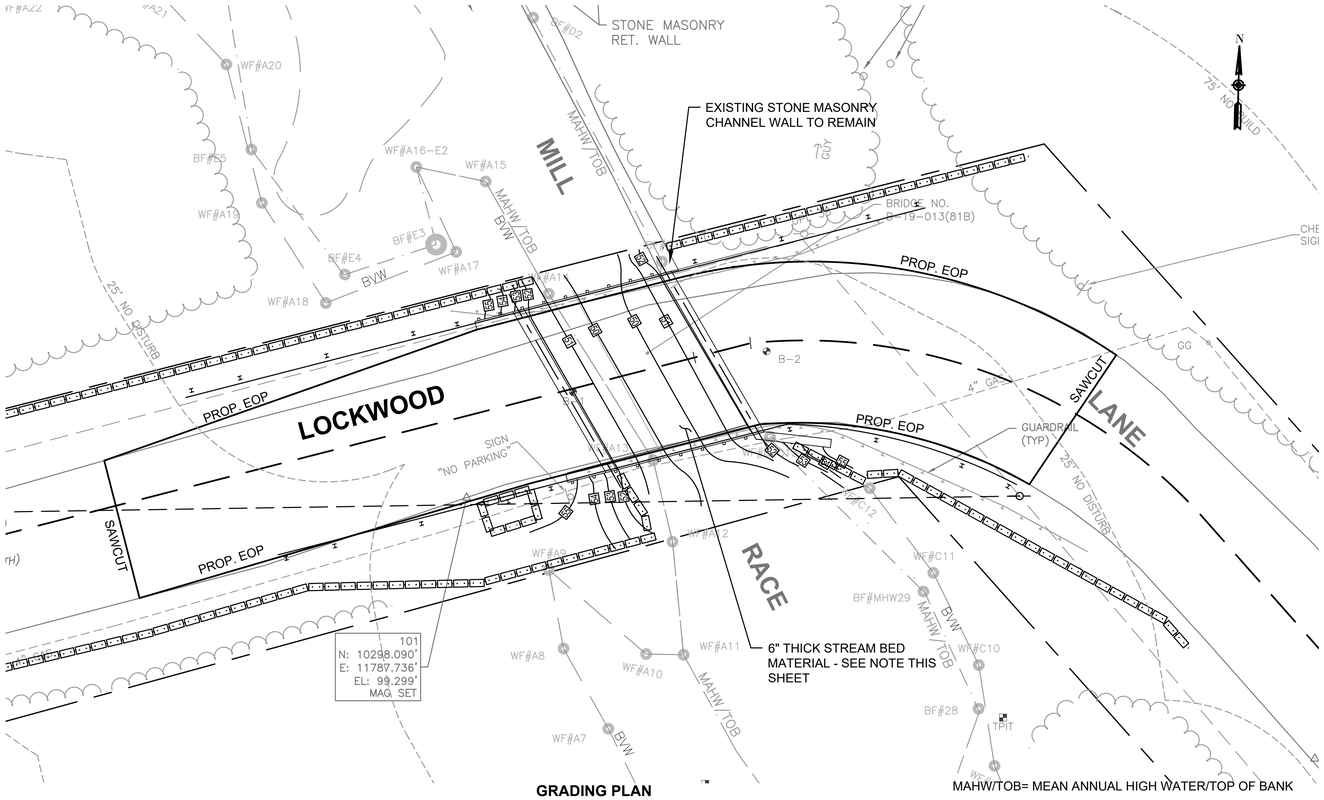


GRADING PLAN

SCALE: 1"=10'

