Manning's n =	**0.013**
z_s =	**1.00**	$n_{concrete}$ =	**0.011**	Flow Depth =	**0.43** ft
y_f =	0.67 ft	Ramp Height (ft) =	**7.00**	Flow Area =	0.57 ft^2
y_s =	0.67 ft	Upper Radius (ft) =	**3.50**	Wetted Perimeter =	2.14 ft
$n_{splitter}$ =	**0.009**	Lower Radius (ft) =	**2.25**	Hydraulic Radius =	0.26 ft
$n_{concrete}$ =	**0.011**	Length 1 (ft) =	**21.50**	Velocity =	4.71 ft/sec
		Length 2 (ft) =	**4.50**	r.h.s. =	**0.0000** cfs

Run Node	Distance from Control x, (ft)	Elevation Head z, (ft)	Vertical Flow Depth y_v, (ft)	Normal Flow Depth y, (ft)	Water Surface Elevation y, (ft)	Mean Velocity V, (ft/sec)	Froude Number F	Energy E, (ft)	Sequent Depth y_2, (ft)
1	0.00	-4.00	0.43	0.43	-3.57	3.63	1.19	-3.33	
2	0.68	-4.07	0.38	0.37	-3.69	4.52	1.58	-3.34	
3	1.34	-4.27	0.33	0.31	-3.93	5.97	2.26	-3.35	
4	1.94	-4.59	0.31	0.26	-4.28	7.52	3.05	-3.36	
5	2.47	-5.03	0.32	0.23	-4.70	9.11	3.91	-3.38	
6	3.80	-6.35	0.26	0.18	-6.10	12.33	5.83	-3.51	
7	5.13	-7.68	0.23	0.16	-7.46	14.49	7.22	-3.82	
8	6.46	-9.01	0.21	0.15	-8.80	16.10	8.32	-4.28	
9	7.79	-10.34	0.20	0.14	-10.15	17.35	9.19	-4.87	
10	8.23	-10.62	0.19	0.14	-10.43	17.62	9.38	-4.98	
11	8.65	-10.83	0.16	0.14	-10.66	17.65	9.40	-5.15	
12	9.04	-10.96	0.15	0.14	-10.81	17.59	9.36	-5.30	
13	9.38	-11.00	0.14	0.14	-10.86	17.45	9.26	-5.43	1.17
14	16.55	-11.00	0.16	0.16	-10.84	14.08	6.95	-7.30	1.05
15	23.72	-11.00	0.19	0.19	-10.81	11.71	5.45	-8.36	0.97
16	32.01	-11.00	0.12	0.12	-10.88	9.61	4.98	-9.23	0.73
17	33.13	-11.00	0.13	0.13	-10.87	9.29	4.75	-9.33	0.72
18	34.26	-11.00	0.13	0.13	-10.87	8.86	4.43	-9.47	0.70
19	35.38	-11.00	0.13	0.13	-10.87	8.60	4.24	-9.55	0.69



Power Generation

Recommended Generator Report - 450DFEJ*

Project - North Potomac PS

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(110)
Voltage	: 277/480, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 150
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	: 10
Emissions	: EPA, stationary emergency application		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 376.5	**Max. Step kW**	: 342.0 In Step 1	**Cumulative Step kW**	: 342.0
Running kVA	: 439.0	**Max. Step kVA**	: 489.4 In Step 1	**Cumulative Step kVA**	: 489.4
Running PF	: 0.86	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 223.3	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 573.07			**Pct Rated Capacity**	: 83.6

Generator Set Configuration

Alternator	: HC5C	**Engine**	: QSX15-G9 Nonroad 2
BCode	: B424	**Fuel**	: Diesel
Excitation	: PMG	**Displacement, cu in. (Litre)**	: 912.0(14.9)
Voltage Range	: LimR 480	**Cylinders**	: 6
Number of Leads	: 12	**Altitude Knee, ft(m)**	: 7215(2199)
Reconnectable	: Yes	**Altitude Slope, % per 1000ft(304.8m)**	: 6
Full Single Phase Output	: No	**Temperature Knee, °F(°C)**	: 104(40)
Increased Motor Starting	: No	**Temperature Slope, % per 10°F(5.56°C)**	: 6
Extended Stack	: No	**Emissions**	: EPA Tier 2
		Cooling Package	: high ambient

Set Performance

Running At	: 83.6% Rated Capacity
Max. Step Voltage Dip, %	: 19
Max. Step Frequency Dip, %	: 6
Peak Voltage Dip, %	:
Peak Frequency Dip, %	:
Site Rated Standby kW/kVA	: 450 / 563
Site Rated Max. SkW	: 513
Max. SkVA	: 1749
Temp Rise at Full Load, °C	: 150
Voltage Distortion	: 8.1
Site Rated Max Step kW Limit	:

Load Requirements

Max. Allowed Step Voltage Dip	: 20 In Step 1
Max. Allowed Step Frequency Dip	: 10 In Step 1
Peak Voltage Dip Limit %	: 20.0
Peak Frequency Dip Limit %	: 10
Running kW	: 376.5
Running kVA	: 439.0
Effective Step kW	: 314.9
Effective Step kVA	: 489.4
Percent Non-Linear Load	: 54.0
Voltage Distortion Limit	: 10
Max Step kW	:

*Note: Higher temperature rise at full rated load.

*Note: All generator set power derates are based on open generator sets.

Power Generation

Loads Summary Report

Project - North Potomac PS

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(110)
Voltage	: 277/480, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 150
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	: 10
Emissions	: EPA, stationary emergency application		

Loads Summary List

***Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	Sewage Pump	3	62.17	69.08	6.22	6.91	None	None	20.0	10.0	10.0
Step01	Screen and Compactor	1	4.44	5.22	22.88	37.5	None	None	20.0	10.0	0.0
Step01	Exhaust Fans-VFD	2	2.49	2.77	2.49	2.77	None	None	20.0	10.0	10.0
Step01	Exhaust Fans - FVNR	2	1.89	2.39	13.3	19.0	None	None	20.0	10.0	0.0
Step01	Monorail Hoist	1	4.44	5.22	22.88	37.5	None	None	20.0	10.0	0.0
Step01	Lighting	1	10.0	10.53	10.0	10.53	None	None	20.0	10.0	10.0
Step01	Receptacles	1	5.0	5.56	5.0	5.56	None	None	20.0	10.0	0.0
Step01	Odor Control Blower	1	8.67	9.97	35.51	67.0	None	None	20.0	10.0	0.0
Step01	Unit Heater	1	40.0	50.0	40.0	50.0	None	None	20.0	10.0	0.0
Step01	Electric Water heater	1	20.0	25.0	20.0	25.0	None	None	20.0	10.0	0.0
Step01	Bridge Crane	1	8.67	9.97	35.51	67.0	None	None	20.0	10.0	0.0
Step01	Miscellaneous	1	80.0	100.0	100.0	125.0	None	None	20.0	10.0	0.0
Step Summary			376.0	439.0	342.0	489.0	None	None	20.0	10.0	10.0

Project Summary	Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
	kW	kVA	kW	kVA	kW	kVA	kW	kVA	
	376.5	439.0	342.0	489.4	342.0	489.4	0.0	0.0	10.0

***Note: Detailed Loads and Step Report available below**

Power Generation

Loads and Steps Detail Report

Project - North Potomac PS

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(110)
Voltage	: 277/480, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 150
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	: 10
Emissions	: EPA, stationary emergency application		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 376.5	**Max. Step kW**	: 342.0 In Step 1	**Cumulative Step kW**	: 342.0
Running kVA	: 439.0	**Max. Step kVA**	: 489.4 In Step 1	**Cumulative Step kVA**	: 489.4
Running PF	: 0.86	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 223.3	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 573.07				

Step1

Calculated Individual Generator Set Step Load Requirements

Running kW	: 376.0	**Starting kW**	: 342.0	**Cumulative Step kW**	: 342.0
Running kVA	: 439.0	**Starting kVA**	: 489.0	**Cumulative Step kVA**	: 489.0
Running Amps	: 529.0	**Starting Non-linear kVA**	: 37.0		
Running Non-linear kVA	: 223.0				
Alternator kW	: 573.07				
Voltage Distortion Limit for step	: 10				

Sewage Pump Three Phase Quantity : 3 In this Step

Category : Motor

Running kW	: 62.17	**Starting kW**	: 6.22	**Peak kW**	: None
Running kVA	: 69.08	**Starting kVA**	: 6.91	**Peak kVA**	: None
Running PF	: 0.9	**Starting PF**	: 0.9	**Cyclic**	: No
Running Amps	: 83.19	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Running NLL kVA	: 69.08				
Starting NLL kVA	: 6.91			**Voltage**	: 480
Alternator kW	: 124.34				

Shaft Hp	: 75.0	**Type**	: Variable Frequency Drive
Shaft kW	: 55.95	**Ramp Details**	: Slow
Rectifier Type	: 6 pulse	**THDI %**	: 26
Efficiency (%)	: 0.9	**THDV %**	: 10

Load Factor : 100.0

Screen and Compactor Three Phase Quantity : 1 In this Step

Category : Motor

Running kW	: 4.44	**Starting kW**	: 22.88	**Peak kW**	: None
Running kVA	: 5.22	**Starting kVA**	: 37.5	**Peak kVA**	: None
Running PF	: 0.85	**Starting PF**	: 0.61	**Cyclic**	: No
Running Amps	: 6.29	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 4.44			**Voltage**	: 480

Shaft Hp	: 5.0	**Method**	: Across the line
Shaft kW	: 3.73	**Low Inertia**	: No
Efficiency (%)	: 0.84	**LRkVA Factor**	: 7.5
Design	: Standard NEMA Design B,C or D	**LRkVA Code**	: J
Load Factor	: 100.0		

Exhaust Fans-VFD Three Phase Quantity : 2 In this Step

Category : Motor

Running kW	: 2.49	**Starting kW**	: 2.49	**Peak kW**	: None
Running kVA	: 2.77	**Starting kVA**	: 2.77	**Peak kVA**	: None
Running PF	: 0.9	**Starting PF**	: 0.9	**Cyclic**	: No
Running Amps	: 3.34	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Running NLL kVA	: 2.77				
Starting NLL kVA	: 2.77			**Voltage**	: 480
Alternator kW	: 4.98				

Shaft Hp	: 3.0	**Type**	: Variable Frequency Drive
Shaft kW	: 2.24	**Ramp Details**	: None
Rectifier Type	: 6 pulse	**THDI %**	: 26
Efficiency (%)	: 0.9	**THDV %**	: 10
Load Factor	: 100.0		

Exhaust Fans - FVNR Three Phase Quantity : 2 In this Step

Category : Motor

Running kW	: 1.89	**Starting kW**	: 13.3	**Peak kW**	: None
Running kVA	: 2.39	**Starting kVA**	: 19.0	**Peak kVA**	: None
Running PF	: 0.79	**Starting PF**	: 0.7	**Cyclic**	: No
Running Amps	: 2.88	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 1.89			**Voltage**	: 480

