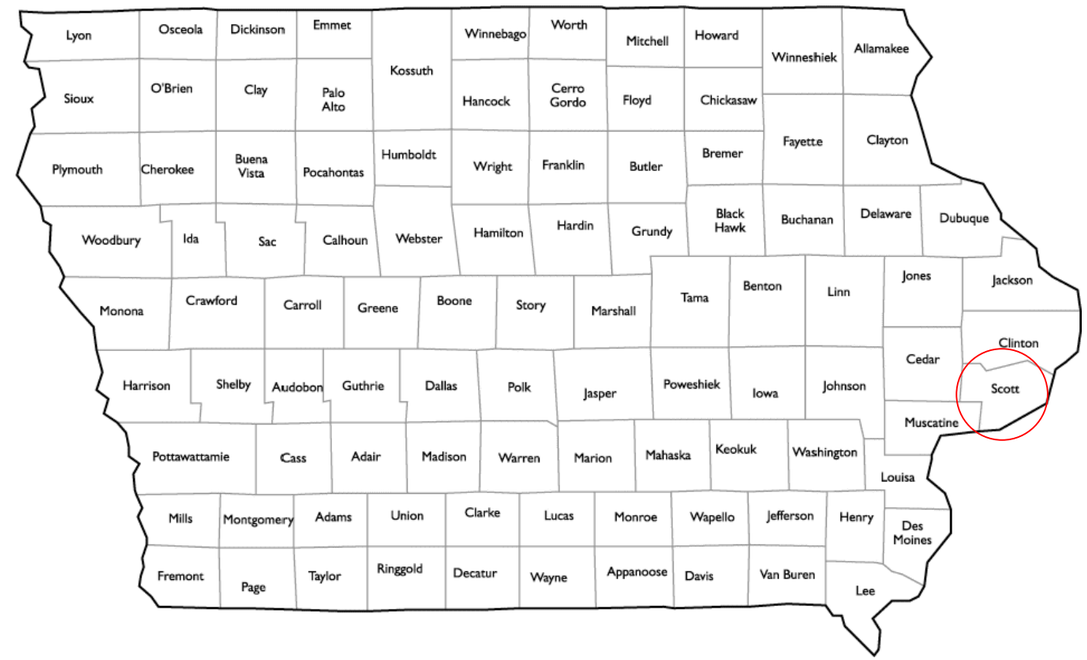
SATURATED BUFFER CONSTRUCTION PLANS

SCOTT CO, IOWA

SECTION 07 - T78N - R2E



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig, 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

8/2/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	7/312023
DRAWN BY	ANDREW MACKRILL	7/31/2023
CHECKED BY	ANDY CRAIG, PE, TSP	7/31/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	585413.8	2383475.2	718.2
2	Distribution Line	585224.2	2383742.2	718.1
3	Distribution Line	585069.5	2383969.5	718.7
4	Distribution Line	584849.7	2384288.4	718.8
5	Distribution Line	584706.1	2384494.1	719.9
6	Distribution Line	584616.5	2384581.5	720.0
7	Benchmark	5853330.5	2383463.6	719.0

Existing 8" Tile

New 8" CMP Outlet With Rodent Guard

Benchmark

1366' of 6" CPT at 0.0% Grade

Buffer Cross Section, See Sheet 3

0+00.00 1 1+00.00 2+00.00 3+00.00 2 4+00.00 5+00.00 6+00.00 3 7+00.00 8+00.00 9+00.00 10+00.00 4 11+00.00 12+00.00 5 13+00.00 13+66.98 6

0+00.00 7 0+45.56

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 585330.5
Easting: 2383463.6
Elevation: 719.0

0 150 300 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Existing 8" CPT Main
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

DATE
DESIGNED BY ANDREW MACKRILL 7/31/23
DRAWN BY ANDREW MACKRILL 7/31/23
CHECKED BY ANDY CRAIG, PE, TSP 7/31/23
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PLAN MAP

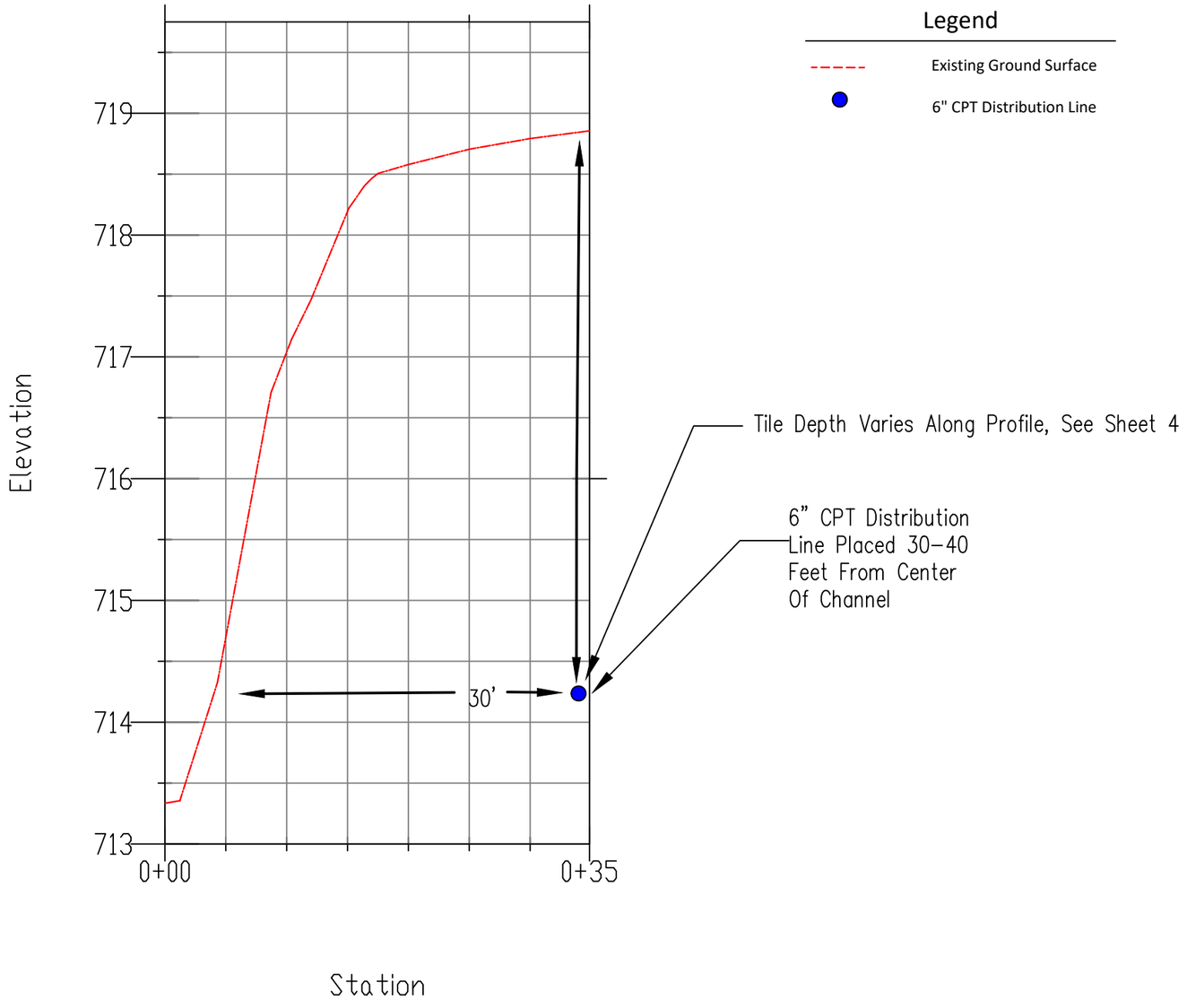
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 07 - T78N - R2E

Cross-Section



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BUFFER AND BANK CROSS SECTION

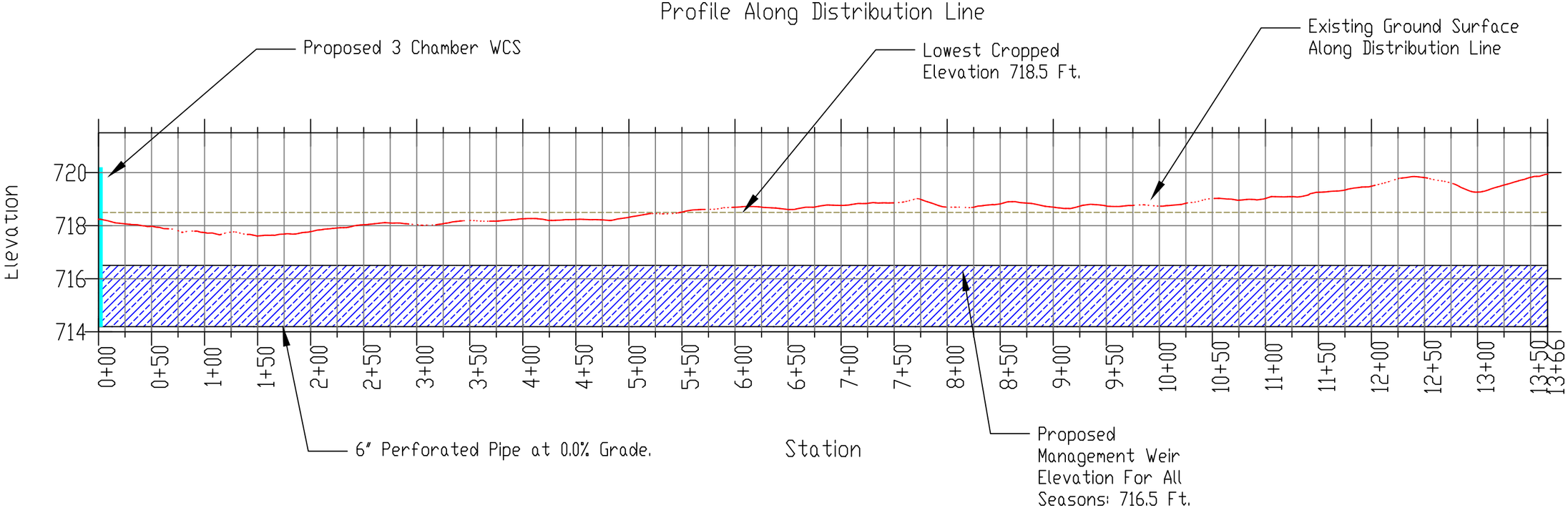
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

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PROFILE ALONG DISTRIBUTION LINE

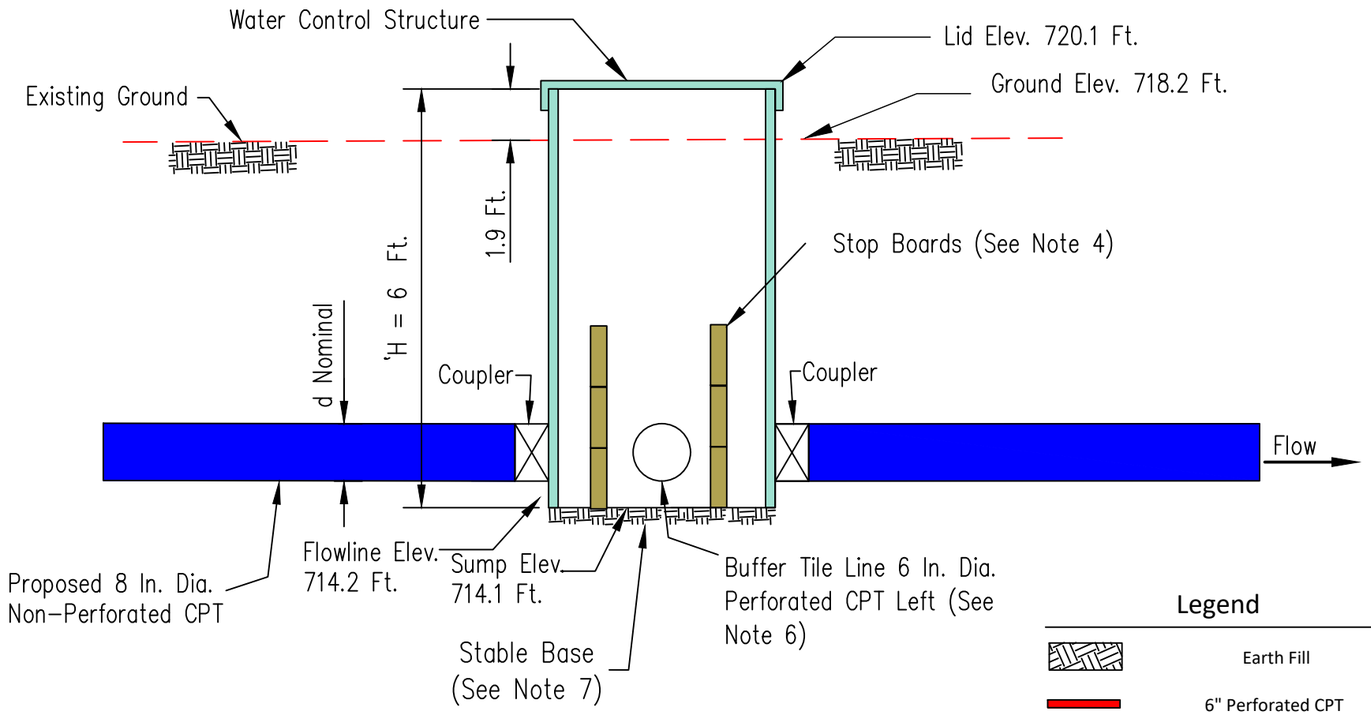
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

A

DRAWING SET

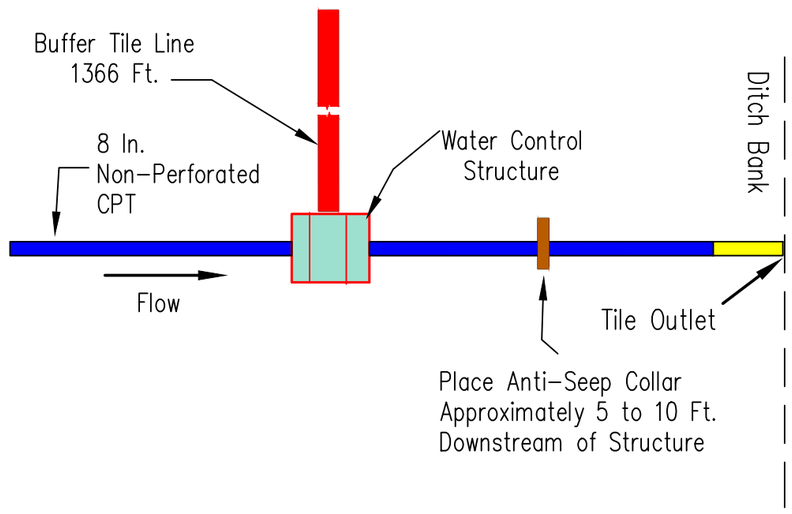
SHEET 4 OF 6



TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 8 in.	1	IA-21, IA-26, CPS-587
8" Non–perforated Pipe (ft)	40	IA-21, IA-45
8" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	1366	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