MAHW/TOB= MEAN ANNUAL HIGH WATER/TOP OF BANK

STREAM BED MATERIAL

1. DUE TO EXCESSIVE VELOCITY WITH THE CHANNEL IN THE VICINITY OF THE STRUCTURE, THE STREAM BED MATERIAL IS LIKELY NOT THE SAME GRADATION AS THE NATURAL CHANNEL. STREAM BED MATERIAL SHALL BE REUSED ONLY WHEN IT MEETS THE CHANNEL GRADATION SPECIFIED BELOW. IN SOME CASES THE EXISTING MATERIAL CAN BE BLENDED WITH FINER MATERIAL TO BE REUSED.
2. CHANNEL SHALL BE BROUGHT TO WITHIN 6 INCHES OF FINISHED BED GRADE USING EXISTING ABUTMENT FIELDSTONES. ANY EXISTING CONCRETE SHALL BE REMOVED AND DISPOSED OF OFF-SITE BY THE CONTRACTOR.
3. STREAM BED MATERIAL SHALL BE CRUSHED, PARTIAL CRUSHED OR NATURALLY OCCURRING GRANULAR MATERIAL.
4. STREAM BED MATERIAL SHALL MEET THE FOLLOWING REQUIREMENTS FOR GRADING AND QUALITY WHEN PLACED IN HAULING VEHICLES FOR DELIVERY TO JOBSITE. (PERCENTAGES BY MASS)

SEDIMENT

SIEVE	% PASSING
2-1/2" SQUARE	100
2" SQUARE	65-100
1" SQUARE	50-85
#4	25-45
#40	16 MAX.
#200	5-10

GRAVEL/COBBLES

PERCENT FINER	SIZE (MM)
D16	8
D35	10
D50	12
D65	15
D84	21
D95	32

GENERAL NOTES:

SEE BRIDGE STRUCTURAL DRAWINGS FOR BRIDGE COMPONENTS AND DESIGN

DEMOLITION NOTES

1. EXISTING SUPERSTRUCTURE TO BE REMOVED
2. EXISTING CONCRETE ABUTMENT CAPS TO BE REMOVED AND DISPOSED OF OFF-SITE.
3. EXISTING ABUTMENT FIELDSTONES SHALL BE STOCKPILED FOR REUSE AS CHANNEL FILL AND EMBANKMENT KEYSTONES.

NOTE: UPSTREAM CHANNEL WALL SHALL NOT BE REMOVED.

VEGETATED AREAS/SLOPES:
3:1 SLOPES: 4" LOAM AND SEED
2:1 SLOPES: 4" LOAM AND STRAW MULCH

HYDRAULIC DESIGN DATA

DRAINAGE AREA:	14.1 SQUARE MILES
DESIGN FLOOD DISCHARGE:	400 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY:	10 YEARS
DESIGN FLOOD VELOCITY:	3.9 FEET PER SECOND
DESIGN FLOOD ELEVATION:	54.63 FEET
LOWER CHORD ELEVATION:	54.68 FEET

EMBANKMENT KEYSTONES

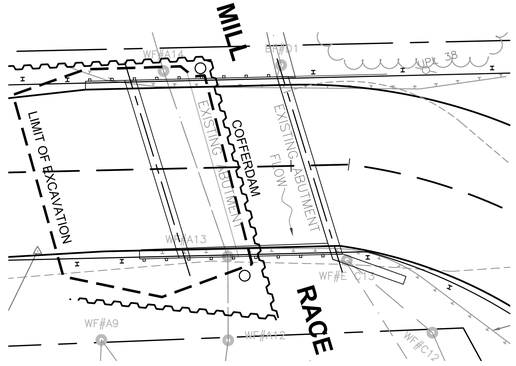
1. BASE STONES FROM EXISTING STONE MASONRY ABUTMENTS SHALL BE REUSED AS EMBANKMENT STONES.
2. WHERE THE EXISTING ABUTMENT STONES ARE NOT OF SUFFICIENT VOLUME, STONES SHALL VARY IN WEIGHT FROM 500 LBS - 2,000 LBS EACH AND SHALL CONSIST OF HARD, DURABLE ROCK.
3. STONES SHALL BE KEYED INTO THE RIVERBED AND RIVERBANK TO PROVE A RELATIVELY UNIFORM SLOPE.
4. AASHTO #1 AGGREGATE SHALL BE USED AS INFILL MATERIAL AROUND EMBANKMENT STONES PRIOR TO PLACING GRANULAR BACKFILL TO GRADES SHOWN ON THE PLANS.

