

WESTFORD WATER DEPARTMENT

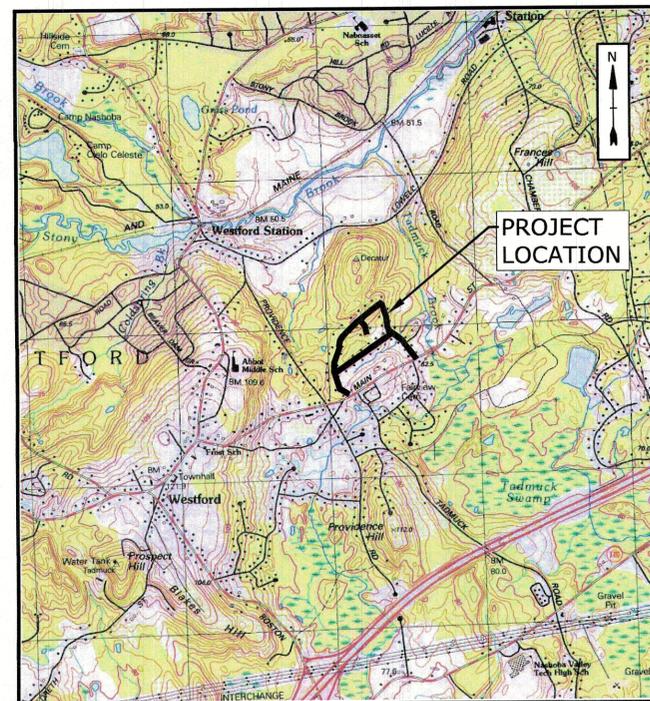
KIRSI CIRCLE

WATER MAIN REPLACEMENT PROJECT

WESTFORD, MASSACHUSETTS

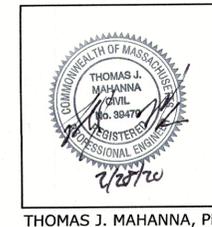
February 2020

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G-003	SHEET INDEX
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C-103	KIRSI CIRCLE WATER MAIN
C-104	KIRSI CIRCLE WATER MAIN
C-105	DOUGLAS ROAD WATER MAIN (ADD ALTERNATE NO. 1)
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C-502	DETAILS - 2 OF 3
C-503	DETAILS - 3 OF 3
C-504	TEMPORARY TRAFFIC MANAGEMENT PLAN

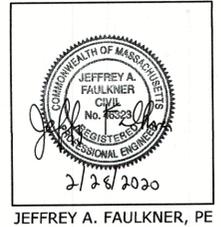


LOCATION MAP
SCALE 1" = 2000'

PREPARED BY:
Tighe & Bond
Engineers | Environmental Specialists



THOMAS J. MAHANNA, PE



JEFFREY A. FAULKNER, PE

PREPARED FOR:
WESTFORD WATER DEPARTMENT
STEPHEN CRONIN, SUPERINTENDENT

BOARD OF WATER COMMISSIONERS
HUGH MAGUIRE, CHAIRPERSON
TITUS PALMER, VICE-CHAIRPERSON
CHAUNCEY CHU, SECRETARY

COMPLETE SET 13 SHEETS

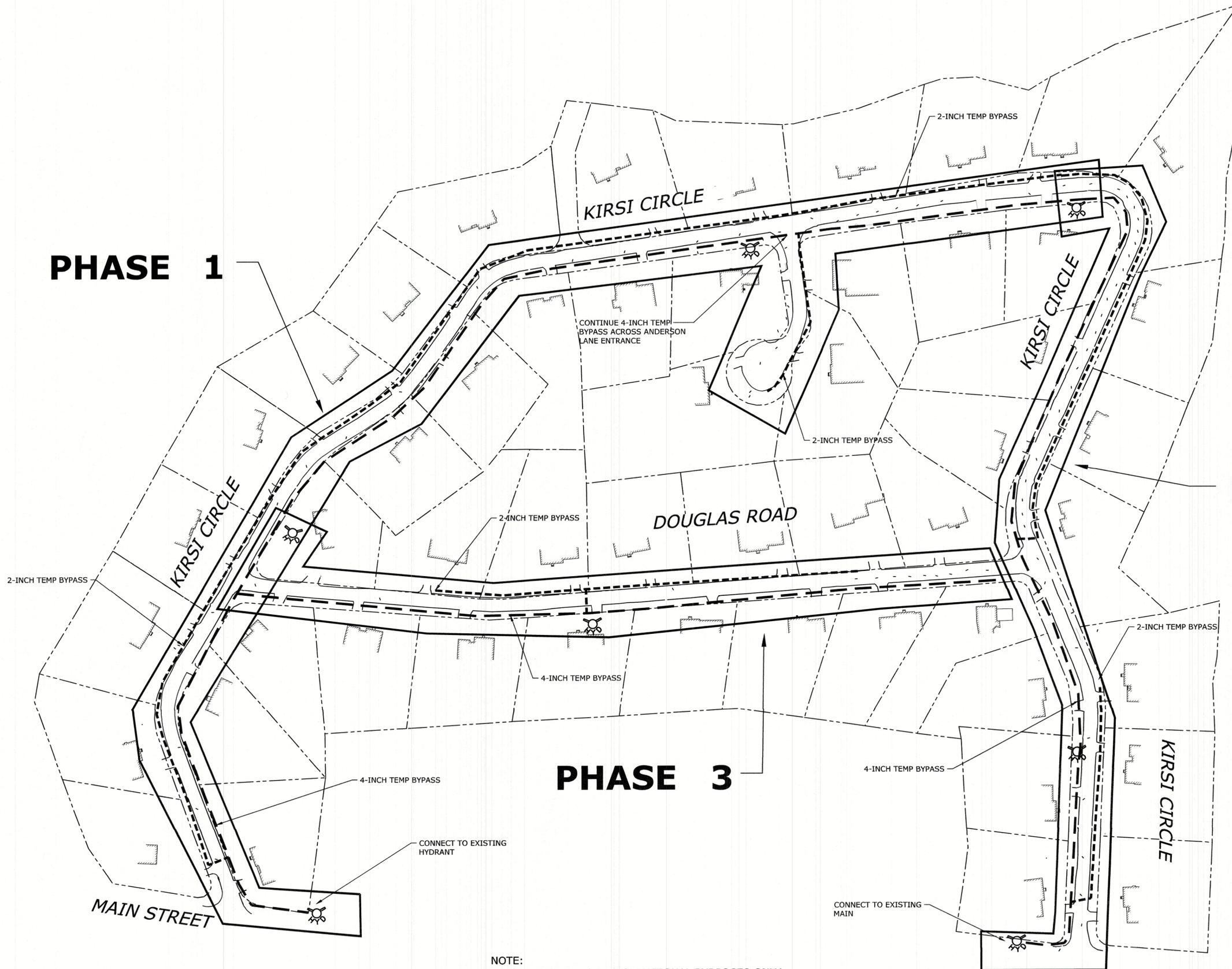
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Plotted On: Feb 26, 2020 2:44pm By: ERChurch
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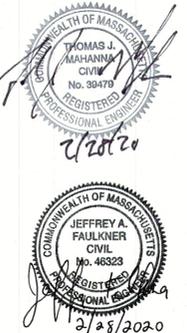
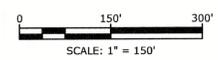
PHASE 1

PHASE 2

PHASE 3



NOTE:
THIS LAYOUT IS FOR INFORMATIONAL PURPOSES ONLY.
THE CONTRACTOR SHALL DEVELOP A TEMPORARY
WATER BYPASS PUMPING PLAN WITH THE APPROVAL OF
THE OWNER AND THE ENGINEER