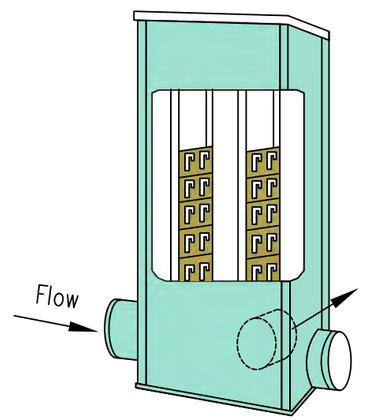
PLAN

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:

1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

DATE	
DESIGNED BY ANDREW MACKRILL	7/31/23
DRAWN BY ANDREW MACKRILL	7/31/23
CHECKED BY ANDY CRAIG, PE, TSP	7/31/23
APPROVED BY	

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 5 OF 6

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
3. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion. Contact ESE for assistance with construction inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the existing tile and setting WCS.
   b. Distribution pipe has been laid and capped.
4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

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CHECKED BY ANDY CRAIG, PE, TSP 7/31/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

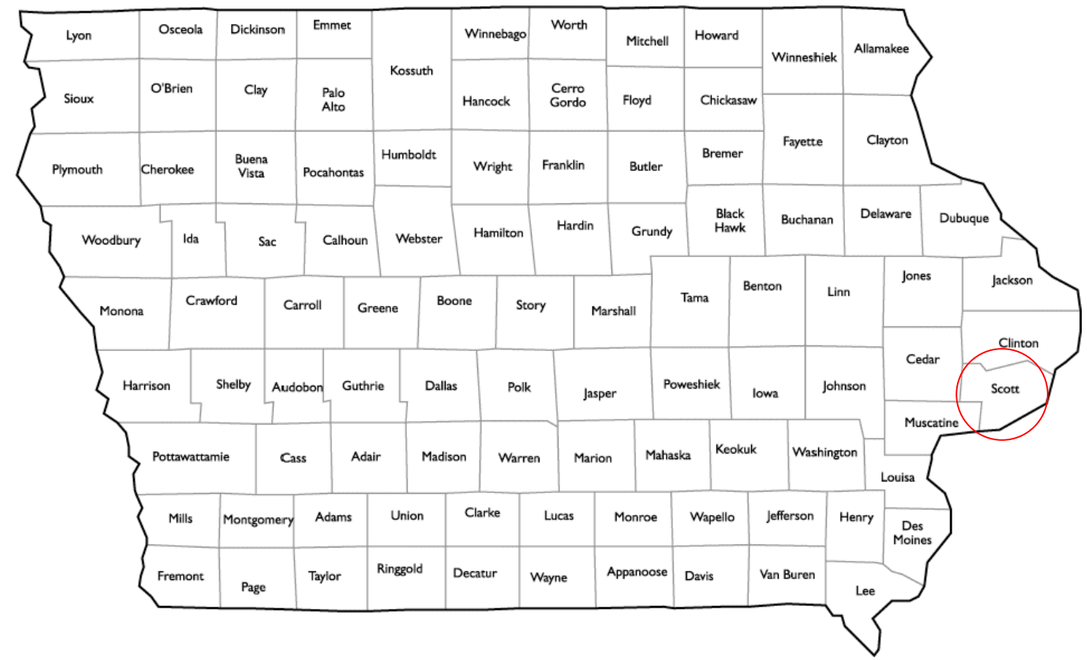
FILE NAME
A

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

SCOTT CO, IOWA

SECTION 07 - T78N - R2E



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ENGINEERING CLASS 2

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APPROVED BY		

ESE Ecosystem Services Exchange *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	584735.4	2384342.2	718.4
2	Distribution Line	584763.9	2384299.1	718.7
3	Distribution Line	584867.6	2384139.5	717.9
4	Distribution Line	585013.6	2383916.3	717.9
5	Distribution Line	585150.9	2383715.4	718.0
6	Distribution Line	585300.9	2383498.8	718.1
7	Benchmark	585330.5	2383463.6	719.0

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 585330.5
Easting: 2383463.6
Elevation: 719.0

0 150 300 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 10" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" CMP Outlet
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

Benchmark

1015' of 6" CPT at 0.0% Grade

Buffer Cross Section, See Sheet 3

New 10" CMP Outlet With Rodent Guard

Existing 10" Tile

7 6 5 4 3 2 1

10+15.00 9+00.00 8+00.00 7+00.00 6+00.00 5+00.00 0+38.50 4+00.00 3+00.00 2+00.00 1+00.00 0+00.00

DESIGNED BY ANDREW MACKRILL 7/31/23
DRAWN BY ANDREW MACKRILL 7/31/23
CHECKED BY ANDY CRAIG, PE, TSP 7/31/23
APPROVED BY
DATE

PLAN MAP

ESE Ecosystem Services Exchange Valuing Conservation

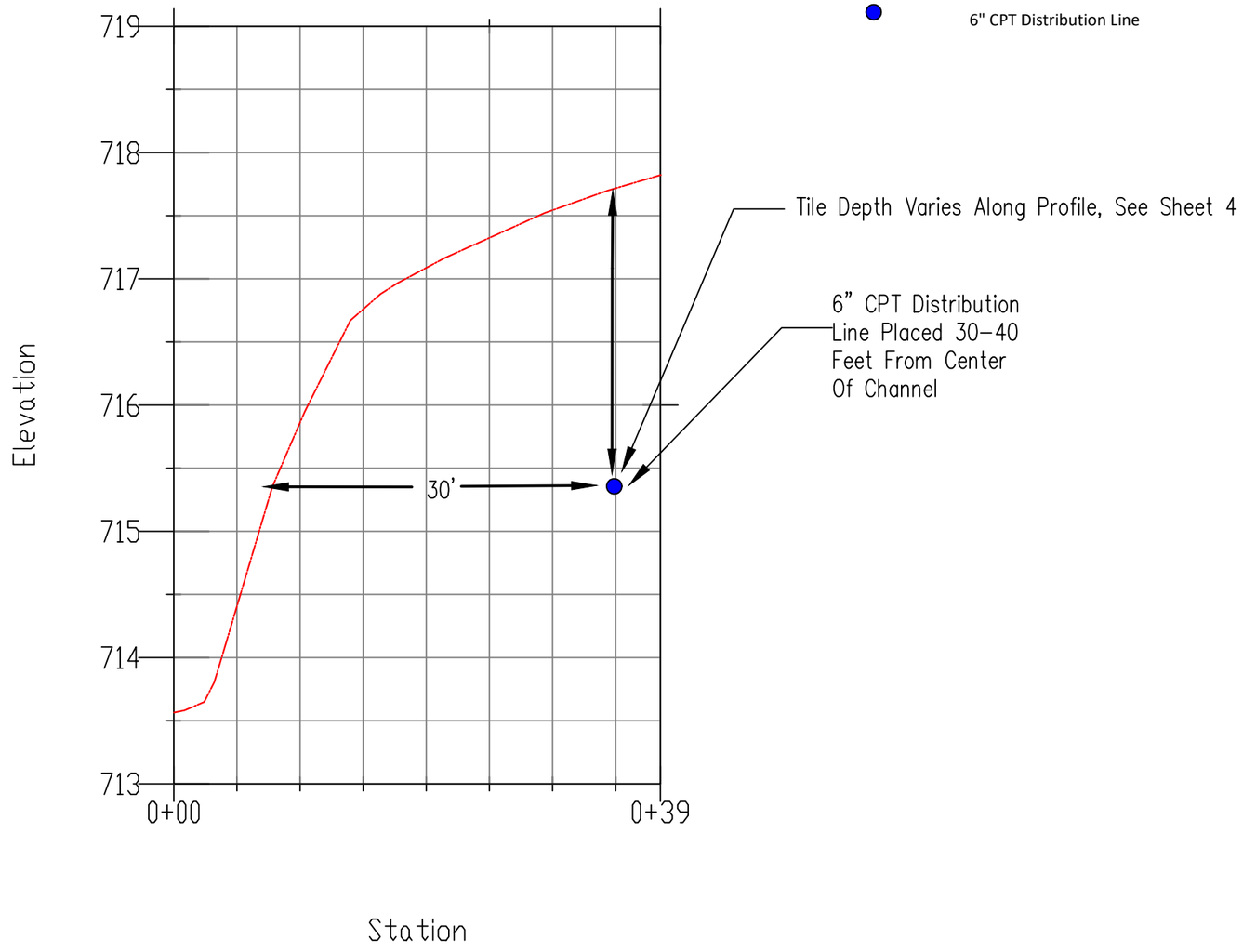
FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER

LOCATION SECTION 07 - T78N - R2E

Cross-Section



LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

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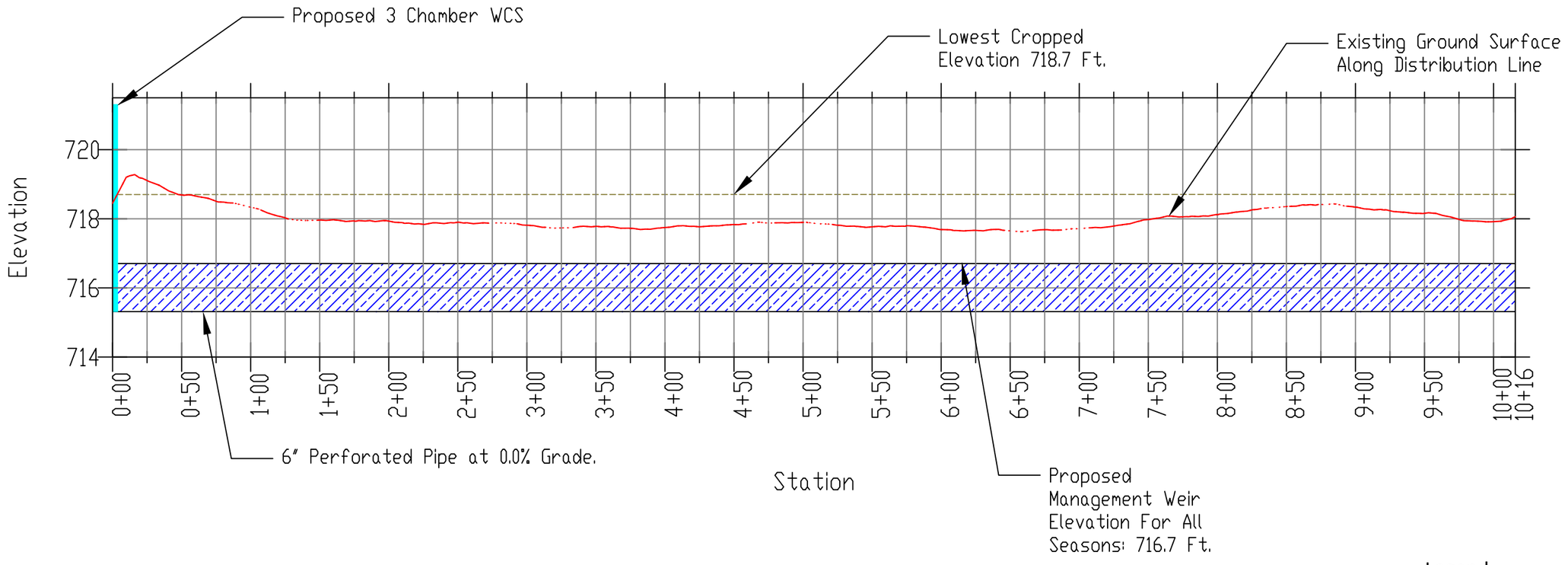
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME
A

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

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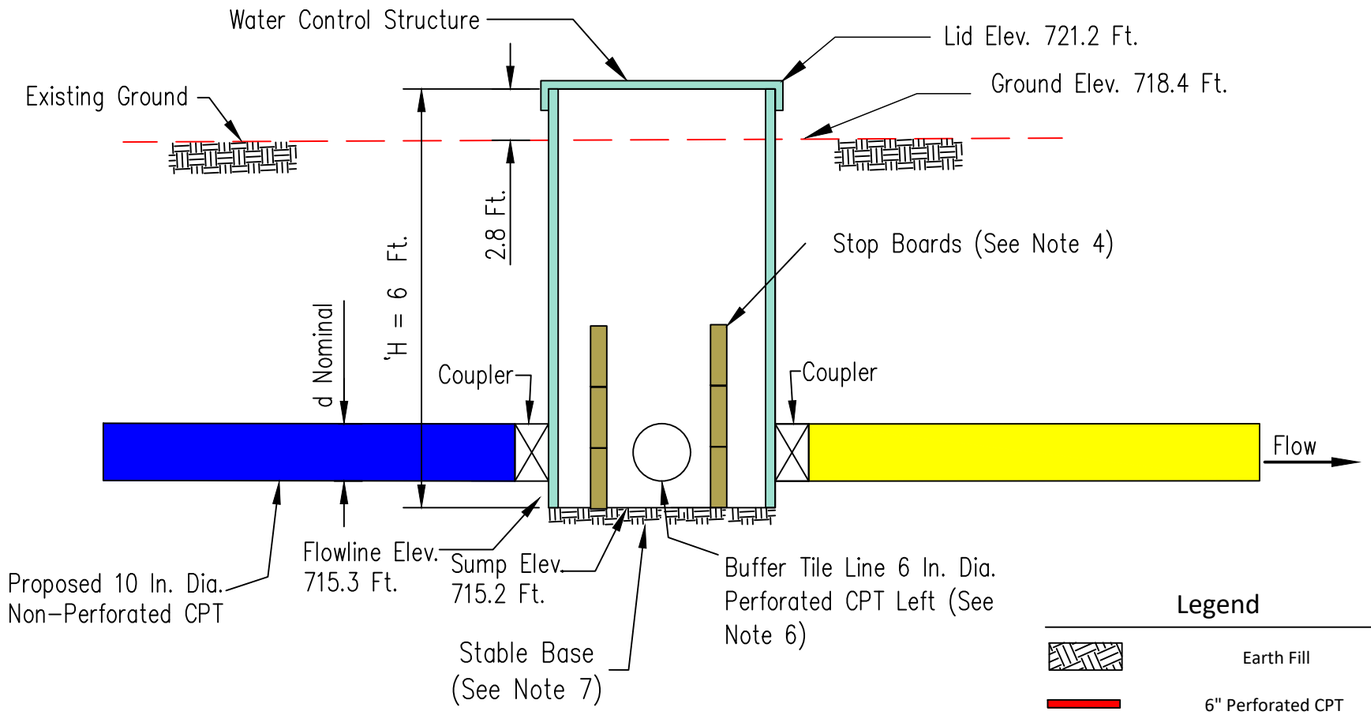
PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION

