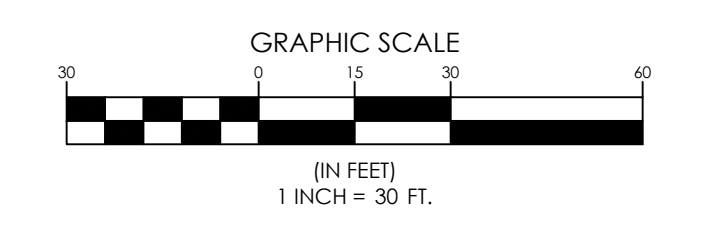


LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
	STORM DRAIN
	DRAINAGE MANHOLE
	CATCH BASIN
	CULVERT
	TRANSFORMER PAD
	LIGHT POLE
	UTILITY POLE
	GUY WIRE
	UNDERGROUND ELECTRIC
	OVERHEAD ELECTRIC
	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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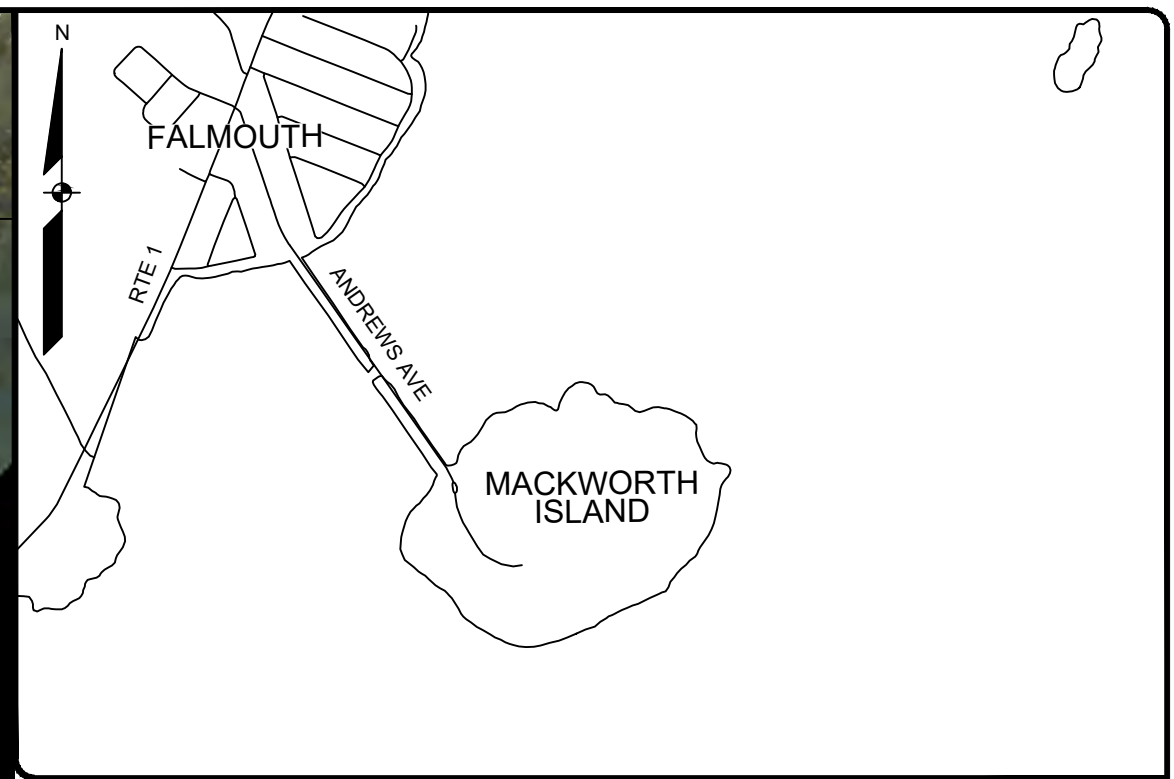
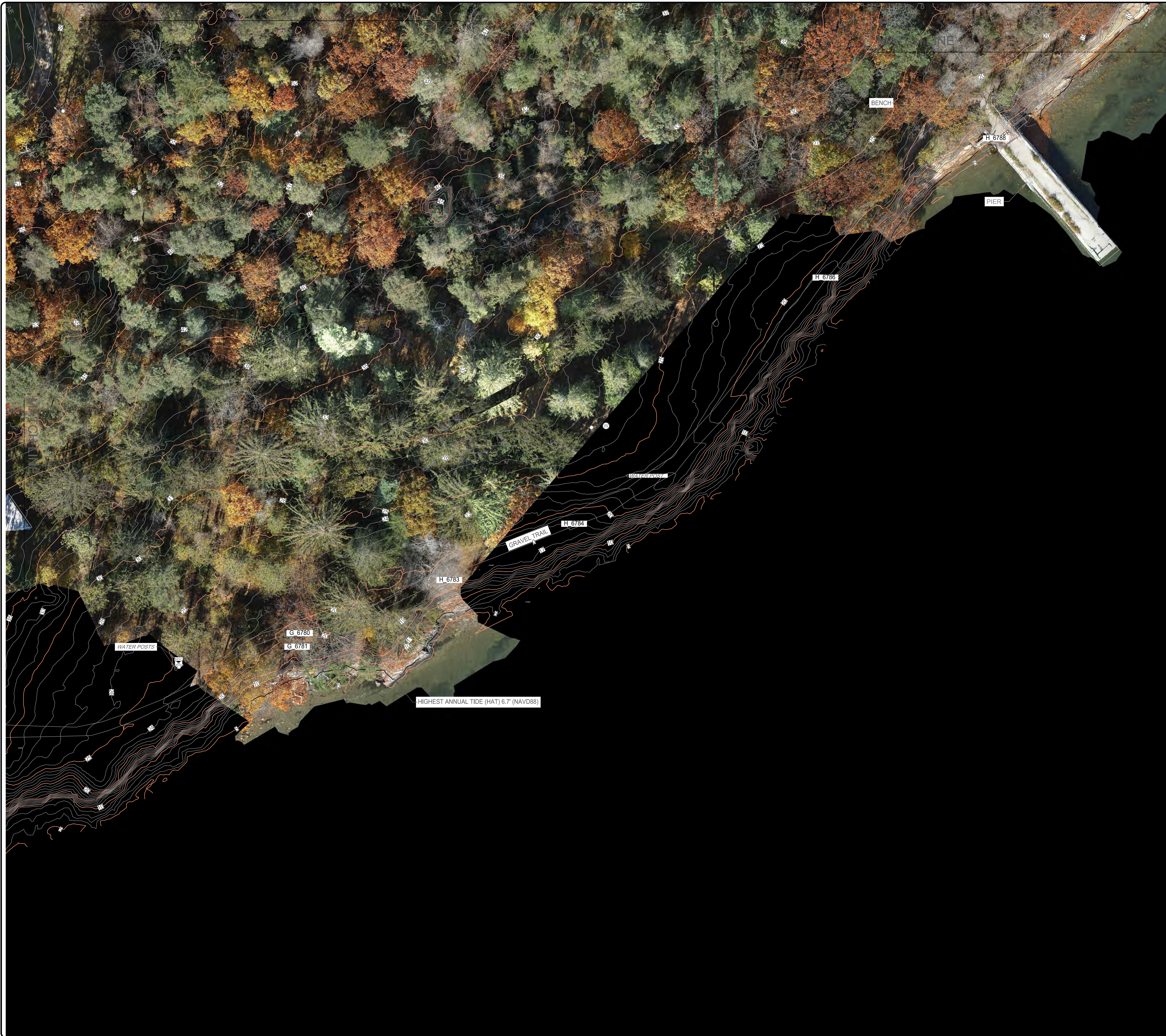
South Portland, Brighton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105

FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

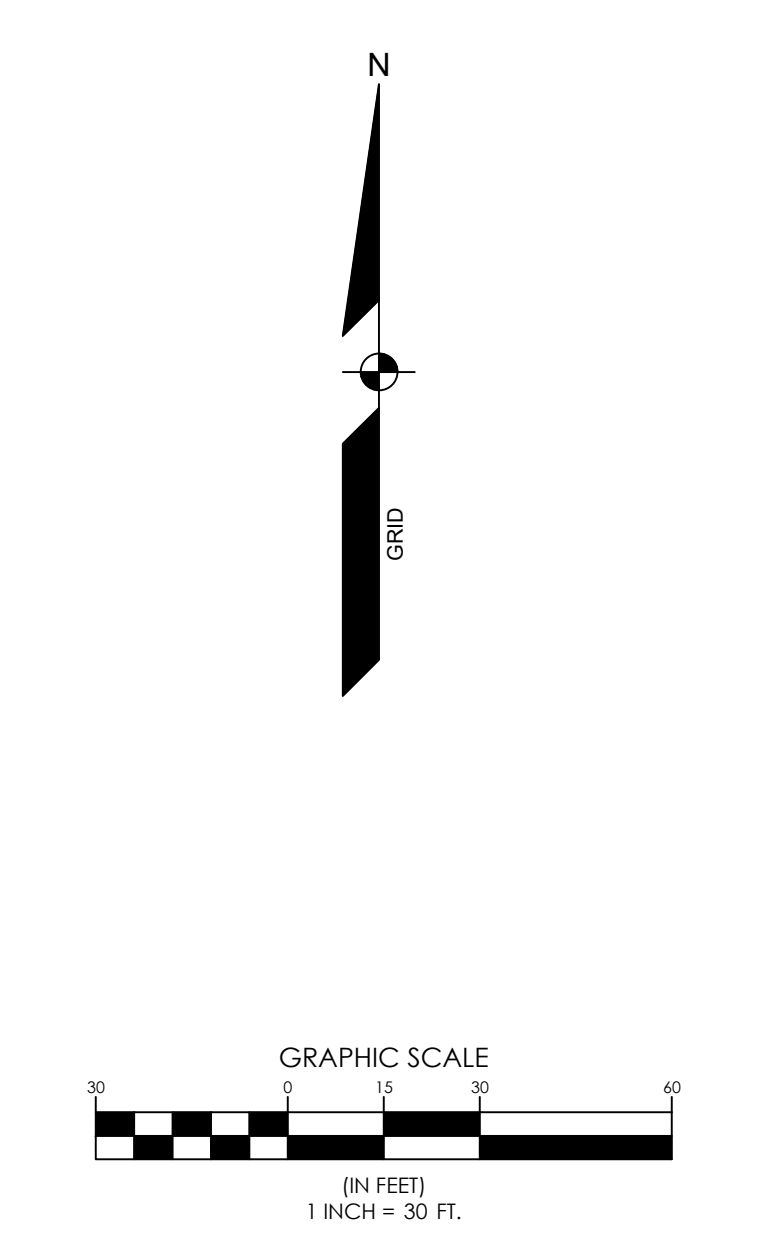
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LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
	STORM DRAIN
	DRAINAGE MANHOLE
	CATCH BASIN
	CULVERT
	TRANSFORMER PAD
	LIGHT POLE
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	GUY WIRE
	UNDERGROUND ELECTRIC
	OVERHEAD ELECTRIC
	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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BY			
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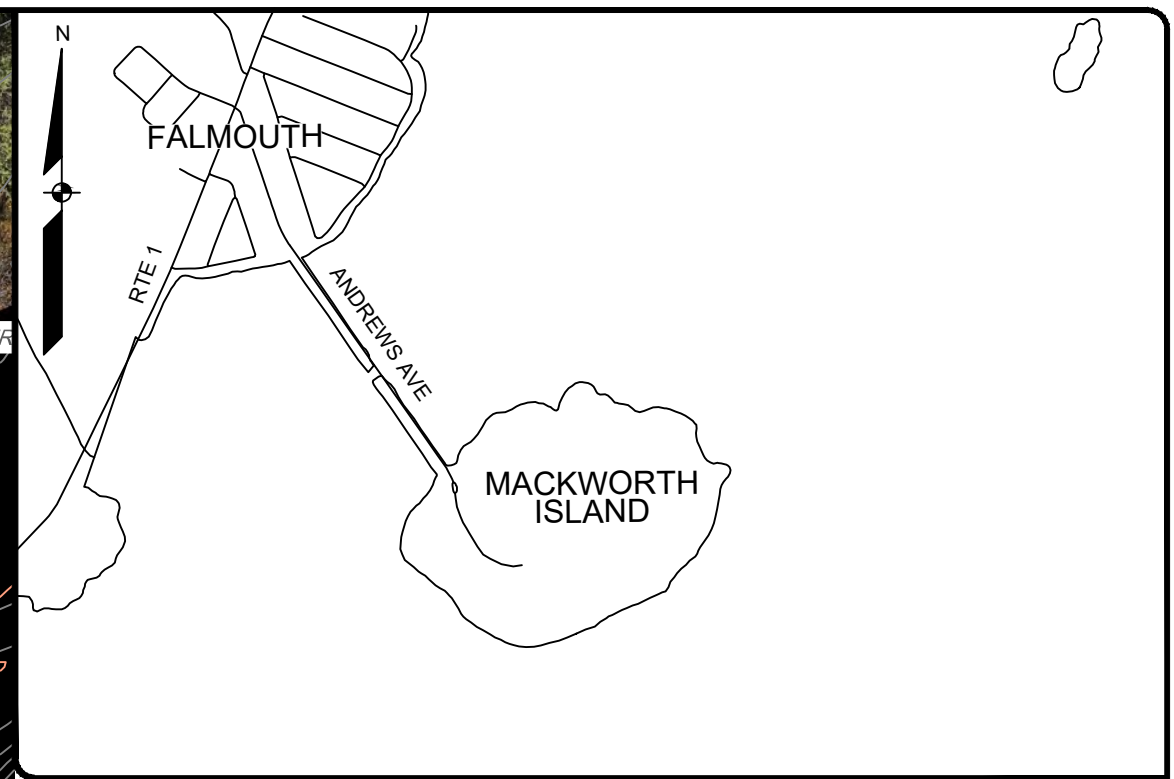
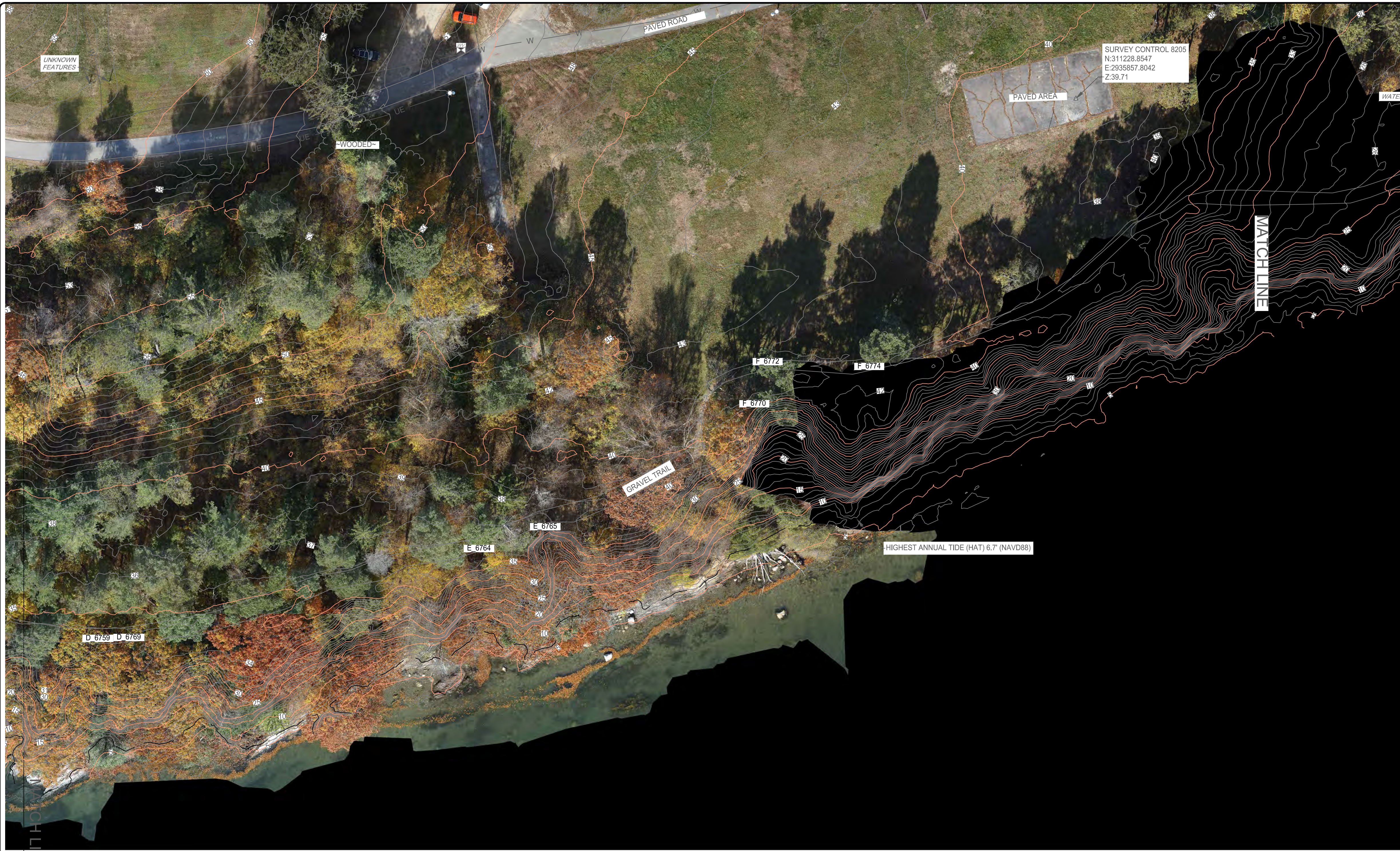
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OF:
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ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

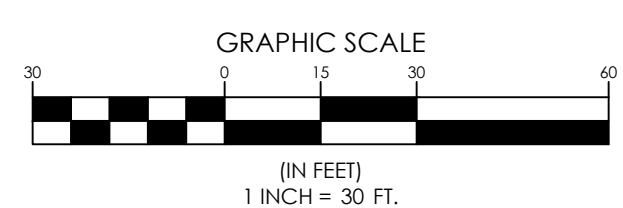
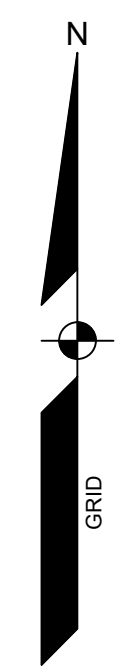
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LOCATION MAP

LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
- STORM DRAIN
- DRAINAGE MANHOLE
- CATCH BASIN
- CULVERT
- TRANSFORMER PAD
- LIGHT POLE
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- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



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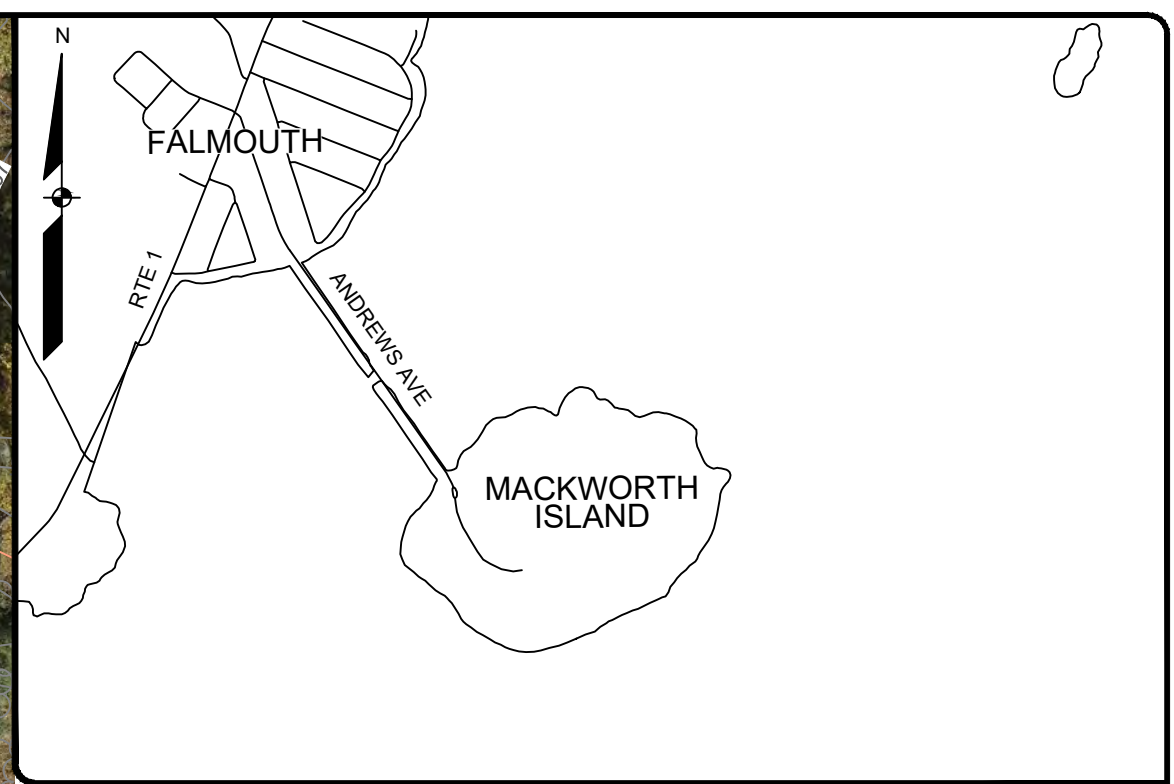
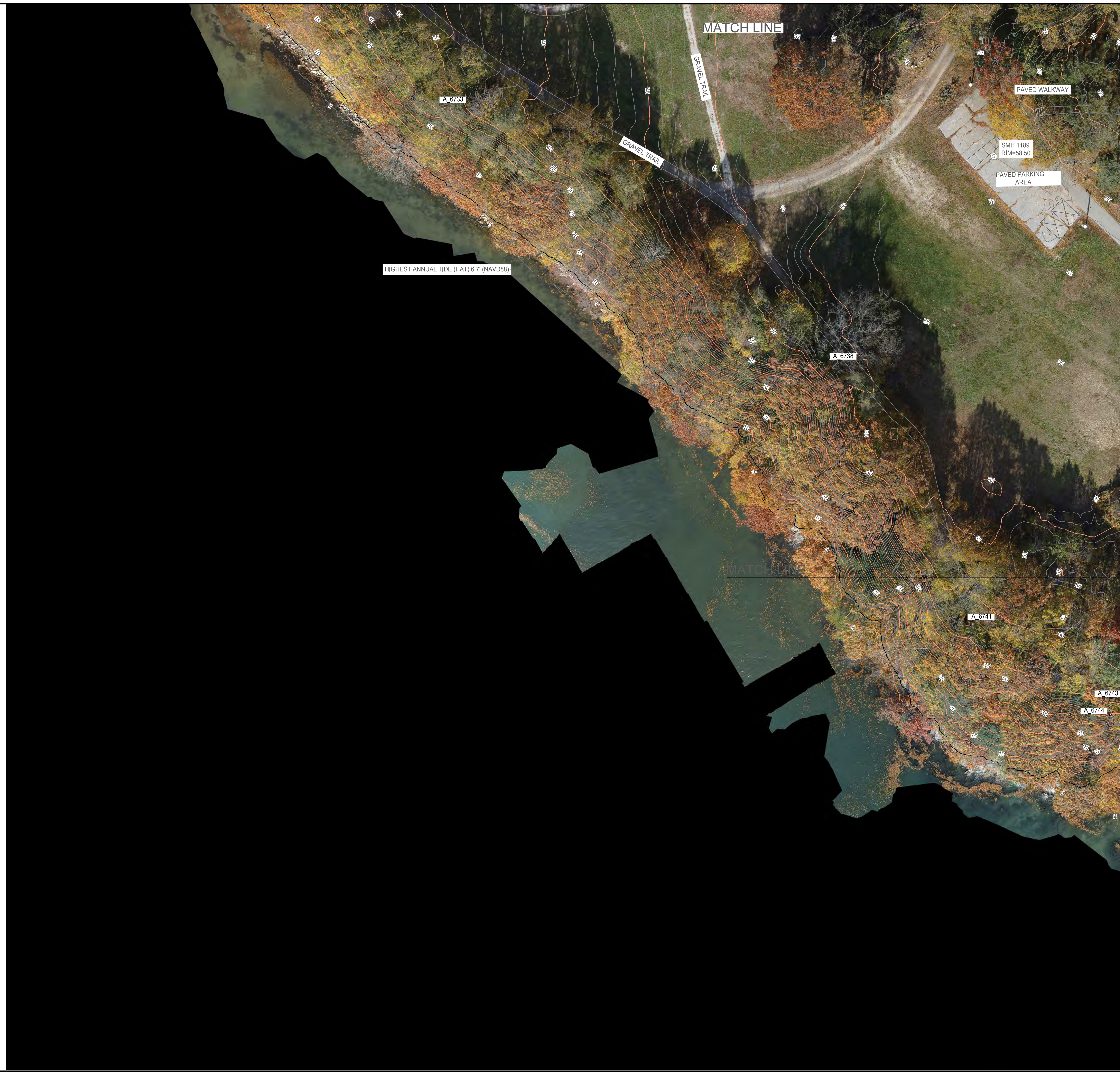
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FALMOUTH, MAINE 04105
FOR: HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

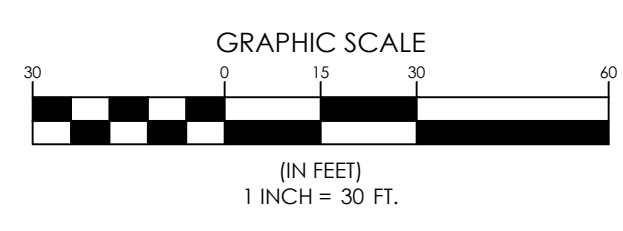
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LOCATION MAP

LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
- STORM DRAIN
- DRAINAGE MANHOLE
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- GAS
- BOULDER
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REV	BY	DATE	STATUS
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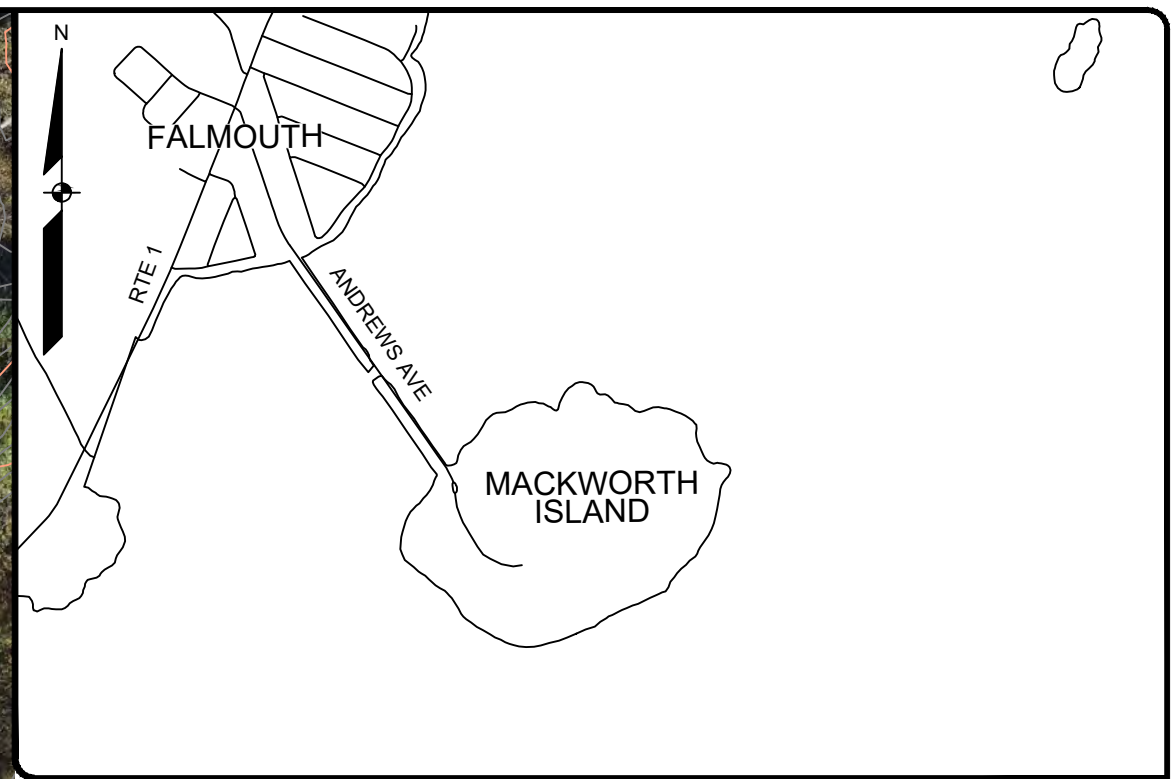
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ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
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23 HARRIMAN DRIVE
ALBURN, MAINE 04210

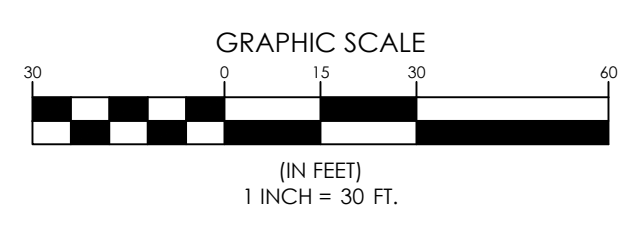
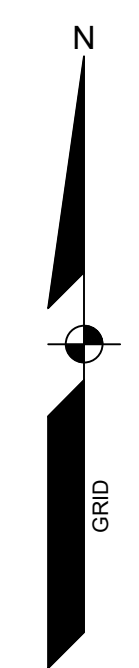
DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
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	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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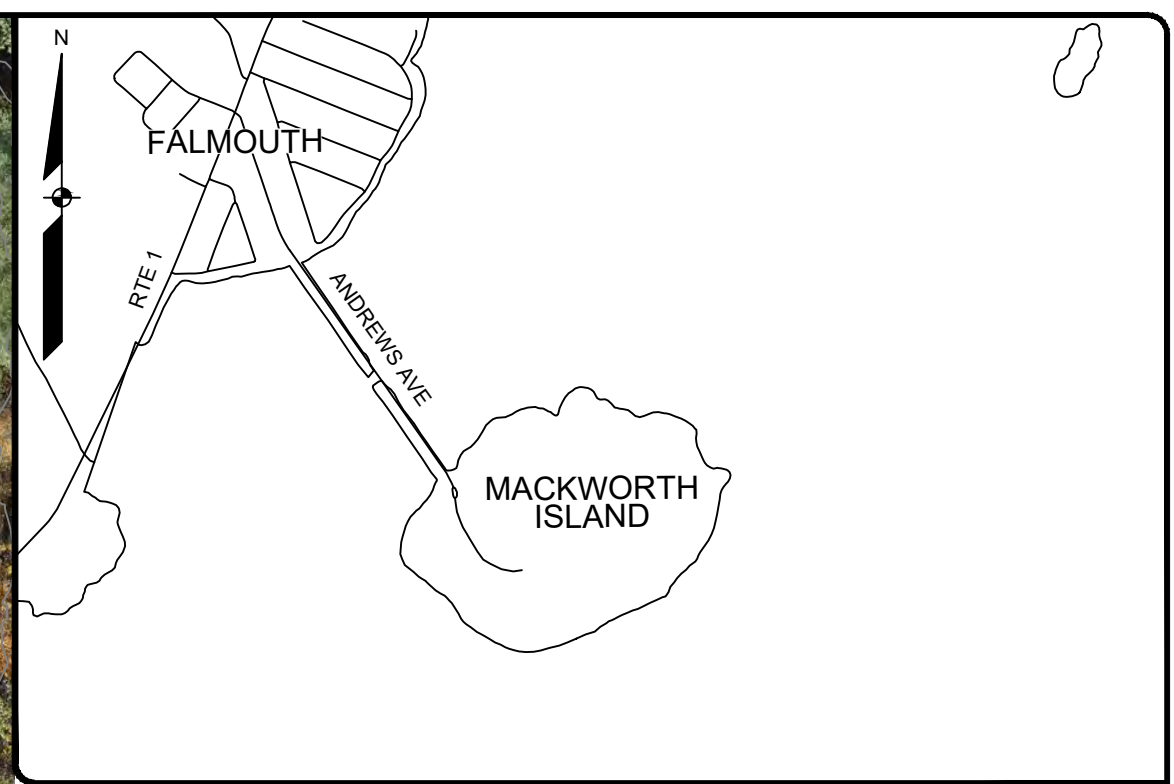
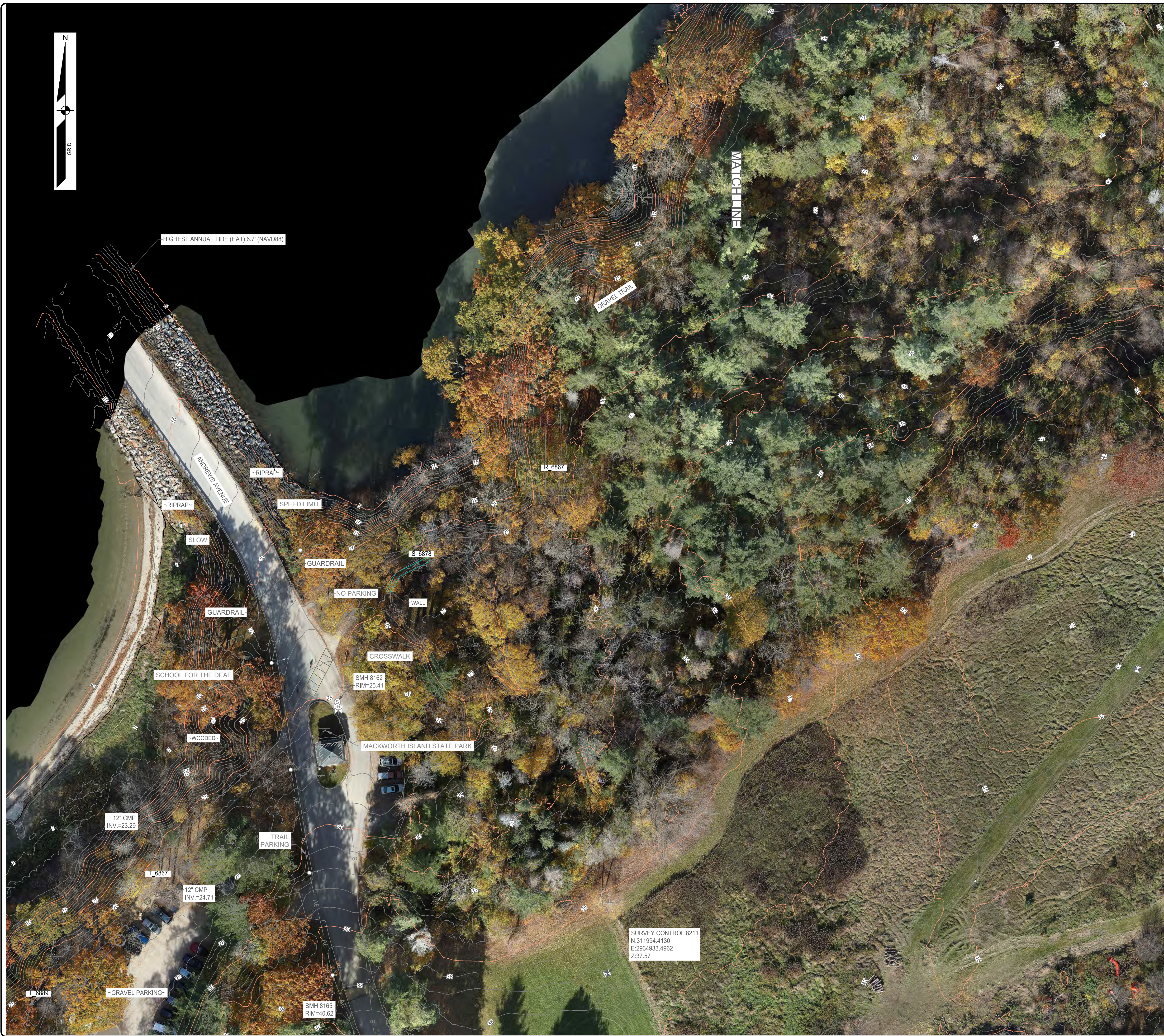
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 FALMOUTH, MAINE 04105
 FOR:
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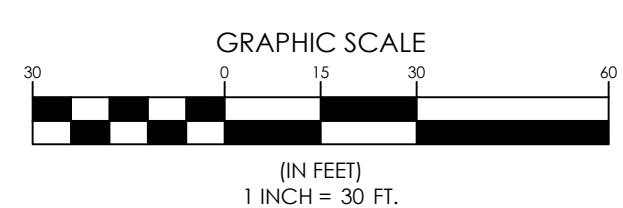
DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
	STORM DRAIN
	DRAINAGE MANHOLE
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	LIGHT POLE
	UTILITY POLE
	GUY WIRE
	UNDERGROUND ELECTRIC
	OVERHEAD ELECTRIC
	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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PLS OR FE

REV	DATE	ISSUED TO	STATUS
1	02/10/2023	CLIENT	ISSUED

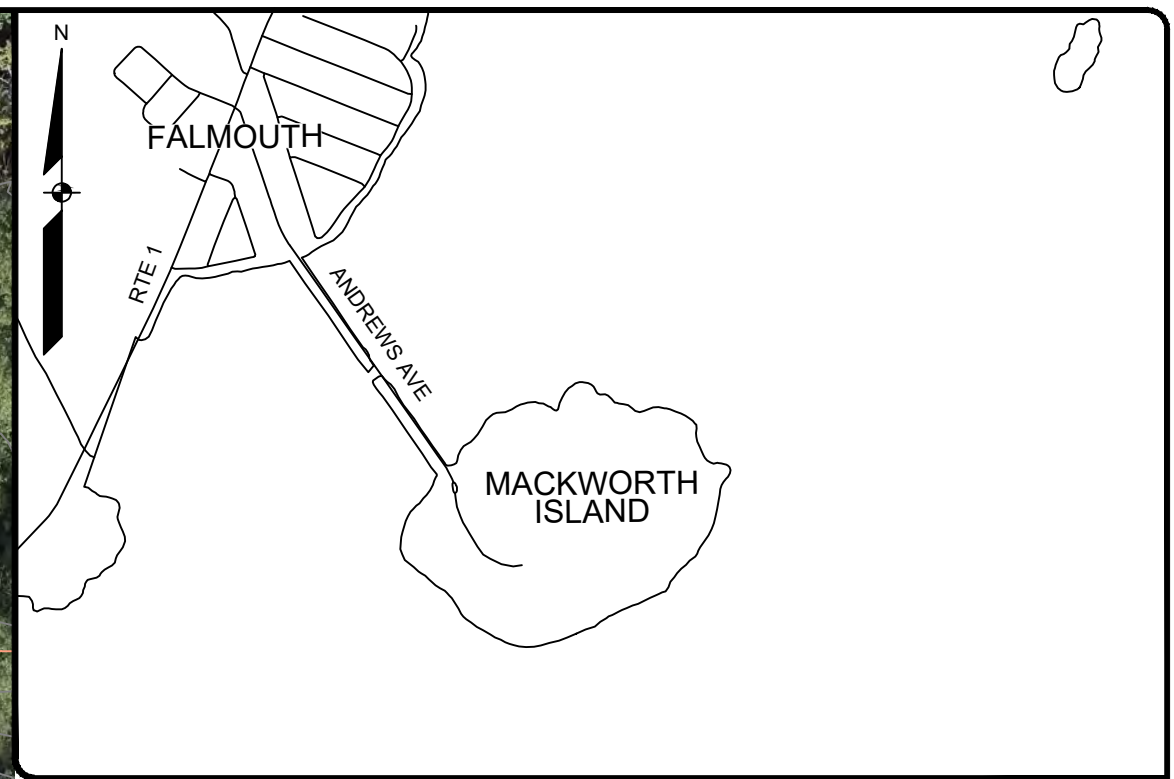
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EXISTING CONDITIONS SURVEY
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 ANDREWS AVENUE CAUSEWAY
 FALMOUTH, MAINE 04105
 FOR:
 HARRIMAN
 23 HARRIMAN DRIVE
 AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

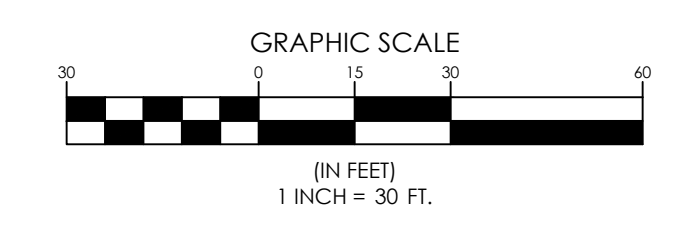
220594.dwg, TAB: NSE Sh. 11



LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
	STORM DRAIN
	DRAINAGE MANHOLE
	CATCH BASIN
	CULVERT
	TRANSFORMER PAD
	LIGHT POLE
	UTILITY POLE
	GUY WIRE
	UNDERGROUND ELECTRIC
	OVERHEAD ELECTRIC
	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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REV	DATE	ISSUED TO CLIENT
1	02/10/2023	STATUS

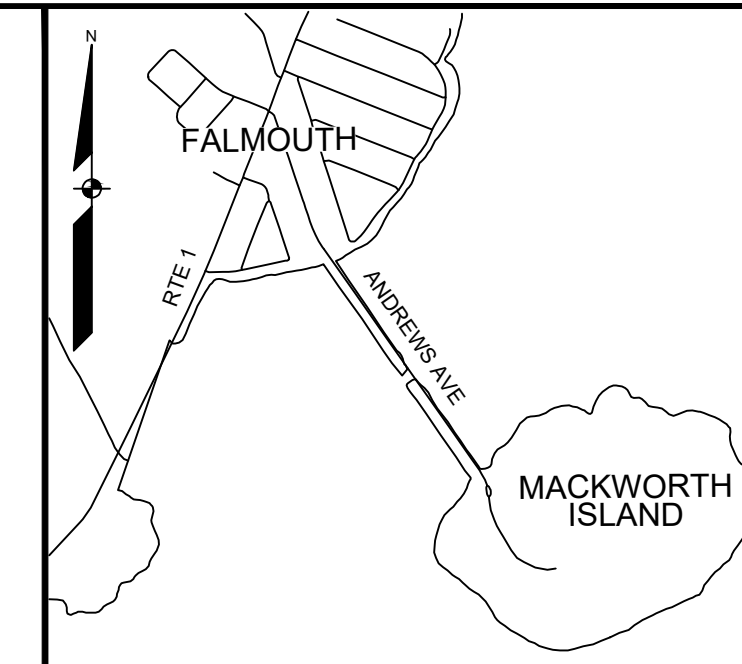
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EXISTING CONDITIONS SURVEY
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 ANDREWS AVENUE CAUSEWAY
 FALMOUTH, MAINE 04105
 FOR:
HARRIMAN
 23 HARRIMAN DRIVE
 ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

POINT #	STRUCTURE TYPE	RIM EL.	INV.	INV. EL.	SIZE	TYPE	LOCATION (N=12)	COMMENTS
1285	CB	73.23	IN	70.60	8	CLAY	5	
			OUT	70.55	6	CLAY	11	
			SUMP	70.60				
1123	MH	53.85	IN	47.60	UNKNOWN	UNKNOWN	10	FROM BUILDING?
			IN	46.40	10	CLAY	2	WHERE DOES IT ORIGINATE?
			OUT	46.40	15	CLAY	7	TO MH IN FIELD
			SHELF	47.05				
1143	SMH	66.47	IN	61.23	8	CI	4	FOLLOWS ROAD
			OUT	60.53	6	CLAY	10	FOLLOWS ROAD
			SHELF	61.25				
1155	MH SQUARE	68.64	IN	63.69	8	CLAY	4	NOT IN USE
			OUT	63.69	8	CLAY	10	NOT IN USE
1157	MH SQUARE	68.63	IN	63.69	8	CLAY	4	NOT IN USE
			OUT	63.69	8	CLAY	10	NOT IN USE
1189	SMH	58.47	IN	50.55	8	CLAY	4	
			OUT	50.50	8	CLAY	12	
			SHELF	51.12				
8162	SMH	25.26	0	25.41	0	0	0	
8165	SMH	40.59	IN	33.34	8	CLAY	5	
			OUT	31.47	8	CLAY	11	
8168	SMH	51.18	IN	44.03	8	CLAY	7	
			IN	44.23	6	CLAY	4	FOLLOWS ROAD
			OUT	42.31	8	CLAY	11	FOLLOWS ROAD
8500	MH	54.01	IN	43.22	15	CLAY	2	FROM PARKING AREA
			IN	43.22	12	CLAY	9	
			OUT	43.17	12	CLAY	6	TO PUMP
			SHELF	44.07				
8502	DMH	56.27	IN	52.88	8	PVC	12	FROM BUILDING?
			IN	51.41	8	PVC	2	FROM DMH
			OUT	51.38	12	PVC	8	TO WHERE?
			SUMP	48.98				
8504	SMH	56.43	IN	51.17	4	PVC	1	FROM BUILDING?
			IN	51.07	8	PVC	2	FROM WHERE? PARALLEL BUILDING
			OUT	50.97	8	PVC	8	TO SMH
			SHELF	51.69				
8720	MH	68.42	0	68.44	0	0	0	
8722	MH	68.43	0	68.41	0	0	0	
8806	DMH	59.37	IN	53.97	4	HDPE	9	FROM BUILDING CORNER
			IN	53.87	8	PVC	2	
			IN	53.87	8	HDPE	11	
			OUT	53.85	8	PVC	7	TO DMH
			SUMP	53.42				



LOCATION MAP

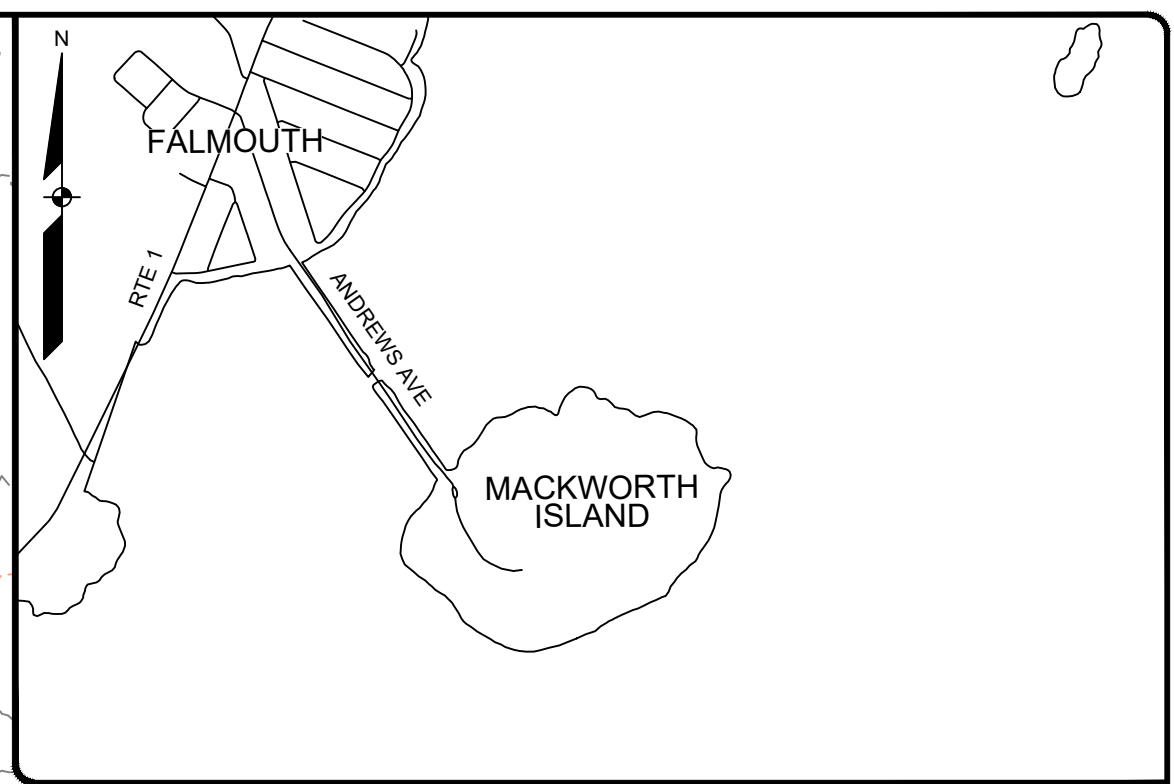
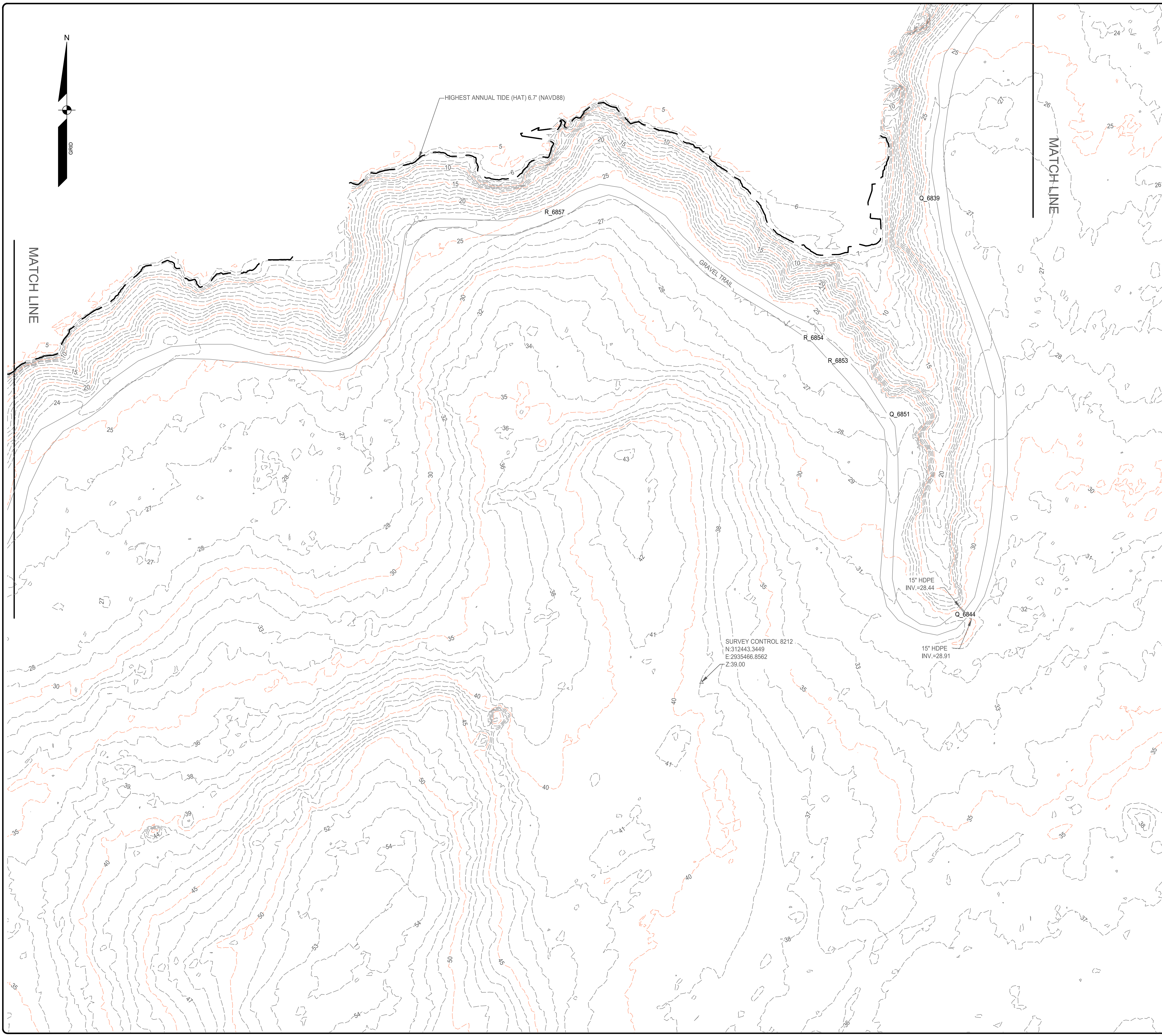
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23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	-
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



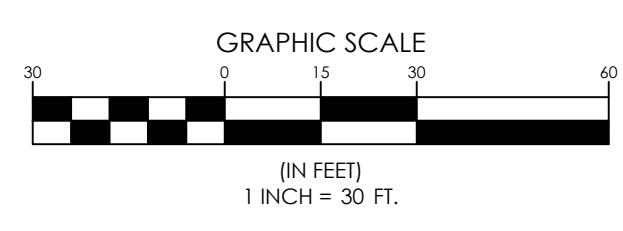
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- BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
Q_6839		
Q_6851		
Q_6844		
- UTILITY INFORMATION DEPICTED HEREON, UNLESS OTHERWISE NOTED, IS OF QUALITY LEVEL D PER AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) STANDARD C1ASCE 38-02. UTILITIES DEPICTED HEREON MAY NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC. (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO CONSTRUCTION AND/OR EXCAVATION.

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
	SANITARY MANHOLE
	SANITARY SEWER
	STORM DRAIN
	DRAINAGE MANHOLE
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	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



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REV	NO	DATE	ISSUED TO CLIENT	STATUS

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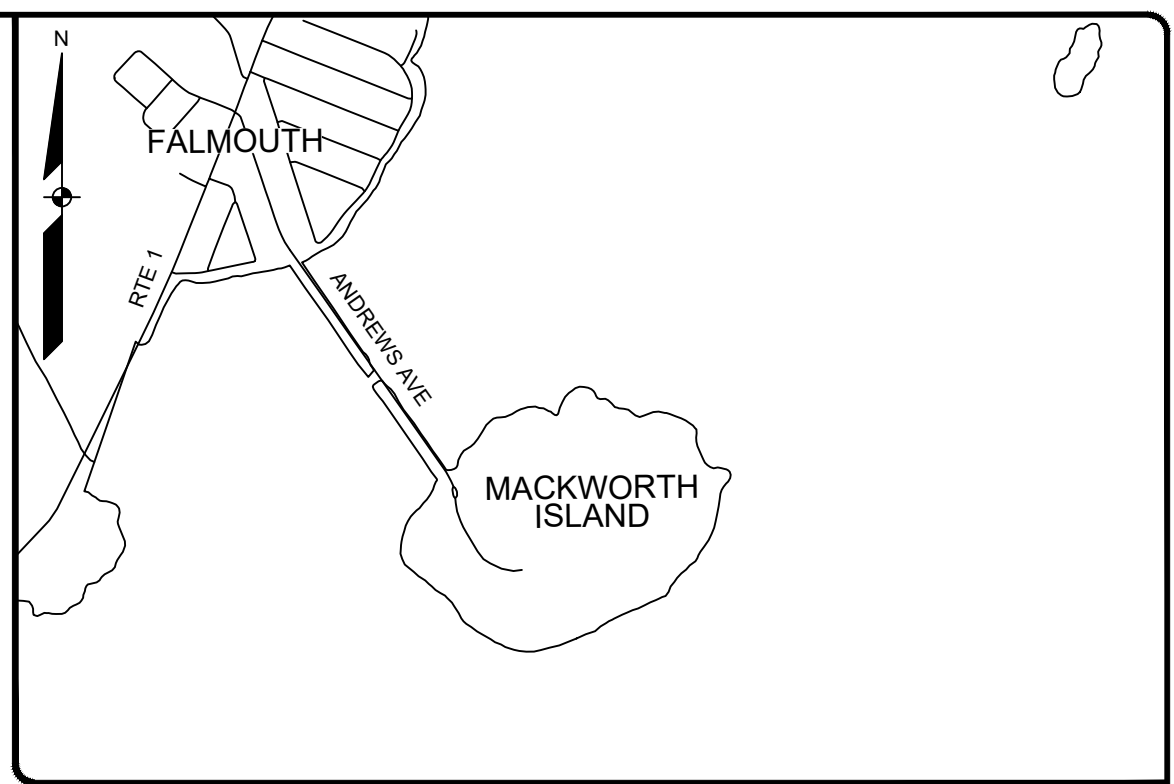
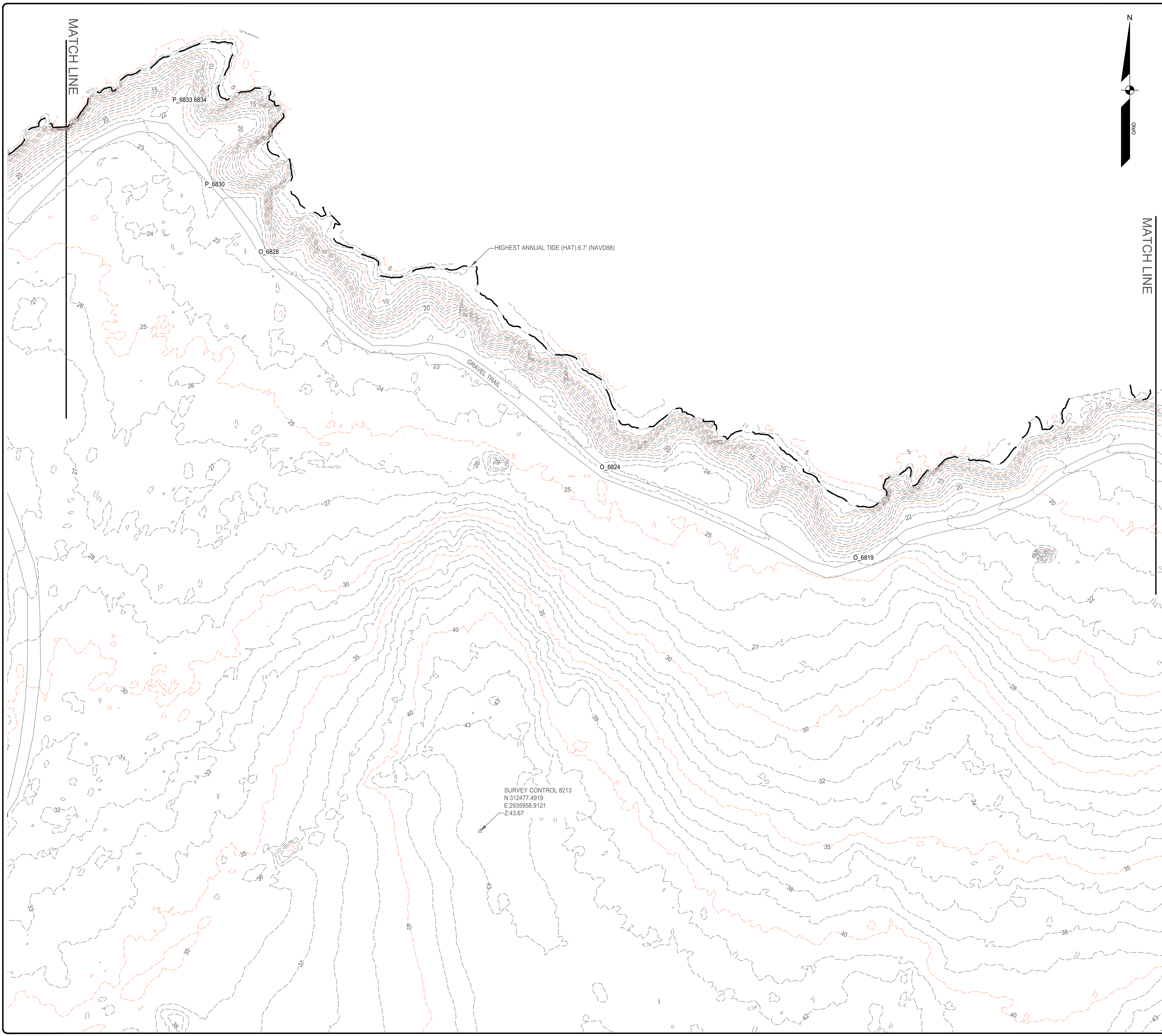
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DESIGNED	-
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

SHEET 2 OF 14

220594.dwg, TAB NSE Sh. 2



LOCATION MAP

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- BENCHMARK:

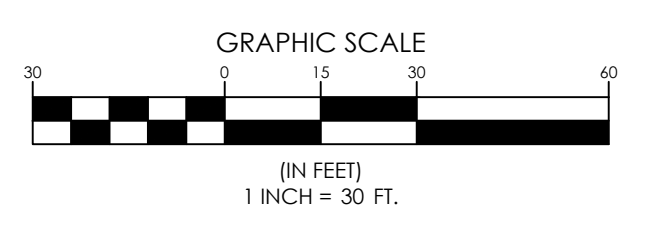
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- UTILITY INFORMATION DEPICTED HEREON, UNLESS OTHERWISE NOTED, IS OF QUALITY LEVEL D PER AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) STANDARD C/ASCE 38-02. UTILITIES DEPICTED HEREON MAY NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC. (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO CONSTRUCTION AND/OR EXCAVATION.