Shaft Hp	: 2.0	**Method**	: Across the line
Shaft kW	: 1.49	**Low Inertia**	: No
Efficiency (%)	: 0.79	**LRkVA Factor**	: 9.5
Design	: Standard NEMA Design B,C or D	**LRkVA Code**	: L
Load Factor	: 100.0		

Monorail Hoist Three Phase Quantity : 1 In this Step

Category : Motor

Running kW	: 4.44	**Starting kW**	: 22.88	**Peak kW**	: None
Running kVA	: 5.22	**Starting kVA**	: 37.5	**Peak kVA**	: None

Running PF	: 0.85	**Starting PF**	: 0.61	**Cyclic**	: No
Running Amps	: 6.29	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 4.44			**Voltage**	: 480

Shaft Hp	: 5.0	**Method**	: Across the line
Shaft kW	: 3.73	**Low Inertia**	: No
Efficiency (%)	: 0.84	**LRkVA Factor**	: 7.5
Design	: Standard NEMA Design B,C or D	**LRkVA Code**	: J
Load Factor	: 100.0		

Lighting Three Phase Quantity : 1 In this Step

Category : Light - LED

Running kW	: 10.0	**Starting kW**	: 10.0	**Peak kW**	: None
Running kVA	: 10.53	**Starting kVA**	: 10.53	**Peak kVA**	: None
Running PF	: 0.95	**Starting PF**	: 0.95	**Cyclic**	: No
Running Amps	: 12.68	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Running NLL kVA	: 10.53				
Starting NLL kVA	: 10.53			**Voltage**	: 480
Alternator kW	: 15.09				

Receptacles Three Phase Quantity : 1 In this Step

Category : General Receptacle

Running kW	: 5.0	**Starting kW**	: 5.0	**Peak kW**	: None
Running kVA	: 5.56	**Starting kVA**	: 5.56	**Peak kVA**	: None
Running PF	: 0.9	**Starting PF**	: 0.9	**Cyclic**	: No
Running Amps	: 6.69	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 5.0			**Voltage**	: 480

Odor Control Blower Three Phase Quantity : 1 In this Step

Category : Motor

Running kW	: 8.67	**Starting kW**	: 35.51	**Peak kW**	: None
Running kVA	: 9.97	**Starting kVA**	: 67.0	**Peak kVA**	: None
Running PF	: 0.87	**Starting PF**	: 0.53	**Cyclic**	: No
Running Amps	: 12.01	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 8.67			**Voltage**	: 480

Shaft Hp	: 10.0	**Method**	: Across the line
Shaft kW	: 7.46	**Low Inertia**	: No
Efficiency (%)	: 0.86	**LRkVA Factor**	: 6.7
Design	: Standard NEMA Design B,C or D	**LRkVA Code**	: H
Load Factor	: 100.0		

Unit Heater Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 40.0	**Starting kW**	: 40.0	**Peak kW**	: None
Running kVA	: 50.0	**Starting kVA**	: 50.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 60.21	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0

Alternator kW	: 40.0			**Voltage**	: 480

Electric Water heater Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 20.0	**Starting kW**	: 20.0	**Peak kW**	: None
Running kVA	: 25.0	**Starting kVA**	: 25.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 30.11	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 20.0			**Voltage**	: 480

Bridge Crane Three Phase Quantity : 1 In this Step

Category : Motor

Running kW	: 8.67	**Starting kW**	: 35.51	**Peak kW**	: None
Running kVA	: 9.97	**Starting kVA**	: 67.0	**Peak kVA**	: None
Running PF	: 0.87	**Starting PF**	: 0.53	**Cyclic**	: No
Running Amps	: 12.01	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 8.67			**Voltage**	: 480

Shaft Hp	: 10.0	**Method**	: Across the line
Shaft kW	: 7.46	**Low Inertia**	: No
Efficiency (%)	: 0.86	**LRkVA Factor**	: 6.7
Design	: Standard NEMA Design B,C or D	**LRkVA Code**	: H
Load Factor	: 100.0		

Miscellaneous Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 80.0	**Starting kW**	: 100.0	**Peak kW**	: None
Running kVA	: 100.0	**Starting kVA**	: 125.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 120.42	**Max. % Voltage Dip**	: 20.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 80.0			**Voltage**	: 480

Power Generation

Steps and Dips Details Report

Project - North Potomac PS

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(110)
Voltage	: 277/480, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 150
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	: 10
Emissions	: EPA, stationary emergency application		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 376.5	**Max. Step kW**	: 342.0 In Step 1	**Cumulative Step kW**	: 342.0
Running kVA	: 439.0	**Max. Step kVA**	: 489.4 In Step 1	**Cumulative Step kVA**	: 489.4
Running PF	: 0.86	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 223.3	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 573.07				

Generator Set Configuration

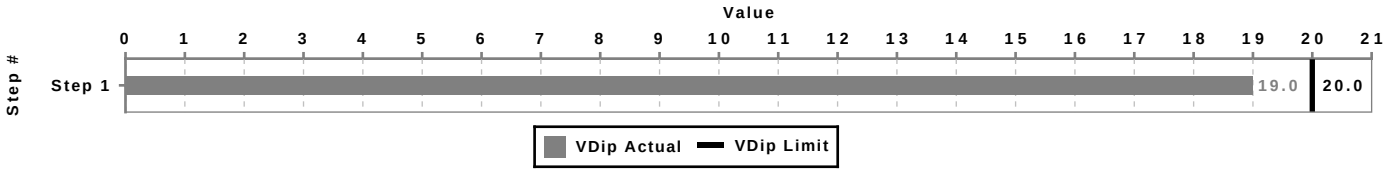
Model	: 450DFEJ*	**Alternator**	: HC5C
Engine Model	: QSX15-G9 Nonroad 2	**Excitation**	: PMG
Fuel	: Diesel		high ambient

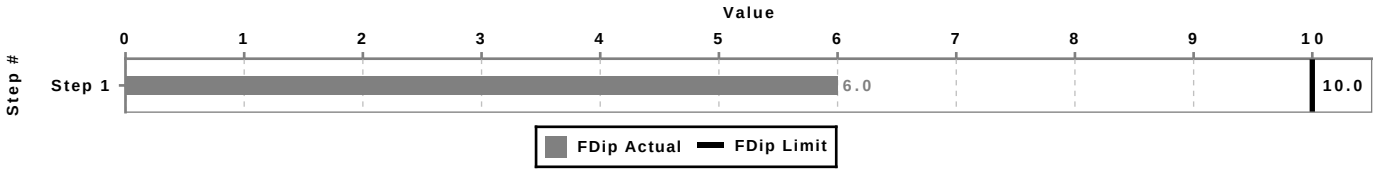
Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1	20	19	3.7	10	6	2.6

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

**Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.


Value
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Step #
Step 1
19.0
20.0
VDip Actual
VDip Limit


Value
0 1 2 3 4 5 6 7 8 9 10
Step #
Step 1
6.0
10.0
FDip Actual
FDip Limit

APPENDIX B
Cut Sheets

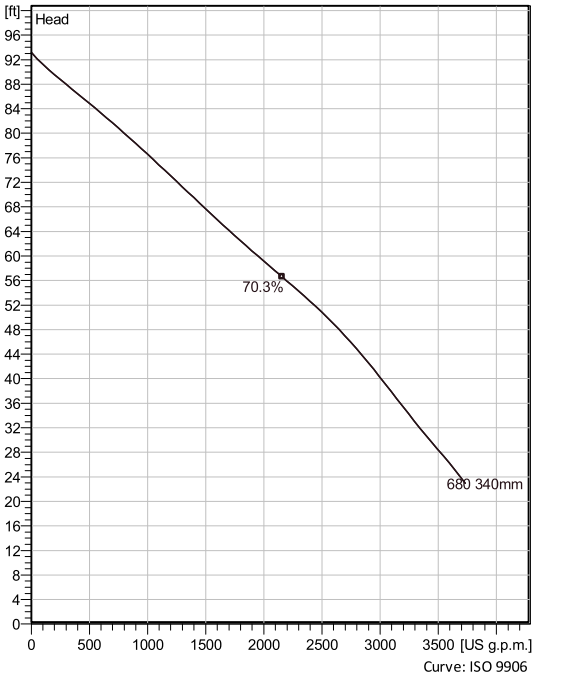
1. Pumps – Flygt NT 3231
2. Screens – SUEZ Climber Screen
3. Compactor – SUEZ Helico Compactor
4. Generator – Cummins 400 KW

NT 3231/665 3~ 680

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
N0665.000 35-45-6AA-D 140hp

Installation type
T - Vertical Permanent, Dry

Impeller diameter
340 mm

Discharge diameter
7 7/8 inch

Pump information

Impeller diameter
340 mm

Discharge diameter
7 7/8 inch

Inlet diameter
250 mm

Maximum operating speed
1185 rpm

Number of blades
3

Materials

Impeller
Hard-Iron ™

Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

Technical specification

Motor - General

Motor number N0665.000 35-45-6AA-D 140hp	**Phases** 3~	**Rated speed** 1185 rpm	**Rated power** 140 hp
Approval No	**Number of poles** 6	**Rated current** 179 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1

Motor - Technical

Power factor - 1/1 Load 0.79	**Motor efficiency - 1/1 Load** 92.5 %	**Total moment of inertia** 45.9 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.73	**Motor efficiency - 3/4 Load** 93.0 %	**Starting current, direct starting** 1200 A	
Power factor - 1/2 Load 0.62	**Motor efficiency - 1/2 Load** 92.5 %	**Starting current, star-delta** 399 A	