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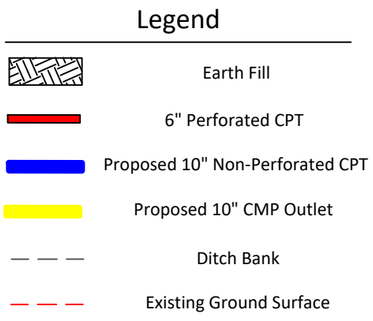

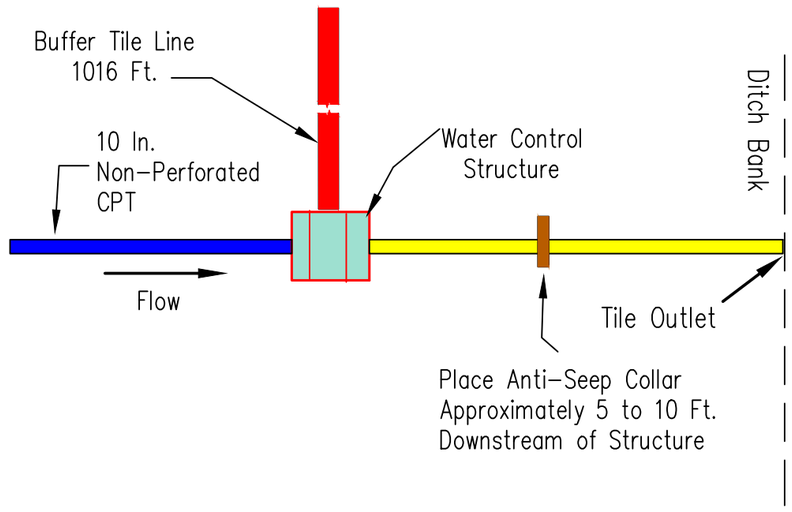

PLAN

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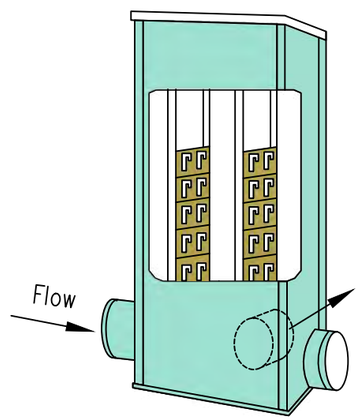

IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

DATE
DESIGNED BY ANDREW MACKRILL 7/31/23
DRAWN BY ANDREW MACKRILL 7/31/23
CHECKED BY ANDY CRAIG, PE, TSP 7/31/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

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IA-6	Seeding and Mulching for Protective Cover
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IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 07 - T78N - R2E

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APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

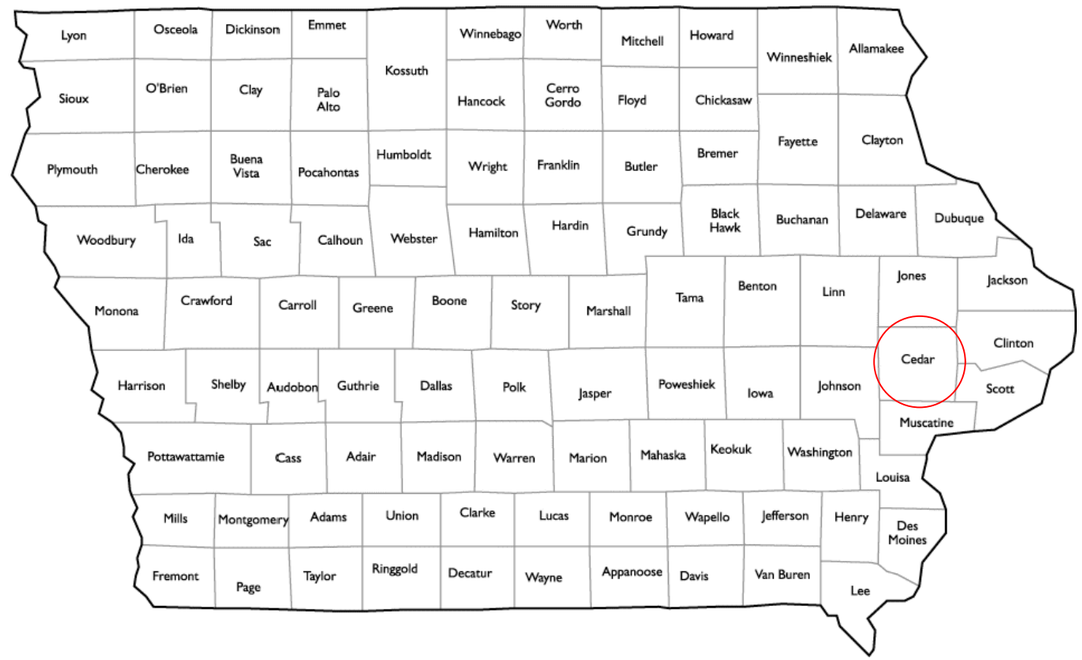
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 16 - T79N - R3W



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My license renewal date is December 31, 2025.
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ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points				
Point	Description	Northing	Easting	Elevation
1	WCS	606556.1	2266863.6	715.0
2	Distribution Line	606724.2	2266871.6	715.1
3	Distribution Line	606899.4	2266863.0	715.5
4	Distribution Line	607048.9	2266855.5	716.3
5	Distribution Line	607162.0	2266849.9	717.1
6	Distribution Line	607279.9	2266844.2	718.0
7	Benchmark	607477.8	2266804.4	719.2

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 607477.8
Easting: 2266804.4
Elevation: 719.2

0 100 200 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 10" Non-Perforated CPT
- Proposed 10" CMP Outlet
- Proposed 10" CPT Main
- Benchmark
- Proposed Water Control Structure
- Staking Point
- 2' Contours

7+00.00 6 6+00.00 5 5+00.00 4 4+00.00 3 3+00.00 2 2+00.00 1 1+00.00

0+00.00 0+37.53

720' of 6" CPT at 0.0% Grade

Buffer Cross Section, See Sheet 3

Existing 8" Tile to be Replaced with 10" Non-Perf Pipe and 10" CMP With Rodent Guard

Abandoned 4-Inch outlet to be destoryed

DATE
DESIGNED BY ANDREW MACKRILL 8/8/23
DRAWN BY ANDREW MACKRILL 8/8/23
CHECKED BY ANDY CRAIG PE,TSP 8/8/23
APPROVED BY

PLAN MAP

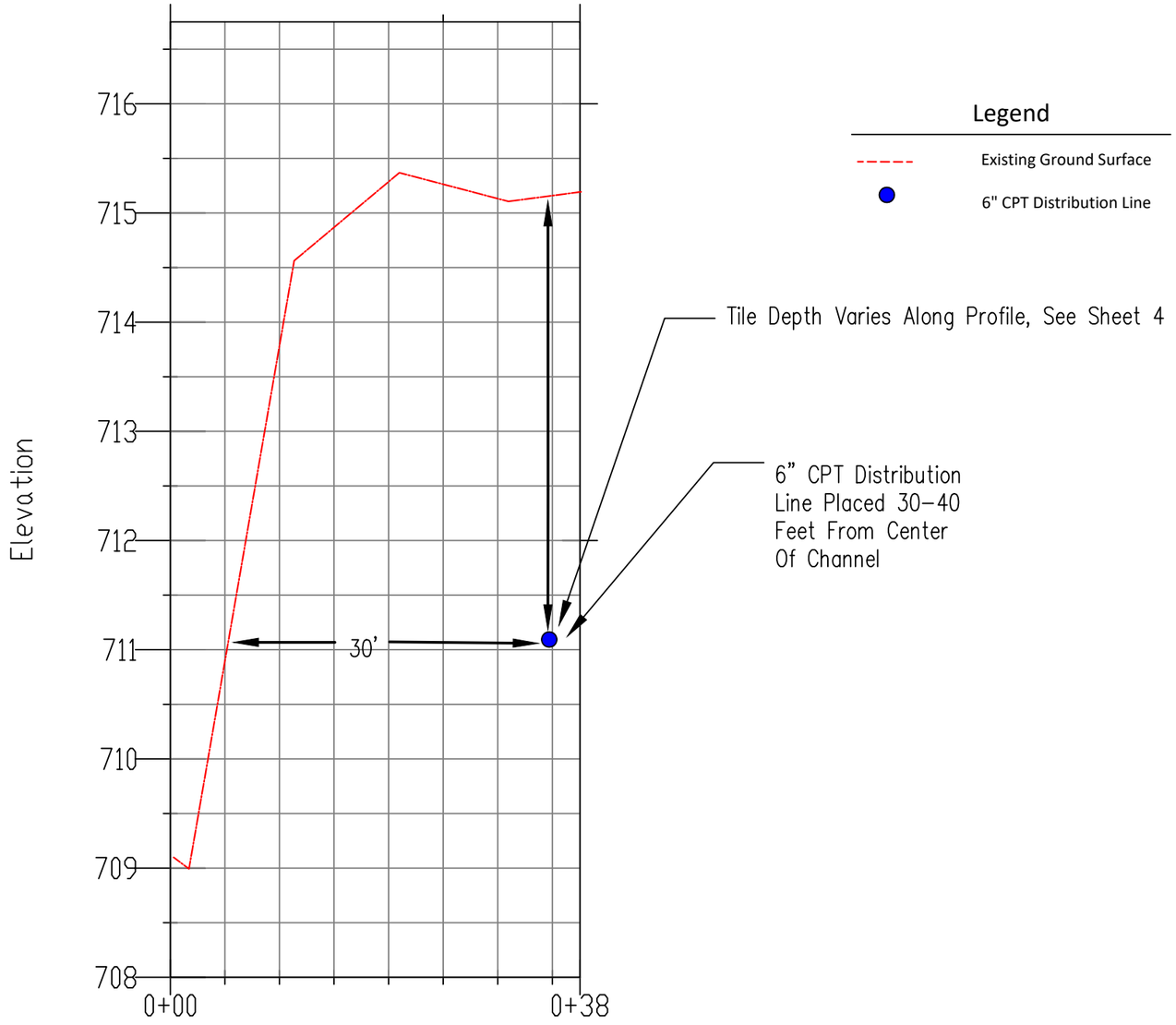
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 16 - T79N - R3W

Buffer Cross-Section



LANDOWNER		LOCATION	SECTION 16 - T79N - R3W

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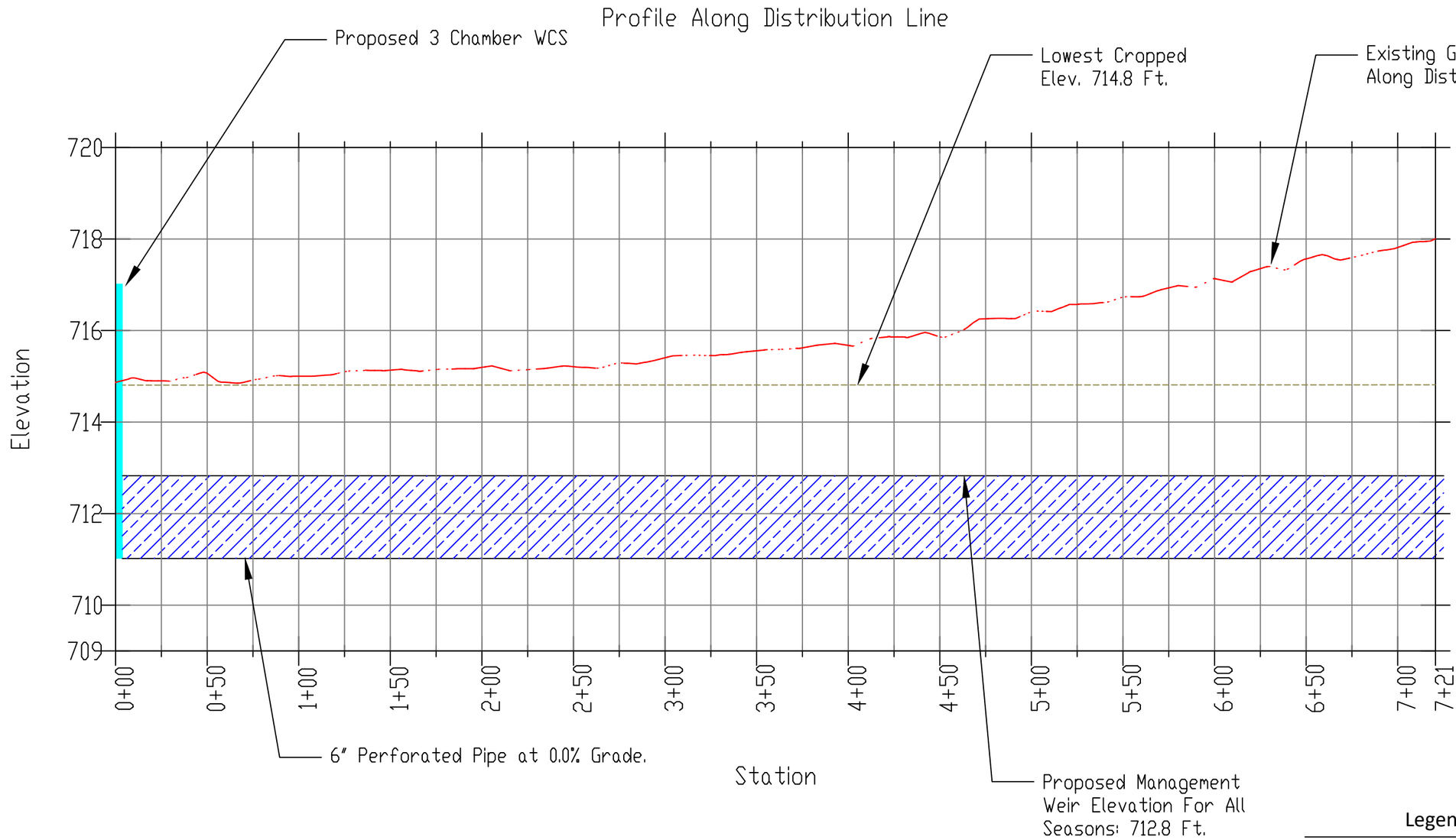
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 16 - T79N - R3W