**Kirsi Circle
Water Main
Replacement
Project**

Westford Water
Department

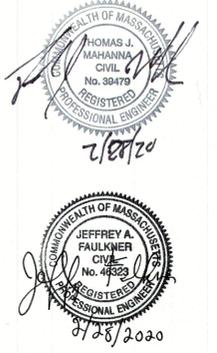
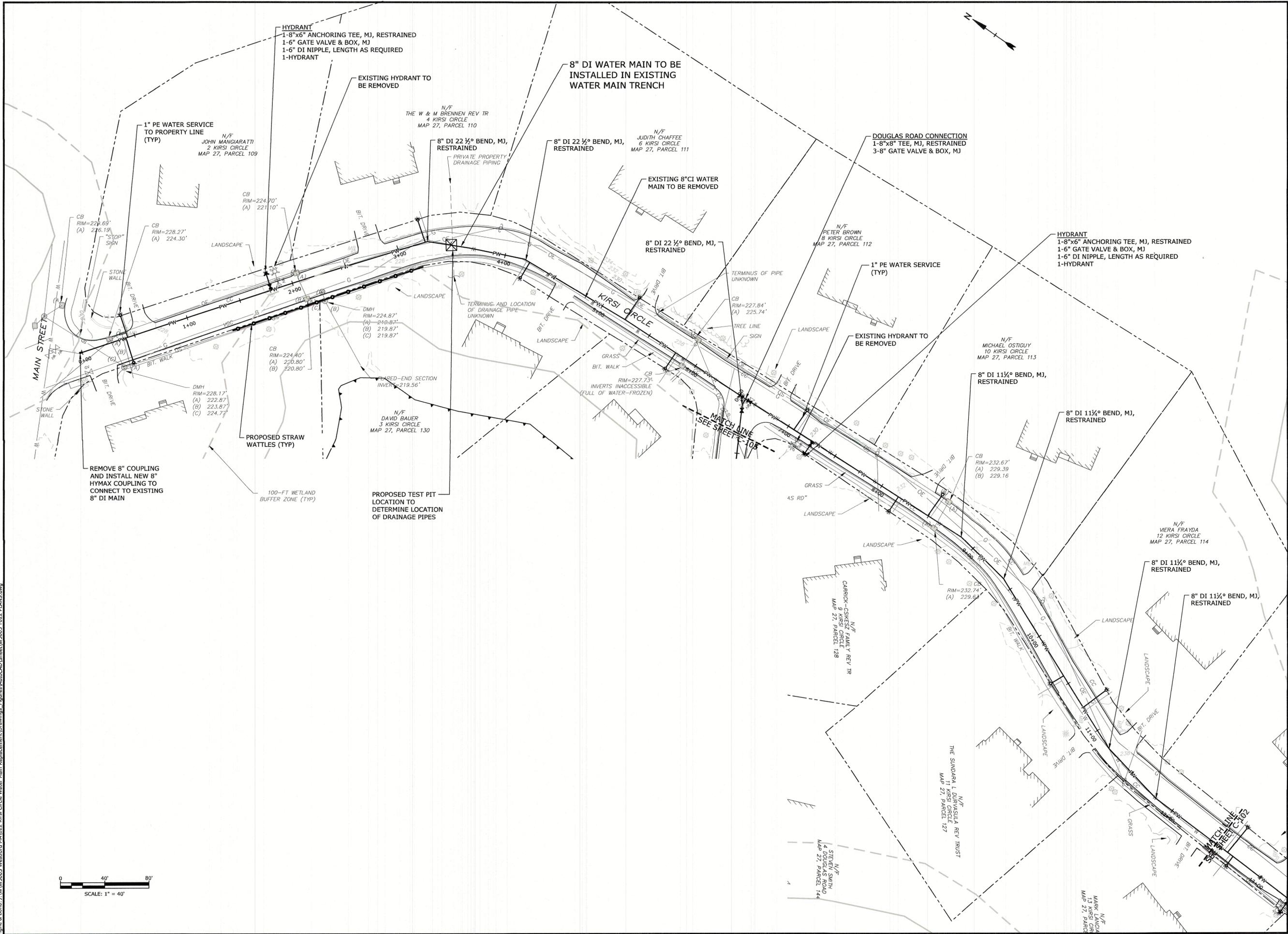
Westford,
Massachusetts

MARK	DATE	DESCRIPTION
A	2/28/2020	BID SET
PROJECT NO:		W5005-022
DATE:		2/28/2020
FILE:		W5005 T022 G-004.dwg
DRAWN BY:		TMP
CHECKED:		ERC/MMO
APPROVED:		TJM

TEMPORARY WATER BYPASS
PHASING

SCALE: 1" = 150'

G-004
SHEET 4 OF 13



**Kirsi Circle
Water Main
Replacement
Project**

Westford Water
Department

Westford,
Massachusetts

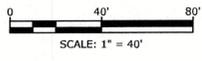
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DATE: 2/28/2020		
FILE: W5005 T022 PLANS.dwg		
DRAWN BY: TMP		
CHECKED: ERC/ MMO		
APPROVED: TJM		

KIRSI CIRCLE WATER MAIN

SCALE: 1" = 40'

C-101
SHEET 5 OF 13

Last Saved: 2/28/2020 12:18pm By: molson
 Plotted On: Feb 28, 2020 12:18pm
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Kirsi Circle Water Main Replacement Project

Westford Water Department

Westford, Massachusetts

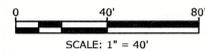
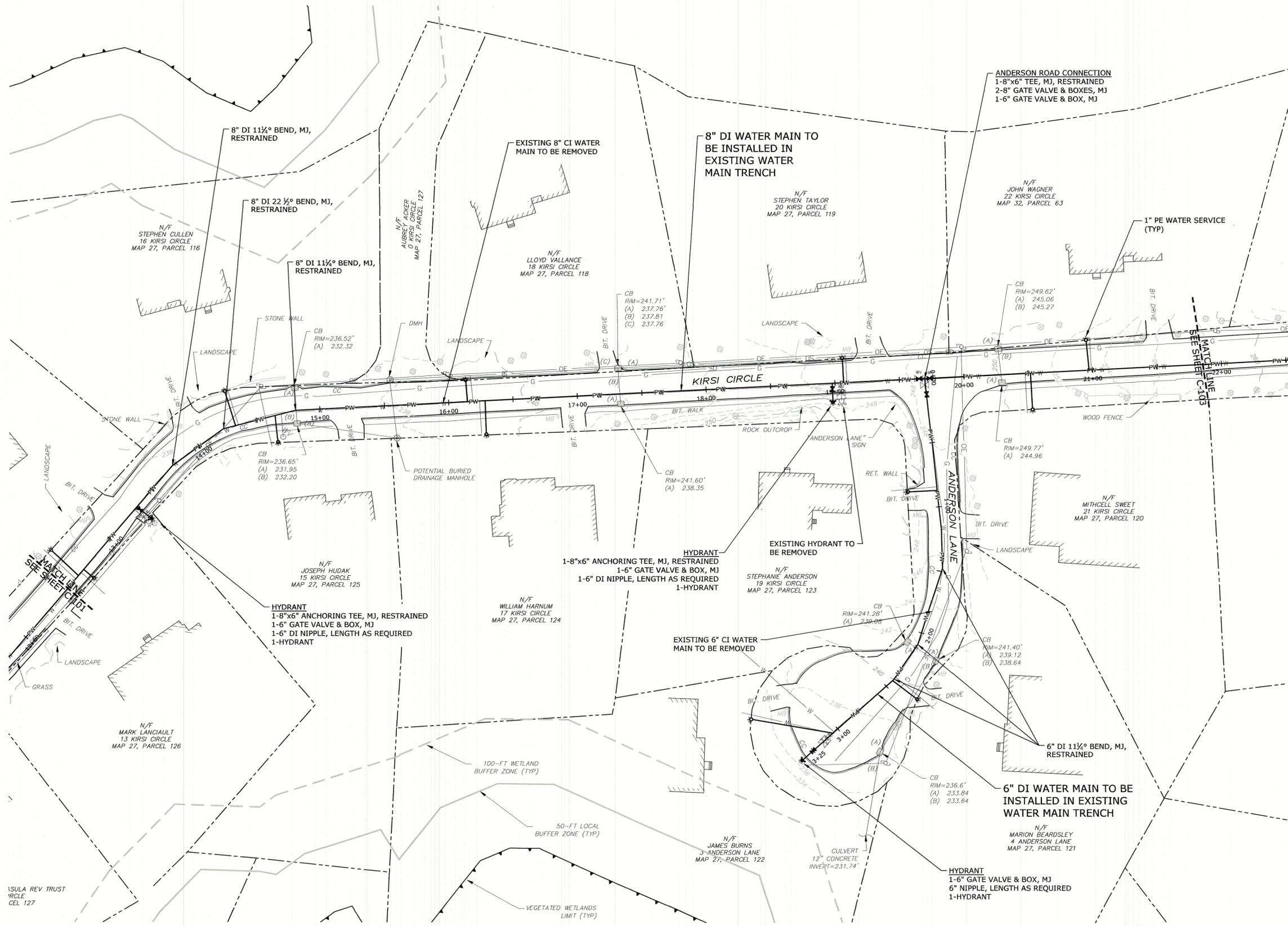
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FILE:	W5005 T022 PLANS.dwg
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CHECKED:	ERC/MMO
APPROVED:	TJM