MATCH LINE



LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
- STORM DRAIN
- DRAINAGE MANHOLE
- CATCH BASIN
- CULVERT
- TRANSFORMER PAD
- LIGHT POLE
- UTILITY POLE
- GUY WIRE
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518

PLS OR PE

REV	NO	DATE	ISSUED TO CLIENT	STATUS

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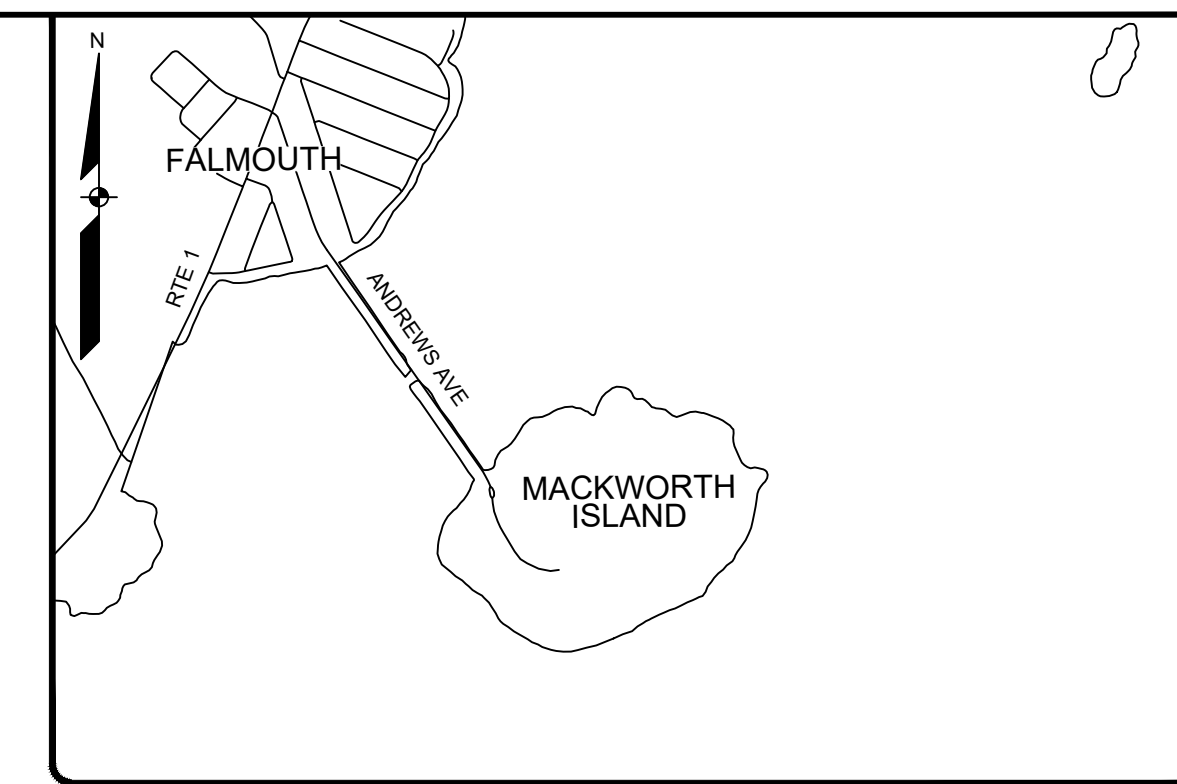
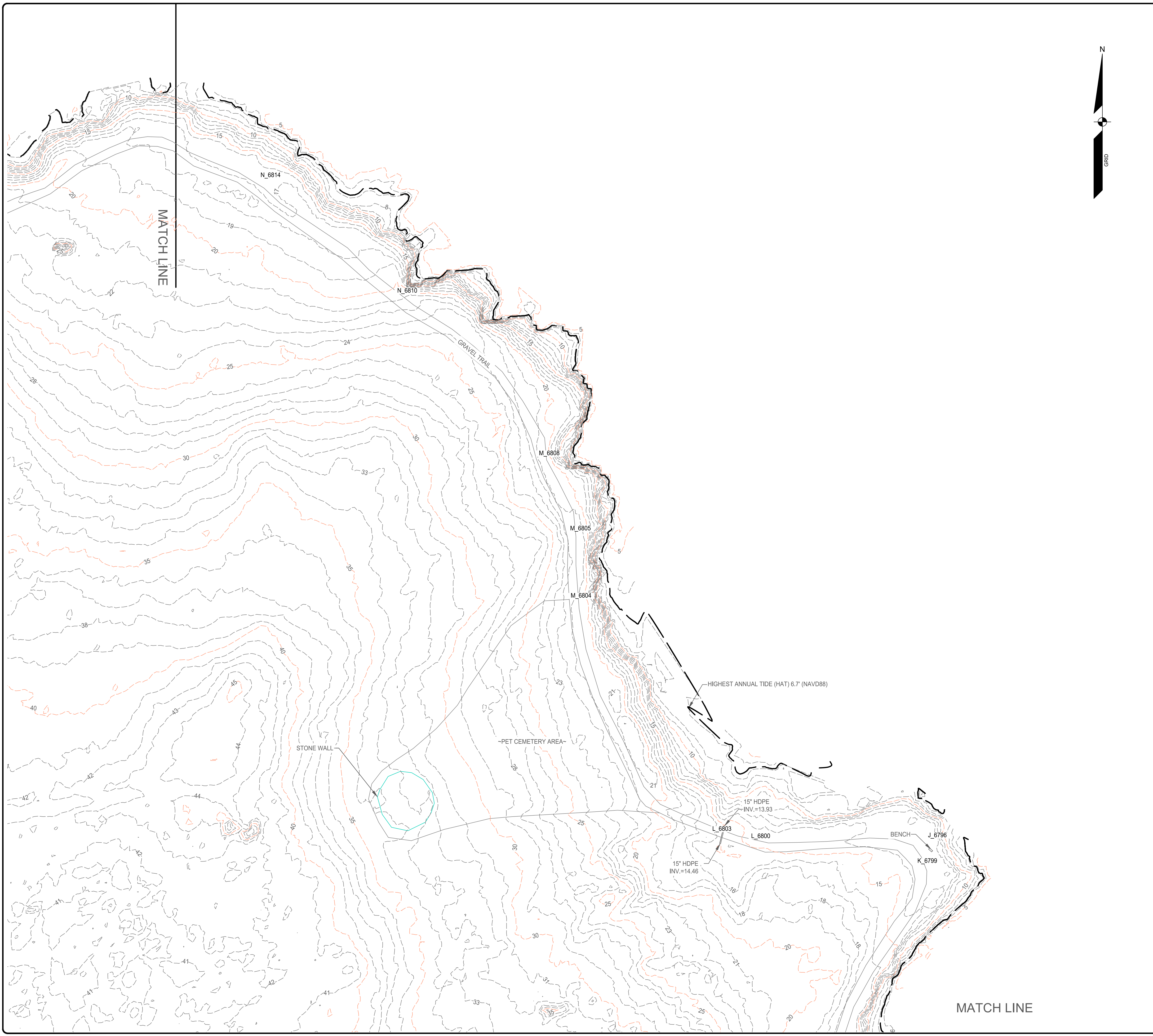
SEBAGO
TECHNICS
SEBAGO TECHNICS.COM
75 John Roberts Rd, Suite 414
South Portland, ME 04106
207-260-2100
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	-
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

SHEET 3 OF 14

220594.dwg, TAB NSE Sh. 3



LOCATION MAP

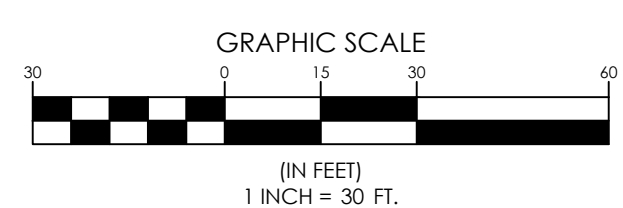
GENERAL NOTES:

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- BENCHMARK:

BM-1	DESCRIPTION	ELEVATION (NAVD88)
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LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
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- SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518

PLS OR PE

REV	NO	DATE	ISSUED TO CLIENT	STATUS

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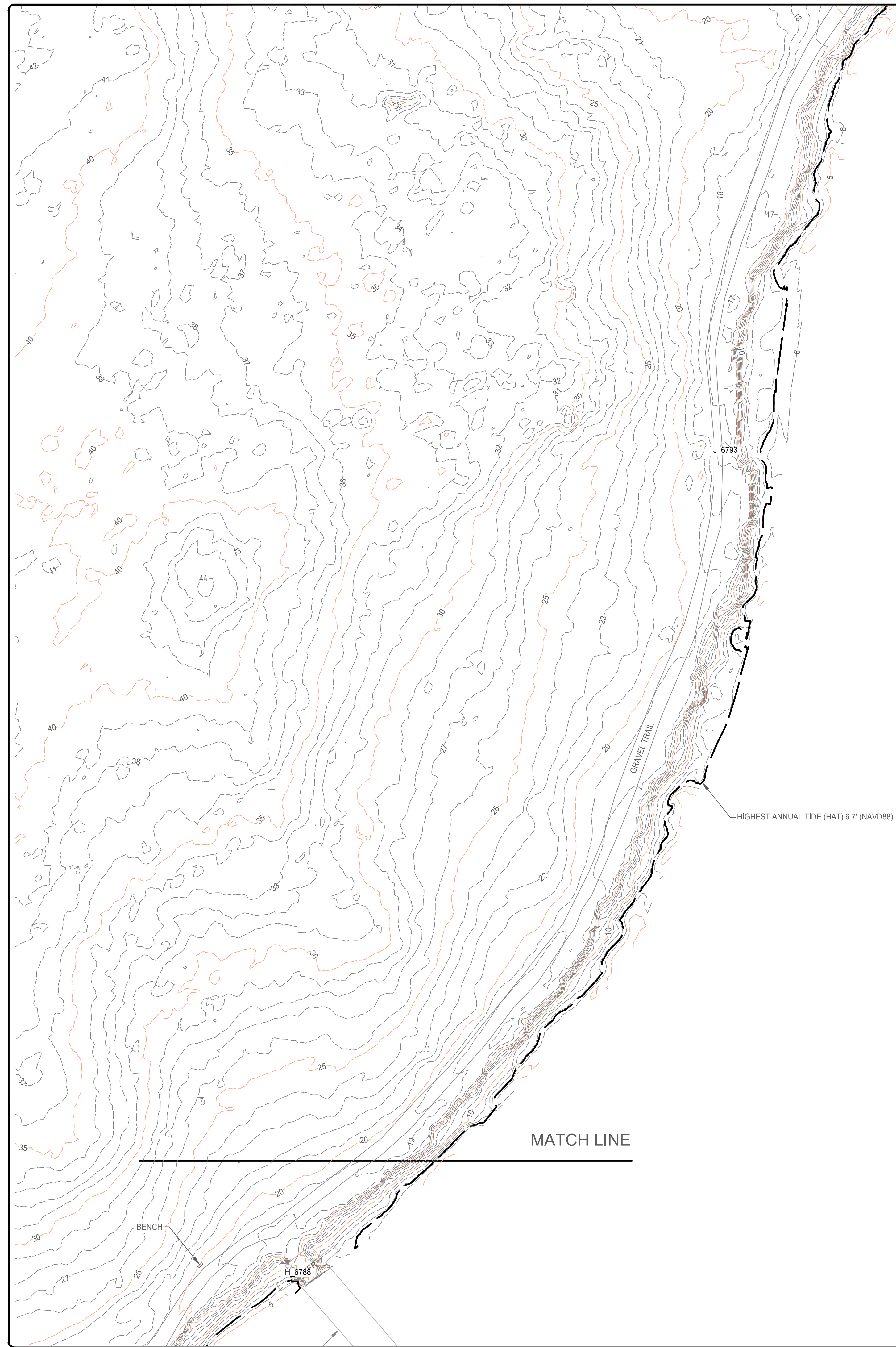
SEBAGOTECHNICS.COM
75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-260-2100

South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105

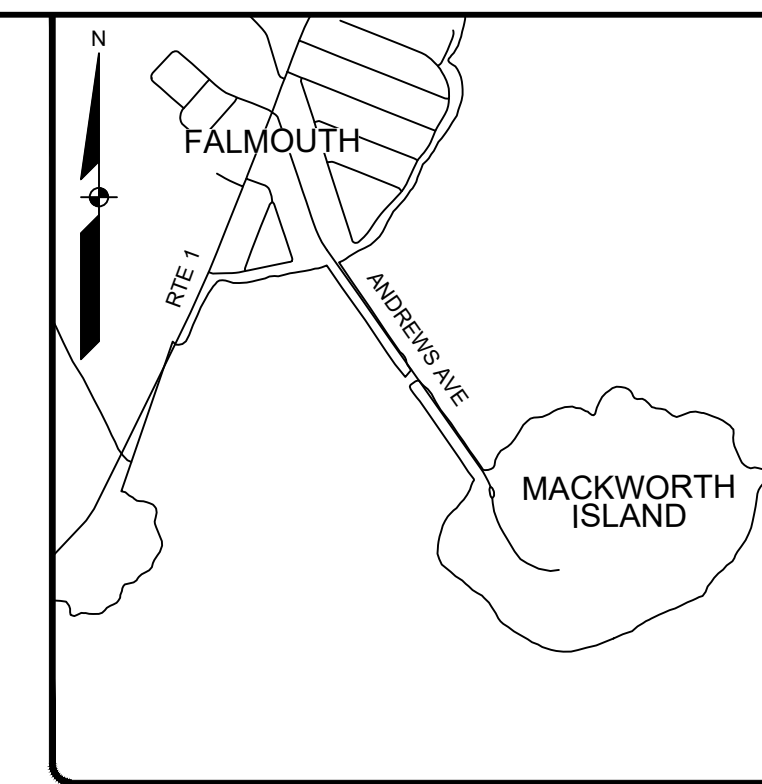
FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



MATCH LINE

MATCH LINE



LOCATION MAP

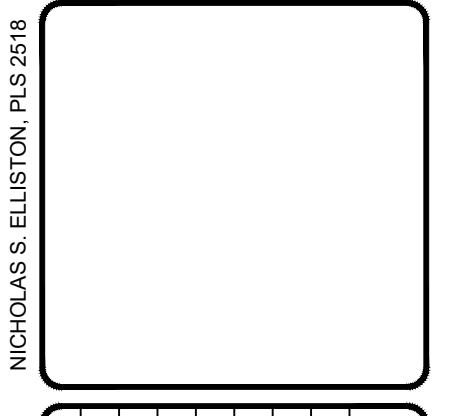
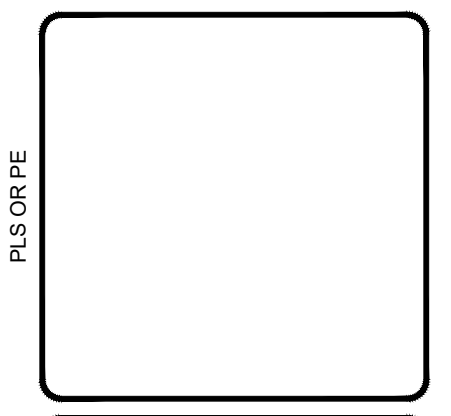
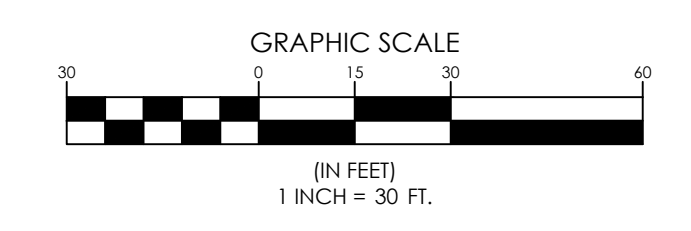
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4. BENCHMARK:

BM-1	DESCRIPTION	ELEVATION (NAVD88)
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LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
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- UNDERGROUND ELECTRIC
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- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



REV	BY	DATE	ISSUED TO	STATUS

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207-206-2100

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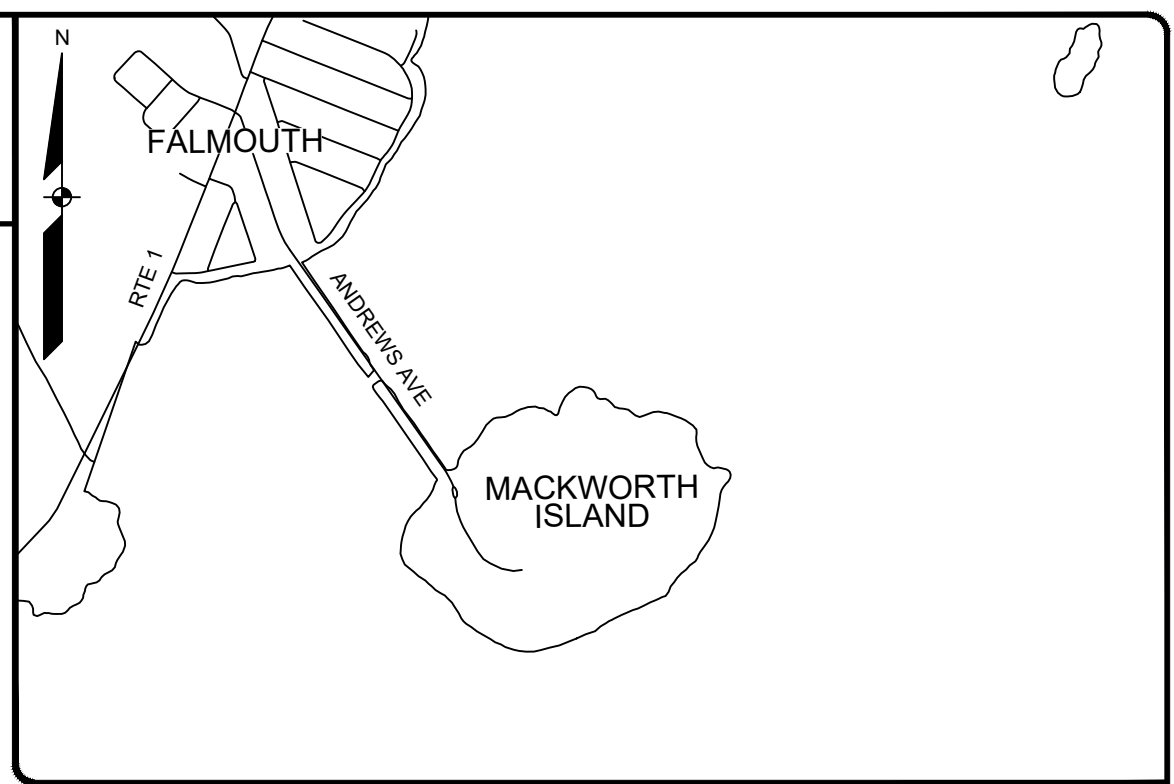
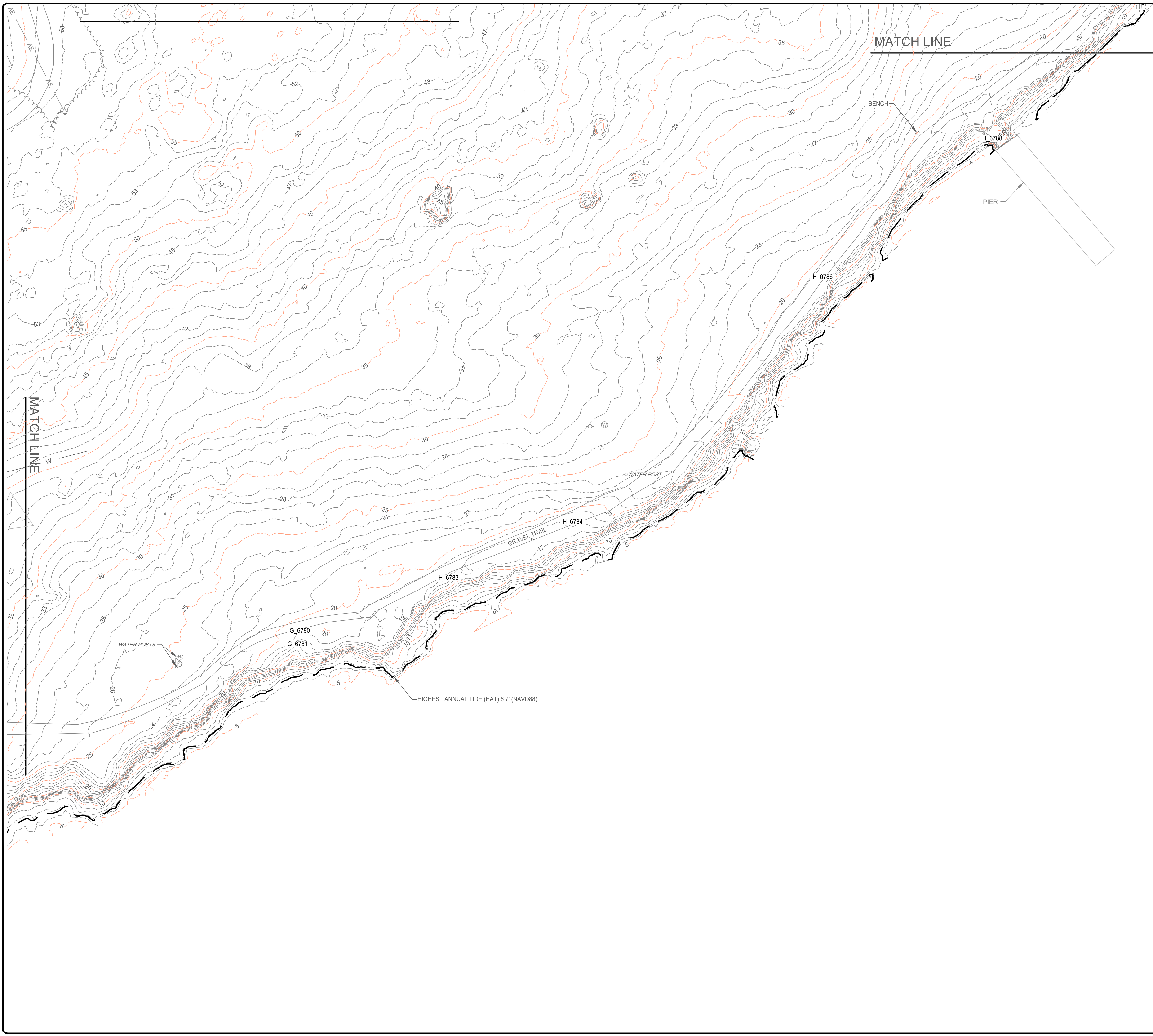
EXISTING CONDITIONS SURVEY

OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105

FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB: NSE SH. 5



LOCATION MAP

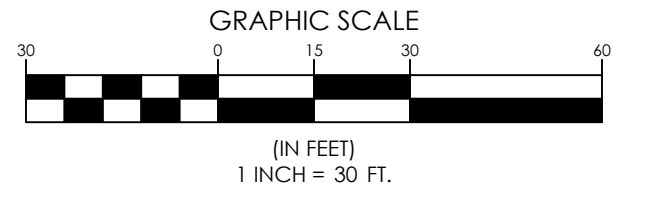
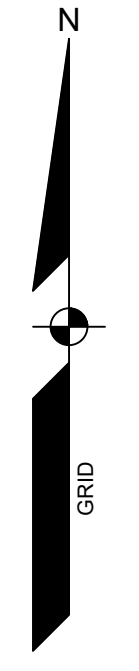
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4. BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
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LEGEND

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- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



NICHOLAS S. ELLISON, PLS 2518

PLS DR PE

REV	NO	DATE	ISSUED TO CLIENT	STATUS

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207-206-2100

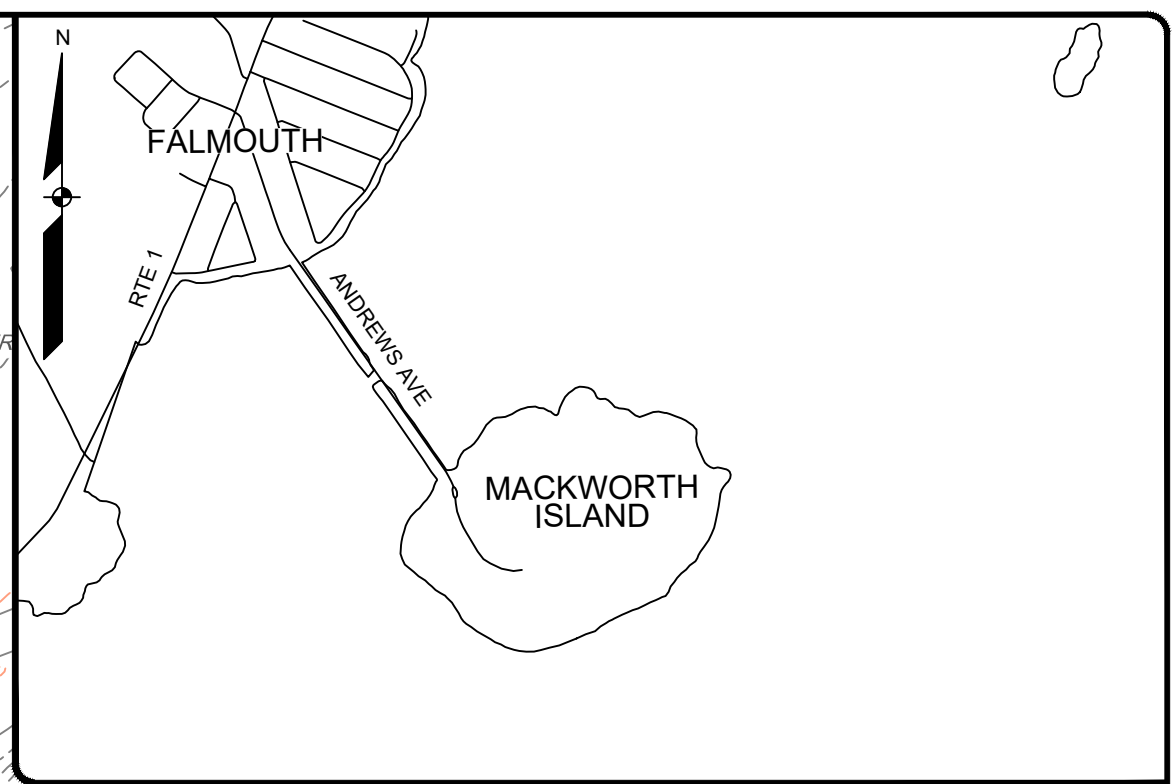
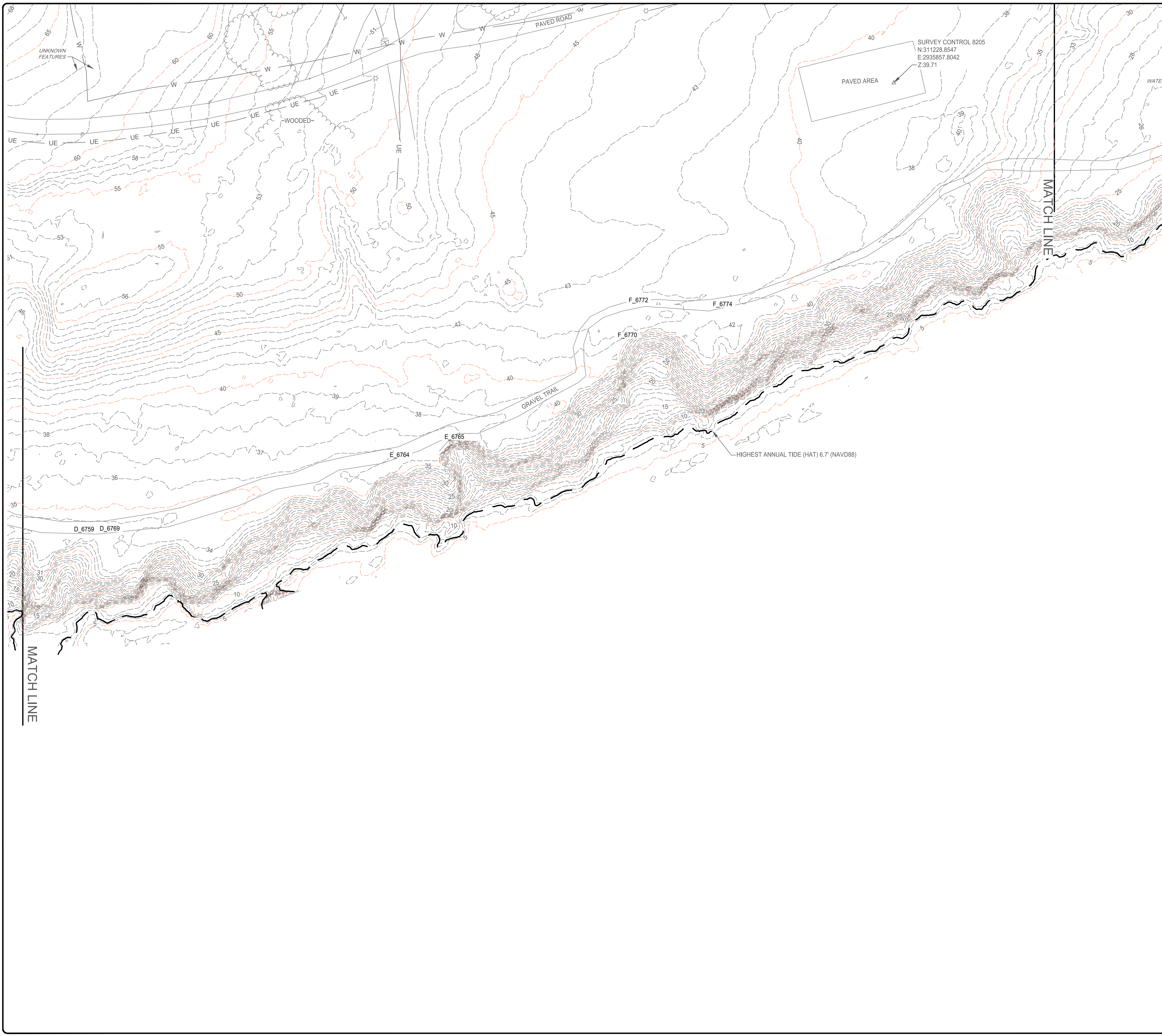
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105

FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB NSE SH. 6

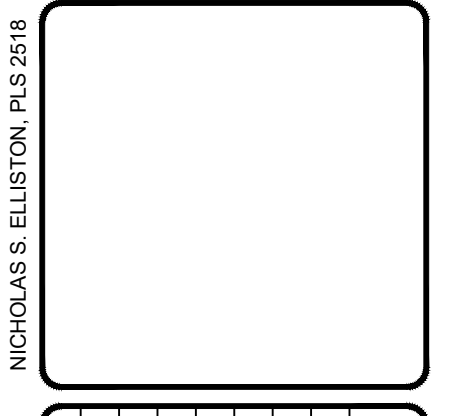
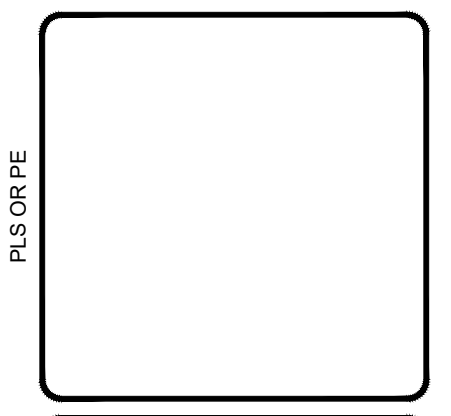
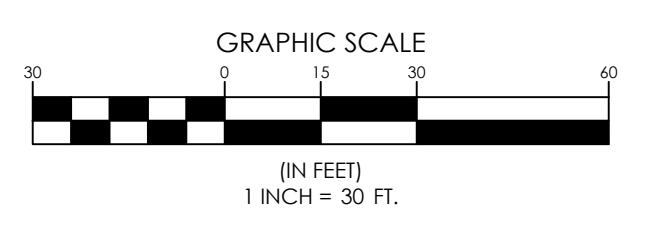
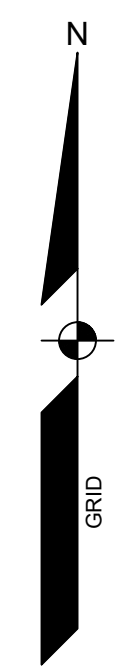


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- BENCHMARK:
BM-1 DESCRIPTION ELEVATION: (NAVD88)
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LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
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- LIGHT POLE
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- GUY WIRE
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



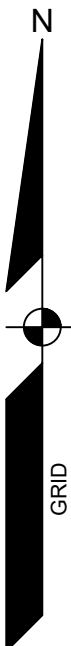
REV	NO	DATE	ISSUED TO CLIENT	STATUS

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SEBAGOTECHNICS.COM
75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-262-2100
South Portland, Bridgton, Sanford and Bath

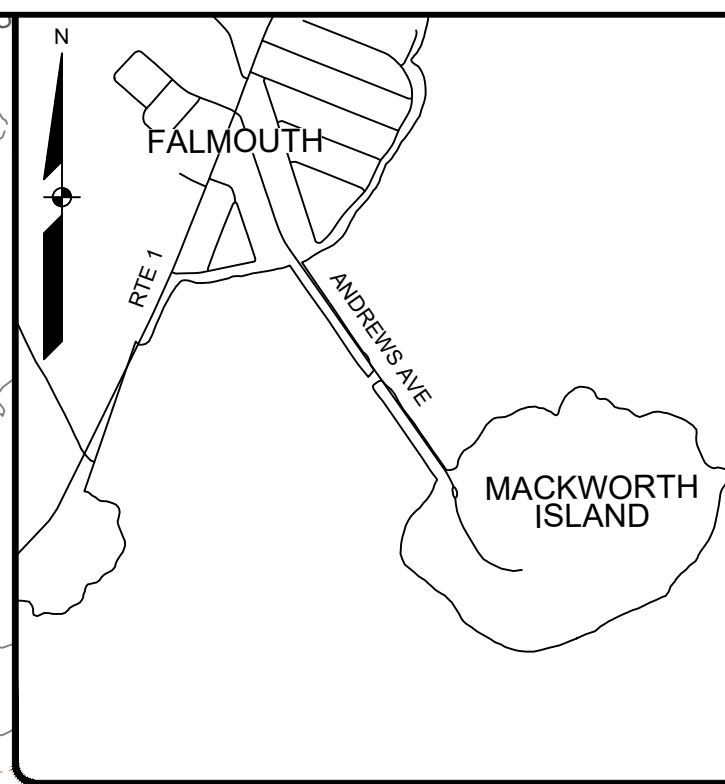
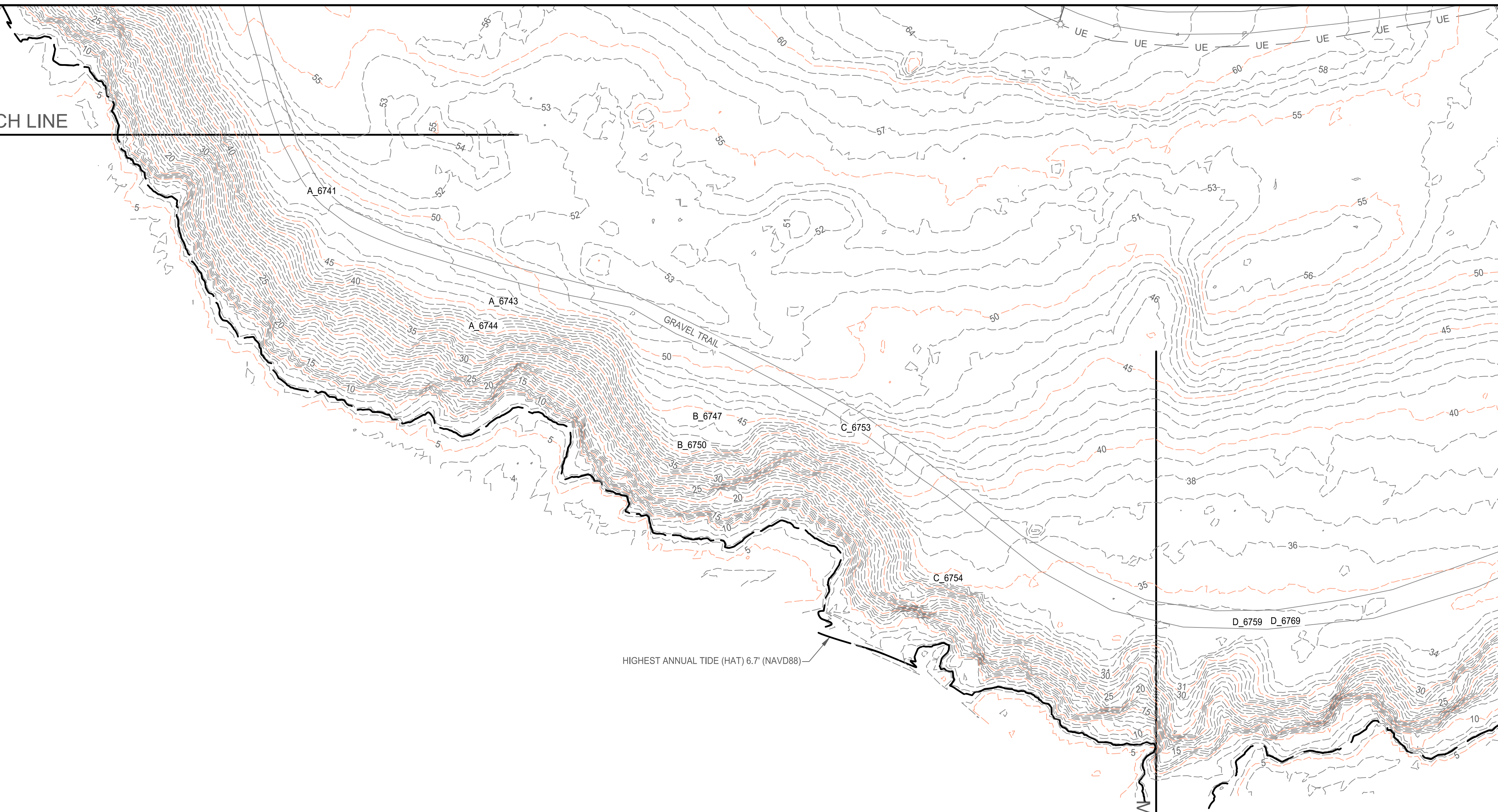
EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB: NSE Sh. 7



MATCH LINE



LOCATION MAP

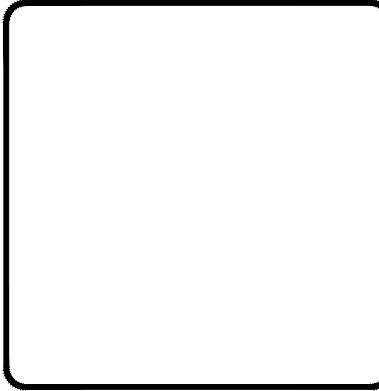
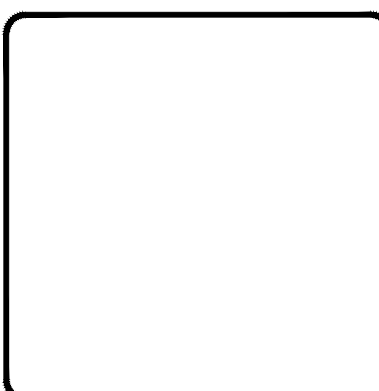
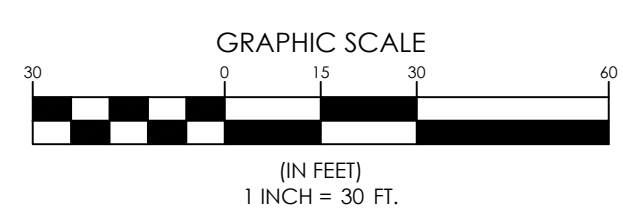
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4. BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
A_6741		
A_6743		
A_6744		
B_6747		
B_6750		
C_6753		
C_6754		
D_6759		
D_6769		
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LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
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- SANITARY SEWER
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- CULVERT
- TRANSFORMER PAD
- LIGHT POLE
- UTILITY POLE
- GUY WIRE
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



REV	BY	DATE	STATUS	ISSUED TO CLIENT

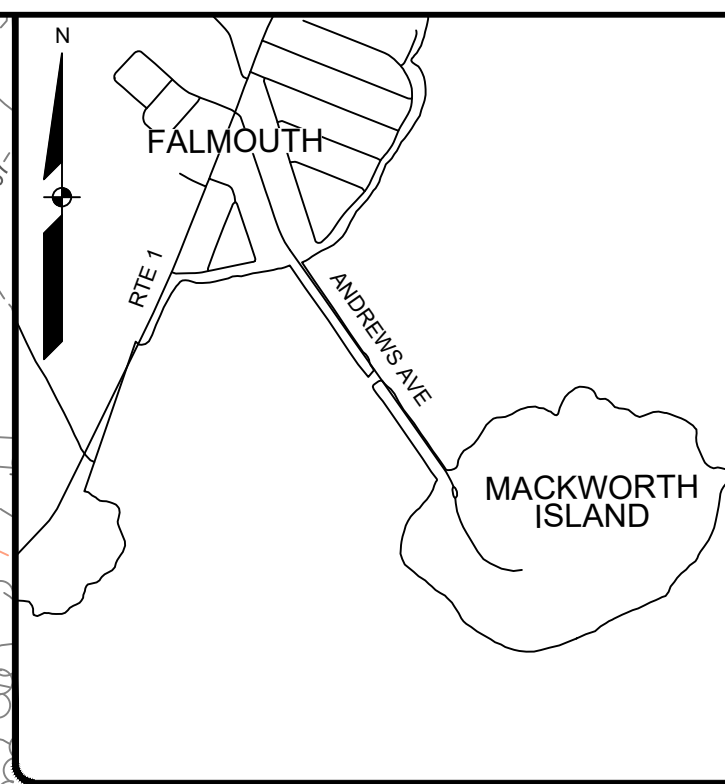
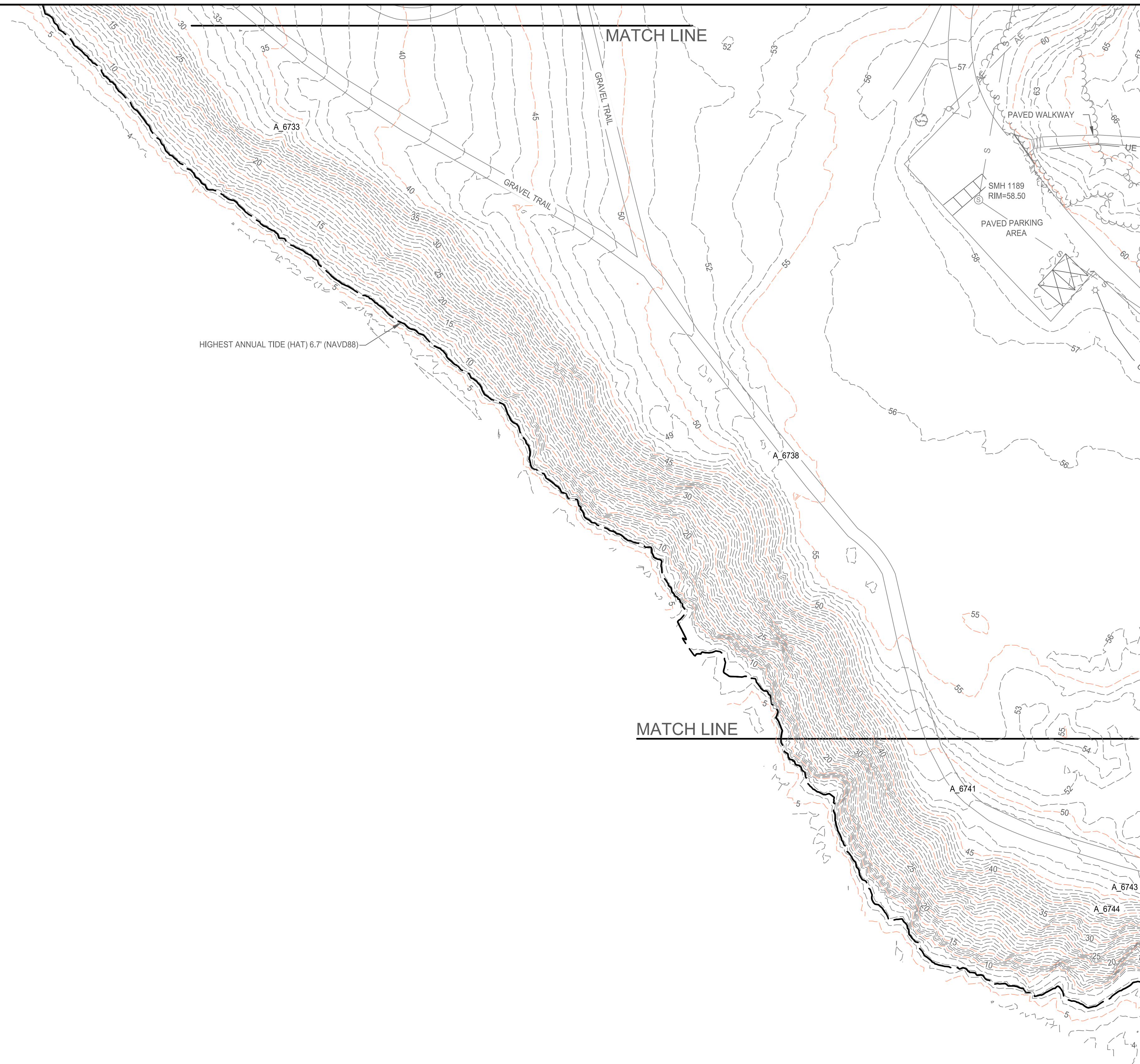
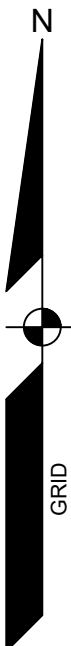
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TECHNICS
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75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-200-2100
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB: NSE Sh-8 NICHOLAS S. ELLISTON, PLS 2518



LOCATION MAP

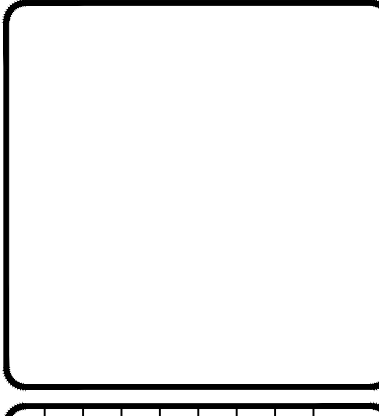
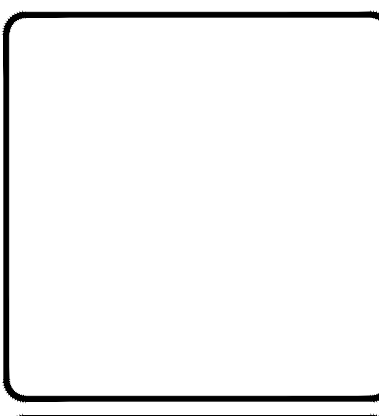
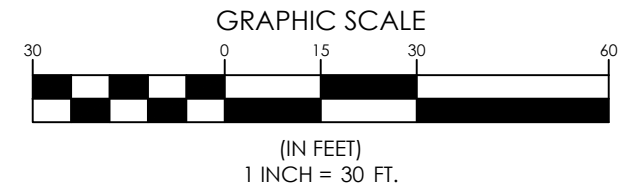
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- BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
SMH 1189	RIM=58.50	
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LEGEND

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- STUMP
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- SURVEY CONTROL



REV	NO	DATE	STATUS	ISSUED TO CLIENT

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SEBAGO
TECHNICS

SEBAGOTECHNICS.COM
75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-889-2100

South Portland, Bridgton, Sanford and Bath

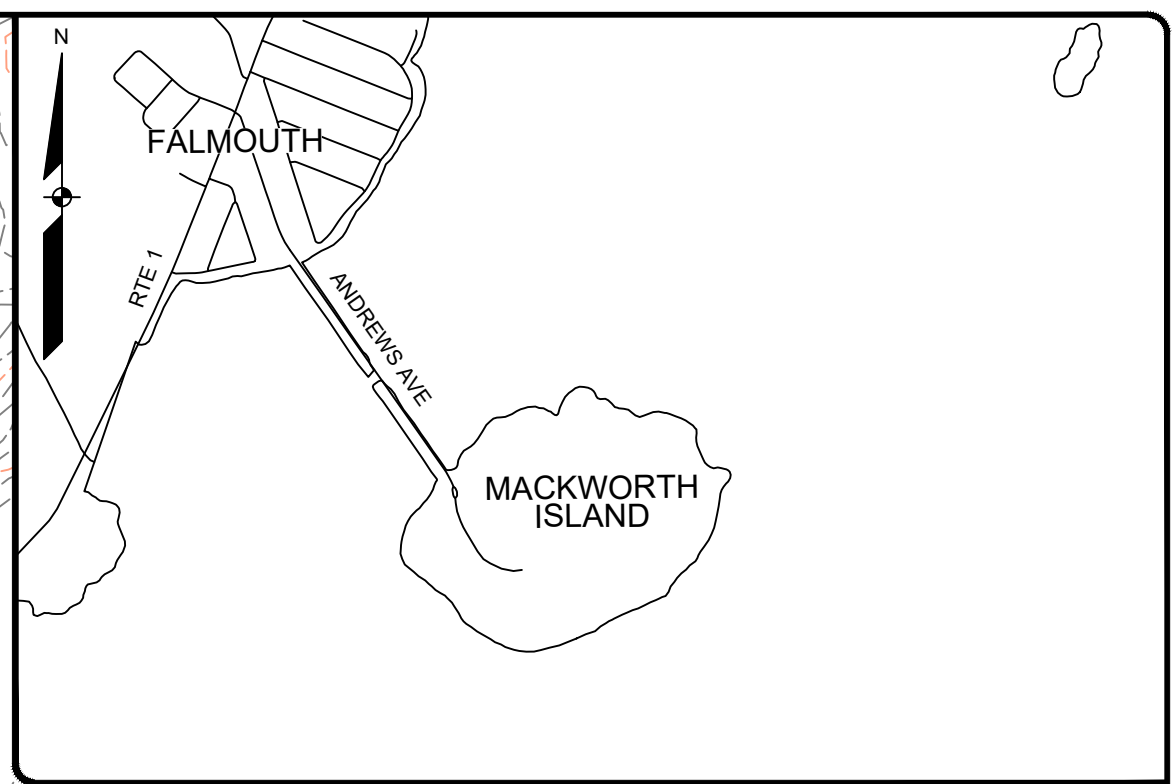
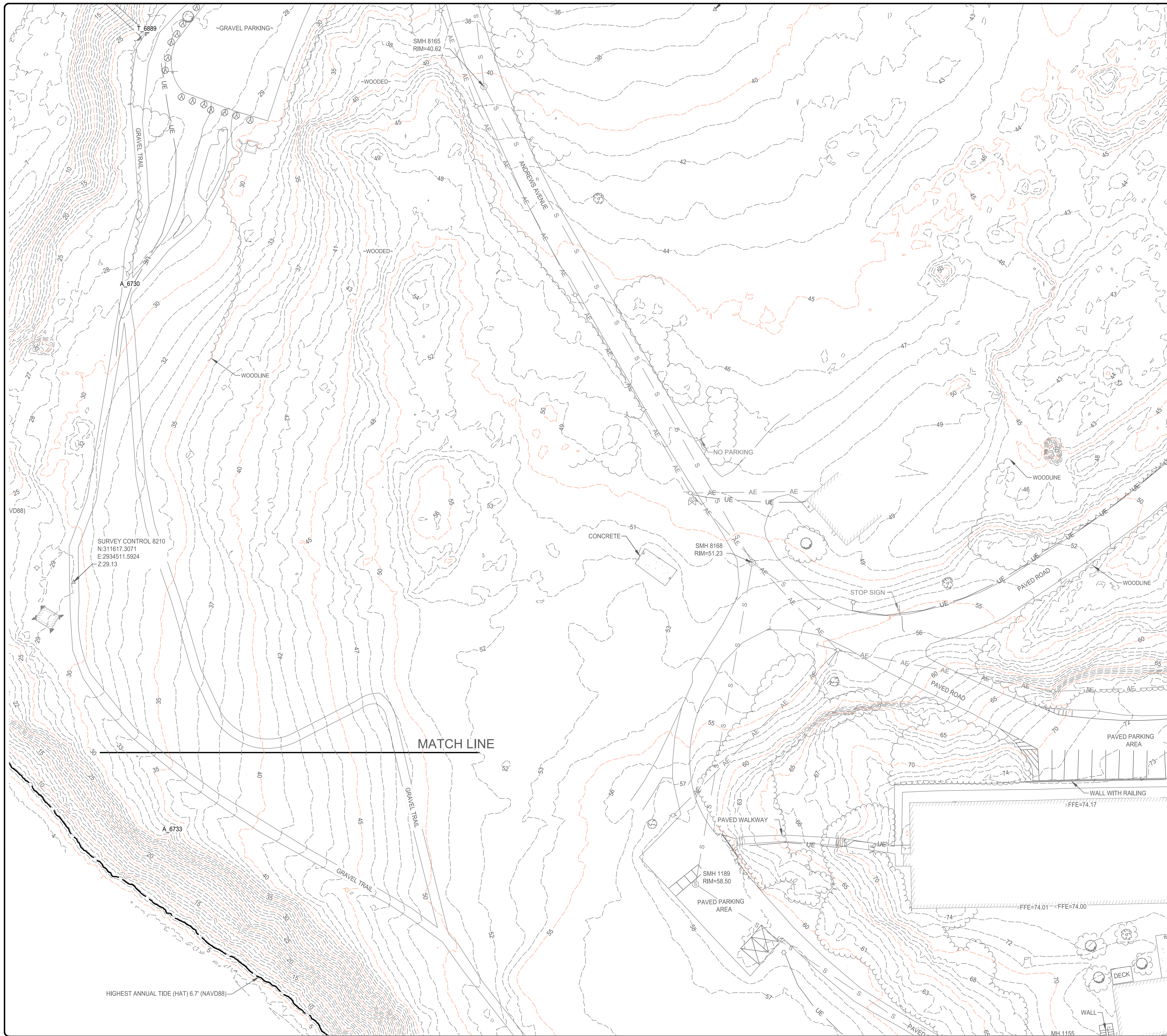
EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB NSE Sh. 9

NICHOLAS S. ELLISTON, PLS 2518

PLS DR PE



LOCATION MAP

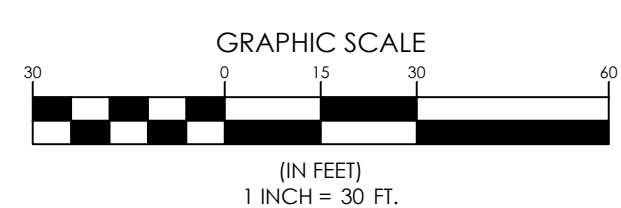
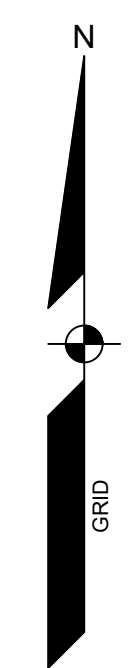
GENERAL NOTES:

- TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED UPON FIELD WORK PERFORMED BY SEBAGO TECHNICS, INC. IN NOVEMBER, 2022.
- TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED UPON FIELD WORK PERFORMED BY SEBAGO TECHNICS, INC. IN NOVEMBER 2022. TRADITIONAL SURVEY MEANS AND METHODS SUPPLEMENTED WITH LIDAR WERE EMPLOYED IN THE COLLECTION OF THIS TOPOGRAPHIC INFORMATION.
- PLAN ORIENTATION IS GRID NORTH, MAINE STATE PLANE COORDINATE SYSTEM, WEST ZONE 1802-NA083. ELEVATIONS DEPICTED HEREON ARE NAVD88, BASED ON DUAL FREQUENCY GPS OBSERVATIONS.
- BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
A_6730		
A_6733		
SMH 8165	RIM=40.62	
SMH 8168	RIM=51.23	
SMH 1189	RIM=58.50	
- UTILITY INFORMATION DEPICTED HEREON, UNLESS OTHERWISE NOTED, IS OF QUALITY LEVEL D PER AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) STANDARD CI/ASCE 38-02. UTILITIES DEPICTED HEREON MAY NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC. (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO CONSTRUCTION AND/OR EXCAVATION.

LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
- STORM DRAIN
- DRAINAGE MANHOLE
- CATCH BASIN
- CULVERT
- TRANSFORMER PAD
- LIGHT POLE
- UTILITY POLE
- GUY WIRE
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



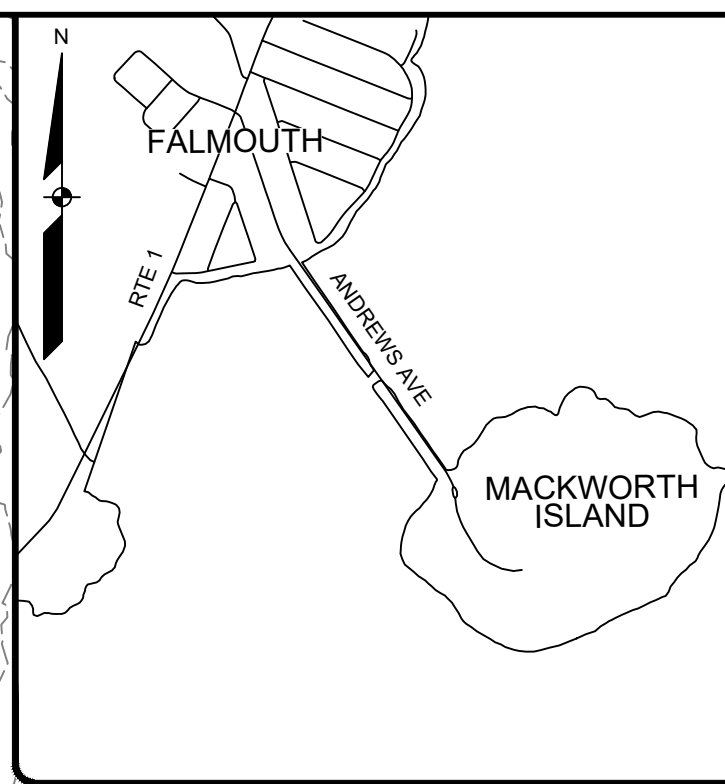
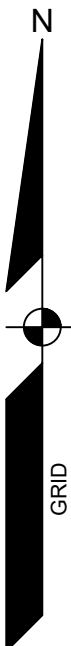
NICHOLAS S. ELLISTON, PLS 2518

REV	NO	DATE	ISSUED TO CLIENT	STATUS

SEBAGO TECHNICS
 SEBAGOTECHNICS.COM
 75 John Roberts Rd, Suite 4A
 South Portland, ME 04106
 207-889-2100
 South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
 OF:
MACKWORTH ISLAND TRAIL LOOP
 ANDREWS AVENUE CAUSEWAY
 FALMOUTH, MAINE 04105
 FOR:
HARRIMAN
 23 HARRIMAN DRIVE
 AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

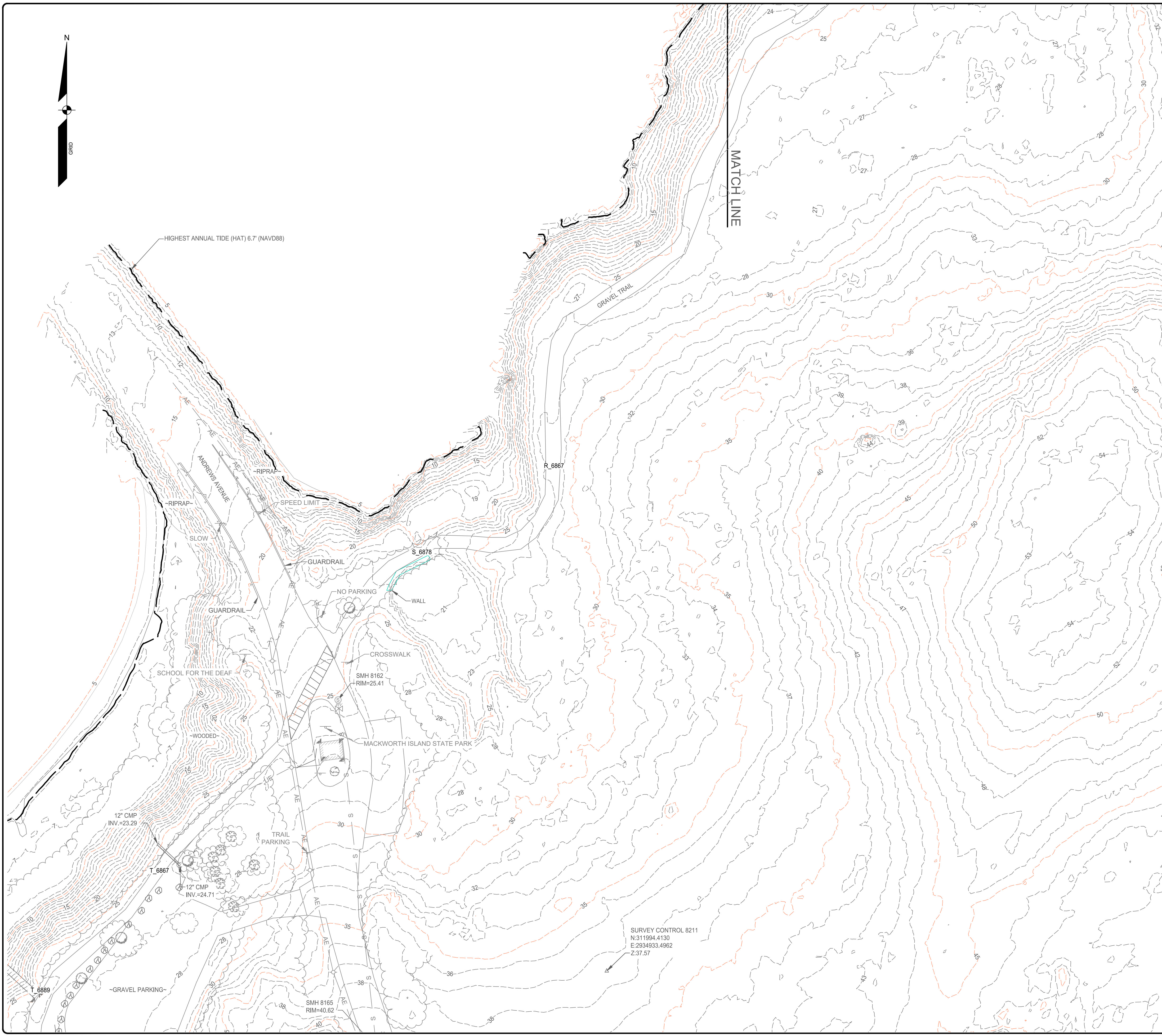


LOCATION MAP

GENERAL NOTES:

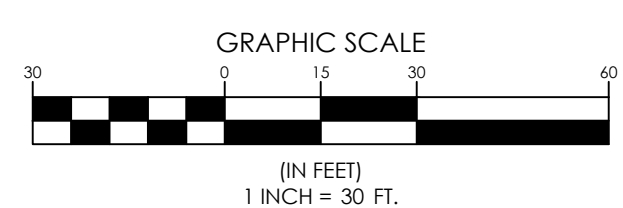
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- BENCHMARK:

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- SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518

PLS DR PE

REV	BY	DATE	ISSUED TO CLIENT	STATUS

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TECHNICS
SEBAGOTECHNICS.COM
75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-265-2100

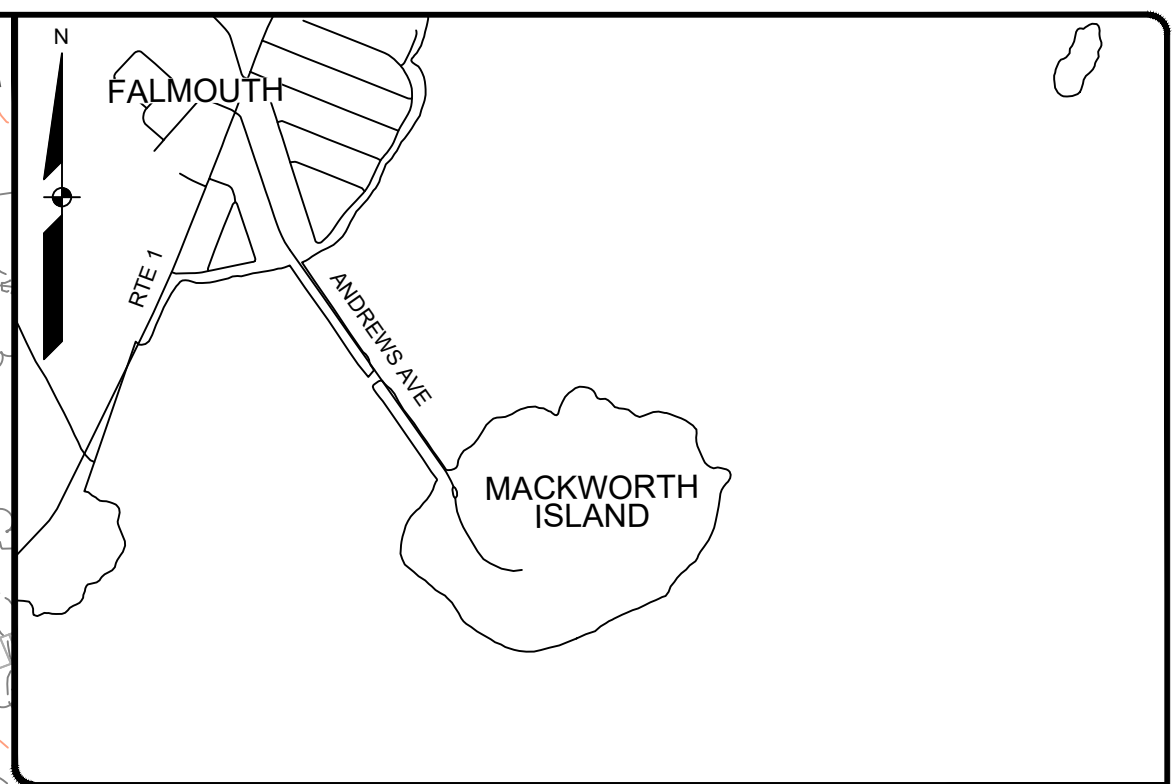
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURY, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

SHEET 11 OF 14

220594.dwg, TAB: NSE Sh. 11

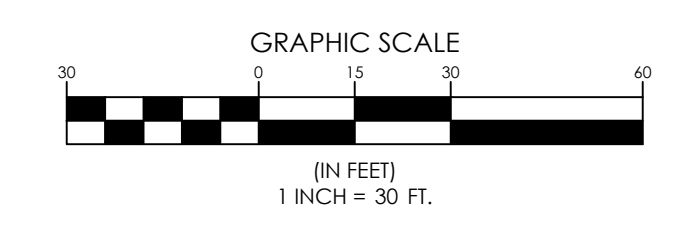


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4. BENCHMARK: BM-1 DESCRIPTION ELEVATION: (NAVD88)
5. UTILITY INFORMATION DEPICTED HEREON, UNLESS OTHERWISE NOTED, IS OF QUALITY LEVEL D PER AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) STANDARD C1ASCE 38-02. UTILITIES DEPICTED HEREON MAY NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC. (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO CONSTRUCTION AND/OR EXCAVATION.

LEGEND

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- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518

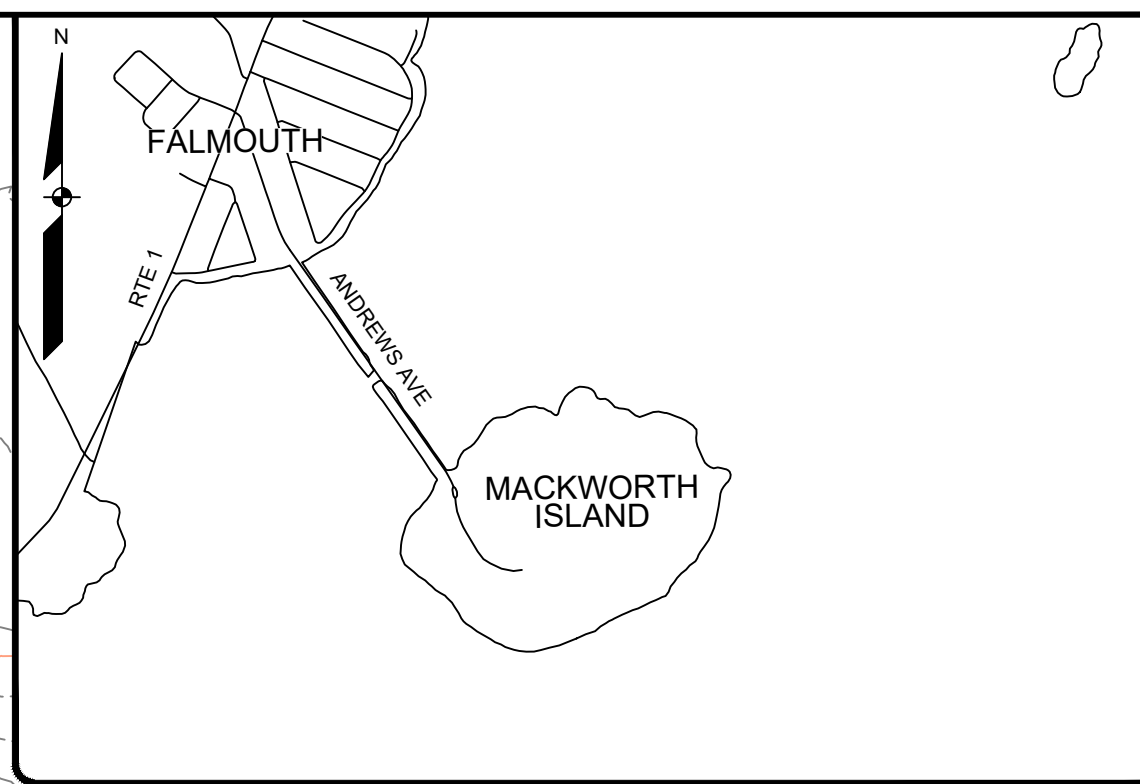
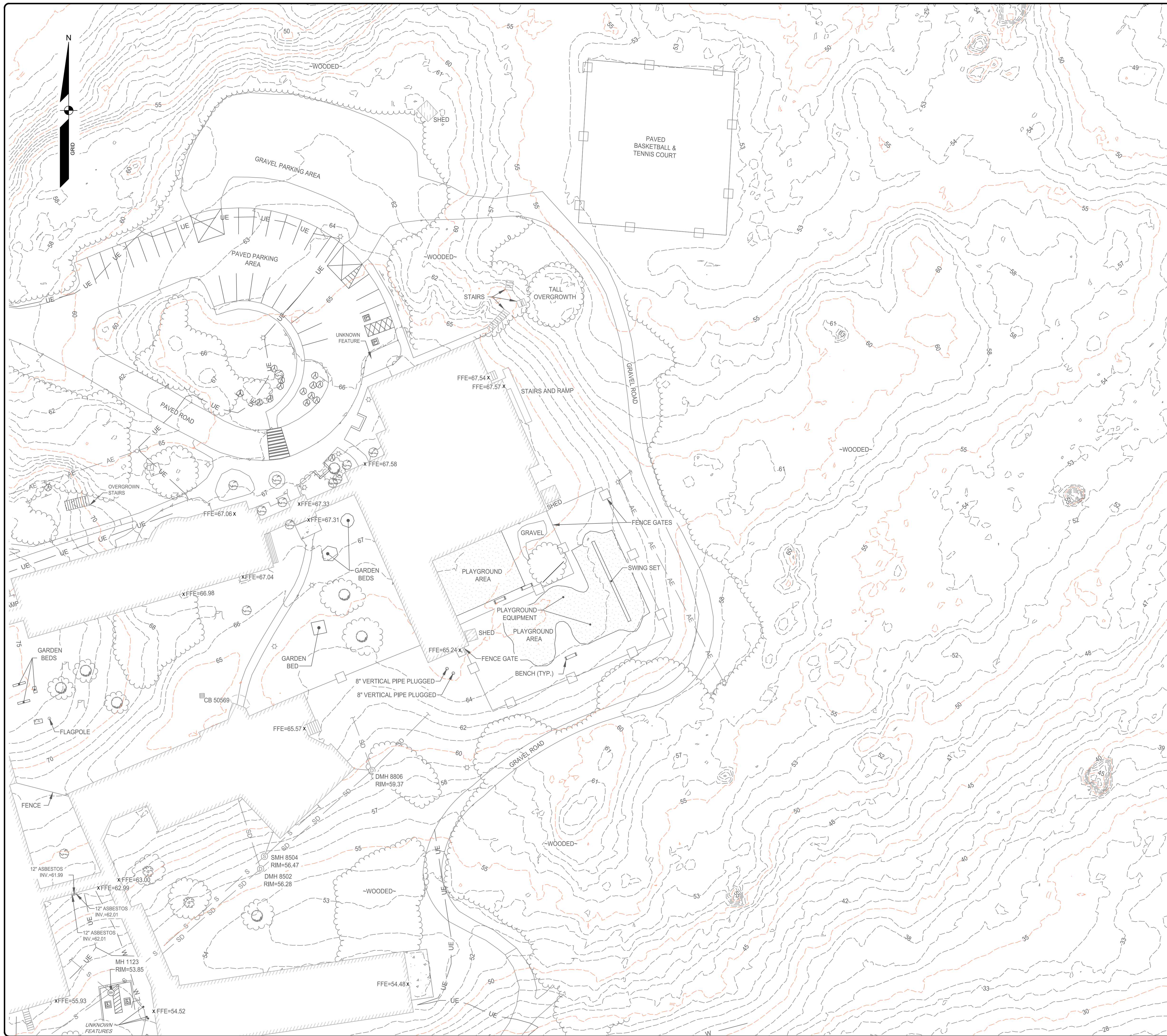
REV	NOSE	DATE	ISSUED TO CLIENT	STATUS

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TECHNICS, INC.
SEBAGOTECHNICS.COM
75 John Roberts Rd, Suite 4A
South Portland, ME 04106
207-230-9210
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



LOCATION MAP

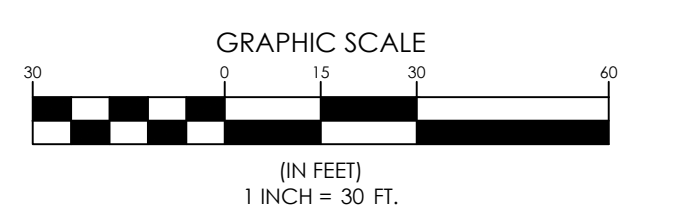
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- BENCHMARK:

BM-1	DESCRIPTION	ELEVATION: (NAVD88)
FFE=67.54 X		
FFE=67.57 X		
X FFE=67.58		
X FFE=67.33		
X FFE=67.31		
X FFE=67.04		
X FFE=66.98		
X FFE=67.06 X		
X FFE=65.24 X		
X FFE=65.57 X		
X FFE=54.48 X		
X FFE=55.93		
X FFE=54.52		
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LEGEND

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- SURVEY CONTROL



NICHOLAS S. ELLISON, PLS 2518

REV	NO	DATE	ISSUED TO CLIENT	STATUS

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SEBAGO TECHNICS
 SEBAGOTECHNICS.COM
 75 John Roberts Rd, Suite 4A
 South Portland, ME 04106
 207-886-2100
 South Portland, Bridgton, Sanford and Bath

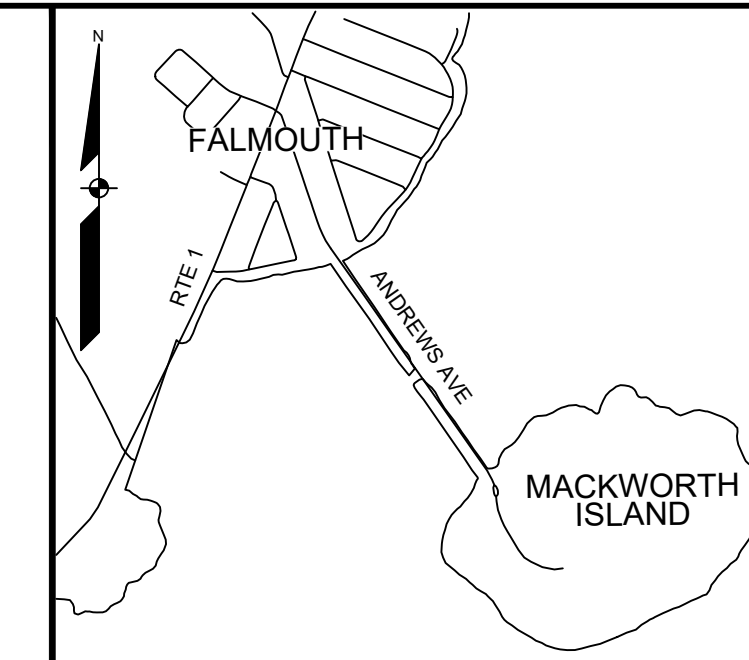
EXISTING CONDITIONS SURVEY
 OF:
MACKWORTH ISLAND TRAIL LOOP
 ANDREWS AVENUE CAUSEWAY
 FALMOUTH, MAINE 04105
 FOR:
HARRIMAN
 23 HARRIMAN DRIVE
 AUBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

SHEET 13 OF 14

220594.dwg, TAB NSE SH. 13

POINT #	STRUCTURE TYPE	RIM EL.	INV.	INV. EL.	SIZE	TYPE	LOCATION (N-12)	COMMENTS
1285	CB	73.23	IN	70.60	8	CLAY	5	
			OUT	70.55	6	CLAY	11	
			SUMP	70.60				
1123	MH	53.85	IN	47.60	UNKNOWN	UNKNOWN	10	FROM BUILDING?
			IN	46.40	10	CLAY	2	WHERE DOES IT ORIGINATE?
			OUT	46.40	15	CLAY	7	TO MH IN FIELD
			SHELF	47.05				
1143	SMH	66.47	IN	61.23	8	CI	4	FOLLOWS ROAD
			OUT	60.53	6	CLAY	10	FOLLOWS ROAD
			SHELF	61.25				
1155	MH SQUARE	68.64	IN	63.69	8	CLAY	4	NOT IN USE
			OUT	63.69	8	CLAY	10	NOT IN USE
1157	MH SQUARE	68.63	IN	63.69	8	CLAY	4	NOT IN USE
			OUT	63.69	8	CLAY	10	NOT IN USE
1189	SMH	58.47	IN	50.55	8	CLAY	4	
			OUT	50.50	8	CLAY	12	
			SHELF	51.12				
8162	SMH	25.26	0	25.41	0	0	0	
8165	SMH	40.59	IN	33.34	8	CLAY	5	
			OUT	31.47	8	CLAY	11	
8168	SMH	51.18	IN	44.03	8	CLAY	7	
			IN	44.23	6	CLAY	4	FOLLOWS ROAD
			OUT	42.31	8	CLAY	11	FOLLOWS ROAD
8500	MH	54.01	IN	43.22	15	CLAY	2	FROM PARKING AREA
			IN	43.22	12	CLAY	9	
			OUT	43.17	12	CLAY	6	TO PUMP
			SHELF	44.07				
8502	DMH	56.27	IN	52.88	8	PVC	12	FROM BUILDING?
			IN	51.41	8	PVC	2	FROM DMH
			OUT	51.38	12	PVC	8	TO WHERE?
			SUMP	48.98				
8504	SMH	56.43	IN	51.17	4	PVC	1	FROM BUILDING?
			IN	51.07	8	PVC	2	FROM WHERE? PARALLEL BUILDING
			OUT	50.97	8	PVC	8	TO SMH
			SHELF	51.69				
8720	MH	68.42	0	68.44	0	0	0	
8722	MH	68.43	0	68.41	0	0	0	
8806	DMH	59.37	IN	53.97	4	HDPE	9	FROM BUILDING CORNER
			IN	53.87	8	PVC	2	
			IN	53.87	8	HDPE	11	
			OUT	53.85	8	PVC	7	TO DMH
			SUMP	53.42				



LOCATION MAP

N.T.S.