LEGEND

- 849 — EXISTING MINOR CONTOUR
- 850 — EXISTING MAJOR CONTOUR
- 850 — PROPOSED CONTOUR
- PROPOSED STRAW BALE/SILT FENCE
- EXISTING OVERHEAD WIRE
- 100 FOOT BUFFER TO BVW
- BUFFER TO TOP OF BANK
- PROPOSED OVERHEAD WIRE
- WFA3 — BVW FLAG
- RFA3 — MAHW/TOB FLAG
- B-01 — SOIL BORING
- UTILITY POLE

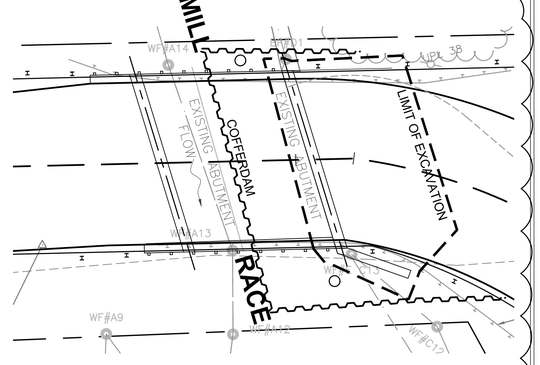
CONSTRUCTION SEQUENCING SAMPLE:

1. INSTALL ALL SILTATION CONTROLS SITE-WIDE, INCLUDING DOWNSTREAM SILT CURTAIN WITH OIL BOOM.
2. INSTALL CONTROL OF WATER MEASURES AND DEWATERING EQUIPMENT.
3. EXCAVATE AND REMOVE EXISTING BRIDGE COMPONENTS, RESERVING ABUTMENT FIELDSTONES FOR REUSE IN THE CHANNEL AND AS EMBANKMENT KEYSTONES.
4. INSTALL ABUTMENT AND WINGWALL FOOTINGS.
5. INSTALL ABUTMENTS AND WINGWALLS AND BACKFILL.
6. PLACE ROCKFILL IN STREAMBED TO WITHIN 6 INCHES OF FINISHED GRADE.
7. PLACE NATURAL STREAM BED MATERIAL.
8. REMOVE CONTROL OF WATER AND RESTORE FLOW TO CHANNEL.
9. REPEAT STEPS 2-8 FOR PHASE 2
10. INSTALL PRECAST DECK BEAMS.
11. INSTALL DECK.
12. GRADE, LOAM AND SEED EMBANKMENTS.



CONTROL OF WATER - PHASE 1

SCALE: 1"=10'



CONTROL OF WATER - PHASE 2

SCALE: 1"=10'

CONTROL OF WATER:

1. ALL SUBSTRUCTURE AND STREAM CONSTRUCTION SHALL BE PERFORMED IN THE DRY TO MINIMIZE THE POSSIBILITY OF SEDIMENT AND SILT TRANSPORT DOWNSTREAM.
2. CONTROL OF WATER SHALL BE ACCOMPLISHED BY PHASED CHANNELING OF WATER USING COFFERDAMS AS SHOWN IN THE PHASING PLAN, ABOVE.
3. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER COMPLETE CONTROL OF WATER PLAN INCLUDING CONSTRUCTION SEQUENCING STEPS INCLUDING, BUT NOT LIMITED TO PRE-INSTALLATION/SITE PREP, CONTROL OF WATER MATERIALS, INSTALLATION STEPS, REMOVAL STEPS AND STREAMBED STABILIZATION.
4. CONTROL OF WATER STEPS SHALL BE CLOSELY COORDINATED WITH THE BOXFORD CONSERVATION COMMISSION OR THEIR DESIGNEE.