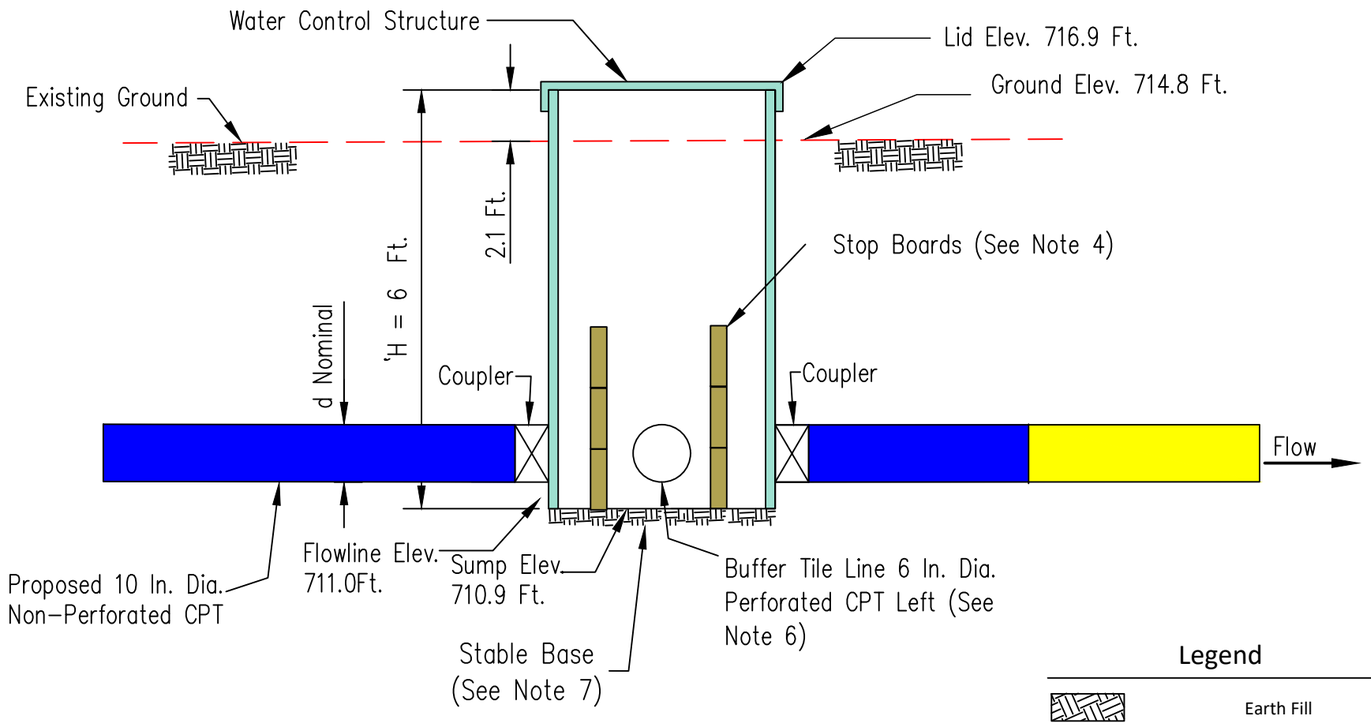
DESIGNED BY ANDREW MACKRILL 8/8/23
DRAWN BY ANDREW MACKRILL 8/8/23
CHECKED BY ANDY CRAIG, PE TSP 8/8/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

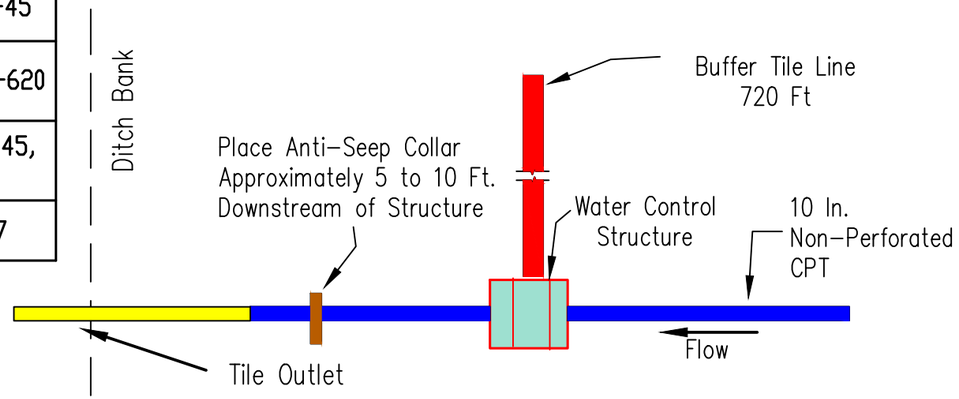
DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 10 in.	1	IA-21, IA-26, CPS-587
10" Non-perforated Pipe (ft)	30	IA-21, IA-45
10" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	720	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers

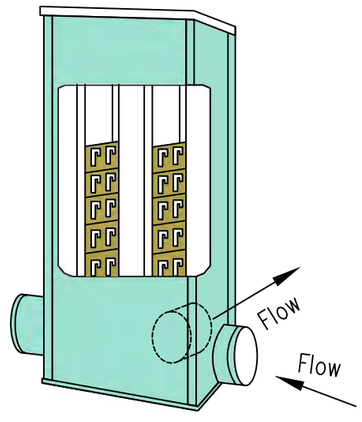


PLAN

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 10" Non-Perforated CPT
- Proposed 10" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 16 - T79N - R3W

DESIGNED BY ANDREW MACKRILL 8/8/23
DRAWN BY ANDREW MACKRILL 8/8/23
CHECKED BY ANDY CRAIG, PE,TSP 8/8/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
3. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion. Contact ESE for assistance with construction inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the existing tile and setting WCS.
   b. Distribution pipe has been laid and capped.
4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 16 - T79N - R3W

DESIGNED BY ANDREW MACKRILL 8/8/23
DRAWN BY ANDREW MACKRILL 8/8/23
CHECKED BY ANDY CRAIG, PE,TSP 8/8/23
APPROVED BY
DATE

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange Valuing Conservation

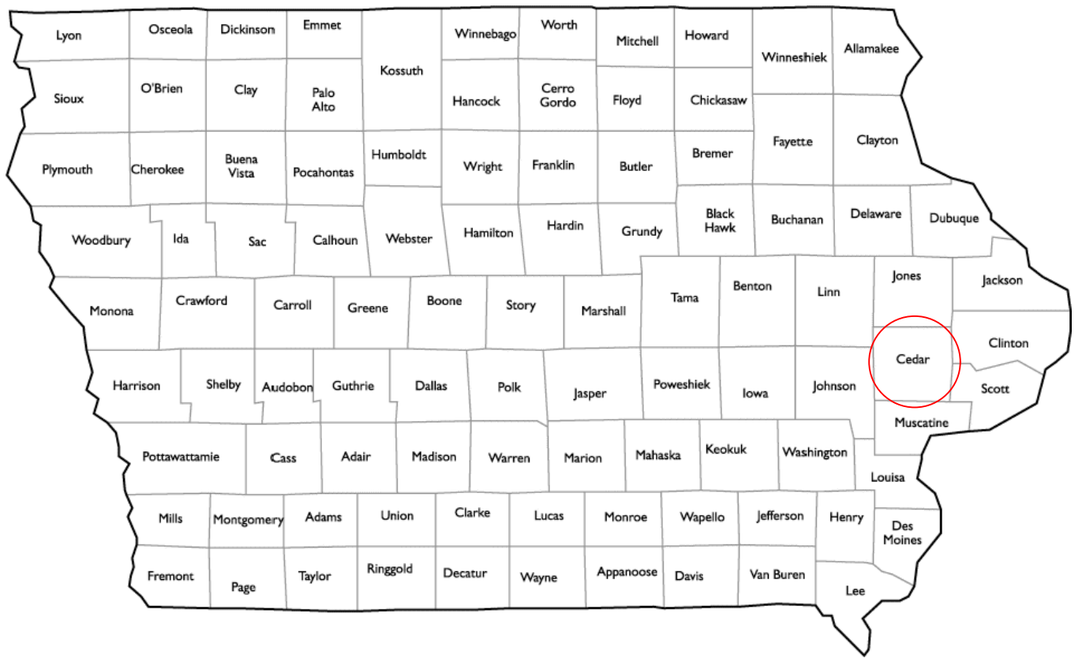
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 33 - T80N - R4W



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

8/22/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 3

		DATE
DESIGNED BY	ANDREW MACKRILL	8/22/2023
DRAWN BY	ANDREW MACKRILL	8/22/2023
CHECKED BY	ANDY CRAIG, PE, TSP	8/22/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 625261.0
Easting: 2237768.1
Elevation: 738.9

0 100 200 Feet

N

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	625236.7	2237894.5	736.8
2	Distribution Line	625215.8	2238064.9	735.6
3	Distribution Line	625204.8	2238188.1	735.4
4	Distribution Line	625182.2	2238343.5	735.1
5	Distribution Line	625123.1	2238454.7	734.8
6	Distribution Line	625072.2	2238565.2	734.3
7	Benchmark	625261.0	2237768.1	738.9

Existing 8" Tile

8" Non-Perf Diversion

700' of 6" CPT at 0.0% Grade

7

Benchmark

0+00.00

1

1+00.00

2

2+00.00

3

3+00.00

4

4+00.00

0+00.00+347

5

5+00.00

6

6+00.00

7+00.00

New 12" CMP Outlet With Rodent Guard

Buffer Cross Section, See Sheet 3

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 12" Non-Perforated CPT
- Proposed 12" CMP Outlet
- Existing 8" CPT Main
- Proposed 8" Non-Perforated CPT
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

DATE
DESIGNED BY ANDREW MACKRILL 8/22/23
DRAWN BY ANDREW MACKRILL 8/22/23
CHECKED BY ANDY CRAIG, PE, TSP 8/22/23
APPROVED BY

PLAN MAP

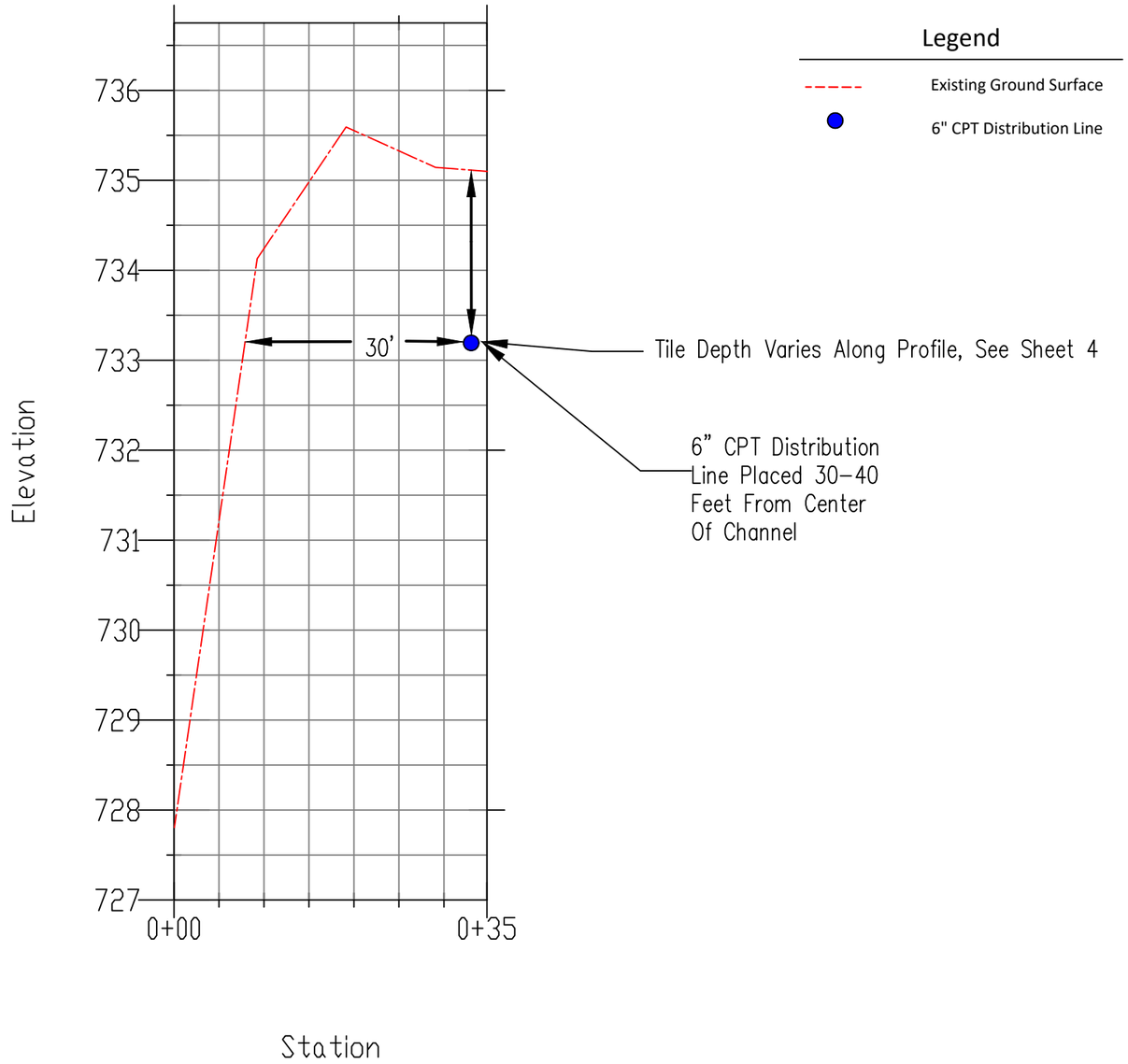
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 33 - T80N - R4W