Project		**Created by**		**Last update**
Block	0	**Created on**	2/25/2020	

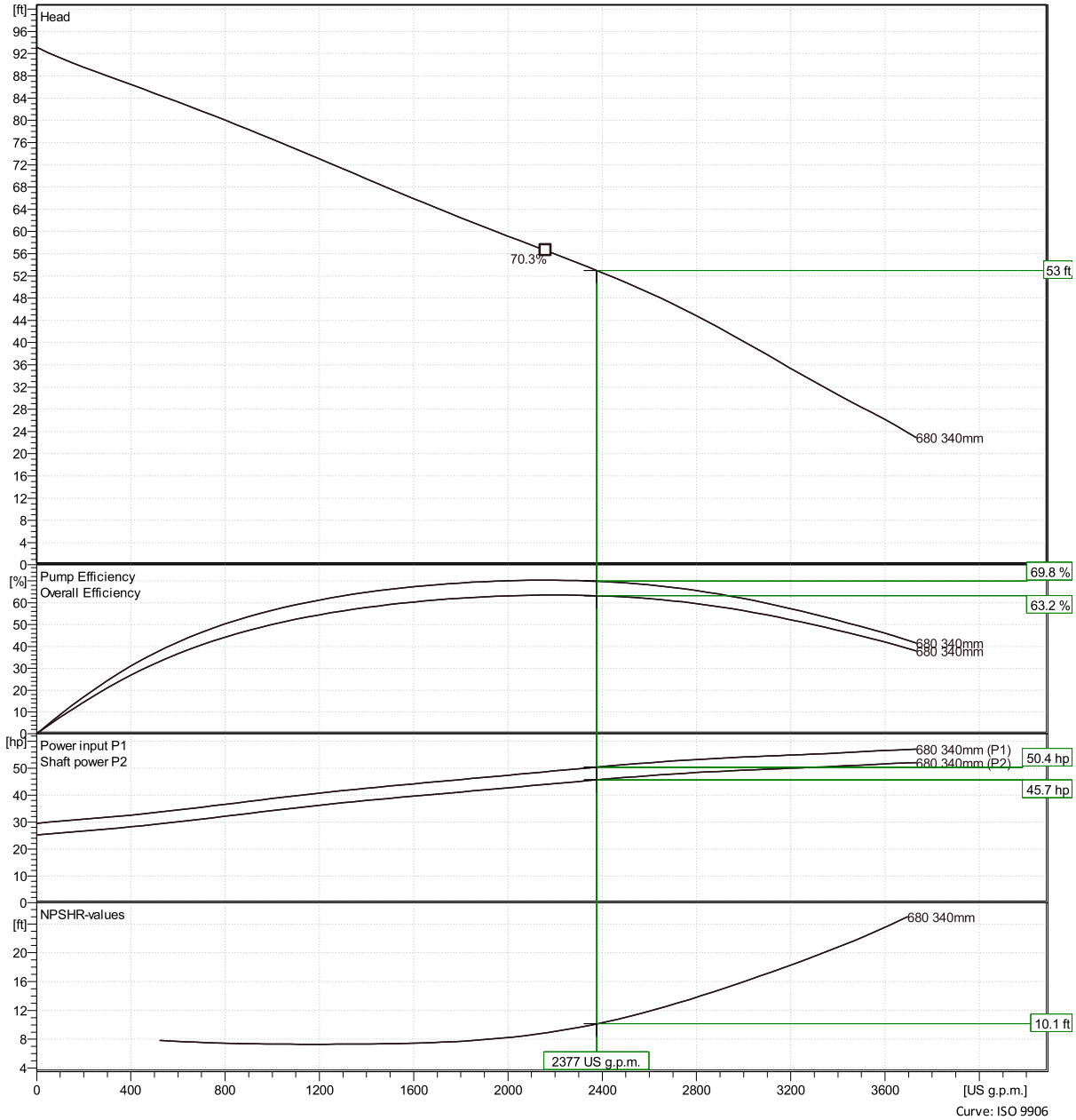
NT 3231/665 3~ 680

Performance curve

Duty point

Flow	Head
2380 US g.p.m.	53 ft

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



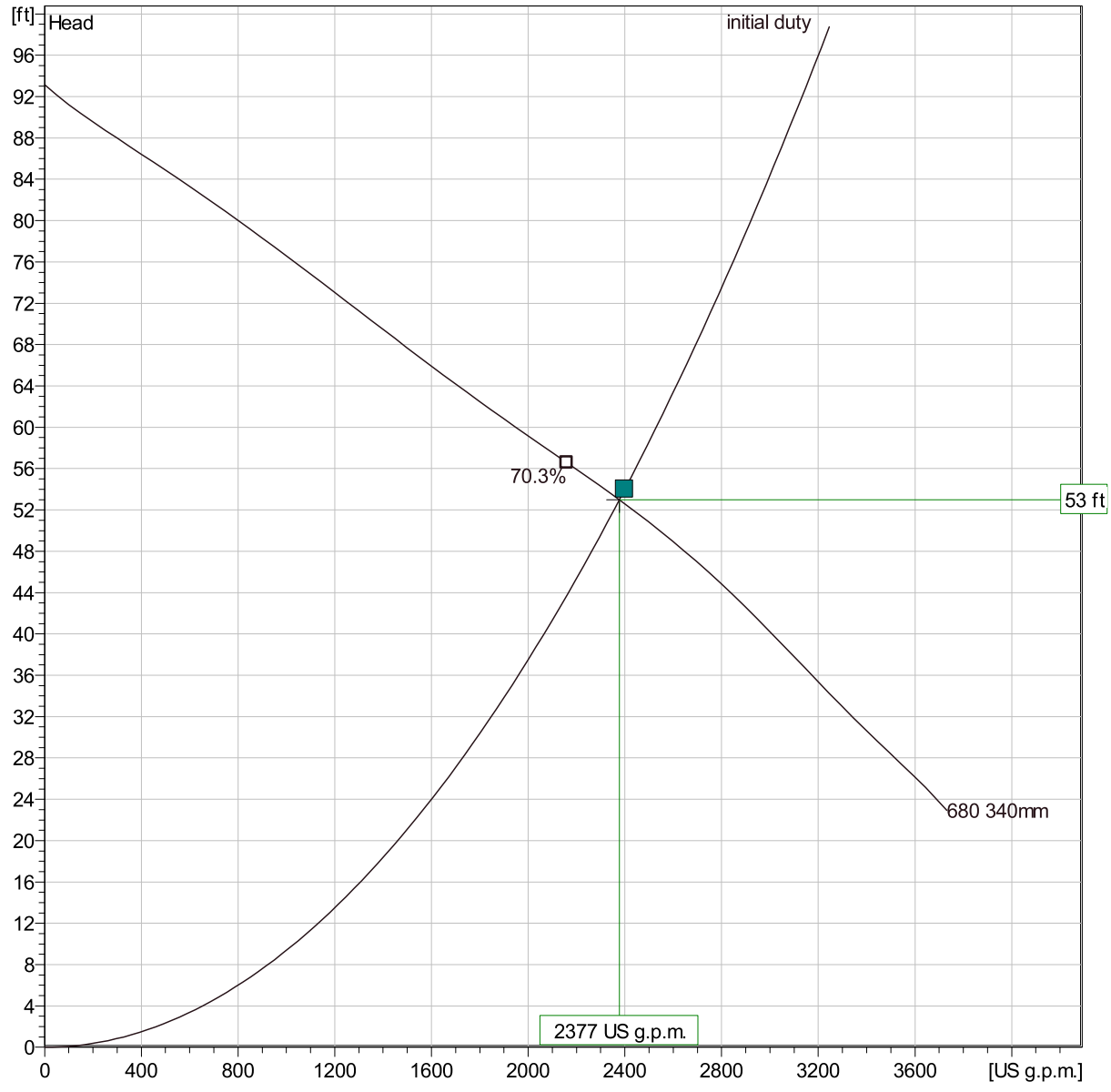
Curve: ISO 9906

Project		Created by		Last update
Block	0	Created on	2/25/2020	

NT 3231/665 3~ 680

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Operating characteristics

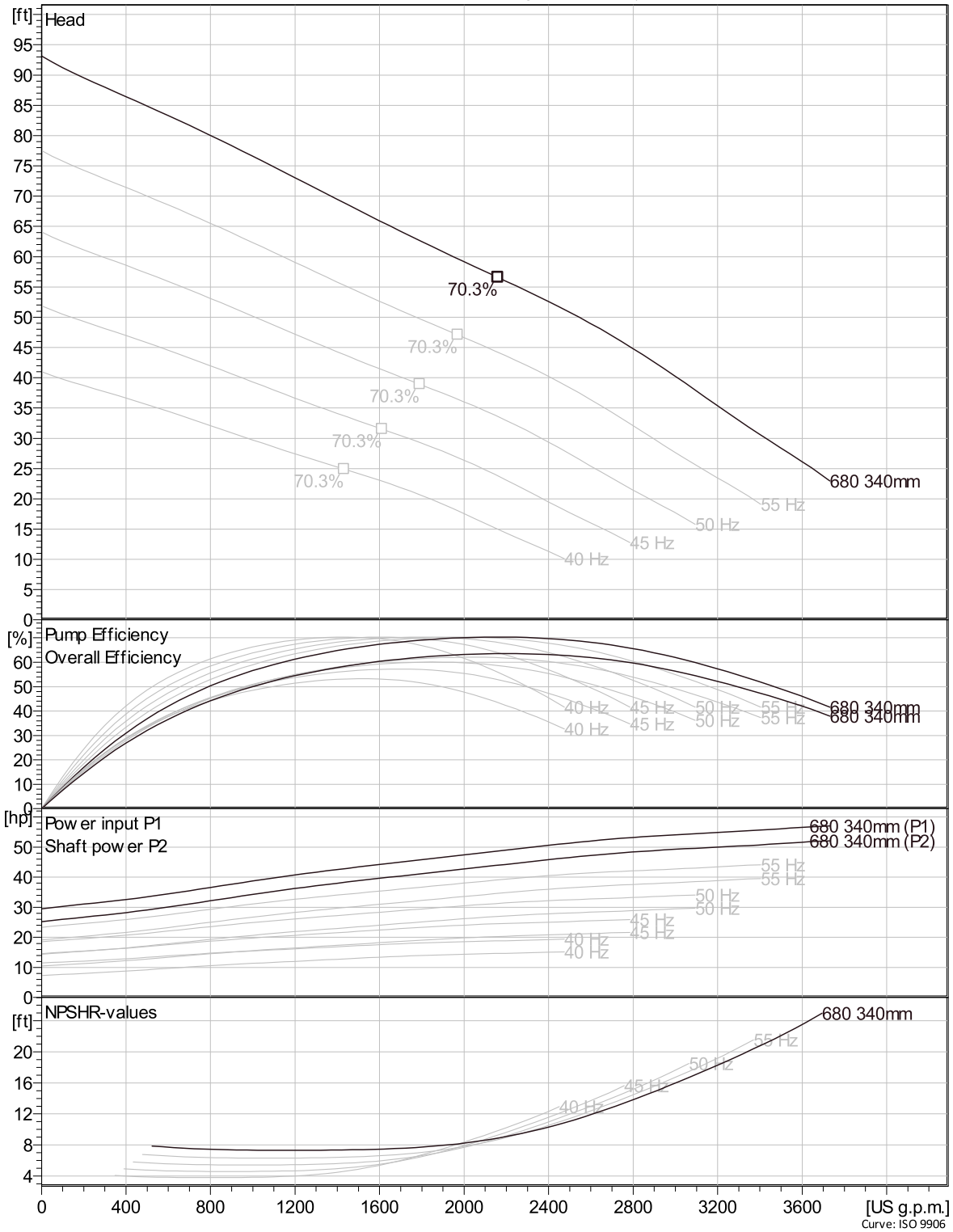
Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
initial duty	2380 US g.p.m.	53 ft	45.7 hp	2380 US g.p.m.	53 ft	45.7 hp	69.8 %	264 kWh/US M(	10.1 ft