DATUM NAVD

REV.	COMMENTS	DATE

PROJECT #	2182578
SCALE	AS NOTED
DATE	9/30/2019
DRAFTED BY	BDS

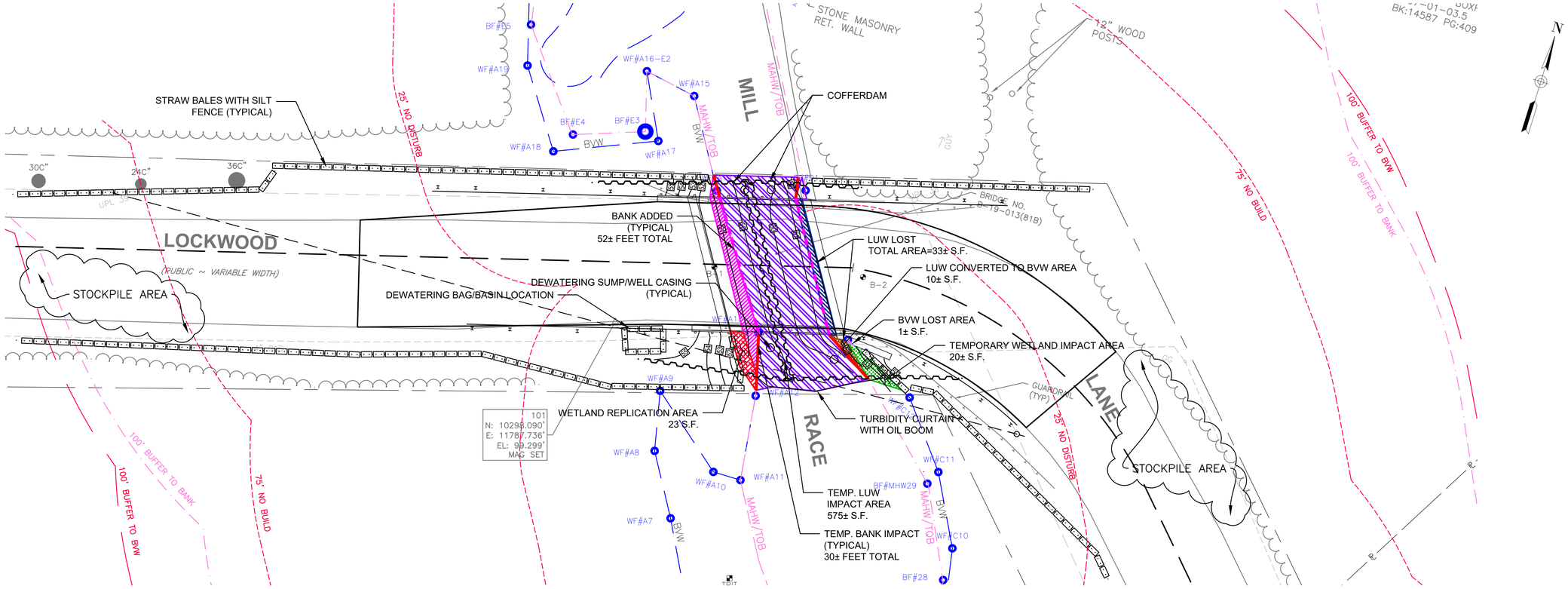
BRIDGE REPLACEMENT
LOCKWOOD LANE OVER FISH BROOK
BOXFORD, MASSACHUSETTS

PREPARED FOR:
TOWN OF BOXFORD DEPARTMENT OF PUBLIC WORKS

Bridge & Structural Engineering
Civil/Site Engineering
Land Surveying
Transportation Engineering
Architectural Design & Building Renovations

BAYSIDE ENGINEERING
600 Unicorn Park Drive ▲ Woburn MA 01801
Phone: 781.932.3201▲ Fax: 781.932.3413

E-4



MAHW/TOB= MEAN ANNUAL HIGH WATER/TOP OF BANK

RESOURCE AREA IMPACTS

SCALE: 1"=10'

RESOURCE IMPACTS

LAND UNDER WATER (LUW)

LUW LOST..... 33 S.F.
LUW TO BVW..... 10 S.F.
LUW TEMP IMPACT..... 575 S.F.

TOTAL LUW IMPACT..... 618 S.F.

REPLACEMENT LUW .....645 S.F.

BORDERING VEGETATED WETLAND (BVW)

BVW LOST..... 1 S.F.
BVW TEMP. IMPACT..... 20 S.F.

TOTAL BVW IMPACT..... 21 S.F.

REPLACEMENT BVW..... 53 S.F.