REV.	BY	DATE	STATUS
A	NSE	02/21/2023	ISSUED TO CLIENT

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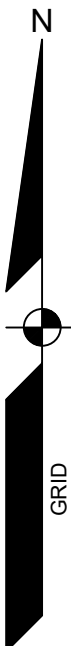
SEBAGO
TECHNIQS

SEBAGOTECHNIQS.COM
75 John Roberts Rd., Suite 4A
South Portland, ME 04106
207-260-2100

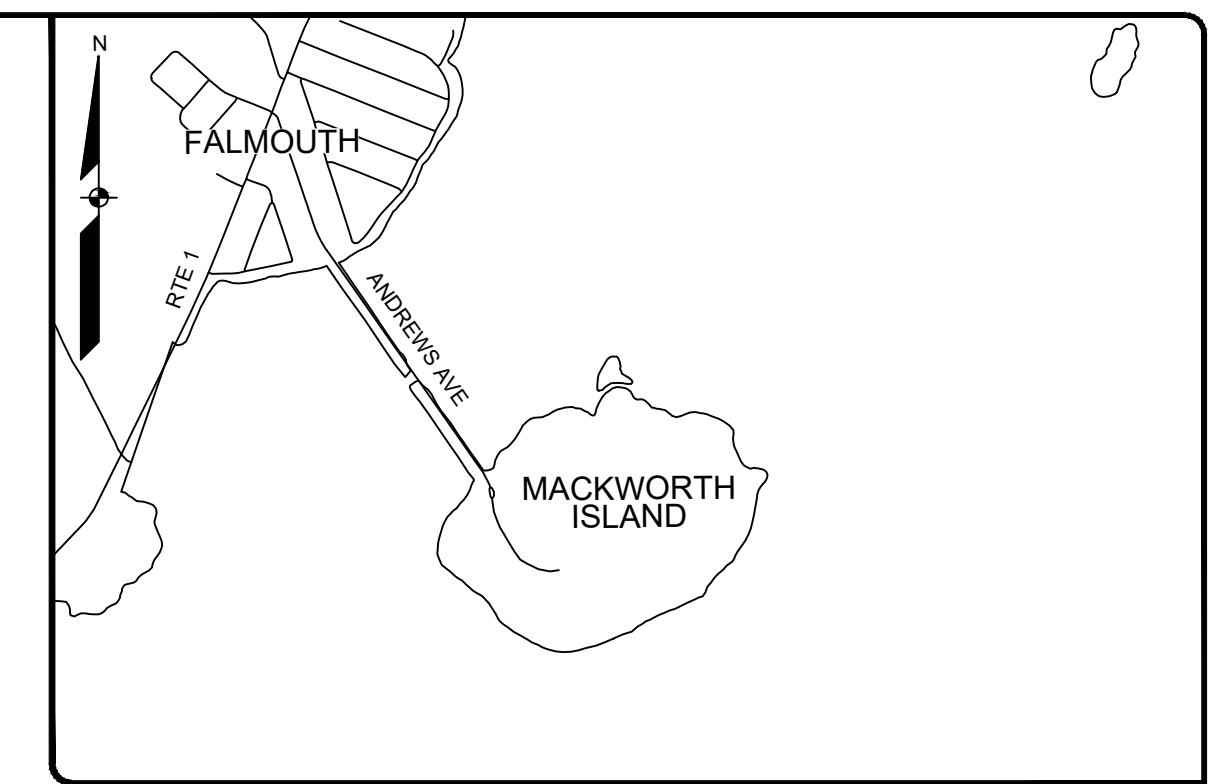
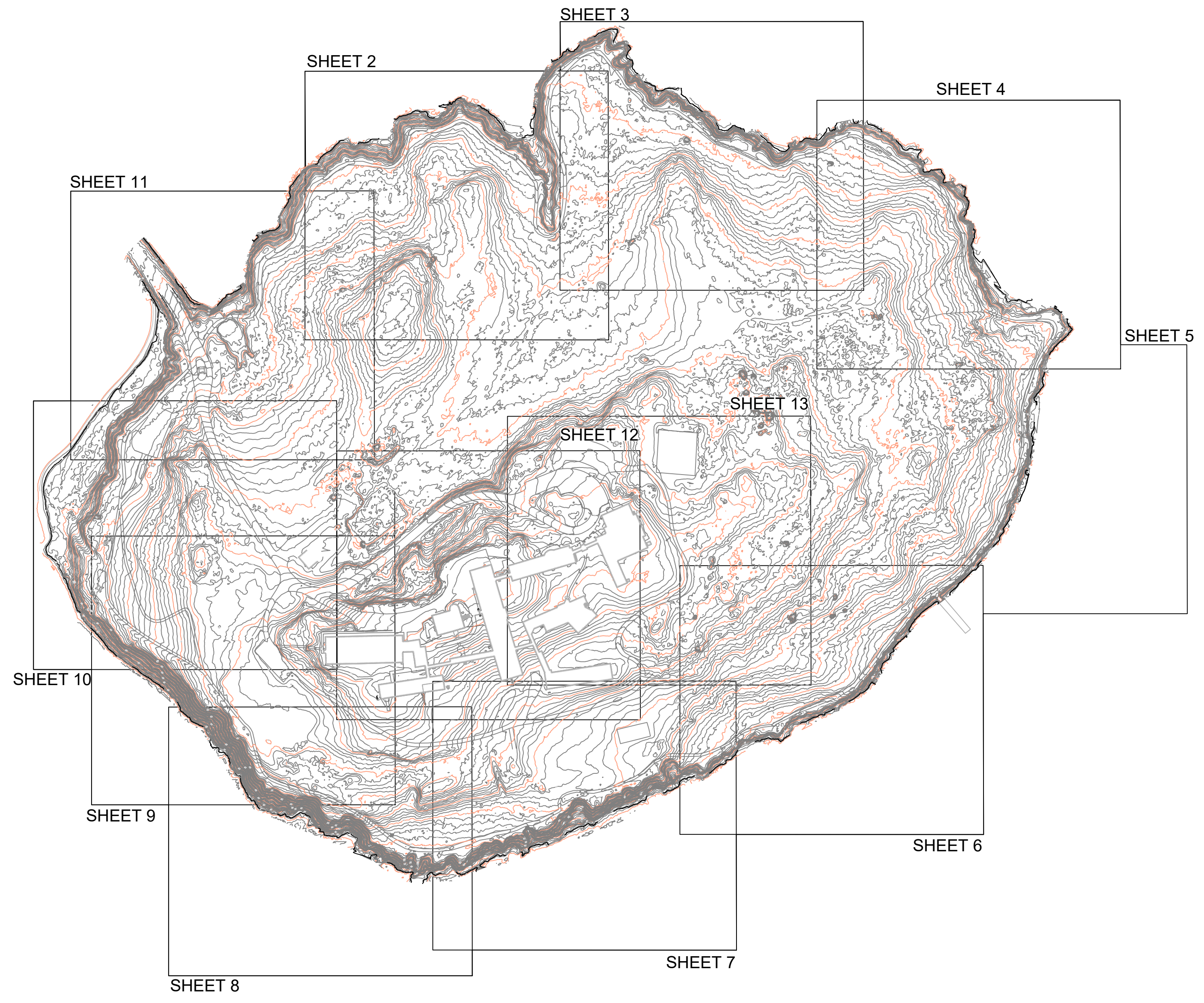
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
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FALMOUTH, MAINE 04105
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23 HARRIMAN DRIVE
AUBURN, MAINE 04210

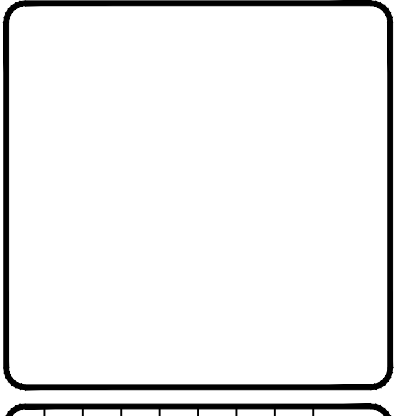
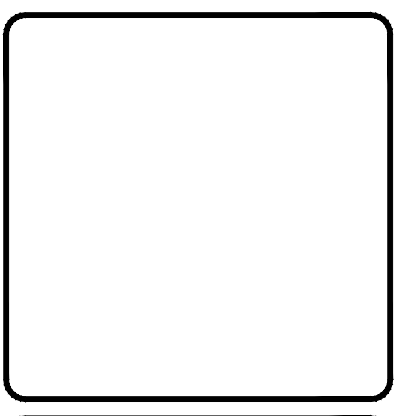
DESIGNED	-
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



MACWORTH ISLAND PROJECT LAYOUT
NOT TO SCALE



LOCATION MAP



REV	NO	DATE	STATUS
1	NSE	02/10/2023	ISSUED TO CLIENT
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

SEBAGO
TECHNICALS

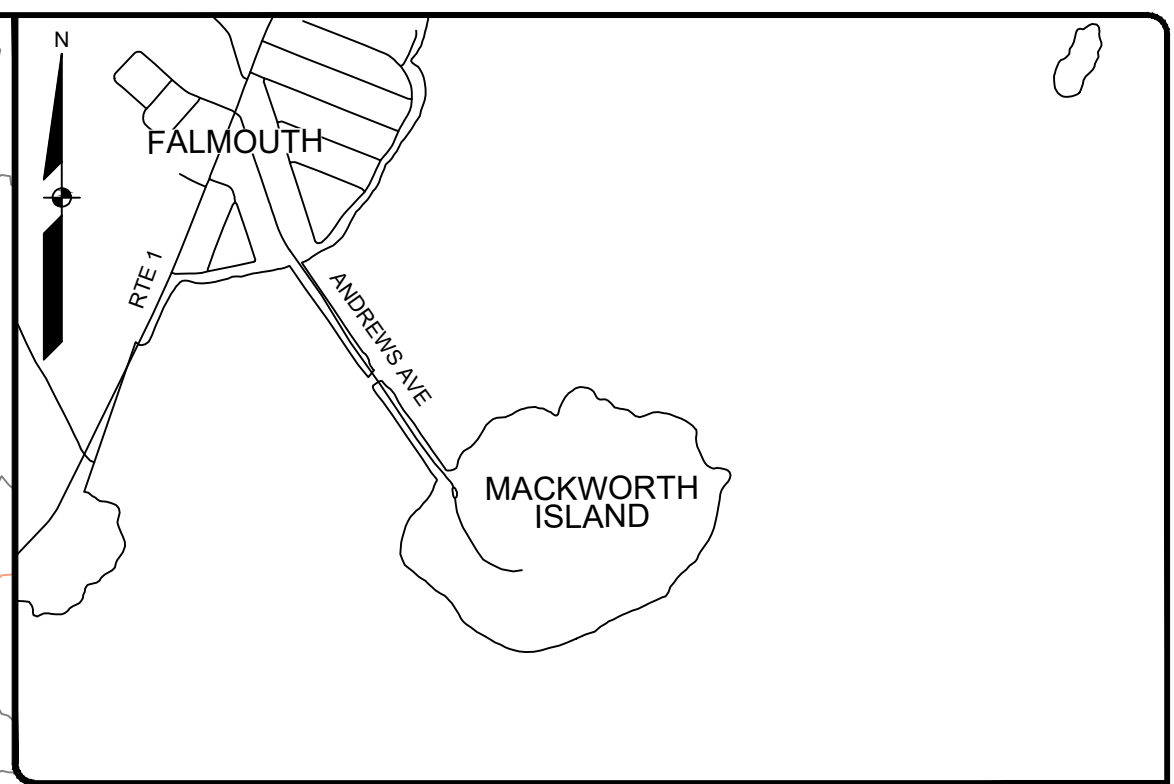
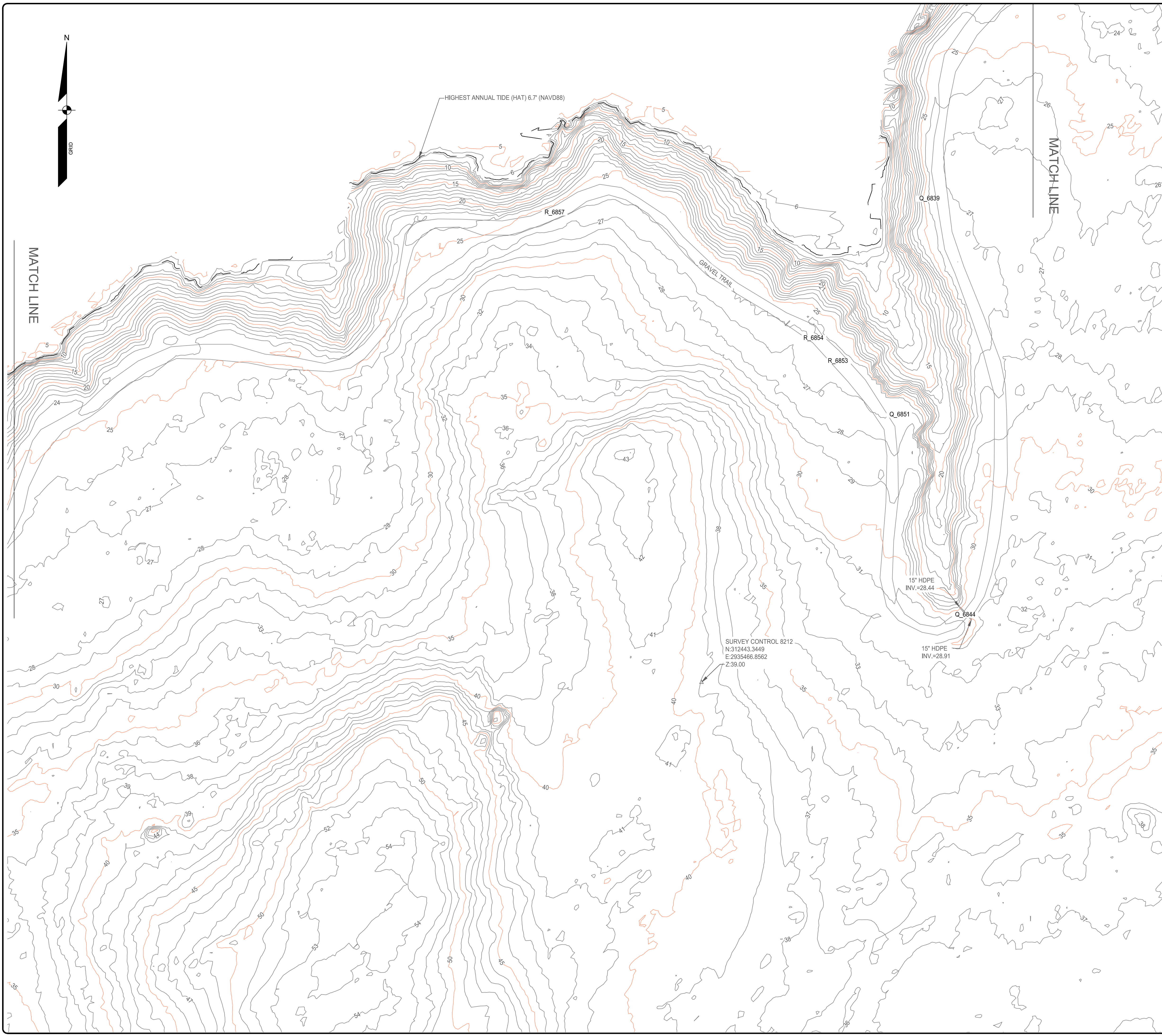
SEBAGOTECHNICALS.COM
75 John Roberts Rd, Suite 41A
South Portland, ME 04106
207-200-2100

South Portland, Bridgton, Sanford and Bath

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ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	-
DRAWN	JMC/CNG
CHECKED	NSE
DATE	11/15/22
SCALE	NONE
PROJECT	220594

NICHOLAS S. ELLISTON, PLS 2518 PLS OR PE

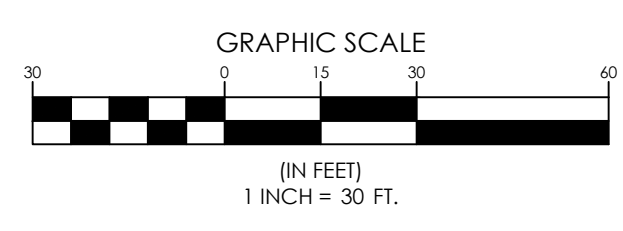


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2. PLAN ORIENTATION IS GRID NORTH, MAINE STATE PLANE COORDINATE SYSTEM, WEST ZONE, 1802-NAD83. US SURVEY FEET. ELEVATIONS DEPICTED HEREON ARE NAVD88, BASED ON DUAL FREQUENCY GNSS OBSERVATIONS.
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LEGEND

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	UTILITY POLE
	GUY WIRE
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	SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518
PLS OR PE

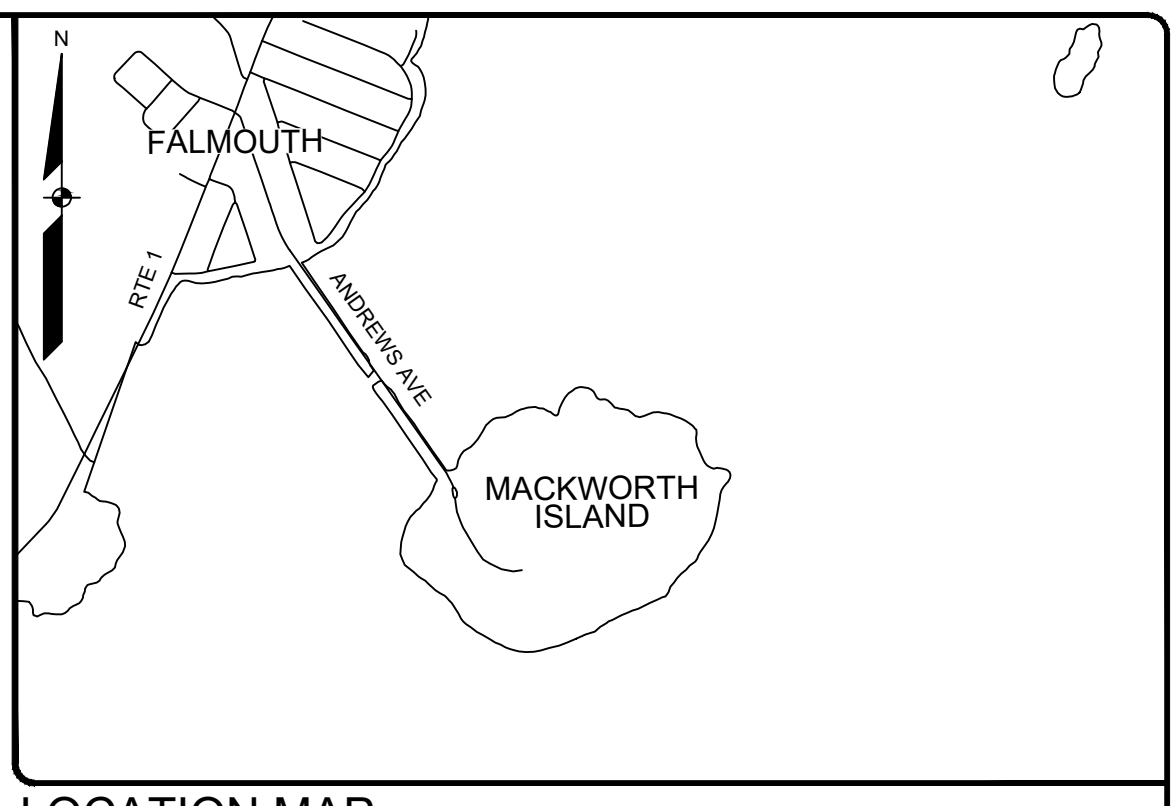
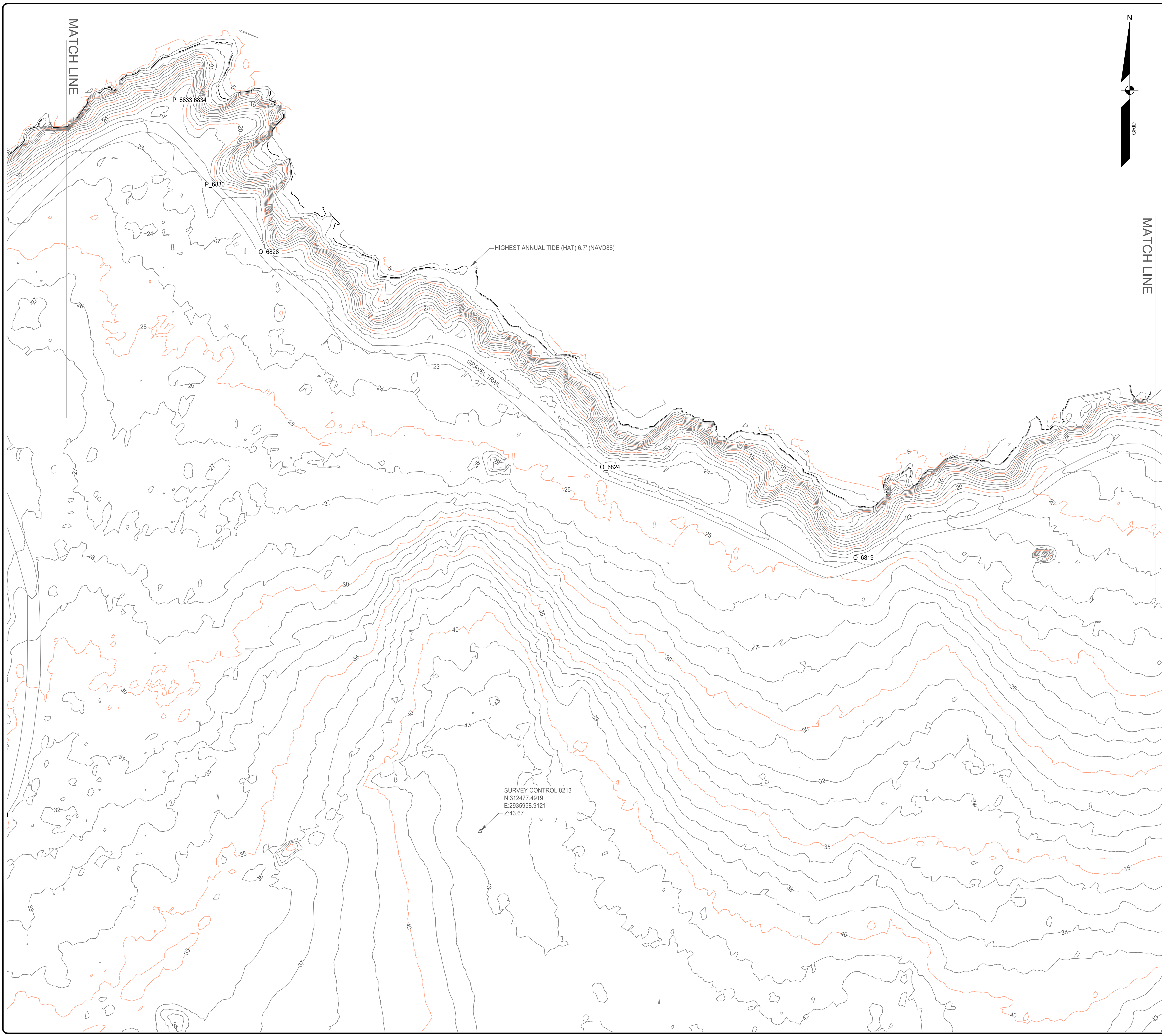
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TECHNICS
SEBAGOTECHNICS.COM
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South Portland, ME 04106
207-266-2100
South Portland, Bridgton, Sanford and Bath

EXISTING CONDITIONS SURVEY
OF:
MACKWORTH ISLAND TRAIL LOOP
ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	-
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

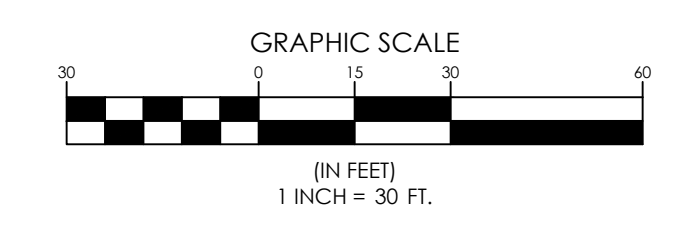


LOCATION MAP

MATCH LINE

LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
- HYDRANT
- WATER
- SANITARY MANHOLE
- SANITARY SEWER
- STORM DRAIN
- DRAINAGE MANHOLE
- CATCH BASIN
- CULVERT
- TRANSFORMER PAD
- LIGHT POLE
- UTILITY POLE
- GUY WIRE
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC
- GAS
- BOULDER
- PHOTO LOCATION
- SURVEY CONTROL



NICHOLAS S. ELLISTON, PLS 2518
PLS OR PE

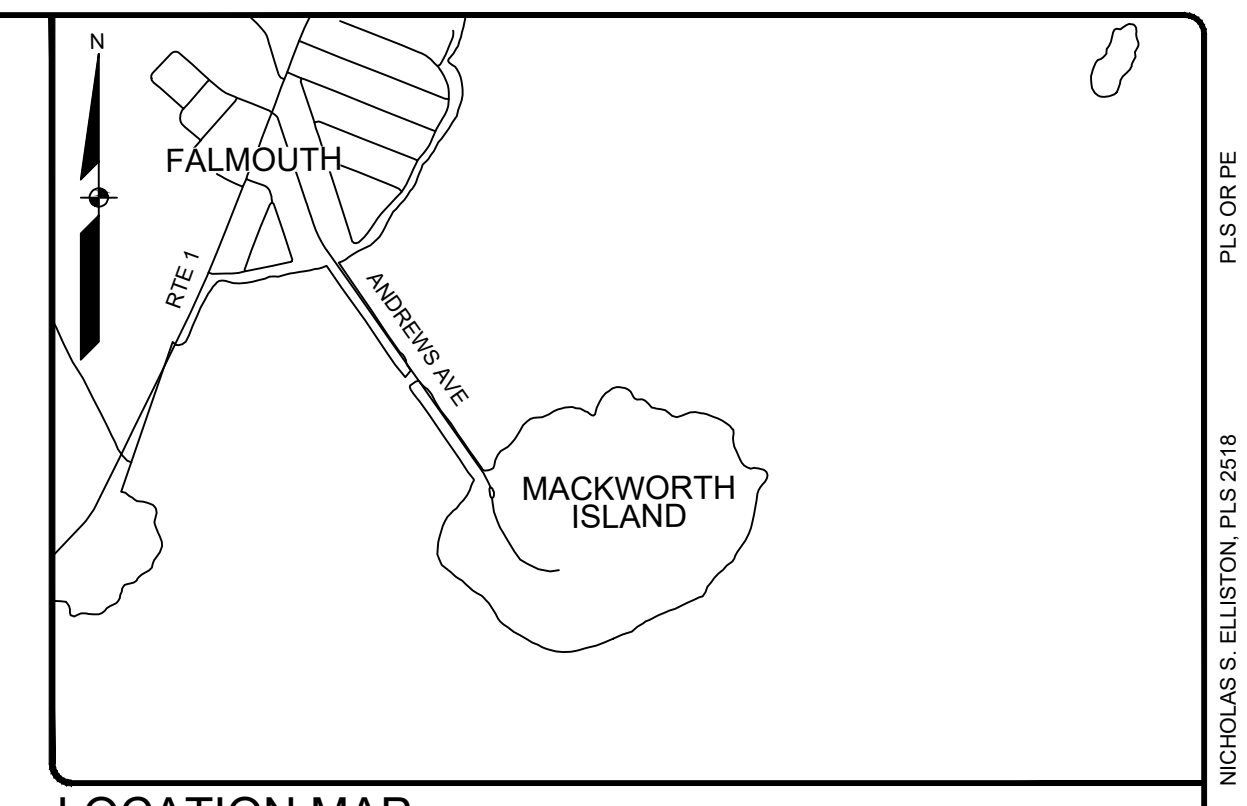
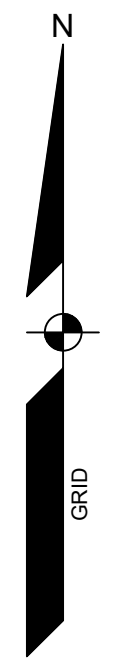
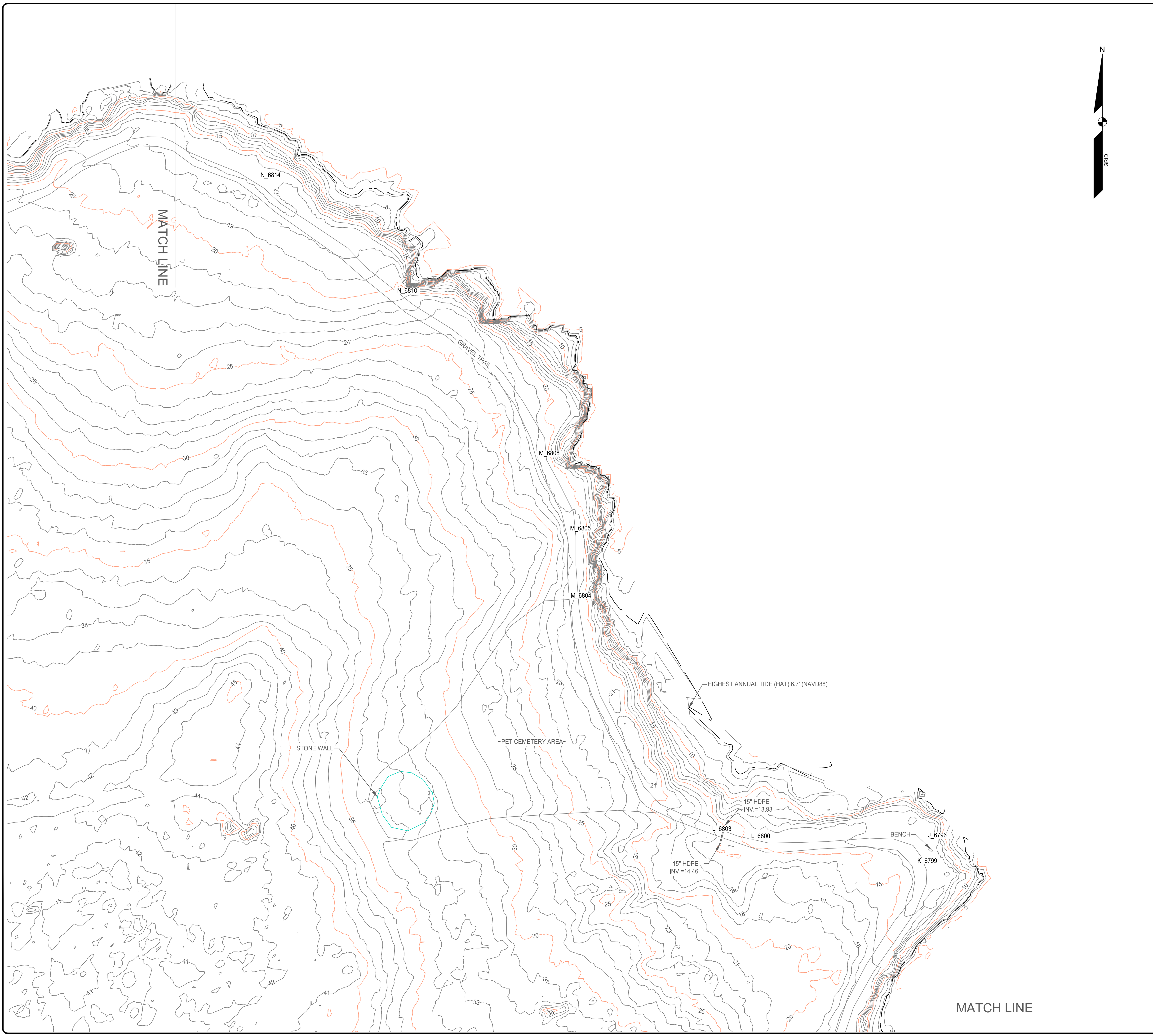
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REV | BY | DATE | STATUS |

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23 HARRIMAN DRIVE
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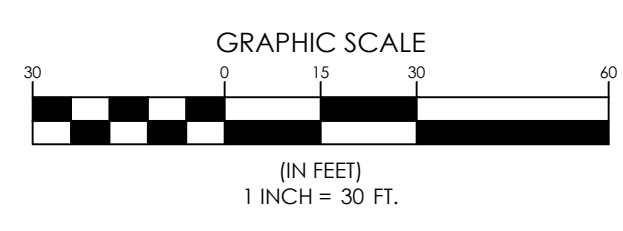
DESIGNED	-
DRAWN	JMC
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DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



LOCATION MAP

LEGEND

- DECIDUOUS TREE
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NICHOLAS S. ELLISTON, PLS 2518
PLS OR PE

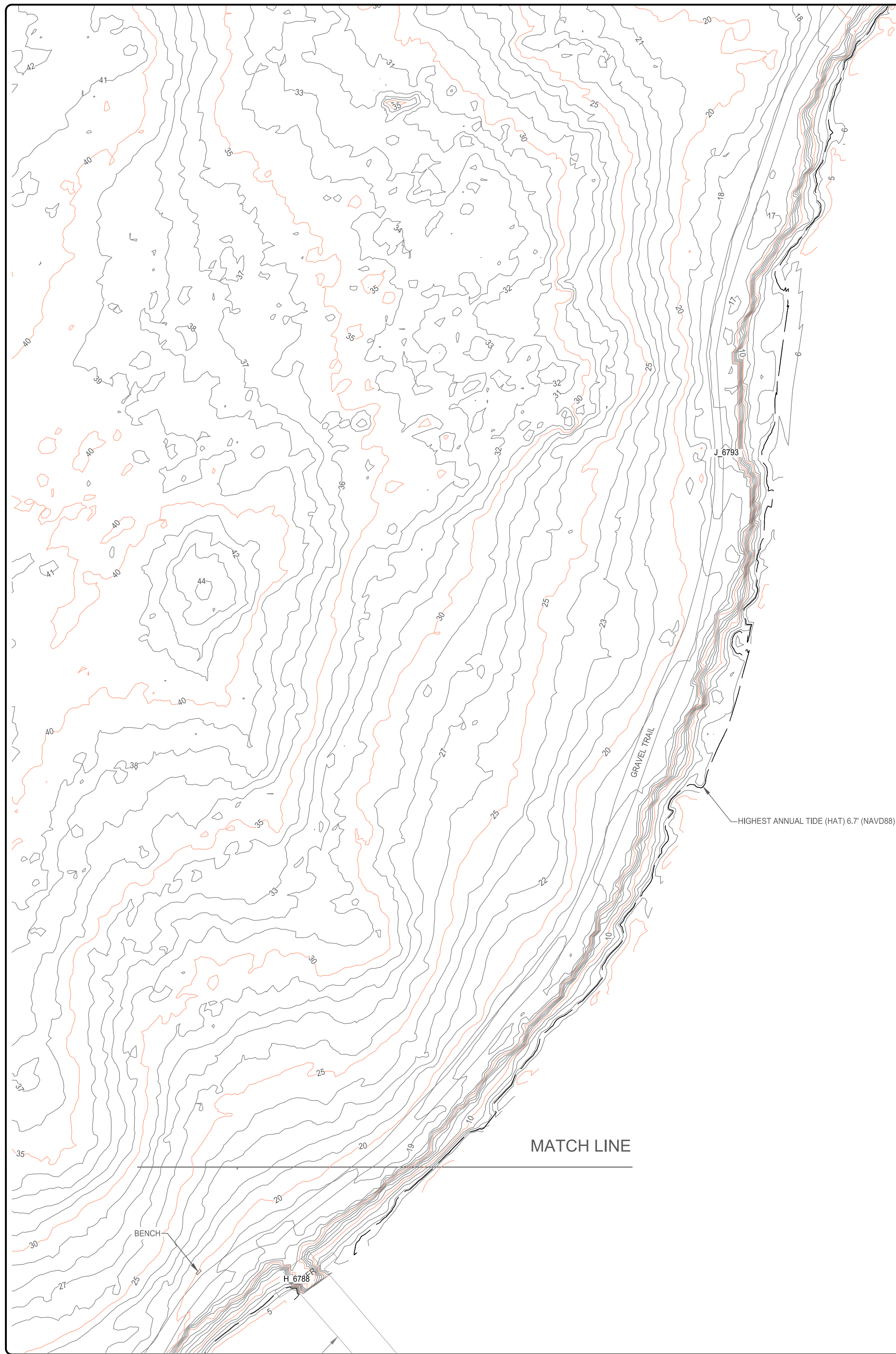
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REV | BY | DATE | STATUS |

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HARRIMAN
23 HARRIMAN DRIVE
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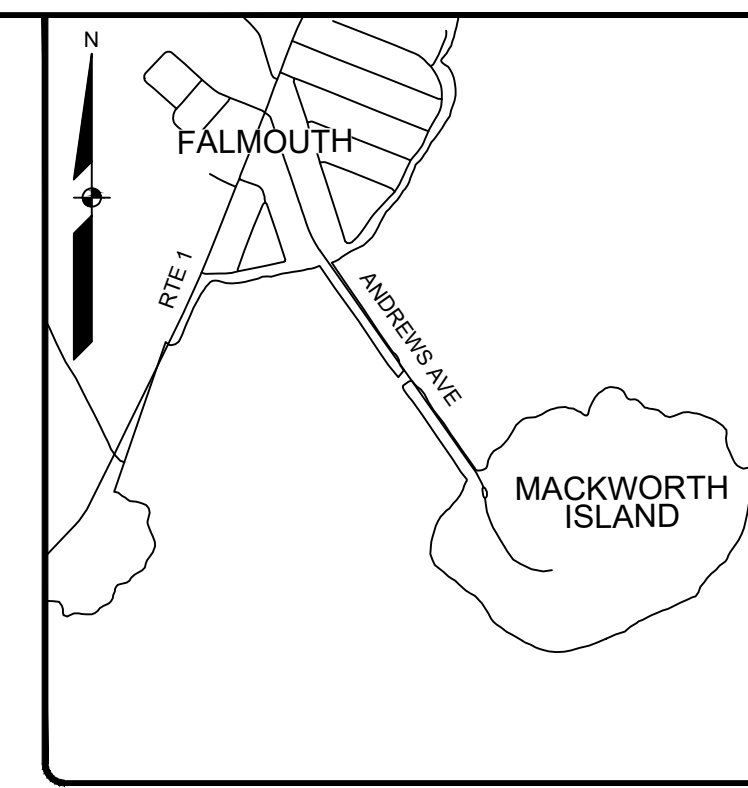
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DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



MATCH LINE

MATCH LINE

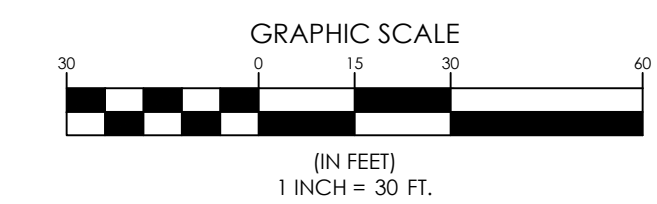
HIGHEST ANNUAL TIDE (HAT) 6.7 (NAVD88)



LOCATION MAP

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- STUMP
- SIGN
- BENCH
- CONTOURS
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PLS OR PE

REV	BY	DATE	STATUS
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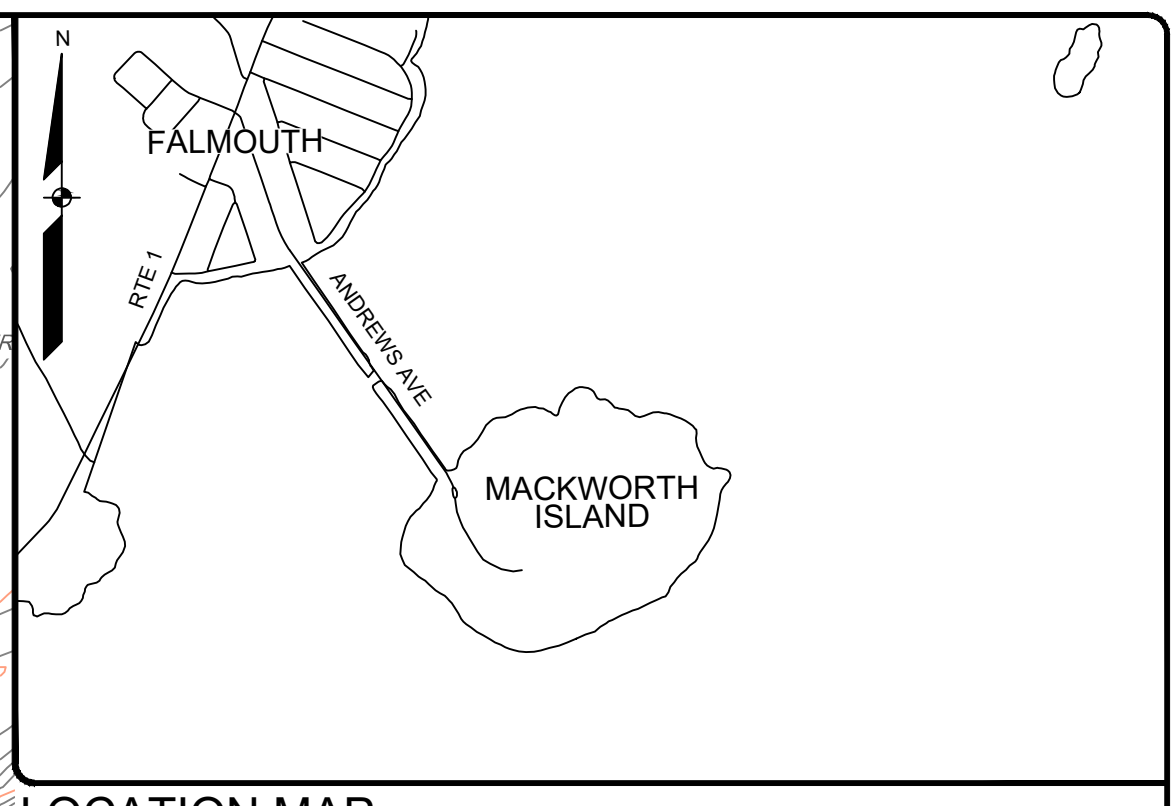
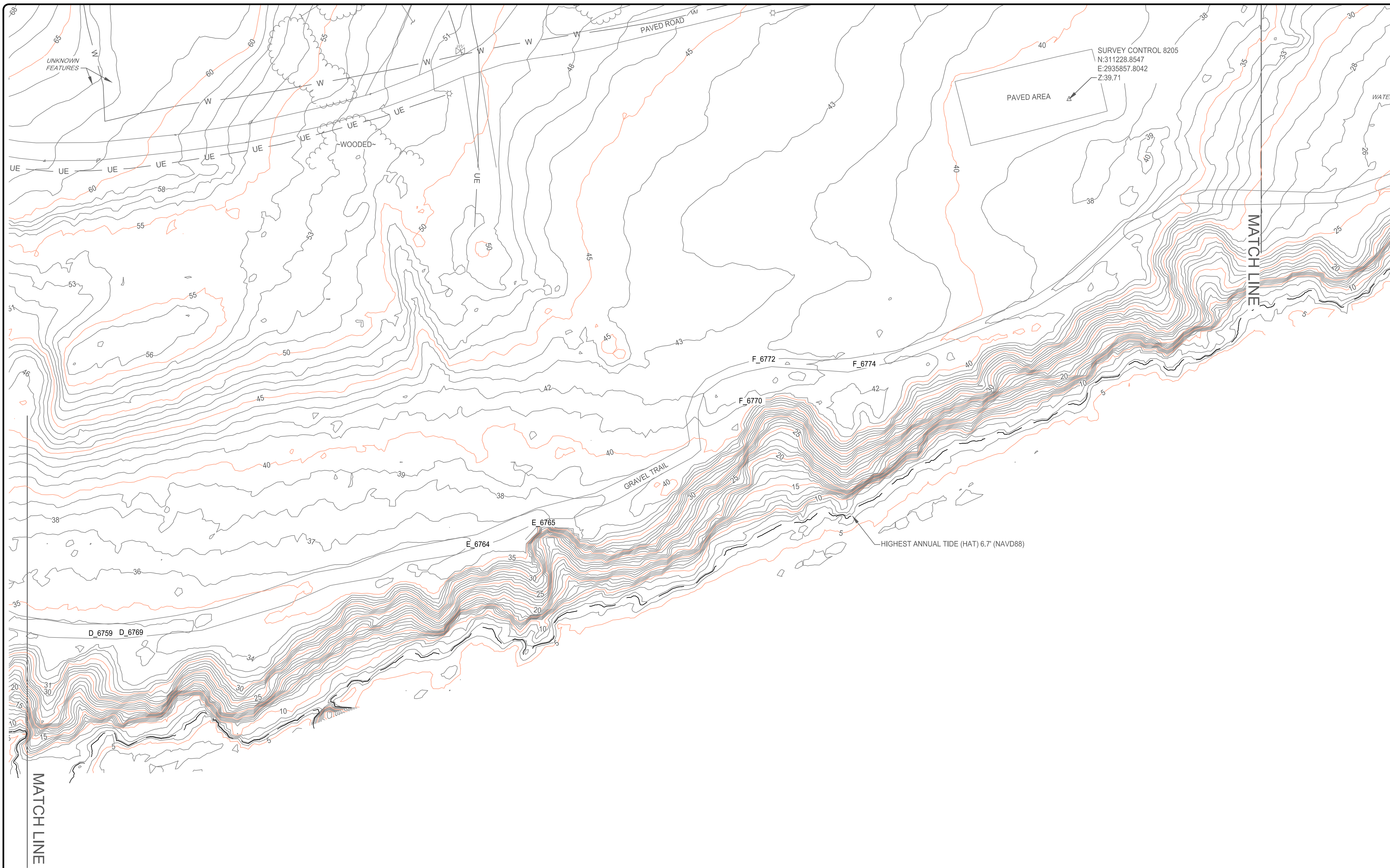
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207-206-2100

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23 HARRIMAN DRIVE
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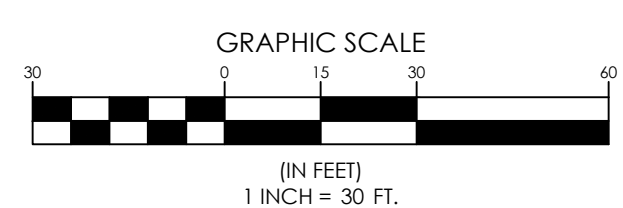
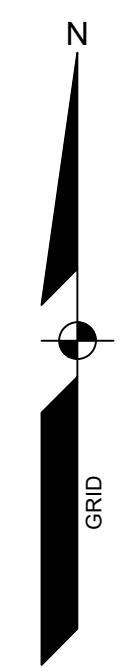
DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB NSE SH. 5



LEGEND

- DECIDUOUS TREE
- STUMP
- SIGN
- BENCH
- CONTOURS
- WATER GATE VALVE
- WATER SHUT OFF
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NICHOLAS S. ELLISON, PLS 2518

PLS OR FE

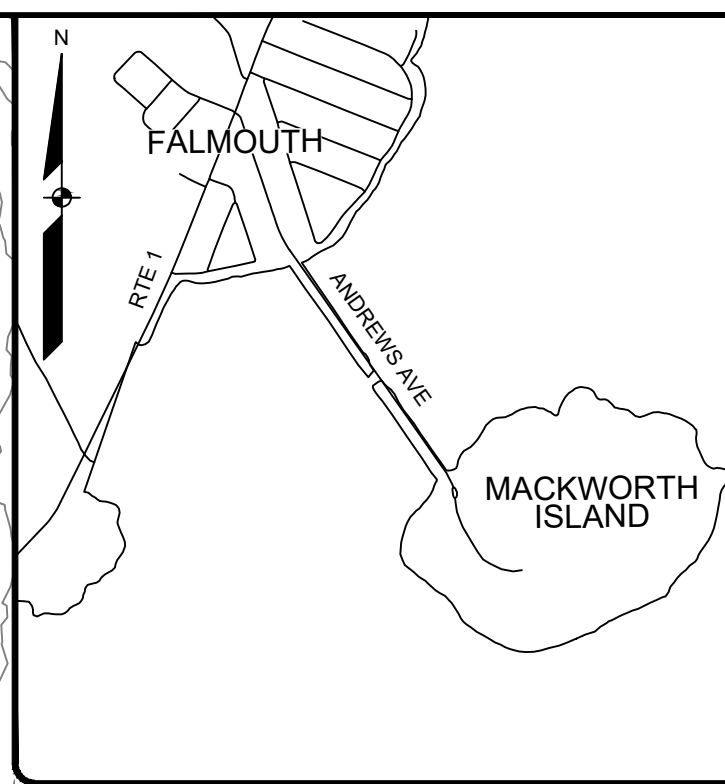
REV	BY	DATE	STATUS	ISSUED TO CLIENT

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SEBAGOTECHNICALS.COM
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207-262-2100
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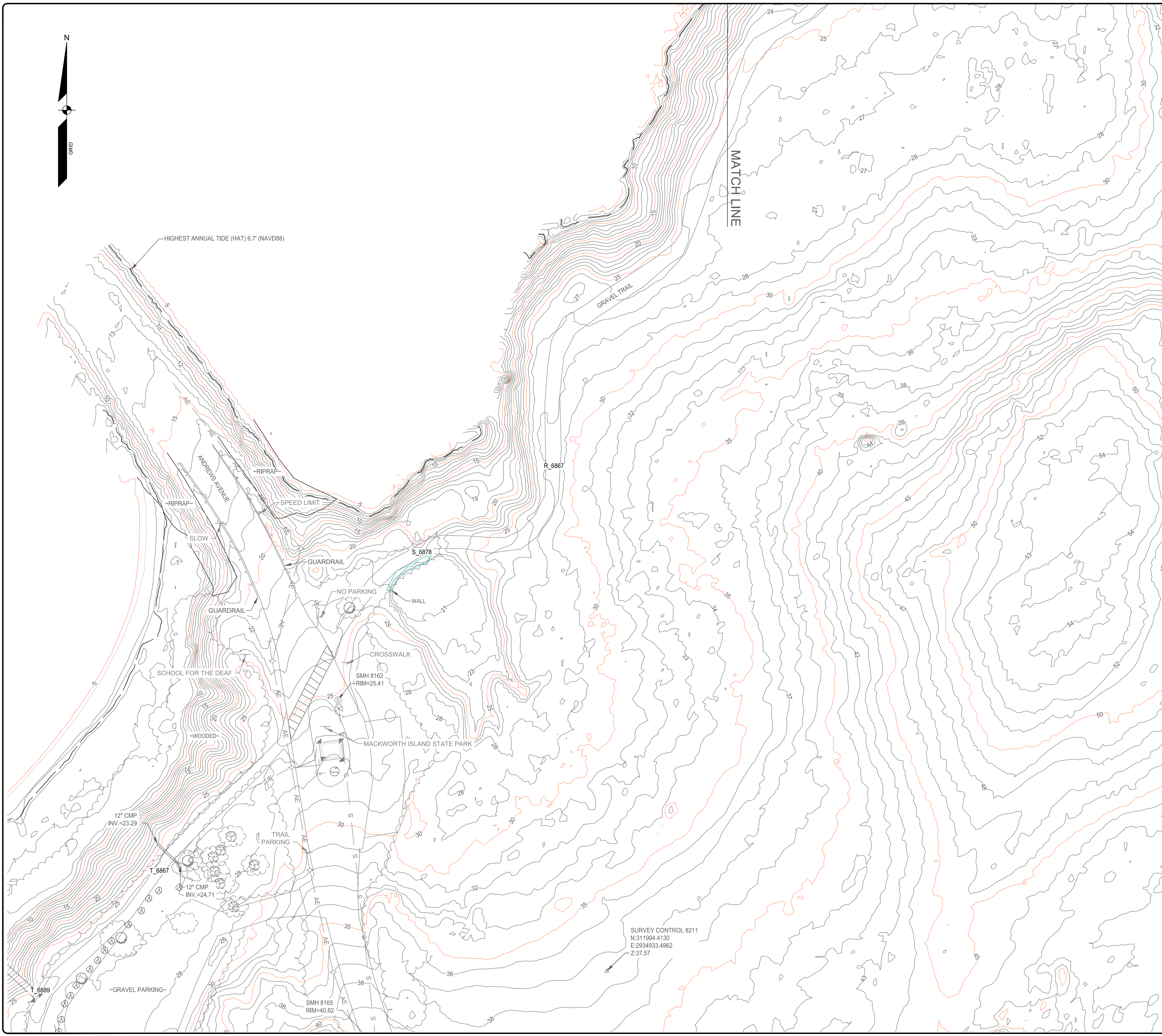
EXISTING CONDITIONS SURVEY
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ANDREWS AVENUE CAUSEWAY
FALMOUTH, MAINE 04105
FOR:
HARRIMAN
23 HARRIMAN DRIVE
ALBURN, MAINE 04210

DESIGNED	
DRAWN	JMC
CHECKED	NSE
DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

220594.dwg, TAB NSE Sh. 7



LOCATION MAP

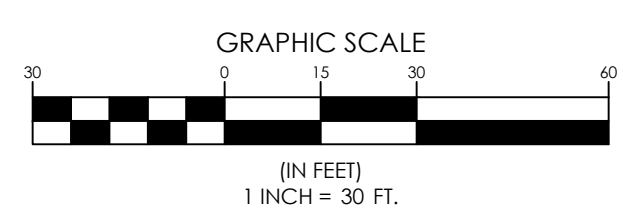


HIGHEST ANNUAL TIDE (HAT) 6.7' (NAVD88)

MATCH LINE

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REV | BY | DATE | STATUS

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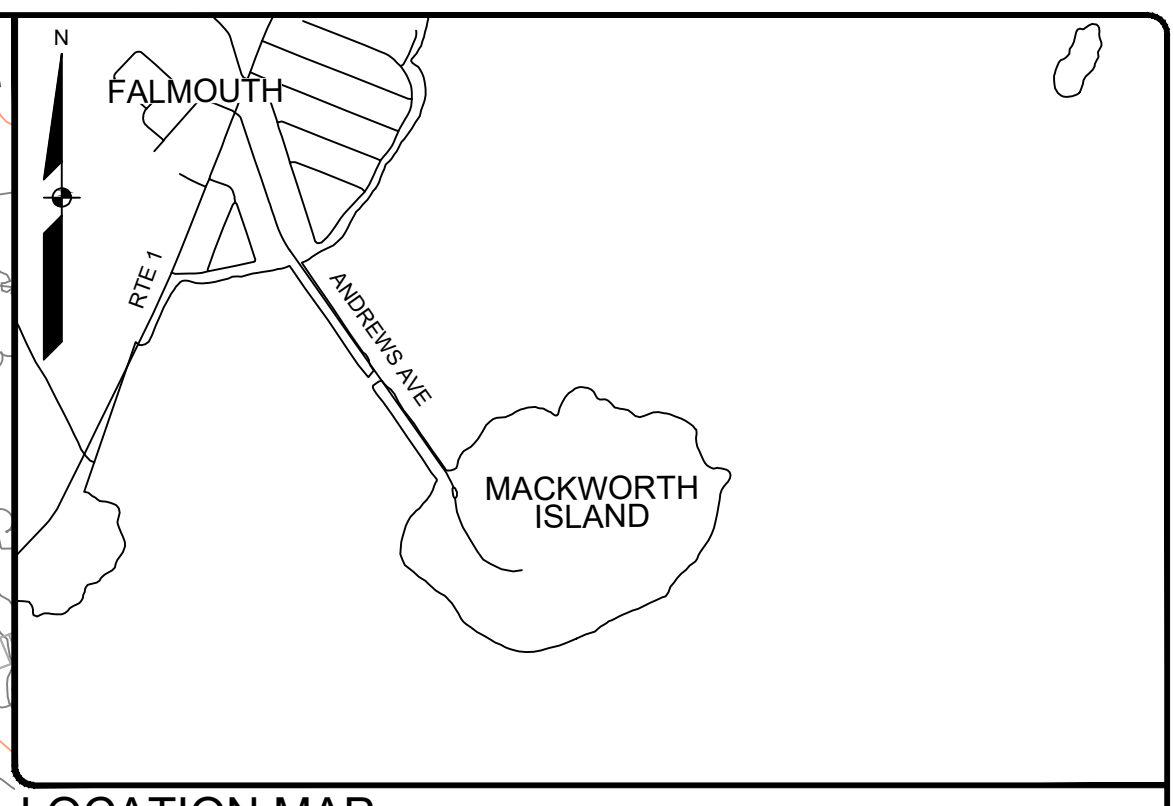
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207-265-2100

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FALMOUTH, MAINE 04105
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ALBURNY, MAINE 04210

DESIGNED	
DRAWN	JMC
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DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594

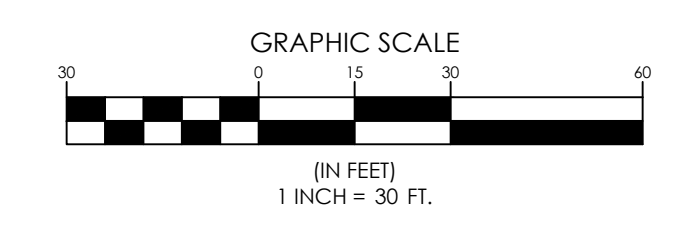
220594.dwg, TAB NSE Sh. 11



LOCATION MAP

LEGEND

	DECIDUOUS TREE
	STUMP
	SIGN
	BENCH
	CONTOURS
	WATER GATE VALVE
	WATER SHUT OFF
	HYDRANT
	WATER
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	GAS
	BOULDER
	PHOTO LOCATION
	SURVEY CONTROL



NICHOLAS S. ELLISON, PLS 2518

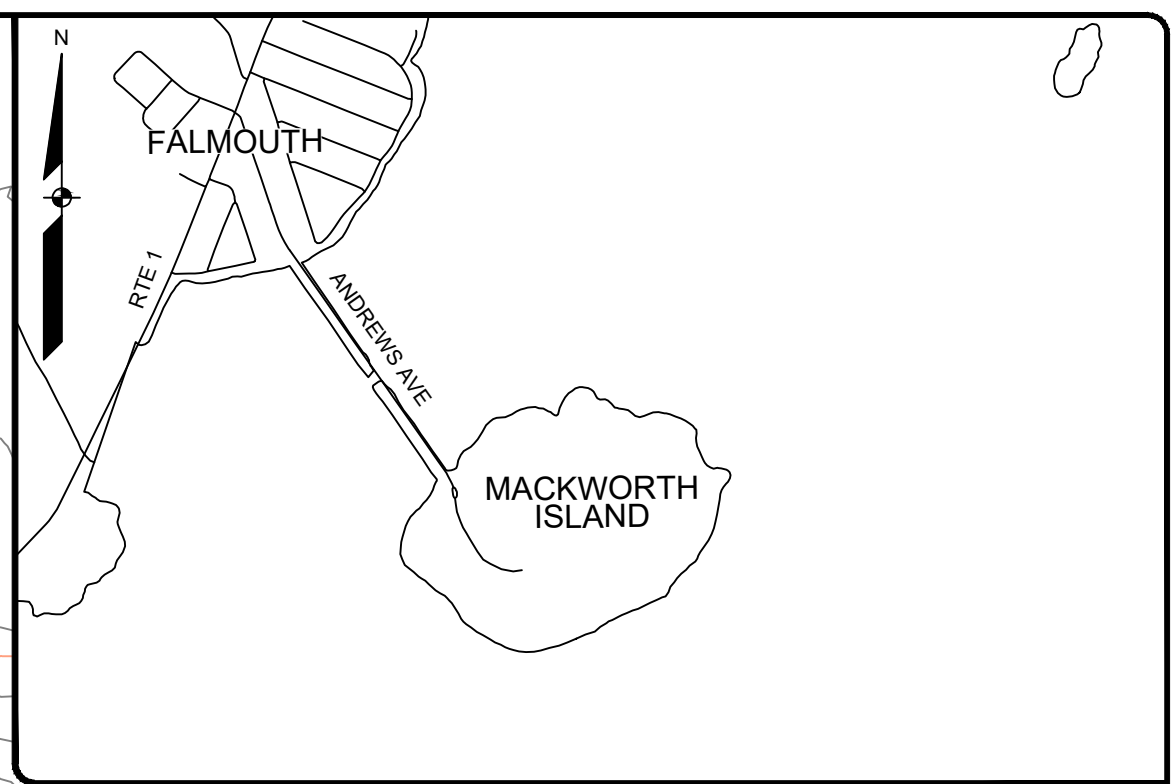
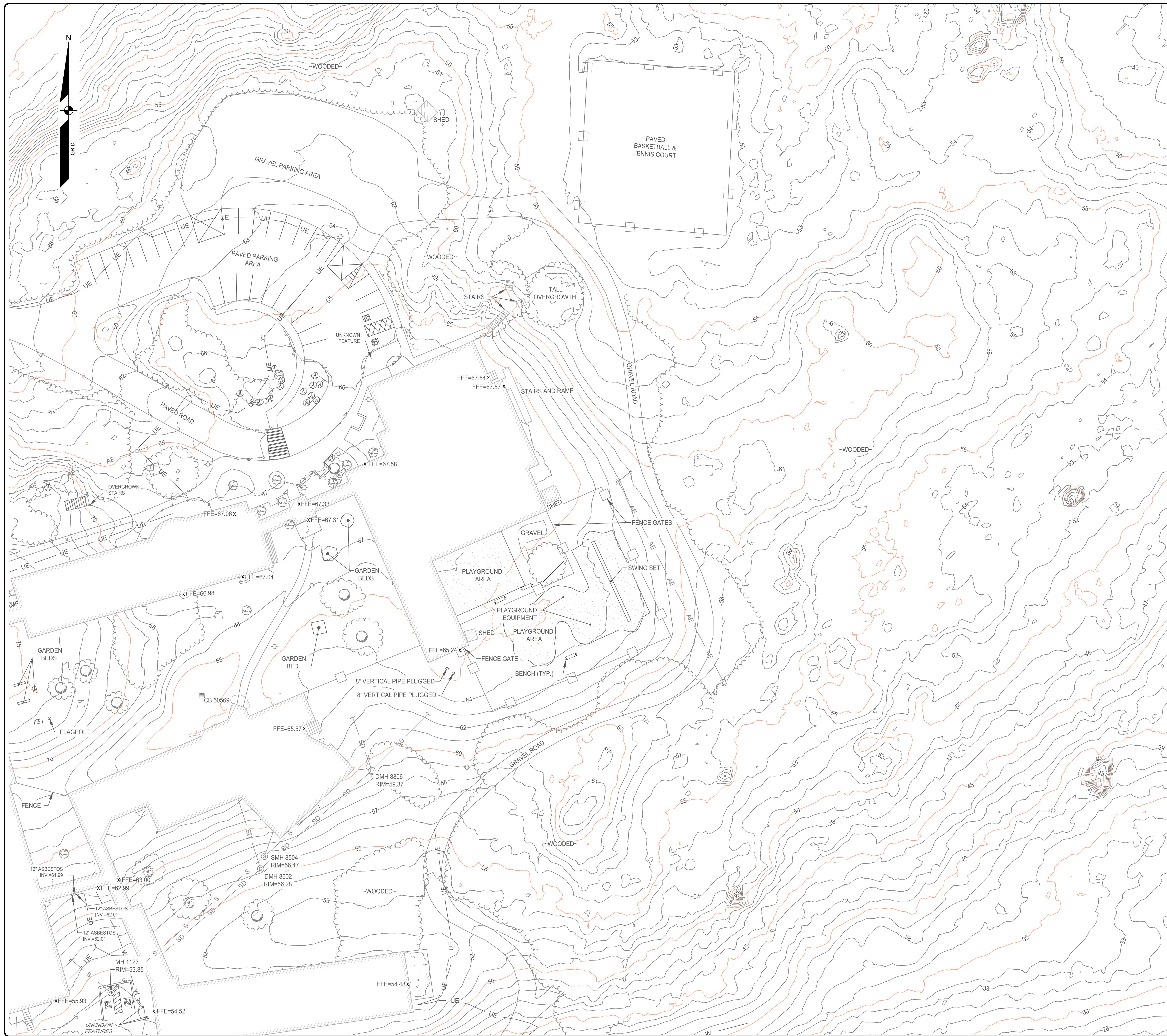
REV	NO	DATE	ISSUED TO CLIENT	STATUS
	1	02/10/2023		

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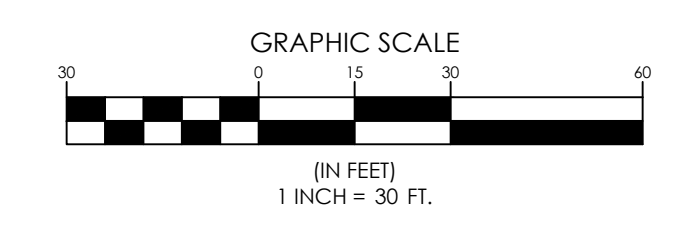
DESIGNED	
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DATE	11/15/22
SCALE	1" = 30'
PROJECT	220594



LOCATION MAP

LEGEND

	DECIDUOUS TREE
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	BENCH
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00 21 13
Instructions to Bidders

1. Bidder Requirements

- 1.1 A bidder is a Contractor which is evidently qualified, or has been specifically pre-qualified by the Bureau of General Services, to bid on the proposed project described in the Bid Documents.
- 1.2 Contractors and Subcontractors bidding on projects that utilize Filed Sub-bids shall follow the requirements outlined in these Bid Documents for such projects. See Section 00 22 13 for additional information.
- 1.3 Contractors and Subcontractors are not eligible to bid on the project when their access to project design documents prior to the bid period distribution of documents creates an unfair bidding advantage. Prohibited access includes consultation with the Owner or with design professionals engaged by the Owner regarding cost estimating, constructability review, or project scheduling. This prohibition to bid applies to open, competitive bidding or pre-qualified contractor bidding or Filed Sub-bidding. The Bureau may require additional information to determine if the activities of a Contractor constitute an unfair bidding advantage.
- 1.4 Each bidder is responsible for becoming thoroughly familiar with the Bid Documents prior to submitting a bid. The failure of a bidder to review evident site conditions, to attend available pre-bid conferences, or to receive, examine, or act on addenda to the Bid Documents shall not relieve that bidder from any obligation with respect to their bid or the execution of the work as a Contractor.
- 1.5 Prior to the award of the contract, General Contractor bidders or Filed Sub-bidders may be required to provide documented evidence to the Owner or the Bureau showing compliance with the provisions of this section, their business experience, financial capability, or performance on previous projects.
- 1.6 The selected General Contractor bidder will be required to provide proof of insurance before a contract can be executed.
- 1.7 Contracts developed from this bid shall not be assigned, sublet or transferred without the written consent of the Owner.
- 1.8 By submitting a bid the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Director of the Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.
- 1.9 The Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

00 21 13
Instructions to Bidders

- 1.10 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

2. Authority of Owner
 - 2.1 The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.
 - 2.2 Subject to the Owner's stated right to accept or reject any or all bids, the Contractor shall be selected on the basis of the lowest dollar value of an acceptable Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications the Owner determines may best serve the interests of the Owner. An acceptable bid is a duly submitted bid from a responsive and responsible bidder.
 - 2.3 The Owner reserves the right to require Bid Bonds or Performance and Payment Bonds for any project of any contract value.

3. Submitting Bids and Bid Requirements
 - 3.1 Each bid shall be submitted on the forms provided in the Bid Documents.
 - 3.2 Each bid shall be valid for a period of thirty calendar days following the Project bid closing date and time. The bid expiration date may be extended in unusual circumstances by mutual consent of the Bidder and the Owner. The bid amount shall not be modified due to the bid expiration date extension.
 - 3.3 Any provision contained in a bid which shows cost escalation, or any modification of schedule or other requirements shall not be accepted. Such a provision causes the bid to be invalid, or, at the discretion of the Owner and BGS, that element of the bid submission may be disregarded for the purpose of awarding the contract without that provision.
 - 3.4 Bidders shall include a Bid Bond or other approved bid security with the bid form submitted to the Owner when the bid form indicates such bid security is required. The bond value shall be 5% of the bid amount. The form of bond is shown in section 00 43 13.
 - 3.5 Bidders recognize that inclusion of contract bonds and the cost of those bonds is dependent on the awarded contract dollar value. Therefore, a Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications, resulting in a contract award shall include the cost of Performance and Payment Bonds in the submitted bid amount when the construction contract value is over \$125,000.00. Similarly, the cost of Performance and Payment Bonds is excluded in the submitted bid amount when the construction contract value is \$125,000.00 or less unless bonds are specifically required by the Bid Documents. When required for the project, the selected Contractor shall provide these bonds before a contract can be executed, pursuant to 14 M.R.S.A., Section 871, Public Works Contractors' Surety Bond Law of 1971, subsection 3. The form of bonds is shown in section 00 61 13.13 and 00 61 13.16.