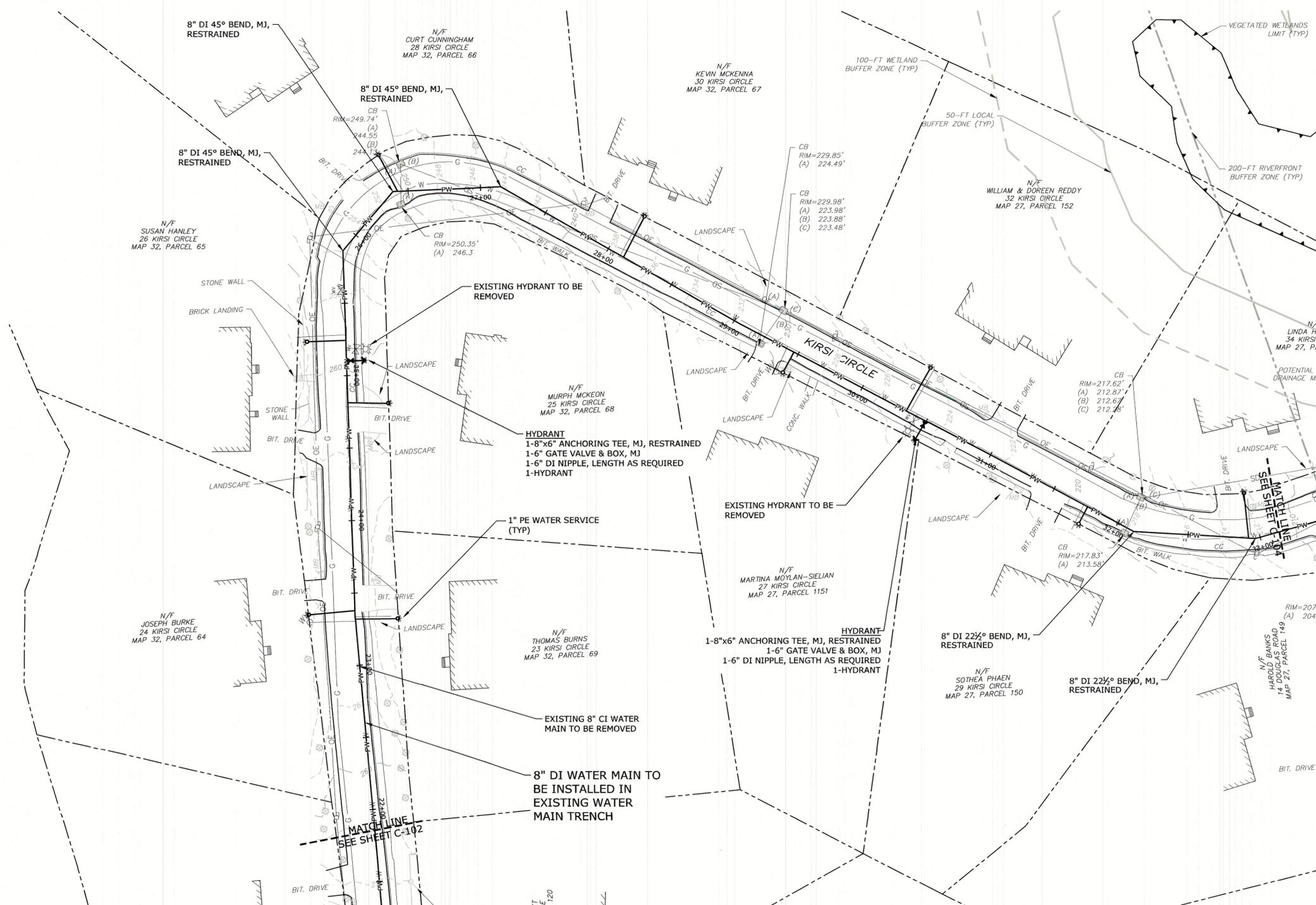
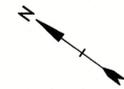
KIRSI CIRCLE WATER MAIN AND ANDERSON LANE WATER MAIN

SCALE: 1"=40'

C-102
SHEET 6 OF 13



Last Saved: 2/28/2020 12:19pm By: molison
 Plotted On: Feb 28, 2020 10:12:15am
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**Kirsi Circle
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 Department

Westford,
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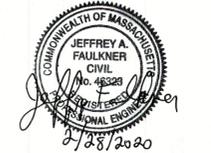
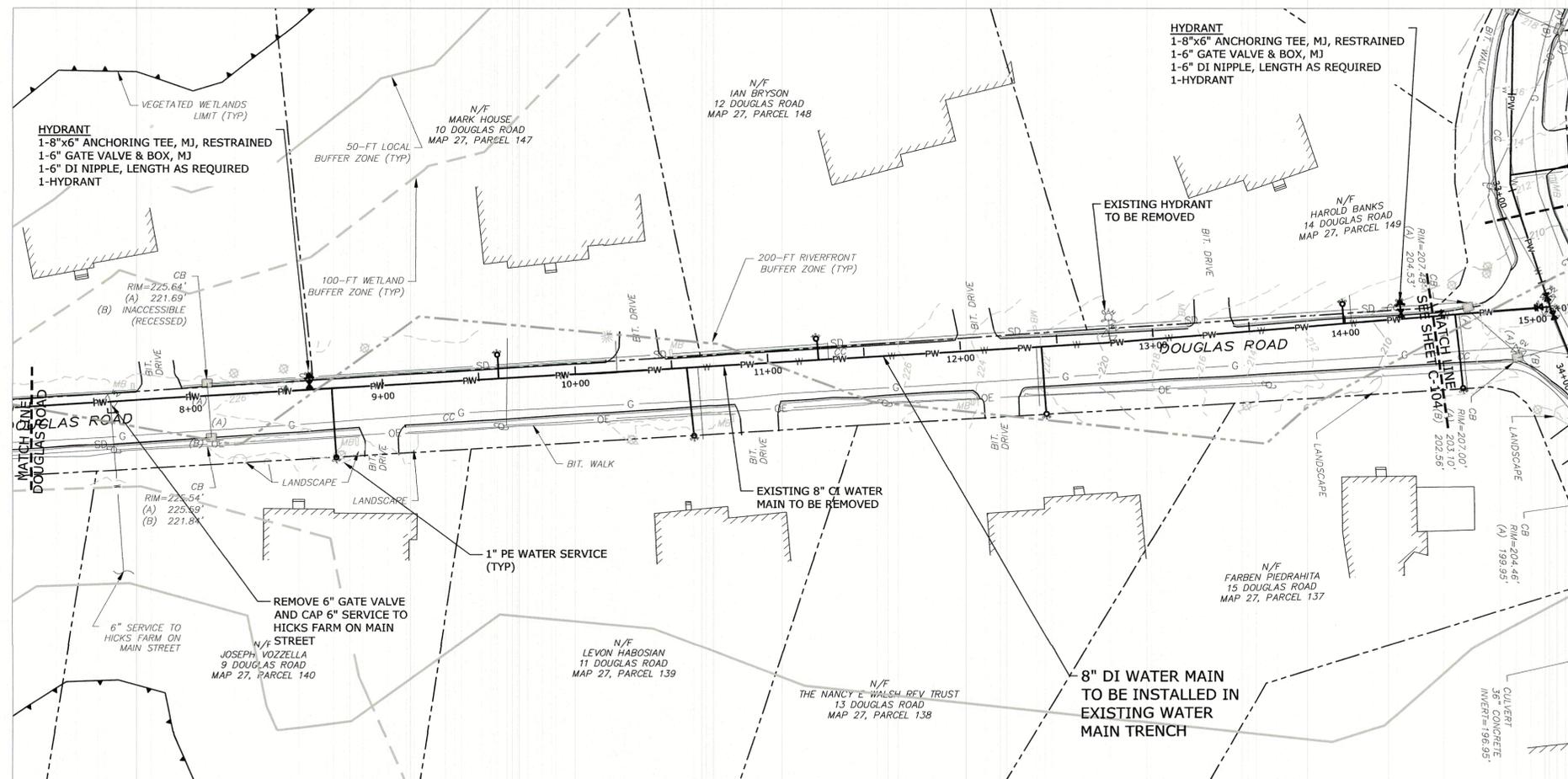
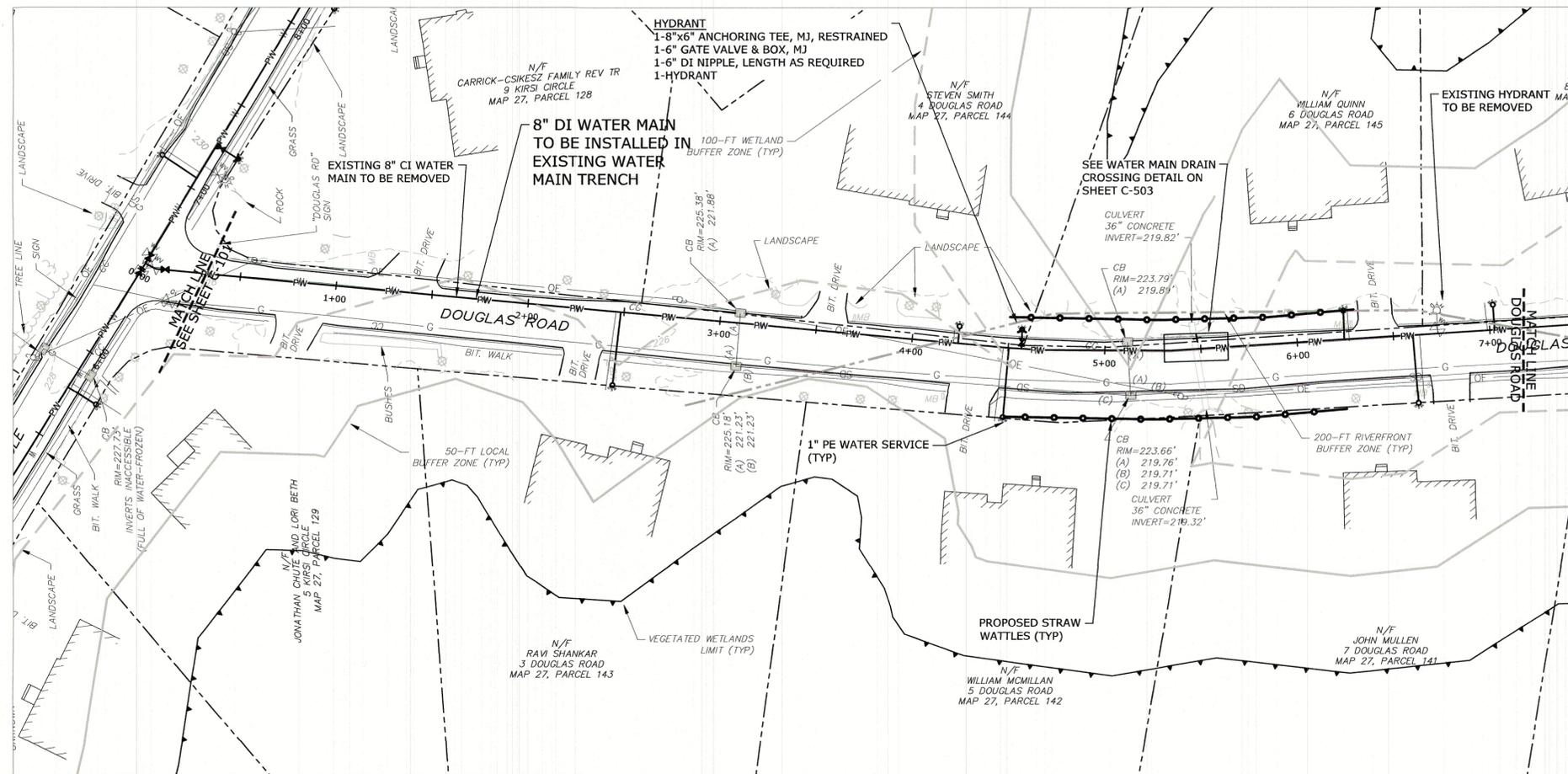
PROJECT NO: W5005-022
 DATE: 2/28/2020
 FILE: W5005 T022 PLANS.dwg
 DRAWN BY: TMP
 CHECKED BY: ERC/ MMO
 APPROVED: TJM