Cross-Section



LANDOWNER		LOCATION	SECTION 33 - T80N - R4W

DESIGNED BY ANDREW MACKRILL 8/22/23
DRAWN BY ANDREW MACKRILL 8/22/23
CHECKED BY ANDY CRAIG, PE, TSP 8/22/23
APPROVED BY

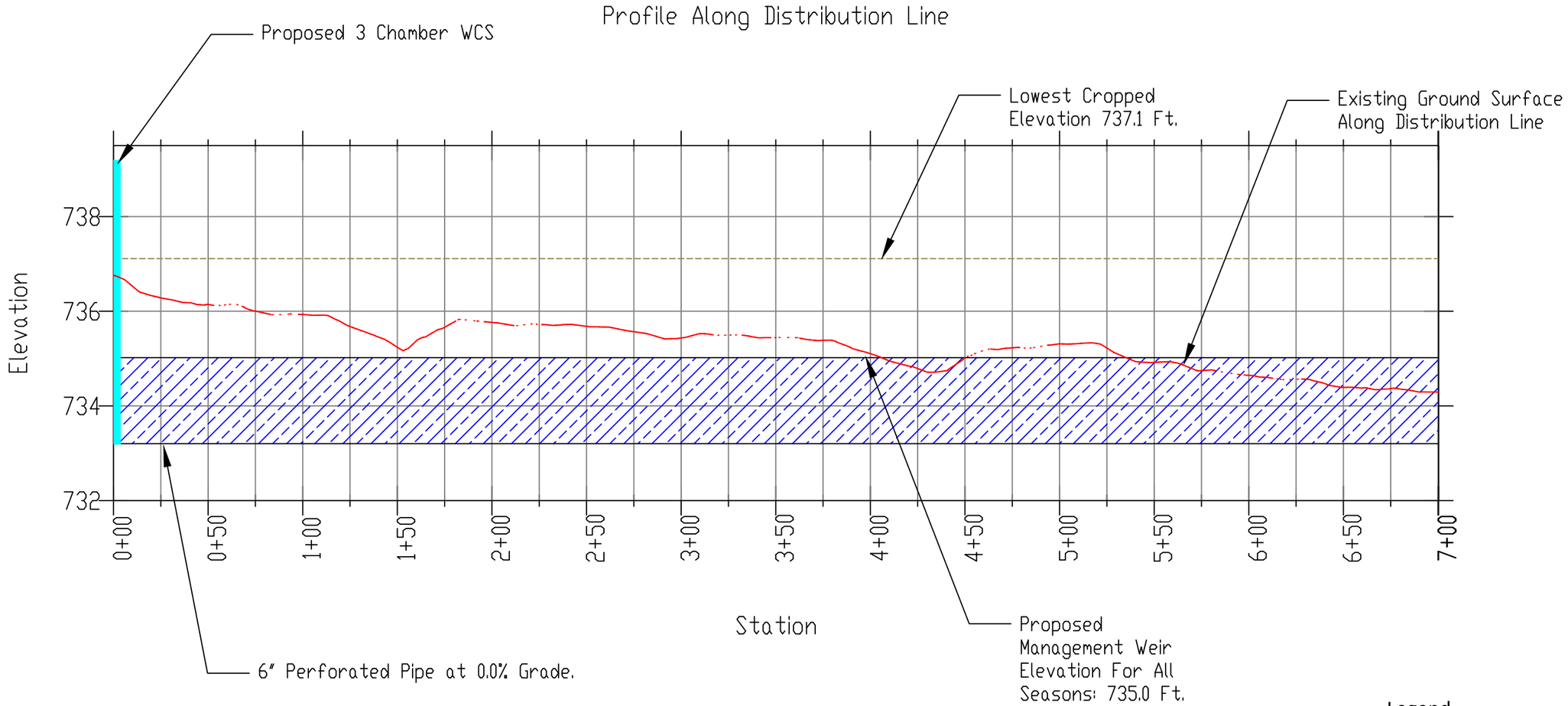
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 33 - T80N - R4W

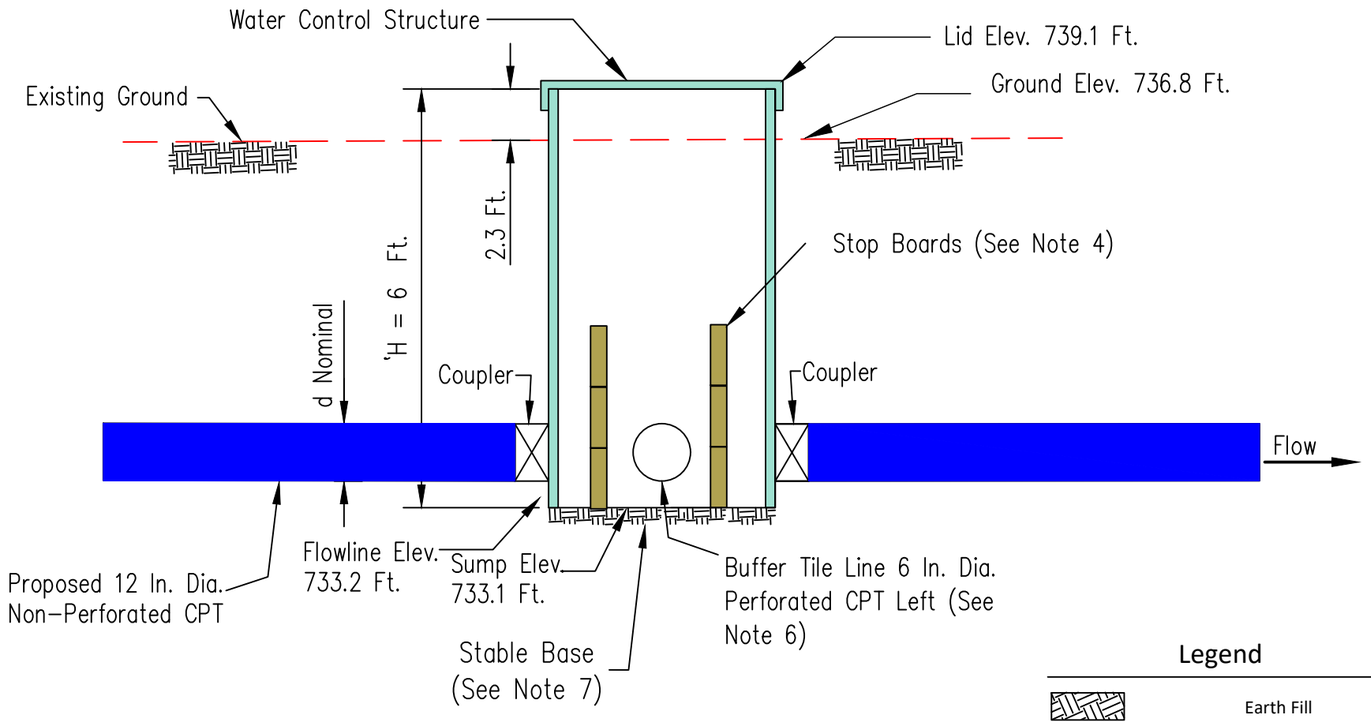
DESIGNED BY ANDREW MACKRILL 8/22/23
DRAWN BY ANDREW MACKRILL 8/22/23
CHECKED BY ANDY CRAIG, PE, TSP 8/22/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

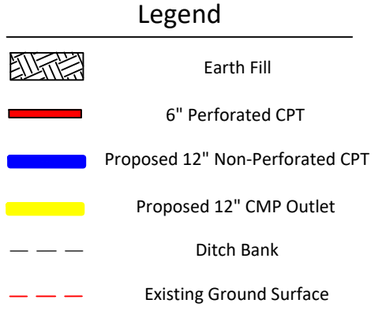
DRAWING SET
SHEET 4 OF 6

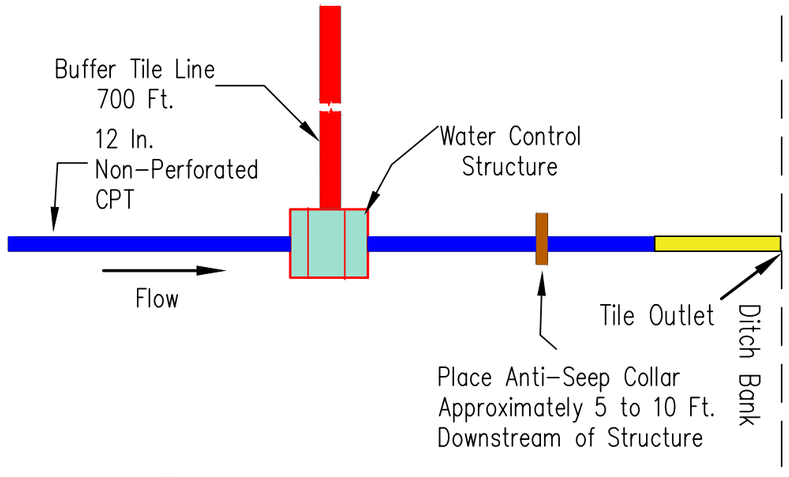


TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 12 in.	1	IA-21, IA-26, CPS-587
12" Non–perforated Pipe (ft)	40	IA-21, IA-45
12" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
8" Non–perforated Pipe (ft)	100	IA-21, IA-45
6" Perforated CPT (ft) Buffer Tile Line	700	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers





PLAN

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
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5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
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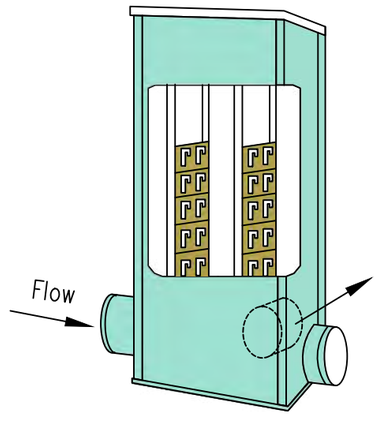
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 33 - T80N - R4W

DATE
DESIGNED BY ANDREW MACKRILL 8/22/23
DRAWN BY ANDREW MACKRILL 8/22/23
CHECKED BY ANDY CRAIG, PE, TSP 8/22/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
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   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
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Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 33 - T80N - R4W

DESIGNED BY ANDREW MACKRILL 8/22/23
DRAWN BY ANDREW MACKRILL 8/22/23
CHECKED BY ANDY CRAIG, PE, TSP 8/22/23
APPROVED BY

CONSTRUCTION NOTES

Ecosystem Services Exchange
Valuing Conservation

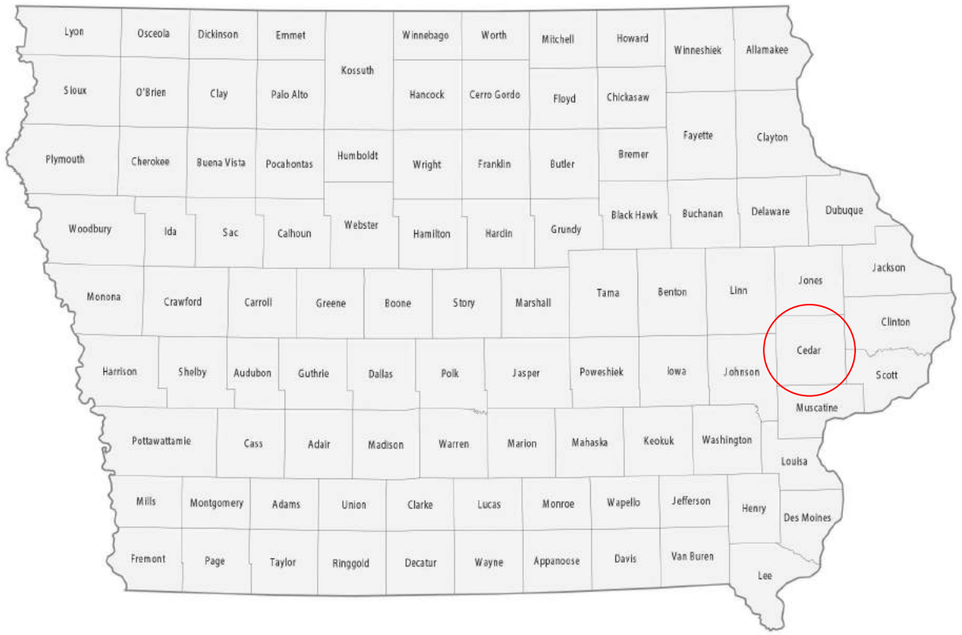
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 29 - T79N - R4W



INDEX OF SHEETS

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THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER Andy J. Craig 20832 IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

07/28/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	BEN REINHART	07/27/2023
DRAWN BY	BEN REINHART	07/27/2023
CHECKED BY	ANDY CRAIG, PE, TSP	07/28/2023
APPROVED BY		

ESE Ecosystem Services Exchange *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD83, Iowa South, US Survey Feet)
Northing: 596160.127
Easting: 2232728.314
Elevation: 674.3

0 150 300 Feet

N

Staking Control Points (NAD83, Iowa South, US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	Benchmark	596160.127	2232728.314	674.3
2	Control Structure	595848.002	2232576.632	672.5
3	Distribution Line	595949.133	2232604.826	673.2
4	Distribution Line	596045.961	2232645.203	673.7
5	Distribution Line	596134.098	2232702.193	673.8
6	Distribution Line	596233.421	2232734.909	673.6
7	Distribution Line	596329.747	2232776.349	674.0
8	Distribution Line	596424.863	2232820.845	674.3
9	Distribution Line	596516.147	2232872.371	674.0
10	Distribution Line	596600.168	2232934.884	674.0
11	Distribution Line	596682.522	2232999.715	674.6
12	Distribution Line	596764.072	2233065.796	674.5
13	Distribution Line	596843.750	2233134.192	674.8
14	Distribution Line	596925.705	2233199.773	674.9
15	Distribution Line	597000.862	2233273.108	675.1
16	Distribution Line	597086.518	2233333.705	676.1

1450' of 6" CPT at 0.0% Grade

Buffer Cross Section, See Sheet 3

Existing 6" Tile Outlet
Located near Benchmark hub. Was not able to be surveyed. It is likely too deep to incorporate into buffer design. The distribution line should cross this tile with 10-feet of 6-inch non-perforated tile on the upstream and downstream sides.