00 21 13
Instructions to Bidders

- 3.6 Bidders may modify bids in writing, by the same means as the original bid submission, prior to the bid closing time. Such written amendments shall not disclose the amount of the initial bid. If so disclosed, the entire bid is considered invalid.
- 3.7 Bidders implicitly acknowledge all Addenda issued when they submit the bid form. By usual practice the Consultant shall not issue Addenda less than 72 hours prior to the bid closing time, to allow ample time for bidders to incorporate the information. However, some information, such as extending the bid due date and time, may be issued with shorter notice. Addenda shall be issued to all companies who are registered holders of Bid Documents.
- 3.8 A bid may be withdrawn without penalty if a written request by the bidder is presented to the Owner prior to the bid closing time. Such written withdrawal requests are subject to verification as required by the Bureau.
- A bid may be withdrawn without penalty after the bid closing time if, in the determination of the Bureau, evidence provided by the Contractor shows an apparent unintended error such as a miscalculation, or an erroneous number on estimating documents, was the cause of an inaccurate bid. The Bureau may allow withdrawal in consideration of the bid bond or, without utilizing a bid bond, if the Bureau considers documented evidence provided by the Contractor shows factual errors had been made on the bid form.
- 3.9 In the event State of Maine Offices unexpectedly close on the published date of a public bid opening in the location of that bid opening, prior to the time of the scheduled deadline, the new deadline for the public bid opening will be the following business day at the originally scheduled hour of the day, at the original location. Official closings are posted on the State of Maine government website.
- 3.10 The Owner may require, in a Notice of Intent to Award letter to the apparent low bidder, a Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers as both a demonstration of capability of the Bidder and as a condition of award.
- 3.11 Projects which require a State of Maine wage determination will include that schedule as part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.12 Projects which require compliance with the Davis-Bacon Act are subject to the regulations contained the Code for Federal Regulations and the federal wage determination which is made a part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.13 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.

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**00 41 13
Contractor Bid Form**

Mackworth Island Renovations Phase 1 - MOLI Pavilion BGS Project #3675

Bid Form submitted by: *email only to email address below*

Bid Administrator:

Attn: Deane Rykerson
Maine Bureau of General Services
77 State House Station
Augusta, ME 04332

BGS.Architect@Maine.gov

Bidder:

Signature: _____

Printed name and
title: _____

Company name: _____

Mailing address: _____

City, state, zip code: _____

Phone number: _____

Email address: _____

State of
incorporation,
if a corporation: _____

List of all partners,
if a partnership: _____

The Bidder agrees, if the Owner offers to award the contract, to provide any and all bonds and certificates of insurance, as well as Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers if required by the Owner, and to sign the designated Construction Contract within twelve calendar days after the date of notification of such acceptance, except if the twelfth day falls on a State of Maine government holiday or other closure day, or a Saturday, or a Sunday, in which case the aforementioned documents must be received before 12:00 noon on the first available business day following the holiday, other closure day, Saturday, or Sunday.

As a guarantee thereof, the Bidder submits, together with this bid, a bid bond or other acceptable instrument as and if required by the Bid Documents.

**00 41 13
Contractor Bid Form**

1. The Bidder, having carefully examined the *Mackworth Island Renovations Phase 1* Project Manual dated July 30, 2024, prepared by Harriman, as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project for the **Base Bid** amount of:

\$ _____ .00

2. Allowances *are not included* on this project.
No Allowances

\$ 55,000.00

3. Alternate Bids *are included* on this project.
Alternate Bids are as shown below

Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **\$0.00**.

1 *Mansion Chimney Repair* \$ _____ .00

2 *Wayfinding Signage* \$ _____ .00

3 *Not Used* \$ _____ .00

4 *Not Used* \$ _____ .00

4. Bid security *is required* on this project.
If noted above as required, or if the Base Bid amount exceeds \$125,000.00, the Bidder shall include with this bid form a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with this completed bid form submitted to the Owner.

5. Filed Sub-bids *are not required* on this project.
If noted above as required, the Bidder shall include with this bid form a list of each Filed Sub-bidder selected by the Bidder on the form provided (section 00 41 13F).

**00 43 13
Contractor Bid Bond**

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of five percent of the bid amount, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

The condition of the above obligation is such that whereas the principal has submitted to the Owner, or State of Maine, to a certain bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the construction of insert name of project as designated in the contract documents

Now therefore:

If said bid shall be rejected, or, in the alternate,

If said bid shall be accepted and the principal shall execute and deliver a contract in the form of contract attached hereto, properly completed in accordance with said bid, and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid and said Surety does hereby waive notice of any such extension.

**00 43 13
Contractor Bid Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

Contractor

(Signature)

insert name and title

insert company name

*insert address
insert city state zip code*

Surety

(Signature)

insert name and title

insert company name

*insert address
insert city state zip code*

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

DOCUMENT 004321 - ALLOWANCE FORM

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: Mackworth Island Renovations – Phase 1.
- C. Project Location: Mackworth Island, Falmouth, Maine.
- D. Owner: Bureau of General Services (BGS)
- E. Owner Project Number: 3375
- F. Architect: Harriman
- G. Architect Project Number: 23216

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. The undersigned Bidder certifies that Base Bid submission to which this Bid Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 012100 "Allowances."

1.3 SUBMISSION OF BID SUPPLEMENT

- A. Respectfully submitted this ____ day of _____, 2024.
- B. Submitted By: _____ (Insert name of bidding firm or corporation).
- C. Authorized Signature: _____ (Handwritten signature).
- D. Signed By: _____ (Type or print name).
- E. Title: _____ (Owner/Partner/President/Vice President).

END OF DOCUMENT 004321

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00 61 13.13
Contractor Performance Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly and faithfully perform the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

**00 61 13.13
Contractor Performance Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 61 13.16
Contractor Payment Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the use and benefit of claimants, defined as an entity having a contract with the principal or with a subcontractor of the principal for labor, materials, or both labor and materials, used or reasonably required for use in the performance of the contract, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the principal in connection with the work described in the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, and shall fully reimburse the obligee for all outlay and expense with said obligee may incur in making good any default of said principal, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

**00 61 13.16
Contractor Payment Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 71 00
Definitions

1. Definitions
 - 1.1 *Addendum*: A document issued by the Consultant that amends the Bid Documents. Addenda shall not be issued less than seventy-two hours prior to the specified bid opening time.
 - 1.2 *Allowance*: A specified dollar amount for a particular scope of work or service included in the Work that is identified in the Bid Documents and included in each Bidder's Bid. The Contractor shall document expenditures for an Allowance during the Project. Any unused balance shall be credited to the Owner. The Contractor is responsible for notifying the Owner of anticipated expenses greater than the specified amount and the Owner is responsible for those additional expenses.
 - 1.3 *Alternate Bid*: The Contractor's written offer of a specified dollar amount, submitted on the Bid Form, for the performance of a particular scope of work described in the Bid Documents. The Owner determines the low bidder based on the sum of the base Bid and any combination of Alternate Bids that the Owner selects.
 - 1.4 *Architect*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
 - 1.5 *Architectural Supplemental Instruction (ASI)*: A written instruction from the Architect for the purpose of clarification of the Contract Documents. An ASI does not alter the Contract Price or Contract Time. ASIs may be responses to RFIs and shall be issued by the Architect in a timely manner to avoid any negative impact on the Schedule of the Work.
 - 1.6 *Bid*: The Contractor's written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of the Work. A Bid may include bonds or other requirements. A base Bid is separate and distinct from Alternate Bids, being the only cost component necessary for the award of the contract, and representing the minimum amount of Work that is essential for the functioning of the Project.
 - 1.7 *Bid Bond*: The security designated in the Bid Documents, furnished by Bidders as a guaranty of good faith to enter into a contract with the Owner, should a contract be awarded to that Bidder.
 - 1.8 *Bidder*: Any business entity, individual or corporation that submits a bid for the performance of the work described in the Bid Documents, acting directly or through a duly authorized representative. See also *Responsive and Responsible Bidder*.
 - 1.9 *Bid Documents*: The drawings, procurement and contracting requirements, general requirements, and the written specifications -including all addenda, that a bidder is required to reference in the submission of a bid.
 - 1.10 *Bureau*: The State of Maine Bureau of General Services, or BGS, in the Department of Administrative and Financial Services.
 - 1.11 *Calendar days*: Consecutive days, as occurring on a calendar, taking into account each day of the week, month, year, and any religious, national or local holidays. Calendar days are used for changes in Contract Time.

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Definitions

- 1.12 *Certificate of Substantial Completion*: A document developed by the Consultant that describes the final status of the Work and establishes the date that the Owner may use the facility for its intended purpose. The Certificate of Substantial Completion may also include a provisional list of items - a "punch list" - remaining to be completed by the Contractor. The Certificate of Substantial Completion identifies the date from which the project warranty period commences.
- 1.13 *Certificate of Occupancy*: A document developed by a local jurisdiction such as the Code Enforcement Officer that grants permission to the Owner to occupy a building.
- 1.14 *Change Order (CO)*: A document that modifies the contract and establishes the basis of a specific adjustment to the Contract Price or the Contract Time, or both. Change Orders may address correction of omissions, errors, and document discrepancies, or additional requirements. Change Orders should include all labor, materials and incidentals required to complete the work described. A Change Order is not valid until signed by the Contractor, Owner and Consultant and approved by the Bureau.
- 1.15 *Change Order Proposal (COP) (see also Proposal)*: Contract change proposed by the Contractor regarding the contract amount, requirements, or time. The Contractor implements the work of a COP after it is accepted by all parties. Accepted COPs are incorporated into the contract by Change Order.
- 1.16 *Clerk of the Works*: The authorized representative of the Consultant on the job site. Clerk of the Works is sometimes called the Architect's representative.
- 1.17 *Construction Change Directive (CCD)*: A written order prepared by the Consultant and signed by the Owner and Consultant, directing a change in the Work prior to final agreement with the Contractor on adjustment, if any, in the Contract Price or Contract Time, or both.
- 1.18 *Contract*: A written agreement between the Owner and the successful bidder which obligates the Contractor to perform the work specified in the Contract Documents and obligates the Owner to compensate the Contractor at the mutually accepted sum, rates or prices.
- 1.19 *Contract Bonds (also known as Payment and Performance Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.20 *Contract Documents*: The drawings and written specifications (including all addenda), Standard General Conditions, and the contract (including all Change Orders subsequently incorporated in the documents).
- 1.21 *Contract Expiration Date*: Date determined by the Owner as a deadline for internal management of contract accounts. This allows time after the Contract Final Completion Date for processing the final Requisition for Payment. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.
- 1.22 *Contract Final Completion Date*: Point of time when the Work is fully completed in compliance with the Contract Documents, as certified by the Consultant. Final payment to the Contractor is due upon Final Completion of the Project.
- 1.23 *Contract Price*: The dollar amount of the construction contract, also called *Contract Sum*.

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Definitions

- 1.24 *Contract Time*: The designated duration of time to execute the Work of the contract, with a specific date for completion.
- 1.25 *Contractor*: Also called the "General Contractor" or "GC" the individual or entity undertaking the execution of the general contract work under the terms of the contract with the Owner, acting directly or through a duly authorized representative. The Contractor is responsible for the means, methods and materials utilized in the execution and completion of the Work.
- 1.26 *Consultant*: The Architect or Engineer acting as Professional-of-Record for the Project. The Consultant is responsible for the design of the Project.
- 1.27 *Drawings*: The graphic and pictorial portion of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.28 *Engineer*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.29 *Filed Sub-bid*: The designated major Subcontractor's (or, in some cases, Contractor's) written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of a particular portion of the Work. A Filed Sub-bid may include bonds or other requirements.
- 1.30 *General Requirements*: The on-site overhead expense items the Contractor provides for the Project, typically including, but not limited to, building permits, construction supervision, Contract Bonds, insurance, field office, temporary utilities, rubbish removal, and site fencing. Overhead expenses of the Contractor's general operation are not included. Sometimes referred to as the Contractor's General Conditions.
- 1.31 *Owner*: The State agency which is represented by duly authorized individuals. The Owner is responsible for defining the scope of the Project and compensation to the Consultant and Contractor.
- 1.32 *Owner's Representative*: The individual or entity contracted by the Owner to be an advisor and information conduit regarding the Project.
- 1.33 *Overhead*: General and administrative expenses of the Contractor's principal and branch offices, including payroll costs and other compensation of Contractor employees, deductibles paid on any insurance policy, charges against the Contractor for delinquent payments, and costs related to the correction of defective work, and the Contractor's capital expenses, including interest on capital used for the work.
- 1.34 *Performance and Payment Bonds (also known as Contract Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.35 *Post-Bid Addendum*: Document issued by the Consultant that defines a potential Change Order prior to signing of the construction contract. The Post-Bid Addendum allows the Owner to negotiate

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Definitions

contract changes with the Bidder submitting the lowest valid bid, only if the negotiated changes to the Bid Documents result in no change or no increase in the bid price.

A Post-Bid Addendum may also be issued after a competitive construction Bid opening to those Bidders who submitted a Bid initially, for the purpose of rebidding the Project work without re-advertising.

- 1.36 *Project*: The construction project proposed by the Owner to be constructed according to the Contract Documents. The Project, a public improvement, may be tied logistically to other public improvements and other activities conducted by the Owner or other contractors.
- 1.37 *Proposal (see also Change Order Proposal)*: The Contractor's written offer submitted to the Owner for consideration containing a specified dollar amount or rate, for a specific scope of work, and including a schedule impact, if any. A proposal shall include all costs for overhead and profit. The Contractor implements the work of a Proposal after it is accepted by all parties. Accepted Proposals are incorporated into the contract by Change Order.
- 1.38 *Proposal Request (PR)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.39 *Punch List*: A document that identifies the items of work remaining to be done by the Contractor at the Close Out of a Project. The Punch List is created as a result of a final inspection of the work only after the Contractor attests that all of the Work is in its complete and permanent status.
- 1.40 *Request For Information (RFI)*: A Contractor's written request to the Consultant for clarification, definition or description of the Work. RFIs shall be presented by the Contractor in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.41 *Request For Proposal (RFP)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.42 *Requisition for Payment*: The document in which the Contractor certifies that the Work described is, to the best of the Contractor's knowledge, information and belief, complete and that all previous payments have been paid by the Contractor to Subcontractors and suppliers, and that the current requested payment is now due. See *Schedule of Values*.
- 1.43 *Responsive and Responsible Bidder*: A bidder who complies, when submitting a bid on a given project, with the following *responsive* standards, as required by the Bid Documents:
- submits specific qualifications to bid the project, if required;
 - attends mandatory pre-bid conferences, if required;
 - submits a bid prior to the close of the bid period;
 - submits a complete bid form;
 - submits a bid without indications of intent contrary to the stated requirements;
 - submits other materials and information, such as bid security, as required;
- and, meets the following minimums regarding these *responsible* standards:
- sustains a satisfactory record of project performance;
 - maintains a permanent place of business in a known physical location;
 - possesses the financial means for short- and long-term operations;
 - possesses the appropriate technical experience and capabilities;
 - employs adequate personnel and subcontractor resources;

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Definitions

maintains the equipment needed to perform the work;
complies with the proposed implementation schedule;
complies with the insurance and bonding requirements;
provides post-construction warranty coverage;
and other criteria which can be considered relevant to the contract.

- 1.44 *Retainage*: The amount, calculated at five percent (5%) of the contract value or a scheduled value, that the Owner shall withhold from the Contractor until the work or portion of work is declared substantially complete or otherwise accepted by the Owner. The Owner may, if requested, reduce the amount withheld if the Owner deems it desirable and prudent to do so. (See Title 5 M.R.S.A., Section 1746.)
- 1.45 *Sample*: A physical example provided by the Contractor which illustrates materials, equipment or workmanship and establishes standards by which the Work will be judged.
- 1.46 *Schedule of the Work*: The document prepared by the Contractor and approved by the Owner that specifies the dates on which the Contractor plans to begin and complete various parts of the Work, including dates on which information and approvals are required from the Owner.
- 1.47 *Schedule of Values*: The document prepared by the Contractor and approved by the Owner before the commencement of the Work that specifies the dollar values of discrete portions of the Work equal in sum to the contract amount. The Schedule of Values is used to document progress payments of the Work in regular (usually monthly) requisitions for payment. See *Requisition for Payment*.
- 1.48 *Shop Drawings*: The drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 1.49 *Specifications*: The portion of the Contract Documents consisting of the written requirements of the Work for materials, equipment, systems, standards, workmanship, and performance of related services.
- 1.50 *Subcontractor*: An individual or entity undertaking the execution of any part of the Work by virtue of a written agreement with the Contractor or any other Subcontractor. Also, an individual or entity retained by the Contractor or any other Subcontractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific portion of the Work.
- 1.51 *Substantial Completion Date*: Point of time when the Work or a designated portion of the Work is sufficiently complete in compliance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended purpose without unscheduled disruption. Substantial Completion is documented by the date of the Certificate of Substantial Completion signed by the Owner and the Contractor.
- 1.52 *Superintendent*: The representative of the Contractor on the job site, authorized by the Contractor to receive and fulfill instructions from the Consultant.
- 1.53 *Surety*: The individual or entity that is legally bound with the Contractor and Subcontractor to insure the faithful performance of the contract and for the payment of the bills for labor, materials and equipment by the Contractor and Subcontractors.

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Definitions

- 1.54 *Work*: The construction and services, whether completed or partially completed, including all labor, materials, equipment and services provided or to be provided by the Contractor and Subcontractors to fulfill the requirements of the Project as described in the Contract Documents.

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General Conditions

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General Conditions

1. Preconstruction Conference

- 1.1 The Contractor shall, upon acceptance of a contract and prior to commencing work, schedule a preconstruction conference with the Owner and Consultant. The purpose of this conference is as follows.
- 1.1.1 Introduce all parties who have a significant role in the Project, including:
Owner (State agency or other contracting entity)
 Owner's Representative
Consultant (Architect or Engineer)
 Subconsultants
 Clerk-of-the-works
Contractor (GC)
 Superintendent
 Subcontractors
Other State agencies
Construction testing company
Commissioning agent
Special Inspections agent
Bureau of General Services (BGS);
- 1.1.2 Review the responsibilities of each party;
- 1.1.3 Review any previously-identified special provisions of the Project;
- 1.1.4 Review the Schedule of the Work calendar submitted by the Contractor to be approved by the Owner and Consultant;
- 1.1.5 Review the Schedule of Values form submitted by the Contractor to be approved by the Owner and Consultant;
- 1.1.6 Establish routines for Shop Drawing approval, contract changes, requisitions, et cetera;
- 1.1.7 discuss jobsite issues;
- 1.1.8 Discuss Project close-out procedures;
- 1.1.9 Provide an opportunity for clarification of Contract Documents before work begins; and
- 1.1.10 Schedule regular meetings at appropriate intervals for the review of the progress of the Work.

2. Intent and Correlation of Contract Documents

- 2.1 The intent of the Contract Documents is to describe the complete Project. The Contract Documents consist of various components; each component complements the others. What is shown as a requirement by any one component shall be inferred as a requirement on all corresponding components.
- 2.2 The Contractor shall furnish all labor, equipment and materials, tools, transportation, insurance, services, supplies, operations and methods necessary for, and reasonably incidental to, the construction and completion of the Project. Any work that deviates from the Contract Documents which appears to be required by the exigencies of construction or by inconsistencies in the Contract Documents, will be determined by the Consultant and authorized in writing by the Consultant, Owner and the Bureau prior to execution. The Contractor shall be responsible for requesting clarifying information where the intent of the Contract Documents is uncertain.
- 2.3 The Contractor shall not utilize any apparent error or omission in the Contract Documents to the disadvantage of the Owner. The Contractor shall promptly notify the Consultant in writing of such errors or omissions. The Consultant shall make any corrections or clarifications necessary in such a situation to document the true intent of the Contract Documents.

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General Conditions

3. Additional Drawings and Specifications

- 3.1 Upon the written request of the Contractor, the Owner shall provide, at no expense to the Contractor, up to five sets of printed Drawings and Specifications for the execution of the Work.
- 3.2 The Consultant shall promptly furnish to the Contractor revised Drawings and Specifications, for the area of the documents where those revisions apply, when corrections or clarifications are made by the Consultant. All such information shall be consistent with, and reasonably inferred from, the Contract Documents. The Contractor shall do no work without the proper Drawings and Specifications.

4. Ownership of Contract Documents

- 4.1 The designs represented on the Contract Documents are the property of the Consultant. The Drawings and Specifications shall not be used on other work without consent of the Consultant.

5. Permits, Laws, and Regulations

- 5.1 The Owner is responsible for obtaining any zoning approvals or other similar local project approvals necessary to complete the Work, unless otherwise specified in the Contract Documents.
- 5.2 The Owner is responsible for obtaining Maine Department of Environmental Protection, Maine Department of Transportation, or other similar state government project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.3 The Owner is responsible for obtaining any federal agency project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.4 The Owner is responsible for obtaining all easements for permanent structures or permanent changes in existing facilities.
- 5.5 The Contractor is responsible for obtaining and paying for all permits and licenses necessary for the implementation of the Work. The Contractor shall notify the Owner of any delays, variance or restrictions that may result from the issuing of permits and licenses.
- 5.6 The Contractor shall comply with all ordinances, laws, rules and regulations and make all required notices bearing on the implementation of the Work. In the event the Contractor observes disagreement between the Drawings and Specifications and any ordinances, laws, rules and regulations, the Contractor shall promptly notify the Consultant in writing. Any necessary changes shall be made as provided in the contract for changes in the work. The Contractor shall not perform any work knowing it to be contrary to such ordinances, laws, rules and regulations.
- 5.7 The Contractor shall comply with local, state and federal regulations regarding construction safety and all other aspects of the Work.
- 5.8 The Contractor shall comply with the Maine Code of Fair Practices and Affirmative Action, 5 M.R.S. §784 (2).

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General Conditions

6. Taxes

- 6.1 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.
- 6.2 Section 1760 further provides in subsection 61 that sales to a construction contractor or its subcontractor of tangible personal property that is to be physically incorporated in, and become a permanent part of, real property for sale to or owned by the Owner, are exempt from Maine State sales and use taxes. Tangible personal property is defined in 36 M.R.S. §1752 (17).
- 6.3 The Contractor may contact Maine Revenue Services, 24 State House Station, Augusta, Maine 04333 for guidance on tax exempt regulations authorized by 36 M.R.S. §1760 and detailed in Rule 302 (18-125 CMR 302).

7. Labor and Wages

- 7.1 The Contractor shall conform to the labor laws of the State of Maine, and all other laws, ordinances, and legal requirements affecting the work in Maine.
- 7.2 The Consultant shall include a wage determination document prepared by the Maine Department of Labor in the Contract Documents for state-funded contracts in excess of \$50,000. The document shows the minimum wages required to be paid to each category of labor employed on the project.
- 7.3 On projects requiring a Maine wage determination, the Contractor shall submit monthly payroll records to the Owner ("the contracting agency") showing the name and occupation of all workers and all independent contractors employed on the project. The monthly submission must also include the Contractor's company name, the title of the project, hours worked, hourly rate or other method of remuneration, and the actual wages or other compensation paid to each person.
- 7.4 The Contractor shall not reveal, in the payroll records submitted to the Owner, personal information regarding workers and independent contractors, other than the information described above. Such information shall not include Social Security number, employee identification number, or employee address or phone number, for example.
- 7.5 The Contractor shall conform to Maine statute (39-A M.R.S. §105-A (6)) by providing to the Workers' Compensation Board a list of all subcontractors and independent contractors on the job site and a record of the entity to whom that subcontractor or independent contractor is directly contracted and by whom that subcontractor or independent contractor is insured for workers' compensation purposes.
- 7.6 The Contractor shall enforce strict discipline and good order among their employees at all times, and shall not employ any person unfit or unskilled to do the work assigned to them.
- 7.7 The Contractor shall promptly pay all employees when their compensation is due, shall promptly pay all others who have billed and are due for materials, supplies and services used in the Work, and shall promptly pay all others who have billed and are due for insurance, workers compensation coverage, federal and state unemployment compensation, and Social Security

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General Conditions

charges pertaining to this Project. Before final payments are made, the Contractor shall furnish to the Owner affidavits that all such payments described above have been made.

- 7.8 The Contractor may contact the Maine Department of Labor, 54 State House Station, Augusta, Maine 04333 for guidance on labor issues.
- 7.9 The Contractor may contact the Maine Workers' Compensation Board, 27 State House Station, Augusta, Maine 04333 for guidance on workers' compensation issues.

8. Indemnification

- 8.1 The Contractor shall indemnify and hold harmless the Owner and its officers and employees from and against any and all damages, liabilities, and costs, including reasonable attorney's fees, and defense costs, for any and all injuries to persons or property, including claims for violation of intellectual property rights, to the extent caused by the negligent acts or omissions of the Contractor, its employees, agents, officers or subcontractors in the performance of work under this Agreement. The Contractor shall not be liable for claims to the extent caused by the negligent acts or omissions of the Owner or for actions taken in reasonable reliance on written instructions of the Owner.
- 8.2 The Contractor shall notify the Owner promptly of all claims arising out of the performance of work under this Agreement by the Contractor, its employees or agents, officers or subcontractors.
- 8.3 This indemnity provision shall survive the termination of the Agreement, completion of the project or the expiration of the term of the Agreement.

9. Insurance Requirements

- 9.1 The Contractor shall provide, with each original of the signed Contract, an insurance certificate or certificates acceptable to the Owner and BGS. The Contractor shall submit insurance certificates to the Owner and BGS at the commencement of this Contract and at policy renewal or revision dates. The certificates shall identify the project name and BGS project number, and shall name the Owner as certificate holder and as additional insured for general liability and automobile liability coverages. The submitted forms shall contain a provision that coverage afforded under the insurance policies will not be canceled or materially changed unless at least ten days prior written notice by registered letter has been given to the Owner and BGS.
- 9.2 The Owner does not warrant or represent that the insurance required herein constitutes an insurance portfolio which adequately addresses all risks faced by the Contractor or its Subcontractors. The Contractor is responsible for the existence, extent and adequacy of insurance prior to commencement of work. The Contractor shall not allow any Subcontractor to commence work until all similar insurance required of the Subcontractor has been confirmed by the Contractor.
- 9.3 The Contractor shall procure and maintain primary insurance for the duration of the Project and, if written on a Claims-Made basis, shall also procure and maintain Extended Reporting Period (ERP) insurance for the period of time that any claims could be brought. The Contractor shall ensure that all Subcontractors they engage or employ will procure and maintain similar insurance

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in form and amount acceptable to the Owner and BGS. At a minimum, the insurance shall be of the types and limits set forth herein protecting the Contractor from claims which may result from the Contractor's execution of the Work, whether such execution be by the Contractor or by those employed by the Contractor or by those for whose acts they may be liable. All required insurance coverages shall be placed with carriers authorized to conduct business in the State of Maine by the Maine Bureau of Insurance.

9.3.1 The Contractor shall have Workers' Compensation insurance for all employees on the Project site in accordance with the requirements of the Workers' Compensation law of the State of Maine. Minimum acceptable limits for Employer's Liability are:

Bodily Injury by Accident.....	\$500,000
Bodily Injury by Disease.....	\$500,000 Each Employee
Bodily Injury by Disease.....	\$500,000 Policy Limit

9.3.2 The Contractor shall have Commercial General Liability insurance providing coverage for bodily injury and property damage liability for all hazards of the Project including premise and operations, products and completed operations, contractual, and personal injury liabilities. The policy shall include collapse and underground coverage as well as explosion coverage if explosion hazards exist. Aggregate limits shall apply on a location or project basis. Minimum acceptable limits are:

General aggregate limit.....	\$2,000,000
Products and completed operations aggregate	\$1,000,000
Each occurrence limit.....	\$1,000,000
Personal injury aggregate.....	\$1,000,000

9.3.3 The Contractor shall have Automobile Liability insurance against claims for bodily injury, death or property damage resulting from the maintenance, ownership or use of all owned, non-owned and hired automobiles, trucks and trailers. Minimum acceptable limit is:

Any one accident or loss	\$500,000
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9.3.4 For the portion of a project which is new construction, the Contractor shall procure and maintain Builder's Risk insurance naming the Owner, Contractor, and any Subcontractor as insureds as their interest may appear. Covered causes of loss form shall be all Risks of Direct Physical Loss, endorsed to include flood, earthquake, transit and sprinkler leakage where sprinkler coverage is applicable. Unless specifically authorized in writing by the Owner, the limit of insurance shall not be less than the initial contract amount, for the portion of the project which is new construction, and coverage shall apply during the entire contract period and until the work is accepted by the Owner.

9.3.5 The Contractor shall have Owner's Protective Liability insurance for contract values \$50,000 and above, naming the Owner as the Named Insured. Minimum acceptable limits are:

General aggregate limit.....	\$2,000,000
Each occurrence limit.....	\$1,000,000

10. Contract Bonds

10.1 When noted as required in the Bid Documents, the Contractor shall provide to the Owner a Performance Bond and a Payment Bond, or "contract bonds", upon execution of the contract. Each bond value shall be for the full amount of the contract and issued by a surety company authorized to do business in the State of Maine as approved by the Owner. The bonds shall be

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executed on the forms furnished in the Bid Documents. The bonds shall allow for any subsequent additions or deductions of the contract.

- 10.2 The contract bonds shall continue in effect for one year after final acceptance of the contract to protect the Owner's interest in connection with the one year guarantee of workmanship and materials and to assure settlement of claims for the payment of all bills for labor, materials and equipment by the Contractor.

11. Patents and Royalties

- 11.1 The Contractor shall, for all time, secure for the Owner the free and undisputed right to the use of any patented articles or methods used in the Work. The expense of defending any suits for infringement or alleged infringement of such patents shall be borne by the Contractor. Awards made regarding patent suits shall be paid by the Contractor. The Contractor shall hold the Owner harmless regarding patent suits that may arise due to installations made by the Contractor, and to any awards made as a result of such suits.
- 11.2 Any royalty payments related to the work done by the Contractor for the Project shall be borne by the Contractor. The Contractor shall hold the Owner harmless regarding any royalty payments that may arise due to installations made by the Contractor.

12. Surveys, Layout of Work

- 12.1 The Owner shall furnish all property surveys unless otherwise specified.
- 12.2 The Contractor is responsible for correctly staking out the Work on the site. The Contractor shall employ a competent surveyor to position all construction on the site. The surveyor shall run the axis lines, establish correct datum points and check each line and point on the site to insure their accuracy. All such lines and points shall be carefully preserved throughout the construction.
- 12.3 The Contractor shall lay out all work from dimensions given on the Drawings. The Contractor shall take measurements and verify dimensions of any existing work that affects the Work or to which the Work is to be fitted. The Contractor is solely responsible for the accuracy of all measurements. The Contractor shall verify all grades, lines, levels, elevations and dimensions shown on the Drawings and report any errors or inconsistencies to the Consultant prior to commencing work.

13. Record of Documents

- 13.1 The Contractor shall maintain one complete set of Contract Documents on the jobsite, in good order and current status, for access by the Owner and Consultant.
- 13.2 The Contractor shall maintain, continuously updated, complete records of Requests for Information, Architectural Supplemental Instructions (or equivalent), Information Bulletins, supplemental sketches, Change Order Proposals, Change Orders, Shop Drawings, testing reports, et cetera, for access by the Owner and Consultant.

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14. Allowances

- 14.1 The Contract Price shall include all allowances described in the Contract Documents. The Contractor shall include all overhead and profit necessary to implement each allowance in their Contract Price.
- 14.2 The Contractor shall not be required to employ parties for allowance work against whom the Contractor has a reasonable objection. In such a case, the Contractor shall notify the Owner in writing of their position and shall propose an alternative party to complete the work of the allowance.

15. Shop Drawings

- 15.1 The Contractor shall administer Shop Drawings prepared by the Contractor, Subcontractors, suppliers or others to conform to the approved Schedule of the Work. The Contractor shall verify all field measurements, check and authorize all Shop Drawings and schedules required by the Work. The Contractor is the responsible party and contact for the Contractor's work as well as that of Subcontractors, suppliers or others who provide Shop Drawings.
- 15.2 The Consultant shall review and acknowledge Shop Drawings, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents.
- 15.3 The Contractor shall provide monthly updated logs containing: requests for information, information bulletins, supplemental instructions, supplemental sketches, change order proposals, change orders, submittals, testing and deficiencies.
- 15.4 The Contractor shall make any corrections required by the Consultant, and shall submit a quantity of corrected copies as may be needed. The acceptance of Shop Drawings or schedules by the Consultant shall not relieve the Contractor from responsibility for deviations from Drawings and Specifications, unless the Contractor has called such deviations to the attention of the Consultant at the time of submission and secured the Consultant's written approval. The acceptance of Shop Drawings or schedules by the Consultant does not relieve the Contractor from responsibility for errors in Shop Drawings or schedules.

16. Samples

- 16.1 The Contractor shall furnish for approval, with reasonable promptness, all samples as directed by the Consultant. The Consultant shall review and approve such samples, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents. The subsequent work shall be in accord with the approved samples.

17. Substitutions

- 17.1 The Contractor shall furnish items and materials described in the Contract Documents. If the item or material specified describes a proprietary product, or uses the name of a manufacturer, the term "or approved equal" shall be implied, if it is not included in the text. The specific item or material specified establishes a minimum standard for the general design, level of quality, type, function, durability, efficiency, reliability, compatibility, warranty coverage, installation factors

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and required maintenance. The Drawing or written Specification shall not be construed to exclude other manufacturers products of comparable design, quality, and efficiency.

- 17.2 The Contractor may submit detailed information about a proposed substitution to the Consultant for consideration. Particular models of items and particular materials which the Contractor asserts to be equal to the items and materials identified in the Contract Documents shall be allowed only with written approval by the Consultant. The request for substitution shall include a cost comparison and a reason or reasons for the substitution.
- 17.3 The Consultant may request additional information about the proposed substitution. The approval or rejection of a proposed substitution may be based on timeliness of the request, source of the information, the considerations of minimum standards described above, or other considerations. The Consultant should briefly state the rationale for the decision. The decision shall be considered final.
- 17.4 The duration of a substitution review process can not be the basis for a claim for delay in the Schedule of the Work.

18. Assignment of Contract

- 18.1 The Contractor shall not assign or sublet the contract as a whole without the written consent of the Owner. The Contractor shall not assign any money due to the Contractor without the written consent of the Owner.

19. Separate Contracts

- 19.1 The Owner reserves the right to create other contracts in connection with this Project using similar General Conditions. The Contractor shall allow the Owner's other contractors reasonable opportunity for the delivery and storage of materials and the execution of their work. The Contractor shall coordinate and properly connect the Work of all contractors.
- 19.2 The Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in work of the Owner's other contractors that impacts the proper execution or results of the Contractor. The Contractor's failure to observe or report any deficiencies constitutes an acceptance of the Owner's other contractors work as suitable for the interface of the Contractor's work, except for latent deficiencies in the Owner's other contractors work.
- 19.3 Similarly, the Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in their own work that would impact the proper execution or results of the Owner's other contractors.
- 19.4 The Contractor shall report to the Consultant and Owner any conflicts or claims for damages with the Owner's other contractors and settle such conflicts or claims for damages by mutual agreement or arbitration, if necessary, at no expense to the Owner.
- 19.5 In the event the Owner's other contractors sue the Owner regarding any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense. The Contractor shall pay or satisfy any judgment that may arise against the Owner, and pay all other costs incurred.

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20. Subcontracts

- 20.1 The Contractor shall not subcontract any part of this contract without the written permission of the Owner.
- 20.2 The Contractor shall submit a complete list of named Subcontractors and material suppliers to the Consultant and Owner for approval by the Owner prior to commencing work. The Subcontractors named shall be reputable companies of recognized standing with a record of satisfactory work.
- 20.3 The Contractor shall not employ any Subcontractor or use any material until they have been approved, or where there is reason to believe the resulting work will not comply with the Contract Documents.
- 20.4 The Contractor, not the Owner, is as fully responsible for the acts and omissions of Subcontractors and of persons employed by them, as the Contractor is for the acts and omissions of persons directly or indirectly employed by the Contractor.
- 20.5 Neither the Contract Documents nor any Contractor-Subcontractor contract shall indicate, infer or create any direct contractual relationship between any Subcontractor and the Owner.

21. Contractor-Subcontractor Relationship

- 21.1 The Contractor shall be bound to the Subcontractor by all the obligations in the Contract Documents that bind the Contractor to the Owner.
- 21.2 The Contractor shall pay the Subcontractor, in proportion to the dollar value of the work completed and requisitioned by the Subcontractor, the approved dollar amount allowed to the Contractor no more than seven days after receipt of payment from the Owner.
- 21.3 The Contractor shall pay the Subcontractor accordingly if the Contract Documents or the subcontract provide for earlier or larger payments than described in the provision above.
- 21.4 The Contractor shall pay the Subcontractor for completed and requisitioned subcontract work, less retainage, no more than seven days after receipt of payment from the Owner for the Contractor's approved Requisition for Payment, even if the Consultant fails to certify a portion of the Requisition for Payment for a cause not the fault of the Subcontractor.
- 21.5 The Contractor shall not make a claim for liquidated damages or penalty for delay in any amount in excess of amounts that are specified by the subcontract.
- 21.6 The Contractor shall not make a claim for services rendered or materials furnished by the Subcontractor unless written notice is given by the Contractor to the Subcontractor within ten calendar days of the day in which the claim originated.
- 21.7 The Contractor shall give the Subcontractor an opportunity to present and to submit evidence in any progress conference or disputes involving subcontract work.

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- 21.8 The Contractor shall pay the Subcontractor a just share of any fire insurance payment received by the Contractor.
- 21.9 The Subcontractor shall be bound to the Contractor by the terms of the Contract Documents and assumes toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.
- 21.10 The Subcontractor shall submit applications for payment to the Contractor in such reasonable time as to enable the Contractor to apply for payment as specified.
- 21.11 The Subcontractor shall make any claims for extra cost, extensions of time or damages, to the Contractor in the manner provided in these General Conditions for like claims by the Contractor to the Owner, except that the time for the Subcontractor to make claims for extra cost is seven calendar days after the receipt of Consultant's instructions.
22. Supervision of the Work
- 22.1 During all stages of the Work the Contractor shall have a competent superintendent, with any necessary assistant superintendents, overseeing the project. The superintendent shall not be reassigned without the consent of the Owner unless a superintendent ceases to be employed by the Contractor due to unsatisfactory performance.
- 22.2 The superintendent represents the Contractor on the jobsite. Directives given by the Consultant or Owner to the superintendent shall be as binding as if given directly to the Contractor's main office. All important directives shall be confirmed in writing to the Contractor. The Consultant and Owner are not responsible for the acts or omissions of the superintendent or assistant superintendents.
- 22.3 The Contractor shall provide supervision of the Work equal to the industry's highest standard of care. The superintendent shall carefully study and compare all Contract Documents and promptly report any error, inconsistency or omission discovered to the Consultant. The Contractor may not necessarily be held liable for damages resulting directly from any error, inconsistency or omission in the Contract Documents or other instructions by the Consultant that was not revealed by the superintendent in a timely way.
23. Observation of the Work
- 23.1 The Contractor shall allow the Owner, the Consultant and the Bureau continuous access to the site for the purpose of observation of the progress of the work. All necessary safeguards and accommodations for such observations shall be provided by the Contractor.
- 23.2 The Contractor shall coordinate all required testing, approval or demonstration of the Work. The Contractor shall give sufficient notice to the appropriate parties of readiness for testing, inspection or examination.
- 23.3 The Contractor shall schedule inspections and obtain all required certificates of inspection for inspections by a party other than the Consultant.

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- 23.4 The Consultant shall make all scheduled observations promptly, prior to the work being concealed or buried by the Contractor. If approval of the Work is required of the Consultant, the Contractor shall notify the Consultant of the construction schedule in this regard. Work concealed or buried prior to the Consultant's approval may need to be uncovered at the Contractor's expense.
- 23.5 The Consultant may order reexamination of questioned work, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to conform to the Contract Documents, the Owner shall pay the expense of the reexamination and remedial work. If the work is found to not conform to the Contract Documents, the Contractor shall pay the expense, unless the defect in the work was caused by the Owner's Contractor, whose responsibility the reexamination expense becomes.
- 23.6 The Bureau shall periodically observe the Work during the course of construction and make recommendations to the Contractor or Consultant as necessary. Such recommendations shall be considered and implemented through the usual means for changes to the Work.
24. Consultant's Status
- 24.1 The Consultant represents the Owner during the construction period, and observes the work in progress on behalf of the Owner. The Consultant has authority to act on behalf of the Owner only to the extent expressly provided by the Contract Documents or otherwise demonstrated to the Contractor. The Consultant has authority to stop the work whenever such an action is necessary, in the Consultant's reasonable opinion, to ensure the proper execution of the contract.
- 24.2 The Consultant is the interpreter of the conditions of the contract and the judge of its performance. The Consultant shall favor neither the Owner nor the Contractor, but shall use the Consultant's powers under the contract to enforce faithful performance by both parties.
- 24.3 In the event of the termination of the Consultant's employment on the project prior to completion of the work, the Owner shall appoint a capable and reputable replacement. The status of the new Consultant relative to this contract shall be that of the former Consultant.
25. Management of the Premises
- 25.1 The Contractor shall place equipment and materials, and conduct activities on the premises in a manner that does not unreasonably hinder site circulation, environmental stability, or any long term effect. Likewise, the Consultant's directions shall not cause the use of premises to be impeded for the Contractor or Owner.
- 25.2 The Contractor shall not use the premises for any purpose other than that which is directly related to the scope of work. The Owner shall not use the premises for any purpose incompatible with the proposed work simultaneous to the work of the Contractor.
- 25.3 The Contractor shall enforce the Consultant's instructions regarding information posted on the premises such as signage and advertisements, as well as activities conducted on the premises such as fires, and smoking.

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25.4 The Owner may occupy any part of the Project that is completed with the written consent of the Contractor, and without prejudice to any of the rights of the Owner or Contractor. Such use or occupancy shall not, in and of itself, be construed as a final acceptance of any work or materials.

26. Safety and Security of the Premises

26.1 The Contractor shall designate, and make known to the Consultant and the Owner, a safety officer whose duty is the prevention of accidents on the site.

26.2 The Contractor shall continuously maintain security on the premises and protect from unreasonable occasion of injury all people authorized to be on the job site. The Contractor shall also effectively protect the property and adjacent properties from damage or loss.

26.3 The Contractor shall take all necessary precautions to ensure the safety of workers and others on and adjacent to the site, abiding by applicable local, state and federal safety regulations. The Contractor shall erect and continuously maintain safeguards for the protection of workers and others, and shall post signs and other warnings regarding hazards associated with the construction process, such as protruding fasteners, moving equipment, trenches and holes, scaffolding, window, door or stair openings, and falling materials.

26.4 The Contractor shall restore the premises to conditions that existed prior to the start of the project at areas not intended to be altered according to the Contract Documents.

26.5 The Contractor shall protect existing utilities and exercise care working in the vicinity of utilities shown in the Drawings and Specifications or otherwise located by the Contractor.

26.6 The Contractor shall protect from damage existing trees and other significant plantings and landscape features of the site which will remain a permanent part of the site. If necessary or indicated in the Contract Documents, tree trunks shall be boxed and barriers erected to prevent damage to tree branches or roots.

26.7 The Contractor shall repair or replace damage to the Work caused by the Contractor's or Subcontractor's forces, including that which is reasonably protected, at the expense of the responsible party.

26.8 The Contractor shall not load, or allow to be loaded, any part of the Project with a force which imperils personal or structural safety. The Consultant may consult with the Contractor on such means and methods of construction, however, the ultimate responsibility lies with the Contractor.

26.9 The Contractor shall not jeopardize any work in place with subsequent construction activities such as blasting, drilling, excavating, cutting, patching or altering work. The Consultant must approve altering any structural components of the project. The Contractor shall supervise all construction activities carried out by others on site to ensure that the work is neatly done and in a manner that will not endanger the structure or the component parts.

26.10 The Contractor may act with their sole discretion in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Contractor may negotiate with the Owner for compensation for expenses due to such emergency work.

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- 26.11 The Contractor and Subcontractors shall have no responsibility for the identification, discovery, presence, handling, removal or disposal of, or exposure of persons to, hazardous materials in any form at the project site. The Contractor shall avoid disruption of any hazardous materials or toxic substances at the project site and promptly notify the Owner in writing on the occasion of such a discovery.
- 26.12 The Contractor shall keep the premises free of any unsafe accumulation of waste materials caused by the work. The Contractor shall regularly keep the spaces “broom clean”. See the Close-out of the Work provisions of this section regarding cleaning at the completion of the project.
27. Changes in the Work
- 27.1 The Contractor shall not proceed with extra work without an approved Change Order or Construction Change Directive. A Change Order which has been properly signed by all parties shall become a part of the contract.
- 27.2 A Change Order is the usual document for directing changes in the Work. In certain circumstances, however, the Owner may utilize a Construction Change Directive to direct the Contractor to perform changes in the Work that are generally consistent with the scope of the project. The Owner shall use a Construction Change Directive only when the normal process for approving changes to the Work has failed to the detriment of the Project, or when agreement on the terms of a Change Order cannot be met, or when an urgent situation requires, in the Owner's judgment, prompt action by the Contractor.
- 27.3 The Consultant shall prepare the Construction Change Directive representing a complete scope of work, with proposed Contract Price and Contract Time revisions, if any, clearly stated.
- 27.4 The Contractor shall promptly carry out a Construction Change Directive which has been signed by the Owner and the Consultant. Work thus completed by the Contractor constitutes the basis for a Change Order. Changes in the Contract Price and Contract Time shall be as defined in the Construction Change Directive unless subsequently negotiated with some other terms.
- 27.5 The method of determining the dollar value of extra work shall be by:
- .1 an estimate of the Contractor accepted by Owner as a lump sum, or
 - .2 unit prices named in the contract or subsequently agreed upon, or
 - .3 cost plus a designated percentage, or
 - .4 cost plus a fixed fee.
- 27.6 The Contractor shall determine the dollar value of the extra work for both the lump sum and cost plus designated percentage methods so as not to exceed the following rates. The rates include all overhead and profit expenses.
- .1 Contractor - for any work performed by the Contractor's own forces, up to 20% of the cost;
 - .2 Subcontractor - for work performed by Subcontractor's own forces, up to 20% of the cost;
 - .3 Contractor - for work performed by Contractor's Subcontractor, up to 10% of the amount due the Subcontractor.
- 27.7 The Contractor shall keep and provide records as needed or directed for the cost plus designated percentage method. The Consultant shall review and certify the appropriate amount which

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- includes the Contractor's overhead and profit. The Owner shall make payments based on the Consultant's certificate.
- 27.8 Cost reflected in Change Orders shall be limited to the following: cost of materials, cost of delivery, cost of labor (including Social Security, pension, Workers' Compensation insurance, and unemployment insurance), and cost of rental of power tools and equipment. Labor cost may include a pro-ratio share of a foreman's time only in the case of an extension of contract time granted due to the Change Order.
- 27.9 Overhead reflected in Change Orders shall be limited to the following: bond premium, supervision, wages of clerks, time keepers, and watchmen, small tools, incidental expenses, general office expenses, and all other overhead expenses directly related to the Change Order.
- 27.10 The Contractor shall provide credit to the Owner for labor, materials, equipment and other costs but not overhead and profit expenses for those Change Order items that result in a net value of credit to the contract.
- 27.11 The Owner may change the scope of work of the Project without invalidating the contract. The Owner shall notify the Contractor of a change of the scope of work for the Owner's Contractors, which may affect the work of this Contractor, without invalidating the contract. Change Orders for extension of the time caused by such changes shall be developed at the time of directing the change in scope of work.
- 27.12 The Consultant may order minor changes in the Work, not involving extra cost, which is consistent with the intent of the design or project.
- 27.13 The Contractor shall immediately give written notification to the Consultant of latent conditions discovered at the site which materially differ from those represented in the Drawings or Specifications, and which may eventually result in a change in the scope of work. The Contractor shall suspend work until receiving direction from the Consultant. The Consultant shall promptly investigate the conditions and respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the discovered conditions warrant a Change Order.
- 27.14 The Contractor shall, within ten calendar days of receipt of the information, give written notification to the Consultant if the Contractor claims that instructions by the Consultant will constitute extra cost not accounted for by Change Order or otherwise under the contract. The Consultant shall promptly respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the Contractor's claim warrants a Change Order.
28. Correction of the Work
- 28.1 The Contractor shall promptly remove from the premises all work the Consultant declares is non-conforming to the contract. The Contractor shall replace the work properly at no expense to the Owner. The Contractor is also responsible for the expenses of others whose work was damaged or destroyed by such remedial work.

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- 28.2 The Owner may elect to remove non-conforming work if it is not removed by the Contractor within a reasonable time, that time defined in a written notice from the Consultant. The Owner may elect to store removed non-conforming work not removed by the Contractor at the Contractor's expense. The Owner may, with ten days written notice, dispose of materials which the Contractor does not remove. The Owner may sell the materials and apply the net proceeds, after deducting all expenses, to the costs that should have been borne by the Contractor.
- 28.3 The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any related damage to other work which appears within a period of one year from the date of substantial completion, and in accord with the terms of any guarantees provided in the contract. The Owner shall promptly give notice of observed defects to the Contractor and Consultant. The Consultant shall determine the status of all claimed defects. The Contractor shall perform all remedial work without unjustifiable delay in either the initial response or the corrective action.
- 28.4 The Consultant may authorize, after a reasonable notification to the Contractor, an equitable deduction from the contract amount in lieu of the Contractor correcting non-conforming or defective work.
29. Owner's Right to do Work
- 29.1 The Owner may, using other contractors, correct deficiencies attributable to the Contractor, or complete unfinished work. Such action shall take place only after giving the Contractor three days written notice, and provided the Consultant approves of the proposed course of action as an appropriate remedy. The Owner may then deduct the cost of the remedial work from the amount due the Contractor.
- 29.2 The Owner may act with their sole discretion when the Contractor is unable to take action in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Owner shall inform the Contractor of the emergency work performed, particularly where it may affect the work of the Contractor.
30. Termination of Contract and Stop Work Action
- 30.1 The Owner may, owing to a certificate of the Consultant indicating that sufficient cause exists to justify such action, without prejudice to any other right or remedy and after giving the Contractor and the Contractor's surety seven days written notice, terminate the employment of the Contractor. At that time the Owner may take possession of the premises and of all materials,

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tools and appliances on the premises and finish the work by whatever method the Owner may deem expedient. Cause for such action by the Owner includes:

- .1 the contractor is adjudged bankrupt, or makes a general assignment for the benefit of its creditors, or
- .2 a receiver is appointed due to the Contractor's insolvency, or
- .3 the Contractor persistently or repeatedly refuses or fails to provide enough properly skilled workers or proper materials, or
- .4 the Contractor fails to make prompt payment to Subcontractors or suppliers of materials or labor, or
- .5 the Contractor persistently disregards laws, ordinances or the instructions of the Consultant, or is otherwise found guilty of a substantial violation of a provision of the Contract Documents.

- 30.2 The Contractor is not entitled, as a consequence of the termination of the employment of the Contractor as described above, to receive any further payment until the Work is finished. If the unpaid balance of the contract amount exceeds the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such balance shall be paid to the Contractor. If the expense of finishing the Work exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The Consultant shall certify the expense incurred by the Contractor's default. This obligation for payment shall continue to exist after termination of the contract.
- 30.3 The Contractor may, if the Work is stopped by order of any court or other public authority for a period of thirty consecutive days, and through no act or fault of the Contractor or of anyone employed by the Contractor, with seven days written notice to the Owner and the Consultant, terminate this contract. The Contractor may then recover from the Owner payment for all work executed, any proven loss and reasonable profit and damage.
- 30.4 The Contractor may, if the Consultant fails to issue a certificate for payment within seven days after the Contractor's formal request for payment, through no fault of the Contractor, or if the Owner fails to pay to the Contractor within 30 days after submission of any sum certified by the Consultant, with seven days written notice to the Owner and the Consultant, stop the Work or terminate this Contract.

31. Delays and Extension of Time

- 31.1 The completion date of the contract shall be extended if the work is delayed by changes ordered in the work which have approved time extensions, or by an act or neglect of the Owner, the Consultant, or the Owner's Contractor, or by strikes, lockouts, fire, flooding, unusual delay in transportation, unavoidable casualties, or by other causes beyond the Contractor's control. The Consultant shall determine the status of all claimed causes.
- 31.2 The contract shall not be extended for delay occurring more than seven calendar days before the Contractor's claim made in writing to the Consultant. In case of a continuing cause of delay, only one claim is necessary.
- 31.3 The contract shall not be extended due to failure of the Consultant to furnish drawings if no schedule or agreement is made between the Contractor and the Consultant indicating the dates

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which drawings shall be furnished and fourteen calendar days has passed after said date for such drawings.

- 31.4 This article does not exclude the recovery of damages for delay by either party under other provisions in the Contract Document.

32. Payments to the Contractor

- 32.1 As noted under *Preconstruction Conference* in this section, the Contractor shall submit a Schedule of Values form, before the first application for payment, for approval by the Owner and Consultant. The Consultant may direct the Contractor to provide evidence that supports the correctness of the form. The approved Schedule of Values shall be used as a basis for payments.
- 32.2 The Contractor shall submit an application for each payment (“Requisition for Payment”) on a form approved by the Owner and Consultant. The Consultant may require receipts or other documents showing the Contractor's payments for materials and labor, including payments to Subcontractors.
- 32.3 The Contractor shall submit Requisitions for Payment as the work progresses not more frequently than once each month, unless the Owner approves a more frequent interval due to unusual circumstances. The Requisition for Payment is based on the proportionate quantities of the various classes of work completed or incorporated in the Work, in agreement with the actual progress of the Work and the dollar value indicated in the Schedule of Values.
- 32.4 The Consultant shall verify and certify each Requisition for Payment which appears to be complete and correct prior to payment being made by the Owner. The Consultant may certify an appropriate amount for materials not incorporated in the Work which have been delivered and suitably stored at the site. The Contractor shall submit bills of sale, insurance certificates, or other such documents that will adequately protect the Owner’s interests prior to payments being certified.
- 32.5 In the event any materials delivered but not yet incorporated in the Work have been included in a certified Requisition for Payment with payment made, and said materials thereafter are damaged, deteriorated or destroyed, or for any reason whatsoever become unsuitable or unavailable for use in the Work, the full amount previously allowed shall be deducted from subsequent payments unless the Contractor satisfactorily replaces said material.
- 32.6 The Contractor may request certification of an appropriate dollar amount for materials not incorporated in the Work which have been delivered and suitably stored away from the site. The Contractor shall submit bills of sale, insurance certificates, right-of-entry documents or other such documents that will adequately protect the Owner’s interests. The Consultant shall determine if the Contractor's documentation for the materials is complete and specifically designated for the Project. The Owner may allow certification of such payments.
- 32.7 Subcontractors may request, and shall receive from the Consultant, copies of approved Requisitions for Payment showing the amounts certified in the Schedule of Values.
- 32.8 Certified Requisitions for Payment, payments made to the Contractor, or partial or entire occupancy of the project by the Owner shall not constitute an acceptance of any work that does

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General Conditions

not conform to the Contract Documents. The making and acceptance of the final payment constitutes a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty work or materials appearing within one year from final payment or from requirements of the Drawings and Specifications, and of all claims by the Contractor, except those previously made and still unsettled.

33. Payments Withheld

- 33.1 The Owner shall retain five percent of each payment due the Contractor as part security for the fulfillment of the contract by the Contractor. The Owner may make payment of a portion of this “retainage” to the Contractor temporarily or permanently during the progress of the Work. The Owner may thereafter withhold further payments until the full amount of the five percent is reestablished. The Contractor may deposit with the Maine State Treasurer certain securities in place of retainage amounts due according to Maine Statute (5 M.R.S. §1746).
- 33.2 The Consultant may withhold or nullify the whole or a portion of any Requisitions for Payment submitted by the Contractor in the amount that may be necessary, in his reasonable opinion, to protect the Owner from loss due to any of the following:
- .1 defective work not remedied;
 - .2 claims filed or reasonable evidence indicating probable filing of claims;
 - .3 failure to make payments properly to Subcontractors or suppliers;
 - .4 a reasonable doubt that the contract can be completed for the balance then unpaid;
 - .5 liability for damage to another contractor.

The Owner shall make payment to the Contractor, in the amount withheld, when the above circumstances are removed.

34. Liens

- 34.1 The Contractor shall deliver to the Owner a complete release of all liens arising out of this contract before the final payment or any part of the retainage payment is released. The Contractor shall provide with the release of liens an affidavit asserting each release includes all labor and materials for which a lien could be filed. Alternately, the Contractor, in the event any Subcontractor or supplier refuses to furnish a release of lien in full, may furnish a bond satisfactory to the Owner, to indemnify the Owner against any lien.
- 34.2 In the event any lien remains unsatisfied after all payments to the Contractor are made by the Owner, the Contractor shall refund to the Owner all money that the latter may be compelled to pay in discharging such lien, including all cost and reasonable attorney’s fees.

35. Workmanship

- 35.1 The Contractor shall provide materials, equipment, and installed work equal to or better than the quality specified in the Contract Documents and approved in submittal and sample. The installation methods shall be of the highest standards, and the best obtainable from the respective trades. The Consultant’s decision on the quality of work shall be final.

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General Conditions

- 35.2 The Contractor shall know local labor conditions for skilled and unskilled labor in order to apply the labor appropriately to the Work. All labor shall be performed by individuals well skilled in their respective trades.
- 35.3 The Contractor shall perform all cutting, fitting, patching and placing of work in such a manner to allow subsequent work to fit properly, whether that be by the Contractor, the Owner's Contractors or others. The Owner and Consultant may advise the Contractor regarding such subsequent work. Notwithstanding the notification or knowledge of such subsequent work, the Contractor may be directed to comply with this standard of compatible construction by the Consultant at the Contractor's expense.
- 35.4 The Contractor shall request clarification or revision of any design work by the Consultant, prior to commencing that work, in a circumstance where the Contractor believes the work cannot feasibly be completed at the highest quality, or as indicated in the Contract Documents. The Consultant shall respond to such requests in a timely way, providing clarifying information, a feasible revision, or instruction allowing a reduced quality of work. The Contractor shall follow the direction of the Consultant regarding the required request for information.
- 35.5 The Contractor shall guarantee the Work against any defects in workmanship and materials for a period of one year commencing with the date of the Certificate of Substantial Completion, unless specified otherwise for specific elements of the project. The Work may also be subdivided in mutually agreed upon components, each defined by a separate Certificate of Substantial Completion.
36. Close-out of the Work
- 36.1 The Contractor shall remove from the premises all waste materials caused by the work. The Contractor shall make the spaces "broom clean" unless a more thorough cleaning is specified. The Contractor shall clean all windows and glass immediately prior to the final inspection, unless otherwise directed.
- 36.2 The Owner may conduct the cleaning of the premises where the Contractor, duly notified by the Consultant, fails to adequately complete the task. The expense of this cleaning may be deducted from the sum due to the Contractor.
- 36.3 The Contractor shall participate in all final inspections and acknowledge the documentation of unsatisfactory work, customarily called the "punch list", to be corrected by the Contractor. The Consultant shall document the successful completion of the Work in a dated Certificate of Substantial Completion, to be signed by Owner, Consultant, and Contractor.
- 36.4 The Contractor shall not call for final inspection of any portion of the Work that is not completely and permanently installed. The Contractor may be found liable for the expenses of individuals called to final inspection meetings prematurely.
- 36.5 The Contractor and all major Subcontractors shall participate in the end-of-warranty-period conference, typically scheduled close to one year after the Substantial Completion date.

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General Conditions

37. Date of Completion and Liquidated Damages

- 37.1 The Contractor may make a written request to the Owner for an extension or reduction of time, if necessary. The request shall include the reasons the Contractor believes justifies the proposed completion date. The Owner may grant the revision of the contract completion date if the Work was delayed due to conditions beyond the control and the responsibility of the Contractor. The Contractor shall not conduct unauthorized accelerated work or file delay claims to recover alleged damages for unauthorized early completion.

- 37.2 The Contractor shall vigorously pursue the completion of the Work and notify the Owner of any factors that have, may, or will affect the approved Schedule of the Work. The Contractor may be found responsible for expenses of the Owner or Consultant if the Contractor fails to make notification of project delays.

- 37.3 The Project is planned to be done in an orderly fashion which allows for an iterative submittal review process, construction administration including minor changes in the Work and some bad weather. The Contractor shall not file delay claims to recover alleged damages on work the Consultant determines has followed the expected rate of progress.

- 37.4 The Consultant shall prepare the Certificate of Substantial Completion which, when signed by the Owner and the Contractor, documents the date of Substantial Completion of the Work or a designated portion of the Work. The Owner shall not consider the issuance of a Certificate of Occupancy by an outside authority a prerequisite for Substantial Completion if the Certificate of Occupancy cannot be obtained due to factors beyond the Contractor’s control.

- 37.5 Liquidated Damages may be deducted from the sum due to the Contractor for each calendar day that the Work remains uncompleted after the completion date specified in the Contract or an approved amended completion date. The dollar amount per day shall be calculated using the Schedule of Liquidated Damages table shown below.

If the original contract amount is:	The per day Liquidated Damages shall be:
Less than \$100,000	\$250
\$100,000 to less than \$2,000,000	\$750
\$2,000,000 to less than \$10,000,000	\$1,500
\$10,000,000 and greater	\$1,500 plus \$250 for each \$2,000,000 over \$10,000,000

38. Dispute Resolution

38.1 Mediation

- 38.1.1 A dispute between the parties which arises under this Contract which cannot be resolved through informal negotiation, shall be submitted to a neutral mediator jointly selected by the parties.

- 38.1.2 Either party may file suit before or during mediation if the party, in good faith, deems it to be necessary to avoid losing the right to sue due to a statute of limitations. If suit is filed before good faith mediation efforts are completed, the party filing suit shall agree to stay all proceedings in the lawsuit pending completion of the mediation process, provided such stay is without prejudice.

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General Conditions

38.1.3 In any mediation between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

38.2 Arbitration

38.2.1 If the dispute is not resolved through mediation, the dispute shall be settled by arbitration. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator; the third arbitrator shall be appointed by the arbitrators selected by the parties. The arbitration shall be conducted in accordance with the Maine Uniform Arbitration Act (MUAA), except as otherwise provided in this section.

38.2.2 The decision of the arbitrators shall be final and binding upon all parties. The decision may be entered in court as provided in the MUAA.

38.2.3 The costs of the arbitration, including the arbitrators' fees shall be borne equally by the parties to the arbitration, unless the arbitrator orders otherwise.

38.2.4 In any arbitration between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

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Wage Determination Schedule

PART 1- GENERAL

1.1 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section.

1.2 Summary

- A. This Section includes the wage determination requirements for Contractors as issued by the State of Maine Department of Labor Bureau of Labor Standards or the United States Department of Labor.

1.3 Requirements

- A. Conform to the wage determination schedule for this project which is shown on the following page.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

State of Maine Department of Labor - Bureau of Labor Standards
Augusta, Maine 04333-0045 - Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2024 Fair Minimum Wage Rates -- Building 2 Penobscot County (other than 1 or 2 family homes)

Occupational Title	Minimum Wage	Minimum Benefit	Total
Brickmasons And Blockmasons	\$32.25	\$2.95	\$35.20
Bulldozer Operator	\$31.50	\$7.53	\$39.03
Carpenter	\$19.57	\$18.35	\$37.92
Cement Masons And Concrete Finisher	\$22.63	\$3.67	\$26.30
Commercial Divers	\$30.00	\$4.62	\$34.62
Construction And Maintenance Painters	\$21.00	\$0.97	\$21.97
Construction Laborer	\$22.00	\$2.31	\$24.31
Crane And Tower Operators	\$34.00	\$10.12	\$44.12
Crushing Grinding And Polishing Machine Operators	\$23.00	\$4.94	\$27.94
Drywall And Ceiling Tile Installers	\$26.20	\$10.62	\$36.82
Earth Drillers - Except Oil And Gas	\$21.41	\$5.51	\$26.92
Electrical Power - Line Installer And Repairers	\$38.93	\$8.91	\$47.84
Electricians	\$37.58	\$6.36	\$43.94
Elevator Installers And Repairers	\$68.38	\$45.29	\$113.67
Excavating And Loading Machine And Dragline Operators	\$26.00	\$7.01	\$33.01
Excavator Operator	\$31.38	\$5.91	\$37.29
Fence Erectors	\$26.75	\$4.05	\$30.80
Flaggers	\$20.00	\$0.38	\$20.38
Floor Layers - Except Carpet/Wood/Hard Tiles	\$27.00	\$6.21	\$33.21
Glaziers	\$37.00	\$6.60	\$43.60
Grader/Scrapper Operator	\$23.00	\$1.99	\$24.99
Hazardous Materials Removal Workers	\$20.63	\$1.25	\$21.88
Heating And Air Conditioning And Refrigeration Mechanics And Installers	\$30.08	\$5.49	\$35.57
Heavy And Tractor - Trailer Truck Drivers	\$21.50	\$0.95	\$22.45
Highway Maintenance Workers	\$20.00	\$0.00	\$20.00
Industrial Machinery Mechanics	\$31.25	\$1.01	\$32.26
Industrial Truck And Tractor Operators	\$29.25	\$4.06	\$33.31
Insulation Worker - Mechanical	\$23.00	\$3.59	\$26.59
Ironworker - Ornamental	\$29.00	\$11.24	\$40.24
Light Truck Or Delivery Services Drivers	\$23.34	\$1.67	\$25.01
Millwrights	\$33.75	\$8.78	\$42.53
Mobile Heavy Equipment Mechanics - Except Engines	\$27.75	\$4.89	\$32.64
Operating Engineers And Other Equipment Operators	\$24.00	\$2.38	\$26.38
Paver Operator	\$27.03	\$6.49	\$33.52
Pile-Driver Operators	\$32.75	\$1.95	\$34.70
Pipelayers	\$28.50	\$4.89	\$33.39
Plumbers Pipe Fitters And Steamfitters	\$29.50	\$5.48	\$34.98
Pump Operators - Except Wellhead Pumpers	\$31.49	\$32.08	\$63.57
Radio Cellular And Tower Equipment Installers	\$26.00	\$3.77	\$29.77
Reclaimer Operator	\$27.03	\$7.68	\$34.71
Reinforcing Iron And Rebar Workers	\$30.83	\$24.97	\$55.80
Riggers	\$29.25	\$7.79	\$37.04
Roofers	\$23.00	\$3.13	\$26.13
Screed/Wheelman	\$29.25	\$4.94	\$34.19
Sheet Metal Workers	\$26.00	\$6.39	\$32.39
Structural Iron And Steel Workers	\$30.83	\$24.97	\$55.80
Tapers	\$25.00	\$5.11	\$30.11
Telecommunications Equipment Installers And Repairers - Except Line Installers	\$30.00	\$2.39	\$32.39
Telecommunications Line Installers And Repairers	\$23.00	\$5.16	\$28.16
Tile And Marble Setters	\$27.75	\$6.73	\$34.48

Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)

Apprentices – The minimum wage rates for registered apprentices are the rates recognized in the sponsorship agreement for registered apprentices working in the pertinent classification.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: 
 Scott R. Cotnoir
 Wage & Hour Director
 Bureau of Labor Standards

Expiration Date: 12-31-2024
 Revision Date: 1-3-2024

**State of Maine
Department of Labor
Bureau of Labor Standards
Augusta, Maine 04333-0045
Telephone (207) 623-7906**

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

**2023 Fair Minimum Wage Rates
Building 2 Cumberland County
(other than 1 or 2 family homes)**

<u>Occupational Title</u>	<u>Minimum Wage</u>	<u>Minimum Benefit</u>	<u>Total</u>
Brickmasons And Blockmasons	\$33.00	\$4.62	\$37.62
Bulldozer Operator	\$30.00	\$7.29	\$37.29
Carpenter	\$32.59	\$12.38	\$44.97
Cement Masons And Concrete Finisher	\$24.50	\$3.86	\$28.36
Construction And Maintenance Painters	\$23.00	\$2.38	\$25.38
Construction Laborer	\$21.74	\$3.06	\$24.80
Control And Valve Installers And Repairers - Except Mechanical Door	\$31.00	\$9.86	\$40.86
Crane And Tower Operators	\$33.50	\$11.51	\$45.01
Drywall And Ceiling Tile Installers	\$26.50	\$3.91	\$30.41
Earth Drillers - Except Oil And Gas	\$28.25	\$4.94	\$33.19
Electrical Power - Line Installer And Repairers	\$54.08	\$25.81	\$79.89
Electricians	\$29.64	\$6.43	\$36.07
Elevator Installers And Repairers	\$65.62	\$43.13	\$108.75
Excavating And Loading Machine And Dragline Operators	\$24.00	\$3.24	\$27.24
Excavator Operator	\$28.00	\$2.10	\$30.10
Fence Erectors	\$24.00	\$4.59	\$28.59
Floor Layers - Except Carpet/Wood/Hard Tiles	\$24.00	\$6.32	\$30.32
Glaziers	\$22.75	\$4.75	\$27.50
Grader/Scraper Operator	\$24.76	\$3.96	\$28.72
Hazardous Materials Removal Workers	\$21.00	\$0.84	\$21.84
Heating And Air Conditioning And Refrigeration Mechanics And Installers	\$30.55	\$5.02	\$35.57
Heavy And Tractor - Trailer Truck Drivers	\$22.50	\$1.31	\$23.81
Industrial Machinery Mechanics	\$33.43	\$2.38	\$35.81
Insulation Worker - Mechanical	\$22.63	\$3.63	\$26.26
Ironworker - Ornamental	\$27.22	\$5.55	\$32.77
Light Truck Or Delivery Services Drivers	\$22.00	\$3.17	\$25.17
Millwrights	\$33.90	\$10.37	\$44.27
Mobile Heavy Equipment Mechanics - Except Engines	\$25.00	\$4.32	\$29.32
Operating Engineers And Other Equipment Operators	\$26.63	\$7.17	\$33.80
Pipelayers	\$25.50	\$3.54	\$29.04
Plasterers And Stucco Masons	\$42.18	\$19.67	\$61.85
Plumbers Pipe Fitters And Steamfitters	\$32.00	\$4.76	\$36.76
Reinforcing Iron And Rebar Workers	\$24.00	\$5.94	\$29.94
Riggers	\$28.00	\$9.74	\$37.74
Roofers	\$25.00	\$1.08	\$26.08
Sheet Metal Workers	\$26.40	\$2.47	\$28.87
Structural Iron And Steel Workers	\$32.02	\$24.67	\$56.69
Tapers	\$28.00	\$4.18	\$32.18
Telecommunications Equipment Installers And Repairers - Except Line Installers	\$30.50	\$10.07	\$40.57
Telecommunications Line Installers And Repairers	\$24.00	\$4.13	\$28.13
Tile And Marble Setters	\$25.00	\$5.03	\$30.03

Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)


Apprentices – The minimum wage rates for registered apprentices are the rates recognized in the sponsorship agreement for registered apprentices working in the pertinent classification.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: 

**Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards**

Expiration Date: 12-31-2023

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Work covered by the Contract Documents.
 2. Type of the Contract.
 3. Work schedule.
 4. Work under other contracts.
 5. Use of premises.
 6. Owner's occupancy requirements.
 7. Work restrictions.
 8. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Mackworth Island Renovations Phase 1.
- B. Project Location: Maine Education Center for the Deaf and hard of Hearing (A.K.A. Governor Baxtor School for the Deaf) Falmouth, Maine
- C. Owner: State of Maine
 1. Owner's Representative: Deane Rykerson
- D. Architect: Harriman, 46 Harriman Drive, Auburn, Maine.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 PERMITS

- A. The Contractor is responsible for obtaining all permits required by the Town of Falmouth.