KIRSI CIRCLE WATER MAIN

SCALE: 1" = 40'

C-103
 SHEET 7 OF 13

Last Saved: 2/28/2020 12:19pm
 Plotted On: Feb 28, 2020 12:19pm
 By: molson
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**Kirsi Circle
Water Main
Replacement
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Westford Water
Department

Westford,
Massachusetts

MARK	DATE	DESCRIPTION
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PROJECT NO: W5005-022

DATE: 2/28/2020

FILE: W5005 T022 PLANS.dwg

DRAWN BY: TMP

CHECKED: ERC/MMO

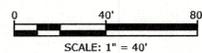
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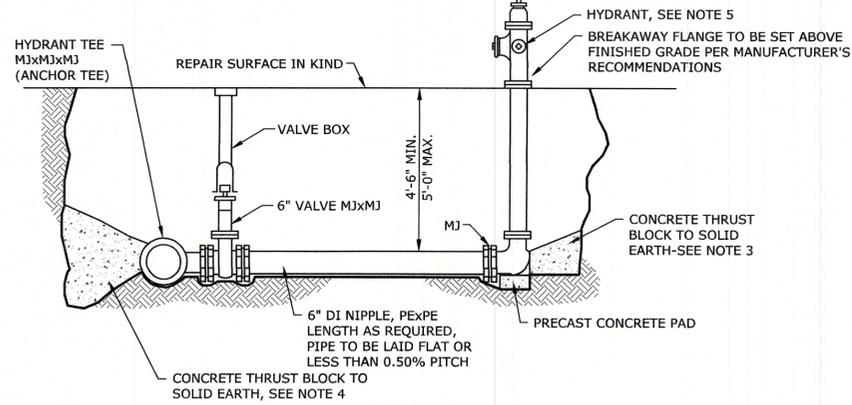
**DOUGLAS ROAD WATER
MAIN
ADD ALTERNATE NO. 1**

SCALE: 1"=40'

C-105
SHEET 9 OF 13

Last Saved: 2/28/2020 12:20pm By: molson
 Plotted On: Feb 28, 2020 12:20pm
 Tighe & Bond: J:\W5005 Westford MA\022 Kirsi Circle Water Main Replacement\Drawings\Figures\AutoCAD\Sheet\W5005 T022 PLANS.dwg



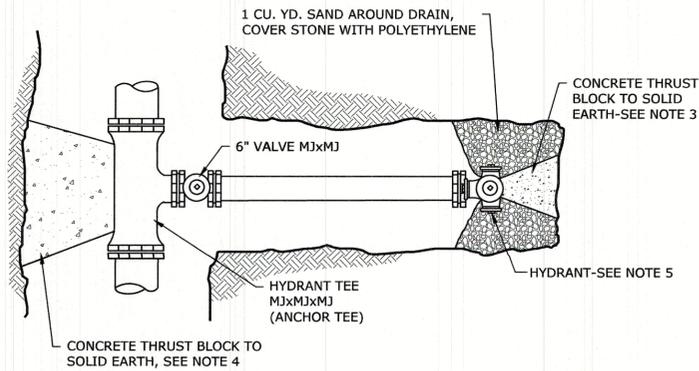


ELEVATION

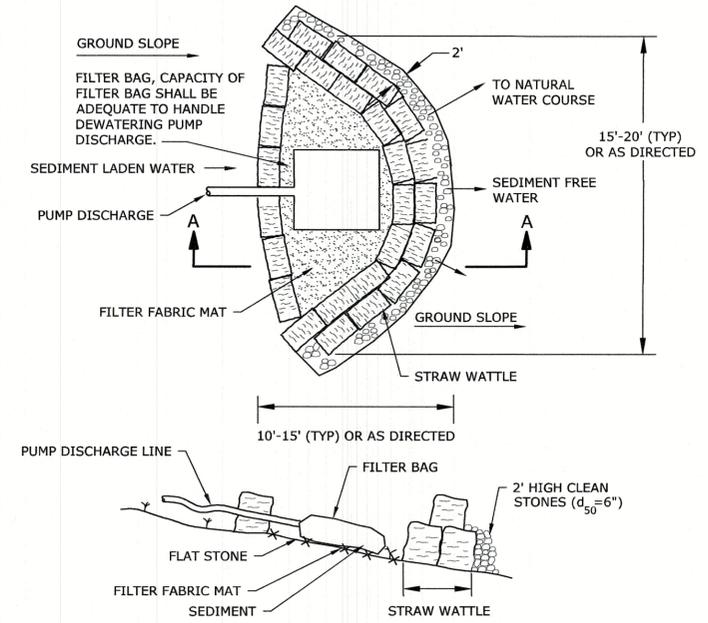
NOTES

1. ALL CONCRETE TO BE PRECAST (3000 PSI).
2. ALL MJ JOINTS SHALL HAVE RETAINER GLANDS.
3. CARE SHALL BE TAKEN TO SHIELD HYDRANT BASE DRAIN HOLES DURING PLACEMENT OF THE CONCRETE THRUST BLOCK. DRAIN HOLES SHALL BE VERIFIED AS OPEN AND FREE OF OBSTRUCTIONS PRIOR TO BACKFILLING.
4. CARE SHALL BE TAKEN TO SHIELD ALL MECHANICAL JOINT GLANDS AND BOLTS DURING PLACEMENT OF CONCRETE THRUST BLOCK. ALL BOLTS AND GLANDS SHALL BE FREE AND UNOBSTRUCTED BEFORE BACKFILLING.
5. HYDRANT SHALL BE SET PLUMB. VERTICAL HYDRANT EXTENSIONS SHALL BE USED AS NECESSARY TO PROPERLY LOCATE THE BREAKAWAY FLANGE PER MANUFACTURER'S RECOMMENDATIONS. HYDRANT LOCATION TO BE COORDINATED WITH THE WESTFORD WATER DEPARTMENT.

WATER MAIN HYDRANT INSTALLATION
NO SCALE



PLAN

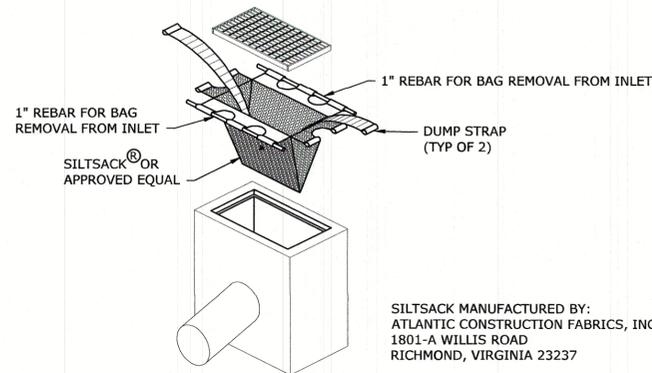


SECTION A-A

NOTES:

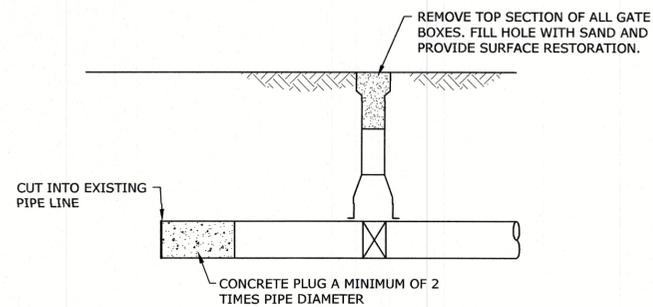
1. THE GROUNDWATER DISCHARGE FILTER SHALL BE INSTALLED FOR ANY DEWATERING ACTIVITY LOCATED WITHIN THE 100' WETLAND REGULATED AREA. A FILTER BAG IS REQUIRED FOR DEWATERING ACTIVITIES LOCATED OUTSIDE OF THE REGULATED AREA.