Project		**Created by**		**Last update**	
Block	0	**Created on**	2/25/2020		

NT 3231/665 3~ 680

VFD Curve

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

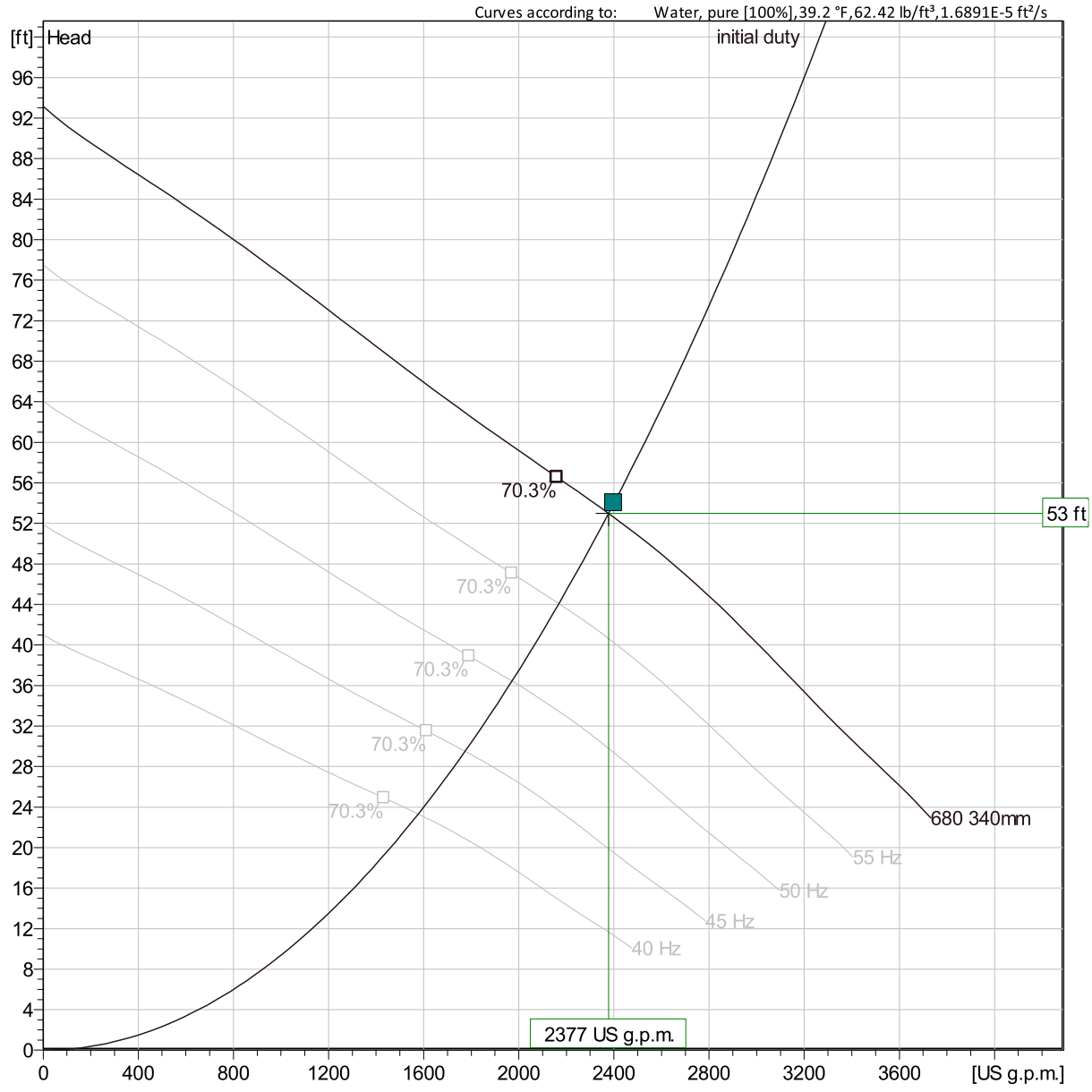


Curve: ISO 9906

Project		**Created by**		**Last update**	
Block	0	**Created on**	2/25/2020		

NT 3231/665 3~ 680

VFD Analysis



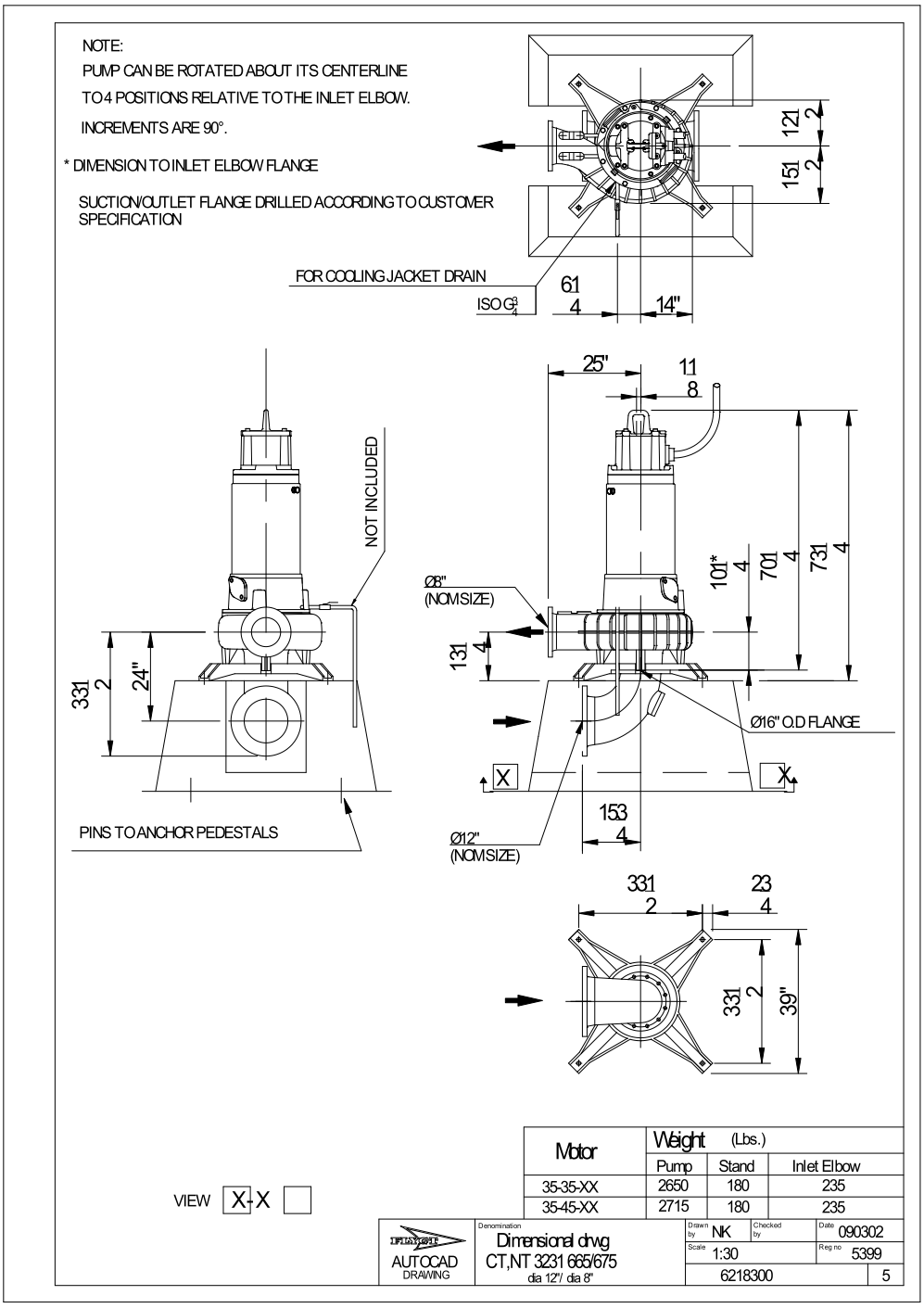
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
initial duty	60 Hz	2380 US g.p.m	53 ft	45.7 hp	2380 US g.p.m	53 ft	45.7 hp	69.8 %	264 kWh/US M	10.1 ft
initial duty	55 Hz	2170 US g.p.m	44.3 ft	34.9 hp	2170 US g.p.m	44.3 ft	34.9 hp	69.8 %	225 kWh/US M	8.78 ft
initial duty	50 Hz	1980 US g.p.m	36.6 ft	26.2 hp	1980 US g.p.m	36.6 ft	26.2 hp	69.8 %	192 kWh/US M	7.54 ft

Project		**Created by**		**Last update**	
Block	0	**Created on**	2/25/2020		

NT 3231/665 3~ 680

Dimensional Drawing



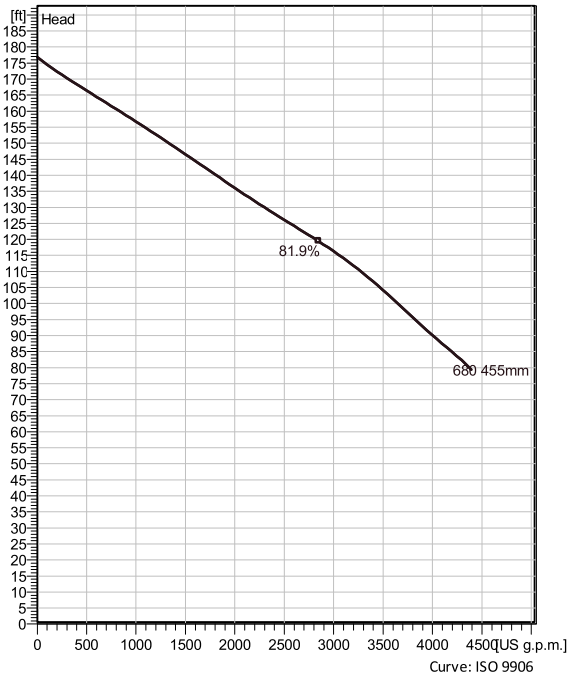
Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.43 lb/ft³,1.6888E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N0665.000 35-45-6AA-D 140hp

Installation type
T - Vertical Permanent, Dry

Impeller diameter
455 mm

Discharge diameter
7 7/8 inch

Pump information

Impeller diameter
455 mm

Discharge diameter
7 7/8 inch

Inlet diameter
250 mm

Maximum operating speed
1185 rpm

Number of blades
3

Materials

Impeller
Hard-Iron ™

Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

Technical specification

Motor - General

Motor number N0665.000 35-45-6AA-D 140hp	**Phases** 3~	**Rated speed** 1185 rpm	**Rated power** 140 hp
Approval No	**Number of poles** 6	**Rated current** 179 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1

Motor - Technical

Power factor - 1/1 Load 0.79	**Motor efficiency - 1/1 Load** 92.5 %	**Total moment of inertia** 50.4 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.73	**Motor efficiency - 3/4 Load** 93.0 %	**Starting current, direct starting** 1200 A	
Power factor - 1/2 Load 0.62	**Motor efficiency - 1/2 Load** 92.5 %	**Starting current, star-delta** 399 A	