1.6 WORK SCHEDULE

- A. The construction start dates shall be as follows:
 1. Contractor mobilization shall be on a date to be determined by the Owner.
- B. Completion dates for the work:

1. The work shall be substantially complete on or before (9) nine months after contract is awarded. Final completion, including completion of punch list items shall be done on or before (12) twelve months after contract is awarded.
- C. Time: The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

1.7 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts. References to concurrent work included throughout the contract documents is intended to identify areas of potential overlap and conflict but does not necessarily capture all work under separate contracts. The Contractor shall coordinate fully with the Architect, Owner, and separate contractors prior to the commencement of work to identify all potential conflicts between separate contractors and to confirm scheduling requirements for a successful project completion.

1.8 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated: identified as the IF&W Building and its adjacent parking areas. Access on or near the hospital grounds is strictly prohibited. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Owner Occupancy: Allow for Owner occupancy of facilities adjacent to the work and use by the public.
 2. Driveways and Entrances: Keep driveways, parking, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Campus Tobacco Use Policy: A tobacco-free campus has been established at the Maine Education Center for the Deaf and Hard of Hearing on Mackworth Island (MECDHH).
1. The MECDHH is a tobacco-free campus. This policy applies to all staff, contractors, vendors and visitors. The use of tobacco and all smoking products is not permitted on any MECDHH property, which includes but is not limited to, buildings, campus grounds, parking areas, and walkways,.
 2. Tobacco use by definition includes the possession of any lighted tobacco products, or the use of any type of smokeless tobacco, including but not limited to chew, snuff, snus, electronic cigarettes, and all other nicotine delivery devices that are non-FDA approved as cessation products.
 3. It is the shared responsibility of all members of the campus community to respect and abide by this policy. The successful implementation of this policy depends on the courtesy and cooperation of the entire campus community.

- D. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building during construction period.

1.9 OWNER'S OCCUPANCY REQUIREMENTS

- A. During the construction period the building is not intended to be occupied outside of general maintenance. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
 - 1. Maintain access to existing walkways, roadways, and other adjacent occupied or used facilities. Do not close or obstruct walkways, roadways, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
 - 3. Provide protective coverings for all furnishings (flooring, desks, shelves, equipment, etc..) that remain in the building to ensure that no damage occurs during construction.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of Work, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

1.10 WORK RESTRICTIONS

- A. Adhere to posted weight limits to and from construction areas. The Mackworth Island causeway and bridge have a posted weight limit.
- B. On-Site Work Hours: Work shall be generally performed inside the existing building during normal hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, except otherwise indicated.
 - 1. Early Morning Hours: Contractor allowed access to site during early morning hours (prior to 7:00 am) upon request and approval of the owner.
 - 2. Hours for Utility Shutdowns: to be coordinated with the Owner a minimum of two weeks prior to the estimated time of work.
 - 3. Hours for Core Drilling and Concrete Saw Cutting: Work shall be performed during Early Morning Hours and be coordinated with the Owner a minimum of two weeks prior to the estimated time of work.
 - 4. Care should be taken to limit disruption of the Andrews Avenue neighborhood, Mackworth Island State Park, and ongoing programs/activities on school grounds. Work that impacts the use and/or access of the above-mentioned locations must be coordinated with school facility staff a minimum of two weeks prior to the estimated time of work.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two weeks in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

3. Shutdown of building electrical service shall be only after indicated temporary electrical service is in place and critical loads have been cut over.
- D. Worker Supervision:
1. The Contractor shall supervise the actions of employees and sub-contractors with regard to inappropriate activity at the site. Comply with the following requirements:
 - a. Sexual harassment of any nature will not be tolerated.
 - b. No pornography on property.
 - c. No alcohol on property.
 - d. No drugs on property.
 - e. No guns or weapons on property.
 - f. No smoking or vaping on property.
 2. Failure to comply with the requirements outlined above will result in immediate action by the Owner. First Offense: The individual removed permanently from premises. Second Offense: The responsible subcontractor removed permanently from premises.

1.11 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "2004 Master Format" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.12 MISCELLANEOUS PROVISIONS

- A. Material safety data sheets shall be made available in accordance with OSHA requirements.
- B. No asbestos containing materials shall be used in the work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
- C. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight[,] and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.10 CONTINGENCY ALLOWANCES

- A. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- B. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- C. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.11 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 - 3. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 - 4. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump-Sum Allowance: Include the sum of \$5,000.00 for miscellaneous metals required to support gate hinge attachment to masonry gateway.
 - 1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.
- A. Allowance No. 2: Lump-Sum Allowance: Include the sum of \$15,000.00 for Campus Wayfinding Signage (Add-Alternate No. 2).
 - 1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Document 012200B "Unit Prices Form" for required Unit Prices

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification; or if estimated quantities of Work issued by allowance required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, hauling, disposal, equipment, labor, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012200

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DOCUMENT 012200 - UNIT PRICES FORM

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: _____.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. The undersigned Bidder proposes the amounts below be added to or deducted from the Contract Sum on performance and measurement of the individual items of Work.

1.3 UNIT PRICES

- A. Unit-Price No. 1: Excavation of unsuitable material and removal from site -per cubic yard, in place – open or trench.
 - 1. _____ Dollars (\$ _____) per unit.
- B. Unit-Price No. 2: Excavation and backfill with excavated material - per cubic yard, in place - open.
 - 1. _____ Dollars (\$ _____) per unit.
- C. Unit-Price No. 3: Excavation and backfill with excavated material - per cubic yard, in place - trench.
 - 1. _____ Dollars (\$ _____) per unit.
- D. Unit-Price No. 4: Rock blasting mobilization and pre-blast survey, Lump Sum.
 - 1. _____ Dollars (\$ _____) per unit.
- E. Unit-Price No. 5: Rock excavation, including removal from site, in place -per cubic yard-open.
 - 1. _____ Dollars (\$ _____) per unit.
- F. Unit-Price No. 6: Rock excavation, including removal from site, in place -per cubic yard - trench.
 - 1. _____ Dollars (\$ _____) per unit.
- G. Unit-Price No. 7: Granular borrow fill (off-site source) -in place, per cubic yard.

- 1. _____ Dollars (\$ _____) per unit.
- H. Unit-Price No. 8: Gravel base (off-site source), in place - per cubic yard.
 - 1. _____ Dollars (\$ _____) per unit.
- I. Unit-Price No. 9: Gravel subbase (off-site source), in place - per cubic yard.
 - 1. _____ Dollars (\$ _____) per unit.
- J. Unit-Price No. 11: Crushed Stone (off-site source), in place - per cubic yard.
 - 1. _____ Dollars (\$ _____) per unit.
- K. Unit-Price No. 12: Bituminous Pavement MDOT HMA 9.5mm, in place, per ton.
 - 1. _____ Dollars (\$ _____) per unit.
- L. Unit-Price No. 13: Bituminous Pavement MDOT HMA 19mm, in place, per ton.
 - 1. _____ Dollars (\$ _____) per unit.

1.4 SUBMISSION OF BID SUPPLEMENT

- A. Respectfully submitted this ____ day of _____, 2024.
- B. Submitted By: _____ (Insert name of bidding firm or corporation).
- C. Authorized Signature: _____ (Handwritten signature).
- D. Signed By: _____ (Type or print name).
- E. Title: _____ (Owner/Partner/President/Vice President).

END OF DOCUMENT 012200

SECTION 012300 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed for certain work defined in the construction documents that may be added to or deducted from the contract amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Mansion (Building A) Chimney Restoration
 - 1. Base Bid: Construct as shown on Drawings. Coordinate with all drawings and specifications.
 - 2. Add Alternate: Provide scope to repair and restore portions of the Mansion chimney as indicated on Drawing A51-1 and in specification section 045000. Coordinate with all drawings and specifications.

B. Alternate No. 2: Campus Wayfinding Signage

1. Add Alternate: Provide free-standing wayfinding sign as indicated on Drawings C20-1, C30-1, A01-1, A50-1, A50-2 and specification sections 033000, 047200, 047315, 101400, 311000, 312000, 323000, 329200, 329300. Coordinate with all drawings and specifications.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days after receipt of Proposal Request or earlier as specified in Proposal Request issued, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include quotes on supplier's and subcontractor's letterhead for the requested change.
 - e. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float time before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float time before requesting an extension of the Contract Time.
 6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests, or format as approved by the Owner.

1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a University of Maine Change Order form for signatures of Owner and Contractor.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract Documents, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. The forms for application for payment, duly notarized, shall be the current authorized edition of the AIA Document G702, Application for Payment, supported by a current authorized edition of AIA G703, Continuation Sheet. Samples of these, and other required AIA documents, are provided in the Contract Documents under Division 00 for informational purposes only.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect prior to the pre-construction meeting.
- B. Format and Content: Use the specification table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Contractor's name and address.
 - d. Date of submittal.
 - 2. Submit draft of AIA G702 Application for Payment form and AIA G703 Continuation Sheet (Schedule of Values) form.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.

- d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers).
 - g. Dollar value.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Specification table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - a. For each line item, provide a sublist breakdown as follows:
 - 1) Material.
 - 2) Labor.
 5. Documentation: Submit proper documentation for the amounts being requisitioned from subcontractors and material suppliers with each Application for Payment. Three (3) copies of an Application for Payment or a Payment Requisition are required for all subcontracted work. Three (3) copies of the invoice is required for each major supplier.
 6. Stored Materials: If Contractor is requesting payment for stored materials as part of the Application for Payment, Contractor must complete Column F in the G703 Continuation Sheet (Schedule of Values) to record the stored materials amounts against line items that pertain to those stored materials. Stored materials are materials or equipment purchased or fabricated and stored, but not yet installed or incorporated into the Work.
 - a. Complete and provide three (3) copies of 00 62 79 Stored Materials form with all required documentation. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
 - b. Only major long lead delivery items may be considered for off-site storage (example: long lead custom mechanical unit). Standard order and production materials and products shall be delivered to the site before including in Application for Payment of such items.
 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values.
 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when approved Change Orders or Construction Change Directives result in a change in the Contract Sum.
 10. Retainage: The required five percent (5%) retainage held per Application for Payment submission shall be accounted for on the G703 on a per line item basis. Each line item with a value in Column G "Total Completed and Stored To Date" shall have a corresponding five percent retainage value entered in Column I.
 - a. Final Release of Retainage: The final release of retainage shall be entered as a separate line item on the G703 as "Final Release of Retainage" with the full amount of the five percent retainage entered as a negative number in Column I. The final release of retainage request is submitted as a separate application.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: G702 Application for Payment shall be submitted to Architect and Owner not less than seven (7) days before monthly progress meeting. The period covered by each Application for Payment is one (1) month, ending on the last day of the month.
- C. Payment Application Forms: The Contractor is required under the Contract Documents to use official original AIA documents. Samples of the required documents are provided in Division 00 of the Specifications.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of approved Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal:
 - 1. Submit three (3) signed and notarized originals of:
 - a. AIA G702 Application & Certificate for Payment.
 - b. AIA G703 Continuation Sheet.
 - c. AIA G706 Contractor's Affidavit of Payment of Debts & Claims.
 - d. AIA G706A Contractor's Affidavit of Release of Liens.
 - e. 00 65 19.17 Waiver of Lien.
 - 2. Transmit each Application for Payment with a transmittal form listing attachments and recording appropriate information about submission.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit three (3) copies of waivers of mechanic's lien from subcontractors, sub-subcontractors, major suppliers, and every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit final waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - 5. Waiver Forms: Submit 00 65 19.17 Waiver of Lien forms, executed in a manner acceptable to Owner.
- G. Certified Payrolls: Wages paid to all workers performing work on the Project shall be in accordance with the Section 00 73 64 Wage Determination Schedule for the Project. Contractor shall submit one (1) copy of each weekly certified payroll for Contractor and all subcontractors, sub-subcontractors, sub-sub-subcontractors, etc. performing work on

the Project during the time covered by the Application for Payment. The certified payroll shall be completed in accordance with Section 3.4.4 of the A201 General Conditions and contain the following information:

1. Contractor name.
2. Contractor address.
3. Period number.
4. Week ending date.
5. Employee(s)'s name.
6. Employee(s)'s job title.
7. Employee hourly wage:
 - a. Straight time rate.
 - b. Overtime rate.
8. Hours worked per day (broken down by straight time and overtime hours).
9. Hours worked per week (broken down by straight time and overtime hours).
10. Total earned for the week:
 - a. Straight time.
 - b. Overtime.
11. Benefits that form a part of the wage rate.
12. The signature and name of the authorized payroll person.

H. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule.
4. Submittals Schedule.
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits and other required permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.
11. Insurance verification through submission of insurance certificates, for all Subcontractors.

I. Progress Applications for Payment: Administrative actions and submittals that must precede or coincide with submittal of progress Applications for Payment include the following:

1. Contractor's Construction Schedule update.
2. Submittals for Work being requisitioned that are complete and approved.
3. Submission of list of completed tests, checklists, commissioning, reports, and similar requirements for the work that are submitted and in compliance with the Contract Documents.
4. Distribution of minutes of previous month's progress meeting.
5. Current record drawings.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion, less retainage, for portion of the Work claimed as substantially complete. Application must:

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. Reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that fees and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA G707 Consent of Surety to Final Payment, three (3) originals.
 5. Evidence that claims have been settled.
 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 7. Final, liquidated damages settlement statement, if a liquidated damages claim has been processed.
 8. As-built drawings.
 9. Operation and maintenance manuals.
 10. Final lien waivers.
 11. All training and equipment testing is complete.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Administrative and supervisory personnel.
 - 2. Project meetings.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components.
- B. Coordinate with contractors doing work for the Owner under separate contracts.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings as determined by the Contractor and subcontractors, if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for requests for interpretations (RFIs).
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 - x. USM campus operational protocols and procedures.
 3. Minutes: Record and distribute meeting minutes.
 - a. Include action items and responsible party.
- C. Progress Meetings: Conduct progress meetings at intervals as required by the project schedule. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Application for Payment: Contractor shall bring copy of Application for Payment to meeting. Review Application for Payment and required attachments, including record drawing and documents status, waivers of mechanic's liens, list of completed tests, checklists, commissioning, reports, and similar requirements for the work are submitted and in compliance with the Contract Documents.
 - c. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Requests for interpretations (RFIs).
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Record and distribute the meeting minutes.
 - a. Include action items and responsible party.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 1. Preliminary Construction Schedule.
 2. Contractor's Construction Schedule.
 3. Submittals Schedule.
 4. Field condition reports.
 5. Special reports.
- B. Related Sections include the following:
 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.
 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.

- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fagnets: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Preliminary Construction Schedule: Submit two copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- C. Preliminary Network Diagram: Submit two copies, large enough to show entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Submit two copies of initial schedule, large enough to show entire schedule for entire construction period.
- E. CPM Reports: Concurrent with CPM schedule, submit two copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

G. Special Reports: Submit two copies at time of unusual event.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
4. The Owner will review the schedule of submittals and identify the submittals that they want to receive a copy of at the same time that the Architect's copies are sent out.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include times for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - i. Restriction of noise making operations during final exam weeks.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Mechanical Commissioning, Substantial Completion, and Final Completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training.
3. Each activity cost shall reflect an accurate value subject to approval by Architect.
4. Total cost assigned to activities shall equal the total Contract Sum.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 BROAD SCOPE MILESTONE SCHEDULE

A. Submit a separate general broad scope schedule to provide a basic progress report for the Owner's use. Examples of broad scope line items to include are: Site Work, Cast-In-Place Concrete, Framing, Rough MEP, Building Envelope, Interior Finishes, Exterior Finishes, Final MEP, Commissioning, 2 Week IAQ Flush Out, Certificate of Occupancy. Update schedule on a monthly basis for submission at project meetings.

2.4 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports to Architect within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES (2023)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. 013100 "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 014000 "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Section 017700 "Closeout Procedures" for submitting warranties.
 - 6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 8. Section 017900 "Demonstration and Training" for submitting documentation of demonstration of equipment and training of Owner's personnel.
 - 9. Division 01 to 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

- D. Portable Document Format (PDF): An open standard file format used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Electronic Document Files: Copies of the Contract Drawings in electronic format will be made available by the Architect to those requesting same in accordance with the "Agreement Between Harriman (Architect & Engineer of Record) and Owner or Contractor for Release of Electronic Documents" form attached to the end of this section. Agreement form shall be filled out and signed by each party requesting electronic documents before electronic media is released to them.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each specification section concurrently.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 5. No products shall be incorporated into the work unless they have been approved by the Contractor and Architect. No work will be paid for until required submittals for applicable work have been submitted and approved.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 14 calendar days minimum for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 14 calendar days minimum for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 calendar days minimum for initial review of each submittal.
- E. Electronic Submittals: Architect is using Newforma software to process electronic submittals. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into single files incorporating submittal requirements of a single specification section and transmittal form.
 - a. Provide a separate transmittal form for Product Data, a separate transmittal form for Shop Drawings, and a separate transmittal form for Informational Submittals required by each Specification Section.
 - b. Maximum File Size: A single file size, up to 18 MB can be received. Contact Architect for instructions if file exceeds 18 MB.
 - c. For each transmittal, attach one single PDF only. Where multiple PDFs are required for a transmittal, utilize a combine feature to merge the PDFs into a single PDF.
 - 1) Unacceptable Formats: In order to process the transmittals in Newforma, the single PDF file protocol must be followed. Transmittals zip files or grouped PDFs cannot be electronically processed and will be returned without action for correction and resubmittal.
 - 2) Submittals will be returned without action for correction and resubmittal if:
 - a) Submittal does not have an electronic Transmittal Form.
 - b) Multiple specification sections are contained within a single Transmittal form. Submittals must be separated into individual Specification Sections.
 - c) Submittal does not include the Contractors' signed reviewed stamp
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a dash and then a sequential number (e.g., LNHS-061000-01). Resubmittals shall include an alphabetic suffix after another dash (e.g., LNHS-061000-01-A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Location(s) where product is to be installed, as appropriate.
 - k. Related physical samples submitted directly.
 - l. Indication of full or partial submittal.
 - m. Other necessary identification.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract

Documents, including minor variations and limitations. Include same identification information as related submittal.

- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with appropriate notation from Architect's action stamp.
- I. Architect will return all processed submittals through the Newforma file transfer procedure. Contractor will be responsible for incorporating the processed submittals into their file management systems as appropriate.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with appropriate notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals by either of the following methods:
 - a. Via email as PDF electronic file to constructadmin@harriman.com.
 - 1) Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - b. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
 - 1) Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.

- c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
 7. Do not submit Material Safety Data Sheets (MSDSs).
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if specified.
 2. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.

- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Y. Material Safety Data Sheets (MSDSs): Submit information directly to Owner at end of the project; do not submit to Architect. Maintain copy at the site for the duration of the construction.
 - 1. Architect will not review submittals that include MSDSs and will return them.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Contractor to mark submittal with their approval stamp before submitting to Architect.
 - 1. The Contractor shall review submittals for completeness and compliance with the Contract Documents. If submittal contains substitutions, Contractor shall process substitutions in accordance with Division 01 Section "Substitutions and Product

Options,” and not part of specified Shop Drawings or Product Data submittals. Contractor is responsible for keeping Subcontractors on time with the submittal schedule. If the Contractor submits submittals that are repeatedly rejected, requiring the Architect to perform multiple reviews of the same submittal because of the failure to properly prepare and complete the submittals:

- a. Owner will compensate Architect for such additional services.
- b. Owner will deduct the amount of such compensation from the final payment to the Contractor.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's submittal stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an appropriate mark to indicate status.

1. The Architect's marking of "Reviewed, Furnish as Corrected or similar verbiage means submittal has been reviewed for general conformance to the contract documents only and does not mean unqualified acceptance. The Contractor is fully responsible for compliance with the contract documents.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents will be returned by the Architect without action.

END OF SECTION 013300

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**AGREEMENT BETWEEN HARRIMAN (ARCHITECT & ENGINEER OF RECORD)
AND OWNER OR CONTRACTOR
FOR RELEASE OF ELECTRONIC DOCUMENTS**

RECIPIENT:

Name: _____ Phone Number: _____

Address: _____

Email Address: _____ Date: _____

Project Name: _____ HA Project No.: _____

- This request to for Harriman to provide the following Electronic Documents (AutoCad file or Revit model), dated _____, for the project use by the Recipient:

(List requested documents clearly) _____

-
- Electronic Documents will be provided in the current software version used by Harriman at the time of the request. Alternate versions may be available at Harriman’s discretion. Current software versions are AutoCAD 2023 and Autodesk Revit 2023.

Alternate Version Requested: _____

- Transfer method shall be by Electronic File Transfer to the email address provided above.
- A fee may be assessed for processing and distributing requested document. Recipient will be notified on any fees prior after receipt of this request document. Fees are payable prior to receiving requested documents.

TERMS AND CONDITIONS:

1. For the purpose of this document, both 2d CAD files and 3d Revit models shall be collectively defined as “Electronic Documents”.
2. It is understood and agreed that all drawings, specifications, or other documents of any kind prepared by Harriman or its subconsultants, whether in hard copy or in electronic format including Electronic Documents (collectively "Harriman’s Documents"), are instruments of their services prepared solely for use in connection with the single project for which they were prepared and that Harriman and its subconsultants retain all common law, statutory and other reserved rights, including the copyright. This agreement is not intended in any way to alter the respective interests of the parties in the Instruments of Service as set forth in the Owner/Architect Agreement, notwithstanding Harriman’s agreement to release the Electronic Documents to Recipient.
3. The Electronic Documents are provided as a convenience to the Recipient for informational purposes only in connection with the Recipient’s performance of its responsibilities and obligations relating to the Project. The Electronic Documents do not replace or supplement the paper copies of the Drawings and Specifications, which are, and remain, the Contract Documents for the Project. In all instances, it is the responsibility of the Recipient to ensure that the Electronic Documents are

consistent with the Contract Documents.

4. The parties agree that the Electronic Documents are not, nor shall they be construed to be, a product. It is expressly agreed by the Recipient that there are no warranties of any kind in such Electronic Documents or in the media in which they are contained, either expressed or implied.
5. Harriman makes no representation as to the compatibility of the Electronic Documents with any hardware or software.
6. Since the information set forth on the Electronic Documents can be modified unintentionally or otherwise, Harriman reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
7. If any differences exist between printed Instruments of Service and Electronic Documents, the information contained in the printed documents shall be presumed to be correct and take precedence over the Electronic Documents.
8. Recipient agrees not to add to, modify or alter in any way, or to allow others to add to, modify or alter in any way, the Electronic Documents or any printed copies thereof.
9. Revit models are Design Models and will only contain elements and content that Harriman deems necessary and appropriate to share. Not all objects in the models are 3d objects and no specific Level of Detail is implied or expected. Consequently, the models cannot be used to extract precise material or object quantities. The Recipient agrees that no proprietary Revit families or Revit content shall be removed from the model and/or used for any other purpose but to support this specific project.
10. The Electronic Documents are supplied in a translatable format. Any conversion of the format is solely the responsibility of the Recipient. Recipient understands and agrees that the conversion of hard copies of Instruments of Service into electronic format or the conversion of Electronic Documents from formats used by Harriman to some other format may introduce errors or other inaccuracies. Recipient agrees to accept all responsibility for any errors or inaccuracies and to release Harriman, and its subconsultants from any liability or claims for recovery of damages or expenses arising as the result of such errors or inaccuracies.
11. Where the Recipient has received specific permission to use the Electronic Documents in connection with the Recipient's obligation to prepare certain documents for Project, Recipient shall, in addition to the other obligations set forth therein, be obligated to remove Harriman's or its Consultant's title block from the copy of the Electronic Documents used by Recipient. It is understood and agreed that, without the separate express written permission of Harriman to do so, the Electronic Documents are not to be used by any contractor or any of its subcontractors of any tier of material supplier or vendor as a shop drawing or any other type of submittal or as the basis for preparing such shop drawing or submittal. The sole exception to this prohibition shall be that the Recipient may use the Electronic Documents as a clearly distinguishable separate background upon which to prepare its shop drawings or other submittal.
12. Recipient further agrees that Harriman's Documents were prepared for use in connection with this project only and that the Electronic Documents are supplied to Recipient for the limited use stated above only. Recipient agrees not to use, or to allow others to use, the Electronic Documents, in whole or in part, for any purpose other than as stated above.

13. Harriman believes that no licensing or copyright fees are due to others on account of the transfer of the Electronic Documents, but to the extent any are, the Contractor will pay the appropriate fees and hold Harriman harmless from such claims.
14. Any purchase order number provided by the Contractor is for Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
15. Harriman has prepared these Electronic Documents for the sole purpose of plotting and printing a hard copy of the design documents. Harriman believes only the hard copy print to be the accurate representation of all drawing information. Hard copy written dimensions override electronic measured dimensions. User must verify computer data against hard copy prints.
16. Electronic Documents are an inherently unstable medium subject to "bugs," deterioration, modifications, and viruses. Electronic Documents are subject to inadvertent changes in the process of moving from one computer to another or by compressing/decompressing the data; or by moving from one software revision to another; or any kind of manipulation of the data will lead to defects.
17. This agreement shall be governed by the laws of the principal place of business of Harriman. Only printed copies of the Instrument of Service shall be signed and sealed.
18. Recipient agrees to waive any and all claims and liability against Harriman and its subconsultants resulting in any way from any failure by Recipient to comply with the requirements of this Agreement for the Delivery of Documents in Electronic Format.
19. The Recipient agrees that no third-party beneficiary status or any other right of action is created in favor of any contractor, subcontractor, materialmen or other third party against Harriman by virtue of this Agreement or in connection with its delivery of Electronic Documents, and no third-party beneficiary status is intended.
20. Recipient further agrees to indemnify and save harmless Harriman and its subconsultants and each of their partners, officers, shareholders, and directors and employees from any and all claims, judgments, suits, liabilities, damages, costs or expenses (including reasonable defense and attorney's fees including claims asserted in breach of contract, breach of warranty, negligence, or any other tort) arising as a result of either: 1) Recipient's failure to comply with any of the requirements of Agreement for the Delivery of Documents in Electronic Format; or 2) a defect, error or omission in the Electronic Documents or the information contained therein, which defect, error or omission was not contained in the Contract Documents as defined in Paragraph 2 or where the use of such Contract Documents would have prevented the claim, judgment, suit, liability, damage, cost, or expense.
21. Harriman reserves the right to deny a request to translate files.

AUTHORIZED ACCEPTANCE

By Recipient

By Harriman (Architect/Engineer of Record)

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date

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SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep an element or detail secure and intact.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
1. Schedule construction operations in sequence required to obtain best Work results.
 2. Coordinate sequence of alteration work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.
 - b. Owner's partial occupancy of completed Work.
 - c. Other known work in progress.
 - d. Tests and inspections.
 3. Detail sequence of alteration work, with start and end dates.
 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 5. Use of elevator and stairs.
 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
1. Attendees: In addition to representatives of Owner' Representative, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
 2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
 - a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Fire-prevention plan.
 - c. Governing regulations.
 - d. Areas where existing construction is to remain and the required protection.
 - e. Hauling routes.
 - f. Sequence of alteration work operations.
 - g. Storage, protection, and accounting for salvaged and specially fabricated items.
 - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - i. Qualifications of personnel assigned to alteration work and assigned duties.
 - j. Requirements for extent and quality of work, tolerances, and required clearances.
 - k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
 3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

- B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at intervals agreed upon by Owner and Architect. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
 - a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
 - b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
 - 1) Interface requirements of alteration work with other Project Work.
 - 2) Status of submittals for alteration work.
 - 3) Access to alteration work locations.
 - 4) Effectiveness of fire-prevention plan.
 - 5) Quality and work standards of alteration work.
 - 6) Change Orders for alteration work.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 INFORMATIONAL SUBMITTALS

- A. Alteration Work Subschedule:
1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- C. Alteration Work Program: Submit 30 days before work begins.

1.6 QUALITY ASSURANCE

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has

completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
- B. Hazardous Materials: Hazardous materials (lead) are presumed to be present in the windows to be removed.
 1. Do not disturb hazardous materials or other items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- D. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.7 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawings and preconstruction photographs.
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 6 inches (300 mm) or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
- B. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

3.2 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.3 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.

- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. The Owner will hire an independent firm to do the testing and balancing of the air system and to do mechanical commissioning.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where

indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.

- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and re-inspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 26.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

- D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, in compliance with applicable building code.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 014200 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216

AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989

APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industry International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood-Preservers' Association www.awpa.com	(205) 733-4077

AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583

CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040

ESD	ESD Association www.esda.org	(315) 339-6937
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarooft.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Now GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200

HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation www.internationalbadminton.org	(6-03) 9283-7155
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150

ITS	Intertek Testing Service NA www.intertek.com	(972) 238-5591
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926

NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (303) 697-8441
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818

NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540

RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154

SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tilerroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422

USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	

ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	
UBC	Uniform Building Code (See ICC)	

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111

HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800

CPUC California Public Utilities Commission
www.cpuc.ca.gov

(415) 703-2782

TFS Texas Forest Service
Forest Resource Development
<http://txforestsERVICE.tamu.edu>

(979) 458-6650

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections including the following:
- C. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- D. Temporary utilities include, but are not limited to, the following:
 - 1. Sanitary facilities, including toilet facilities.
 - 2. Electric power service.
- E. Support facilities include, but are not limited to, the following:
 - 1. Waste disposal facilities.
 - 2. Construction aids and miscellaneous services and facilities.
 - 3. Security and protection facilities include, but are not limited to, the following:
 - 4. Security enclosure and lockup.
 - 5. Temporary enclosures.
- F. Related Sections include the following:
 - 1. Division 01 Section "Execution Requirements" for progress cleaning requirements.

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum.
- B. The use of existing power, and water will be allowed for Work in the existing building only.

1.4 QUALITY ASSURANCE

- A. The Contractor is responsible for the implementation, monitoring, and maintenance of job site safety program for the duration of the contract.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
- B. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- C. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.
- D. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site. Construction noise from loud machinery, equipment, hammering and similar loud noises shall be restricted to the hours when the facility is not in use. Obey State and local noise ordinances.
- E. Access to water: There is no water or heat in Buildings B, G, or associated connector. The Contractor may utilize water via a hose connection, to be provided by the Contractor, at Building K for via the existing Laundry Room. If water is required during freezing temperatures, Contractor is to coordinate a plan with the Owner to prevent frozen lines and resulting damage. If damage occurs in occupied buildings, it is the Contractor's responsibility to make and pay for repairs to return the condition prior to the start of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
 - 1. Coordinate with the Engineer and Owner at the preconstruction meeting.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Add provisions for work not in the Contract but served by temporary facilities if required.
- B. Water Service: Obtain water required for the work from location designated by the Owner. There is no water or heat in Buildings B, G, or associated connector. The Contractor may utilize water via a hose connection, to be provided by the Contractor, at Building K for via the existing Laundry Room. If water is required during freezing temperatures, Contractor is to coordinate a plan with the Owner to prevent frozen lines and resulting damage. If damage occurs in occupied buildings, it is the Contractor's responsibility to make for repairs at the Contractor's expense to return the condition prior to the start of the project.
- C. Electrical Service: Provide required power cords and connect to existing outlets where available and approved for use by the owner. Provide portable power generator in all other areas. In coordination with the Owner, the Contractor may utilize power at the existing Carter Hall Building until service is disconnected. After disconnecting prior to demolition, connection to Building K for power can be made via the existing Laundry Room. Otherwise temporary power shall be provided by the Contractor to support completion of the scope of work.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Waste Disposal Facilities: Provide waste-collection dumpsters and containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 01 Section "Execution Requirements" for progress cleaning requirements.
 - 1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
 - 2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.
- B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- C. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 2. Maintain and touch up signs, so they are legible at all times.
- E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Cherry Pickers and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- F. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life. Any expense as a result of corrective work to the elevator to be incurred by the Contractor.
1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- G. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use. Any expense as a result of corrective work to the stairs and it's components to be incurred by the Contractor.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Restoration of Roadways and Pavement: Roadways, pavements and curbs that are broken, damaged, settled, or otherwise defective as a result of receiving, handling, storage of materials or the performance of any work under this Contract, shall be fully restored to the satisfaction of the owner and authorities having jurisdiction.
- C. Restore site surfaces disturbed during construction, including stockpile and storage areas, to their pre-construction condition, or better. Leave vegetated areas smooth and finished with loam, seed, and erosion control mulch and mesh.

- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor.
 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Substitutions and Product Options" for procedures and requirements for product substitutions.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 3. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on

product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
 - 1. For correction of installed work.
 - 2. For repairs due to testing.
- B. Related Sections include the following:
 - 1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 2. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Primary operational systems and equipment.

2. Control systems.
 3. Communication systems.
 4. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components outside the building abatement project scope in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Equipment supports.
 4. Piping, ductwork, vessels, and equipment.
 5. Noise and vibration-control elements and systems.
- D. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials similar to in-place materials.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017329

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, and Other Specification Sections requiring or referencing demolition and construction waste apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, Landlord requirements, and phasing requirements.
 - 2. Section 015000 "Temporary Facilities and Controls"
 - 3. Section 024119 "Selective Demolition"

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Manage waste in compliance with the approved Waste Management Plan, including:
 - 1. Construction waste.
 - 2. Demolition waste.
 - 3. Coordination with Landlord's handling and storage requirements for excavation waste.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 7 days of the Waste Management Conference to the Owner, Landlord and Architect.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Landlord's Requirements: Provide coordination and compliance as required by the Landlord in regards to the Landlord's excavation and removal of soil or other waste management requirements that it provides, or for management of other incidental excavated soil as specified and approved by the Landlord.
- C. Waste Management Conference: Conduct conference at Project site in conjunction with the Preconstruction Conference to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each party involved.
 - 2. Review and finalize procedures for materials separation and verify availability of containers and bins needed.
 - 3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 4. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste management, including construction waste, demolition waste, and coordination with waste handling, storage and removal for the work that will be undertaken by the Landlord or others. Identify all locations where excavation below existing grade and ground floor slabs will be required. Identify the estimated amount of excavate and fill. Describe and provide for coordination and compliance with all procedures, means, and methods as required by the Landlord...

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner and Landlord. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.

- B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final Completion procedures.
 - 3. List of incomplete items.
 - 4. Submittal of Project warranties.
 - 5. Final cleaning.
 - 6. Site restoration.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Owner's Representative. Label with manufacturer's name and model number.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 6. Advise Owner of changeover in utility services.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements.
 - 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 - 11. Complete site restoration requirements.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
 1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Architect will return annotated file.
 - b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit by email to Architect and Owner's Representative.
- E. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each window and surrounding work area to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep hard floor areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Remove snow and ice to provide safe access to building.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
 - g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
 - h. Clean transparent materials, including glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - i. Remove labels that are not permanent.
 - j. Clean work area adjacent radiators of dust and debris.
 - k. Leave Project clean and ready for continued interior renovation.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."
- D. Restore surfaces disturbed during construction, including stockpile and storage areas, to their pre-construction condition, or better. Leave vegetated areas smooth and finished with loam, seed, and erosion control mulch and mesh. Restore damaged paved areas with new pavement to the existing thickness.

3.2 CORRECTION OF THE WORK

- A. Complete repair and restoration operations required by "Correction of the Work" Article in Division 01 before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting copies of final operation and maintenance manuals before final payment.
 - 2. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 3. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 4. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 5. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit 1 electronic PDF draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect and Owner's commissioning agent will review, Architect will return draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit one electronic PDF copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments after final inspection.
 - 1. Correct or modify each manual to comply with and Owner's commissioning agent and Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor and primary subcontractors.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Arrange contents alphabetically by system, subsystem, and equipment. Assemble instructions for subsystems, equipment, and components of one system into a single electronic folder. Bookmark data and information based on the table of contents.
 - 1. Include Record Shop Drawings and Product Data on CD-R in .PDF format.

2.3 OPERATION MANUALS

- A. Content: Daily operations and management of systems and equipment. In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
 - 11. Emergency operations and shutdown information that must be immediately available during emergency situations to protect life and property and to minimize disruptions to building occupants.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.

- 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
- F. Emergency Instructions and Procedures: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties. Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- G. Copy of approved submittals.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate electronic manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Record Shop Drawings.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Submit one set(s) of marked-up Record Prints and one copy on CD-R in .PDF format.
- B. Record Specifications: Submit one hard copy and one copy on electronic media of Project's Specifications, including addenda and contract modifications.
- C. Record Shop Drawings and Product Data: Submit one hard copy and one copy on electronic media of each Product Data submittal.
 - 1. Insert typewritten pages indicating drawing titles, descriptions of contents, and Record Shop Drawings and Product Data locations drawing locations that are part of operation and maintenance manuals.
 - 2. Electronic Media: In addition to paper copy, submit record copy of record Shop Drawings and Product Data on CD-R in .PDF format. Bookmark Product Data based on the table of contents.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
6. Electronic Media: Submit record copy of record specification on CD-R in .PDF format. Bookmark based on the table of contents.

2.3 RECORD SHOP DRAWINGS AND PRODUCT DATA

- A. Preparation: Mark Shop Drawings and Product Data, including equipment operation manuals to indicate the actual product installation where installation varies substantially from that indicated in Shop Drawings and Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
 4. Bind product data in heavy-duty, D-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents but not greater than 2 inches, and sized to receive 8-1/2-by-11-inch paper. Do not over fill D-ring, allowing 1/2 inch space for future additions.
 5. Provide heavy paper dividers with plastic-covered tabs for each specification section with product data. Mark tab to identify the specification section. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 6. Identify each binder on the front and spine with the typed or printed title "PRODUCT DATA," Project name, and name of Contractor.
 7. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. Maximum size of drawings to be included in the binders shall not exceed 11-by-17-inch. Fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and submit envelopes with manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.
 8. Electronic Media: Submit record copy of marked-up Shop Drawings and Product Data on CD-R in .PDF format. Bookmark based on the table of contents, and for each Shop Drawings and Product Data within each section. Where Record Shop Drawings and Product Data is required as part of operation and maintenance manuals, submit electronic media of marked-up Shop Drawings and Product Data as part of manual instead of submittal as Record Shop Drawings and Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training videos.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
 - 2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Demonstration and Training: Submit list of systems and equipment to be demonstrated and training provided.
- B. At completion of training, submit one complete training/instruction/operation manual(s) for Owner's use.
 - 1. Submit one electronic copy on CD in .PDF format.
- C. Attendance Record: For each training session, submit list of participants and person(s) providing training.

1.4 QUALITY ASSURANCE

- A. Demonstrator and Trainer Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate providing notification of dates, times, length of instruction time, and training content.
- C. Coordinate content of training with content of approved operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program: Develop an instruction program that includes individual training for each system and equipment not part of a system, as required by individual Specification Sections, and including the following:
1. Fire-protection systems, including fire alarm, sprinkler and fire-extinguishing systems.
 2. Intrusion detection systems.
 - 3.
 4. HVAC systems, including instrumentation and controls.
 5. Electrical service and distribution, including switchboards, and panelboards.
 6. Lighting equipment and controls.
 7. Communication systems, voice and data, security system, and equipment.
 8. Access control system.
 9. As required by sections in Division 02 through 33.
- B. Training: Include instruction as applicable for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Operations and maintenance manuals.
 - b. Project Record Documents.
 - c. Warranties and bonds.
 - d. Maintenance service agreements and similar continuing commitments.
 - e. Applicable video presentations.
 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. Operations: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Startup procedures.
 - c. Equipment or system break-in procedures.
 - d. Routine and normal operating instructions.
 - e. Regulation and control procedures.
 - f. Control sequences.
 - g. Safety procedures.
 - h. Instructions on stopping.
 - i. Normal and emergency shutdown instructions.
 - j. Operating procedures for system, subsystem, or equipment failure.

- k. Seasonal and weekend operating instructions.
- l. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble materials necessary for instruction.

3.2 DEMONSTRATION AND TRAINING INSTRUCTION

- A. Engage qualified personnel to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide demonstration and training instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least fourteen days' advance notice.

END OF SECTION 017900

Sample

(Modify objectives and agenda subjects for systems and equipment being covered)

TRAINING AND ORIENTATION AGENDA

Project: _____

Date: _____

Equipment / System: _____ Spec Section: _____

Section 1. Audience and General Scope

Intended audience type (enter number of staff): ___ facility manager, ___ facility engineer, ___ facility technician, ___ project manager, ___ tenant, ___ other: _____

General objectives and scope of training: (check all that apply)

- ___ A. Provide an overview of the purpose and operation of this equipment, including required interactions of trainees with the equipment.
- ___ B. Provide technical information regarding the purpose, operation and maintenance of this equipment at an intermediate level, expecting that serious malfunctions will be addressed by factory reps.
- ___ C. Provide technical information regarding the purpose, operation, troubleshooting and maintenance of this equipment at a very detailed level, expecting that almost all operation, service and repair will be provided by the trainees.

Section 2. Instructors

<u>ID</u>	<u>Trainer</u>	<u>Company</u>	<u>Position / Qualifications</u>
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____

Section 3. Agenda [The responsible contractors have their trainers fill out this section and submit to Owner and Commissioning Agent for review and approval prior to conducting training.]

Location: ___ site _____ Date _____
___ classroom (location) _____, Date _____

Agenda of general subjects covered

<u>(√ all that will be covered)</u>	<u>(√ when completed)</u>	<u>Duration</u> (min.)	<u>Instructor</u> (ID)	<u>Completed</u> (√)
___ General purpose of this system or equipment (design intent)	_____	_____	_____	_____
___ Review of control drawings and schematics (have copies for attendees)	_____	_____	_____	_____
___ Startup, loading, normal operation, unloading, shutdown, unoccupied operation, seasonal changeover, etc., as applicable	_____	_____	_____	_____
___ Integral controls (packaged): programming, troubleshooting, alarms, manual operation	_____	_____	_____	_____
___ Building automation controls (BAS): programming, troubleshooting, alarms, manual operation, interface with integral controls	_____	_____	_____	_____
___ Interactions with other systems, operation during power outage and fire	_____	_____	_____	_____
___ Relevant health and safety issues and concerns and special safety features	_____	_____	_____	_____
___ Energy conserving operation and strategies	_____	_____	_____	_____
___ Any special issues to maintain warranty	_____	_____	_____	_____
___ Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics	_____	_____	_____	_____
___ Special requirements of tenants for this equipment's function	_____	_____	_____	_____

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes:
 - 1. Demolition and removal of site elements including existing tennis courts, tennis court equipment, fencing, and lighting.
- B. Related Requirements:

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Bronze plaque mounted at exterior of Carter Hall (Building G) is to be carefully removed, protected, and retained for reuse and installation in the proposed campus gateway.
 - 2. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.

2. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review areas where existing construction is to remain and requires protection.
4. Review and finalize protection requirements.
5. Review procedures for noise control. and dust control
6. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

1.6 FIELD CONDITIONS

- A. On-site sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.2 PREPARATION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area.
 2. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

3.3 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Adhere to posted weight limits to and from construction areas.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.5 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.6 SELECTIVE DEMOLITION SCHEDULE

- A. Remove:
 - 1. Existing exterior windows
 - 2. Exterior wood window sills
 - 3. Interior wood window sills
 - 4. Exterior window opening associated wood blocking

END OF SECTION 024119

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SECTION 028213 - ASBESTOS ABATEMENT & RELATED WORK

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PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of the Contract, including General and Supplementary Conditions and Other Abatement Specification Sections, apply to the work of each of the Specification Sections.
- B. This section addresses abatement of asbestos-containing material (ACM) only.

- C. Related Work: The following items are closely related to this work but not included in this Section and shall be performed under the designated Sections.

- 1. 024119 Selective Demolition

1.2 PROJECT SCOPE-OF-WORK

- A. General: Furnish all labor, materials, equipment and perform all work required to safely remove, and otherwise abate as indicated herein, transport, and legally dispose of all asbestos-containing materials (ACM). The scope of work includes the removal, transport, and disposal of designated ACM at the Dorothea Dix Psychiatric Center, Pooler Pavilion Building located at 656 State Street in Bangor, Maine. All work is to be completed in accordance with the schedules stated herein, in the Contract Documents, and as designated by the Owner. It is essential that all work be phased and scheduled as required to Mafacilitate Owner's renovation and upgrade work. All work is to be completed in strict accordance with applicable local, Maine (State), and federal codes and regulations and the requirements stated in this specification and Contract Documents.
- B. Table 1 of Appendix A includes the listing of ACM to be removed, packaged, transported, and disposed of in accordance with the Contract Documents.
- C. Reference full inspection reports for discussions and additional information and limitations of Owner survey. Quantities listed in Table 1 are approximate only and Contractor shall remove all ACM in the work areas.
- D. The work areas have or may have other regulated or hazardous materials present that are not covered in the Section including but not limited to polychlorinated biphenyl (PCB)-containing materials, mercury, lead paint, guano, mold contamination, other hazardous materials, and universal waste. Contractor's OSHA-competent person shall also inspect the workplace for other potential hazardous building material during the work. If encountered during the work immediately notify Owner's Representative. Use only qualified, trained workers to remove, package, transport, and dispose (or recycle) of such material in strict compliance with all local, State, and Federal requirements.

1.3 WORK SCHEDULES

- A. All work shall be completed in accordance with the schedule requirements as indicated by the Owner and as stated in the Contract Documents.
- B. All work shall be strictly coordinated and scheduled by the Contractor as indicated by and approved by the Owner, the Owner's industrial hygiene consultant (IH Consultant), and the General Contractor. Work is to be phased as required to facilitate Owner operations, general occupancy of the site, and general construction activity. Contractor must provide proposed daily schedules to Owner and IH Consultant for each phase of work and each Owner work request. Adequate advance notice shall be provided to the Owner and the IH Consultant prior to any schedule changes. Start and completion dates for the work and specific phasing requirements not otherwise specified herein shall be submitted to Owner and IH Consultant for approval. Contractor shall update all State and EPA notifications and permits as needed for schedule modifications.

1.4 CONTRACTOR ESTIMATES

- A. Estimates: Contractor shall conduct necessary field measurements and site review as deemed necessary by Contractor to delineate the scope of work and site conditions prior to submittal of bid. Contractor shall note on bid any discrepancies between Contractor field measurements and listings of work stated herein. It is the responsibility of the Contractor to verify all project information and site conditions as necessary to satisfy the Contractor as to the requirements of the work for each specific phase of the project. The Contractor must notify the Owner and the IH Consultant of any conflicting information or clarifications required for the preparation of any bids, estimates, and submittal documentation. Unless otherwise stated by the Owner, the Contractor is responsible for the removal of all designated ACM at Owner facility, so designated by the Owner.

1.5 EXISTING CONDITIONS

- A. Prior to commencement of work, inspect areas in which work shall be performed. Prepare a listing and photographs of damage to structure, surfaces, finishes, insulations, and equipment that could be misconstrued as damage resulting from the work. The contractor is responsible for all damage to equipment, furnishings, finishes and building surfaces in the work area and adjacent caused by the Contractor during the course of abatement and general housecleaning. Contractor is responsible for completing all repairs to damaged items/surfaces caused by the work. In addition, Contractor must fully repair all tape, adhesive, and other staining and damage to meet or exceed existing conditions.

1.6 POTENTIAL ASBESTOS HAZARD

- A. The work site contains ACM. Review all site survey reports and conduct ongoing inspections of the work areas to identify potential hazardous material that may be encountered. Provide OSHA competent person to supervise and review work procedures and conduct ongoing work area inspections. Train all affected personnel at the job site based on the hazards and hazardous material to be encountered, impacted, or disturbed including but not limited to ACM.
- B. The disturbance or dislocation of ACM may cause asbestos fibers to be released into the building's atmosphere, thereby creating potential health hazards to workers, and building occupants. Apprise all employers on site, workers, supervisory personnel, subcontractors, and consultants who shall be at the job site of the seriousness of the hazards, other possible site hazards, and of proper work procedures that must be followed.
- C. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified asbestos-containing materials, take appropriate continuous measures as necessary to protect all building occupants from the potential hazard of exposure to airborne asbestos fibers and dust. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable federal, state, and local agencies.
- D. Complete, and coordinate with Owner's Representative as applicable, all communication of hazards in strict accordance with 29 CFR 1926.1101 (k) and other applicable OSHA and State regulations. The contractor shall coordinate with the Owner's Representative to review all existing inspection records and testing results as needed. Ensure that complete inspections of the space and affected materials have been completed of copies of inspection reports have been provided to the Owner, Contractor site supervisor and other affected contractors and subcontractors at the site as applicable. All site personnel working in areas containing ACM shall be apprised of the locations,

types, and quantities of ACM present and all such personnel shall be provided a minimum of asbestos awareness level training (for non-asbestos contractors) or additional training as indicated herein. In the event that other suspect material is encountered (or previously inaccessible spaces are accessed) that are not identified in the inspection report as having been properly inventoried and testing, then immediately cease work that would impact such materials and notify Owner's Representative such that proper testing and inspection can be performed.

1.7 CONTRACTOR USE OF PREMISES

- A. General: The Contractor shall limit his use of the site to the work indicated, so as to allow for Owner operations and general construction activity. Confine operations at the site to the specified work areas of the Specification. Take all precautions necessary to protect the site, buildings, any occupants, and surrounding areas from work-related hazards during the construction period. Maintain building in a safe and structurally sound condition throughout the work. Maintain access to the public and other trades in designated areas (for example, stairwells) as indicated herein and as otherwise noted by Owner. Provide additional barriers and site security as needed to accommodate such access. Use care to prevent damage to existing surfaces during installation of solid barriers, critical barriers, and primary isolation barriers.
- B. Install solid barriers to prevent unauthorized access and visibility from adjacent, public, or Owner-occupied areas as designated by Owner and using materials and construction methods approved by Owner.

1.8 STOP WORK

- A. The Contractor's Site Supervisor shall stop work and shall not proceed until corrective measures are implemented in the event that any of the below occur:
 - Airborne fiber concentrations outside the work area exceed 0.010 f/cc.
 - Airborne fiber concentrations inside the work area exceed 0.10 f/cc.
 - Loss of integrity of any critical barrier
 - Failure to work in accordance with state and federal regulations or this plan.
 - Visible emissions created.
 - Other potential safety and health emergencies and changes as warranted.
- B. Complete all corrective work with no change in the Contract Price if high airborne fiber counts or other conditions resulting in stop work were caused by Contractor activities or compliance deficiencies.

1.9 PROJECT COORDINATION

- A. Site Supervisor: Provide a full-time Site Supervisor who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the Contractor's Representative responsible for compliance with the specification and all applicable federal, state, and local regulations, particularly those relating to asbestos-containing materials.
 - 1. Experience and Training: The Site Supervisor must have completed a course at an EPA Training Center or equivalent certificate course in asbestos abatement procedures and have had a minimum of five (5) years on-the-job training in similar asbestos abatement procedures.

2. Accreditation/Qualifications: The Site Supervisor is to be (1) a Competent Person as required by OSHA in 29 CFR 1926, and (2) accredited and certified in accordance with the AHERA regulation 40 CFR Part 763, Subpart E, Appendix C; and (3) licensed in accordance with current State requirements.
- B. Project Manager: Provide a qualified and experienced project manager to perform administrative and project management responsibilities and to serve as Contractor management point of contact in addition to the project supervisor.
 - C. Pre-Construction Conference: An initial progress meeting, recognized as "Pre-Construction Conference" shall be convened by Owner with Contractor prior to the start of work for each phase. This meeting shall be held to review the scope-of-work, scheduling, coordination, and contractor plan of action and submittals and other applicable items.
 - D. Daily Log: Maintain at the work area a daily log documenting the dates and time of but not limited to, the following items:
 1. Visitations; authorized and unauthorized
 2. Daily sign-in sheet for all personnel entering and leaving the work area (name, certification, expirations).
 3. Special or unusual events, i.e., barrier breaching, equipment failures, accidents
 4. Documentation of the following:
 - a) Supervisor's daily inspections and exposure monitoring test results
 - b) Work progress each day for each work area.
 - c) Removal of waste material (number and type of containers) from each work area
 - d) Removal of waste from site including a copy of the accompanying waste shipment record
 - e) Decontamination of work area and equipment
 - f) Final inspection and air clearance results, and
 - g) Documentation of containment removal and final general housecleaning activity
 5. Complete and maintain daily log in accordance with applicable State and federal record keeping requirements. Provide access to logs to Owner and IH Consultant at all times and provide copies of logs with the submittal package in accordance with the construction submittal requirements.

1.10 STANDARDS

- A. Applicability of Standards: It is the Contractor's responsibility to complete all work in accordance with (or exceeding) all applicable industry standards and guidelines. Except where Contract Documents include more stringent requirements, all applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents. Applicable construction standards are made a part of the Contract Documents by reference. Where compliance with an industry standard is required, comply with the most current standards in effect as of date of Contract Documents.
- B. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement shall be enforced, unless the Contract Documents indicate otherwise. Refer

to Owner and IH Consultant any requirements that are different or conflicting; outline the more stringent requirement before proceeding.

- C. Comply with applicable standards including, but not limited to, American National Standards Institute (ANSI) standards and American Society for Testing and Materials (ASTM) standards.

1.11 CODES, REGULATIONS, AND STANDARDS

- A. Adhere to work practices and procedures set forth in applicable codes, regulations and standards related to work. Obtain permits, licenses, inspections, and similar documentation, as well as payments and similar requirements associated with codes, regulations, and standards. Update permits, as necessary.
- B. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations. The Contractor shall hold Owner, Owner's Project Management Consultant, and IH Consultant harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of himself, his employees, or his subcontractors.
- C. All work performed under this contract shall comply with applicable provisions, including most current versions, and not limited to the listed and all other applicable local, state, and federal codes and regulations.
- D. Federal Requirements: which govern asbestos abatement work or hauling, and disposal of asbestos waste materials include but are not limited to the following:

OSHA: U.S. Department of Labor, Occupational Safety and Health Administration, including but not limited to:

1. Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite; Final Rules
2. 29 CFR 1910.1001 and 29 CFR Part 1926.1101
3. Respiratory Protection: Title 29, Part 1910, Section 134 of the CFR
4. Construction Industry: Title 29, Part 1926, of the CFR and all related Subparts
5. Access to Employee Exposure and Medical Records: 29 CFR, Part 1910, Section 1020
6. Hazard Communication: Title 29, Part 1910, Section 1200 of the CFR
7. Specifications for Accident Prevention Signs and Tags: 29 CFR Part 1910, Sec. 145

DOT: U. S. Department of Transportation, including but not limited to:

1. Hazardous Material Regulations: Title 49, Part 171-180 CFR

EPA: U. S. Environmental Protection Agency (EPA), including but not limited to:

1. Asbestos Abatement Projects; Worker Protection Rule: Title 40 Part 763, Sub-part G
2. Asbestos School Hazard Abatement Reauthorization Act (ASHARA)
3. Asbestos Containing Materials in Schools Final Rule 40 CFR Part 763, Sub-part E.
4. National Emission Standard for Hazardous Air Pollutants (NESHAPS); National Emission Standard for Asbestos, 40 CFR Part 61, Sub-part A, and Sub-part M (Revised Sub-part B)

- E. Local Requirements: Abide by all local requirements that govern asbestos abatement work or hauling and disposal of asbestos waste materials.
- F. Maine Department of Environmental Protection: which govern asbestos abatement work or hauling, and disposal of asbestos waste materials include but are not limited to the following:
 - 1. Chapter 425 Asbestos Management Regulations

1.12 DEFINITIONS

- A. General Definitions: Definitions contained in this Section are not necessarily complete but are general to the extent that they are not defined more explicitly elsewhere in the Contract Documents.
 - 1. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by Owner's representative", "requested by the "IH Consultant", and similar phrases. However, no implied meaning shall be interpreted to extend the IH Consultant's, or the Owner's Project Management Consultant's responsibility into the Contractor's area of construction supervision.
 - 2. Approve: The term "approved," where used in conjunction with the Owner, Owner's Project Management Consultant, or the IH Consultant's action on the Contractor's submittals, applications, and requests, is limited to the responsibilities and duties of the IH Consultant as indicated in the Contract Documents. Such approval or acceptances do not express or claim any certification of completeness, compliance, or approval of programs and documentation, including but not limited to review of analytical results, historical information, and interpretations. Such approval shall not release the Contractor from responsibility to fulfill Contract Document requirements, unless otherwise provided in the Contract Documents.
 - 3. Furnish: The term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations."
 - 4. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations."
 - 5. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
 - 6. Installer: An "Installer" is an entity engaged by the Contractor, either as an employee, subcontractor, or sub- subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged in performing.
 - 7. IH Consultant: This is the entity employed or engaged as industrial hygiene consultant as described in the Contract Documents. All references to Owner's Consultant, Air Monitoring Consultant, or Consultant with regard to asbestos abatement in the Contract Documents in all cases refer to the IH Consultant. The IH Consultant shall represent Owner during abatement and until final payment is due. The Owner representative may also constitute other people representing Owner, other than the IH Consultant or consultant, as indicated by Owner. Owner's

instructions to the Contractor shall be made directly to the Contractor or forwarded through the IH Consultant.

8. Site Supervisor: This is the Contractor's Representative at the work site. This person shall be the Competent Person required by OSHA in 29 CFR 1926 and licensed Site Supervisor/Foreman as required by the State. Provide licensed supervisor at each individual work site during work.

B. Definitions - Asbestos Abatement:

1. Accredited or Accreditation (when referring to a person or laboratory): A person or laboratory accredited in accordance with section 206 of Title II of the Toxic Substances Control Act (TSCA).
2. Adequately Wet: Means sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from the asbestos-containing material, then that material has not been adequately wetted. The absence of visible emissions is not sufficient evidence, or measure, of a material being adequately wet.
3. Air Monitoring: The process of measuring the fiber content of a specific volume of air.
4. Amended Water: Water to which a surfactant has been added to decrease the surface tension to 35 or less dynes.
5. Asbestos: The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite. For purposes of determining respiratory and worker protection both the asbestiform and non-asbestiform varieties of the above minerals and any of these materials that have been chemically treated and/or altered shall be considered as asbestos.
6. Asbestos-Containing Material (ACM): Any material containing equal to or more than 1% of asbestos of any type or mixture of types.
7. Asbestos-Containing Building Material (ACM): Surfacing ACM, thermal system insulation ACM, or misc. ACM in or on interior structure or other parts of a building.
8. Asbestos-Containing Waste Material: Any material that is or is suspected of being or any material contaminated with an asbestos-containing material that is to be removed from a work area for disposal. May also be referred to as "asbestos waste."
9. Asbestos debris: Pieces of ACM or ACM that can be identified by color, texture, or composition, or means dust, if an accredited inspector determines the dust to be ACM or reasonably likely to have asbestos fibers present under conditions present and based on work operations.
10. Authorized Visitor: Owner, the IH Consultant, testing lab personnel, emergency personnel or a representative of any federal, state, and local regulatory or other agency having authority over the project.
11. Barrier: Any surface that seals off the work area to inhibit the movement of fibers.
12. Breathing Zone: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.

13. Category I Non-Friable ACM: means ACM packings, gaskets, resilient floor covering, and asphalt roofing products containing equal to or more than 1% asbestos. Also see definition for Regulated ACM.
14. Category II Non-Friable ACM: means any non-friable ACM, except for Category I Non-Friable ACM.
15. Certified Industrial Hygienist (CIH): An industrial hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene.
16. Critical Barrier: Polyethylene sheeting, typically 6-mil polyethylene sheeting, over windows, doors, and air passageways separating the work area from non-work area portions of the building. Critical barriers remain in place until clearance testing or inspections are completed and results meet clearance test criteria.
17. Demolition: The wrecking or taking out of any building component, system, finish, or assembly of a facility together with any related handling operations.
18. Disposal Bag: A properly labeled 6 mil thick leak-tight plastic bag used for transporting asbestos waste from work and to disposal site.
19. Contractor: The contractor engaged by the Owner to perform asbestos related activities must be licensed by the State, as applicable, and in accordance with Maine Department of Environmental Protection Chapter 425 Asbestos Management Regulations. All workers and site supervisors engaging in asbestos activity must also be trained and licensed in accordance with current State regulations and 40 CFR Part 763 (ASHERA).
20. Encapsulant: A material that surrounds or embeds asbestos fibers in an adhesive matrix, to prevent release of fibers.
 - a. Bridging encapsulant: an encapsulant that forms a discrete layer on the surface of an in-situ asbestos matrix.
 - b. Penetrating encapsulant: an encapsulant that is absorbed by the in-situ asbestos matrix without leaving a discrete surface layer.
21. Encapsulation: Treatment of asbestos-containing materials, with an encapsulant and application of appropriate post removal encapsulant on substrate and containment barriers.
22. Enclosure: The construction of an air-tight, impermeable, permanent barrier around asbestos-containing material to control the release of asbestos fibers into the air.
23. Excursion Limit: Ensure that no employee is exposed to airborne concentrations of asbestos in excess of 1.0 fibers per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of thirty (30) minutes, as determined by PCM analysis in accordance with NIOSH Method 7400 and as indicated in 29 CFR Part 1926. Also referred to as the short-term exposure limit, (STEL).
24. Friable Asbestos Material: Material that contains more than or equal to 1.0% asbestos and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry. This also includes materials which, when subjected to removal methods and other disturbances, may release fibers and dust due to the abatement actions.

25. Glovebags: Glovebags for removal of insulation in accordance with 29 CFR Part 1926.
26. HEPA Filter: A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in diameter.
27. HEPA Filter Vacuum Collection Equipment (or vacuum cleaner): High efficiency particulate air filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers of 0.3 microns or larger.
28. Negative Pressure Respirator: A respirator in which the air pressure inside the respiratory-inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.
29. Permissible exposure limit (PEL): the Contractor shall ensure that no employee is exposed to an airborne fiber concentration of asbestos in excess of 0.1 f/cc of air as an eight (8) hour time-weighted average (TWA) in accordance with 29 CFR Part 1926.
30. Personal Monitoring: Sampling of the asbestos fiber concentrations within the breathing zone of an employee.
31. Pressure Differential and Ventilation System: A local exhaust system, utilizing HEPA filtration capable of maintaining a pressure differential with the inside of the Work Area at a lower pressure than any adjacent area, and which cleans re-circulated air or generates a constant air flow from adjacent areas into the Work Area.
32. Regulated ACM (RACM): RACM means friable ACM, Category I Non-friable ACM that has been rendered friable, Category I ACM that shall be or has been subjected to sanding, cutting, grinding, or abrading (abrasive action), or Category II Non-friable ACM that has a high probability of becoming, or has become, crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of renovation or demolition operations. Grinding means breaking into small pieces or fragments.
33. Repair: Returning damaged ACM or ACM to an undamaged condition or to an intact state so as to prevent fiber release.
34. Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.
35. Time Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period.
36. Visible Emissions: Any emissions coming from RACM, ACM, ACM, asbestos debris, or asbestos waste material, which is visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.
37. Waste Shipment Record: Means the shipping document, required to be originated and signed by the waste generator, used to track, and substantiate the disposition of Asbestos waste.
38. Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using clothes, mops, or other cleaning utensils which have been dampened with

amended water and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.

39. Work Area: The area where asbestos-related work or removal operations are performed which is defined and/or isolated to prevent the spread of asbestos dust, fibers or debris, and entry by unauthorized personnel. Work area is a Regulated Area as defined by 29 CFR 1926.

1.13 NOTICES

- A. U.S. Environmental Protection Agency: Send proper written notification as required by USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) Asbestos Regulations (40 CFR 61, Subpart M) to the regional Asbestos NESHAPS Contact - Reno/Demo Clerk - at least 10 working days prior to beginning any work which shall directly or indirectly result in disturbance of asbestos-containing materials. Post notifications at job sites.
- B. State and Local Agencies: Send written notification as required by state and local regulations prior to beginning any work on asbestos-containing materials. At least 10 working days prior to the start of work, submit appropriate notification to the Maine Department of Environmental Protection. Post notifications at job sites.

Obtain all necessary State and local permits and work method waivers/approvals for conducting controlled demolition activity to facilitate asbestos removal in unsafe building space.

- C. Permits: Obtain all local, state, and federal permits necessary to conduct the work of this specification. Obtain water permits as necessary for the release of any water originating from the Work. Notify all local emergency agencies of the abatement work to be completed as required. All asbestos containing waste is to be transported by an entity maintaining a current "DOT Common Hauler Permit" specifically for asbestos-containing materials, as required for transporting of waste asbestos-containing materials to a disposal site.
- D. Licenses: Maintain current licenses as required by applicable state and local districts for the removal, transporting, disposal or other regulated activity relative to the work of this contract. Post all company, supervisor, and worker licenses at work area entrance.
- E. Posting and Filing of Regulations: Post all notices required by applicable federal, state, and local regulations. Maintain at least one (1) copy of applicable federal, state, and local regulations and standards at each job site. Post copies of the specification at the job site.
- F. Coordinate with Owner and local fire department authorities the notification and handling of heat and smoke detectors in the work areas, including sealing of detectors during work and removal of seals at the completion of work or shifts.

1.14 SUBMITTAL REQUIREMENTS

- A. Submittal Schedule: The Contractor shall provide submittals as specified herein including (1) Preconstruction Submittal Documentation prior to start of work and (2) Project Closeout Submittals within 25 days upon completion of on-site work. Submit ongoing submittals as required herein and as specified by the Owner and IH Consultant. Provide at the job site a copy of all current submittal packages and related documentation. Ongoing submittals shall also be submitted during the work as required to update the Pre-construction and Closeout submittals including, but not limited to:

1. Schedule or phasing changes, including description and explanations as applicable.
2. Proposed alternative work methods. Requests for revisions in work procedures must be approved by the Owner and IH Consultant.
3. Updated notifications and permitting.
4. Changes to licenses and training records for all personnel at the site
5. Other changes or revisions to the submittals.

B. Submittal Preparation

1. Package and furnish to Owner and IH Consultant each submittal appropriately. Submittal packages shall be in a neat and orderly fashion, shall include an index, and shall be compiled in the order requested herein. Clearly mark and label all sections of the submittal documents.
2. In the event that a submittal package does not meet the requirements herein the submittal may not be accepted, and the Contractor shall make necessary revisions and re-submit the submittal documents.
3. By “approval” or acceptance of submittals, Owner and IH Consultant do not express or claim any certification of completeness, compliance, or approval of programs and documentation, not limited to review of analytical results, historical information, regulatory compliance, and interpretations. Contractor is solely responsible for compliance with Specification and regulatory requirements associated with the work and submittal documentation.

C. Preconstruction Submittal Documentation

1. Provide the following Preconstruction Submittal Documentation prior to the start of each phase of work:
 - a) Notifications: Copies of EPA, State, and local notifications.
 - b) Waste Hauler and Landfill Permits and notifications. Submit names, address, and licenses/permits for the waste hauler(s) and disposal facilities.
 - c) Names, addresses, experience, and references for any subcontractors the Contractor proposes to utilize for Work. Indicate if any asbestos workers or supervisors to be used for Work are subcontracted labor.
 - d) Names and 24-hour phone numbers/pagers for Project Supervisor and other key personnel for the Contractor. Post emergency contact information at Decontamination Unit entrance.
 - e) List of personnel to be on-site. Copies of all company, supervisor, and worker licenses, training and certifications required in accordance with this Specification.
 - f) Notarized Certifications: Submit notarized certification signed by an officer of the Contract stating that exposure measurements, respiratory protection programs, medical surveillance, worker training, and recordkeeping has and shall be completed and maintained during the

Work for all involved personnel in accordance with 29 CFR Part 1926 and other applicable State and federal regulations.

- g) Certify the dates for primary and secondary HEPA filter changes for all negative air units.
- h) Level of respiratory protection anticipated for each operation required by the project. Include supporting documentation of previous exposure monitoring on a sufficient number similar project and operations in accordance with OSHA requirements.
- i) Detailed schedule and phasing, containment layouts, and summary of approach; detail of any special work procedures or methods to be used if not included or addressed in the abatement specification.
- j) Safety Data Sheets: for all materials to be used on-site not limited to encapsulants, spray adhesives, and other related work material. Note: It is Contractor's responsibility to notify all other contractors and parties in accordance with applicable OSHA hazard communication regulations.
- k) Contingency Plan: Prepare a site-specific contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failure, or any other event that may require modification or abridgement of decontamination or work area isolation procedures. Include in plan specific procedures for decontamination or work area isolation. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency. The emergency contingency plan must be in accordance (meet or exceed the requirements of) with applicable OSHA requirements.
- l) Other submittals required by the Contract Documents or as indicated by Owner.