DEWATERING DISCHARGE FILTER
NO SCALE

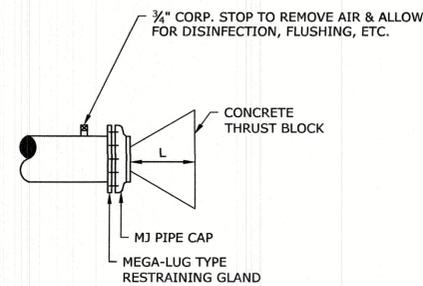


SILTSACK MANUFACTURED BY:
ATLANTIC CONSTRUCTION FABRICS, INC.
1801-A WILLIS ROAD
RICHMOND, VIRGINIA 23237

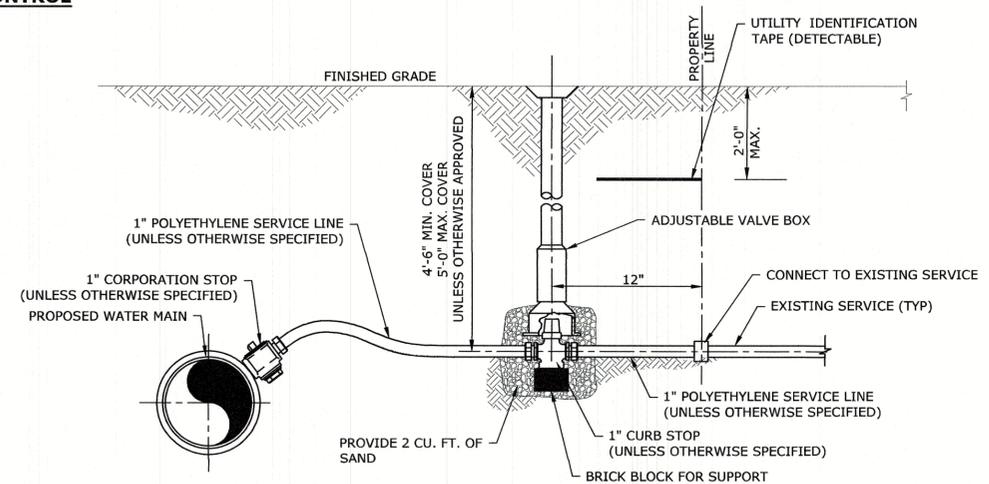
SILTSACK[®] EROSION CONTROL
NO SCALE



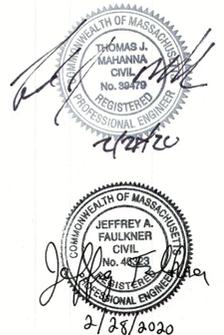
TYPICAL WATER MAIN ABANDONMENT DETAIL (FOR PIPES NOT SUBJECT TO PRESSURE)
NO SCALE



WATER MAIN CAPPING DETAIL
NO SCALE



WATER SERVICE CONNECTIONS
NO SCALE



Kirsi Circle Water Main Replacement Project

Westford Water Department

Westford, Massachusetts

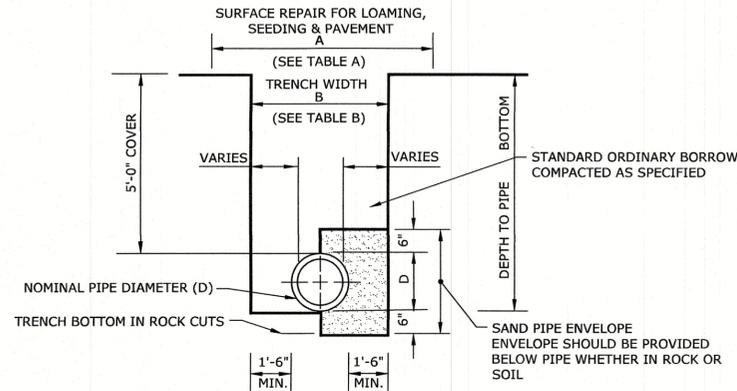
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FILE: W5005 T022 Details.dwg
DRAWN BY: TMP
CHECKED: ERC/MMO
APPROVED: TJM

DETAILS
1 OF 3

SCALE: NO SCALE

C-501
SHEET 10 OF 13

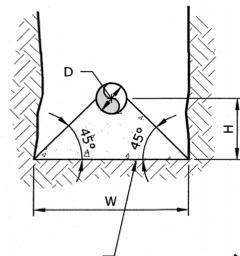


TYPICAL TRENCH SECTION - EARTH AND ROCK EXCAVATION PIPE TRENCH PAYLINE LIMITS
NO SCALE

TABLE A - MAXIMUM SURFACE REPAIR PAY WIDTHS (SEE NOTES)	
NOMINAL PIPE DIAMETER	0 - 12"
LOAMING & SEEDING	8'-6" MAX.
TABLE B - MAXIMUM TRENCH EXCAVATION PAY WIDTHS (SEE NOTES)	
NOMINAL PIPE DIAMETER	0 - 12"
	5'-0"

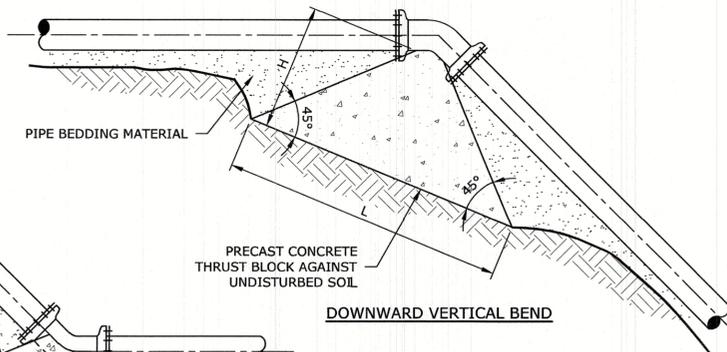
- NOTES:**
- THE PAYLINE DIMENSIONS SHOWN REPRESENT THE MAXIMUM PAYLINE LIMITS TO BE PAID. WHEN THE ACTUAL SURFACE REPAIR OR TRENCH WIDTH IS LESS, THE ACTUAL WIDTH SHALL BE PAID FOR AT THE APPLICABLE UNIT PRICE.
 - ALL EXCAVATION EXCLUDING ROCK THAT IS RELATED TO PIPE AND STRUCTURE INSTALLATION IS INCLUDED IN THE UNIT PRICE PER PIPE OR STRUCTURE ITEM. TRENCH PAYLINE LIMITS ARE USED FOR ROCK EXCAVATION ONLY.

TRENCH PAYLINES
NO SCALE

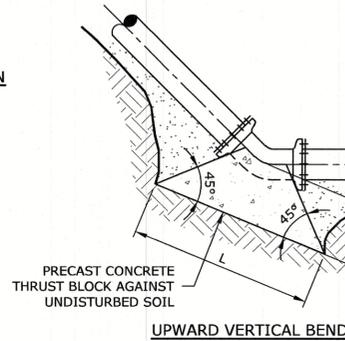


PRECAST CONCRETE THRUST BLOCK AGAINST UNDISTURBED SOIL

SECTION



DOWNWARD VERTICAL BEND



UPWARD VERTICAL BEND

D	UPWARD VERTICAL BENDS				DOWNWARD VERTICAL BENDS			
	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)
12"	2.0	2.6	4.0	10.5	8.8	4.4	5.0	22.0
8"	2.8	2.2	1.8	4.92	6.0	3.0	5.0	15.1
6"	2.1	2.3	1.4	2.86	4.6	2.3	5.0	11.5

* THE WIDTH OF THE BLOCK (W) IS ASSUMED TO BE THE WIDTH OF THE TRENCH.