Project		**Created by**		**Last update**
Block	0	**Created on**	2/25/2020	

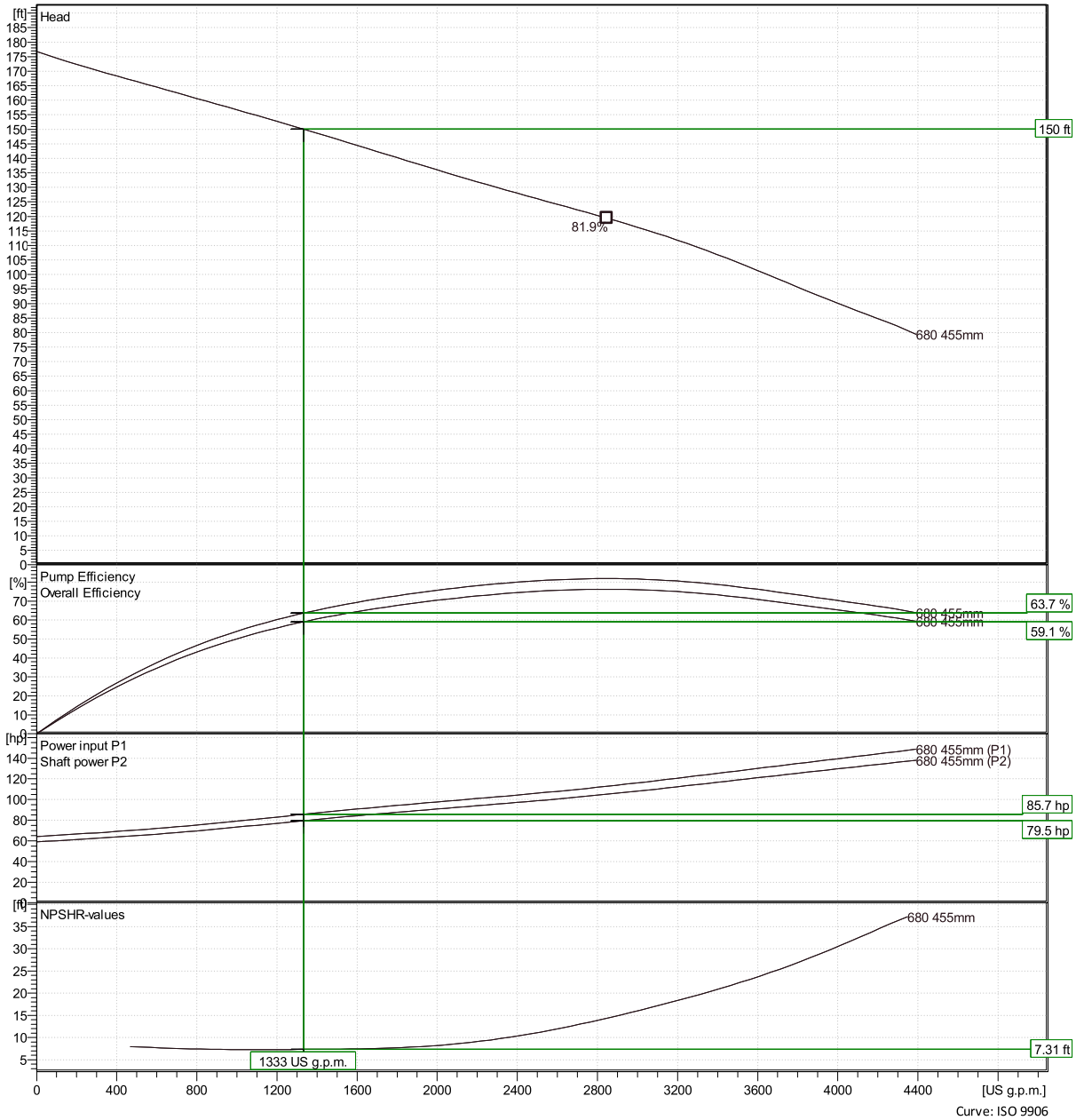
NT 3231/665 3~ 680

Performance curve

Duty point

Flow	Head
1330 US g.p.m.	150 ft

Curves according to: Water, pure [100%],39.2 °F,62.43 lb/ft³,1.6888E-5 ft²/s



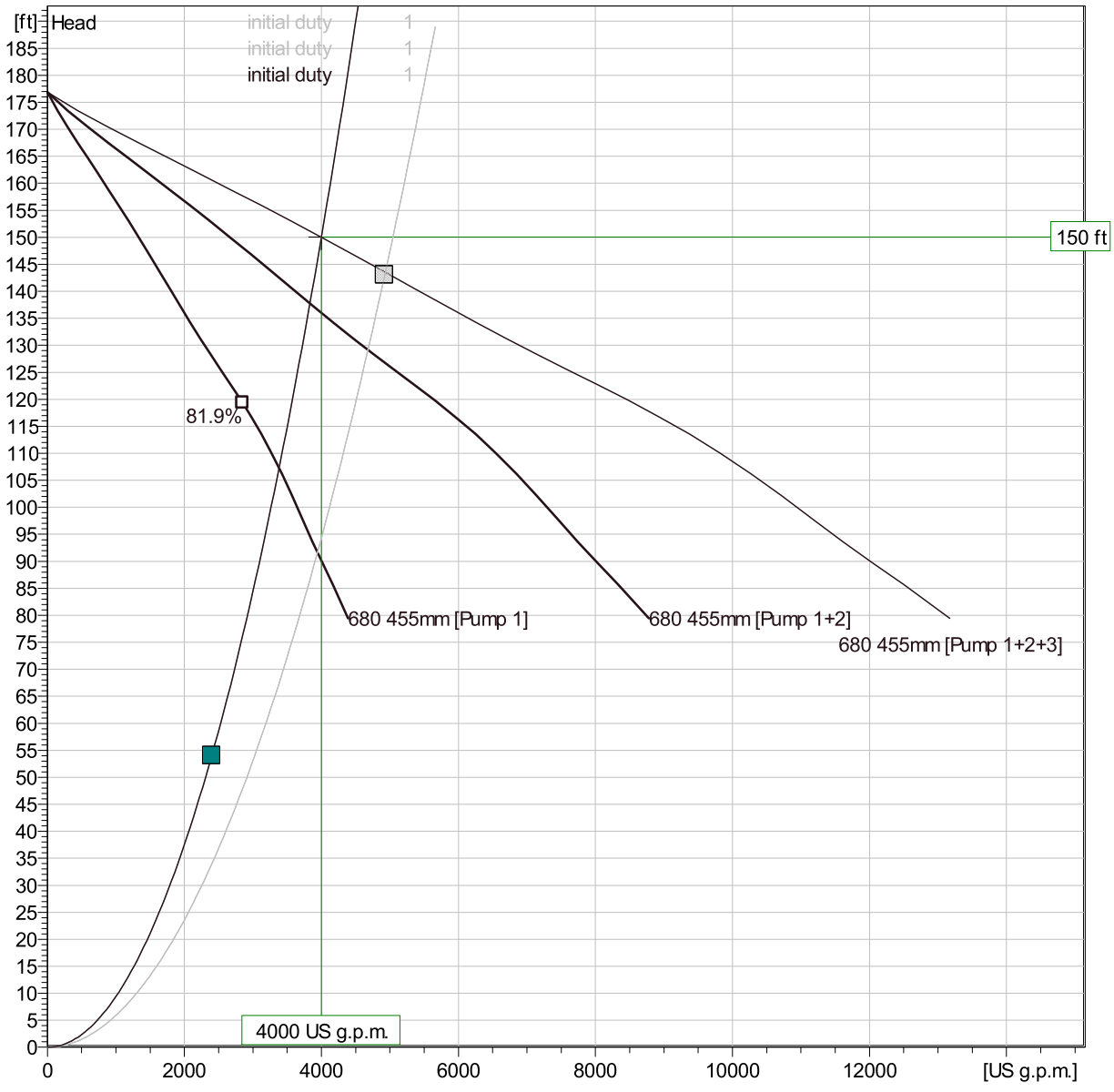
Curve: ISO 9906

Project		Created by		Last update
Block	0	Created on	2/25/2020	

NT 3231/665 3~ 680

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.43 lb/ft³,1.6888E-5 ft²/s



Curve: ISO 9906

Operating characteristics

Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1 / initial ...	3380 US g.p.m.	107 ft	116 hp	3380 US g.p.m.	107 ft	116 hp	78.9 %	459 kWh/US M(	20.6 ft
3 / 1	1640 US g.p.m.	144 ft	85.1 hp	4930 US g.p.m.	144 ft	255 hp	70.2 %	692 kWh/US M(	7.47 ft
2 / 1	2340 US g.p.m.	129 ft	96.2 hp	4680 US g.p.m.	129 ft	192 hp	79.5 %	549 kWh/US M(	9.91 ft
1 / 1	3940 US g.p.m.	91.6 ft	128 hp	3940 US g.p.m.	91.6 ft	128 hp	71.2 %	435 kWh/US M(	29.4 ft

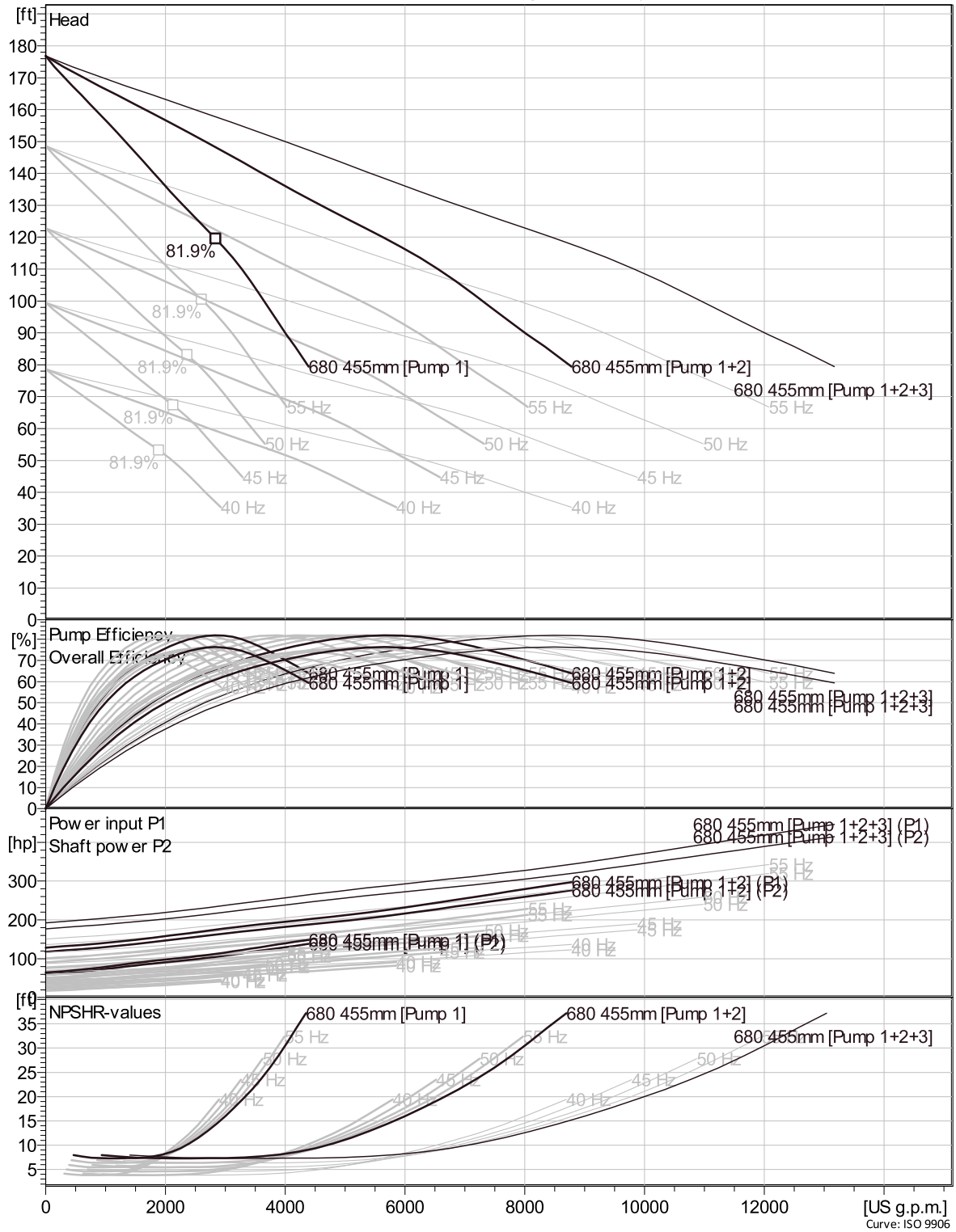
Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure [100%],39.2 °F,62.43 lb/ft³,1.6888E-5 ft²/s