D. Closeout Submittals

1. The following Closeout Submittals shall be provided upon substantial completion of Work.
 - a) Copies of all daily logs in accordance with Section 1.9 Project Coordination of this specification.
 - b) A copy of each waste shipment record, hazardous waste manifest, and chain-of-custody form, signed by the transporter and disposal facility operator, indicating that waste was packaged and disposed of properly. Include a description of any temporary storage facilities used including dates, times, and locations of temporary storage. Note: In accordance with NESHAPS, submit all waste shipment documentation within 35 days from transport of waste from the site (provide interim submittals during the work as needed to comply with federal regulations). Note: copies of waste shipment records in progress shall also be provided to IH Consultant and Owner immediately upon removal of waste from site.
 - c) Complete copy of all revisions and changes to the Pre-Construction Submittals.
 - d) Copy of other written construction documents such as Change Orders and work modifications issued in printed form during construction. Mark these documents and a site drawing to show the work completed and to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications.

1.15 AIR MONITORING

- A. Ambient Area Air Monitoring: IH Consultant shall/may monitor ambient area airborne fiber counts in and around the Work Area. The purpose of this air monitoring shall be to detect airborne asbestos concentrations that may challenge the ability of the Work Area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers and to monitor concentrations outside the containment or work area perimeter.
- B. Clearance Air Monitoring: Refer to the Work Area Clearance section of this specification.
- C. If any air sample taken outside of the Work Area exceeds 0.010 f/cc, immediately and automatically stop all work except corrective action necessary to address elevated concentrations if it is determined that the elevated concentration is or may likely be the result a deficiency of the Contractor's work; initiate the following actions:
 - a) Erect additional critical barriers to isolate the affected area.
 - b) Install HEPA filtration negative air units in affected area.
 - c) Decontaminate the affected area in accordance with appropriate cleaning procedures.
 - d) Require that respiratory protection and personal protective equipment be used in affected areas until the area is cleared for re-occupancy in accordance with the work area clearance requirements.

Complete corrective work with no change in the Contract Price or Sum if high airborne fiber counts were caused by Contractor activities.

- D. Analytical Methods: Owner reserves the right to use either phase contrast microscopy (PCM) and/or transmission electron microscopy (TEM) to analyze air samples. PCM analysis shall be performed using the NIOSH 7400 method at the job site or at an off-site laboratory. TEM may also be used as Owner deems necessary for ambient area air samples using the analysis method as determined by IH Consultant. Also see the Work Area Clearance section.
- E. Schedule of Air Samples
 - 1. Prior to the start of work: The IH Consultant may collect air samples to establish a base line before the start of work. Base line is an action level expressed in fibers per cubic centimeter that is twenty-five percent greater than the largest of the following:
 - a) Average of the PCM samples collected outside each Work Area
 - b) Average of the PCM samples collected outside the building.
 - c) And 0.010 f/cc
 - 2. Daily: From start of work involving Temporary Enclosures through the work of Project Decontamination, IH Consultant may be collecting samples during the Work, including but not necessarily limited to:
 - a) At HEPA Exhaust areas
 - b) Non-work-area portions of the building
 - c) At entrance to the Decontamination Unit
 - d) Outside the building
 - e) Clearance sampling: See the Air Clearance Requirements.

F. Laboratory Testing:

1. The owner shall employ the services of a testing laboratory to perform laboratory analyses of the air samples. Samples shall be sent overnight on a daily basis, so that verbal reports on air samples can be obtained within 24 hours. Results of all air monitoring tests shall be available at the job site on a daily basis.

G. OSHA Monitoring and Additional Testing:

1. Additional Testing: The Contractor may conduct his own air monitoring and laboratory testing. If he elects to do this the cost of such air monitoring and laboratory testing shall be at no additional cost to the Owner.
2. OSHA Compliance and Ambient Area Monitoring: Contractor must provide for collection and laboratory analysis services of Contractor's OSHA personal exposure samples, including daily TWA and STEL monitoring for asbestos and other contaminants resulting from the Work, including but not limited to carbon monoxide, volatile organic compounds, and chemical exposures.

1.16 TEMPORARY FACILITIES

- A. General: Provide temporary connection to existing building utilities or provide temporary facilities as required to complete work. The owner must approve all connections to utilities and facility components. Provide temporary portable water and power sources for all exterior work as indicated and coordinated with Owner, as applicable.

B. Water Service:

1. Temporary Water Service Connection: Provide hot and cold water to the Work Area. Provide a qualified and experienced licensed plumber as necessary to complete all water service work in conformance with applicable building codes and regulations.
2. All connections to the Owner's water system shall include back-flow protection. Monitor for leaks and repair or replace as needed.
3. Water Hoses: Employ suitable heavy-duty abrasion-resistant hoses to provide water into each work area and to each Decontamination Unit.

C. Electrical Service:

1. General: Provide a qualified and experienced licensed electrician to complete all electrical service work. Comply with applicable OSHA, NEMA, NECA, UL and other industry standards and governing regulations for materials and layout of temporary electric service. Provide adequate temporary power to the Work Area sized and equipped to accommodate all electrical equipment required for completion of the work and related testing and inspections. Provide temporary electrical panels as needed sized and equipped to accommodate all electrical equipment and lighting required by the work. Connect temporary panel to existing building electrical system. Protect with circuit breaker or fused disconnect. Locate temporary panel

outside of the work area and in a location acceptable to Owner. Equip all circuits for any purpose entering the Work Area with ground fault circuit interrupters (GFCI).

2. Lamps and Light Fixtures: Provide appropriate temporary work area lighting. Protect lamps with guard cages or tempered glass enclosures where fixtures are exposed to breakage by construction operations.
- D. First Aid: Comply with governing regulations and recognized recommendations within the construction industry. Provide appropriate first aid supplies.
 - E. Fire Extinguishers: Provide appropriate fire extinguishers for temporary offices, storage, work areas and other portions of the site occupied or used by the Contractor for the work.
 - F. Execution: Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they shall serve the entire project adequately and result in minimum interference with the performance of the Work. Coordinate all such work with Owner. Require that tradesmen be licensed as required by local authorities. Relocate, modify, and extend services and facilities as required during the course of work so as to accommodate the entire work of the project.

1.17 PRESSURE DIFFERENTIAL AND AIR CIRCULATION SYSTEM

- A. Continuously monitor and record the pressure differential between the Work Area and the building outside of the Work Area. Maintain accurate records of time and locations of testing on-site and in daily logs.
2. HEPA Filtered Fan Units: Supply the required number of HEPA filtered fan units to the site in accordance with these specifications. Units must meet the requirements of all applicable regulations and standards.

1.18 WORKER PROTECTION

- A. Comply with respiratory protection requirements as specified in this specification and applicable regulations. Provide worker protection as required by the most stringent OSHA and/or EPA regulations and industry standards applicable to the work. The following procedures are minimum requirements to be adhered to regardless of fiber concentrations in the Work Area.
- B. Worker Training
 1. AHERA Accreditation: All workers are to be accredited as Abatement Workers as required by the AHERA regulation 40 CFR 763 Appendix C to Subpart E, April 30, 1987. All training must be current including current annual refresher training.
 2. Train all supervisors and workers in accordance with EPA NESHAPs and 29 CFR Part 1926 (OSHA) for asbestos and other hazards anticipated during the work. All workers and supervisors must be licensed and certified as required by applicable State regulations.
- C. Medical Examinations: Provide medical examinations for all workers who shall enter the Work Area for any reason in accordance with OSHA requirements as set forth in 29 CFR 1926 and 29 CFR 1910.20.

D. Protective Clothing

1. Coveralls: Provide cloth full-body coveralls and hats and require that they be worn by all workers in the Work Area. Require that workers change out of coverall in the Equipment Room of the Personnel Decontamination Unit. Dispose of used coverall as asbestos waste.
2. Other: Provide other personal protective equipment as required by OSHA regulations and industry standards, not limited to hard hats, eye protection (goggles), gloves, fall safety, and footwear.

E. Entering Work Area: Each time the Work Area is entered, remove all street clothes in the changing (clean) room of the personnel decontamination unit and put on new disposable coverall, new head cover, and a clean respirator. Proceed through shower room to equipment room and put on work boots. Only properly licensed/certified personnel shall enter the decontamination unit and work area. All personnel entering the work area must post their State license at the decontamination unit entrance.

F. Decontamination Procedures: Require all workers to adhere to the following personal decontamination procedures whenever they leave the Work Area:

1. HEPA vacuum all gross debris from the protective clothing prior to entering the equipment room of the decontamination unit. When exiting area, remove disposable coveralls, disposable head covers, and disposable footwear covers or boots in the equipment room.
2. Still wearing respirators, proceed to showers. Showering is mandatory. Care must be taken to follow reasonable procedures in removing the respirator to avoid asbestos fibers while showering. The following procedure is required as a minimum:
3. Carefully wash face piece of respirator inside and out. Each worker leaving the work area must shower completely with soap and water. Rinse thoroughly. Proceed from shower to clean room and change into street clothes or into new disposable work items.

G. Within Work Area: Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area. Maintain proper use of personnel protective equipment.

H. Respiratory Protection: Provide sufficient respiratory protection in accordance with applicable OSHA requirements in addition to ANSI and NIOSH standards. Select proper level of protection based on personnel exposure monitoring and the applicable OSHA Permissible Exposure Limits. Require that respiratory protection be used at all times that there is any possibility of disturbance of asbestos-containing materials whether intentional or accidental.

1. Instruct and train each worker for proper respirator use in accordance with OSHA and other applicable industry standards. Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, until the area has been cleared for re-occupancy.
2. Provide and complete all necessary fit testing for respiratory protection in strict accordance with applicable OSHA regulations.
3. In the event that applicable OSHA PEL's (8-hour TWA and 30-minute STEL) are exceeded, stop work. Do not recommend work until work procedures, including use of engineering controls, are modified to maintain exposures within the acceptable PEL's.

- I. Complete all lock-out and tag-out of power and air handling systems within the Work Area in accordance with OSHA regulations. Coordinate all lock-out and tag-out with Owner.

1.19 TEMPORARY ENCLOSURES

- A. Work areas are to be considered contaminated during the work and shall be completely isolated from other locations such that asbestos fibers cannot pass through or beyond the perimeters of the work area and into non work areas. Should areas beyond the work area become contaminated with asbestos as a result of the Contractor's work, the Contractor shall be responsible for cleaning non-work areas as required. All costs including cleaning, decontaminating, monitoring, and testing shall be borne by the contractor.
- B. Contractors shall construct temporary containment enclosures in each work area. Prior to proceeding with ACM abatement coordinate and complete inspections of the work area with the IH Consultant. Proceed with work sequentially as listed or indicated.
- C. Disable ventilating systems or any other system bringing air into or out of the Work Area. Disable the system by disconnecting wires, removing circuit breakers, by lockable switch or other positive means that shall prevent accidental premature restarting of equipment as approved by Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Provide new or used materials and equipment that are undamaged and in a serviceable condition. Provide only materials and equipment that are recognized as being suitable for the intended use and in strict compliance with appropriate standards. Do not bring products, materials, and equipment to the Owner's site or Owner work areas that are damaged or contain construction or potential contaminated debris.
- B. Warning Signs, Caution Signs and Demarcation: Provide all demarcation, warning signs, caution signs, and other postings required for the work and in accordance with State and federal codes and regulations.
- C. Polyethylene Sheet: A single polyethylene film in the largest sheet size possible to minimize seams, in 6.0 mil thickness, clear or black as indicated.
- D. Duct Tape: Provide duct tape in 3" widths with an adhesive, which is formulated to stick aggressively to sheet polyethylene.
- E. Spray Cement: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.
- F. Foam Pack: Provide foam pack for sealing small crevices and cracks at critical barriers as required. All foam pack must be approved by Owner and local authorities, not limited to the Fire Department.
- G. Scaffolding: Provide all scaffolding, ladders and/or staging, etc. as necessary to accomplish the work of this contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding shall comply with all applicable OSHA provisions. Equip rungs of all metal

- P. Other PPE: Provide other personal protective equipment as required by OSHA regulations and industry standards, not limited to hard hats, eye protectives, gloves, and footwear.
- Q. Respiratory Protection: Provide respiratory protection in strict accordance with ANSI Z88.2 - 1992 "Practices for Respiratory Protection" and 29 CFR 1926 and 1910.134. The respirators shall be sanitized and maintained in accordance with manufacturer's specifications and recommendations. Provide sufficient respiratory protection based on applicable ANSI and NIOSH standards. Select proper level of protection based on personnel exposure monitoring and the applicable OSHA Permissible Exposure Limits. Use only respirators and filters that are NIOSH-approved for use with asbestos and other atmospheres anticipated during the work.
- R. Solvents: Provide appropriate solvent materials to aid in the removal of flooring materials and mastics. Such solvent materials should be "low odor" rated and all SDS's shall be submitted to the Owner for review prior to storing or using such materials at the job site. The contractor is solely responsible for all environmental and worker protection precautions required for the safe use, clean-up, and disposal of such materials. Additional air testing (area and personal exposure monitoring) must be completed by the Contractor (at no additional cost to the Owner) depending on the solvents to be used and as necessary to ensure a safe environment for site workers and adjacent public. Coordinate with Owner as necessary to assure compatibility with replacement materials prior to installation of solvents and coordinate special cleaning efforts with Owner for replacement issues in accordance with manufacturer's guidelines and flooring industry standards. The contractor shall sufficiently wash and clean all floor areas where solvent is used. Conduct necessary wash, dry, and air change sequences to eliminate residual solvent odors and residual. Note: Charcoal pre-filters shall be required on all HEPA exhaust/filter equipment during use of solvents.
- S. Construction Materials: Provide other construction materials such as plywood, strapping, studs, other related abatement materials, etc., as required to complete the work in accordance with this Specification.
- T. All necessary testing and monitoring equipment as applicable to complete work, including but not limited to gas detection equipment, manometers, exposure sampling equipment.

2.2 WATER SERVICE

- A. Provide water service as necessary to complete Work in accordance with applicable local, state, and federal building codes and regulations.

2.3 ELECTRICAL SERVICE

- A. Provide electric service as necessary to complete Work in accordance with applicable local, state, and federal building codes and regulations.

2.4 PRESSURE DIFFERENTIAL AND FILTRATION

- A. General: Supply the required number of HEPA filtered negative air fan units to the site in accordance with this Specification, industry standards, and applicable State and federal requirements. Use fan units that are intended for asbestos abatement as stated by the manufacturer. Provide HEPA filters that are individually tested and certified by the manufacturer to have an efficiency of not less than 99.97 percent when challenged with 0.3 um dioctylphthalate (DOP) particles or equivalent when tested in accordance with Military Standard Number 282 and Army Instruction Manual

136-300-175A. Provide filters that bear a UL586 label to indicate ability to perform under specified conditions.

- B. Pre-filters: which protect the final filter by removing the larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are required.
- C. Provide appropriate charcoal pre-filters during all work involving use of solvents to minimize odors. Allow HEPA units to run for a sufficient period of time after use of solvents to allow for adequate number of air changes and filtration to adequately dilute odors.
- D. Safety and Warning Devices: Provide units with the appropriate safety and warning devices including but not limited to missing or failure of HEPA filter, automatic shut down in the event of filter rupture or blockage, operating status indicator lights, and audible alarms.

2.6 AUXILIARY GENERATOR

- A. Provide adequate, suitable alternative power with a capacity adequate to power a minimum of 50% of the HEPA filtered fan units in operation at any time during the work as needed for emergency use and backup.

PART 3 – EXECUTION

3.1 TEMPORARY ENCLOSURES

- A. Control Access: Isolate the Work Area to prevent entry by building occupants and the public into the Work Area. Notify the Owner of all doors and other openings that must be secured to isolate Work Area. Maintain safety access to stairwells and building exits. Construct work area containments and isolation barriers as required allowing for Owner operations and as approved by Owner.
 - 1. Secured Access: Arrange Work Area so that the only access into Work Area is through securable doors to personnel and equipment decontamination units.
 - 2. Solid Construction Barriers: Provide solid construction barriers as indicated by Owner to prohibit unauthorized access and visibility by adjacent occupants and public. At a minimum provide solid barriers as necessary to isolate all work areas with abatement activity from portions of the building to maintain normal Owner operations.
 - 3. Provide Warning Signs at each door and barrier leading to Work Area reading as follows:

Legend:

DANGER
KEEP OUT
BEYOND THIS POINT
CONSTRUCTION WORK
IN PROGRESS

- 4. Immediately inside door (leading to Work Area) and outside all accessible critical barriers post a manufactured asbestos danger sign, approximately 20 inches by 14 inches, displaying the following legend with letter sizes and styles of a visibility required by 29 CFR 1926:

LEGEND:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED
IN THIS AREA

- B. Critical Barriers: Completely separate the Work Area from other portions of the building and the outside by closing and sealing all openings with sheet plastic barriers at least 6 mil in thickness, or by sealing cracks leading out of Work Area with duct tape or equivalent methods. Seal the perimeter of all sheet plastic barriers with duct tape, spray adhesive or other mechanical supports, as necessary. Individually seal all ventilation openings (supply and exhaust), lighting fixtures, clocks, doorways, windows, convectors and speakers, roof exhausts, and other openings into the Work Area with duct tape alone or with polyethylene sheeting at least 6 mil in thickness, taped securely in place with duct tape. Maintain seal until all work including Project Decontamination is completed. Take care in sealing of lighting and other fixtures, as applicable, to avoid melting or burning of sheeting, as applicable. Coordinate with Owner to provide adequate ventilation to space and equipment that requires air ventilation.
- C. Pressure and Circulation in the Work Area and Decontamination Units
1. Isolate the Work Area from all adjacent areas or systems of the building with a Pressure Differential that shall cause a movement of air from outside to inside at any breach in the physical isolation of the Work Area.
 2. Relative Pressure in Work Area: Continuously maintain the work area at an air pressure that is lower than that in any surrounding space in the building, or at any location in the immediate proximity outside of the building envelope. This pressure differential when measured across any physical or critical barrier must equal or exceed a static pressure of 0.02 inches of water. Accomplish the pressure differential by exhausting a sufficient number of HEPA negative air filtered fan units from the work area. Provide sufficient ventilation for a minimum of 8 air changes per hour and sufficient air movement throughout entire containment area.
 3. Vent HEPA negative air ventilation units to outside of building. Ensure adequate security and weather tight seals at each exhaust point.
 4. Provide a differential pressure meter or manometer to demonstrate the required pressure differential at every barrier separating the Work Area from the balance of the building or outside. Provide continuous manometer measurements and printouts for all work performed adjacent to public occupied spaces if such spaces are occupied during the work.
 5. Start fan units before beginning work involving disturbance of ACM or debris and run units continuously to maintain a constant pressure differential and air circulation until decontamination of the work area is complete and the air clearance criteria has been met.
 6. At completion of abatement work, allow fan units to run as specified under Project Decontamination requirements, to remove airborne fibers that may have been generated during abatement work and cleanup and to purge the Work Area with clean makeup air.
- D. Pre-Clean and Other Preparation Work Area:

1. Complete the following after installation of (1) critical barriers, (2) pressure differential/air filtration systems, and (3) decontamination facilities as indicated below and in other Specification Sections.
 - a) Pre-clean all work area surfaces, fixtures, and equipment using HEPA vacuums and wet wiping.
 - b) Seal non-removable fixtures and equipment with polyethylene sheeting. Provide a minimum of 12" of overlap, sealed with spray adhesive and duct tape on both flap ends, on all joints in the barriers. Do not damage materials and items to be covered.
2. Provide and install transparent inspection windows in the containment barriers as indicated by the IH Consultant. Maintain inspection window clean of debris to allow for inspection of work in progress.
3. Complete other preparation work as necessary to allow for complete precleaning and allow for installation of containment barriers.

E. Primary Barrier:

1. Do not install primary barriers until all work area surfaces have been pre-cleaned using wet cleaning and HEPA vacuuming.
 2. Protect building and other surfaces in the Work Area from damage from water and high humidity or from contamination from asbestos-containing debris, slurry, or high airborne fiber levels by covering with a primary barrier as described below. Coordinate with Owner to provide adequate ventilation to space and equipment that requires air ventilation.
 3. Primary Barrier Sheet Plastic: Protect floor surfaces with a minimum of 2 layers of 6-mil plastic sheeting on floors. Provide additional floor protection as required to prevent damage to carpets and other existing flooring surfaces to remain after construction. Protect all existing walls, ceiling, fixed equipment, and other building surfaces with a minimum of 1 layer of 6-mil plastic sheeting in addition to critical barrier systems.
 4. Provide a minimum of 12" of overlap, sealed (poly-to-poly) with spray adhesive and duct tape on both flap ends, on all joints in the barriers. Extend floor sheeting up adjoining walls a minimum of 18 inches. Do not place seams at, or within 18" of any wall, ceiling, or floor joints. Stagger all joints by at least 18 inches. Wall and vertical surface poly shall extend over floor sheeting such that floor sheeting extends up the wall and is covered by the wall sheeting overlap.
 5. Protect all existing building surfaces and fixed equipment/items, also including non-ACM insulations in the work areas, with a minimum of 2 layers of 6-mil plastic sheet as required to maintain existing conditions and to prevent contamination, water damage, or other damages due to the work. Provide a minimum of 12" of overlap, sealed with spray adhesive and duct tape on both flap ends, on all joints in the barriers.
- F. Seal all ducts and equipment with primary barriers. Isolate and shut down air systems in work area during abatement. Isolate all exterior intakes sufficiently from HEPA exhaust points. Ventilation units and ductwork shall be fully sealed with polyethylene sheeting.
- G. Stop Work: If the Critical or Primary Barrier fails or is breached in any manner stop work immediately and repair the breach as required. Do not start work until authorized by the IH

Consultant. Any contamination and/or suspect contamination, as determined by Owner and the IH Consultant, resulting from a breach in the barriers or other neglect by the Contractor shall be thoroughly abated in accordance with this Specification at no additional cost to Owner.

H. Decontamination Units

1. Provide personnel and equipment decontamination facilities in accordance with State and OSHA regulations and require that the personnel decontamination unit be the only means of ingress and egress for the Work Area (for personnel, waste, equipment, and other related items). Provide portable shower units, with continuous dedicated water source, sufficient for personnel decontamination in accordance with State and OSHA regulations, and cascaded filter units on drain lines from showers or any other water source carrying asbestos-contaminated water from the Work Area. The clean room shall be a minimum of 24 square feet for work areas involving 3 or fewer workers entering the regulated area per work shift and a minimum of 32 square feet for all other projects.
2. Water from the shower shall either be filtered through a minimum of a 2-stage filtration assembly equipped with a 50-micron primary filter and a 5-micron final filter or containerized for disposal as asbestos waste. Do not discharge filtered water unless testing and permitting has been completed as applicable in accordance with State and local requirements.
3. Clean debris and residue from inside of Decontamination Units on an ongoing basis.
4. Post an asbestos warning sign at the entrance of the decontamination unit.
5. Secure door to entrance of decontamination unit at the completion of each shift.

I. Containment Locations

1. Construct and install containment barriers around each work area as coordinated and indicated by Owner and IH Consultant. Do not allow containment location and installation to inhibit access and adequate airflow to all other areas of the building and mechanical equipment. Coordinate with Owner the isolation of mechanical equipment in the work area.

3.2 REMOVAL OF ASBESTOS-CONTAINING MATERIALS

- A. Inspections: Prior to commencing with ACM removal or other ACM disturbance, each individual work area must pass an inspection by the IH Consultant. If deficiencies are observed, immediate correct in a manner satisfactory to IH Consultant.
- B. Maintain all work area isolation and controls during work of this section. The Contractor shall conduct ongoing inspections of the work area, adjacent areas, and surrounding areas beneath, as applicable, for containment breaches, leaks, or other containment failures. In the event breeches or potential breeches are identified, immediately repair the containment barriers as needed and complete all clean up and decontamination work.
- C. Secondary Barrier: Over any floors and surfaces beneath ACM to be removed in the work areas, install as a drop cloth a clear 6-mil sheet plastic in all areas where asbestos removal work is to be conducted. Completely cover floor with sheet plastic. Install Secondary Barrier at the beginning of each work shift. Install only sufficient plastic for work of that shift. Remove Secondary Barrier at end of each work shift or as work in an area is completed. Carefully pack in disposal bags

D. Wet Removal and Waste Packaging - General:

1. Thoroughly wet ACM to be removed or otherwise disturbed prior to disturbance, stripping and/or tooling to reduce fiber dispersal into the air. Maintain materials as adequately wetted during Work and as required by NESHAPS. Accomplish wetting by a fine spray (mist) of amended water. Saturate material sufficiently to wet to the substrate without causing excess dripping. Allow time for amended water to penetrate material and seams thoroughly. Spray material repeatedly during the work process to maintain a continuously wet condition.
 2. Where necessary, carefully remove ACM while simultaneously spraying amended water to minimize dispersal of asbestos fibers into the air. Mist work area continuously with amended water whenever necessary to reduce airborne fiber levels. Do not allow ACM to dry out. As it is removed, simultaneously pack material into appropriate asbestos waste disposal bags/containers. For waste bags, twist neck of waste bags, bend over and seal with minimum three wraps of duct tape. Clean outside of packaging and move packaged waste to the equipment decontamination unit for further cleaning and waste re-packaging. Once in the equipment decontamination unit and cleaned, repackage waste in 2nd waste bag and seal as indicated above.
 3. Continuously clean excess water using wet wiping and HEPA vacuuming such that excess water build up on the floor and other containment surfaces does not occur and so that water does not leak or migrate outside of the work area.
 4. Use work procedures that result in 8-hour TWA and STEL airborne fiber counts less than the required limits established by OSHA and as described herein. If airborne fiber counts exceed this level immediately mist the area with amended water to lower fiber counts and revise work practices and engineering controls to maintain level within the required limits.
- E. The contractor may encounter and shall investigate all areas of the building to identify concealed ACM insulation and miscellaneous ACM. Provide full access and selective controlled demolition, as necessary, to identify and fully remove all ACM. Remove as ACM all co-mingled debris or building materials where ACM is embedded or has come in contact with such material and decontamination is not feasible.
- F. Other Safety: As applicable, comply with all appropriate safety procedures during Work in accordance with industry standards and all applicable OSHA regulations including but not limited to: confined space work safety procedures in accordance with 29CFR Part 1910.146; proper personal protective equipment; worker safety training and written programs per current OSHA requirements; fall protection; lockout tag out; and take precautions to avoid burns and heat stress when working in areas of hot equipment and excessive heat as applicable.

G. Fire Door Insulation

1. Fire doors containing ACM insulation shall be removed whole component and without damaging the doors such that the insulation is disturbed. This removal shall be accomplished within demarcated, OSHA regulated work areas at a minimum. Any doors with damaged outer casings and with ACM insulation exposed shall be secured to prevent further disturbance of the material. ACM shall be wetted prior to disturbance of the door. Each door shall be wrapped in two layers of independently sealed 6-mil poly sheeting, labelled, and disposed of as asbestos waste.

H. Removal of Tank, Breeching, Pipe and Fitting Insulation

1. Coordinate shut-off and lock-out/tag-out of systems with the Owner. Conduct removal work within full containment barriers. Cut bands holding preformed insulation, slit jackets at seams, remove, and hand place into a disposal bag. Remove job molded fitting insulation in chunks and hand-place to the bottom of the waste bag. Do not drop any material or allow material or water to fall onto the floor or other lower surfaces. Remove any residue on substrate with stiff-bristle-nylon hand brush. Place all waste directly into a waste bag by hand.
2. Remove fiberglass in contact with the ACM and damaged fiberglass insulation in the general vicinity of damaged ACM as asbestos contaminated waste. All other non-ACM insulation shall be precleaned, sealed in primary barriers and left in place unless otherwise designated by Owner. Cut back (and remove as asbestos waste) all fiberglass insulation within 4" of ACM insulation removed.
3. In areas of soil/dirt floor, prior to removal and final preparation work, wet ground/floor areas with amended water. Hand-pick or HEPA vacuum gross debris from all surfaces. Fine cleaning or contaminated soil removal shall be completed following abatement of pipe insulation as indicated below. Once all gross debris has been removed, install negative pressure enclosures and polyethylene sheeting drop cloths.
4. After completion of gross removal and cleaning operations (and passing preliminary visual inspection by IH Consultant), remove the outer boiler casing within the containment area. Fully clean all exterior casing using wet wiping and HEPA vacuuming. Cover with polyethylene sheeting and store in the work area or place into temporary storage area(s) as approved by Owner. Once the exterior casing is removed, fully clean all insulation, gasket, and refractory brick as assumed ACM unless otherwise stated by Owner and IH Consultant based on proper testing to be performed as Owner deems in its best interest. In lieu of IH Consultant testing of suspect material, such materials shall be handled as, and removed as, ACM as stated herein. Coordinate all such testing of suspect material encountered with IH Consultant. Provide a minimum of 48 hours advance notice of requested testing by IH Consultant.
5. For boilers to be demolished as specifically indicated by Owner, fully disassemble, and demolish entire boiler as needed to remove ACM. Properly dispose of or recycle all boiler components and ash in accordance with local, state, and federal requirements in addition to Owner demolition specification sections. All assumed ACM and confirmed ACM insulation, gasket, packing, brick, and other ACM within and on the boiler shall be removed using the above stated methods by the abatement contractor. In the event that suspect ACM is encountered during disassembling and demolition of the boiler unit, work shall cease in the affected area, and the IH Consultant shall be notified. The IH Consultant shall then conduct testing or assume the materials to be ACM and the contractor shall then coordinate and conduct necessary abatement of all additional ACM identified in accordance with the work methods stated herein and applicable local, State and Federal requirements. Update all local, State and Federal permits and notifications as needed.
6. Properly dispose of or recycle all boiler components in accordance with local, state, and federal requirements in addition to Owner demolition specification sections.
7. After gross removal and final cleaning of the pipe insulation, remove drop cloths and ground/floor polyethylene sheeting in areas of soil contamination. Remove all visible debris to a minimum depth of 3" and lightly rake the surface while conducting misting operations. Start

from the furthest point (away from decontamination unit) and do not track debris or walk from dirty areas to newly removed areas. Then inspect and rake through remaining soil areas and remove any debris. Continue process until no visible debris is present or can be brought easily to the surface. All soil generated by this process and debris shall be handled, packaged, and disposed of as Asbestos waste.

I. Glovebag Removal of Pipe and Pipe Fitting Insulation

1. Glovebags shall be used to remove pipe and pipe fitting insulation. Conduct glovebag removal within negative pressure enclosures or full containment barriers as indicated in Section 3.2. Glovebags shall be used in strict accordance with 29 CFR 1926.1101 (OSHA) and other applicable regulations. Conduct work in negative pressure enclosure or full containment barriers. Install polyethylene sheeting drop cloths beneath pipe areas to be worked and along all foot traffic areas in the work area. After the negative pressure enclosure is constructed, install glovebags in accordance with manufacturer's instructions and regulatory requirements.
2. Once completely sealed around the pipe to be worked, inspect glovebag for adequate seals and using proper smoke testing. Allow amended water to saturate material to substrate and ensure ACM remains adequately wetted. Cut bands holding preformed insulation, slit jackets at seams, remove, and hand place in a disposal bag or bottom of glovebag as applicable. Provide dedicated water supply to each glovebag during the entire removal and cleaning operation within the glovebag. Remove job molded fitting insulation in chunks and hand place to the bottom of the glovebag. Spray amended water continuously such that ACM is adequately wetted. Do not drop any material or allow material or water to fall out of the glovebag or to fall to the floor. Remove any residue on pipe or fitting with stiff-bristle-nylon hand brush. Once all cleaning is complete, twist the glovebag with the debris at the bottom of the glovebag and seal with duct tape. Remove the glovebag, bend the top over, and then reseal the neck with duct tape.
3. After gross removal and final cleaning of the pipe insulation, remove drop cloths and ground/floor polyethylene sheeting in areas of soil contamination. Remove all visible debris to a minimum depth of 3" and lightly rake the surface while conducting misting operations. Start from the furthest point (away from decontamination unit) and do not track debris or walk from dirty areas to newly removed areas. Then inspect and rake through remaining soil areas and remove any debris. Continue process until no visible debris is present or can be brought easily to the surface. All soil generated by this process and debris shall be handled, packaged, and disposed of as Asbestos waste.

J. Handling of suspect ACM Encountered in Mechanical Equipment and Previously Inaccessible Space

1. It is possible that the interiors of various mechanical equipment components at the site contain ACM. During the course of work, use care when accessing previous inaccessible spaces. Or mechanical equipment, in the event that gasket material, caulk, or other suspect insulation are encountered, notify Owner and IH Consultant immediately such that proper testing and inspection can be arranged for. In the event that ACM is identified requiring abatement, conduct abatement in accordance with this specification and the Contract Documents and as authorized by Owner. In the event that additional suspect ACM or known ACM is encountered within wall, floor, or ceiling space that was inaccessible previous to the work, stop work in the affected area and immediately notify the Owner and IH Consultant such that proper inspection and testing can be arranged for. Contractor shall conduct abatement of such additional ACM in accordance with this specification and the Contract Documents and as authorized by Owner.

K. ACM Switchgear

1. The ACM switchgear shall be removed whole component, maintaining the switchgear as nonfriable, within a demarcated, OSHA regulated work area. The switchgear shall be de-energized following established lockout-tagout (LOTO) requirements. All accessible surfaces within the switchgear shall be pre-cleaned using wet wiping and HEPA vacuuming to remove any debris prior to removal of any ACM components. The ACM components shall be removed from the switchgear using hand tools to remove any fasteners and without breaking any of the ACM components. Wetting and shaving cream shall be applied to all ACM components as appropriate to prevent the release of any fibers. The ACM components shall be maintained in a nonfriable condition as whole components. Rendering the components friable shall require removal within a full containment negative pressure enclosure. As they are removed, ACM panels shall be placed in asbestos disposal bags and packaged in accordance with the applicable section of this work plan.

L. Window Caulking and Glazing Material

1. Conduct work within exterior OSHA regulated Work area. Drop cloths of 6-mil polyethylene sheeting shall be placed on ground below each work area and extending out sufficiently to protect the ground from possible debris. The drop cloths and any debris generated shall be disposed of as asbestos waste at the end of each work shift and following the work. Install critical barriers over windows, doors, and other openings in the building. Ensure ACM remains adequately wet. Remove entire window casing units intact without damaging caulk or glaze, packaging, and dispose of as ACM waste. Use hand tools and HEPA vacuums to scrape the caulking from the substrate. Use care to prevent the material from becoming friable. Clean all caulk material that may be encountered during window or door removal from the building substrate. Coordinate with the Owner for safety and building security for any areas that have entire window and/or door units removed.
2. The asbestos contractor shall conduct necessary inspections to ensure safe working conditions and install necessary supports, engineering controls and fall protection to allow for the safe removal of the ACM. Employee and/or General Contractor operations in the surrounding areas shall also be restricted as deemed necessary by the site supervisor/OSHA competent person.
3. The IH Consultant shall be providing representative perimeter area air monitoring during exterior ACM removal work. The acceptable perimeter air monitoring result is 0.010 f/cc.

M. ACM Sink Basin Undercoat

1. Conduct work within regulated area. Drop cloths of 6-mil polyethylene sheeting shall be placed on floors below each work area, and the drop cloths and any debris generated shall be disposed of as asbestos waste following the work. The sink basins containing ACM undercoating shall be removed in whole components. The panels shall be adequately wetted during the entire process. The panels shall be removed by removal of the trim, screws, and nails that secure the panels and using wet-wiping, HEPA vacuums, and continuous misting. Immediately wet-wipe and HEPA vacuum any debris or dust. All substrate and trim shall also be cleaned using wet wiping and HEPA vacuums. As the sinks are removed, wrap in two separate layers of 6-mil polyethylene sheeting, seal with duct tape and spray adhesives. Seal each layer separately. Properly label the outside of the sheeting as an asbestos waste container as indicated in this specification and in accordance with State and federal regulations. Clean all substrate, floor

surfaces, and other items in the immediate work area using wet-wiping and HEPA vacuums. Do not render panels friable.

N. Pressboard (white) Behind Radiators

1. Conduct work within full containment barriers. Drop cloths shall be placed below each work area. Drop cloths and any debris generated shall be disposed of as asbestos waste following each shift and at the completion of work. Allow amended water to saturate material to substrate and ensure ACM remains adequately wetted. Use care to maintain ACM intact and do not render the material friable. Remove gypsum panels and ACM in sections with care to minimize breaking and cutting to the extent needed to remove and package manageable sections of the ACM. As the material is removed, immediately package it as asbestos waste.

O. ACM Roofing

1. Conduct work within exterior OSHA regulated Work areas. The Contractor shall install barrier tape and otherwise properly demarcated the work site areas to prevent unauthorized access in accordance with 29 CFR 1926.1101. Employee and/or general contracting operations in the surrounding areas shall also be restricted as deemed necessary by the OSHA competent persons on site. The Contractor shall conduct necessary inspections to ensure safe working conditions and install necessary supports, engineering controls and fall protection to allow for the safe removal of the ACM.
2. Install drop cloths of 6-mil polyethylene sheeting on ground and lower levels below each work area, as applicable, and extend drop cloths out sufficiently to protect the ground from possible debris. Install critical barriers, consisting of 6-mil polyethylene sheeting, over all roof top ducts, vents, or other openings in the work area. The drop cloths and any debris generated shall be disposed of as asbestos waste at the end of each work shift and following the work. Install critical barriers over windows, doors, and other openings in the building. Ensure ACM remains adequately wet. All ACM roof (asphalt products, flashings, caulk, and sealants) work shall be completed in accordance with current State requirements in addition to this specification and federal requirements. The ACM to be removed shall be adequately wetted by the asbestos contractor during all phases of work as required to minimize dust and visible emissions in accordance with State and federal regulations. The ACM shall be removed using hand tools, wetting, and, as deemed necessary by the asbestos contract, HEPA-equipped saws. Verify areas beneath roof decking are adequately sealed off to prevent debris from dislodging from roof work into attic or other building space.
3. The ACM and associated debris generated during the work shall be either placed into proper asbestos waste bags or sealed and labeled in two layers of 6-mil polyethylene sheeting. Care shall be used to cover rough edges and prevent tearing of waste packaging. Properly packaged waste shall be transported by hand, lowered to the ground, and placed within the waste dumpster to be provided by the Contractor adjacent to the work area. In the event the waste chutes are used for roofing materials, the chute system shall be air-tight and chute directly to an ACM waste dumpster which is lined with a minimum of 2 layers of 10-mil polyethylene sheeting, labeled, and seal with duct tape and spray adhesives, as needed.
4. The IH Consultant shall be providing representative perimeter area air monitoring during exterior ACM removal work. The acceptable perimeter air monitoring result is 0.010 f/cc.

3.3 INITIAL CLEAN-UP WORK

- A. Once gross removal is completed, clean all visible debris on the substrate and containment barriers using HEPA vacuums, scrub brushes, and wet wiping. Do not allow materials to dry out. As material is removed and clean-up is completed, simultaneously pack wetted material into proper waste disposal bags or package as noted above. For waste bags, twist the neck of the bags, bend the neck over, and seal with a minimum of three wraps of duct tape. Clean the outside of the bags with wet wiping and HEPA vacuum and move to the wash down station in the Equipment Decontamination Unit. Once washed clean, place the clean disposal bags into a second asbestos disposal bag and seal the bag in the same manner as the first. Bags shall then be transported from the work area to the asbestos waste dumpster. Note: Waste dumpster must remain labeled and locked at all times when loading is complete or idle.
- B. Label waste dumpsters in accordance with 29 CFR 1910.145:

DANGER
ASBESTOS DUST HAZARD
CANCER & LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

- C. Change all filters on the pressure differential systems and properly dispose of as asbestos waste. Maintain adequate filtration and pressure differential during all filter changes.

3.4 PROJECT DECONTAMINATION

- A. Work of This Section includes the decontamination of air and surfaces in the Work Area which has been, or may have been, contaminated by the elevated airborne asbestos fiber levels generated during abatement activities, or which may previously have had elevated fiber levels due to ACM in the space. IH to be present to monitor decontamination and cleaning process.
 1. First Cleaning
 - a) Carry out a first cleaning of all surfaces of the work area including items of remaining sheeting, tools, scaffolding and/or staging by use of damp- or wet-cleaning and mopping, and HEPA vacuuming. Do not perform dry dusting or dry sweeping. Use each surface of a cleaning cloth once only and then dispose of as contaminated waste. Continue this cleaning until there is no visible debris from the substrate and other work area surfaces.
 - b) At the completion of the above cleaning Contractor Supervisor shall visually inspect all work area surfaces. Re-clean if any dust, debris, etc. is found. Inspect the area and if any debris or dust is found, repeat the cleaning. Continue this process until no debris dust or other material is found while sweeping of all surfaces with forced air equipment (important: forced air sweeping to be used only in full containment work areas).
 - c) Remove and replace all negative air unit pre-filters, dispose of used filters as asbestos waste.
 2. Second and Third Cleaning
 - a) At the completion of the first cleaning and Contractor inspection, carry out a second cleaning of all surfaces in the work area in the same manner as the first cleaning. For containments with multiple layers of polyethylene sheeting on floors, remove top layers of

sheeting on the floor leaving one layer of the primary barrier remaining. Clean newly exposed areas as outlined above and dispose of removed sheeting as asbestos waste.

- b) Carry out a third cleaning of all surfaces in the same manner as the first cleaning. Change filters on pressure differential systems and properly dispose of as asbestos waste. Allow for sufficient settling period prior to clearance testing. Complete additional cleaning as required and until no visible dust or debris is present.
- B. Visual Inspection: After completion of above cleaning and Contractor's own visual inspection, The IH Consultant shall perform a visual inspection for debris from any sources, residue on surfaces, dust, or other matter in the Work Area to confirm the Contractor's inspection findings.
1. For full containment work areas, during visual inspection sweep entire work area including walls, ceilings, ledges, floors, and other surfaces in the room with exhaust from forced air equipment (leaf blower with approximately 1 horsepower electric motor or equivalent).
 2. IH Consultant Visual inspection is complete when the area is visually clean, and no debris, residue, dust, or other material is found. If any debris, residue, dust, or other matter is found repeat Contractor cleaning and the IH Consultant Visual Inspection.
 3. Encapsulation of substrate: After successful final visual inspection, perform encapsulation of substrate as approved by Owner using suitable encapsulant material. Coordinate with Owner to ensure compatibility with replacement materials and fire-retardant ratings for the surfaces to be encapsulated. Do not allow overspray to damage other surfaces, materials and equipment in the work area and do not allow overspray and build up or pooling of encapsulant.
- C. Clearance Testing: Air clearance sampling shall be conducted by the IH Consultant. See Work Area Clearance section. Air clearance testing shall not be completed until the work area passes visual inspection, has had adequate air changes, and sufficient time for surfaces to adequately dry.
- D. Removal of Work Area Isolation: Complete only after the work area clearance sections have been met and verified by the IH Consultant. Remove all Primary Barrier sheeting and equipment decontamination unit(s), leaving only: critical barriers, personnel decontamination unit, and operational pressure differential/air filtration systems. Properly dispose of sheeting as asbestos-waste. Use care to prevent damage to building surfaces and materials during teardown. All damage to surfaces and materials shall be repaired by Contractor unless otherwise noted and agreed to in writing by Owner.
1. Re-inspect all work area surfaces and adjacent areas for any dust and debris that may have originated from the work. Clean all surfaces using HEPA-vacuums and wet-wiping as required and until all surfaces are clean of visible debris. Shut down and remove the Pressure Differential System. Seal HEPA filtered fan units, HEPA vacuums and similar equipment with 6 mil polyethylene sheet and duct tape to form a tight seal at intake end before being moved from Work Area.
 2. Remove personnel decontamination unit. Remove the critical barriers and properly dispose of as asbestos-waste. Clean all surfaces using HEPA-vacuums and wet-wiping as required and until all surfaces are clean of visible debris.
- E. Final Cleaning: This cleaning is now being applied to existing room conditions. Take care to avoid watermarks or other damage. Wet-wipe and HEPA vacuum surfaces in the work area until clean and

free from dust and debris. Complete final cleaning in accordance with the project close-out requirements. Accompanied by the Owner, the Contractor Site Supervisor shall complete a final post-abatement inspection of all surfaces and re-clean and conduct repairs, as necessary.

3.5 WORK AREA CLEARANCE

- A. Contractor Release Criteria: The Work Area shall be considered cleared when the Work Area meets the final visual inspection criteria described in the project decontamination section and airborne fiber structure concentrations have been reduced to the level specified below and pursuant to applicable State and federal asbestos regulations. The contractor must provide at least 48 hours advance notice to the IH Consultant for any clearance testing or other inspections required.
- B. Clearance Air Monitoring: Air clearance samples shall be collected by the IH Consultant. In full containment areas air clearance sampling shall be conducted using aggressive sampling techniques in accordance with state and federal regulations.
- C. Analytical Method: The number and volume of air samples taken and analytical methods used by the IH Consultant based on conditions of work and the various State and federal requirements. Phase Contrast Microscopy (PCM) and Transmission Electron Microscopy (TEM) may be used for analysis of clearance samples collected to confirm completion of abatement of ACM in accordance with applicable State and federal regulations. Other analytical methods may also be used as determined by IH Consultant based on conditions of the work and other factors.
- D. PCM Air Clearance Testing: Decontamination of Work Areas requiring PCM air clearance testing only is complete when every Work Area clearance sample collected has total fiber concentrations below the 0.010 f/cc. If any sample does not meet the clearance criteria, the decontamination is incomplete and Contractor shall repeat final cleaning. The Contractor shall be responsible for all costs for each subsequent and additional round of testing and analysis required until the clearance criteria are met.

3.6 DISPOSAL OF ASBESTOS-CONTAINING WASTE MATERIAL

- A. General: Asbestos-containing waste materials and debris which is packaged in accordance with the provisions of this Specification may be disposed of at designated sanitary landfills when certain precautions are taken not limited to: notice to appropriate EPA Regional Offices and notice and permit from appropriate State and local agencies are completed. Waste disposal site(s) must be properly licensed, permitted, and qualified to accept and handle Asbestos waste in accordance with all applicable local, State, and federal codes and regulations.
- B. Disposal: Comply with the following sections during all phases of this work: worker protection requirements and respiratory protection requirements. All waste is to be hauled by a waste hauler with all required licenses and permits from all state and local authority with jurisdiction.
 - 1. Carefully load all containerized asbestos-containing waste material on sealed and lined trucks or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that no unauthorized persons have access to the materials.
 - 2. All ACM and asbestos materials removed are to be properly containerized in one of the following: (1) Two 6 mil disposal bags, or (2) Two 6 mil disposal bags and a fiberboard drum, or (3) equivalent method as approved by Owner and State. Do not store disposal bagged material

outside of the work area. Take bags or drums from the work area directly to a sealed truck or dumpster. Glove bags shall not be used as waste disposal bags.

3. The owner shall provide a designated location for placement of proper waste dumpster. Line waste dumpster with a minimum of 2 layers of 6 mil polyethylene sheeting and such that a minimum total of 20 mils of lining exists (including waste bags). Waste dumpster(s) shall not be allowed to remain at the job site for longer than 72 hours upon completion of each phase (work area) of work by the Contractor. Do not transport disposal bagged materials on open trucks. During loading and unloading, properly demarcate and label dumpster on all 4 sides. Dumpster shall be sealed, labeled, and locked during all non-loading periods.
4. In accordance with NESHAPs and State regulations, advise the landfill operator or processor in advance of transport of the quantity of material to be delivered. At a disposal site, sealed plastic bags may be carefully unloaded from the truck. If bags are broken or damaged, leave in truck and clean entire truck and contents using procedures set forth herein. Retain receipts from landfill or processor for materials disposed of. At completion of hauling and disposal of each load submit copy of waste manifest, chain of custody form, and landfill receipt to Owner and IH Consultant.
5. Provide copy of waste shipment record (complete to date) to Owner and IH Consultant prior to removing waste from the site. Provide final copy of completed waste shipment record to Owner and IH Consultant within 25 days of removing waste from the site.

3.7 ASBESTOS PROJECT CLOSEOUT

- A. The contractor shall achieve Substantial Completion and then Final Completion as indicated below prior to requesting final payment.
- B. General cleaning during and after construction is required as needed to maintain general housekeeping and as otherwise required herein. Complete all final, general housekeeping and cleaning in the work areas in accordance with 29 CFR Part 1910 and 29 CFR Part 1926, as applicable. Remove temporary protection and facilities installed for protection or security of the work during construction. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of them in a lawful manner. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.
- C. Conduct all other related work, non-asbestos work, and general construction activity in accordance with the Contract Documents and Owner's written request.
- D. Substantial Completion consists of the following: (1) all work area abatement, decontamination and related site work is complete; (2) interim submittal requirements are submitted; (3) final visual inspection and air clearance requirements have been met in each work area; (4) removal of containment barriers and Contractor equipment is complete; (5) all general cleaning has been performed and approved as indicated herein; (6) other work tasks and administrative requirements have been completed in accordance with the contract documents and specification; and (7) post-abatement site inspection and review with Owner has been performed.

- E. Final Completion consists of the following: (1) Substantial Completion met; (2) completion of all Closeout Submittal requirements; and (3) complete, to Owner's satisfaction, any remaining punch-list items identified during the post-abatement site inspection with Owner.

END OF SECTION 028213

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Suspended slabs.
 - 5. Exterior concrete slabs and walks.
 - 6. Concrete floor slab patching at existing floor slab removals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for heating and dehumidification requirements for drying new concrete slabs to receive floor finishes.
 - 2. Division 03 Section "Concrete Slab Rehabilitation" for patching of spalls and holes in existing slabs.
 - 3. Division 07 Section "Under-Slab Vapor Retarders" for vapor retarders under slabs-on-grade.
 - 4. Divisions 31, 32 and 33 Sections for drainage fill under slabs-on-grade.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include special reinforcing required for openings through concrete structures.
- D. Submit locations for construction and control joint layout for walls, slabs and exterior flatwork and walks.
- E. Qualification Data: For ACI certified flatwork finisher certificate.

- F. Submit for record, a written plan of the field procedures to be implemented for hot and cold weather protection.
- G. Submit chart for application requirements of evaporation control should field conditions require use.
- H. Minutes of pre-concrete conference and pre-concrete slab conference.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications - Slabs:** A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and an on site supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. **Testing Agency Qualifications:** An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. **Pre-Concrete Conference:** Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Review requirements of submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for concrete design mixtures.
 - c. Agency responsible for field quality control.
 - d. Concrete flatwork subcontractor, including ACI Certified Concrete Flatwork Finisher and ACI Certified field foreman.
 - e. Ready-mix concrete manufacturer.

- f. Concrete subcontractor.
 - g. Architect.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, steel reinforcement installation, and concrete protection.
- G. Pre-Concrete Slab Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Review mix design requirements for concrete containing. Review requirements of submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for concrete design mixtures.
 - c. Agency responsible for field quality control.
 - d. Ready-mix concrete manufacturer.
 - e. ACI Certified Concrete Flatwork Finisher, including ACI Certified field foreman.
 - f. Architect.
 - g. Concrete flatwork subcontractor.
 - h. Resilient athletic-flooring subcontractor.
 - i. Party responsible for under slab vapor barrier installation.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation coordination, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.
 - 3. Review floor trowel finish requirements specified in Article 3.8, test area location, and coordination for review by all parties.
 - 4. Review slab drying requirements for the placement of floor finishes per Section 015000.
- H. Allow concrete slabs receiving finish flooring, including gymnasium athletic flooring, resilient flooring, carpet and thin-set ceramic and quarry tile to cure for 120 days minimum before the installation of floor systems.

1.5 PROJECT CONDITIONS

- A. To prevent exterior concrete entrance slabs, pavement and walks from repeated freeze thaw cycles and deicers before adequate curing to protect concrete has occurred, placement shall occur before October 1 or in the Spring after frost in the ground is gone and temperatures remain above freezing so surface is not exposed to freezing temperature. No deicers shall be applied to the concrete surface during the project.

1.6 FOUNDATION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly in writing.
- B. General: Engage an engineering surveyor to lay out the Work using accepted surveying practices.
 - 1. Work from establish benchmarks and control points to set lines and levels.
 - 2. Inform installers of lines and levels to which they must comply.
 - 3. Check the location, level and plumb, of every major element as the Work progresses.
 - 4. Notify Contractor and Architect when deviations from required lines and levels exceed allowable tolerances.
 - 5. Coordinate and locate anchor bolt layouts.
 - 6. Coordinate elevation and locations of openings, bondouts, sleeves and inserts required to be placed in the work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 1/2 by 1/2 inch, minimum.

- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Comply with State of Maine DEP regulations for VOC content of not more than 450 g/L. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Deformed-Steel Wire: ASTM A 496.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or II, gray.
 - a. Supplementary Cementitious Materials (Permitted for Footings and Walls Only):
 - 1) Ground Granulated Blast-Furnace Slag, ASTM C 989, Grade 100 or 120. Limit the amount of ground granulated blast-furnace slag ash as a percentage of cementitious materials to 40% maximum.

- 2) Fly Ash: ASTM C 618, Class F. Limit the amount of fly ash as a percentage of cementitious materials to 30% maximum.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: #57 gradation (nominal size 1-inch to No. 4).
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A or Type F.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 3/4 inches long.
1. Products:
 - a. Monofilament Fibers:
 - 1) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.

2.8 CURING AND SEALING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products:
 - a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - b. Dayton Superior Corporation; Sure Film.
 - c. Euclid Chemical Company (The); Eucobar.
 - d. L&M Construction Chemicals, Inc.; E-Con.
 - e. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - f. Meadows, W. R., Inc.; Sealtight Evapre.
 - g. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - h. Sika Corporation, Inc.; SikaFilm.
 - i. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - j. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

- B. Moisture-Retaining Cover:
 - 1. Interior Slabs: ASTM C 171, white polyethylene film or white polyethylene sheet with rayon and polyester fiber.
 - 2. Exterior Slabs: White polyethylene sheet with rayon and polyester fiber fabric coated contact surface.
 - a. PNA HydraCure S16 or equivalent.
- C. Exterior Concrete Flatwork Sealer: Water-based silane/siloxane water repellent and chloride screen.
 - 1. Prosoco Consolideck Saltguard WB.
- D. Water: Potable.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D3575, 1.7 pound minimum density closed cell polyethylene with 1/2-inch deep top strip-off edge to allow installation of joint sealant; 1/2-inch thickness by full depth of slab..
 - 1. A.H. Harris; Harristrip-Off; Harris Polyethylene Joint Filler.
 - 2. Foam Peel HT; Foamtastic, division of Hohmann & Barnard.
 - 3. W.R. Meadows; Deck-O-Foam.
- B. Joint-Filler Strips Left Exposed: ASTM D 1751, asphalt-saturated cellulosic fiber.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 REPAIR MATERIALS

- A. Repair Underlayment (To Receive Resilient Floor Covering): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Admixtures: Use admixtures according to manufacturer's written instructions.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Exterior Concrete: Proportion normal-weight (145 pcf) concrete mixture as follows:
 - 1. Minimum Compressive Strength: 5000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.40.
 - 3. Slump Limit: 4 inches max.
 - a. 6 inches for concrete with addition of mid-range water-reducing admixture or plasticizing admixture.
 - b. 8 inches for concrete with addition of high-range water-reducing admixture or plasticizing admixture.
 - 4. Air Content: 6 percent, plus or minus 1.5 percent at point of discharge.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information. Include on batch ticket the amount of water introduced into the mix at the plant, and amount of water that can be added later, and stay within the specified water-cementitious materials ratio.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces (exposed concrete surface).
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Do not use rust-stained steel form-facing material for exposed surfaces.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not weld reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, with a one inch minimum, as follows:
 - 1. Sawed Joints: Form contraction joints with Soff-Cut early-entry dry-cut control joint saw cutting. Install cuts at each control joint location as soon as concrete will support weight of saw and operator without disturbing final finish. Provide adequate equipment to

complete cutting operations within 2 hours after final pass of trowel. Use Soff-Cut blades and skid plates, using a new skid plate with each new blade. Remove debris in path of cut and under skid plate before cutting. Install Soff-Cut joint protector at saw-cut intersection prior to cross-cut. Remove dry powder saw cut concrete spoils immediately without disturbing finish.

2. Joint Width: 1/8-inch for slabs to receive floor coverings. 1/4-inch for joints to be left exposed and filled with joint sealant.
3. Contraction joints shall be placed in accordance with approved Shop Drawings. The panel shall be as nearly square as possible. If panel cannot be square, do not exceed panel length to panel width ratio of 1 to 1-1/2. Conform to bay spacing wherever possible (at column centerlines, half bays, third bays, one quarter bays, or equal division to meet the specified spacing requirements).
4. Make initial saw cut at mid-length of slab and proceed by saw-cutting at mid-length of each subsequent panel until all joints have been cut.
5. Joints are not permitted in slabs of coolers or freezers.
6. Avoid traffic across saw cut until sufficient strength is gained to protect joint edges.
7. Saw cut slabs on grade in accordance with spacing indicated. Where not indicated, saw cut in accordance with the following maximum spacing:
 - a. 4 inches thick slab: 8 feet.
 - b. 5 to 6 inches thick: 10 feet.
 - c. 6 1/4 to 7 inches thick: 12 feet.
 - d. 7 1/4 to 8 inches thick: 14 feet.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Slab Joints: Install plate system and support assemblies at construction joints and joints where indicated.
- F. Joints in Sidewalks and Exterior Flatwork: Radius edges of walks and outside edges of slabs with 1/4-inch radius edge tool.
1. Saw cut joints, complying with contraction joint cutting requirements, unless indicated otherwise. Submit shop drawing of saw cut layout for approval.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect. Record water added at the Project site on batch ticket. Added water shall not exceed allowable amount to maintain concrete water cement ratio.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. If pan floats are used, the first floating shall be done by power trowel with conventional float blades to open surface to allow release of bleed water and prevent blistering. Restraighten, cut down high spots, and fill low spots as required to meet the floor flatness and levelness tolerances. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a smooth trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, paint, or another thin-film-finish coating system.
 - a. Trowel finish shall provide a smooth, uniform surface, with no ridges or swirl marks that would telegraph through floor coverings. Do not trowel to a shiny burnish surface. The intent is to provide a smooth even floor while leaving the surface texture open enough to permit drying of the slab to achieve required moisture content for floor covering installation.
 - 1) Provide a trowel finish test area and review surface finish with Architect and floor covering subcontractor.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 3. Floor flatness and levelness for gymnasium floor system shall meet flooring manufacturer's tolerances at the time of the floor installation. Grind and fill slab as required to meet the required tolerances.

4. Where floor drains occur, water test the slab in the presence of the Architect to confirm proper slope to drains without high and low areas that cause ponding and bird baths. Grind high spots to permit drainage.
 - a. Include testing of slabs to receive thin set ceramic tile.
- D. Exterior Concrete Walks and Flatwork: Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate. Avoid working bleed water into surface mortar.
 1. Bull float directly behind screed before bleedwater appears. IF bleed water appears, do not work bleed water into surface, allow it to evaporate.
 2. Immediately behind bullfloat, drag broom across surface for a light broom finish if surface paste provides adequate stiffness to maintain acceptable surface texture. If bleedwater appears before application of broom finish, allow surface water to evaporate before brooming.
 3. Coordinate required final broom finish with Architect before application.
 4. Walks and slabs shall be flat at no greater than plus or minus 1/4 inch in 10 feet. Walks and slabs shall pitch to permit drainage, free of ponding water.

3.9 SLAB PATCHING AT EXISTING SLABS

- A. Verify compaction of ground at trenched locations has been completed. Coordinate leveling of grade to receive new concrete slab infill.
- B. Install vapor retarder to completely cover ground at floor slab infill repair areas.
- C. Place concrete and work into infill repair areas, filling all voids. Screed concrete flush with existing slab. Float concrete before bleed water appears. Allow bleed water to evaporate and concrete stiffen before additional troweling and finishing operations. Steel trowel surface to a smooth flat finish complying with floor slab finishing specified in Article 3.8.
- D. Cover trench patch with moisture-retaining cover for 3 days.
- E. After concrete cures for not less than 28 days, grind along edges of patches to remove concrete splatter and buildup from existing slab surface, smoothing, leveling and unifying new concrete infill to existing concrete surfaces so infill patches do not telegraph through finish flooring.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations sloped to detail.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING AND SEALING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete slab surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture-Retaining-Cover Curing (Slabs receiving floor coverings, sealer, exterior walks and exterior slabs): Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Do not add water to surface of interior concrete slabs before covering.
 - 2. Concrete shall remain above 40°F for a minimum of 28 days to permit proper curing.

3.12 EXTERIOR CONCRETE FLATWORK SEALER

- A. Exterior Concrete Flatwork Sealer: Apply sealer to all exterior horizontal surfaces including, walks, entrance slabs, plazas, landings, concrete steps and ramps.
 - 1. Allow concrete to dry for a minimum of 7 days after moisture retaining curing methods are removed.
 - 2. Concrete surface and air temperatures during application and for at least 8 hours following shall be above 40°F.
 - 3. Clean dirt and dust from surface before application of sealer and allow concrete to dry.
 - 4. Apply sealer to clean dry surface in accordance with manufacturer's application instructions. Keep surface wet with sealer to permit penetration. Broom out puddles thoroughly until all sealer has penetrated the surface.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas in new work when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Formed Surfaces Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 1. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample (assumes 6" diameter by 12" cylinders per ASTM).
 - b. Properly store cylinders while awaiting transport to laboratory, maintaining temperature between 60 deg F and 80 deg F. Deliver to laboratory for curing within 24 hours of casting test specimen.
 - c. Field-Cured Cylinders: For severe cold weather concrete operations, where and when directed by the Architect, prepare an additional set of four standard cylinders to be cured at the site, maintaining cylinders in the conditions and at the temperature of the in-place concrete. Provide cure box with temperature recorder. Protect field cylinders from being hit, damaged, and from vibration during initial set
 - 2. Compressive-Strength Tests: ASTM C 39/C 39M;
 - a. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days (assumes 6" diameter by 12" cylinders per ASTM). If 4" diameter by 8" cylinders are used test one cylinder at 7 days and one set of three

cylinders at 28 days. Additional cylinders may be taken as directed by contractor for tests outside of days specified.

- b. A compressive-strength test shall be the average compressive strength from a set of specimens obtained from same composite sample and tested at age indicated.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
4. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
5. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
6. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
7. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
8. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
9. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 045000 - MASONRY

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to all Sections within Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 033000 – Concrete Repairs
- B. Section 076200 – Sheet Metal Flashing and Trim

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, staging, temporary protection, tools and appliances necessary for the proper completion of the work in this section, as required in the specification and in accordance with good construction practice. The work under this Section includes, but is not limited to, the following:

- A. Remove and replace damaged, cracked, or spalled brick masonry units at locations indicated in the Contract Drawings.
- B. Cut and repoint masonry mortar joints at locations as indicated in the Contract Documents.
- C. Rebuild deteriorated brick masonry at locations as indicated in the Contract Documents.
- D. Remove abandoned anchors/fasteners and infill with new brick or mortar at locations as indicated on the Contract Drawings.
- E. Remove and replace deteriorated sealants at locations and as indicated in the Contract Drawings.
- F. Clean all surfaces at work locations and adjacent to where masonry renovations were performed.

1.4 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, temporary heat, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.

- B. The Contractor shall use dust collection vacuums (HEPA vacuums) to limit airborne dust associated with grinding the existing mortar joints. All costs associated with additional power generators shall be the Contractor's responsibility.
- C. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied.
- D. Cold Weather Application - Applies only to rebuilding, no repointing shall be completed when air temperature is less than forty degrees Fahrenheit (< 40°F). The Contractor shall comply with the following cold weather masonry construction requirements at no change in contract price and provide all necessary heat:
 1. The cold weather construction and protection requirements shall be closely followed.
 2. Construction materials shall be received, stored, and protected in ways that prevent water from entering the materials.
 3. If climatic conditions warrant, temperatures of construction materials should be measured. Frozen sand and wet masonry units must be thawed. Masonry units below twenty degrees Fahrenheit (< 20°F) must be heated above twenty degrees Fahrenheit (>20°F) without overheating. Sufficient mortar ingredients should be heated to produce mortar temperatures between forty- and one hundred twenty degrees Fahrenheit (40°F-120°F). Every effort should be made to produce consecutive batches of mortar with the same temperatures falling within this range. The mortar temperature after mixing and before use should be above forty degrees Fahrenheit (40°F), maintainable either by auxiliary heaters under the mortar board or by more frequent mixing of mortar batches. Heated mortar on mortar boards should not become excessively hot (greater than one hundred twenty degrees Fahrenheit (>120°F)).
 4. During below-normal temperatures, masonry should be placed only on sound unfrozen foundations. Masonry should never be placed on a snow or ice-covered surface, because of the danger of movement when the base thaws and the possibility of very little bond being developed between the mortar and the supporting surface.
 5. At the end of the day, the top surface of all masonry should be protected to prevent moisture, as rain, snow or sleet, from entering the masonry. This protection must cover the top surface and should extend a minimum of two feet (2') down all sides of the masonry.

WORKDAY TEMPERATURE	CONSTRUCTION REQUIREMENT	PROTECTION REQUIREMENT
Above 40°F	Normal masonry procedures.	<i>Cover walls with plastic or canvas at end of workday to prevent water entering masonry.</i>
40°F - 32°F	Heat mixing water to produce mortar temperatures between 40°F - 120°F.	<i>Cover walls and materials to prevent wetting and freezing. Covers should be plastic or canvas.</i>
32°F - 25°F	Heat mixing water and sand to produce mortar temperatures between 40°F - 120°F.	<i>With wind velocities over fifteen miles per hour (> 15 mph) provide windbreaks during day and cover walls and materials at the end of the workday to prevent wetting and freezing. Maintain masonry above freezing for sixteen hours (16 hrs.) using auxiliary heat or insulated blankets.</i>
25°F - 20°F	Mortar on boards should be maintained above 40°F.	

WORKDAY TEMPERATURE	CONSTRUCTION REQUIREMENT	PROTECTION REQUIREMENT
E 20°F - 0°F and below	Heat mixing water and sand to produce mortar temperatures between 40°F - 120°F.	<i>Provide enclosures and supply sufficient heat to maintain masonry enclosure above thirty-two degrees Fahrenheit (32°F) for twenty-four hours (24 hrs.).</i>

Note: Construction requirements, while work is in progress, are based on *ambient* temperatures. Protections requirements, after masonry is placed, are based on *mean* daily temperatures.

- E. Hot Weather Application – The Contractor shall keep the areas being built sufficiently moist at all times during the operations. Mortar mixed and ready for application shall be used within one hour’s time and continually remixed to prevent excessive evaporation of moisture from the mortar. Discard all mortar which has begun to set or is not used within two hours’ time. Water for tempering shall be available at all times.
- F. Under no circumstances shall the Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.
- G. No building interiors, whether new or existing shall be left exposed to the weather at the end of each workday.
- H. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.
- I. The Contractor shall put silt debris protection within the adjacent roofing drains to collect masonry dust from entering the leader lines.
- J. Fully charged, inspected and approved fire extinguishers shall be on site at all times. No cutting, grinding or welding of any kind shall proceed without an approved fully charged fire extinguisher.
- K. The general nature, quantity and surface area of the various work items are shown on the Contract Drawings.
- L. The Contractor shall provide a dust proof site during the course of the work. Wet cutting methods, dust tight staging and enclosures as well as other methods shall be employed as necessary to meet this requirement.

1.5 DIMENSIONS AND QUANTITIES

- A. All dimensions and quantities shall be determined or verified by the Contractor. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.6 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions.
- B. Submit a site-specific safety plan.
- C. The Contractor shall submit the following items with their submittal package.
 - 1. Methods of removal of materials.
 - 2. Temporary protection procedures.
 - 3. Staging/set-up procedures.
 - 4. Program for containment of cleaning chemicals.
- D. Submit a range to match the existing color, size and texture.
- E. Proposed method of providing a dust proof site (dust removal) during masonry demolition work.
- F. Proposed method of protection for adjacent landscaping, pavement, walkways, site plantings, and related sitework from damage.

1.7 TEST AREAS

- A. Before full scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture and appearance match with the existing construction. Test areas will be at locations established by the Owner and Engineer:
 - 1. Two (2) square feet of repointing.
 - 2. One (1) square feet of rebuilding.
 - 3. Six (6) square feet of cleaning.
 - 4. Two (2) linear feet of sealant replacement.
- B. Prepare, install and cure all materials in accordance with these specifications and the manufacturer's instructions.
- C. Trial areas shall be repeated until acceptable results are obtained. The accepted work shall be a standard for all subsequent work. Areas of masonry repointing shall be allowed to weather for seven days prior to Owner acceptance.

1.8 CLEANUP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All roof, building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.
- C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

1.9 GUARANTEE

- A. Upon completion of the work and prior to final payment, the Contractor shall submit a Guarantee of his work to be free from defect in materials and workmanship. This Guarantee shall be for a period of two years (2 yrs.) and shall be signed by a Principal of the Contractor's firm and sealed if a corporation.
- B. Contractor to provide sealant manufacturer's standard five-year (5-yr.) warranty.

PART 2 – MATERIALS

2.1 SALVAGED MATERIALS AND ITEMS

- A. All building materials, equipment and debris of whatever nature from the portions of the existing structure removed under this project and not designated to be reused or reinstalled shall become the property of the Contractor and legally disposed of off-site. The Contractor will be required to place all discarded materials in the appropriate rubbish receptacles for legal disposal by the Contractor.

2.2 BRICK MASONRY

- A. Replacement brick masonry shall conform to ASTM C 216, Grade SW, Type FBS specifications. Brick shall match existing in size, configuration, color and texture. The majority of the brick masonry units appear to be two-inch by three- and one-half inch by seven- and five-eighths inch (2" x 3-1/2" x 7-5/8") in dimension. However, these units vary and will require the Contractor to confirm brick masonry unit sizes prior to ordering.
- B. All brick shall be submitted to the Owner for acceptability as to color and appearance match with the existing brick. The Contractor may be required to submit additional brick samples for approval. No brick shall be purchased or installed until approval by the Owner is obtained.