CONCRETE THRUST BLOCK FOR VERTICAL BENDS
NO SCALE

SIZE (IN.)	FITTING	MINIMUM RESTRAINED LENGTH, FT. *
8"	90° BEND	19
8"	45° BEND	8
8"	22 1/2° BEND	4
8"	11 1/4° BEND	2
8"	DEAD END	39
8"	45° VERTICAL UP BEND	5
8"	45° VERTICAL DOWN BEND	16
	8"x12" TEE	1
	8"x8" TEE	5
	8"x6" TEE	1
	6"x6" TEE	1

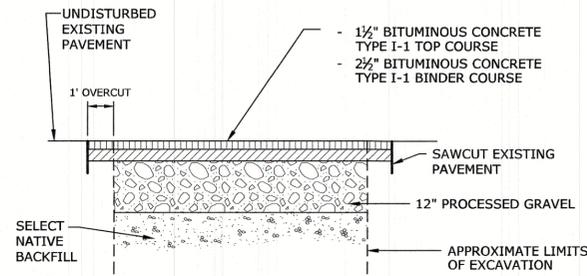
MINIMUM RESTRAINED LENGTH BASED ON EBAA IRON RESTRAINT LENGTH CALCULATOR, LATEST EDITION.

FOLLOWING CONDITIONS APPLY:
SOIL TYPE: SAND SILT
MAX. PRESSURE: 200psi
TRENCH TYPE 4
BURIED DEPTH: 5'

ALL RESTRAINED LENGTH FOR 6-INCH PIPE TO MATCH THOSE FOR 8-INCH PIPE SHOWN IN TABLE.

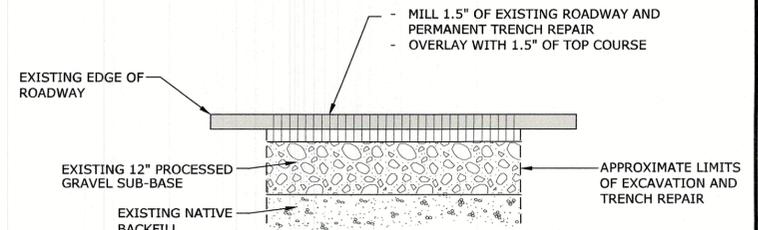
* TABLE SUBJECT TO RECALCULATIONS BASED ON OBSERVED FIELD CONDITIONS.

MINIMUM RESTRAINED LENGTHS FOR DI PIPE



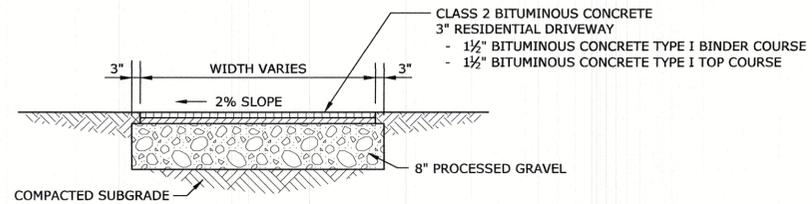
- NOTES:**
- REFER TO SPECIFICATION SECTION 02740 FOR COMPLETE PAVEMENT REPAIR REQUIREMENTS.

TRENCH REPAIR
NO SCALE

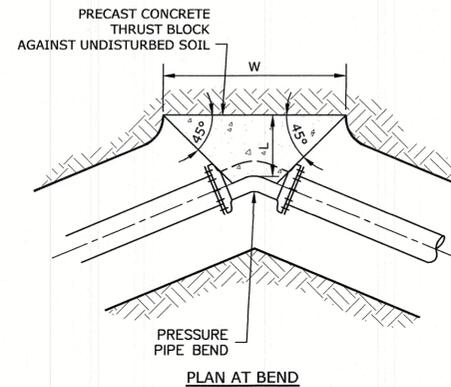


- NOTE:**
- AFTER ADDITIONAL SETTLEMENT PERIOD, COMPLETE 3" FULL-WIDTH MILL AND OVERLAY FOR ALL STREETS

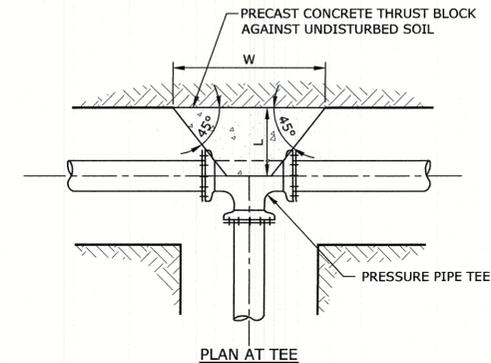
FULL-WIDTH MILL AND OVERLAY (ADD ALTERNATE NO. 1)
NO SCALE



BITUMINOUS CONCRETE DRIVEWAY DETAIL
NO SCALE

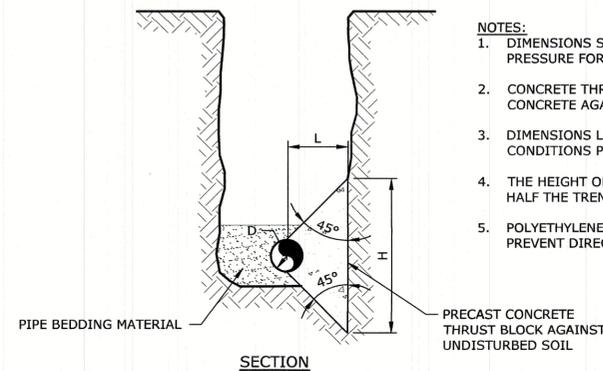


PLAN AT BEND



PLAN AT TEE

- NOTES:**
- DIMENSIONS SHOWN CALCULATED PER 200 PSI INTERNAL PIPE PRESSURE FOR SOIL BEARING LOADS OF 3,000 PSF.
 - CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED OF PRECAST CONCRETE AGAINST UNDISTURBED SOIL.
 - DIMENSIONS L, W, & H MAY BE ADJUSTED TO MEET FIELD CONDITIONS PROVIDED THE BEARING AREA REMAINS UNCHANGED.
 - THE HEIGHT OF THE BLOCK (H) SHALL BE LESS THAN OR EQUAL TO HALF THE TRENCH DEPTH.
 - POLYETHYLENE SHEETING SHALL BE PLACED OVER MJ FITTINGS TO PREVENT DIRECT CONTACT BETWEEN CONCRETE AND THE FITTING.



SECTION

D	CONCRETE THRUST BLOCK																
	11 1/4° BEND				22 1/2° BEND				45° BEND				TEE/DEAD END				
	AREA (OUTSIDE DIA.) (IN SQ)	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)	"L" (FT)	"H" (FT)	"W" (FT)	BEARING AREA (SF)
12"	136.8	0.7	1.3	2.1	2.68	1.0	1.9	2.8	5.34	1.3	2.6	4.0	10.47	1.5	3.0	4.6	13.68
8"	64.3	0.5	0.9	1.4	1.26	0.7	1.3	1.9	2.51	0.9	1.8	2.7	4.92	1.1	2.1	3.1	6.43
6"	37.4	0.4	0.7	1.0	0.73	0.5	1.0	1.5	1.46	0.7	1.4	2.0	2.86	0.8	1.6	2.3	3.74