Existing 8" Tile

New 8" CMP Outlet with Rodent Guard

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Proposed Water Control Structure
- Existing 8" CPT Main
- Benchmark
- Staking Points
- 2' Contours

LANDOWNER		LOCATION	SECTION 29 - T79N - R4W

DATE
DESIGNED BY BEN REINHART 07/27/23
DRAWN BY BEN REINHART 07/27/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

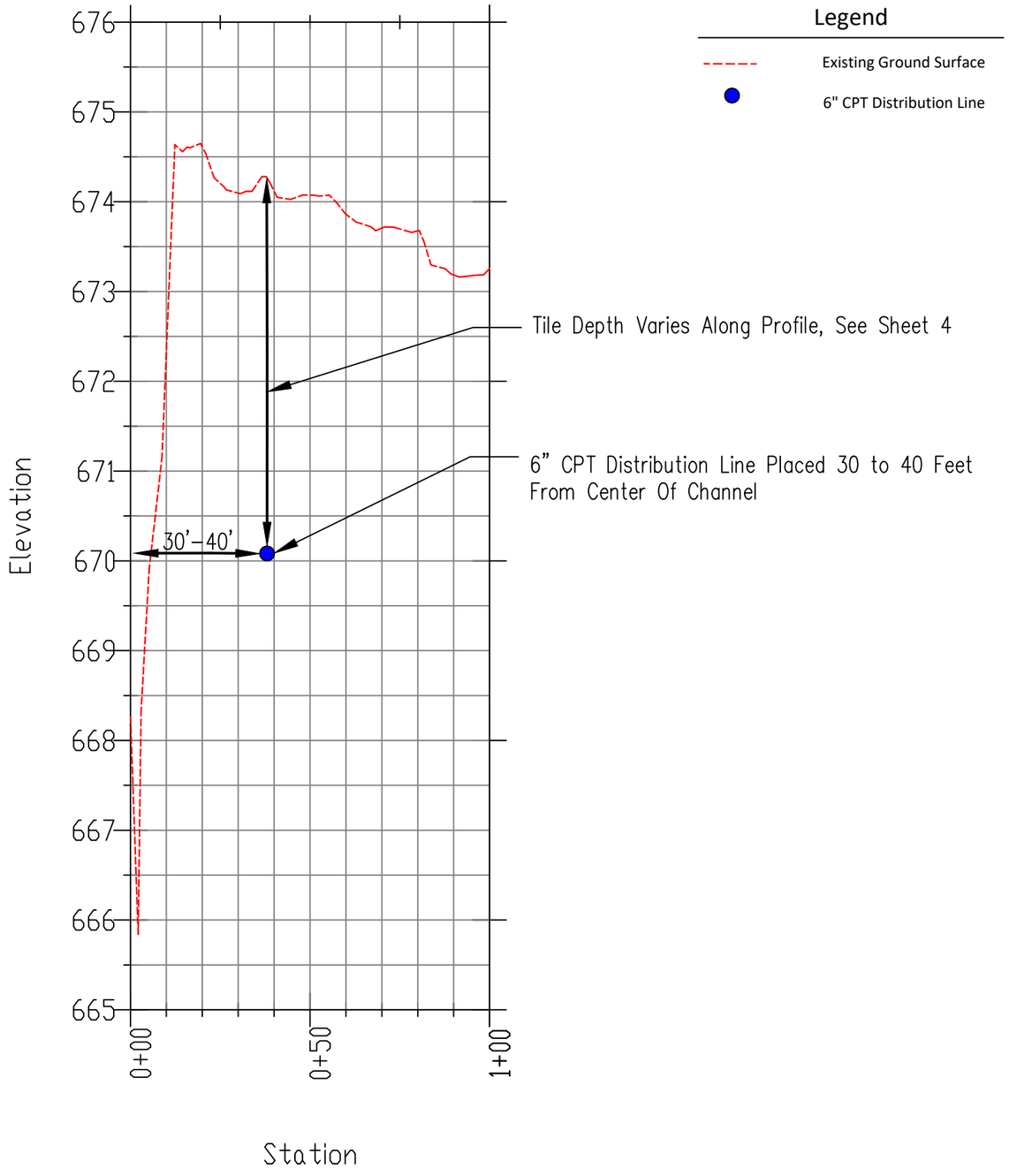
PLAN MAP

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

Buffer Cross Section



LANDOWNER		LOCATION	SECTION 29 - T79N - R4W

DESIGNED BY BEN REINHART 07/27/23
DRAWN BY BEN REINHART 07/27/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

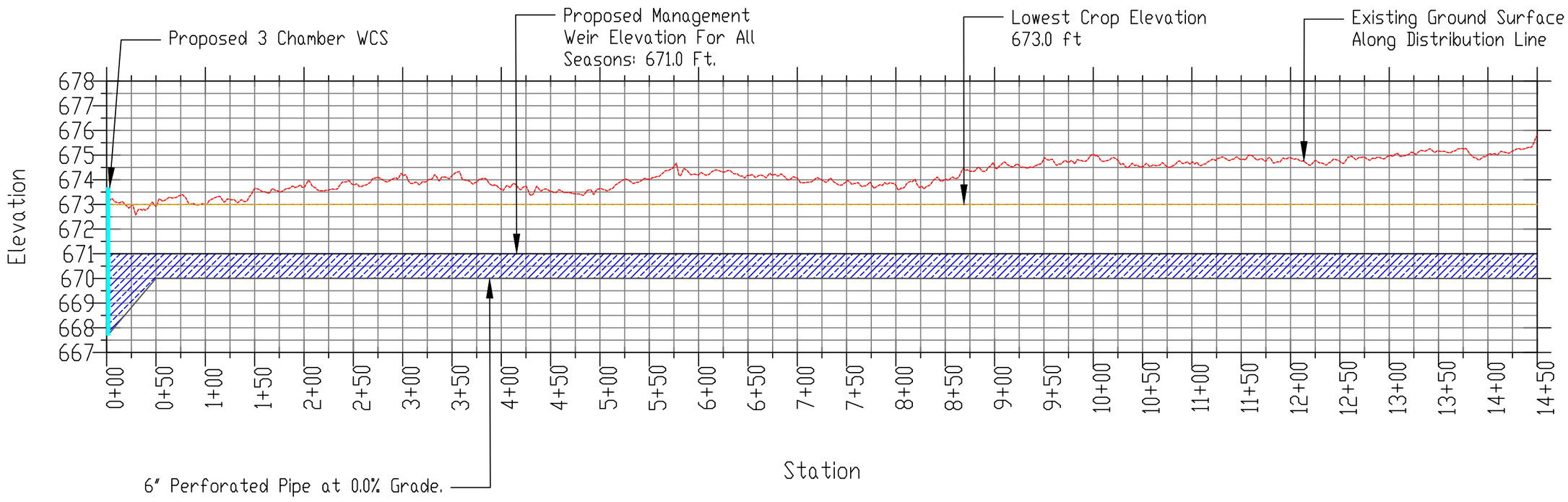
FILE NAME
Bio

DRAWING SET
SHEET 3 OF 6

Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Crop Elevation

Profile Along Distribution Line



LANDOWNER		LOCATION	SECTION 29 - T79N - R4W

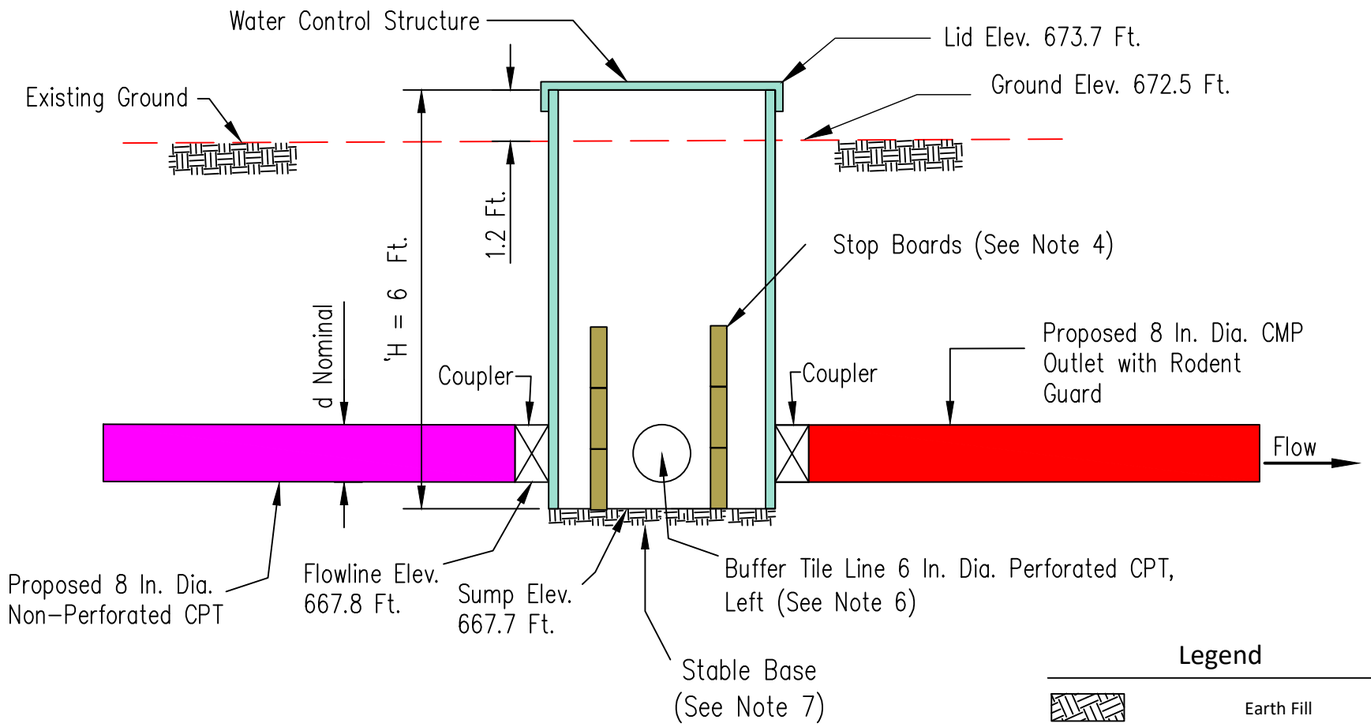
DESIGNED BY BEN REINHART 07/27/23
DRAWN BY BEN REINHART 07/27/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
B

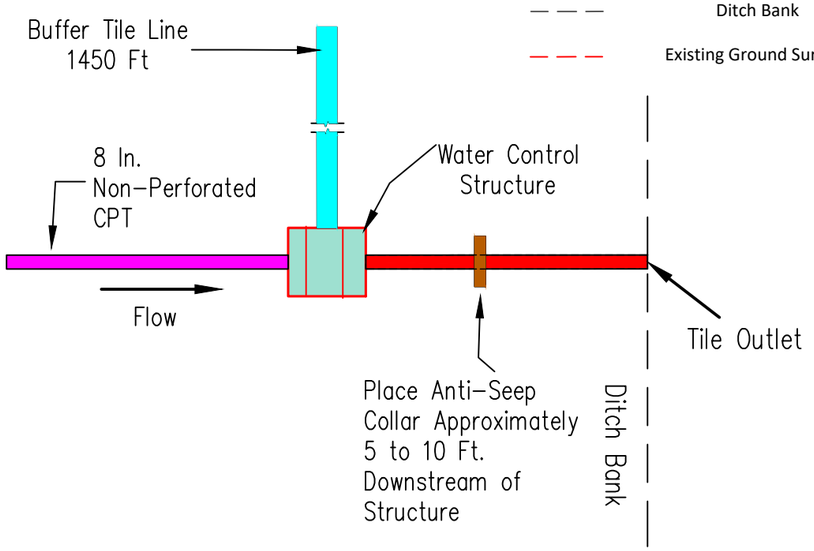
DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 8 in.	1	IA-21, IA-26, CPS-587
8" Non–perforated CPT (ft)	20	IA-21, IA-45
8" CMP Outlet with Rodent Guard	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	1430	IA-21, IA-45, IA-46
6" Non–perforated CPT (ft) Buffer Tile Line (see Plan Map, Pg 2)	20	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
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7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
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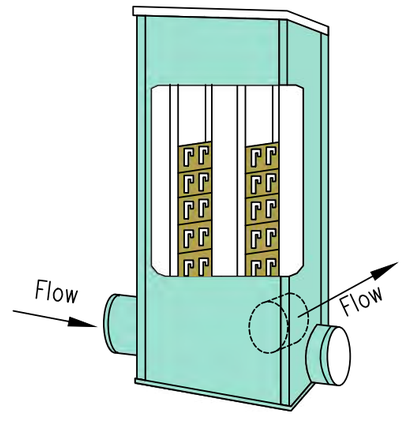

IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 29 - T79N - R4W

DATE
DESIGNED BY BEN REINHART 07/27/23
DRAWN BY BEN REINHART 07/27/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
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   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
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Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 29 - T79N - R4W

DATE
DESIGNED BY BEN REINHART 07/27/23
DRAWN BY BEN REINHART 07/27/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

JOHNSON CO, IOWA

SECTION 36 - T80N - R5W

INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
Andy J. Craig
20832
IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

08/02/2023

Andy J. Craig, P.E.
License number: 20832

My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	BEN REINHART	07/31/2023
DRAWN BY	BEN REINHART	07/31/2023
CHECKED BY	ANDY CRAIG, PE, TSP	08/02/2023
APPROVED BY		

ESE Ecosystem Services Exchange
Valuing Conservation

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD83, Iowa South, US Survey Feet)
Northing: 625150. 611
Easting: 2218841.530
Elevation: 776.8

0 60 120 Feet

N

Staking Control Points (NAD83, Iowa South, US Survey Feet)

Point	Description	Northing	Easting	Elevation
1	Benchmark	625150.611	2218841.530	776.8
2	Control Structure	625118.602	2218709.047	771.1
3	Distribution Line	625047.713	2218772.452	771.0
4	Distribution Line	624961.137	2218822.192	770.2
5	Distribution Line	624890.201	2218891.457	770.2
6	Distribution Line	624821.809	2218964.330	770.2
7	Distribution Line	624751.297	2219035.240	770.2

Existing 12" Tile

500' of 6" CPT
at 0.0% Grade

Buffer Cross
Section, See
Sheet 3

New 12" CMP Outlet
with Rodent Guard

1 2 3 4 5 6 7

0+00.00 0+50.00 1+00.00 1+50.00 2+00.00 2+50.00 3+00.00 3+50.00 4+00.00 4+50.00

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 12" Non-Perforated CPT
- Proposed 12" CMP Outlet
- Proposed Water Control Structure
- Existing 12" CPT Main
- Benchmark
- Staking Points
- 2' Contours

DATE
DESIGNED BY BEN REINHART 07/31/23
DRAWN BY BEN REINHART 07/31/23
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APPROVED BY

PLAN MAP

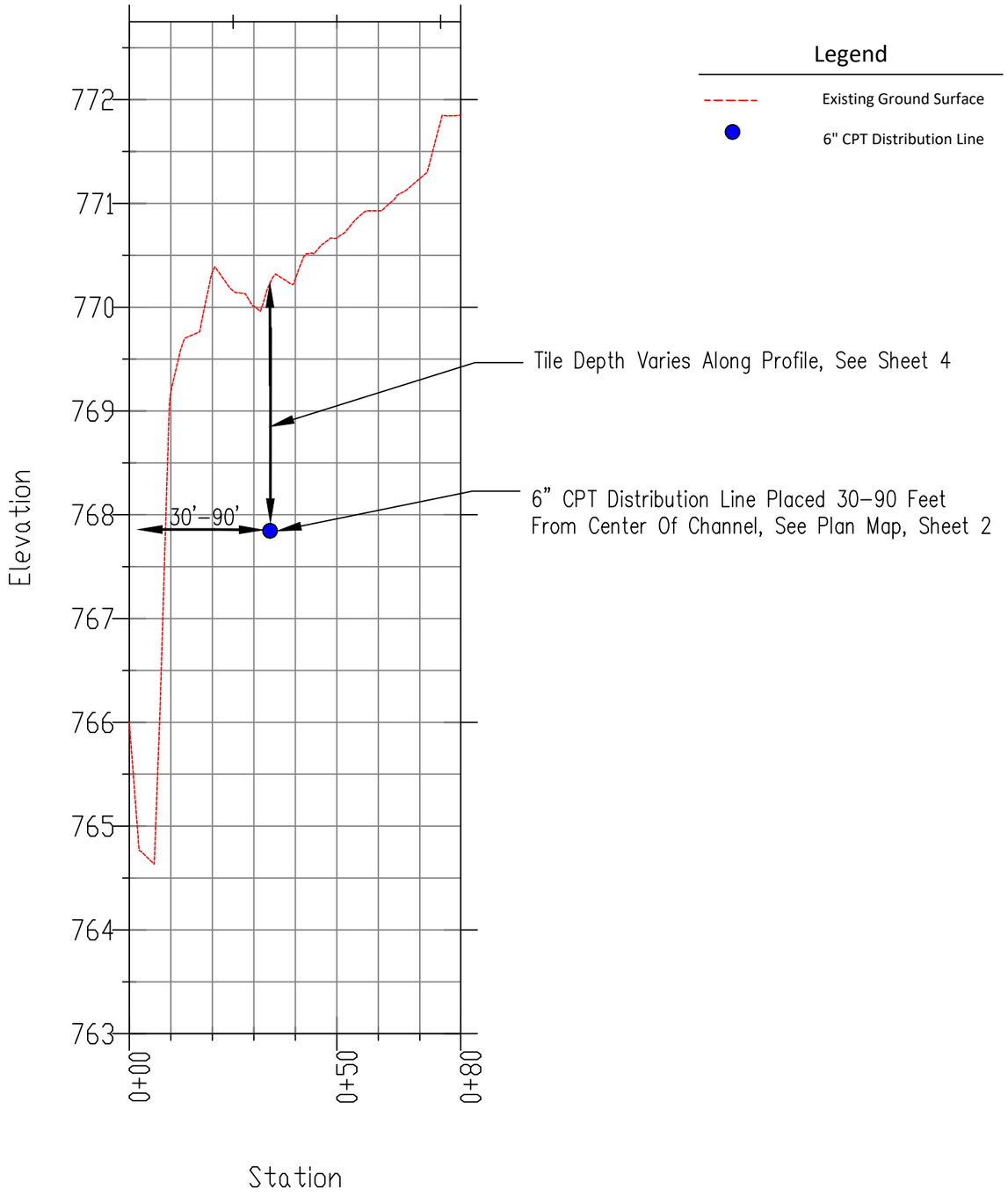
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME
Bla