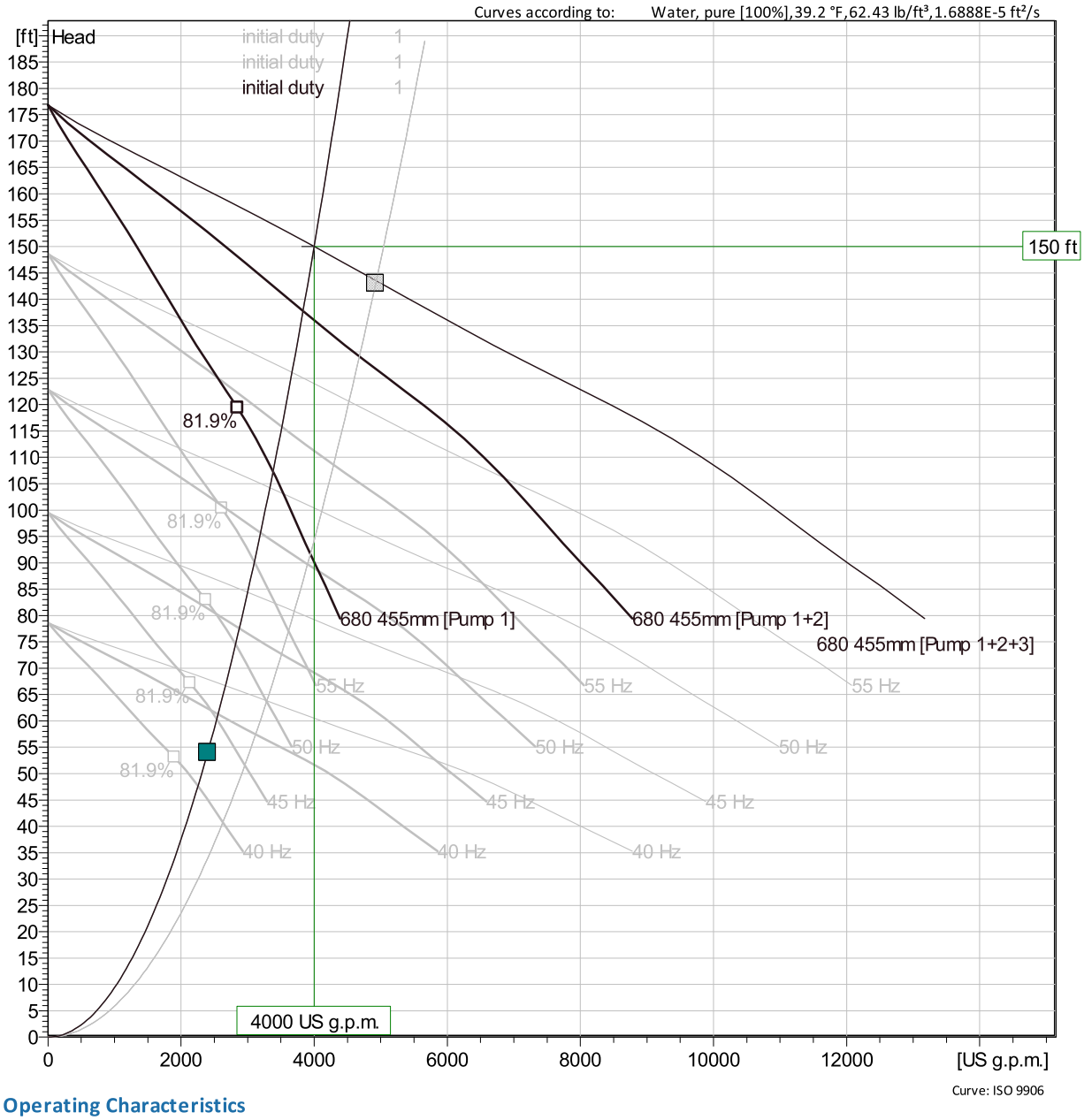


Curve: ISO 9906

Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

VFD Analysis



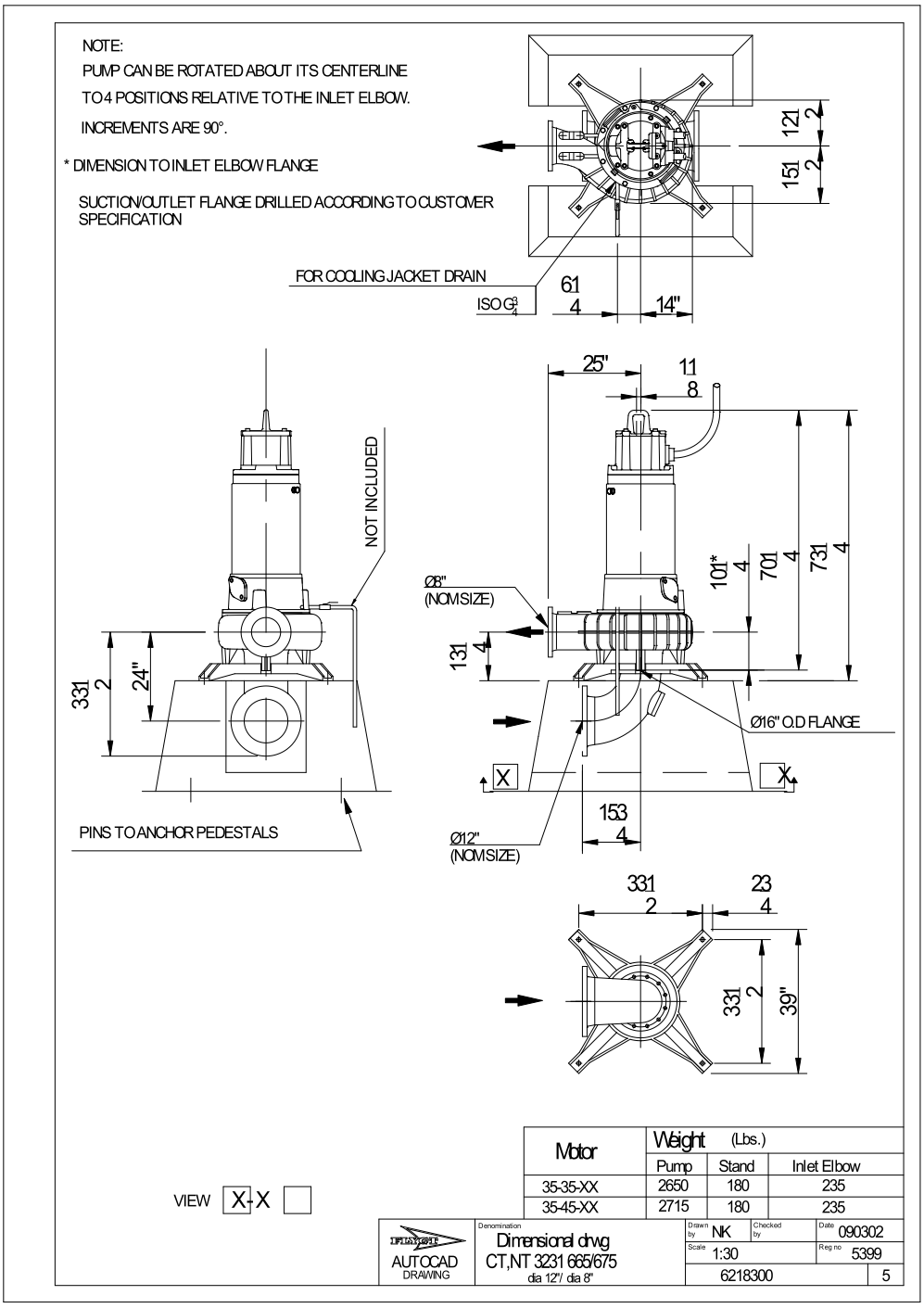
Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1 / initial ...	60 Hz	3380 US g.p.m	107 ft	116 hp	3380 US g.p.m	107 ft	116 hp	78.9 %	459 kWh/US M	20.6 ft
1 / initial ...	55 Hz	3110 US g.p.m	90.8 ft	90.6 hp	3110 US g.p.m	90.8 ft	90.6 hp	78.9 %	389 kWh/US M	18.1 ft
1 / initial ...	50 Hz	2830 US g.p.m	75.1 ft	68.1 hp	2830 US g.p.m	75.1 ft	68.1 hp	78.9 %	324 kWh/US M	15.5 ft