CONCRETE THRUST BLOCK FOR HORIZONTAL BENDS AND TEES
NO SCALE

THOMAS J. MAHANNA
CIVIL ENGINEER
No. 98479
2/27/20

JEFFREY A. FAULKNER
CIVIL ENGINEER
No. 46323
2/28/2020

Kirsi Circle Water Main Replacement Project

Westford Water Department

Westford, Massachusetts

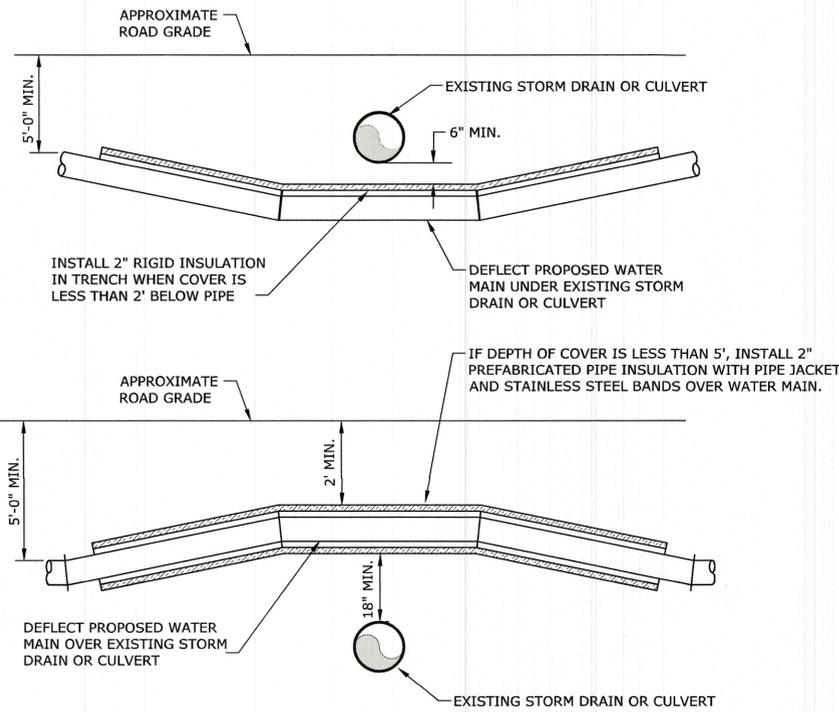
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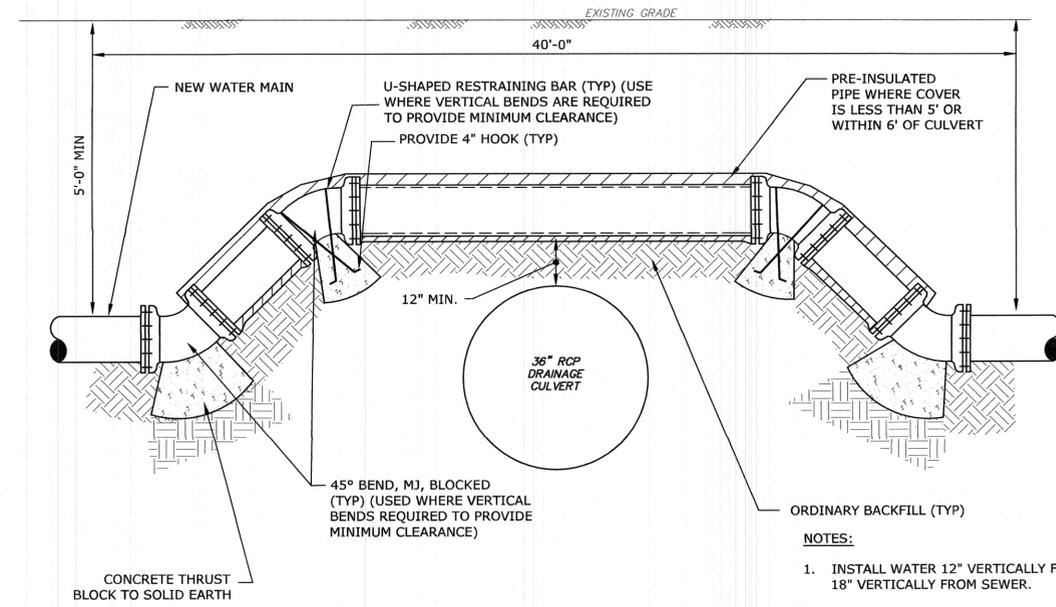
DETAILS
2 OF 3

SCALE: NO SCALE

C-502
SHEET 11 OF 13

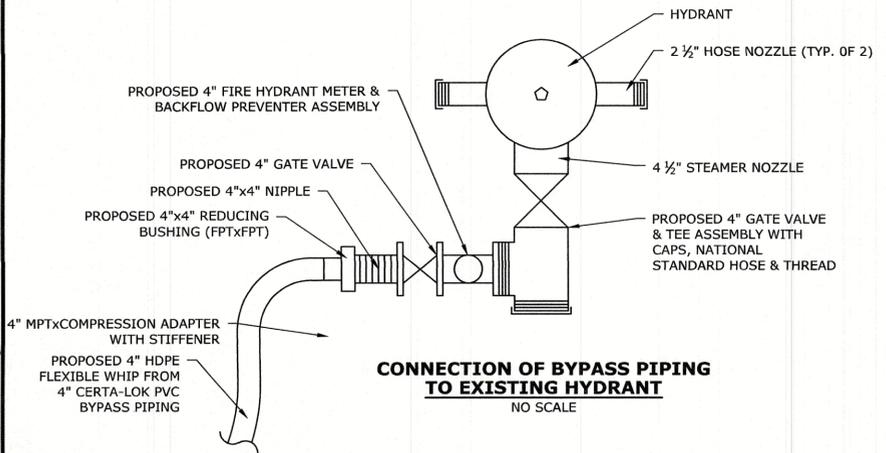


WATER MAIN DRAIN CROSSING
NO SCALE

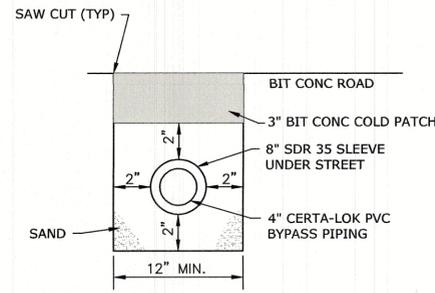


PROFILE OF WATER MAIN INSTALLATION AT CULVERT CROSSING - OVER CULVERT ON KIRSI CIRCLE AT STA. 35+50
NO SCALE

- NOTES:
1. INSTALL WATER 12" VERTICALLY FROM UTILITY, 18" VERTICALLY FROM SEWER.
 2. PIPE SHALL BE FULLY RESTRAINED MINIMUM 18" EACH SIDE OF ELBOWS.

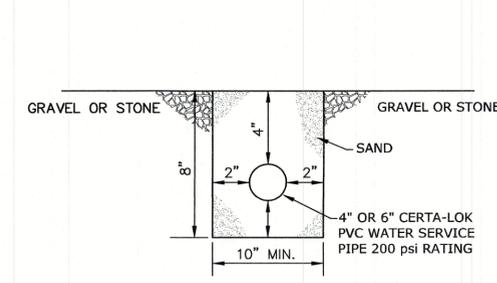


CONNECTION OF BYPASS PIPING TO EXISTING HYDRANT
NO SCALE

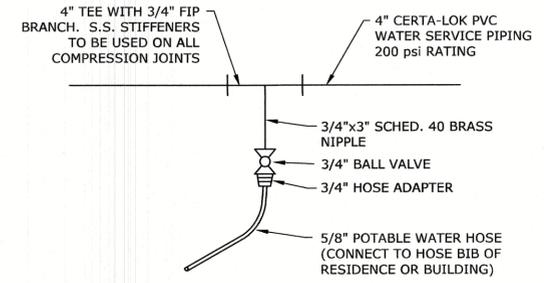


TYPICAL BYPASS PIPING - STREET CROSSING
NO SCALE

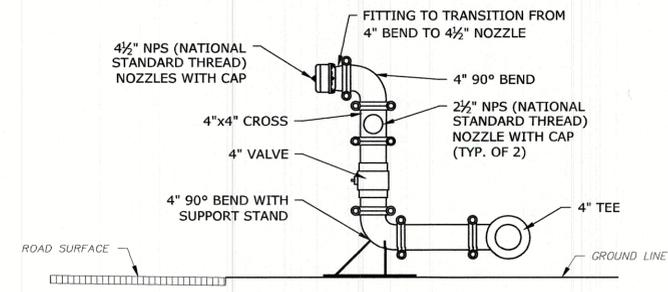
- NOTES:
1. AFTER BYPASS PIPING IS REMOVED, REPAIR AS SHOWN IN DETAIL



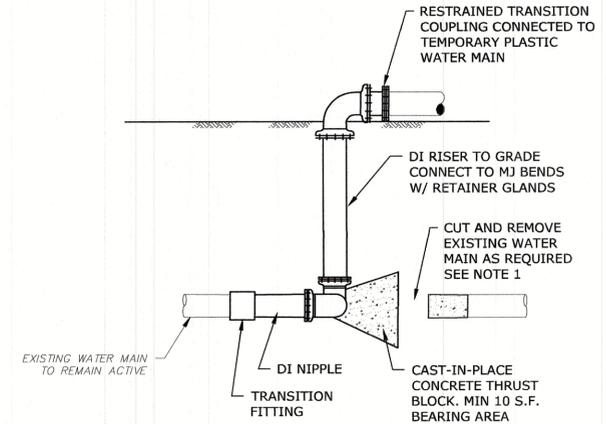
BYPASS PIPING CROSSING A STONE OR GRAVEL DRIVEWAY
NO SCALE



TEMPORARY WATER SERVICE CONNECTION
NO SCALE



TEMPORARY HYDRANT DETAIL
NO SCALE



- NOTE:
1. AT END OF PROJECT, REMOVE TEMPORARY PIPING TO A MINIMUM 3 FT BELOW GRADE. PLUG AND ABANDON EXISTING WATER MAIN IN PLACE.

CONNECTION OF TEMPORARY WATER MAIN TO EXISTING WATER MAIN
NO SCALE

Kirsi Circle Water Main Replacement Project

Westford Water Department

Westford, Massachusetts

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CHECKED BY: ERC/ MMO		
APPROVED BY: TJM		

DETAILS
3 OF 3

SCALE: NO SCALE

C-503
SHEET 12 OF 13

Last Saved: 2/28/2020 11:52am By: molson
Printed On: Feb 28, 2020 11:52am By: molson
Tighe & Bond: J:\W5005 Westford MA\022 Kirsi Circle Water Main Replacement\Drawings_Figures\AutoCAD\Sheet\W5005 T022 Details.dwg

GENERAL NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
- THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM LANE WIDTH IS TO BE 10 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- SIGN MA-R2-10a AND MA-R2-10e SHALL BE LOCATED AT THE PROJECT LIMITS FOR THE DURATION OF THE WORK.