2.3 MORTAR

- A. Mortar for rebuilding brick veneer shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture and appearance. Mortar shall conform to Parts 8 and 11 E of the BIA Technical Notes.
- B. Mortar for tuck pointing shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture and appearance. Mortar shall be pre-hydrated and conform to Part 7 of the BIA Technical Notes.
- C. Portland cement shall be Type II (Type III may be used only if previously approved) conforming to ASTM C150, specifications.
- D. Hydrated lime shall conform to ASTM C207, Type S specifications.
- E. Sand shall conform to ASTM C144, amended as follows:

Sieve Size	% Passing (By Weight)
#4	100
#8	95-100
#16	70-100
#30	40-75
#50	20-40
#100	10-25
#200	0-10

- F. Tinting or coloring agent shall be added to the sand, lime cement to color the fully-cured, in-place mortar to match the physical and chemical characteristics and specified requirements of the Type N mortar.
- G. Admixtures: No admixtures shall be allowed.
- H. Water shall be clean, potable tap water.

2.4 MASONRY CLEANERS

- A. Cleaner for newly installed, brick masonry, and repointing areas shall be Sure-Kleen 101 lime solvent by Pro-So-Co, Inc., Hydroclean HT 455 by Hydrochemical Techniques, Inc., 200 Lime Solvent as manufactured by Diedrich Technologies, or approved equal.
- B. The cleaner shall be specifically recommended by the manufacturers for the removal of efflorescence from masonry, Radonseal Efflorescence cleaner, or approved equal. Cleaners with harsh chemicals and/or strong acids are not recommended but may be considered. Windows should be protected when using cleaners.
- C. Masking materials shall be commercially available masking or duct tape of appropriate width. Self-adhesive materials shall be completely strippable, leaving no adhesive residue when removed.
- D. Plastic sheet for masking tape areas shall be four millimeters (4 mils.) thick minimum polyethylene sheet of appropriate size to cover the required areas.

2.5 SEALANT AND ACCESSORIES

- A. Sealant for exposed locations shall be a one-part polyurethane conforming to ASTM C920-87, Type S, Grade NS, Class 25, Uses NT, M, A, and O such as manufactured by Tremco, BASF-Sonneborn, Sika Corp., or Engineer approved equal.
 - 1. Contractor to provide sealant manufacturer's standard five-year (5-yr.) warranty.
- B. Color(s) shall be selected by the Owner from the approved manufacturer's color chart. Colors shall be the manufacturer's available premium colors.
- C. Primer shall be non-staining type as manufactured or recommended by the sealant manufacturer for each substrate.
- D. Substrate cleaner shall be non-corrosive and non-staining as recommended by the sealant manufacturer. Cleaner shall be totally compatible with the sealant for each substrate.

- E. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Follow all applicable local, state and federal requirements regarding construction of scaffolding and protection of the public safety. Specific reference should be made to OSHA Construction Safety Regulations.
- B. Set up of scaffolding or similar access and location of on-site storage areas shall be subject to review and approval by the Owner.
- C. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.
- D. During freezing weather, the Contractor shall protect all masonry with tarpaulins or other approved material. Masonry materials shall be stacked on platforms and covered, or stored in a manner acceptable to the Owner, to protect them from contact with soil and weather exposure. Materials with stained faces will not be used in the walls.
- E. No masonry work shall be executed when the temperature in the work area has dropped below forty degrees Fahrenheit (< 40°F) unless it is rising. The Contractor shall provide heat and maintain the temperature of masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of masonry materials to at least forty degrees Fahrenheit (40°F), but not more than one hundred degrees Fahrenheit (100°F), and maintain an air temperature above forty degrees Fahrenheit (40°F) on both sides of completed masonry for a period of at least seventy-two hours (72 hrs.).
- F. Keep covers tightly sealed on all evaporative products to prevent premature curing.
- G. All debris shall be transported to dumpsters, in locations approved by the Owner, at ground level by enclosed chute or crane and scaling bucket. Uncontrolled dropping of debris to ground level will not be permitted.
- H. During the removal of any existing component, the Contractor shall report to the Owner any areas of damaged, deteriorated or otherwise unsuitable framing, wood blocking, or wall materials uncovered during the work. Do not cover unacceptable areas until reviewed by the Owner and Engineer. Provide temporary protection to the area in question.
- I. Any wall areas opened for replacement shall receive the new system that day and shall be enclosed with masonry. Should rebuilding of masonry not be completed, temporary weather protection and shoring for the wall shall be provided by the Masonry Contractor at no additional charge to the Owner.
- J. If needed, the Contractor shall lay-up granite units' plumb, level, and true to the lines and dimensions at the existing walls. Chipped or broken units shall be repaired. If any such units

are placed in the finished wall, they shall be removed and replaced with new units at no additional cost to the Owner.

- K. The repointing of granite mortar joints is included at the locations shown on the Contact Drawings, and as specified in the Unit Price Section. Only additional scope of work designated by the Owner will be paid for at the Unit Price. The Contractor must confirm additional unit price items with the Owner prior to performing the work should compensation be desired. Adjacent masonry units damaged or removed as a result of the work will be removed and replaced at no cost to the Owner.
- L. All shoring of the masonry components will be the responsibility of the masonry Contractor. Maximum spacing of temporary shoring shall be twelve inches (12") on center. Any damage as a result of insufficient shoring shall be repaired or replaced at no additional cost to the Owner.
- M. Refer to Brick Industry Association (BIA) technical notes for standard practice for masonry repointing, rebuilding and repair.

3.2 MASONRY STORAGE

- A. Storage of all masonry shall be in the area designated by the Owner. All stored masonry units shall be covered.

3.3 REMOVAL OF BRICK MASONRY

- A. Remove brick masonry units in the locations shown on the Contract Drawings. Use hand and power tools to remove masonry. Pneumatic demolition tools are not permitted.
- B. Saw-cut surrounding mortar joints to remove the designated masonry units. Remove adjacent units as required. Provide temporary shoring and protection, as necessary.
- C. Remove masonry units in a manner so as not to damage sound materials designated to remain.

3.4 BRICK MASONRY REPLACEMENT

- A. Reconstruct brickwork with new brick to follow the existing profile and configuration. All brick masonry shall be plumb, level and true to the lines and dimensions of existing wall. Chipped or broken units shall not be used. If any such units are placed in the finished wall they shall be removed and replaced with new units at no additional cost to the Owner.
- B. The Contractor shall supply all jacks, shoring and temporary supports necessary to support brickwork above and adjacent to any area to assure proper installation of the work.
- C. Wet all new and existing masonry units in the work area. Masonry shall be kept damp but without standing water.
- D. Utilize rotary mixers when fabricating all mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. No anti-freeze compounds or other substances shall be added to the mortar. Mix all mortar for at least three minutes (3 min.) and not more than five minutes (5 min.) with the minimum amount of water to produce a workable consistency.

The maximum allowable air content of cured mortar shall be twelve percent (12%) by volume. Re-tempering of mortars that have stiffened because of evaporation of water will be allowed in order to provide the proper consistency provided all mortar in a batch is utilized within two hours (2 hrs.) of initial mixing.

- E. Set each brick in a full bed of mortar and build upward. Tool all joints to match the existing joint profile. Fully butter all heads.
- F. Work mortar into joints for complete width and depth. Consolidate and tool into joint using tooling equipment to completely fill the joint cavity to match the existing joint profile. Tool exposed joints slightly with a suitable jointer when the mortar is thumbprint hard. For horizontal joints, jointers shall be at least twelve inches (12") long for brickwork. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool vertical joints first. Brush joints to remove all loose and excess mortar. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall.
- G. Set new masonry unit in full beds of mortar, top, bottom and sides. Utilize slate wedges as required to maintain mortar joint width. Should new masonry set in mortar require removal due to un-level/plumb conditions, that masonry unit shall be removed from the work area, cleaned and allowed to dry prior to reinstallation.
- H. Provide full joint depth of new mortar. Strike off and tool joints to match existing joint configuration. Allow areas to fully cure prior to cleaning.
- I. Where brick masonry replacement occurs in areas to be repointed, rake back joints and repoint together with the wall area.
- J. Totally clean the areas of masonry rebuilding only after the rebuilding is completed and the mortar has been allowed to cure for eight (8) days minimum. Clean surfaces free of all dust, dirt and mortar stains as described in this section.

3.5 REPOINTING

- A. Any masonry unit damaged during the repointing process shall be replaced by the Contractor at no additional cost to the Owner. Repoint the deteriorated masonry mortar joints as designated on the Contract Drawings.
- B. Cut and point one hundred percent (100%) of masonry mortar joints where shown on the Contract Drawings..
- C. Refer to Technical Notes, Section 7 of the Brick Industry Association concerning methods and materials for tuck pointing repairs.
- D. Remove existing mortar to a depth of at least three-quarter inch ($\frac{3}{4}$ ") in the areas to be repointed. Removal shall be accomplished using hand and power tools so as not to damage the existing masonry. Remove both horizontal and vertical joints. Brush the joint clean of all loose mortar and dust and wet the exposed surface down with a light water spray. Keep exposed surface damp throughout procedure.

- E. Utilize rotary mixers when fabricating mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. No antifreeze compounds or other substances shall be added to the mortar. Mix dry ingredients before adding water. Mix all mortar for at least three minutes (3 min.) and not more than five minutes (5 min.) with the minimum amount of water to produce a workable consistency. The maximum allowable air content of cured mortar shall be twelve percent (12%) by volume. Retempering of mortars that have stiffened because of evaporation of water will be allowed in order to provide the proper consistency, provided all mortar in a batch is utilized within two hours (2 hrs.) of initial mixing.
- F. Pre-hydrated mortar shall be used for tuck pointing of masonry. Add only a sufficient amount of water to produce a damp mass of such a consistency that it would retain its form when pressed into a ball with hands but will not flow under a trowel. Allow mortar to stand for not less than one hour (1 hr.) nor more than two hours (2 hrs.). Be sure that the color and texture sample of the cured mortar has been viewed and approved by the Owner.
- G. Work mortar into prepared joints for complete width and depth. Consolidate and tool into joint using concave tooling equipment to completely fill the joint cavity and to match the existing joint profile. Repoint rebuilt masonry areas along with the existing. Repointed masonry shall be raked or concave as required to match the existing wall mortar joints.
- H. Protect areas of repointing from inclement weather during cure.
- I. Allow repointing areas to fully cure prior to masonry cleaning as described in this section.

3.6 TEMPORARY SHORING

- A. It is the responsibility of the Contractor to design, erect, and maintain all necessary shoring procedures sufficient to comply with applicable regulations, securely support all masonry or other elements left unsupported by the required removals and permit the work of other trades to proceed.
- B. If cracks occur in mortar joints of brick intended to remain, completely stabilize the area with additional shoring or new construction, cut out the damaged joint area and repoint it after removal of shoring. Secure the Engineer's approval of repair.
- C. Solidly patch all holes (with new mortar) left in mortar by withdrawal of shore fastenings.
- D. Completely remove shoring system when no longer needed.
- E. Notify the Owner forty-eight hours (48 hrs.) in advance of installation of shoring.
- F. The maximum spacing of temporary shoring vertical supports shall be twelve inches (12") on-center.
- G. The additional of temporary lateral bracing or blocking between vertical shoring elements is required.
- H. A sequenced shoring scheme is recommended at all shoring applications. The minimum length of remaining solid masonry wall located between each removed masonry section shall be four feet (4').

- I. Masonry and flashing replacement work must be completed in the same day that existing components are removed unless adequate temporary weather protection is provided to the satisfaction of the Owner and Engineer. Submit the intended demolition, shoring, and construction sequencing to accommodate this requirement. Submit the means and methods of temporary weather protection to include materials and methods of fastening or securing.
- J. Submit the means and methods of temporary protection to low roof areas and their components.
- K. Submit the means and methods of temporary covering or masking of wall and roof penetrations, grills, vents, and mechanical units.
- L. All temporary shoring of the brick masonry components to complete the masonry and flashing repairs will be the sole responsibility of the masonry Contractor. The Contractor must supply, install, and maintain all temporary shoring for the duration of the project.

3.7 SEALANT INSTALLATION

- A. Install sealant where shown on the Contract Drawings and as required for the proper completion of the work.
- B. Clean and prime substrates in strict accordance with sealant manufacturer's requirements.
- C. Precondition sealants to a temperature between sixty- and seventy degrees Fahrenheit (60°F - 70°F) or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between sixty- and eighty-five degrees Fahrenheit (60°F - 85°F).
- D. Joint primer shall be applied to all properly prepared, cleaned, and dry substrates. Primer shall be approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.
- E. Sealant shall have a minimum application life of three hours (3 hrs.) after mixing.
- F. Unless otherwise required by the sealant manufacturer, the sealant shall be mixed for a period of six minutes (6 min.) minimum with a slow speed electrical drill and mixing paddle. The sides of the container shall be repeatedly scraped to ensure adequate mixing.
- G. Sealant shall be applied to clean, dry, joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.
- H. All joint sealant shall be immediately tooled to assure full adhesion. Sealant shall be dry tooled, straight, uniform, smooth, and neatly finished to the profiles detailed. No soaps, wetting or slicking agents will be allowed.

3.8 MASONRY CLEANING

- A. Totally clean all repaired, or repointed masonry areas of all construction stains and excess mortar. Do not perform any cleaning until mortar joints and adjacent sealants are fully cured.

- B. Test the specified cleaners on a small area of masonry wall to determine compatibility with the masonry, window units, sealants, etc. Evidence of discoloration, metallic salts or other detritus shall be grounds for requiring the use of a substitute cleaner.
- C. The Contractor will be required to clean the masonry units with the minimum cleaning solution mix ratios as recommended by the cleaner manufacturer. Should the minimum dilution ratios not clean the masonry, the Contractor will be required to slightly decrease the dilution rates to clean the surfaces. It is recommended that the Contractor use care when performing the masonry repairs to prevent increasing the mixing solutions.
- D. Apply the cleaner at the manufacturer's recommended dilution rate and dwell duration. Pre-wet the wall if the manufacturer so recommends.
- E. Allow the cleaner to stand for the manufacturer's recommended dwell period while monitoring to ensure that the surface does not dry. Steel bristle wire brushes are not to be used.
- F. Rinse all cleaner from the wall with water applied at the manufacturer's recommended flow and pressure. High pressure washing equipment may be required. Coordinate activities so that the Architect may witness and approve a mockup cleaning with the use of the proper spray tip and high-pressure equipment. Any acid neutralizing agent required by the manufacturer shall be applied as part of this rinse. Ensure that effluent does not accumulate at ground level, and fully rinse all effluent from sidewalks, streets and landscaping each day.
- G. The Contractor must provide sufficient site protection to prevent the cleaning effluent from draining into the adjacent storm drains. The Contractor will provide a narrative as to how the site protection will be performed.

3.9 CLEANUP

- A. Prior to acceptance of the masonry work covered in this section, the Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

SECTION 047200 - STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior Stone Veneer
- B. Related Requirements:
 - 1. Section 033000 Cast-in-place Concrete
 - 2. Section 047315 Manufactured Stone Veneer
 - 3. Section 07900 Joint Sealers

1.2 TERMINOLOGY

- A. Attachment Adhesive: Portland cement based synthetic adhesive used to bond the cast stone to the substrate.
- B. Tuscan Grout: Mortar-like synthetic grout used in joints between ends of cast stone pieces. Manufactured by Tuscan StoneWorx.
- C. Substrate: the surface to which the cast stone is attached.
- D. Tuscan Cast Stone: Individual pieces of factory fabricated, limestone cast architectural stone.
- E. Cold Stone: Individual pieces of factory fabricated, recycled content cast architectural stone with granite appearance.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 3. ASTM C 297 - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.
 - 4. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
 - 5. ASTM C 1186 - Standard Specification for Flat Fiber-Cement Sheets.
 - 6. 6. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.
 - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM G 155 - Standard Practice for Operating-Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- B. International Code Council (ICC): ICC-ES AC 219 - Acceptance Criteria for Exterior Insulation and Finish Systems.
- C. Gypsum Association GA-253: Recommended Specifications for the Application of Gypsum Sheathing.
- D. Gypsum Association GA-254 - Fire Resistant Gypsum Sheathing.

1.4 PERFORMANCE REQUIREMENTS

- A. Cast Stone: Products shall meet the following performance characteristics:
 1. Accelerated Weathering: ASTM G 155, passed, 2,000 hours; no deleterious effects, no cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating.
 2. Freeze/Thaw Resistance: ICC AC 219, passed, 10 cycles; no deleterious effects, no cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating.
 3. Water Absorption: ASTM C 1185, < 4%, passed; no deleterious effects, no cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating.
 4. Tensile Adhesion: ASTM C 297, 25 PSI, Minimum 15 PSI.
 5. Water Resistance: ASTM D 2247, passed, passed 14 days; no deleterious effects, no cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating
 6. Salt Spray: ASTM B 117, no deleterious effect, passed at 300 hours; no deleterious effects, no cracking, checking, crazing, erosion, rusting, blistering, peeling or delaminating.
 7. Surface Burning Characteristics: ASTM E 84, 0 Flame Spread/ 0 Smoke Develop, passed.
 8. Compressive Strength: ASTM C 39, < 7,000 PSI, passed.
 9. Flexural Strength: ASTM C 1185/1186,

1.5 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Cleaning and maintenance instructions.
- B. Shop Drawings: Provide detailed dimensioned elevations of each unit. Shop drawings shall include the following:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.

- C. Samples for Verification: For each product specified, two hand-size samples of colors, textures and shapes to be used on the project.
- D. Warranty: Copy of manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Cast stone manufacturer shall have a formal, written internal quality control program in effect when producing the case stone.
- B. Installer Qualifications
 - 1. Installer experienced to perform work of this section when specialized in the installation of work similar to that required for this project.
 - 2. Submit reference list of completed projects.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of project.
- B. Protect liquid materials from freezing temperatures and temperatures in excess of 90 degree F (32 degrees C). Store covered, out of direct sunlight.
- C. Protect Portland cement and other dry powder type materials from moisture and humidity. Store under cover and off the ground in a dry location.

1.8 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
 - 2. Maintain ambient and surface temperature above 40 degrees F (4 degrees C) during application and drying period, minimum 24 hours after application of cast stone.
 - 3. Provide supplementary heat for installation in temperatures less than 40 degrees F (4 degrees C).
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.
- C. For outdoor application, provide temporary protection as needed from precipitation, wind, airborne dust and debris, etc.
- D. Provide protection of surrounding areas and adjacent surfaces from application of cast stone materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone Veneer: Obtain material from single source from single manufacturer.
 - 1. Acceptable Manufacturers:
 - a. Basis of Design: Old New England Rounds in thin and full set veneer thicknesses: by Delgado Stone Distributors, 55 Del Mar Drive Brookfield, CT 06804.
 - b. Boston Round Blend in thin and full set veneer thicknesses: by Stoneyard, 2 Spectacle Pond Road, Littleton, MA 01460
 - c.
 - 2. Substitutions: Written substitutions are allowed provided they meet the design intent. Architect is not obligated to accept any substitution requests.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 STONE

- A. Accessory Materials:
 - 1. Grouting Materials: Tuscan Grout, ready-to use textured caulk with integral color
 - 2. Adhesive: Dryvit Systems, Inc. Primus Adhesive or equivalent.
 - 3. Surface Sealer: Tuscan Sealer.
 - 4. Sealant Backer Rod: As recommended by manufacturer.
- B. Water: Clean, clear and potable.
- C. Portland Cement: Type I in conformance with ASTM C150, fresh and free of lumps.

2.3 MORTAR MATERIALS

- A. Provide mortar materials that comply with this section
- B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

- F. Colored Cement Products: Packaged blend made from [portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Portland Cement-Lime Mix:
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 4. For joints less than **1/4 inch (6 mm)** thick, use aggregate graded with 100 percent passing the **No. 16 (1.18-mm)** sieve.
 5. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Water: Potable.
- H. Anchors: Type and size indicated, fabricated from Type 316 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666
- I. Dowels: **1/2-inch- (12-mm-)** diameter round bars, fabricated from Type 316 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666
Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
- J. Comply with ASTM C270, Proportion Specification.
- K. For setting mortar, use Type S Preblended dry mortar mix complying with ASTM C1714/C1714M and capable of producing mortar strength as indicated in ASTM C270.
- L. For setting mortar, use Type S Pigmented Mortar: Use colored cement product

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If rough opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SUBSTRATE INSPECTION

- A. Verify substrate is suitable in accordance with manufacturer's recommendations. Check dimensions of substrate surfaces (length, width, height, radiuses, angles) and openings to insure that supporting wall surface, as built, will accept the pieces as manufactured.
- B. Inspect pieces as delivered to insure that all the profiles, length, colors and finishes that are needed to install all the pieces are on hand.
- C. Inspect Surfaces For the Following:
 - 1. Contamination including algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
 - 2. Surface absorption and chalkiness.
 - 3. Cracks; measure crack width and record location of cracks.
 - 4. Damage and deterioration.
 - 5. Moisture content and moisture damage. Use a moisture meter to determine if the surface is dry enough to receive the pieces and record any areas of moisture damage.
 - 6. Compliance with specification tolerances. Record areas that are out of tolerance, greater than 1/4 inch in 8 feet (6mm in 2438 mm) deviation in plane.
- D. Inspect sheathing application for compliance with manufacturer's recommendations.
- E. Report deviations from the requirements of project specifications or other conditions that might adversely affect the installation to the Contractor. Do not start work until deviations are corrected.

3.3 SUBSTRATE PREPARATION

- A. Repair damaged or cracked surfaces.
- B. Level surfaces to comply with required tolerances in this specification.
- C. Remove surface contaminants on concrete and concrete masonry surfaces, such a form release oils, dust, paint, waterproofing, and similar items.
- D. Apply conditioner to substrate by sprayer or roller to chalking or excessively absorptive surfaces.

3.4 PROTECTION AND CLEANING

- A. Protection:
 - 1. Protect installed materials from water impinging on the visible surface, Tuscan Grout, sealants joints, and from behind.
 - 2. Protect installed materials from dust, dirt, precipitation, freezing, damage, spilled materials, and continuous high humidity until they are fully dry.
- B. Cleanup and Job Close-Out:
 - 1. Remove temporary supports, if employed, once adhesive and Tuscan Grout has set.
 - 2. Remove left over materials from work area and dispose of properly.

3. Remove left over materials from work area and dispose of properly.
 4. Furnish Owner with extra pieces for future maintenance, if any, as specified herein.
- C. Cleaning and Maintenance: Comply with the following recommendations and guidelines.
1. Avoid impacts. Care should be taken to protect pieces from impact as it can be chipped, especially at corners and edges.
 2. Avoid the Use of Salt and Other Deicers:
 - a. In winter, use of any deicing compound, even if it is not chemically reactive with cast stone, can cause spalling and pop-outs by subjecting the pieces to the deleterious effects of naturally occurring freeze-thaw cycles.
 - b. New cast stone, less than one-year old, is especially susceptible to salt and deicer type of damage and may be affected with just one application. If salt or other ice melting chemicals must be used, apply Tuscan Sealer for protecting cast stone from the effects of salt and other deicers. Tuscan Sealer may prevent or significantly reduce the amount of damage that occurs from the use of deicers. When shoveling, sweeping, plowing, or snow-blowing deicer contaminated snow, efforts should be made not to throw the contaminated snow so that it lands on or against any cast stone (such as wall caps or trim) as this could lead to spalling of those items.
 - c. Since the effectiveness of most sealers will wear off over time, they may need to be reapplied periodically.
 3. Protect Cast Stone from Extreme Heat: Do not expose extreme heat to pieces. Do not use torches to melt ice. Do not weld against pieces.
 4. Cleaning Cast Stone Surfaces: Minimize abrading of the finish to promote the longstanding appearance, consistency, and integrity of the cast stone.
 - a. Primary recommended cleaning method (least abrasive), lightly scrub with a soft bristle fiber brush, using a mild detergent and water followed by a thorough rinse with clean running water.
 - b. Alternative cleaning methods (progressively more abrasive), use of a bucket of water with mild detergent and soft bristle brush.
 - c. Before cleaning, thoroughly drench all surrounding masonry and concrete surfaces to prevent the dirty wash-down water from being absorbed into it. When cleaning has been completed, wash down entire work area to ensure no residual dirty or contaminated rinse water remains. No acids or prepared cleaners shall be used without the approval of Tuscan StoneWorx.

END OF SECTION 047200

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SECTION 047315 - MANUFACTURED STONE VENEER

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Adhered manufactured stone veneer.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 033000 Cast-in-place Concrete
 - 2. Section 047200 – Stone Masonry
 - 3. Section 076200 Metal Flashing
 - 4. Section 07900 Joint Sealers

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stone units.
- B. Samples for Verification:
 - 1. For each type of stone required.
 - 2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.
- C. Mockup Samples: Furnish sample units for each color and texture of stone required, as indicated on Drawings for installation in mockups.
- D. Qualification Data: For manufacturer.
 - 1. Include copies of material test reports for completed projects, indicating compliance of stone with ASTM C 1364.
- E. Quality-Control Plan: Manufacturer's written quality-control plan.

1. Provide copies of documentation showing compliance with quality-control plan as requested by Architect.
- F. Material Test Reports: For each mix required to produce stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
1. Provide test reports based on testing within previous two years.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of stone units similar to those indicated for this Project, with sufficient production capacity to manufacture required units.
1. Manufacturer is a producing member of the National Concrete Masonry Association (NCMA).
- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Stone: Obtain stone units through one source from a single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.
- B. Pack, handle, and ship stone units in suitable packs or pallets.
1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone units, if required, using dollies with wood supports.
 2. Store stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store installation materials on elevated platforms, under cover, and in a dry location.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Construction: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. When ambient temperature is within limits indicated, use the following procedures:
1. Install when ambient temperature is greater than 40 degrees F.
 2. Protect from freezing for minimum of 48 hours after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURED STONE MATERIALS

- A. General: Comply with ASTM C 1670 and the following:
 - 1. Basis of Design: Old Country Fieldstone by Cultured Stone.
 - 2. Height: Refer to Drawings.
 - 3. Lengths: Refer to Drawings.
 - 4. Walls: Refer to Drawings.
- B. Portland Cement: ASTM C 150, Type I, containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation as needed to produce required textures and colors as needed to produce required stone colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation as needed to produce required textures and colors as needed to produce required stone colors.
- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis. The amount of pigment shall not exceed 10% by weight of the cement used.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 - 1. For pigmented mortar, use a colored portland cement-lime mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mortar Color: As selected by Architect.
- D. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch and pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 - 1. White Aggregates: Natural white sand or ground white stone.
 - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
 - 3. Mortar Color: As selected by Architect.
- E. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar and containing no carbon black.

- F. Water: Potable.
- G. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Colored Portland Cement-Lime Mix:
 - a. Color Mortar Blend; Glen-Gery Corporation.
 - b. Rainbow Mortamix Custom Color Cement/Lime; Holcim, Inc.
 - c. Centurion Colorbond PL; Lafarge Corporation.
 - d. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
 - e. Riverton Portland Cement Lime Custom Color; Essroc.
 - 2. Mortar Pigments:
 - a. Bayferrox Iron Oxide Pigments; LanXess
 - b. True Tone Mortar Colors; Davis Colors.
 - c. Centurion Pigments; Lafarge Corporation.
 - d. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

2.3 ACCESSORIES

- A. Metal Lath: 2.5 lb/sq.yd., self-furring, diamond-mesh lath complying with ASTM C847. Fabricate from structural-quality, zinc-coated steel sheet complying with ASTM A653, G60.
- B. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C1063. Select fastener length and diameter as required for attachment through rigid insulation and sheathing.
- C. Concealed Sheet Metal Flashing: Fabricate from stainless steel complying with requirements specified in Section 076200 - SHEET METAL FLASHING AND TRIM in thicknesses indicated, but not less than 0.0156 inch thick.
 - 1. At Contractor's option, fabricate flashing from lead for installation in locations where flashing rests on continuous members.
- D. Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A653, G60.
- E. External Corner Reinforcement: Fabricated from galvanized metal lath.
- F. Cornerbeads: Small nose corner bead with expanded flanges, fabricated from galvanized steel

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone cladding and conditions under which stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by mortar work.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. and NCMA Installation Guide for Adhered Manufactured Stone Veneer, ASTM C 1780, ASTM C 1063, and applicable Codes.
- B. Install Related Materials in accordance with type of substrate and manufactured stone veneer manufacturer's installation instructions.
- C. Install weep screed per stone manufacturer's instructions.
- D. Flashing: Coordinate with Flashings specified in Section 076200 - Sheet Metal Flashing and Trim.
- E. Expanded-Metal Lath: Install in accordance with ASTM C1063.
 - 1. Fasten lath through sheathing and insulation to studs.
 - 2. Overlap at least 6 inches at vertical seams and at least 2 inches at horizontal seams.
 - 3. Overlap 16 inches around corners.
 - 4. Tie overlaps with wire ties.
- F. Provide wire ties for accessory attachment to lath.
- G. Provide minimum 1/2-inch-thick mortar scratch coat to encapsulate metal lath and provide continuous bed.
- H. Rake out joints for pointing mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.
- I. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide periodic site visits as requested by Architect. Report any discrepancies to the Contractor with copies to the Architect within 24 hours of each visit.

3.5 CLEANING AND PROTECTION

- A. Clean manufactured masonry in accordance with manufacturer's installation instructions

- B. Protect finished work from rain and work on either side of the wall during and for 48 hours following installation.
- C. Protect installed products until completion of project.
- D. Clean prior to project closeout.
- E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Rigid insulation under slabs-on-grade and at perimeter foundation walls.
 - 2. Mineral-wool blanket and board insulation.
 - 3. Spray polyurethane foam insulation.
 - 4. Vapor retarders.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 019113 - GENERAL COMMISSIONING for Contractor's responsibilities for commissioning and coordination with the Owner's commissioning agent.
 - 2. Section 070800 - BUILDING ENVELOPE COMMISSIONING for Contractor's responsibilities in commissioning of the building enclosure assembly testing and coordination with the Owner's commissioning agent.
 - 3. Section 055000 - METAL FABRICATIONS - for sheet metal closures for mineral wool closures at underside of roofs and where indicated.
 - 4. Section 072700 - AIR BARRIERS for air and vapor barrier membrane.
 - 5. Section 092110 - GYPSUM BOARD ASSEMBLIES for acoustic insulation in gypsum board assemblies.
 - 6. Division 22 - PLUMBING for plumbing insulation.
 - 7. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for mechanical insulation.

1.3 SUBMITTALS

- A. Product Data: Manufacturer product data, installation instructions, performance criteria, and product limitations for each type of product indicated.
- B. Cavity Wall Insulation Certification: Submit manufacturer's certification that cavity wall insulation, as designed in the assemblies indicated on the Drawings, has been tested to meet the requirements of NFPA 285 and passed.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Installer Qualifications: A qualified installer who has been trained by and is acceptable to spray polyurethane foam insulation manufacturer to install manufacturer's products.
- C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- D. Fire Test Performance for Insulation in Cavity Wall: Passes NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
- E. Testing Agency Qualifications: An independent agency qualified as a "Certified Infrared Thermographer" per ASNT SNT-TC-1A guidelines, Level I certification minimum.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store in a dry and secure location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic and spray polyurethane foam insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver materials to Project site before installation time.
 - 3. Complete installation and concealment of materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 FOUNDATION WALL AND UNDER SLAB INSULATION

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Dow Chemical Company, The, Styrofoam Tongue and Groove.
 - 2. Owens Corning, Foamular 250.
 - 3. Pactiv Building Products, GreenGuard Insulation Board.
- B. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, square edged undrslab and tongue and groove or shiplap at perimeter foundation walls, of type, density, and compressive strength indicated below, 2 inches thick unless noted otherwise:
 - 1. For vertical applications, Type IV, 1.6-lb/cu. ft. minimum density and 25-psi minimum compressive strength.
 - 2. For horizontal applications, pedestrian traffic, Type VII, 2.2-lb/cu. ft. minimum density and 60-psi minimum compressive strength.

3. For horizontal applications, vehicular traffic, Type V, 3-lb/cu. ft. minimum density and 100-psi minimum compressive strength.

- C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.2 CAVITY WALL INSULATION, POLYISOCYANURATE BOARD AT COMPOSITE METAL PANEL SYSTEMS

- A. Composite Insulated Panels: Rigid, closed cell polyisocyanurate foam insulation, complying with ASTM C 1289, Type V, Type II, bonded to coated glass facer on one side and plywood on the other side.
 1. Insulation Fire-Test-Response Characteristics: ASTM E 84, maximum flame-spread and smoke-development indexes of 25 and 450, respectively.
 2. Polyisocyanurate Foam thickness: 3 inches.
 3. Plywood Nominal Thickness: 5/8 inch.
 4. Total Panel thickness: 3-5/8 inches.
 5. Panel LTTR: Not less than 19.1.
 6. Products, subject to compliance with requirements:
 - a. Atlas Roofing Corporation, EnergyShield Ply Pro.
 - b. Cornell Corporation, ThermalCal Exterior Wall Insulation Panels.
 - c. Hunter Panels, Hunter Panels Xci NB, Basis of Design.

2.3 CAVITY WALL INSULATION AT MASONRY WALLS

- A. Extruded-Polystyrene Board Insulation (Steel stud Backup): ASTM C578, Type IV, 25 psi, closed-cell product extruded with an integral skin, tongue and groove edges, 48- by 96-inch sheets. Installation shall be NFPA compliant for assemblies indicated.
 1. Thickness 3 inches, unless otherwise noted.
 2. LTTR Value: R-15.0.
 3. Products:
 - a. Dow Chemical Company, Styrofoam.
 - b. Owens Corning, Foamular 250.

2.4 BLANKET INSULATION, MINERAL-WOOL BLANKET

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Owens Corning; Thermafiber UltraBatt FF.
 2. Isolatek International.
 3. Rockwool (formerly Roxul).
- B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Mineral-Wool Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene. GreenGuard certified as formaldehyde free and low chemical emissions.

2.5 SPRAYED-FOAM INSULATION, AT GAPS AND VOIDS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Dow Chemical; GreatStuff Pro.
 - 2. ICP Adhesives and Sealants (formerly Fomo Products): Handi-Foam products.
- B. Sprayed-Foam Insulation: Water-cure closed cell polyurethane containing no urea-formaldehyde and no CFCs.
 - 1. Fire Resistance: UL 723, Flame Spread 25 max., and Smoke Developed 50 max.

2.6 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include:
 - 1. Demilec (USA) LLC; Heatlock HFO Pro.
 - 2. Dow Chemical Company; Styrofoam Brand CM Series.
 - 3. Icynene-Lapolla; Icynene; ProSeal HFO
 - 4. Johns Manville; a Berkshire Hathaway Company; JM Corbond III SPF.
- B. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II.
 - 1. Minimum density of 2.0 lb/cu. ft., thermal resistivity (R-value) of 6.0 deg F x h x sq. ft./Btu x in. at 75 deg F.
 - 2. Fire Resistance: ASTM E 84 or UL 723, Flame Spread 25 or less., and Smoke Developed 450 max.
 - 3. Density: ASTM D 2856, 90 Percent minimum
 - 4. Vapor Permeance: ASTM E 96, 1- inch thickness, 1.2 perms maximum
 - 5. Fungi Resistance: ASTM C 1338, no growth.

2.7 THERMAL AND IGNITION BARRIERS

- A. Thermal Barrier for Foam Plastic Insulation at Occupied Spaces: Provide thermal barrier recommended by foam plastic manufacturer and tested with the specific product. Product shall have an active building code evaluation report that lists report number and effective dates of product acceptance.

2.8 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.06 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.9 AUXILIARY INSULATING MATERIALS

- A. Insulation support Anchors for Walls: 25 gage, galvanized continuous metal support strip with pre-punched tabs at 8 inches on center.
 - 1. Product: Insul-Hold; JR Metal Frames; Phone 9207) 465-9066.

- B. Insulation Support Wire for floor/Ceiling Assemblies: Steel wire, not less than 0.090 inch diameter, with chisel cut ends for use with wood trusses, coordinate length with truss spacing.
- C. Product: Simpson Strong-Tie Company, Inc., Insulation Supports or equal.
- D. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- E. Masonry and Concrete Fasteners:
 - 1. Hardened nails, pneumatically-driven fasteners or other anchors recommended by insulation manufacturer, sufficient to penetrate substrate and permanently retain insulation.
 - 2. Self-adhering insulation stick pins: Galvanized steel plate welded to projecting steel spindle; capable of holding insulation thicknesses indicated securely in position indicated with self-locking galvanized steel washer in place. Backseal fastener penetrations.
- F. Tape: Adhesive tape recommended by insulation manufacturer, to tape joints and tears in faced insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Spray Polyurethane Foam: Comply with recommendations of the American Chemistry Council, "Health and Safety Product Stewardship Workbook for High-Pressure Application of Spray Polyurethane Foam (SPF)."
 - 1. Spray Polyurethane Foam: Spray insulation no greater than 1-1/2 inch thickness per layer. Allow each layer to fully cure before spraying additional thickness.

2. Contain and fully ventilate the area being sprayed with negative air machines, venting directly to the exterior. Do not operate permanent building HVAC system during installation. Continue ventilation during curing process.
 3. Install spray polyurethane foam insulation with uniform full thickness and with density which will not displace adjacent materials.
 4. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- E. Miscellaneous Voids: Install spray polyurethane foam insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.
1. Cure insulation with continuous natural or mechanical ventilation.
 2. Remove and dispose of over-spray.

3.4 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set rigid insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
1. If not otherwise indicated, extend insulation a minimum of 48 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay rigid insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. On units of foam-plastic board insulation, install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties (if applicable) and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates indicated. Fill gaps with compatible insulating material.
- B. Install mineral wool board cavity insulation per manufacturer's instructions. Fit insulation with edges butted tightly in both directions. Do not compress insulation. Maintain cavity width of dimension indicated between insulation and cladding material.
1. Masonry Veneers: Secure with clips installed over masonry anchors. Provide at least 6 clips per mineral wool board.
 2. Panel Veneers: Secure with adhesively attached, spindle-type insulation anchors. Space anchors according to insulation manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

3.7 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 1. Attach vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints.
 2. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports.
- B. Infrared Camera Survey: Perform an infrared camera scan of walls, floors, and ceilings to determine where insulation and air barrier are not continuous, after insulation has been installed, but prior to plaster patching or new gypsum board installation.
 1. Provide complete digital report with images of test results with recommendations for repairs.
- C. Repair or replace work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

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SECTION 078410 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items. Single source for all trades.
 - a. Penetrations in fire-resistance rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke partitions.
 - d. Compliance with requirements of UL assemblies indicated for fire-rated construction.
- B. Coordinate and apply for all necessary Engineering Judgements "EJ's" required for unique conditions.
- C. Review completed work with third party inspectors and code officials for compliance review.
- D. The firestopping sub-contractor shall be responsible for all fire stopping, and shall coordinate with the Mechanical, Electrical, Plumbing, Fire Suppression and Communications sub-contractors.
 - 1. All penetrations shall have a manufacturer's label attached adjacent to the penetration listing the manuf, UL#, HR rating, date and installer to aid in the inspection and maintenance of the building.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 078440 - FIRE-RESISTIVE JOINT SYSTEMS for fire-resistive joint sealers.
 - 2. Section 079200 - JOINT SEALANTS for standard joint sealers.
 - 3. Division 21 - FIRE SUPPRESSION for fire-protection piping penetrations.
 - 4. Division 22 - PLUMBING for piping penetrations.
 - 5. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.
 - 6. Division 26 - ELECTRICAL for cable and conduit penetrations.
 - 7. Division 27 - COMMUNICATIONS.

1.3 COORDINATION

- A. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected. If jobsite conditions do not match any UL-classified systems, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
- B. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations.
- C. Verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems with all related trades.
- F. Be available to review completed work with third party inspectors and code officials for compliance review.
- G. Coordinate and apply for all necessary Engineering Judgements "EJ's" necessary for unique conditions.
- H. Provide access to all installations for inspection. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by inspector, if required by authorities having jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping:
1. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems demonstrating no evidence of water leakage when tested according to UL 1479.
 - b. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
- F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose

work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hilti, Inc.
 - 2. BioFireshield; RectorSeal Corporation.
 - 3. Specified Technologies, Inc. (STI).
 - 4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the approved Through-Penetration Firestop System Schedule submittal. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
 - 1. Basis of Design:
 - a. BioFireshield; RectorSeal Smoke and Acoustic Sealant.
 - b. Hilti; CP 606 Flexible Firestop Sealant.
 - c. Hilti; CP 653 BA Firestop Speed Sleeve.
 - d. Hilti; FS-ONE Intumescent Firestop Sealant.
- C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- D. Endothermic Mats: 3M Interam Endothermic Mats by 3M Fire Protection Products; located in rated walls behind cabinet unit heaters, fire extinguisher cabinets and electrical panels where there are space limitations to maintain the wall rating.

2.3 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports, as required by 2015 IBC 1705.17 and 1705.17.1. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Testing Services: Inspecting of completed installations of penetration firestopping systems shall take place in successive stages as installation of the systems proceeds. Do not proceed with installation of penetration firestopping systems for the next area until inspecting agency determines completed work shows compliance with requirements.
 - 1. Inspecting agency shall state in each report whether inspected penetration firestopping systems comply with or deviate from requirements.
- C. Inspecting agency shall state in each report whether inspected penetration firestopping systems comply with or deviate from requirements.
- D. Remove and replace penetration firestopping systems where inspections indicate that they do not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- F. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 078410

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SECTION 081110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
 - 3. Hollow metal frames with kerf for smoke seals, sound seals, and weather stripping.
 - 4. Hollow metal borrowed lite frames.
 - 5. Smoke seals and weather stripping gaskets for kerfed frames.
- B. Alternates: Refer to Drawings and Section 012300 - ALTERNATES for requirements.
- C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 042000 - UNIT MASONRY for building anchors into masonry construction.
 - 2. Section 087100 - DOOR HARDWARE for door hardware for steel doors.
 - 3. Section 088000 - GLAZING for glazed lites.
 - 4. Section 092110 - GYPSUM BOARD ASSEMBLIES for insulation.
 - 5. Section 099000 - PAINTING AND COATING for field painting steel doors and frames.
 - 6. Section 13480 - BULLET RESISTANT SYSTEMS for bullet resistant metal frames and glazing.
 - 7. Division 26 and Division 27 for electrical connections including conduit and wiring for door controls, operators, electrified mag switches and miscellaneous equipment and accessories.

1.3 SUBMITTALS

- A. Submittals for the following sections shall be made concurrently:
 - 1. Section 081110 - HOLLOW METAL DOORS AND FRAMES.
 - 2. Section 081400 - FLUSH WOOD DOORS.
 - 3. Section 084410 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS.
 - 4. Section 087100 - DOOR HARDWARE.
- B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.
- C. Shop Drawings:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
 9. Details of conduit and preparations for power, signal, and control systems.
- D. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door, Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- D. Fire-Rated, Borrowed-Light Assemblies (Including Sidelights and Transoms): Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to door installation including, but not limited to the following:
1. Meet with Owner, Architect, door installer, hardware installer, door supplier and door manufacturer's representative. Door preinstallation conference shall run concurrently with hardware preinstallation conference.
 2. Review methods and procedures related to door installation, including manufacturer's written instructions.
 3. Review installation of fire doors, including hinge screw application to fire rated doors and requirements for door removal from frame if required after installation.

4. Review door swing and closer installation to permit maximum swing without binding at frame opening.
5. Review floor covering requirements to provide proper door undercut clearances.
6. Review fire rated door requirements regarding no field modifications to labeled doors.
7. Document proceedings, including corrective measures and actions required, and furnish a copy of record to each participant.
8. Provide 7 business days minimum advance notice to participants prior to convening preinstallation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Ceco Door Products; an ASSA ABLOY Group Company.
 2. CURRIES Company; an ASSA ABLOY Group Company.
 3. J/R Metal Frames Manufacturing, Inc.
 4. Steelcraft; an Allegion (formerly Ingersoll-Rand) company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- C. Metallic-Coated, (Galvanized/Galvannealed) Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60/A60 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Insulation: Comply with requirements in Section 092110 - GYPSUM BOARD ASSEMBLIES.
- H. Glazing: Comply with requirements in Section 088000 - GLAZING.

2.3 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 2.5 when tested according to ASTM C 1363.
 - 3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
 - 4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated (galvanized/galvannealed) steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated (galvanized/galvannealed) steel sheet.
 - 1. Fabricate frames with full profile welded joints.
 - 2. Frames for Level 3 Steel Doors: 0.067-inch-thick steel sheet.
 - 3. Provide frames with kerf seal gaskets at fire rated doors and doors indicated to receive seals.
 - a. Where the note “Kerf smoke/sound/weatherstripping seals provided in Section 081110” is listed in the hardware sets specified in Section 087100 - DOOR HARDWARE, provide doors listed for the hardware sets with a kerfed hollow metal frame and seal gaskets.
 - 4. Exposed Finish: Prime.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 - 1. Fabricate frames with full profile welded joints.
 - 2. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
 - 3. Provide frames with kerf seal gaskets at fire rated doors and doors indicated to receive seals.
 - a. Where the note “Kerf smoke/sound/weatherstripping seals provided in Section 081110” is listed in the hardware sets specified in Section 087100 - DOOR HARDWARE, provide doors listed for the hardware sets with a kerfed hollow metal frame and seal gaskets.
 - 4. Exposed Finish: Prime.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

2.10 HARDWARE REINFORCEMENT

- A. Hardware Reinforcement for Doors: Fabricate according to ANSI/SDI A250.6 with reinforcing plates of sufficient strength from same material as door face sheets to support hardware without through bolting and to comply with the following minimum sizes:
 1. Hinges: Minimum 0.123 inch thick, 10 gage, by 1-1/2 inches wide and by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - a. Continuous Hinges: Minimum 0.067 inch thick, 14 gage, full height of door.
 2. Lock Face, Flush Bolts, Closers, Overhead Stops, and Concealed Holders: Minimum 0.067 inch thick, 8 gage.
 3. All other surface mounted hardware: Minimum 0.067 inch thick, 8 gage.
- B. Hardware Reinforcement for Frames: Fabricate according to ANSI/SDI A250.6 with reinforcing plates of sufficient strength from same material as door face sheets to support hardware without through bolting and to comply with the following minimum sizes:
 1. Hinges: Minimum 0.123 inch thick, 10 gage, by 1-1/2 inches wide and by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - a. Continuous Hinges: Minimum 0.067 inch thick, 14 gage, full height of door.

2. Lock Face, Flush Bolts, Closers, Overhead Stops, and Concealed Holders: Minimum 0.067 inch thick, 8 gage.
 3. All other surface mounted hardware: Minimum 0.067 inch thick, 8 gage.
- C. Locate hardware reinforcement plates as indicated on Shop Drawings or if not indicated according to ANSI/SDI A250.6.
- D. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick, 28 gage steel sheet to close off interior openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

2.11 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Full Profile Welded Frames: Weld joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
 - a. For kerf frames, weld along joint profile (soffit, returns, stop interior), except the kerfed stop portion.
 2. Full Profile Welded Frames at Fire-Rated Doors and Exterior Doors: Weld joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt welding.
 4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.

- 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Borrowed Lites: Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (16 gage).
- 1. Borrowed Lites: receiving security or laminated glazing shall be fabricated from 0.067 inch thick, 14 gage steel sheet.
 - 2. Glazing stops for lites receiving security or laminated glazing shall not be less than 3/4 inches high.
 - 3. Construction: Face welded.
 - 4. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal frames.
 - 5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
- F. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- G. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 087100 - DOOR HARDWARE.
- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 - ELECTRICAL.
- H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
- 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings, so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.12 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard epoxy primer immediately after cleaning and pretreating.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
 2. Refer to Section 099000 – PAINTING AND COATING for field-applied coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack insulation behind frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for filling space between frames and masonry with insulation.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with insulation.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 - 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

- c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
- 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- 3. Smoke-Control Doors: Install doors according to NFPA 105.

- D. Glazing: Comply with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- C. Metallic-Coated (Galvanized/Galvannealed) Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081110

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Glass and glazing for the following products and applications:
 - a. Steel doors, frames and sidelights specified in Section 081110 - HOLLOW METAL DOORS AND FRAMES.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: As required by Code.
 - b. Specified Design Snow Loads for Sloped Glazing: As required by Code.
 - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - d. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
 - 1) For monolithic-glass lites heat-treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - e. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-wide interspace.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 6.3 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: 12-inch- square Samples for each type of glass and glass assembly, glazing sealants.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- E. Qualification Data: For installers.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each type of glazing products:
- H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 - 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
- J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.

- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATING-GLASS UNITS

- A. Insulating-Glass Units for Vertical Glazing: 1 inch thick insulating glass consisting of two lites of 1/4 inch glass, low e coating on the No. 2 surface and argon gas filled.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.

3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- C. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.
- D. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction for Framed Units: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 2. Construction for Units with Exposed Edges: Laminate glass with cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
 3. Interlayer Thickness: 0.030 inch (0.76 mm) thick for vertical glazing, 0.060 inch (1.52 mm) thick for sloped glazing.
 4. Interlayer Color: Clear unless otherwise indicated.

2.3 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, interlayer of laminated glass, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco Inc.; Spectrem 1.

- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.4 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Glazing Film: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

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SECTION 092110 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Interior gypsum wallboard.
 - 2. Thermal insulation in gypsum wallboard assemblies.
 - 3. Non-load-bearing steel framing.
- B. Alternates: Refer to Drawings and Section 012300 - ALTERNATES for requirements.
- C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 054000 - COLD-FORMED METAL FRAMING for load-bearing steel framing.
 - 2. Section 061000 - ROUGH CARPENTRY for plywood backing panels.
 - 3. Section 061600 - SHEATHING for gypsum sheathing at exterior assemblies.
 - 4. Section 072100 - THERMAL INSULATION for insulation at exterior wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 - 2. Locate within 15 feet of end of each wall and repeat at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 - 3. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," or other wording.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: If materials and systems other than those specified and those indicated on the Drawings are proposed for use, submit shop drawings signed and sealed by a structural engineer licensed in the jurisdiction of the project certifying proposed systems meet code requirements, project requirements and the following deflection criteria:
 - 1. For gypsum board assemblies without applied rigid finishes L/240; for gypsum board assemblies with applied rigid finishes such as tile, stone, wood paneling L/360. Lateral load 5 psf except at shafts. Lateral load at shafts shall be required based on analysis of equipment and systems using shaft.
- C. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. California Expanded Metals Co. (CEMCO).
 - 2. Clarkwestern Dietrich Building Systems LLC.
 - 3. EB Metal U.S.
 - 4. Marino\WARE.
 - 5. Super Stud Building Products, Inc.
- B. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Steel (Uncoated) Thickness: 0.0296 inches (20 gage)
- C. Steel framing for cantilevered partial wall systems that are unsupported at the top track:
 - 1. Clarkwestern Dietrich Building Systems LLC, Pony Wall Heavy, Basis of Design.
 - a. Plate Material: ASTM A 36, hot rolled steel, 1/2 inch thick.
 - b. Stud Material: Structural Grade 50 Type H, 50ksi, 12 gage, 0.0966 inch minimum thickness.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Brady Innovations; Sliptrack Systems.
 - 2) California Expanded Metals Co. (CEMCO); CST Slotted Tracks.

- 3) Clark Dietrich Building Systems; MaxTrak Slotted Deflection Track.
 - 4) Steel Network Inc. (The); VertiTrack VT Series.
- E. Fire Stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. California Expanded Metals Co. (CEMCO); FAS-TRK 1000 Slotted Tracks.
 - b. Clark Dietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
 - c. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
- G. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
 2. Depth: 1-1/2 inches.
- I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission. Strictly comply with manufacturer's installation instruction.
1. Basis-of-Design: ClarkDietrich RC Deluxe, asymmetrical configuration.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- K. Beam Clips: Column and beam single step clips, Claw International, The Claw, Basis of Design.
- L. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- M. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Gypsum, Inc.
 2. National Gypsum Company.
 3. United States Gypsum Company (USG).

- B. Gypsum Wallboard: ASTM C 1396.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Panels.
 - 2. Thickness: 1/2 inch and 5/8 inch as indicated.
 - 3. Long Edges: Tapered.
- C. Gypsum Wallboard, Fire-Resistant Type X: ASTM C 1396.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Panels Firecode X.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.
- D. Abuse-Resistant Type: ASTM C 1629. Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Mold Tough Firecode X.
 - 2. Core: 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS – NOT USED

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

- D. Joint Compound for Tile Backing Panels:

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious tile backing units, use screws of type and size recommended by panel manufacturer.
- D. Insulation Support Anchors: Continuous, galvanized metal support trip, 25 gage, with pre-punched tabs at 8 inches on center.
 - 1. Product: Insul-hold; Insul-Hold Co., Inc.; phone: (207) 465-9066.
- E. Firestopping: Provide firestopping where fire rated gypsum board assemblies butt masonry, steel deck, joists, beams, and structural members as part of gypsum board assembly work. See Division 07 section – FIRE RESISTIVE JOINT SYSTEMS.
- F. Melt-Away Clips: Aluminum clips that melt from temperature rise and allow fire-engulfed structure to collapse independent of fire; size clips as indicated.

2.8 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

- A. Identification Labels: Self-adhesive signs, to comply with applicable local Code.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Wall Signs, Inc.
 - b. Marking & Identification Tape (mnitape.com).
 - c. My Safety Sign.
 - d. Safety Supply Warehouse.
 - 2. Text: "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

- D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Z-Furring Members:
 - 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.4 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.5 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels to minimize end joints.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 1. Level 1: Ceiling plenum areas and concealed areas not exposed to view.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Not Used.
 4. Level 4: Panel surfaces that will be exposed to view (typical panels).
 5. Level 5: Where indicated on Drawings.
- E. Cementitious Tile Backing Units: Finish according to manufacturer's written instructions.

3.8 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

- A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.9 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092110

SECTION 096510 - RESILIENT FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Resilient flooring.
 - 2. Resilient wall base and accessories.
 - 3. Substrate preparation for resilient flooring and accessories.
- B. Alternates: Refer to Drawings and Section 012300 - ALTERNATES for requirements.
- C. Related Work: Not applicable.

1.3 PERFORMANCE REQUIREMENTS

- A. Wet Dynamic Coefficient of Friction: For flooring exposed as a walking surface, provide products with the following values as determined by testing identical products per ANSI/ NFSI B101.3 - 2012 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials, or ANSI 326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Materials - 2017. Testing by other methods or earlier editions of the specified test method is not acceptable.
 - 1. Wet Dynamic Coefficient of Friction: Not less than 0.43.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of resilient flooring required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.7 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, presumed manufacturer of existing flooring, or approved equal.
 - 2.
- B. : Match existing VCT flooring to patch as necessary
 - 1. Style and Colors: Excelon, color to match existing.

2.2 RESILIENT WALL BASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Johnsonite, a division of Tarkett, presumed manufacturer of existing wall base, or approved equal.
- B. Resilient Wall Base: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Shape: Straight (toeless) at carpet and coved at concrete and resilient flooring.
 - 2. Minimum Thickness: 0.125 inch.

3. Height: Match existing.
4. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
5. Outside Corners: Premolded.
6. Inside Corners: Premolded.
7. Surface: Smooth.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 1. Adhesives, for Resilient Sheet Flooring:
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
 - 1) Forbo; L885 Adhesive.
 - 2) Forbo; Sustain 885M Adhesive.
 - 3) Forbo; T940 Adhesive.
 - 4) Forbo; V885 Eternal Vinyl Sheet Adhesive.
 2. Adhesives, for Wall Base:
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
 - 1) Forbo; L910W Wall Adhesive.
 - 2) Johnsonite; 960 Cove Base Adhesive.
- C. Seamless-Installation Accessories:
 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor covering.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within a range on pH scale not less than 5 or more than 9 pH, or as otherwise required in writing by manufacturer of flooring.
 3. Moisture Vapor Emission Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, or as otherwise required in writing by manufacturer of flooring.
 4. Relative Humidity Testing:
 - a. Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level of 75 percent, or as otherwise required in writing by manufacturer of flooring.
 5. Perform tests indicated above and as recommended by flooring manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SHEET INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
 1. Maintain uniformity of floor covering direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 3. Match edges of floor coverings for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
- J. Integral-Flash-Cove Base: Cove floor coverings up vertical surfaces as indicated on Drawings. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.

3.4 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, doorframes, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H.

3.5 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.

3.6 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Stair Accessories:
 - 1. Tightly adhere to substrates throughout length of each piece.
 - 2. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.7 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
 - 2. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096510

SECTION 099000 - PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Field painting of exposed interior items and surfaces.
 - 2. Field painting of exposed exterior items and surfaces.
 - 3. Surface preparation for painting.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1.
 - 2. Section 055000 - METAL FABRICATIONS for shop priming ferrous metal.
 - 3. Section 081110 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.
 - 4. Section 092110 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do NOT paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Toilet enclosures.
 - d. Metal lockers.
 - e. Kitchen appliances.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Finished mechanical and electrical equipment.
 - i. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:

- a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 3. Submit two 8 inch by 12 inch Samples for each type of finish coating for Architect's review of color and texture only.
- C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - b. Small Areas and Items: Architect will designate items or areas required.
2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: Furnish four unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Paint Colors Match existing wall color. Metal railings to match existing campus railing color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

- b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Exterior Exposed Steel: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - b. Interior Exposed Steel, in Humid Environments: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - c. Interior Exposed Steel, in Dry Environments: Clean steel surfaces in accordance with SSPC-SP2 or SP3 Hand or Power Tool Cleaning.
 - 4. Galvanized Surfaces: Clean galvanized surfaces in accordance with SSPC-SP16 Brush off Blast Cleaning of Galvanized Steel and NonFerrous Metals, to achieve a minimum 1 mil anchor profile.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.

2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors and doors in wet areas on tops, bottoms, and side edges the same as exterior faces.
9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
 2. Uninsulated plastic piping.
 3. Pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panelboards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block and brick and to clay brick at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 - 2. Testing agency will perform appropriate tests for the following characteristics as required by the Architect.
 - 3. The Architect may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance

criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Exterior Paint Schedule:

C. Interior Paint Schedule, Typical:

1. Interior Gypsum Wallboard and Plaster, Latex Paint Finish:

a. One Coat, Primer:

- 1) Imperial Paints ECOS Interior Wall Primer.
- 2) Moore Ultra Spec 500 Interior Latex Primer 534.
- 3) PPG Speedhide Zero VOC Interior Primer 6-4900XI.
- 4) S-W Harmony Interior Primer B11 series.
- 5) S-W ProMar 200 HP Zero VOC Interior Primer.

b. And Two Coats, Eggshell Finish: At walls and elsewhere as indicated.

- 1) Imperial Paints ECOS Interior Eggshell.
- 2) Moore Ultra Spec 500 Interior Latex Low Sheen 537.
- 3) PPG Speedhide Zero VOC Interior Latex Eggshell 6-4310XI.
- 4) S-W ProMar 200 HP Zero VOC Interior Eg-Shel.

c. And Two Coats, Semi-Gloss Finish: At toilet rooms, other wet areas, and elsewhere as indicated.

- 1) Imperial Paints ECOS Interior Satin.
- 2) Moore Ultra Spec 500 Interior Latex Semi-Gloss 539.
- 3) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.
- 4) S-W ProMar 200 HP Zero VOC Interior Semi-Gloss.

2. Interior Metals (Not specified to receive other coating systems/not shop finished), Acrylic Paint Finish:

a. One Coat: Approved primer, in shop under other Sections (where specified). If not shop primed, provide primer recommended by finish coating manufacturer.

b. And Two Coats:

- 1) Moore Ultra Spec 500 Interior Latex Semi-Gloss 539.
- 2) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.
- 3) S-W ProMar 200 HP Zero VOC Interior Semi-Gloss.

3. Interior Exposed Steel, Joists, Ductwork, Conduit and Similar Items (where indicated), Dry-Fall or Dry-Fog Painted System:

a. One Coat:

- 1) Moore Latex Dry Fall Flat 395 at 2.5 to 3.0 mils DFT.
- 2) PPG Speedhide Super Tech WB Interior Dry-Fog Latex 6-725XI Flat at 2.0 to 2.5 mils DFT.

- 3) S-W WB Pro Industrial Waterborne Acrylic Dryfall Flat B42 series at 2.5 to 3.0 mils DFT.
- 4) Tnemec 115 WB Unibond at 2.5 to 3.0 mils DFT.

D. Mechanical and Electrical Work: Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork. Same as specified for other interior metals, hereinabove.

END OF SECTION 099000

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide labor, materials, accessories, and other related items as required to complete operations in connection with the complete installation of the HVAC and mechanical systems as indicated on the Drawings and as specified herein.

1.2 RELATED REQUIREMENTS

- A. Conditions of the Contract apply to the work, including the work of this Division. Examine Contract Documents for requirements affecting the work.

1.3 CONTRACT DOCUMENTS

- A. The general location of the apparatus and the details of the work are indicated on the Drawings. Exact locations not indicated shall be determined at the site as the work progresses and shall be subject to the Architect's approval.
- B. It is not intended that the Drawings shall show every pipe, pipe rise, pipe drop, duct rise, duct drop, pipe fitting, duct fitting, or appliance, but it shall be a requirement to furnish, without additional expense, material and labor necessary to complete the systems in accordance with the design intent and with the highest possible quality available.
- C. The Contractor shall take no advantage of any apparent error or omission in the Drawings and Specifications, and the Designer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Drawings and Specifications. Where errors or omissions appear in the Contract Documents, the Contractor shall promptly notify the Designer in writing of such errors or omissions. Inconsistencies in the contract documents are to be reported before proposals are received, whenever found.
- D. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of work and/or materials unless otherwise directed by written addendum to the Contract Documents.

1.4 ALTERATIONS

- A. Execute alterations, additions, removals, relocations, new work, and other related items as indicated or required to provide a complete installation in accordance with the intent of the Contract Documents, including changes required by building alterations.
- B. Existing work disturbed or damaged by the alterations or the new work shall be repaired or replaced to the Architect's satisfaction and at no additional cost to the Owner.
- C. Existing ductwork, piping, and other systems indicated to be removed, shall be removed from the site. Cap off existing services remaining. The Owner retains the right to ownership of heating and ventilating equipment scheduled to be removed; store such equipment where

requested by the Owner. Material not retained by the Owner shall be removed from the site.

1.5 CONTINUITY OF SERVICE

- A. Arrange to execute the work at such times and in such locations as may be required to provide uninterrupted service for the building or any of its locations. Any unavoidable conditions requiring reduced building capacity shall be arranged for by programming with the Owner's duly authorized representative at the building subject to the Architect's approval. If necessary, temporary work shall be installed to provide for the condition. Authorization for interrupting service shall be obtained in writing from the Owner. Any interruption of normal service shall be performed during an overtime period to be scheduled with the Owner. Costs for overtime work shall be included in the Bid.

1.6 REQUIREMENTS

- A. Installation Instructions: Obtain manufacturer's printed installation instructions to aid in properly executing work on major pieces of equipment. Install equipment in accordance with manufacturer's recommendations.
- B. Objectionable Noise, Fumes and Vibration:
 - 1. Mechanical and electrical equipment shall operate without creating objectionable noise, fumes, or vibration, as determined by the Architect.
 - 2. If such objectionable noise, fumes, or vibration is produced and transmitted to occupied portions of building by apparatus, piping, ducts, or any other part of mechanical and electrical work, make necessary changes and additions, as approved, without extra cost to Owner.
- C. Equipment Design and Installation:
 - 1. Uniformity: Unless otherwise specified, equipment or material of same type or classification, used for same purposes, shall be product of same manufacturer.
 - 2. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog number shall be designed in conformity with ASME, IEEE, or other applicable technical standards, suitable for maximum working pressure, and with neat and finished appearance.
 - 3. Installation: Erect equipment aligned, level, and adjusted for satisfactory operation. Install so that connecting and disconnecting of piping and accessories can be made readily, and so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements may be made, as approved.
- D. Hanging of Equipment, Ductwork and Piping:
 - 1. Attach supports only to structural framing members and non-metal deck concrete slabs.
 - 2. Support equipment, ductwork, and piping from the top chord of bar joists at the "Panel Points" or from the top flange of beams. Provide intermediate support consisting of steel angle or equal as required where supports are installed between joist spaces.
 - 3. Piping 2-inch (50 mm) nominal and smaller may be supported from the bottom chord of the bar joists at the "Panel Points" or from the bottom flange of the beams.
 - 4. Do not anchor supports to metal decking with or without a concreted slab.
- E. Protection of Equipment and Materials: Responsibility for care and protection of materials and mechanical work rests with the Contractor until the entire project has been completed, tested and the project is accepted by the Owner.

- F. Ceiling Mounting: Where ceiling mounting is indicated or specified, use suspended platform, threaded rod, or strap hangers, bracket or shelf, whichever is most suitable for equipment and its location. Construct of structural steel members, steel plates, or rods, as required; brace and fasten to building structure or to inserts as approved, or as detailed.

1.7 ELECTRIC WORK

- A. Provide motors, pilot lights, controllers, limit switches, and other related items for equipment provided under Division 23.
- B. Except as noted, required line switches, fused switches, and other related items and necessary wiring to properly connect equipment to motors and switches shall be furnished and installed under Division 26, Electric.
- C. Provide complete wiring system for automatic temperature controls as specified under Section Division 23 Section "Instrumentation and Controls for Mechanical Systems."
- D. Wiring shall conform to the requirements of the National Electrical Code.

1.8 SUBMITTALS

- A. After award of Contract and before installation, submit for approval Shop Drawings, bulletins, Product Data, Samples, and other related items.
- B. Submit Shop Drawings and Product Data as required in each Section. Submittal shall include physical data and performance data required to verify compliance with the Contract Documents.
- C. Architect/Engineer's review will not include the review, coordination, or verification of dimensions or quantities; these shall be the responsibility of the Contractor.

1.9 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Divisions having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of work of separate Sections in preparation for Substantial Completion.

- F. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.10 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.
- C. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of responsible manufacturer's representative in accordance with manufacturer's instructions.
- F. When specified in individual Specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.11 OPERATING AND MAINTENANCE MANUALS

- A. Furnish quantity required in Division 01 of the Specifications, of bound operating and maintenance manuals. Deliver to the Architect for review. Required quantity is for the Owner; the Architect will not retain a bound copy.
- B. For maintenance purposes, provide approved Submittals, parts lists, specifications, and manufacturer's maintenance bulletins for each piece of equipment. For materials used which have been submitted to the Architect for approval but do not require regular maintenance, such as piping, ductwork, and insulation, provide one copy of approved Submittals.
- C. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment or material so that service or spare parts can be readily obtained.

1.12 WARRANTY

- A. Provide guarantees and warranties for work under this Contract as indicated in the General Requirements of the Specifications.
- B. Provide manufacturers' standard warranties and guarantees for work by the mechanical trades. However, such warranties and guarantees shall be in addition to and not in lieu of other liabilities which the manufacturer and the Mechanical Contractor may have by law or by other provisions of the Contract Documents.

- C. Guarantee that elements of the systems provided under this Contract are of sufficient capacity to meet the specified performance requirements as set forth in these Specifications or as indicated on the Drawings.
- D. Upon receipt of notice from the Owner of failure of any part of the mechanical systems or equipment during the warranty period, the Mechanical Subcontractor shall replace the affected part or parts.
- E. Furnish a written guarantee covering the above requirements before submitting the application for final payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230500

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SECTION 230719 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.
- C. Shields, Inserts, and Saddles.

1.2 RELATED SECTIONS

- A. Division 23 Section “Hydronic Piping”: Placement of hangers and hanger inserts.

1.3 REFERENCES

- A. Division 01 Section “References”: Requirements for references and standards.
- B. ASTM
- C. NAIMA National Insulation Standards.
- D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01 Section “Submittal Procedures”.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum 3 years’ experience.
- B. Applicator Qualifications: Company specializing in performing the work of this Section with minimum 3 years’ experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 and UL 723. For elastomeric foam insulation, rating shall apply for thicknesses up to 2 inches (50 mm).
- B. Insulation materials and accessories shall be asbestos-free. No fibers with dimensions similar to asbestos fibers shall be released from any material.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Division 01 Section "Product Requirements": Transport, handle, store, and protect products.
- B. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 Section "Product Requirements": Environmental conditions affecting products on site.
- B. Maintain ambient conditions required by manufacturers of each product.
- C. Maintain temperature before, during, and after installation for minimum of 24 hours.

1.9 EXISTING PIPING

- A. Insulate existing piping as indicated on the Drawings. Contractor shall be responsible to field-verify quantities and sizes. Provide access to existing piping as required for complete insulation. Remove existing finishes and existing insulation as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Glass and Mineral Fiber Products:
 - 1. Knauf Insulation.
 - 2. Certainteed Corporation.
 - 3. Johns Manville.
 - 4. Owens Corning.
 - 5. No substitutions.

2.2 GLASS FIBER

- A. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') value: ASTM C177, 0.24 Btu-in/(hr-sq.ft- degrees F) at 75 degrees F (0.035 W/m-K at 24 degrees C).
 - 2. Maximum service temperature: 850 degrees F (454 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket:
 - 1. ASTM C1136, White kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
- C. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
- E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

- F. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- G. Insulating Cement: ASTM C449/C449M.