Project		**Created by**	**Last update**
Block	0	**Created on**	2/25/2020

NT 3231/665 3~ 680

Dimensional Drawing



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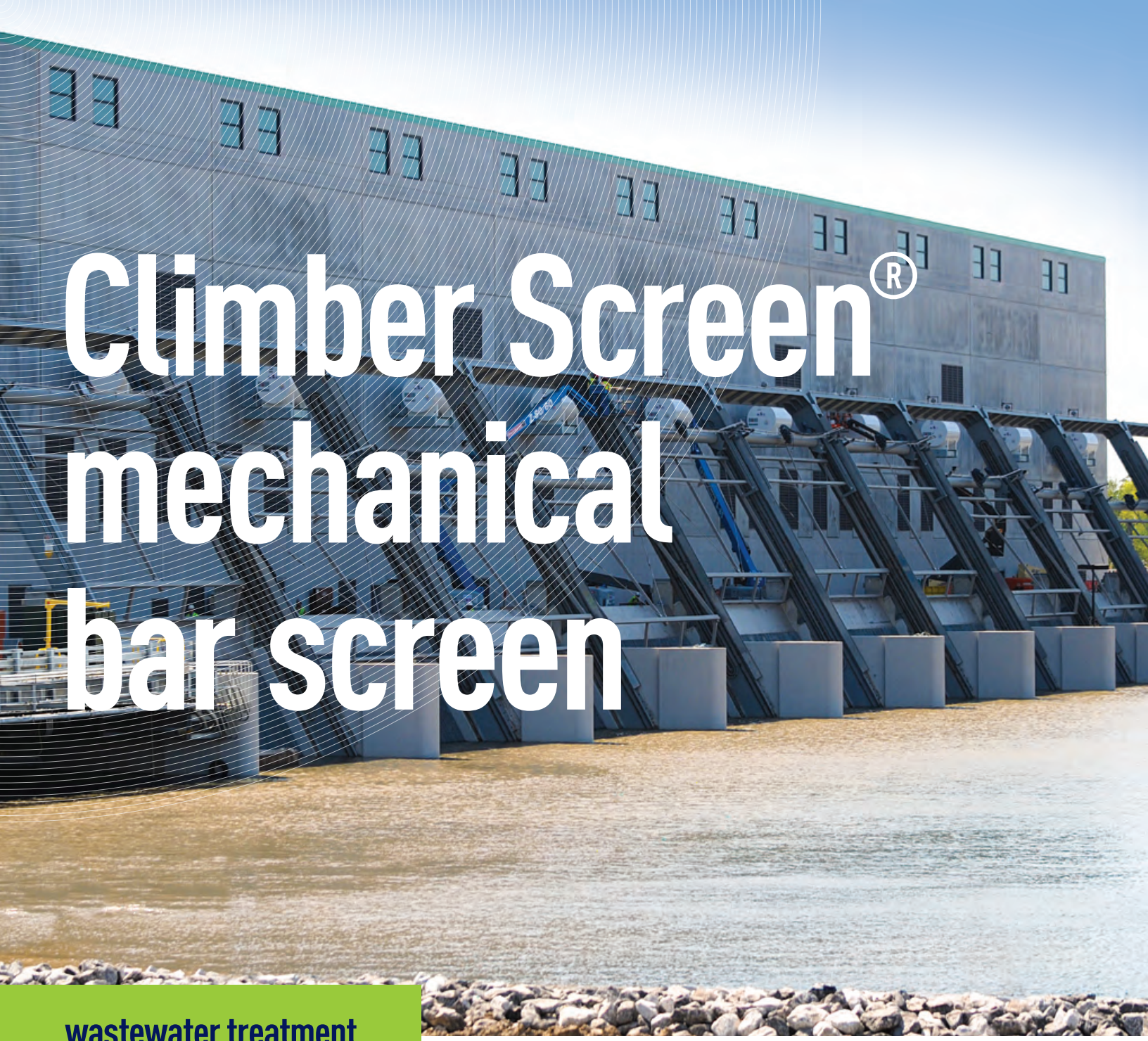
Block	0	**Created on**	2/25/2020



Climber Screen® mechanical bar screen

wastewater treatment

Invest in the leader: Maximize screenings capture, minimize problems. Climber Screen® reduces costs and complications for pump stations and wastewater treatment plants by removing channel debris before it can damage downstream equipment.

The Climber Screen® was developed to provide a low maintenance solution to previous screening technologies, which used permanently submerged rotating parts such as sprockets and bearings. Engineered for years of severe duty service, Climber Screen® can tackle large obstructions with ease. The rake simply disengages from the bar rack to clear the object until it can be removed on a subsequent pass.

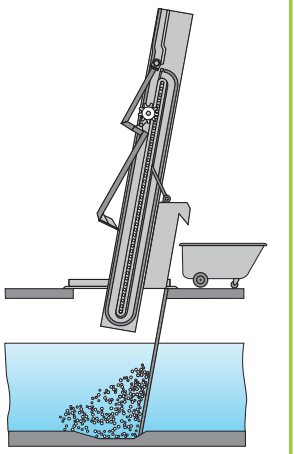
ready for the resource revolution

suez

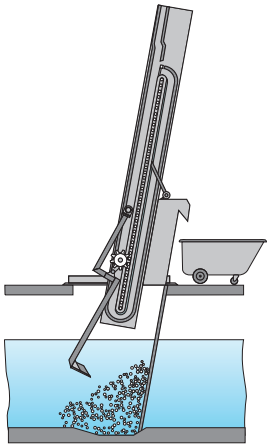
how it works

The smooth running, endless track system employs a gear-driven cleaning rake to carry screenings from the submerged bar rack to a discharge chute for removal – without the use of chains, sprockets, cables or any underwater moving parts. An object too large for the rake to clear will activate an alarm to reverse the unit, facilitating access for manual removal.

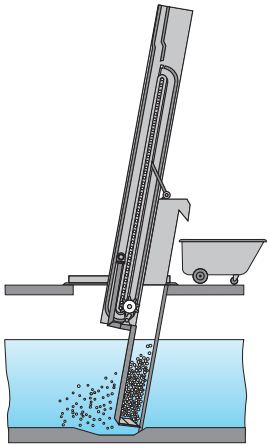
1 Cogwheels move the rake arm down the pin rack upon activation.



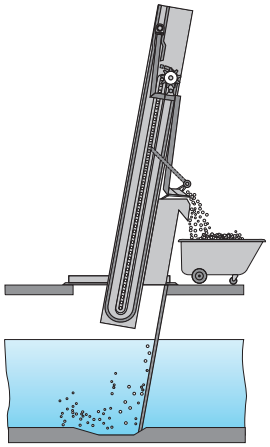
2 The rake arm enters the channel upstream from the screen.

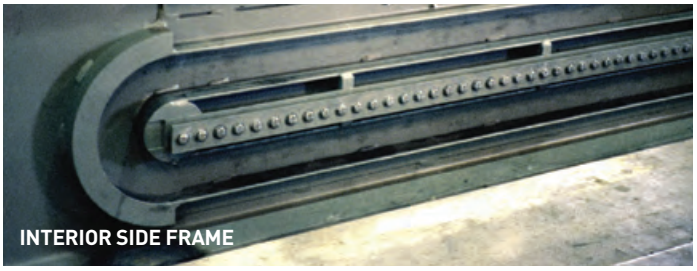


3 At the bottom of the pin rack, the rake engages the screen.



4 Cogwheels walk the rake arm up the pin rack, transporting screenings for removal.





INTERIOR SIDE FRAME

main features

- above water operation
- no submerged moving parts
- flexible design
- heavy duty design
- wide range of opening sizes
- positive screening discharge
- machined parts

applications

- WWTP headworks: protect downstream equipment
- pumping stations: flood control
- water intake: remove large debris
- ideal for both municipal and industrial use

features

- precision engineering
- low maintenance
- easy installation
- decades of proven performance
- machined parts
- experienced product team
- hydraulic drive option
- sanitary or cso models

typical 60 mgd Climber Screen®

typical 120 mgd Climber Screen®

storm drainage pump station

typical 30 mgd Climber Screen®

standard duty

model	application range		max. water level	available bar rack spacing
	channel width	flow type		
MODEL I	1' 6"-3' 0"	sanitary	8' 6" (without special construction or submergence protection)	1/4" to 6"
MODEL II	3' 1"-5' 6"	sanitary		
MODEL IIA	5' 4"-6' 6"	sanitary		
MODEL IIIA	6' 7"-12' 0"	sanitary		

severe duty

model	application range		max. water level	available bar rack spacing
	channel width	flow type		
MODEL IIS	3' 6" - 7' 0"	combined	recommended max. not to exceed 2 times the channel width	1/4" to 6"
MODEL IIIAS	7' 4" - 12' 0"	combined		
MODEL IIIBS	12' 0" - 16' 0"	combined * flood control & storm drainage		
MODEL IVS	16' 0" - 30' 0"	combined * flood control & storm drainage		

(*) flood control maximum through velocity: 2.25 fps

technical data

MECHANICAL ADVANTAGES

- positive screenings discharge – hinged wiper assembly with smooth cushion return.
- precision engineering – machine components and removal of loose tolerance components such as chains and sprockets.
- above water operation – all moving parts remain above maximum water level during operation.
- flexible design – custom manufactured units for retrofit or new designs to suit nearly any size application.
- easy to install, control and maintain – shipped in as few parts as possible, automatic control, integral brake motor to stop the unit at any level to maintain from the easiest access point.

TECHNICAL FEATURES

- flow rates ..... 1.5 to 300 MGD
- machine widths ..... 18" to 30'-0"
- machine depths ..... up to 90'-0"
- bar clear openings ..... ¼" to 6"
- rake speed ..... 20, 30 and 40 fpm

general requirements

minimum approach velocity	maximum* through velocity	desired upstream channel length	minimum upstream channel length
1.5 fps	5.0 fps	4 x channel width	2 x channel width

(*) flood control maximum through velocity: 2.25 fps

A RELIABLE INVESTMENT WITH YEARS OF RETURN

- Maximizing screenings capture reduces downstream equipment loading, thus lasting longer and with fewer mechanical problems.
- The Climber Screen® consists of a smooth, vibration-free bilateral, endless pin rack system. The roller and bushing system is designed specifically for this linear track application.
- The Climber Screen® unit is engineered to last and to be virtually maintenance-free. Finely-tuned components such as the pin racks, bearing design, and close tolerance cam tracking pay for themselves in longevity and reduced maintenance costs.

suez

Climber Screen®

mechanical bar screen

precision design and fabricating

With state-of-the-art engineering tools and a trained staff available, Infilco can offer detailed solid modeling for ease of installation into existing structures as well as complete new designs.

options

fiberglass odor enclosure

patented submersible motor enclosure

hydraulic drive system

services

Aftermarket

SUEZ in North America sells parts and components for most SUEZ brand equipment as well as parts for demineralizers, thickeners, nozzles, pressure filters, and valves. We offer reliable spare parts at competitive prices. We maintain records of previous installations to quickly identify your requirements. Many items are shipped directly from stock for quick delivery.

Rebuilds, Retrofits and Upgrades

SUEZ in North America offers cost-effective rebuilds and upgrades for SUEZ provided systems, no matter what year they were built. If you are interested in an economical alternative to installing a whole new system, contact us for a proposal.

If interested in this product, check out some of our complementary products:

- **ABW® Automatic Backwash Filter**
- **AquaDAF® Clarifier**
- **Cleargreen®**
- **Densadeg® Clarifier/Thickener**
- **Ferazur®/Mangazur®**
- **Meteor® IFAS/MBBR**
- **Ultragreen™**
- **Climber Screen®**
- **Vortex®**
- **Cannon® Mixer**
- **2PAD**
- **Thermylis® HTFB**

contact

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042016

Helico™ screenings washer & compactor

wastewater treatment

- **EFFICIENCY**
  - screenings are more easily transported to the landfill or incinerated
- **COST SAVINGS**
  - reduce maintenance and handling costs related to screenings

reliable screenings removal for optimum wastewater treatment plant performance

ready for the resource revolution

suez

Helico™ — the natural complement to the Climber Screen® and all mechanically cleaned bar screens.