WETLAND REPLACEMENT RATIO 2.5x

RIVERFRONT IMPACTS

RIVERFRONT IMPACT.....4,815 S.F.
(4,815 S.F. 0'-100', 0 S.F. 100'-200')
RIVER BANK ADDED..... 52 L.F.
TEMP RIVER BANK IMPACT..... 30 L.F.

TOTAL RIVERFRONT IMPACT.....4,815 S.F.
(ALL OCCURS IN PREVIOUSLY ALTERED RIVERFRONT)

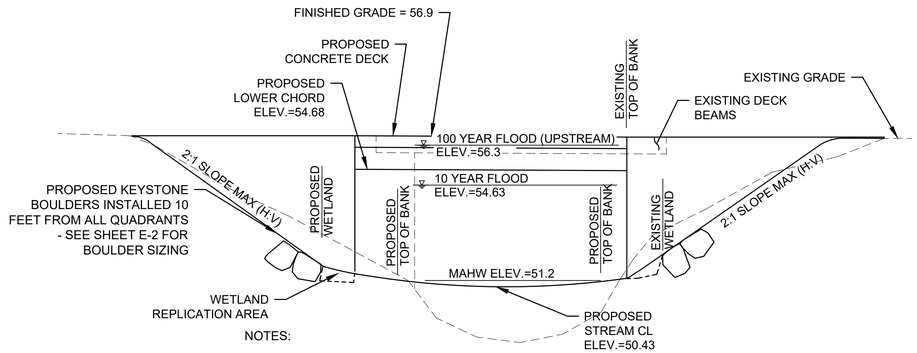
LUW CONVERTED TO BVW
LUW LOST
BVW LOST
TEMP. LUW IMPACT
TEMP. BVW IMPACT
BVW ADDED
LUW ADDED
TEMP. BANK IMPACT
BANK ADDED

LEGEND

849 — EXISTING MINOR CONTOUR
850 — EXISTING MAJOR CONTOUR
850 — PROPOSED CONTOUR
PROPOSED STRAW BALE/SILT FENCE
EXISTING OVERHEAD WIRE
100 FOOT BUFFER TO BVW
BUFFER TO TOP OF BANK
PROPOSED OVERHEAD WIRE
WFA3 — BVW FLAG
RFA3 — MAHW/TOB FLAG
B-01 — SOIL BORING
UTILITY POLE

SCALE: 1" = 10' 0 10 25 50

GRAPHIC SCALE



NOTES:

1. KEYSTONE BOULDERS SHALL BE INSTALLED FLUSH WITH PROPOSED EMBANKMENT.
2. BOULDERS SHALL NOT BE INSTALLED WITHIN WETLAND RESOURCE AREAS.
3. OVERSEED DISTURBED WETLAND AREAS WITH WETLAND RESTORATION MIX BY NEW ENGLAND WETLAND PLANTS, INC. OR APPROVED EQUAL.
4. COMPLETE SPECIFICATIONS FOR WETLAND REPLICATION, SEEDING/SEED MIXES, INVASIVE SPECIES CONTROL, AND MONITORING ARE PROVIDED IN THE SPECIAL PROVISIONS.

SOUTH ELEVATION
(NORTH ELEVATION SIMILAR)

NOT TO SCALE

DATUM NAVD

MEAN ANNUAL HIGH WATER (MAHW) = 51.2

BRIDGE NO. B-19-013 (81B)

REV.	COMMENTS	DATE

PROJECT #	2182578
SCALE	AS NOTED
DATE	9/30/2019
DRAFTED BY	BDS

BRIDGE REPLACEMENT
LOCKWOOD LANE OVER FISH BROOK
BOXFORD, MASSACHUSETTS

PREPARED FOR:
TOWN OF BOXFORD DEPARTMENT OF PUBLIC WORKS

Bridge & Structural Engineering
Civil/Site Engineering
Land Surveying
Transportation Engineering
Architectural Design & Building Renovations

BAYSIDE ENGINEERING
600 Unicorn Park Drive ▲ Woburn MA 01801
Phone: 781.932.3201▲ Fax: 781.932.3413

E-5

CONSTRUCTION NOTES/CONSTRUCTION SEQUENCING:

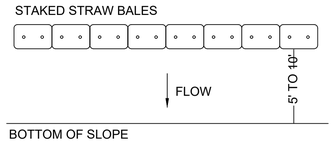
1. INSTALL SEDIMENTATION AND EROSION CONTROLS PRIOR TO BEGINNING WORK.
2. ALL WORK SHALL BE CLOSELY COORDINATED WITH THE BOXFORD CONSERVATION COMMISSION OR THEIR DESIGNEE.
3. ALL IN-STREAM WORK SHALL BE COORDINATED SO THAT BRIDGE REMOVAL AND NEW BRIDGE INSTALLATION BEGINS AND IS COMPLETED DURING A PERIOD OF "LOW FLOW" CONDITIONS AND IS PERFORMED IN ACCORDANCE WITH THE ORDER OF CONDITIONS. CONTRACTOR'S PROPOSED WORK SCHEDULE AND VERIFICATION OF WEATHER CONDITIONS SHALL BE SUBMITTED TO THE BOXFORD HIGHWAY DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO COMMENCING WORK.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTROL OF WATER AND STORM WATER AT ALL TIMES INCLUDING BUT NOT LIMITED TO MAINTAINING, REPLACING AND RE-FASTENING EROSION AND SEDIMENTATION CONTROL DEVICES AS NEEDED TO PREVENT SEDIMENT FROM LEAVING THE SITE AND ENTERING WETLAND RESOURCE AREAS.
5. EXISTING STREAMBED MATERIAL SHALL BE STOCKPILED SEPARATELY FOR REUSE. ADDITIONAL STREAMBED MATERIAL SHALL CONSIST OF CLEAN GRANULAR MATERIAL WITH THE SAME GRADATION AS THE EXISTING STREAM CHANNEL AS INDICATED IN THE CONTRACT DOCUMENTS. STREAMBED MATERIAL SHALL BE DURABLE WASHED ROUNDED AGGREGATE FREE OF FINES, ORGANIC AND DELETERIOUS MATERIAL. CONCRETE, BRICK AND OTHER CONSTRUCTION DEBRIS IS PROHIBITED. THE ENGINEER SHALL APPROVE MATERIAL PRIOR TO PLACEMENT.
6. THE REFUELING OF VEHICLES WITHIN 100 FEET OF THE STREAM SHALL NOT BE PERMITTED.
7. STOCKPILES SHALL BE LOCATED AS FAR AS PRACTICABLE FROM THE RESOURCE AREA. ADDITIONAL EROSION AND SEDIMENT CONTROLS SHALL BE IMPLEMENTED TO PREVENT SEDIMENT FROM BEING WASHED INTO RESOURCE AREAS.
8. WORK IN WETLAND RESOURCE AREAS SHALL BE CONDUCTED FROM UPLAND AREAS OR BY HAND. WITH EXCEPTION OF HAND HELD TOOLS, NO MECHANICAL EQUIPMENT SHALL BE OPERATED WITHIN THE RESOURCE AREA.
9. DISTURBED AREAS AND SLOPES SHALL BE STABILIZED WITH APPROVED SEED MIX, PLANTINGS AND/OR EROSION CONTROL BLANKET, AS NECESSARY, AS SHOWN ON THE PLANS. SEED MIX AND EROSION CONTROL BLANKET (WHERE APPLICABLE) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS.
10. DEBRIS FROM CONSTRUCTION THAT FALLS INTO THE RESOURCE AREA WILL BE REMOVED PRIOR TO THE COMPLETION OF EACH WORKDAY.
11. ALL DISTURBED LAND UNDER WATER AREAS SHALL BE STABILIZED AS INDICATED ON THE PLANS, DETAILS AND SECTIONS, OR AS DIRECTED BY THE ENGINEER OR THE TOWN PRIOR TO REMOVING WATER CONTROL MEASURES.
12. EROSION AND SEDIMENTATION CONTROLS SHALL BE REMOVED AFTER COMPLETION AND ACCEPTANCE OF ALL WORK AND WHEN AUTHORIZED BY THE BOXFORD CONSERVATION COMMISSION OR DESIGNEE.