DRAWING SET
SHEET 2 OF 6

LANDOWNER		LOCATION	SECTION 36 - T80N - R5W	

Buffer Cross Section



LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

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BUFFER AND BANK CROSS SECTION

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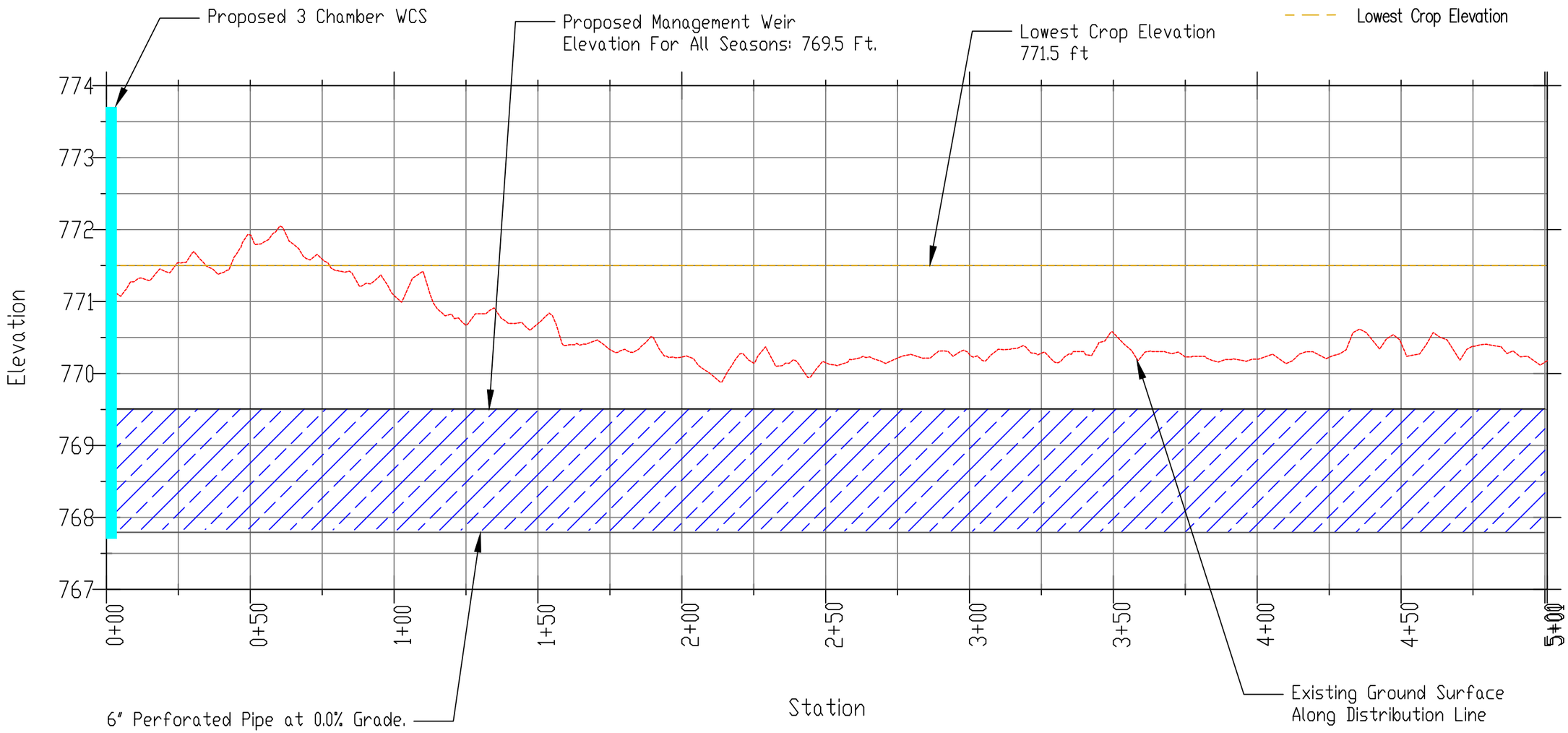
FILE NAME
B

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



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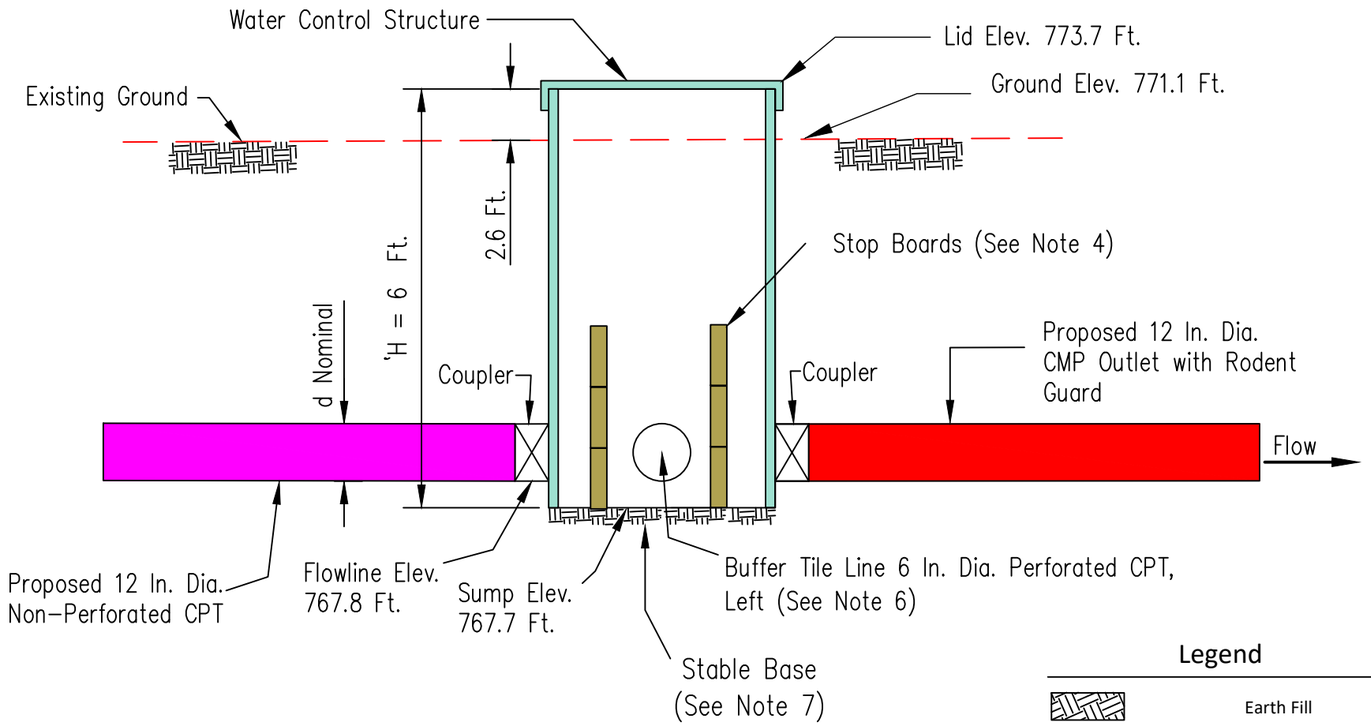
PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 4 OF 6

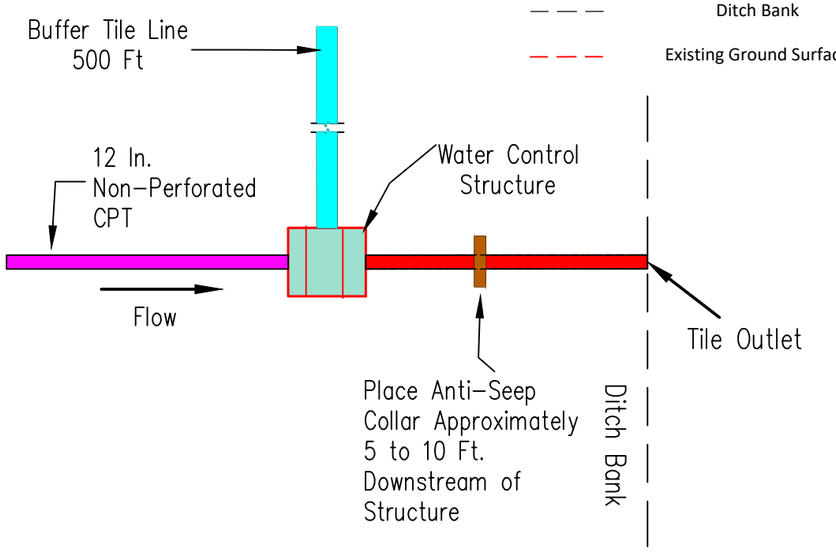
LANDOWNER		LOCATION	SECTION 36 - T80N - R5W



TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 12 in.	1	IA-21, IA-26, CPS-587
12" Non-perforated CPT (ft)	20	IA-21, IA-45
12" CMP Outlet with Rodent Guard	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	500	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 12" Non-Perforated CPT
- Proposed 12" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
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4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
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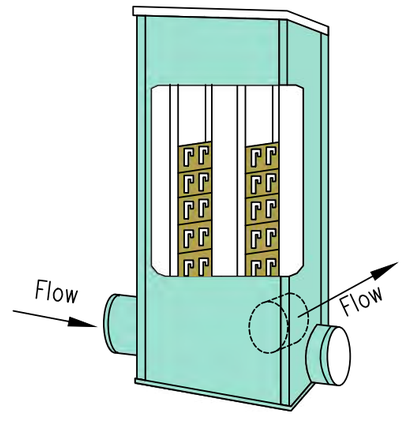

IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

DATE
DESIGNED BY BEN REINHART 07/31/23
DRAWN BY BEN REINHART 07/31/23
CHECKED BY ANDY CRAIG, PE, TSP 08/02/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

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Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
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IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

DESIGNED BY BEN REINHART DATE 07/31/23
DRAWN BY BEN REINHART DATE 07/31/23
CHECKED BY ANDY CRAIG, PE, TSP DATE 08/02/23
APPROVED BY DATE

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
Bk

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

Know what's below. Call before you dig.

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SECTION 36 - T80N - R5W

INDEX OF SHEETS

LICENSED PROFESSIONAL ENGINEER
Andy J. Craig
20832
IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

08/02/2023

Andy J. Craig, P.E.
License number: 20832

My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	BEN REINHART	08/01/2023
DRAWN BY	BEN REINHART	08/01/2023
CHECKED BY	ANDY CRAIG, PE, TSP	08/02/2023
APPROVED BY		

ESE
Ecosystem Services Exchange
Valuing Conservation

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

PLAN VIEW

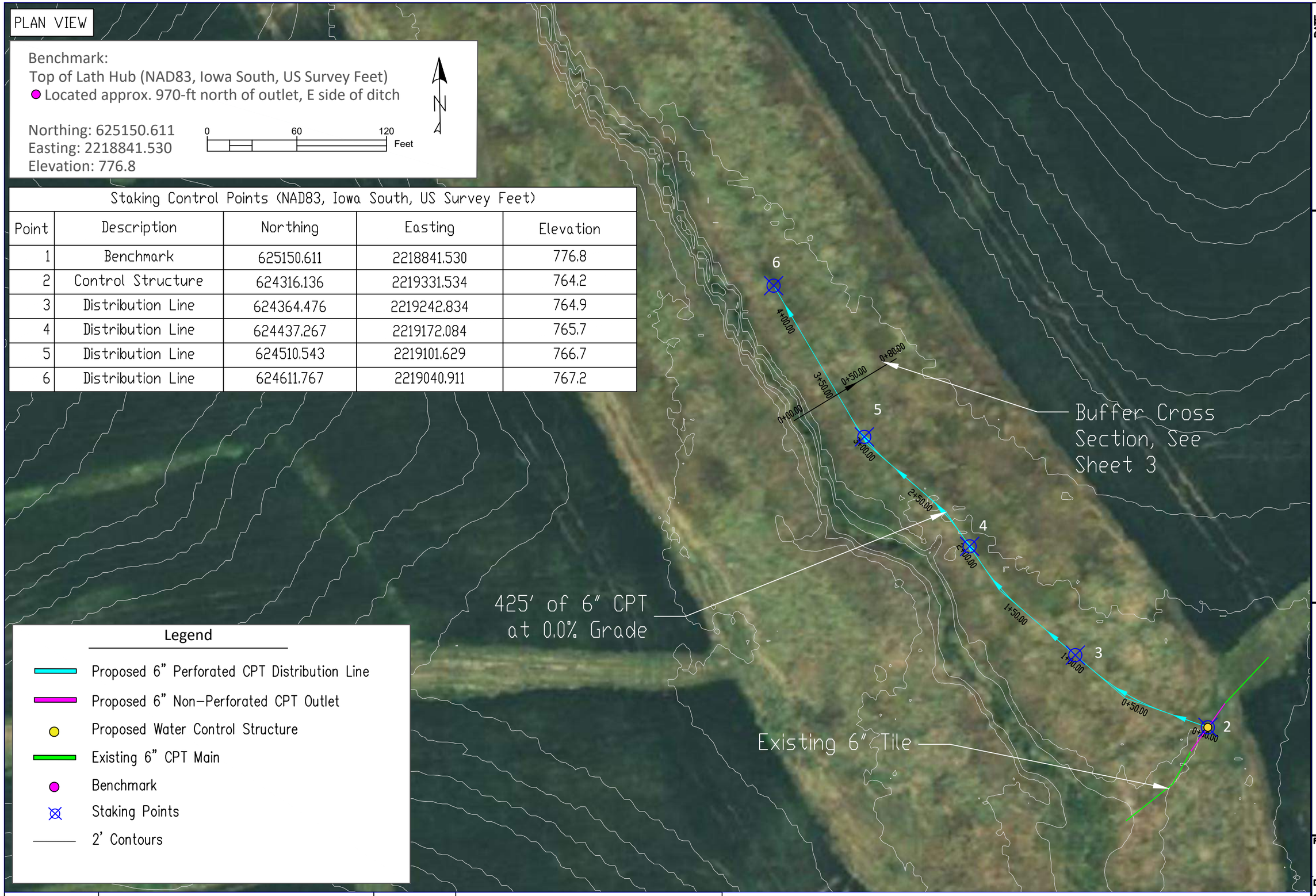
Benchmark:
Top of Lath Hub (NAD83, Iowa South, US Survey Feet)
● Located approx. 970-ft north of outlet, E side of ditch