Multiple sizes of models available to suit the need of any application.

MODEL 200

8" Diameter Auger (nominal)
Auger helical flight thickness: 1/2"
Screenings Capacity:

- Nominal Minimum: 25-33 cubic ft/hr
- Nominal Max: 100 cubic ft/hr

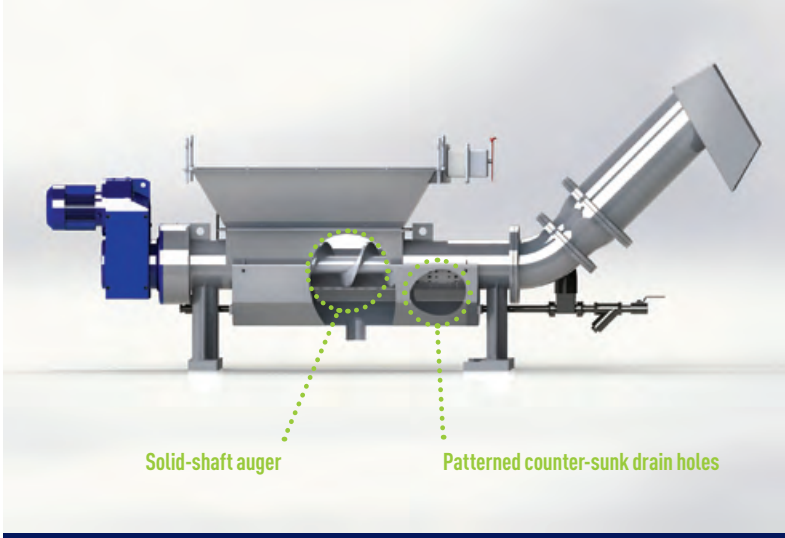
MODEL 300

12" Diameter Auger (nominal)
Auger helical flight thickness: 5/8"
Screenings Capacity:

- Nominal Minimum: 50-75 cubic ft/hr
- Nominal Max: 150 cubic ft/hr

Dual Hopper units available for both Models 200 & 300.
Dual Hopper units are the optimal solution for plants with multiple screen units in close proximity to one another, utilizing a single efficient 2 hp motor, press-tube, auger and discharge location for multiple hopper inlets.

Screenings Wash Header attachments are available for aiding in the removal of biological matter from debris and odor reduction of dewatered screenings.



KEY FIGURE:
screenings volume reduction up to
75%

advantages

- finished moisture content of less than 55%
- 65-85% weight reduction of screenings
- volume reduction of 70-75%
- rate of feed can vary without effect on operation or performance
- robust and durable construction
- single & dual hopper configurations
- automatic startup tied to bar screen functions with option for skip cycle counter operation.
- specially patterned counter-sunk drain hole configuration reduces clogging and congestion without the need of a brush or wiper attachment
- solid shaft of hardened steel and thick auger flights provides robust and long-lasting operation
- available with either victaulic or flanged schedule 40 piping connections

contact

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042016

Specification sheet

Diesel generator set QSX15 series engine

450 kW – 500 kW Standby

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications.

Features

Cummins heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Permanent Magnet Generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

Fuel tanks - Dual wall sub-base fuel tanks are also available.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating	Prime rating	Continuous rating	Data sheets
Model	60 Hz kW (kVA)	60 Hz kW (kVA)	60 Hz kW (kVA)	60 Hz
DFEJ	450 (563)	410 (513)		D-3400
DFEK	500 (625)	455 (569)		D-3401

Our energy working for you.™

Generator set specifications

Governor regulation class	ISO 8528 part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
EMS compatibility	IEC 61000-4-2: Level 4 Electrostatic discharge IEC 61000-4-3: Level 3 Radiated susceptibility

Engine specifications

Design	Turbocharged with air-to-air charge air-cooling
Bore	136.9 mm (5.39 in.)
Stroke	168.9 mm (6.65 in.)
Displacement	14.9 L (912.0 in^3)
Cylinder block	Cast iron with replaceable wet liners, in-line 6 cylinder
Battery capacity	1400 Amps minimum at ambient temperature 0 ℃ (32 ℉)
Battery charging alternator	35 Amps
Starting voltage	24 volt, negative ground
Fuel system	Full authority electronic (FAE) Cummins HPI-TP
Fuel filter	
Air cleaner type	
Lube oil filter type(s)	Single spin-on combination full flow and bypass filters
Standard cooling system	40 ºC (104 ºF) ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip-proof revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible discs
Insulation system	Class H
Standard temperature rise	125 ℃ standby at 40 ℃ ambient
Exciter type	PMG (Permanent Magnet Generator)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 50% per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3%

Available voltages

60 Hz Line – Neutral/Line - Line

- 110/190
- 110/220
- 115/200
- 115/230
- 120/208
- 127/220
- 139/240
- 220/380
- 230/400
- 240/416
- 255/440
- 277/480
- 347/600

Note: Consult factory for other voltages.

Generator set options

Engine

- 208/240/480 V thermostatically controlled coolant heater for ambient above 4.5 ℃ (40℉)
- 208/240/480 V thermostatically controlled coolant heater for ambient below 4.5 ℃ (40℉)
- 120 V 300 W lube oil heater
- Heavy duty air cleaner with safety element

Alternator

- 80 ℃ rise
- 105 ℃ rise
- 150 ℃ rise
- 120/240 V 200 W anti-condensation heater

Exhaust system

- Critical grade exhaust silencer
- Exhaust packages
- Industrial grade exhaust silencer
- Residential grade exhaust silencer

Fuel system

- 1022 L (270 gal) sub-base tank
- 1136 L (300 gal) sub-base tank
- 1514 L (400 gal) sub-base tank
- 1893 L (500 gal) sub-base tank
- 2271 L (600 gal) sub-base tank
- 2498 L (660 gal) sub-base tank
- 3218 L (850 gal) sub-base tank
- 6435 L (1700 gal) sub-base tank
- 9558 L (2525 gal) sub-base tank

Cooling system

- High ambient 50 ℃ radiator

Control panel

- PC 3.3
- PC 3.3 with MLD
- 120/240 V 100 W control anti-condensation heater
- Ground fault indication
- Remote fault signal package
- Run relay package

Generator set

- AC entrance box
- Battery
- Battery charger
- Export box packaging
- UL 2200 Listed
- Main line circuit breaker
- Paralleling accessories
- Remote annunciator panel
- Spring isolators
- Enclosure: aluminium, steel, weather protective or sound attenuated
- 2 year standby power warranty
- 2 year prime power warranty
- 5 year basic power warranty
- 10 year major components warranty

*Note: Some options may not be available on all models - consult factory for availability.

Control system 2.3

The PowerCommand 2.3 control system - An integrated generator set control system providing voltage regulation, engine protection, generator protection, operator interface and isochronous governing (optional).

Control – Provides battery monitoring and testing features and smart-starting control system.

InPower™ – PC-based service tool available for detailed diagnostics.

PCCNet RS485 – Network interface (standard) to devices such as remote annunciator for NFPA 110 applications.

Control boards – Potted for environmental protection.

Ambient operation – Suitable for operation in ambient temperatures from -40 ℃ to +70 ℃ and altitudes to 13,000 feet (5000 meters). Prototype tested - UL, CSA and CE compliant.

AC protection

- AmpSentry protective relay
- Over current warning and shutdown
- Over and under voltage shutdown
- Over and under frequency shutdown
- Over excitation (loss of sensing) fault
- Field overload
- Overload warning
- Reverse kW shutdown
- Reverse Var shutdown
- Short circuit protection

Engine protection

- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- High, low and weak battery voltage warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown

Operator/display panel

- Manual off switch
- 128 x 128 Alpha-numeric display with push button access for viewing engine and alternator data and providing setup, controls and adjustments (English or international symbols)
- LED lamps indicating genset running, not in auto, common warning, common shutdown, manual run mode and remote start
- Suitable for operation in ambient temperatures from -20 ºC to +70 ºC

Alternator data

- Line-to-Neutral AC volts
- Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kVA, kW, power factor

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature

Control functions

- Time delay start and cool down
- Glow plug control (some models)
- Cycle cranking
- PCCNet interface
- (4) Configurable inputs
- (4) Configurable outputs
- Remote emergency stop
- Battle short mode
- Load shed
- Real time clock with exerciser
- Derate

Digital governing (optional)

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase Line-to-Line sensing
- Configurable torque matching
- Fault current regulation under single or three phase fault conditions

Other data

- Genset model data
- Start attempts, starts, running hours
- Fault history
- RS485 Modbus® interface
- Data logging and fault simulation (requires InPower service tool)
- Total kilowatt hours
- Load profile

Options

- Auxiliary output relays (2)
- 120/240 V, 100 W anti-condensation heater
- Remote annunciator with (3) configurable inputs and (4) configurable outputs
- PMG alternator excitation
- PowerCommand for Windows® remote monitoring software (direct connect)
- AC output analogue meters
- PowerCommand 2.3 and 3.3 control with AmpSentry protection

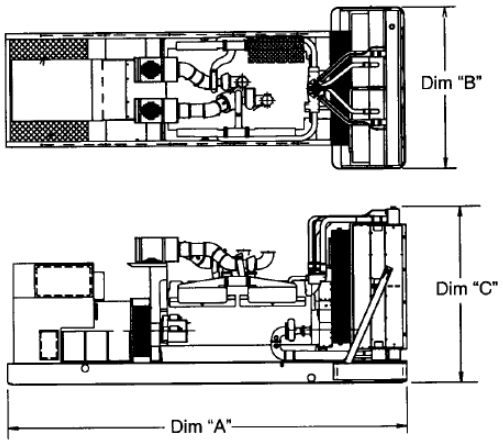
For further detail on PC 2.3 see document S-1569.
For further detail on PC 3.3 see document S-1570.

Emergency Standby Power (ESP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time running Power (LTP):
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime Power (PRP):
Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):
Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing if for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim 'A' mm (in.)	Dim 'B' mm (in.)	Dim 'C' mm (in.)	Set weight dry* kg (lbs)	Set weight wet* kg (lbs)
DFEJ	3864 (152.1)	1524 (60.0)	1812 (71.3)	4098 (9035)	4234 (9335)
DFEK	3864 (152.1)	1524 (60.0)	1812 (71.3)	4325 (9535)	4461 (9835)

*Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.		The generator set is available listed to UL 2200, Stationary Engine Generator Assemblies for all 60 Hz low voltage models. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.
	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.	**U.S EPA**	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards, 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
	All low voltage models are CSA certified to product class 4215-01.	**International Building Code**	The generator set package is available certified for seismic application in accordance with the following International Building Code: IBC2000, IBC2003, IBC2006, IBC2009 and IBC2012.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

S-1582 (08/17)

APPENDIX C
Influent Flow Calculations and Documentation

(To be provided later)