WORK IN WETLAND RESOURCE AREAS

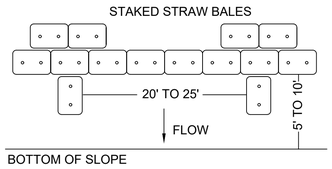
1. WETLAND SOIL SHALL BE EXCAVATED TO A DEPTH OF 12 INCHES, AND STOCKPILED AND COVERED WITH BURLAP OR STRAW MULCH TO RETAIN MOISTURE. PERIODIC LIGHT APPLICATION OF WATER MAY BE REQUIRED TO MAINTAIN MOISTURE.
2. THE STOCKPILED SOIL SHALL BE PLACED IN THE REPLICATION AREA AS SOON AS PRACTICABLE AND WITH A MINIMUM OF HANDLING.
3. WETLAND SOIL SHALL BE RESPREAD 12 INCHES DEEP AND LIGHTLY COMPACTED BY HAND.
4. IF ADDITIONAL SOIL IS REQUIRED, IT SHALL COMPLY WITH THE STANDARDS IN THE SPECIAL PROVISIONS.
5. COMPLETE SPECIFICATIONS FOR WETLAND REPLICATION, SEEDING/SEED MIXES, INVASIVE SPECIES CONTROL, AND MONITORING ARE PROVIDED IN THE SPECIAL PROVISIONS.

CONSTRUCTION ITEM NOTE

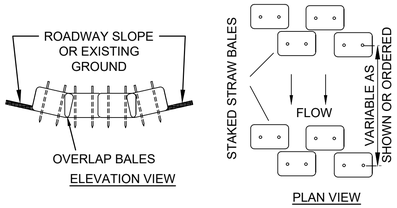
ITEM 984.6 - STONE FOR EROSION CONTROL AND ITEM 698.4 GEOTEXTILE FABRIC FOR EROSION CONTROL ARE PROVIDED AS CONTINGENCY ITEMS FOR STABILIZING ANY EXISTING ERODED AREAS AS FOLLOWS: 12" THICK LAYER OF STONE FOR EROSION CONTROL OVER 6" THICK CRUSHED STONE OVER GEOTEXTILE FABRIC FOR EROSION CONTROL



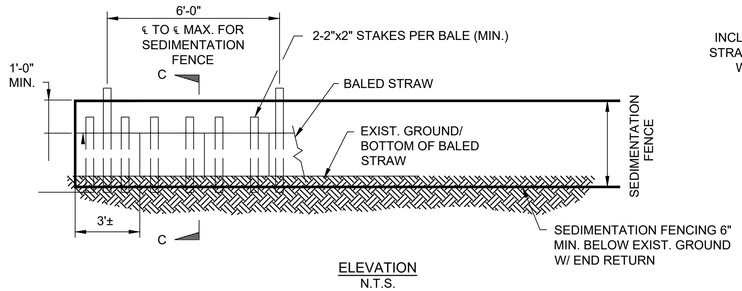
EROSION PROTECTION - TYPE "A"
N.T.S.
NORMAL USE AT BOTTOM OF FILL SLOPES



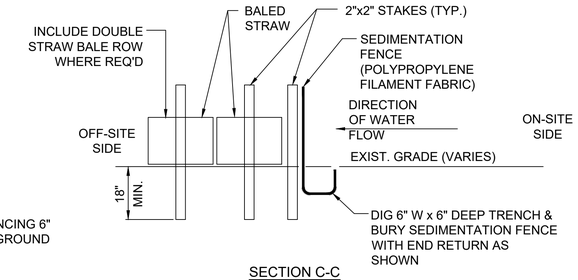
EROSION PROTECTION - TYPE "B"
N.T.S.



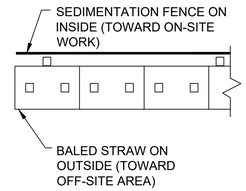
EROSION PROTECTION - TYPE "C"
N.T.S.
NORMAL USE IN WIDE DITCH SECTION



ELEVATION
N.T.S.



SECTION C-C
N.T.S.



NOTE:
SEDIMENTATION FENCING & STAKED BALED STRAW TO BE LOCATED BY ENGINEER AS REQ'D. (STRAW BALES SHALL HAVE A MIN SIZE OF 18"x18"x30")

PLAN
N.T.S.