LEGEND

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- P/F POLICE/FLAGGER DETAIL
- ▨ TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- ➔ ARROW BOARD
- ▨ WORK ZONE
- ➔ DIRECTION OF TRAFFIC
- ▨ IMPACT ATTENUATOR
- ▨ MEDIAN BARRIER
- ▨ MEDIAN BARRIER WITH WARNING LIGHTS
- 🚚 WORK VEHICLE
- 🚚 TRUCK MOUNTED ATTENUATOR
- ➔ TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN

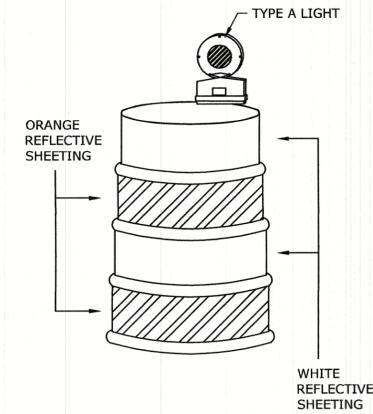


WORK ZONE LIMIT SIGNS
SEE NOTE 12

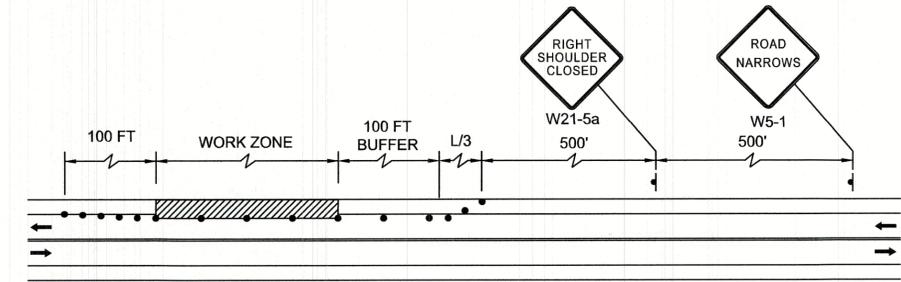
SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

FORMULAS FOR DETERMINING TAPER LENGTHS

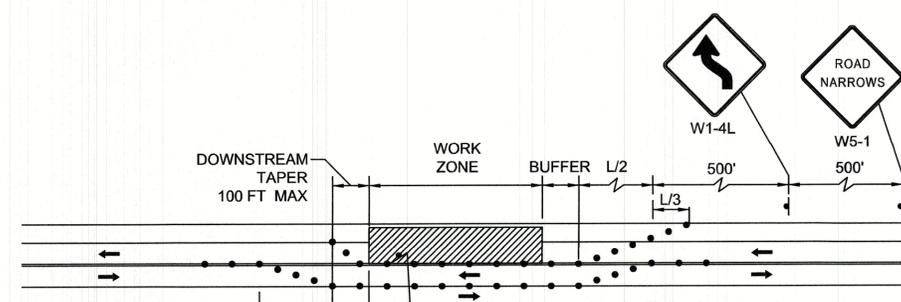
WHERE:
L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH



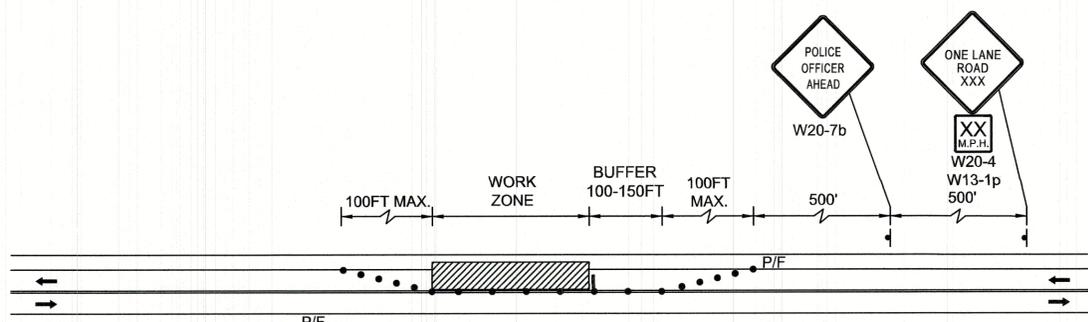
- NOTES:**
- DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.
 - DRUMS SHALL BE APPROXIMATELY 36" IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 3/32" AND A MINIMUM DIAMETER OF 18" REGARDLESS OF ORIENTATION.
 - DRUM MATERIAL MUST BE APPROVED UV RESISTANT, LOW DENSITY, IMPACT RESISTANT, LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT).
 - SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE IV REFLECTORIZED SHEETING CONFORMING TO M.9.30.0.
 - ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS NOT TO REDUCE REFLECTIVE EFFICIENCY. WHEN A DRUM LOSES TARGET VALUE IT SHALL BE REPLACED.
 - STORE UNUSED DRUMS IN ONE LOCATION, AWAY FROM ALL TRAFFIC, OR REMOVE FROM SITE ENTIRELY.



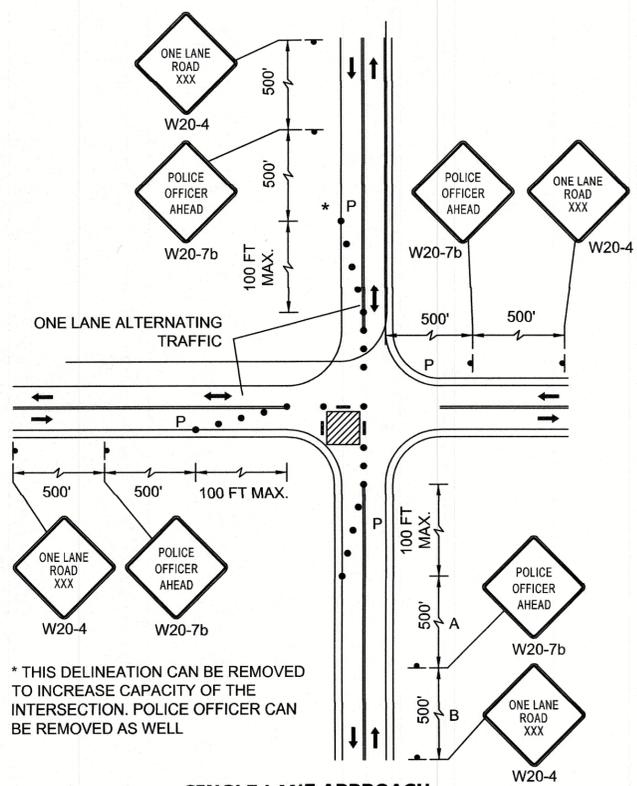
TWO LANE ROAD SHOULDER CLOSED



TWO LANE ROAD SHOULDER AND TRAVEL LANE CLOSED

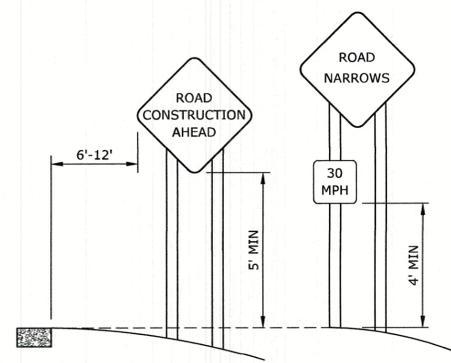


TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC

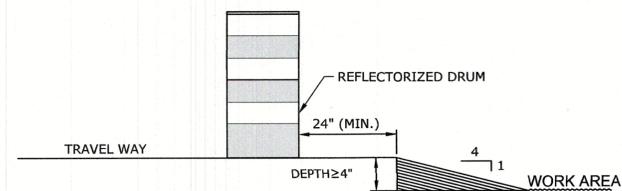


SINGLE LANE APPROACH ONE QUADRANT CLOSURE

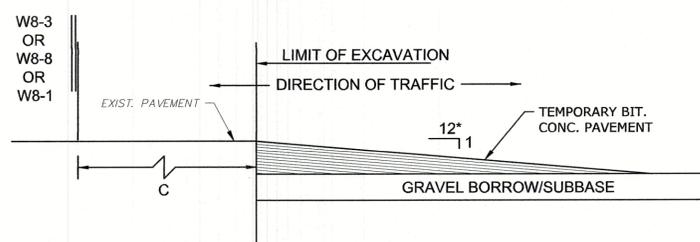
* THIS DELINEATION CAN BE REMOVED TO INCREASE CAPACITY OF THE INTERSECTION. POLICE OFFICER CAN BE REMOVED AS WELL



TYPICAL INSTALLATION OF PROJECT SIGNS



LATERAL DROP-OFF DETAIL
NO SCALE



LONGITUDINAL DROP-OFF DETAIL
NO SCALE

* - INCREASE SLOPE RATIO FOR HIGHER SPEEDS

Kirsi Circle Water Main Replacement Project

Westford Water Department

Westford, Massachusetts

MARK	DATE	DESCRIPTION
A	2/28/2020	BID SET
PROJECT NO: W5005-022		
DATE: 2/28/2020		
FILE: W5005 T022 Details 4.dwg		
DRAWN BY: TMP		
CHECKED: ERC/MMO		
APPROVED: TJM		

TEMPORARY TRAFFIC MANAGEMENT PLAN

SCALE: AS SHOWN

C-504
SHEET 13 OF 13

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