2.3 JACKETS

- A. PVC Plastic.
 - 1. Jacket: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum service temperature: 0 degrees F (-18 degrees C).
 - b. Maximum service temperature: 150 degrees F (66 degrees C).
 - c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
 - d. Thickness: 30 mil (0.76 mm)
 - e. Connections: Brush on welding adhesive, tacks (for heating systems only) or pressure sensitive color matching vinyl tape.
 - 2. Covering Adhesive Mastic: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Division 01 Section "Quality Requirements": Manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards where applicable.
- C. Provide insulation for surfaces of new piping and for surfaces of existing piping that is uninsulated, as indicated and specified.
- D. Insulation values shall meet or exceed the requirements of ASHRAE 90.1-2016, applicable State Energy Codes, and Table I, whichever is greater. In addition, comply with the other requirements of this Section.
 - 1. International Energy Conservation Code (IECC): Chapter 5 of the Code allows the use of ASHRAE 90.1 insulation thicknesses instead of the Minimum Pipe Insulation table which is in Chapter 5 of the IECC. This Specification does not reference the table in IECC.
- E. Piping systems requiring insulation, types of insulation required, and insulation thickness shall be as listed in Table I herein. For piping not listed in Table 1, insulate to meet Code requirements, using suitable specified materials, subject to Architect's approval. Except for flexible unicellular insulation, insulation thicknesses as specified in Table I shall be one inch (25 mm) greater for insulated piping systems located outside the building and in unconditioned spaces. Unless otherwise specified, insulate fittings, flanges, and valves, except valve stems,

hand wheels, and operators. Use factory pre-molded, pre-cut, or field-fabricated insulation of the same thickness and conductivity as used on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking, and non-peeling.

- F. Exposed Piping: Locate insulation and cover seams in least visible locations.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass Fiber Insulated Pipes Conveying Fluids above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Pipe Exposed 10 feet (3 meters) or Less Above Finished Floor: Finish with PVC jacket and fitting covers.

3.3 UNIFORM INSTALLATION

- A. Systems shall use a single insulation type throughout the installation.

3.4 PREPARATION

- A. Insulate piping after system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction of valve handles, safety reliefs, and other components requiring movement. Allow adequate space for pipe expansion. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings. Extend surface finishes to protect surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during the application of any finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:
 - 1. Piping in radiation enclosures, or within cabinets of unit heaters.
 - 2. ASME stamps.

3.5 PIPING INSULATION

- A. Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive, factory applied self sealing lap. Cover circumferential joints with butt strips, not less than 3-inches (76 mm) wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches (38 mm). Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. When a vapor barrier jacket is required, as indicated in Table I, or on the ends of sections of insulation that butt against flanges, unions, valves, fittings, and joints, use a vapor-barrier coating conforming to manufacturer's weatherproof coating for outside service. Apply this vapor barrier coating at longitudinal and circumferential laps. Patch damaged jacket

material by wrapping a strip of jacket material around the pipe and cementing, and coating as specified for butt strips. Extend the patch not less than 1-1/2 inches (38 mm) past the break in both directions. At penetrations by pressure gauges and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Where penetrating roofs, insulate piping to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches (51 mm) down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating.

- B. Seal surfaces of fibrous insulation to prevent release of fibers.

3.6 FIELD INSPECTION

- A. Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I
PIPING INSULATION MATERIAL AND WALL THICKNESS

SERVICE	INSULATION MATERIAL	VAPOR BARRIER REQUIRED	INSULATION WALL THICKNESS AT THE FOLLOWING PIPE DIAMETERS				
			<1 inch	1 inch to <1.5 inches	1.5 inches to <4 inches	4 inches to <8 inches	8 inches or Greater
Heating Systems							
141 degrees F to 200 deg. F	Glass Fiber	No	1.5 inches	1.5 inches	2 inches	2 inches	2 inches

END OF SECTION 230719

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SECTION 232113 – HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings For:
 - 1. Heating water piping system.

1.2 RELATED SECTIONS

- A. Division 23 Section “HVAC Piping Insulation.”
- B. Division 23 Section “Hydronic Specialties.”

1.3 SUBMITTALS

- A. Submit under provisions of Division 01 Section “Submittal Procedures.”
- B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide Manufacturers catalogue information. Indicate valve data and ratings.
- C. Welders Certificate: Include welder’s certification of compliance with ASME SEC 9 and AWS D1.1.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01 Section “Closeout Procedures.”
- B. Record actual locations of valves.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 3 years’ experience.
- B. Installer: Company specializing in performing the work of this Section with minimum 3 years’ experience.
- C. Welders: Certify in accordance with ASME SEC 9 and AWS D1.1.
- D. Pressed Pipe Fittings: Submit documentation of fitting-manufacturer training of installers or their on-site supervisors, with names of individuals.

1.6 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system.

- B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01 Section "Product Requirements."
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53, Schedule 40 **for sizes less than 12 inch (300 mm), 0.375 inch (10 mm) wall for sizes 12 inch (300 mm) and over**, black.
 - 1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
 - 2. Joints: Schedule 40 threaded for pipe sizes 2 inch (50.8 mm) and smaller, and AWS D1.1, welded for pipe sizes over 2 inch (50.8 mm).
 - 3. Grooved and Shouldered Pipe End Couplings: As specified in this Section, with grooved steel pipe, is an acceptable alternate to the above for water service operating at temperatures from -30 to 230 degrees F (-30 to 110 degrees C), utilizing grade E, EPDM gasket compound.
- B. Copper Tubing: ASTM B88, Type L hard drawn.
 - 1. Allowed only for pipe sizes 2 inch (50.8 mm) and smaller.
 - 2. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
 - 3. Joints: Solder or braze, or press fittings.

2.2 BRAZING MATERIALS – 15 percent Silver for copper, brass, and bronze

- A. Manufacturers:
 - 1. Harris (Product: Stay-Silv 15).
 - 2. Lucas-Milhaupt (Product: Sil-Fos 15).
 - 3. Wolverine (Product: Silvaloy 15).
 - 4. No substitutions.
- B. Nominal Composition: 5.0 percent phosphorus, 15.0 percent silver, 0.15 percent other elements

(total), remainder copper. Cadmium-free.

C. Physical Properties:

1. Color: Yellow/Gray
2. Solidus: 1190 degrees F (643 degrees C)
3. Liquidus: 1480 degrees F (802 degrees C)
4. Brazing Range: 1300 – 1500 degrees F (704-816 degrees C)
5. Electrical Conductivity: 9.9 percent IACS
6. Electrical Resistivity: 17.40 Microhm-cm

D. Specification Compliance:

1. ANSI/AWS A5.8, class BCuP-5
2. ASME SFA5.8, class BCuP-5
3. Optional:
 - a. QQB 650C, class BCuP-5
 - b. QQB 654A, class BCuP-5
 - c. QQB 654, class BCuP-5

E. Flux:

1. Harris (Stay-Silv For copper-to-brass joints. No flux required for copper-to-copper joints).

2.3 BRAZING MATERIALS – 35 percent Silver for brazing to ferrous metals (steel)

A. Manufacturers:

1. Harris (Product: Safety-Silv 35).
2. Lucas-Milhaupt (Product: Braze 351).
3. Wolverine (Product: Silvaloy A-35).
4. No substitutions.

B. Nominal Composition: 35.0 percent silver, 33 percent Zinc, 0.15 percent other elements (total), remainder copper. Cadmium-free.

C. Physical Properties:

1. Color: Yellow/Gray
2. Solidus: 1250 degrees F (677 degrees C)
3. Liquidus: 1410 degrees F (732 degrees C)
4. Electrical Conductivity: 19.8 percent IACS
5. Electrical Resistivity: 8.2 Microhm-cm

D. Specification Compliance:

1. ANSI/AWS A5.8, class BAg-5
2. ASME SFA5.8, class BCuP-5

E. Flux:

1. Harris (Stay-Silv white flux, or where heating cycles are extended, Stay-Silv black flux).

2.4 SOLDER MATERIALS:

A. Manufacturers:

1. Harris (Product: Stay-Brite).

2. Lucas-Milhaupt (Product: Clean 'n Brite).
3. Wolverine (Product: Silvabrite).
4. No substitutions.

B. Nominal Composition: Alloy of silver and tin (3-6 percent Ag, remainder Sn). Antimony-free.

C. Physical Properties:

1. Color: Bright Silver
2. Solidus: 430 degrees F (221 degrees C)
3. Liquidus: 430 degrees F (221 degrees C)
4. Electrical Conductivity: 16.4 percent IACS
5. Shear Strength: 10,600 psi (73 MPa)
6. Tensile Strength: 14,000 psi (96 MPa)
7. Elongation: 48 percent

D. Specification Compliance:

1. NSF 51
2. ASTM B32-89, Alloy Grade Sn96
3. Federal Spec. QQ-S-571E, Class Sn 96 with exception to QPL paragraph 3.1
4. J-STD-006, Sn96Ag04A

E. Flux:

1. Harris (Product: Stay Clean Paste Flux, Stay Clean Liquid Flux (used with 4 inch or larger copper tubing also stainless steels), or Bridgit Water Soluble Paste Flux).
2. Canfield (Product: Aqua-Brite or AB Cream Flux). Glycerin-based, water soluble.

2.5 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 inch (50 mm) and Under:

1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.
3. Polypropylene Pipe:
 - a. Manufacturer: Aquatherm, Greenpipe product line, no substitutions.
 - b. Polypropylene with polypropylene nut or brass nut.

B. Flanges for Pipe Over 2 Inch (50 mm):

1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
2. Copper Piping: Bronze.
3. Polypropylene Pipe:
 - a. Manufacturer: Aquatherm, Greenpipe product line, no substitutions.
4. Gaskets: 1/16 inch (1.6 mm) thick preformed neoprene or EPDM, reinforced as required for the system operating pressure, up to relief valve setting.
5. Bolts: ASTM A307 Grade B. [ASTM A193 Grade B7.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.6 PRESS FITTINGS

A. Approved Manufacturers:

1. Viega LLC, Wichita, KS - ProPress System with Smart Connect feature.

2. Grinnell, division of Tyco International – G-Press System with leak-before-press feature.
3. No substitutions.

B. Fitting and Valve Products:

1. Wrought copper and cast copper alloy (brass or bronze) fittings and valves for copper piping.
2. Adapter fittings for transition connections to threaded fittings and dissimilar materials.
3. Available sizes: 1/2 inch to 4 inch (12.7 mm to 101 mm).

C. Features:

1. Seals: O-ring type, factory installed in a fitting bead. Seals in larger sizes shall include a separator ring and a stainless steel grip ring.
2. Seal Materials: EPDM (color shiny black) in copper for hydronic and drain systems.
3. Colored Identification Dots:
 - a. Copper Fittings:
 - 1) Green for EPDM seal.
 - 2) **Yellow for ProPressG fittings with HNBR seal.**
4. Smart Connect feature provides a leakage path to allow water and air to leak past any unpressed connection, for quick identification during pressure testing.

D. Temperature/Pressure ratings (with appropriate type seals):

1. Hydronic Systems: 0 to 250 degrees F (-17 to 121 degrees C) up to 200 psig (1723 kPa), at up to 100 percent maximum concentration of ethylene or propylene glycol.

E. Accessories:

1. Pressing: Use pressing tools, actuator jaws, and pressing rings, Ridgid brand manufactured by Ridge Tool Company, as recommended by the fitting manufacturer for each type of fitting.
2. Lubricants: Do not use. Not recommended by fitting manufacturer.
3. Cutting Tools: For copper or stainless steel pipe, use wheeled cutting tool, or cutting tool approved by the fitting manufacturer. Use deburring tool or reamer after cutting.

2.7 SLEEVES

- A. See Division 23 Section “Sleeves and Escutcheons for HVAC Piping.”

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

- A. Install in accordance with Manufacturer's instructions.
- B. Install components furnished under other Section and Divisions of the Specifications. Such items may include but are not limited to: Sensors furnished under Division 23 Section "Instrumentation and Control for Mechanical Systems."
- C. Install heating water, glycol, condenser water, and engine exhaust piping to ASME B31.9. Install chilled water piping to ASME B31.5.
- D. Pipe used shall be new material, and threads on piping shall be full length and clean cut with inside edges reamed smooth to full inside bore.
- E. Minimum pipe size allowed for hydronic piping shall be 3/4 inch (19 mm). Piping less than 3/4 inch (19 mm) shall not be allowed for these piping systems.
- F. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- G. Install piping to conserve building space, and not interfere with use of space.
- H. Group piping whenever practical at common elevations.
- I. Erect piping to provide for the easy passage and noiseless circulation of water under working conditions.
- J. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level. Slope water piping 1 inch in 40 feet (1:480) and arrange to drain at low points. Slope piping up in direction of water flow.
- K. On closed systems, equip low points with 3/4 inch (19 mm) drain valves and hose nipples. Provide, at high points of mains, collecting chambers and high capacity float operated automatic air vents, with ball valves on their inlets to valve off after initial system startup. Provide, at high points of branches, manual air vents with air chambers.
- L. Use main sized saddle type branch connections for directly connecting branch lines to mains in steel piping if main is at least 1 pipe size larger than the branch for up to 6 inch (152 mm) mains and if main is at least 2 pipe sizes larger than branch for 8 inch (203 mm) and larger mains. Do not project branch pipes inside the main pipe.
- M. Caulking of threads will not be allowed on any piping.
- N. Pipe joint compound shall be put on male threads only.
- O. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- P. Dissimilar Metals: Use non-conducting dielectric connections whenever jointing dissimilar metals. Cast red-brass (not yellow brass) or bronze-bodied fittings such as valves and couplings may be used when joining steel to copper, steel to stainless steel, or copper to stainless steel.

Steel and stainless steel may connect directly to iron, but copper may not connect directly to iron.

- Q. Where welded joints are required, steel piping shall be installed by the use of the oxyacetylene or electric welding process, except immediate connections to accessible equipment may be threaded. Piping shall have butt welds with welding fittings, standard factory fabricated tees, elbows, reducers, caps, and accessories. Branch outlets 2 inch (50.8 mm) and smaller shall be made by the use of approved welding type half-couplings, "Weldolet" or "Threadolet" fittings.
 - 1. Piping smaller than 2 inch (50.8 mm) may be installed at the Contractor's option with welding type, or threaded type fittings, except that piping regardless of size concealed in trenches or inaccessible building construction (for example, concealed behind sheetrock walls or concealed above sheetrock ceilings) shall be welded.
 - 2. Offsets shall be installed with long radius welding elbows.
 - 3. Welding shall be executed only by certified welding mechanics in accordance with the best practice of the trade.

- R. Make such offsets as are shown and required to place the pipes and risers in proper position to avoid other work.

- S. Take branch lines off bottom of mains or at 45 degree bottom angle, as space permits.

- T. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

- U. Install a sufficient number of unions or flanged fittings to facilitate making possible future alterations or repairs.

END OF SECTION 232113

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SECTION 232118 – HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Valves:
 - 1. Ball valves.
- B. Strainers.
- C. Combination valve assemblies.

1.2 RELATED SECTIONS

- A. Division 23 Section “Hydronic Piping.”

1.3 REFERENCES

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01 Section “Submittal Procedures.”
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.
- C. Submit inspection certificates for pressure vessels from authority having jurisdiction.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01 Section “Closeout Procedures.”

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 01 Section “Operation and Maintenance Data.”
- B. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this Section

with minimum 3 years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01 Section "Product Requirements."
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 VALVES

- A. Manufacturers:
 - 1. Nibco.
 - 2. Apollo.
 - 3. Armstrong.
 - 4. Hammond.
 - 5. Milwaukee.
 - 6. Watts.
 - 7. Wheatley.
 - 8. No substitutions.
- B. Ball Valves:
 - 1. Up To and Including 2 inch (50 mm):
 - a. Bronze two piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
 - b. 150 lb S.W.P., 600 lb W.O.G.

2.2 STRAINERS

- A. Manufacturers:
 - 1. Sarco.
 - 2. Armstrong.
 - 3. Barnes and Jones.
 - 4. Bell & Gossett.
 - 5. Flo-Fab.
 - 6. Keckley Co.
 - 7. Muesco.
 - 8. Wheatley.

- B. Size 2 inch (50 mm) and Under: Screwed brass or iron body for 175 psig (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

2.3 BALANCING VALVES AND COMBINATION BALANCING/SHUT-OFF VALVES.

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Armstrong.
 - 3. Flow Design, Inc.
 - 4. Gerand.
 - 5. Griswold Controls.
 - 6. Mepco.
 - 7. Nexus Valve.
 - 8. Taco.
 - 9. Tour and Andersson.
 - 10. Watts.
 - 11. Wheatley.

- B. Size balancing valves to allow a reading of 2 to 5 ft wg (6 to 15 kPa) pressure drop at design flow rates. Submittals shall include a chart of valve selections, indicating room number, terminal heating device tag, flow rate, pressure drop, and differential pressure reading.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve Type Selection:
 - 1. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

- B. With the exception of valves which must be properly sized to ensure design flow rates (such as balancing valves), valves shall be line sized.

- C. Install valves with stems upright or horizontal, not inverted.

- D. Install specialties in accordance with manufacturer's instructions.

- E. Provide manual air vents at system high points and as indicated.

- F. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain, and shutoff ball valve upstream of vent to shut the vent off after initial system startup.

- G. Provide balancing valves on water outlet from terminal heating units such as cabinet unit heaters.

- H. Ensure that balancing valves are installed with minimum upstream length of straight pipe as recommended by the manufacturer.

- I. Ensure that balancing valves are installed with the readout valves fully accessible, including space required for insertion of metering probes.

END OF SECTION 232118

SECTION 238200 – CONVECTION HEATING AND COOLING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cabinet Unit Heaters.

1.2 RELATED SECTIONS

- A. Division 23 Section “Hydronic Piping.”
- B. Division 23 Section “Hydronic Specialties.”
- C. Division 26 “Electrical” - Equipment Wiring Systems: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Division 01 Section “Submittal Procedures.”
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
 - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
 - 2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
 - 3. Indicate mechanical and electrical service locations and requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Division 01 Section “Closeout Procedures”: Procedures for submittals.
- B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings. Submit under provisions of Division 01 Section “Operation and Maintenance Data.”

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum 3 years experience.

1.7 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 EXTRA MATERIALS

- A. Division 01 Section "Closeout Procedures": Maintenance Data.
- B. Provide 2 sets of filters.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

- A. Manufacturers:
 - 1. Daikin Applied (formerly McQuay).
 - 2. Sterling Hydronics.
 - 3. Beacon-Morris.
 - 4. Dunham Bush.
 - 5. Modine.
 - 6. Price Industries.
 - 7. Rittling.
 - 8. Trane.
- B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi (1380 kPa) and 220 degrees F (104 degrees C).
- C. Cabinet: 0.0598 inch (1.5 mm) steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet.
- D. Finish: Factory applied baked enamel of color as selected by the Architect on visible surfaces of enclosure or cabinet.
- E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- F. Motor:
 - 1. Provide ECM blower motor. Factory motor wiring shall be set for optimum fan performance.
 - 2. EC blower motor shall be 3 speeds, single phase with means for proportional field adjustment of each speed.
- G. Control: Multiple speed switch, factory wired, located in cabinet.

- H. Filter: Easily removed 1 inch (25 mm) thick glass fiber throw-away type, located to filter air before coil.
- I. Capacity: As Scheduled, based on 65 degrees F (18 degrees C) entering air temperature.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.
- C. Protection: Provide finished cabinet units with protective covers during balance of construction.
- D. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.
- E. Hydronic Units: Provide with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

3.2 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- C. Install new filters.

END OF SECTION 238200

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place, or removing site utilities, where directed.
7. Temporary erosion- and sedimentation-control measures.

- B. Related Sections in other Divisions:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion- and sedimentation-control measures.
2. Division 01 Section "Execution" for field engineering and surveying.
3. "SITE EROSION CONTROL NOTES" plan for temporary erosion and sedimentation control procedures.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined as a circle around each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Cleared materials shall become Contractor's property and shall be removed from Project site, except for stripped topsoil and other materials that are indicated to be stockpiled, salvaged, or otherwise remain the Owner's property.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect or Owner.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where directed.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
 - 1. Pre-mark the boundaries of your planned excavation with white paint, flags or stakes, so utility crews know where to mark their lines.
 - 2. Call Dig Safe, at either 811 or 1-888-DIGSAFE, at least 72 business hours - but no more than 30 calendar days - before starting work. Don't assume someone else will make the call.
 - 3. If blasting, notify Dig Safe at least 24 business hours in advance.
 - 4. Wait 72 business hours for lines to be located and marked with color-coded paint, flags or stakes. Note the color of the marks and the type of utilities they indicate. Transfer these marks to the As-Built drawings.

5. Contact the landowner and other non-member utilities (water, sewer, gas, etc.), for them to mark the locations of their underground facilities. Transfer these marks to the As-Built drawings.
 6. Re-notify Dig Safe and the non-member utilities if the digging, drilling or blasting does not occur within 30 calendar days, or if the marks are lost due to weather conditions, site work activity or any other reason.
 7. Hand dig within 18 inches in any direction of any underground line until the line is exposed. Mechanical methods may be used for initial site penetration, such as removal of pavement or rock.
 8. Dig Safe requirements are in addition to town, city and/or state DOT street opening permit requirements.
 9. For complete Dig Safe requirements, visit their website.
 10. If you damage, dislocate or disturb any underground utility line, immediately notify the affected utility. If damage creates safety concerns, call the fire department and take immediate steps to safeguard health and property.
 11. Any time an underground line is damaged or disturbed, or if lines are improperly marked, you must call Dig Safe.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. The following practices are prohibited within tree protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards tree protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near tree protection zones.
- I. Soil Stripping, Handling, and Stockpiling: Perform when the topsoil is dry or slightly moist.
- J. Restore surfaces disturbed during construction, including stockpile and storage areas, to their pre-construction condition, or better. Leave vegetated areas smooth and finished with loam, seed, and erosion control mulch and mesh. Restore damaged paved areas with new pavement to the existing thickness.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Erosion and sedimentation control materials and methods are described on drawing entitled, 'Site Erosion Control Notes'".

- B. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving".
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- C. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.
 - 1. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction. The Contractor shall conduct his operations in conformity with all Federal and State permit requirements concerning water, air, or noise pollution, or the disposal of contaminated or hazardous materials. Erosion control measures shown on the Plans are minimum only and are not intended to be complete. Satisfy the current requirements of the regulatory agencies. Comply with materials and procedures listed on the 'SITE EROSION CONTROL NOTES' plan, for temporary erosion and sedimentation control.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross plant or tree protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

- A. General: Protect trees remaining on-site.

- B. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Backfill with soil as soon as possible.
- C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed, or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities within his control, when requested by Contractor.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's or Owner's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.
- D. Removal of underground utilities is included in Division 33 Sections.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Recycle wood and wood debris either on-site or off-site, and do not bury or burn wood material. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Use only hand methods for grubbing within protection zones.
 - 5. Chip removed tree branches and recycle the material either on-site or off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Strip topsoil beneath areas receiving new construction, to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, stones and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, stumps, and other waste materials.
- B. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover with temporary seed and mulch to prevent windblown dust and erosion.
 - 1. Do not stockpile topsoil within protection zones.
 - 2. Dispose of surplus topsoil in same manner specified for surplus soil. Surplus topsoil is that which exceeds quantity required for reuse.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, foundations, retaining walls, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 BUILDING, STRUCTURE, AND UTILITY BELOW-GRADE COMPONENTS

- A. Below-Grade Construction: Demolish foundation walls, below grade utilities and other construction extending below-grade.
 - 1. Remove below-grade construction, including basements, foundation walls, footings, and utility structures completely. Crush material and use for fill in compliance with Division 31 Section "Earth Moving" or remove from site and transport to recycling facilities.
 - 2. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations and utility removals with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."
 - 3. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades and finish grades. Cutting, filling, and providing additional materials required.
2. Excavating, filling, and backfilling to grade.
3. Excavating and backfilling for buildings and structures.
4. Excavating and backfilling for buried structures, tanks, pipes, wires, and conduits inside or outside of buildings.
5. Gravel and structural fill under buildings and structures.
6. Subbase and base course for roadways, drives, walks, and hardscapes.
7. Crushed stone drainage fill.
8. Stone riprap.

B. Related Sections in Other Divisions:

1. Division 01 Section "Construction Progress Documentation" and "Photographic Documentation" for recording preexcavation and earth moving progress.
2. Division 01 Section "Unit Prices" for authorized additional excavation and materials.
3. Division 01 Section "Temporary Facilities and Controls"; also for temporary site fencing if not in another Section.
4. Division 03 Section "Cast-in-Place Concrete".
5. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 UNIT PRICES

- A. Unit prices for additional earth moving are referenced in Division 01 Section "Unit Prices."
- B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
 1. Excavation which measures 6'-0" or less in width, regardless of length, shall be classified as 'trench' excavation.
 2. Excavation which does not meet the requirements for 'trench' excavation shall be classified as 'open' (bulk) excavation.
 3. Where a trench 6'-0" or less in width is excavated lower than a floor subgrade, that is being excavated as 'open', the 'trench' shall be measured only below the floor subgrade. The upper portion of the excavation shall be measured as 'open'.

4. The owner will take credit for excavation and/or fill omitted through changes from the Plans and/or Specifications at the unit price stated.
5. 24 inches outside of concrete forms other than at footings.
6. 12 inches outside of concrete forms at footings.
7. 6 inches outside of minimum required dimensions of concrete cast against grade.
8. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
9. 12 inches beneath bottom of concrete slabs-on-grade.
10. 8 inches beneath pipe in trenches, and the greater of 30 inches wider than pipe or 36 inches wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Gravel layer placed between the subbase course and finish pavement.
- C. Bedding Course: Gravel layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Crushed Stone(Drainage Fill): Crushed stone backfill to facilitate stormwater flow; that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 2. Open(bulk) Excavation: Excavation more than 6 feet (3 m) in width.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Foundation Backfill: Clean course free-draining granular borrow adjacent to building foundation walls.
- I. Granular Borrow: Fill and backfill required beneath the building structural fill, and fill required beneath pavement subbase course.
- J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 2 cu. yd. (1.5 cu. m) for bulk excavation, footing, trench, and pit excavation, that cannot be removed by rock excavating equipment, without systematic drilling,

ram hammering, or blasting, when permitted. Fragmented "weathered" rock which can be removed by excavation equipment with "ripper" teeth will be considered earth.

- K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Structural Fill: Granular soil course placed beneath the building slabs and structural components.
- M. Subbase Course: Gravel layer placed between the subgrade and base course beneath pavement.
- N. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- O. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Insulation board.
 - 3. Warning tapes.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487; with particle gradation test results.
 - 2. Laboratory compaction curve according to ASTM D 1557.
- C. Blasting Plan: Prior to blasting, submit a Blasting Plan to the Maine DEP, prepared by a qualified blaster. Plan must include blasting standards according to 38 MRSA sec. 490-Z(14), and include anticipated blast design, shot pattern, and structures within 500 ft. of blasting locations. Also, submit blasting plan to the Architect, Owner, and Town Code Enforcement Officer.
- D. Seismic survey report from seismic survey agency.
- E. Pre-excavation Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 2. Seismographic monitoring during blasting operations.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 2. Seismographic monitoring during blasting operations.
- C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
- D. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.8 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect or Owner, and then only after arranging to provide temporary utility services according to requirements outlined in Section 311000.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before earth moving operations, as outlined in Section 311000.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, and plant-protection measures are in place, as detailed on the "SITE EROSION CONTROL NOTES" plan, and as outlined in Section 311000.
- E. Restore surfaces disturbed during construction, including stockpile and storage areas, to their pre-construction condition, or better. Leave vegetated areas smooth and finished with loam, seed, and erosion control mulch and mesh. Restore damaged paved areas with new pavement to the existing thickness.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups, free of rock or gravel larger than 6 inches (150 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 100 percent passing a 6-inch (150-mm) sieve, 35-80 percent passing a 1/2-inch (12-mm) sieve, 25-65 percent passing a 1/4-inch (6-mm) sieve, 0-30 percent passing a No. 40 (0.425-mm) sieve, and not more than 7 percent passing a No. 200 (0.075-mm) sieve. Maximum size stone passes 6-inch sieve. MDOT spec. 703.06 Type D.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 100 percent passing a 2-inch (50-mm) sieve, 45-70 percent passing a 1/2-inch (13-mm) sieve, 30-55 percent passing a 1/4-inch (6-mm) sieve, 0-20 percent passing a No. 40 (0.425-mm) sieve, and not more than 6 percent passing a No. 200 (0.075-mm) sieve. MDOT spec. 703.06 Type A.
- F. Structural Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 100 percent passing a 4-inch (100-mm) sieve, 90-100 percent passing the 3-inch (75-mm) sieve, 25-90 percent passing the 1/4-inch (6-mm) sieve, 0-30 percent passing the No. 40 (0.425-mm) sieve, and not more than 5 percent passing a No. 200 (0.075-mm) sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 100 percent passing a 2-inch (50-mm) sieve, 25-100 percent passing 1/4-inch (6-mm) sieve, 0-30 percent passing the No. 40 (0.425-mm) sieve, and not more than 7 percent passing a No. 200 (0.075-mm) sieve.
- H. Crushed Stone: Narrowly graded mixture of washed crushed stone; ASTM C 33; grading Size 56; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- I. Granular Borrow: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with maximum stone size of 4" (100-mm); the portion passing a 3-inch (75-mm) sieve shall meet the following: 100 percent passing the 3-inch (75-mm) sieve, 25-100 percent passing the 1/4-inch (6-mm) sieve, 0-50 percent passing the No. 40 sieve, and not more than 7 percent passing a No. 200 (0.075-mm) sieve. MDOT spec. 703.06 Type E - Modified.
- J. Sand: ASTM C 33; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- L. Stone Rip Rap: Sound angular stone mixture, sized so that 50% of the stones by weight are larger than the specified D50 size. Rip Rap shall be 4" to 12" diameter, with D50 equal to 6".

- M. Stone Dust: Crusher-run fine stone fragments, with 100 percent passing ½-inch sieve, 80-100 percent passing ¼-inch sieve, 50-75 percent passing a No. 10 sieve, and no more than 20 percent passing a No. 200 sieve.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 205 lb ; ASTM D 4632.
 - 3. Sewn Seam Strength: 142 lb; ASTM D 4632.
 - 4. Tear Strength: 80 lb; ASTM D 4533.
 - 5. Puncture Strength: 130 lb; ASTM D 4833.
 - 6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
 - 7. Permittivity: 1.2 per second, minimum; ASTM D 4491.
 - 8. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.
 - 9. Similar to Tencate Mirafi 180N, or approved equal.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 20 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 315 lbf (1402 N); ASTM D 4632.
 - 3. Tear Strength: 113 lbf (503 N); ASTM D 4533.
 - 4. CBR Puncture Strength: 900 lbf (4005 N); ASTM D 6241.
 - 5. Apparent Opening Size: No. 40 (0.430-mm) sieve, maximum; ASTM D 4751.
 - 6. Permittivity: 0.05 per second, minimum; ASTM D 4491.
 - 7. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.
 - 8. Tencate Mirafi 600X, ADS 315W, or equal.

2.3 CONTROLLED LOW-STRENGTH MATERIAL(Flowable Fill)

- A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch (10-mm) nominal maximum aggregate size.
 - 4. Water: ASTM C 94/C 94M.
 - 5. Air-Entraining Admixture: ASTM C 260
- B. Produce conventional-weight, controlled low-strength material with 140-psi (965-kPa) compressive strength when tested according to ASTM C 495.
 - 1. Manufacture molded polystyrene with an inorganic mineral registered with the EPA and suitable for application as a termite deterrent.

2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Water from construction dewatering operations shall be cleaned of sediment before reaching wetlands, water bodies, streams, or site boundaries. Conform to the requirements of the Department of Environmental Protection, and Erosion Control Notes drawing C00.3.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
1. Perform blasting without damaging adjacent structures, property, or site improvements.
 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.
- B. Set no charges and do no blasting prior to coordinating schedule and locations with Owner. Prior to ledge rock blasting, perform a pre-blast survey of all structures and wells within 500 ft. of blasting locations. The pre-blast survey firm shall have 5-years experience in similar survey work. For the survey, interview the landowner of the buildings and wells, obtain a certified water test for nitrates and coliform of each well, photograph and videotape glass, plaster, chimneys, concrete foundations, and other masonry components of each structure. When blasting along roadways, take still photos at 50' maximum spacing along the construction area, and videotape the entire construction length with commercial grade equipment. When explosives are used for rock removal, the work shall be done by experienced powdermen, with a minimum of 5 years documented experience. Blasting shall be conducted in accordance with 25 M.R.S.A. ch. 318, and 38 M.R.S.A. sec. 490, and shall meet listed standards. Conduct blasting in strict accordance with current Department of Interior Rules 816.61-68 and 817.610-68, and the Blasting Guidance Manual, Office of Surface Mining, Reclamation and Enforcement, covering this type of work. Conduct blasting activity in such a manner that the peak particle velocity of ground vibration measured at the nearest property line and the locations of the nearest structures to the blast does not exceed the Asafe limits@ recommended by the U.S. Bureau of Mines in Appendix B of BUMINES RI 8507, as indicated on Figure B-1. Blasts shall be monitored by seismographs to record the effects at the nearest property line and on structures within the survey area, and demonstrate compliance with the regulations. A record of each blast must be kept for at least one year, and must be submitted to the Department of Environmental Protection upon request. Blast records shall consist of all information listed in 38 M.R.S.A. sec. 490-Z(14)(L), including such data as location of blast, depth and number of holes, type and quantity of explosives, time, etc. To reduce the risk of flyrock, blasts shall be properly covered, using blasting mats or other appropriate methods. At a minimum, flyrock must not leave the project boundary or enter a protected natural resource. Damage to structures caused by improper use of explosives shall be corrected at the Contractor's expense. Avoid blasting which will disturb new building foundations and compacted soil backfill. Following blasting activity, blasting records, pre-blast survey, and seismograph readings shall be compiled in a report and submitted to the Owner.
- C. Rock excavation is not anticipated, however if encountered ledge rock excavation shall be paid by unit prices listed in the bid form. Conform to Section 012200. Prior to blasting and rock excavation, provide survey grades of the top of the ledge surface, and calculations of the expected rock quantities to be excavated. Submit this data and obtain Architect's approval prior to proceeding with rock excavation. The Architect will determine the extent of rock excavation and classification.

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Prior to blasting and rock excavation, provide survey grades of the top of the ledge surface, and calculations of the expected rock quantities to be excavated. Submit this data and obtain Architect's approval prior to proceeding with blasting and rock

excavation. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Ripping of weathered ledge material, not classified as rock excavation, is classified as earth excavation.
 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the dimensions listed in paragraph 1.3 Unit Prices.
- B. Unsuitable Soil Excavation: If unsuitable soil, as determined by the Geotechnical Engineer, is excavated within the design limits, it will be either placed on-site if appropriate, or removed and disposed off-site, as determined by the Geotechnical Engineer. There will be no added compensation for unsuitable soil excavated within the design limits, whether hauled on-site or off-site. For unsuitable soils excavated beyond the design limits, see paragraph 3.8 SUBGRADE INSPECTION.
- C. If hazardous waste or special waste as defined by the U. S. Environmental Protection Agency or State Department of Environmental Protection is encountered during excavation, the Contractor shall avoid disturbance of that material, and shall notify the Owner immediately. The State Bureau of Oil and Hazardous Waste Control must be notified and consulted prior to disturbance of the waste or contaminated soil. Removal and disposal of contaminated materials is not included in the Contract Bid, since it must be handled as directed by the regulatory agencies on a case-by-case basis.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Excavate using smooth bucket equipment to not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line, unless pipe inverts are shown otherwise.

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: As indicated.
- C. Trench Bottoms: For ductile iron pipe, excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 8 inches (200 mm) deeper than bottom of pipe elevation in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: For pipe materials other than ductile iron, excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 8 inches (200 mm) deeper than bottom of pipe elevation in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

- A. Notify Architect and Geotechnical Engineer when excavations have reached required subgrade.
- B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements as directed by Geotechnical Engineer. Do not proof-roll wet or saturated subgrades.
 - 1. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Engineer, and replace with compacted backfill or fill as directed.
- D. Payment for the authorized additional excavation of unsuitable material beyond the design limits, including replacement materials, will be made under the Contract provisions for unit prices.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Geotechnical Engineer, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, damp-proofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Place and compact initial backfill of bedding course material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- D. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- E. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use granular borrow material beneath gravel subbase.

3. Under building steps and ramps, use structural fill.
4. Under building slabs, use structural fill course.
5. Under footings and foundations, use structural fill.

C. Place soil fill on subgrades free of organic material, sod, mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12 inches (300 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches (150 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. Under structures, building slabs, steps, walkways, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. Under lawns, turf, or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 3. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.
 4. Compact crush stone to 100% of its dry rodded weight.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn, turf, or unpaved Areas: Plus or minus 1 inch (25 mm).
 2. Pavements and walks: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 18 inches (450 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
 - 1. Compact each filter material layer with a minimum of two passes of a plate-type vibratory compactor.
 - 2. Drainage Backfill: Place and compact filter material over subsurface drain geotextile wrap as indicated.

3.18 SUBBASE AND BASE COURSES

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade or granular fill layer, place subbase course and base course under pavements and walks as follows:
 - 1. Where fill is required, place satisfactory soil or granular borrow fill on prepared subgrade.
 - 2. Place base course material over subbase course under hot-mix asphalt pavement, concrete pavement, and unit pavers.
 - 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
 - 5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 - 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified Geotechnical Engineering testing agency to perform field quality control testing and inspections, as they deem necessary. The Contractor is responsible for attaining specified compaction, whether the Owner engages a Geotechnical testing firm or not.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect or Geotechnical Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Walks: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft.
 - 3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
 - 4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 100 feet (30 m) or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect or Geotechnical Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS AND RESTORATION

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property. Comply with the requirements of Division 01 "Construction Waste Management".
- B. Restore surfaces disturbed during construction, including stockpile and storage areas, to their pre-construction condition, or better. Leave vegetated areas smooth and finished with loam, seed, and erosion control mulch and mesh. Restore damaged paved areas with new pavement to the existing thickness.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Saw-cutting or cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Pavement marking paint

- B. Related Requirements:

1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: For each job mix proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.

- B. Material Certificates: For each paving material.

- C. Material Test Reports: For each paving material, by a qualified testing agency.

- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the latest revision of “Standard Specifications for Highways and Bridges” of the State of Maine Department of Transportation (MDOT), for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Tack Coat: Minimum air temperature of 50 deg F.
 - 2. Asphalt Base Course: Minimum air temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum air temperature of 50 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, conform to MDOT specification Sec. 702.
- B. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application. Emulsified asphalt conforming to MDOT 702.04.
- C. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled asphalt shingles from sources and gradations

that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

- B. Joint Sealant: ASTM D 6690 hot-applied, single-component, polymer-modified bituminous sealant.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: White.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sherwin-Williams Waterborne Traffic Paint, or equal.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Roads and parking:
 - a. Surface Course: Conforming to HMA 9.5mm. MDOT, Section 703.09.
 - b. Binder Course: Conforming to HMA 19mm. MDOT, Section 703.09.
 - 3. Walks:
 - a. Surface Course: Conforming to HMA 9.5mm. MDOT, Section 703.09.

Sieve Size	Percent by Weight Passing – Combined Aggregate		
	Type 19 mm (B)		Type 9.5 mm (D)
25 mm (1")	100		
19 mm (3/4")	90-100		
12.5 mm (1/2")	-90		100
9.5 mm (3/8")	-		90-100
4.75 mm (No. 4)	-		-90
2.36 mm (No. 8)	23-49		32-67
75 µm (No. 200)	2-8		2-10

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tons).

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected, and underground conduits and utilities have been completed.

3.2 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
 3. Treat exposed existing horizontal and vertical pavement surfaces with sprayed bituminous tack coat prior to placing new adjacent or overlaying bituminous pavement. Pavement which has been in place longer than 30 days shall be considered existing.

3.4 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Spread mix at a minimum temperature of 250 deg F (121 deg C).
 3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
 2. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 95 percent of reference laboratory density according to MDOT, but not less than 92.5 percent or greater than 97.5 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for at least 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm). Apply sufficient thickness to completely cover the underlying pavement with solid white(or yellow) lines, such that no pavement color shows through.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 1. Base Course: 3/8 inch (9 mm).
 2. Surface Course: 1/4 inch (6 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. This will not relieve the Contractor of his quality control responsibilities
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Alignment: Pavement edges shall be in conformance to alignment with straight edges or smooth curved edges, without irregularities or ragged edges.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to MDOT specifications.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Replace and compact hot-mix asphalt where core tests were taken.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.10 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

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SECTION 323000 - SITE IMPROVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood Fence

1.3 SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in an undamaged condition.
- B. Carefully store materials off the ground to provide proper protection against oxidation, and other damage caused by ground contact.

PART 2 - PRODUCTS

2.1 CAST IN PLACE CONCRETE

- A. Concrete for exposed equipment pads and slabs shall be 4000 psi, air-entrained, 0.40 w/c ratio, with smooth form finish. Portland cement shall conform to the requirements of ASTM C-150, type III. Aggregates shall conform to the requirements of ASTM C-33, and shall be free of injurious amounts of deleterious substances. Reinforcing steel conforming to ASTM A615. Conform to section 033000 Cast-in-Place Concrete.
- B. Concrete for below-grade posts, encasement, and other 'utility' uses that do not require visual finishes, shall be 3000 psi, air-entrained, 0.40 w/c ratio. Portland cement shall conform to the requirements of ASTM C-150, type III. Aggregates shall conform to the requirements of ASTM C-33, and shall be free of injurious amounts of deleterious substances. Reinforcing steel conforming to ASTM A615.

2.2 PRECAST CONCRETE

Concrete for precast items shall be 4000 psi, air-entrained, 0.40 w/c ratio, with smooth form finish. Portland cement shall conform to the requirements of ASTM C-150, type III. Aggregates shall conform to the requirements of ASTM C-33, and shall be free of injurious amounts of deleterious substances. Reinforcing steel conforming to ASTM A615. Precast concrete products are shown on the drawings for general sizing. The precast manufacturer is

responsible for the structural design and construction to meet the specific application to the site shown on the drawings and specified herein.

2.13 WOOD FENCE

- A. Fabricated of steel tubing of 42,000 psi yield strength galvanized with a minimum zinc coating of 0.60 oz. per sq. ft. meeting the requirements of ASTM A526; and finish coated with thermoset polyester powder spray coating of 2 to 4 mils dry thickness. Fasteners of the same coatings. Color black.
- A. Industrial fence Style #202 by Jerith Manufacturing Co, or approved equal.

PART 3 - EXECUTION

3.1 STRUCTURES, BASES, AND OTHER EQUIPMENT

- A. Install products according to details shown on drawings and manufacturer's recommendations.

3.2 POST INSTALLATION

- A. Install posts for the fence and gates on previously prepared surfaces to line and grade as indicated. Install in accordance with the manufacturer's written installation instructions except as modified herein.
- B. Excavation: Excavate for concrete embedded items to dimensions indicated. Clear post holes of loose material. Dispose of waste material as directed.
- C. Post Setting: Set posts plumb. Provide concrete bases for posts to depths shown on drawings. Thoroughly compact concrete to be free of voids and finish in a dome. Cure concrete a minimum of 72 hours before any further work is done on posts.
- D. Where solid rock is encountered without an overburden of soil, posts shall be set a minimum depth of 12 inches into the solid rock. The hole shall have a minimum width of one (1) inch greater than the largest dimension of the post section to be set.
 - 1. After the post is set and plumbed, the hole shall be filled with grout consisting of one part Portland cement and three parts clean, well graded sand. Other grouting materials may be used if approved by the Engineer. The grout shall be thoroughly worked into the hole so as to leave no voids. The grout shall be crowned to carry water from the post.
 - 2. Where solid rock is covered by an overburden of soil or loose rock, the posts shall be set to the full depth detailed unless the penetration into solid rock reaches the minimum depths specified above, in which case the depth of penetration may be terminated. Concrete footings shall be constructed from the solid rock to the top of the ground. Grouting will be required on the portion of the post in solid rock.

END OF SECTION 323000

SECTION 32 31 13 - ARCHITECTURAL ALUMINUM SEMI-PRIVATE GATES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gate panels fabricated with extruded aluminum planks and structural aluminum profiles including extruded aluminum framework and aluminum infill materials. Gate panels shall be furnished and installed as shown on the plans and specified herein, overall height and opening width of gates shall be as shown on the plans

B. Related Requirements:

1. Section 012100 Allowances
2. Section 033000 Cast-in-place Concrete
3. Section 047200 Stone Masonry

1.2 REQUIREMENTS

- ##### A. Furnish materials, labor, expertise and equipment necessary to complete all work specified in this section and as shown on the drawings.

- ##### B. Structural Performance: Provide product and installation capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform pressure of 30 lbf/sq. ft. acting inward or outward.
2. Thermal Movements resulting from a temperature change (range) of 120 degrees Fahrenheit ambient and 180 degrees Fahrenheit material surfaces.

1.3 SUBMITTALS

- ##### A. Shop drawings and manufacturer's literature: Provide specifications and construction detail drawings to substantiate quality of materials and provide details of fabrication and installation.

- ##### B. Submittals shall be in accordance with standard construction practices to include complete detailed layout of all gate panels and gate posts. Submittals shall include plan layout, elevations and section views of gates.

- ##### C. Certificate: manufacturer's certification that materials meet specification requirements.

1.4 REFERENCES

- ##### A. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- ##### B. ASTM B 221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

- C. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.
- D. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the effects of Rapid Deformation.
- E. ASTM B117 – Standard Practice for Operating Salt Spray Apparatus.
- F. ASTM D822 – Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- G. AWS D1.2 Structural Welding Code – Aluminum.

1.5 QUALITY ASSURANCE

- A. Installation of fence and materials shall conform to the requirements of the fence manufacturer.
- B. The fence shall be warranted from any defects in materials and workmanship for a period as specified in the relevant section of the contract documents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Gate panels:
 1. Approved architectural gate panels and gate posts, Manufacturer:
 - a. Basis of design: PalmSHIELD Manufacturing. Custom design: under-scalloped semi-private with alternating vertical slats, half open, as shown on drawings.
 2. Material Descriptions:
 - a. Extruded Aluminum: ASTM B 221, Alloy 6063 – Temper T-6.
 - b. Sheet Aluminum: ASTM B211, Alloy 6063 – Temper T6.
 - c. Powder Coating Material Hardness: ASTM 3363 2H.
 3. Gate Panel Infill Description: Vertical aluminum privacy slats creating 50% privacy. Horizontal lower and mid rails and under-scalloped top rail. As shown on drawings.
 - a. Gate Height: As shown on drawings.
 - b. Individual Panel Width: As shown on drawings.
 - c. Gate panels consisting of vertical planks fabricated with extruded aluminum framing structural profiles and supported by extruded aluminum fence posts.
 - d. Infill. 1" x 5", 1"x4" or 1"x3" tubular slat, T-6063 spaced as shown on the on plans with alternating gaps and based on screen height.
 4. Gate Frame Description:
 - a. Gate shall have welded frame fabricated from extruded aluminum tubing with aluminum panels to match fencing material. Frame configurations shall be as indicated on the contract drawings.
 - b. Welded frame, 2" x 3" U-Shaped extruded tubular T-6063 aluminum with infill to match fence infill.
 5. Gate Posts:

- a. Gate panel post selection as shown on the plans and per manufacturer's selection.
 - b. Gate posts may be T-6063 aluminum or A-500 tubular steel as per manufacturer.
 - c. Gate posts will be capped.
6. Anchor Bolts: Anchor bolts shall be connected to metal plate which it embedded into cast-in-place concrete gate pier, as shown on drawings. Reactions to be developed by gate subcontractor and submitted for review by Architect and Engineer. Design to be adequate to support loads based on screening height, exposures and loading.
7. Gates Hardware:
- a. All fittings and accessories shall be stainless steel and sized as specified by the fence manufacturer.
 - b. Gate hinges to be Gorilla barrel hinge with 3/4" rod, ball bearing, and grease zert. Hinge plate to be 1/2" thick plates offset to create a 5/8" gap. Standard hardware as required by the gate manufacturer for complete functional operation. Hinges to be bolted to gate frame and field welded to steel gate posts.
 - c. Gate lock to be Locinox FortyLock mortise lock. Lock to be industrial and polished 100% stainless steel locksets include a keyable cylinder and auto-latching mechanism. Lock to be internal lock with exterior grab handles. Lock may be keyed and rekeyed. Lock is accessible from both sides of gate.
 - d. Drop rods to be 1" schedule 40 pipe and through bolted to gate frame.
 - e. Hardware: Size and type as determined by the manufacturer. Provide two hinges per leaf.
 - f. Gate posts shall be as determined by manufacture. Gate posts to be specified to support gates.
8. Factory Finish: Gates shall receive polyester powder coating.
- a. Polyester powder coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.
 - b. Color shall be as selected by Architect and Owner from manufacturer's full range of colors.
 - c. Minimum hardness measured in accordance with ASTM D3363 2H.
 - d. Direct impact resistance tested in accordance with ASTM D2794. Withstand 160 inch-pounds.
 - e. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95° F and 95% relative humidity after 1,000 hours, less than 3/16 inches undercutting.
 - f. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted 45°.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that final grading in gate location is completed and without irregularities which will interfere with gate installation. Variations in height, slopes, stairs steeping shall be shown on contract drawings and on submittal drawings.
- B. Field verify all dimensions and layout prior to commencing installation.

- C. Do not commence work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gate in accordance with manufacturer's installation instructions.
- B. Install gate plumb and level. Posts are plated and mounted to top of surface or as shown on the plans.
- C. Do not install bent, bowed or otherwise damaged gate panels or posts. Remove damaged components from site and replace.
- D. Install gates and adjust hardware for smooth operation.

END OF SECTION

SECTION 323150 – CEDAR SPLIT RAIL FENCING

PART 1 - GENERAL

1.01 Related Documents

- A. Drawings and general provisions of the contract apply to this section.

1.02 Summary

- A. This section includes:

- 1. Cedar Split Rail fencing components.

- B. Related sections: The following sections contain requirements that relate to this section.

- 1. Division 31 Section Earth work.

1.03 Definitions

- A. Posts are the vertical structural support members of the fence.
- B. Rails are the horizontal structural support members of the fence.

1.04 Submittals

- A. Product Data: For each type of product.

1.05 Quality Assurance

- A. Installer Qualifications: Engage an experienced installer who has at least three years experience and has completed at least five Split Rail fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.
- B. Single-Source Responsibility: Obtain Split Rail cedar fences, including accessories, fittings, and fastenings, from a single source.

1.06 Project Conditions

- A. Field Measurements: Verify layout information for fences and gates shown on the drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

1.07 Warranty

- A. Manufacturer's Warranty: Lifetime non-prorated limited transferable warranty applies to original Owner, or 15-year non-prorated limited warranty applies to commercial applications.

PART 2 - PRODUCTS

2.01 Fence Materials

- A. General: Provide white cedar fence materials recognized to be of type indicated and tested to show compliance with indicated performances.
- B. Available Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include:
 - 1. Anchor Fence Co. 2 Bagdon Lane, Kennebunk, ME 04043 (207) 806-5767
 - 2. Horizon Fence Co. 395 Main St. Unit 1, South Portland, ME 04106 (207) 741-0218
 - 3. Maine Line Fence Co. 272 Middle Rd., PO Box 27A Cumberland, ME 04021 (207) 879-5549.

2.02 White Cedar Split Rail Fence Components

- A. General: White cedar, premium grade, G4S (good 4 sides), posts and rails.
- B. Fence Posts: Seven-foot long white cedar posts with chamfered top, slotted to receive two, 4"x4" paddle-end rails as detailed on the plans.
- C. Rails: One piece 4"x4" white cedar with paddle ends as detailed on the plans.

2.03 Miscellaneous Materials

- B. Fasteners and Anchorage: Stainless Steel. All fasteners to be concealed or colored heads to match. Provide sizes as recommended by fence manufacturer.
- D. Cedar Finish: Natural.

PART 3 - EXECUTION

3.01 Installation, General

- A. Install fence in compliance with manufacturer's written instructions. During installation, components shall be carefully handled and stored to avoid contact with abrasive surfaces. Install components in sequence as recommended by fence manufacturer.
 - 1. Install fencing as indicated on the drawings provided.
 - 2. Variations from the installation indicated must be approved before installation.

3.02 Fence Installation

- A. Excavation: Drill or hand-excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on drawings, excavate holes for each post to a minimum diameter of 12" inches.
 - 2. Unless otherwise indicated, excavate hole depths not less than the local frost line.

- B. Posts: Install posts in one piece, plumb and in line. Space a maximum of 8 feet o.c. unless otherwise indicated. Enlarge excavation as required to provide clearance indicated between post and side of excavation.
- C. Top and Bottom Rails: Install rails in one piece into slots carved into posts to receive top and bottom rails with paddle ends. Except at sloping terrain, install rails level. On sloping terrain, install rails to follow approximate grade of slope.

3.04 Adjusting and Cleaning

- A. Remove all traces of dirt and soiled areas.

END OF SECTION

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SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Hydroseeding.
 - 3. Erosion-control material(s).

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- B. Qualification Data: For qualified landscape Installer.
- C. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- D. Material Test Reports: For all soil types for including initial and final tests.
- E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.

2. The soil-testing laboratory shall oversee soil sampling. A minimum of ten representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
 - c. Forward to the Architect two copies of analysis and recommendations of the testing agencies.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.8 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following seasons. Coordinate planting seasons with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting Season: April 15th to June 15th.
 2. Fall Planting Season: August 15th to September 15th.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.
- C. Variance: If special conditions exist which may warrant a variance in the above planting dates, a written request shall be submitted to the Architect stating the special conditions for the

proposed variance. Permission for the variance will be given if warranted in the opinion of the Architect. Regardless of the time of seeding, the Contractor shall be responsible for a full growth of grass.

- D. Place permanent soil stabilization within 15 days of final grading.

1.9 MAINTENANCE PERIOD

- A. Initial Turf Maintenance period: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1. Seeded Turf: 60 days from date of Project Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:
- C. Seed Species: Seed of grass species as follows, with not less than 80 percent germination, not less than 85 percent pure seed, and not more than 0.25 percent weed seed:
 - 1. General Lawn Areas: Proportioned by weight as follows:
 - a. 35 percent creeping red fescue.
 - b. 35 percent chewings fescue.
 - c. 30 percent perennial ryegrass.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.

- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Shall meet Maine Department of Environmental Protection guidelines and must be approved for commercial landscaping. Vendor shall provide approximate nitrogen availability calculations for soil blending and complete set of available plant nutrients, pH, trace metals, total volatile solids, soluble salts, measured water holding capacity and maturity measurements. Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/8-inch sieve; soluble salt content of 0 to 4 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. C:N Ratio: 20:1 – 35:1
 3. Total Nitrogen: <1.5%
 4. Moisture Content: 40 – 60%
 5. Total Volatile Solids: <60%
 6. Density: 800-1200 lbs/cy
 7. Compost will be adequately stabilized, pathogen free with acceptable odor.
 8. Compost source is subject to the review of the Engineer.
- B. Peat: Peat shall be moist. It shall be finely shredded, consist of 90 percent organic moss peat, be brown in color, and suitable for horticultural purposes. Shredded particles shall not exceed one (1) inch in diameter. Peat shall be measured in air dry condition, containing not more than 35 percent moisture by weight. Ash content shall not exceed 10 percent.

2.4 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
 2. Approximately 30% to 50% of the fertilizer shall be a slow release form (UF IDBU SCU).
 3. Delivered to the site in bags labeled with manufacturers guaranteed analysis.
 4. Special Protection: If stored at the site, protect fertilizer from the elements.

2.5 PLANTING SOILS

- A. Topsoil: Topsoil for general site loam, except that existing on the site, will not be made available by the Owner. The Contractor shall be responsible for supplying any additional topsoil needed and hauling it to the site. It shall be obtained from naturally well drained areas. Whether from on-site or off-site source, the topsoil shall be a fertile, friable natural loam.

ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 5 percent organic material content nor more than 15%; soluble salts less than 500 parts per million; free of stones 3/4 inch or larger in any dimension and other extraneous materials harmful to plant growth. Soil shall not be used for planting while in frozen or muddy condition. Unsuitable materials removed shall be disposed of by the Contractor. Topsoil for general loam areas, unless noted otherwise, shall meet the following requirements:

1. Maximum particle size of 3/4-inch, with maximum of 3% retained on the 1/4-inch mesh sieve. Composition in the following range:
 - a. Silt: 15 to 40%
 - b. Sand: 30 to 70%
 - c. Clay: 3 to 15%
2. Initial Testing: Take representative samples of topsoil from the site and from borrow sources and submit samples to a Soil Testing Laboratory for chemical and physical analysis. Each sample shall be made by combining 10 small grab samples from throughout the source. Indicate to the testing agencies that turf is to be planted and the name of the Owner. Forward to the Architect two copies of analysis and recommendations of the testing agencies.
3. Final Testing: After the final topsoil has been amended and mixed as recommended, take representative samples and submit them to a Soil Testing Laboratory for chemical and physical analysis. Each sample shall be made by combining 10 small grab samples from throughout the source. Make final amendments to the topsoil to meet the specification, based on the test results. Forward to the Architect two copies of analysis and recommendations of the testing agencies.

2.6 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.7 PESTICIDES

- A. General: Use of pesticides/herbicides must be coordinated with Owner's Integrated Pest Management Plan, and used only by Owner's permission. Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.8 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. North American Green; P300.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch (75-mm) nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 3 inches (75 mm) to 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Spread planting soil to a depth shown on the drawings, but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- C. Apply fertilizer at a rate as recommended by testing agency, just prior to final grading of the site. Thoroughly and evenly incorporate fertilizer and lime with the soil to a depth of 4" to 6" by discing or other approved method. In areas inaccessible to power equipment, use hand tools. Adjacent to trees and shrubs use hand tools to avoid disturbance of the roots.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future. Remove stones larger than 1 inch in diameter. The finished loam shall also be free of smaller stones in excessive quantities, as determined by the Architect.
- E. The whole surface shall then be rolled with a roller which weighs not more than 100 pounds per foot of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional topsoil, and the surface shall be regraded and rolled until presenting a smooth and even finish to the required grade.
- F. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with mechanical seeder or other approved method. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 lb/1000 sq. ft. (2.3 kg/92.9 sq. m).
- C. Sow 50% in one direction and 50% at right angles to the first seeding. Spread seed when soil is moist. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seed bed in one operation.
- D. Rather than using a cultipacker, the seeded ground shall be lightly raked into top 1/8 inch of soil and rolled lightly in two directions with a water ballast roller. Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades and that the seed is not raked from one spot to another.
- E. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- F. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- G. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
- H. Promptly after seeding, wet the seed bed thoroughly, keeping all areas moist throughout the germination period.
- I. Take whatever measures are necessary to protect the seeded area while it is germinating. These measures shall include furnishing warnings signs, barriers, and other needed measures of protection.

3.6 HYDROSEEDING

- A. Hydroseeding: May be used for general lawn areas and low maintenance areas, but not for Sports Playfield.
- B. Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application. Certify in writing that the hydro seed fertilizer mix is as herein specified and applied at the equivalent rate.

3.7 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Use integrated pest management practices as required to keep turf and soil free of pests and pathogens or disease.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. At the time of the first cutting, there shall be a uniform stand between 3 and 3 ½ inches high, and mower blades shall be set between 2 ½ inches and 3 inches high.
 - 2. Provide at least 3 cuttings of grass in lawn areas not closer than 10 days apart.

3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.
- C. Correct graded areas which settle during the first 12 months after Project Substantial Completion in lawn areas, including loaming and seeding. Reseeding shall be done as herein specified.

3.9 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

- B. When this work is done while buildings are occupied, pavements shall be kept broom cleaned to prevent tracking dirt into buildings.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.
- E. After completion of planting operations, dispose of debris and excess material to the satisfaction of the Architect. Pavements shall be broomed and hosed clean.

3.10 FINAL INSPECTION AND ACCEPTANCE

- A. At the end of the guarantee period, the Architect will inspect guaranteed work for the Final Acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date for final inspection.
- B. Upon completion and re-inspection of repairs or renewals necessary in the judgment of the Architect at that time, he shall certify in writing to the Contractor as to the Final Acceptance of the project.

END OF SECTION 329200

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SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Planting soils.
 - 3. Tree stabilization

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.

- I. **Manufactured Topsoil:** Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- J. **Pesticide:** A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- K. **Pests:** Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- L. **Planting Area:** Areas to be planted.
- M. **Planting Soil:** Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- N. **Plant; Plants; Plant Material:** These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- O. **Root Flare:** Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. **Stem Girdling Roots:** Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- R. **Subsoil:** Soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- S. **Surface Soil:** Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

- A. **Product Data:** For each type of product used, including soils.
 - 1. **Plant Materials:** Include quantities, sizes, quality, and sources for plant materials.
 - 2. **Pesticides and Herbicides:** Include product label and manufacturer's application instructions specific to the Project. (Use of products must be coordinated with Owner's Integrated Pest Management Plan and used by Owner's permission).
 - 3. **Plant Photographs:** Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each

photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- B. Samples for Verification: For each of the following:
 - 1. Trees and Shrubs: Three samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 - 2. Organic Mulch: 1-pint (0.5-liter) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 3. Mineral Mulch: 2 lb (1.0 kg) of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
 - 4. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Material Test Reports: For existing native surface topsoil and imported or manufactured topsoil.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- E. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Pesticide Applicator: State licensed, commercial.

- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 - 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of ten representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 - 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
 - c. Forward to the Architect two copies of analysis and recommendations of the testing agencies.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.
- G. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 - 1. Notify Architect and Construction Manager no fewer than two days in advance of proposed interruption of each service or utility.
 - 2. Do not proceed with interruption of services or utilities without Architect's or Owner's written permission.
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: April 15th to June 15th.
 - 2. Fall Planting: August 15th to September 15th.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods from Date of Substantial Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.10 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 12 months from date of Substantial Completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants(besides Trees and Shrubs): Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: Six months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm

ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
 - 3. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.

2.4 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 - 1. Size: 5-gram tablets.

2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.
- C. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.5 PLANTING SOIL

- A. . Planting Soil shall be topsoil as specified in Section 329200 Turf and Grasses, amended as recommended by the soil testing lab results for the particular plants used.

2.6 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 1. Type: Wood and bark chips.
 2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
 3. Color: Natural.
- B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
 1. Type: Long Island Beach Rounds available by Petro's Ace Hardware & Landscape Center, Auburn Maine. Contact phone number: 207.783.0433.
 2. Size Range: 1-1/2 inches (38 mm) maximum, 3/4 inch (19 mm) minimum.
 3. Color: To be selected by Architect.

2.7 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Needle-punched polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids. Equivalent opening size: US Standard Sieve size 50.

2.8 PESTICIDES

- A. General: Use of pesticides/herbicides must be coordinated with Owner's Integrated Pest Management Plan and used only by Owner's permission. Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.

2.10 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWWA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 4 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Spread planting soil to a depth of 4 inches (100 mm) but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
 2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision of excavations during working hours.
 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subsoil and topsoil removed from excavations may be used as planting soil, provided that it meets the requirements.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal expose the root flare and verify that root ball still meets size requirements.

- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set balled and potted stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Set and support bare-root stock in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grade.
 - 1. Use planting soil for backfill.
 - 2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated.

- Plumb before backfilling and maintain plumb while working backfill around roots and placing layers above roots.
3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 MECHANIZED TREE SPADE PLANTING

- A. Trees may be planted with an approved mechanized tree spade at designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
- C. Cut exposed roots cleanly during transplanting operations.
- D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.
- E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in the same direction as in its original location.

3.7 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Staking and Guying: Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches (760 mm) long, driven to grade.
1. Site-Fabricated Staking-and-Guying Method:
 - a. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide turnbuckle for each guy wire and tighten securely.
 - b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - d. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
 - e. Paint turnbuckles with luminescent white paint.
- C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.
 - a. Install stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation. Saw stakes off at horizontal stake.
 - b. Install screws through horizontal hold-down and penetrating at least 1 inch (25 mm) into stakes. Pre-drill holes if necessary to prevent splitting wood.
 - c. Install second set of stakes on other side of root trunk for larger trees as indicated.

3.9 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines 12 inches (300 mm) apart in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.

- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of thickness shown on Drawings, within radius around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.
 2. Organic Mulch in Planting Areas: Apply 4-inch (100-mm) thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 2 inches (50 mm) of trunks or stems.
 3. Mineral Mulch in Planting Areas: Apply 4-inch (100-mm) thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.11 EDGING INSTALLATION

- A. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch- (100- to 150-mm-) deep, shovel-cut edge.

3.12 Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize

the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and work area in a clean orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.14 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329300

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SECTION 334100 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, fittings, and couplings.
 - 2. Pipe inlets and outlets.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. FRP: Fiberglass-reinforced plastic.
- D. LLDPE: Linear low-density, polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect, Owner, and Public Works Department no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Owner's or Public Works Department written permission.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Use any of the following materials for storm drainage.

2.2 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

2.3 PVC PIPE AND FITTINGS

- A. PVC Type PSM Sewer Piping:
 - 1. Pipe: ASTM D 3034, SDR 35 , PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D 3034, PVC with bell ends.
 - 3. Gaskets: ASTM F 477, elastomeric seals.

2.4 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Ring-Type, Flexible Couplings:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. Fernco Inc.
 - 2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 PIPE OUTLETS

- A. Riprap aprons: Broken, irregular size and shape.
 - 1. Size the stone mixture such that 50% of the stones, by weight, are larger than the specified d50 size. Stones shall not be schistose.
 - 2. Plain Rip-Rap: 4" to 12" diameter, hard, sound angular stones, d50 = 6".
- B. Filter Stone: Clean graded angular stones of 2" to 3" size.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- D. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow at a minimum slope of 0.005 ft./ft., unless otherwise indicated.
 - 2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Where continuous bedding material is used and pipe slope exceeds 3%, construct trench dams along the trench to hinder the flow of ground water through the bedding material. Construct trench dams of relatively impervious clayey or silty material excavated from the trench, extending 1 foot above the pipe embedment zone, and spaced within 25 feet upstream of each manhole, and whenever the trench grade rises 10 feet.
 - 4. Install PE corrugated sewer piping according to ASTM D 2321.
 - 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 6. Coordinate work on municipal utility lines and within street right of way with municipal sewer/water department, State DOT, and public works department.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 - 2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
 - 3. Join dissimilar pipe materials with nonpressure-type flexible couplings.
 - 4.

3.4 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct riprap of broken stone, as indicated.
- B. Install outlets that spill onto grade, where indicated.

3.5 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22.
- B. Make connections to existing piping and structures by cutting opening into existing unit large enough to allow installation of flexible water-tight boot connector, as approved by the utility owner. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate
- C. Connect to building storm drain lines at the building wall, unless noted otherwise.

3.6 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.7 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.8 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soil-tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.9 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334100

SECTION 334600 - SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes subdrainage(underdrain) systems for the following:
 - 1. Site facilities.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Perforated-wall drainage conduits and fittings, including rated capacities.
 - 2. Cleanout frames and covers.
 - 3. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Use either of the following two materials for general underdrain piping, unless noted otherwise.

2.2 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 - 1. NPS 6 (DN 150) and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints. Pipe must be marked as "Heavy-Duty" conforming to ASTM F405, or pipe stiffness of 30 psi at 5% deflection, maximum of 5% elongation.
 - 2. NPS 8 (DN 200) and Larger: ASTM F 667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints. Pipe must be marked as "Heavy-Duty" conforming to ASTM F405, or pipe stiffness of 30 psi at 5% deflection, maximum of 5% elongation.
 - 3. Couplings: Manufacturer's standard, band type.
- B. Polyvinylchloride (PVC), Type PS 46 conforming to ASTM F-789 or PSM (SDR 35) conforming to ASTM D-3034 perforated with two rows of 1/2 inch diameter holes. Gasketed push on joints.

2.3 CLEANOUTS

- A. PVC Cleanouts: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

- B. Cleanout Covers: In hard surfaces use Neehah Foundry model R-1978 series, or approved equal.

2.4 SOIL MATERIALS

- A. Soil materials are specified in Division 31 Section "Earth Moving."

2.5 GEOTEXTILE FILTER FABRICS

- A. Specified in Division 31 Section "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 CLEANOUT APPLICATIONS

- A. In Underground Subdrainage Piping:
 1. At Grade in Earth: PVC cleanouts.
 2. At Grade in Paved Traffic Areas: Cast-iron cleanouts.

3.4 SITE DRAINAGE INSTALLATION

- A. Provide trench width to allow installation of drainage conduit. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.
- B. Lay geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 6 inches (150 mm).
- D. In landscaping areas, install drainage conduits as indicated in Part 3 "Piping Installation" Article for landscaping subdrainage with horizontal distance of at least 6 inches (150 mm) between conduit and trench walls.

- E. Add drainage course to width of at least 6 inches (150 mm) on sides and over top of pipe.
- F. Wrap the geotextile filter fabric over top of drainage course, overlapping edges at least 8 to 12 inches.
- G. Fill to Grade: Place satisfactory soil fill material over drainage course with geotextile wrap. Place material in loose-depth layers not exceeding 6 inches (150 mm). Thoroughly compact each layer. Fill to finish grade.

3.5 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Site Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5percent and with a minimum cover of 4.5 ft., unless otherwise indicated.
 - 2. Lay perforated pipe with perforations down.
 - 3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

3.6 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with coupled, or push-on joints.
- B. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with push-on joints.
- C. Special Pipe Couplings: Join piping of different materials and dimensions with couplings made for this application. Use couplings that are compatible and fit dimensions of both pipes.

3.7 CLEANOUT INSTALLATION

- A. Cleanouts for Subdrainage:
 - 1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
 - 2. Provide cleanout plug inside a cast iron or aluminum handhole and cover, set flush to walkway or drive pavement, where cleanout is in a hard surface area. Neehah Foundry model R-1978 series, or approved equal.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

3.9 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Division 31 Section "Earth Moving."
 - 1. Install PE warning tape or detectable warning tape over ferrous piping.
 - 2. Install detectable warning tape over nonferrous piping and edges of buried structures.

3.10 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
 - 2. Remove obstructions, damaged components, and repeat test until results are satisfactory.

3.11 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600

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