NOTES:

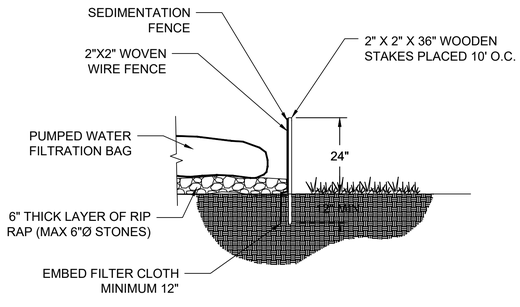
1. BALES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING ADJACENT BALES.
2. BALES SHALL BE SECURELY ANCHORED IN PLACE BY STAKES OR RE-BARS DRIVEN THROUGH THE BALES. THE FIRST STAKE IN EACH BALE SHALL BE ANGLED TOWARDS THE PREVIOUSLY LAID BALE TO FORCE BALES TOGETHER.
3. INSPECTIONS SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
4. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

STRAW BALES AND SILT FENCE
NOT TO SCALE

WETLAND RESTORATION PLAN

SEE "WORK IN WETLAND RESOURCE AREAS" FOR DETAILED CONSTRUCTION INFORMATION.

1. REMOVE SHRUBS, TREES AND WOODY DEBRIS FROM DONOR AREA.
2. REMOVE AND STOCKPILE SOIL FROM DONOR AREA. STOCKPILES SOIL SHALL BE FREE FROM LARGE STUMPS AND WOODY DEBRIS. RHIZOMES, IF ANY, SHALL BE LEFT IN THE SOIL.
3. BACKFILL AND PREPARE SUBGRADE TO 12-INCHES BELOW PROPOSED FINISHED GRADE.
4. RESPREAD WETLAND SOIL TO FINISHED GRADE AND LIGHTLY COMPACT BY HAND.
5. APPLY WETLAND RESTORATION SEED MIX AND LIGHTLY RAKE.
4. COMPLETE SPECIFICATIONS FOR WETLAND REPLICATION, SEEDING/SEED MIXES, INVASIVE SPECIES CONTROL, AND MONITORING ARE PROVIDED IN THE SPECIAL PROVISIONS.



DEWATERING NOTES

1. DEWATERING SHALL BE USED IF NECESSARY TO ENSURE THAT SOIL COMPACTION, CONCRETE PLACEMENT AND BRIDGE INSTALLATION IS PERFORMED "IN THE DRY".
2. DIRECT DEWATERING DISCHARGE TO THE RIVER OR BROOK IS PROHIBITED.
3. DEWATERING EFFLUENT SHALL BE DISCHARGED INTO A WATER FILTRATION BAG SUITABLE FOR THE REQUIRED FLOW AND LOCATED WITHIN A DEWATERING SETTLING BASIN SURROUNDED BY SILT FENCE, LOCATED AS SHOWN ON THE PLANS.
4. THE DEWATERING BASIN SHOULD BE PLACED ON REASONABLY LEVEL, STABLE SOIL.
5. PUMPS AND HOSES SHALL BE IN GOOD WORKING CONDITION AND OF ADEQUATE CAPACITY FOR THE REQUIRED FLOW.
6. ALL EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO COMMENCING DEWATERING OPERATIONS.

DEWATERING BAG/BASIN
NOT TO SCALE

BRIDGE NO. B-19-013 (81B)

REV.	COMMENTS	DATE

PROJECT #	2182578
SCALE	AS NOTED
DATE	9/30/2019
DRAFTED BY	BDS

BRIDGE REPLACEMENT
LOCKWOOD LANE OVER FISH BROOK
BOXFORD, MASSACHUSETTS

PREPARED FOR:
TOWN OF BOXFORD DEPARTMENT OF PUBLIC WORKS

Bridge & Structural Engineering
Civil/Site Engineering
Land Surveying
Transportation Engineering
Architectural Design & Building Renovations

BAYSIDE ENGINEERING
600 Unicorn Park Drive ▲ Woburn MA 01801
Phone: 781.932.3201▲ Fax: 781.932.3413

E-6