Northing: 625150.611
Easting: 2218841.530
Elevation: 776.8

0 60 120 Feet

N

Staking Control Points (NAD83, Iowa South, US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	Benchmark	625150.611	2218841.530	776.8
2	Control Structure	624316.136	2219331.534	764.2
3	Distribution Line	624364.476	2219242.834	764.9
4	Distribution Line	624437.267	2219172.084	765.7
5	Distribution Line	624510.543	2219101.629	766.7
6	Distribution Line	624611.767	2219040.911	767.2



Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 6" Non-Perforated CPT Outlet
- Proposed Water Control Structure
- Existing 6" CPT Main
- Benchmark
- Staking Points
- 2' Contours

LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

DATE
DESIGNED BY BEN REINHART 08/01/23
DRAWN BY BEN REINHART 08/01/23
CHECKED BY ANDY CRAIG, PE, TSP 08/02/23
APPROVED BY

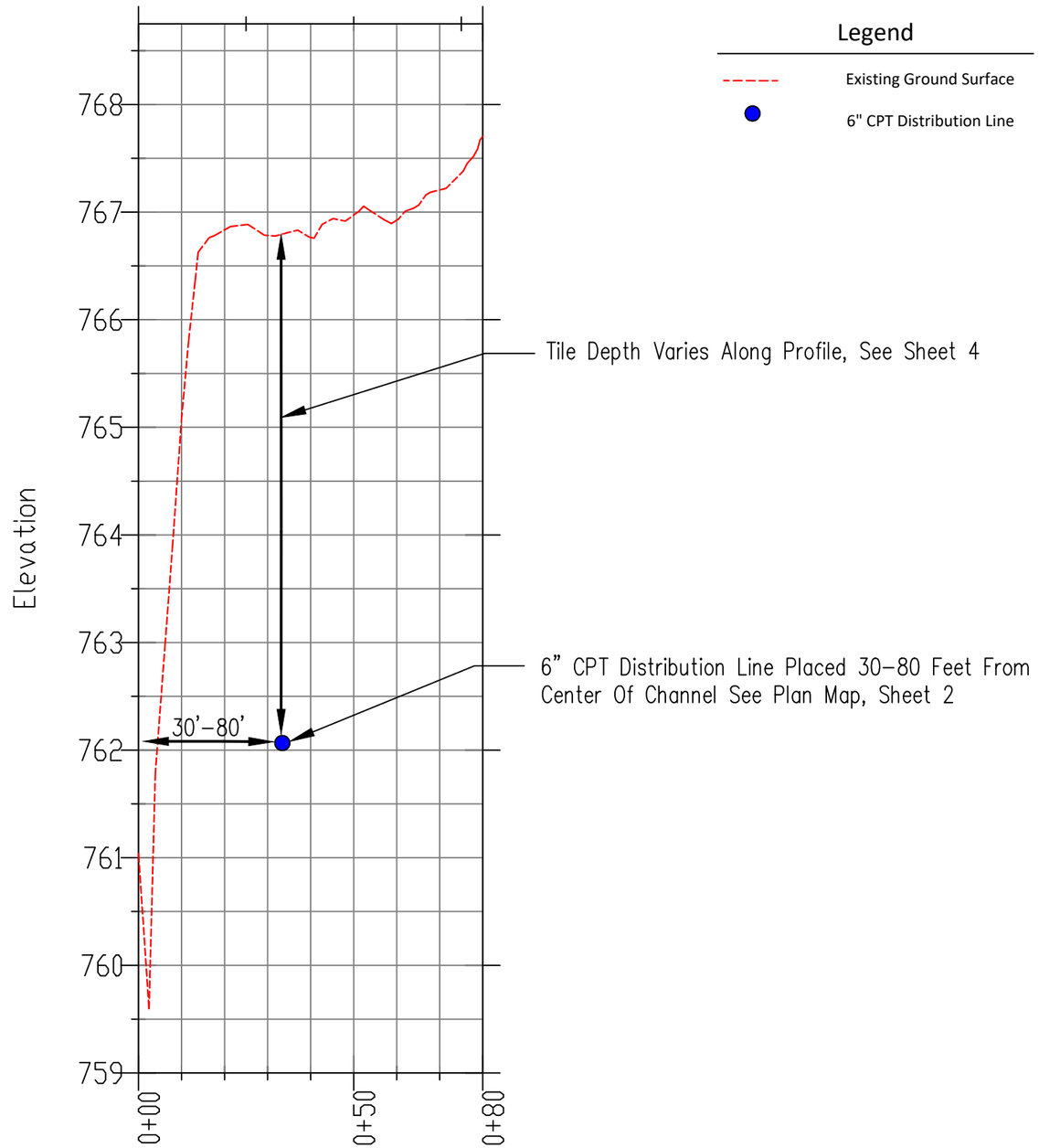
PLAN MAP

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

Buffer Cross Section



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BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

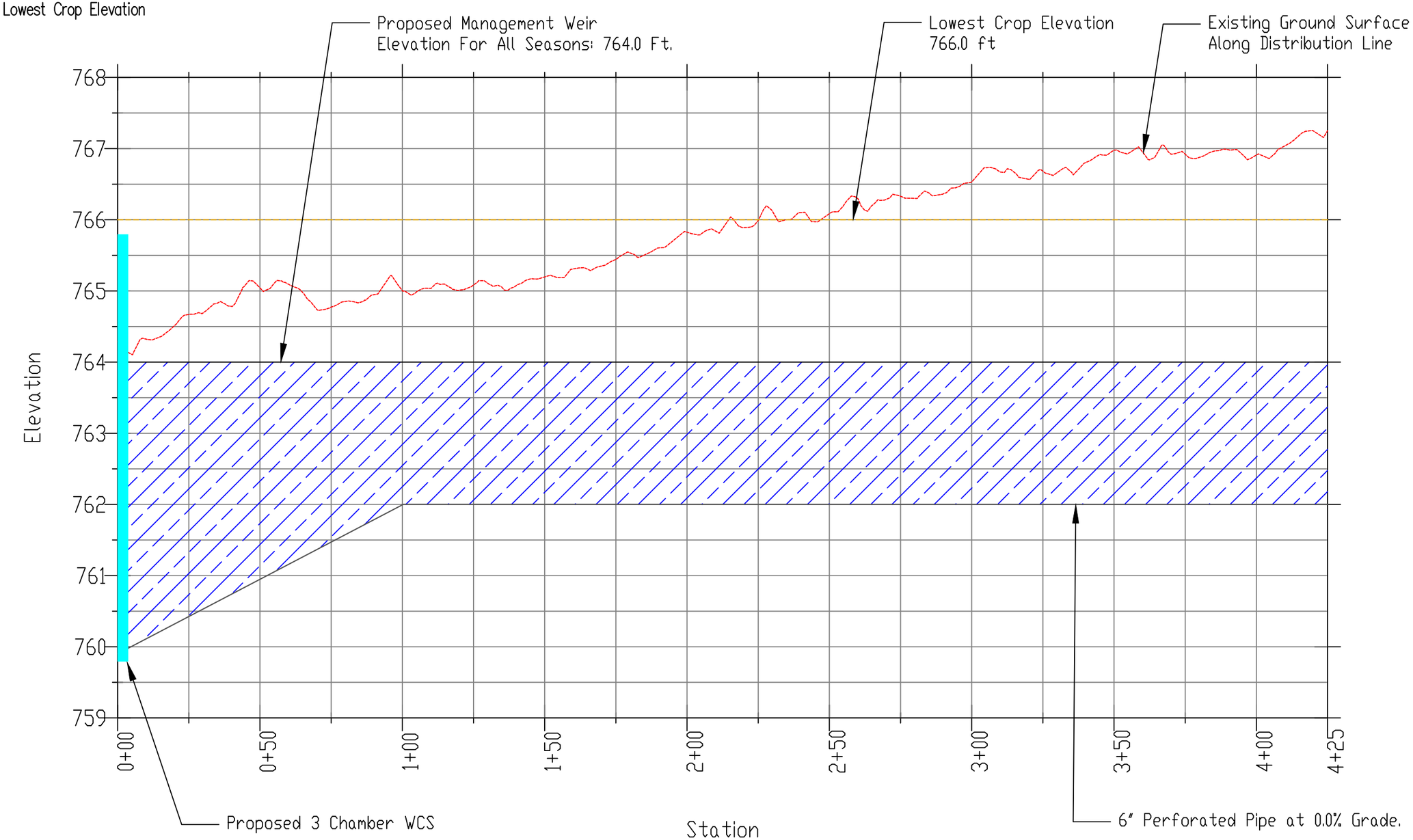
FILE NAME
B

DRAWING SET
SHEET 3 OF 6

Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Crop Elevation

Profile Along Distribution Line



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PROFILE ALONG DISTRIBUTION LINE

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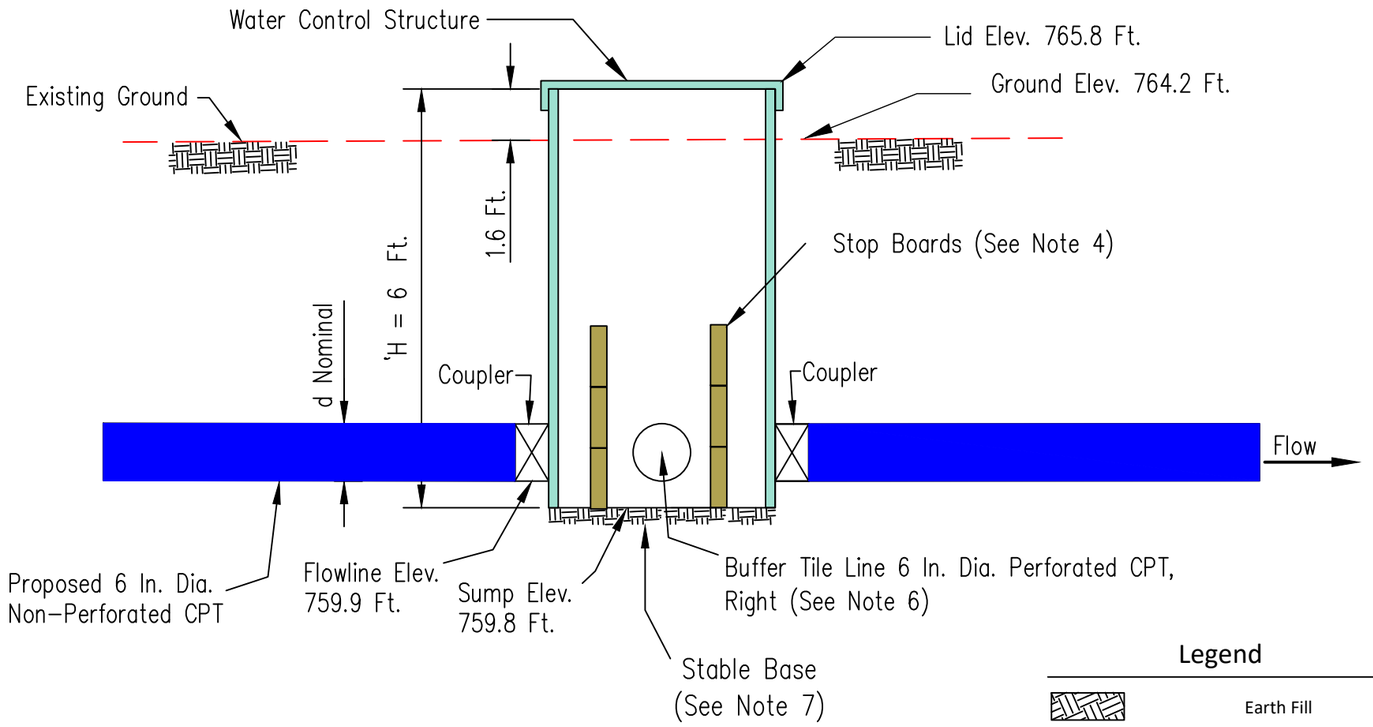
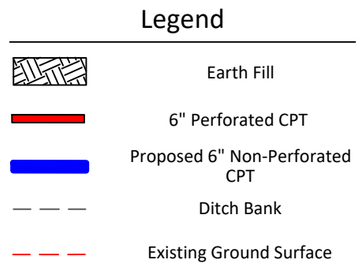
FILE NAME

DRAWING SET
SHEET 4 OF 6

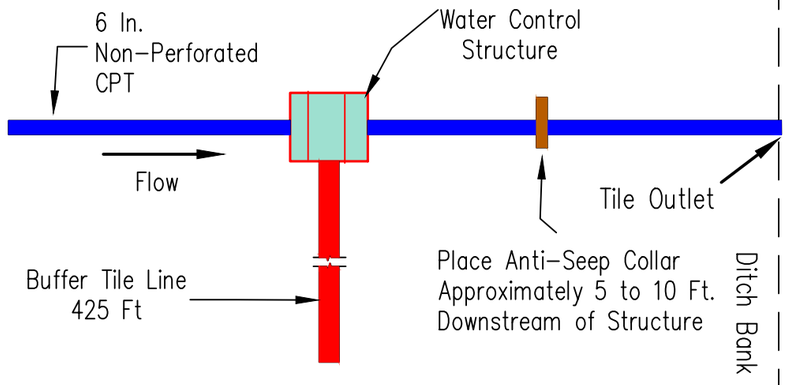


TYPICAL SECTION



QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 6 in.	1	IA-21, IA-26, CPS-587
6" Non-perforated CPT (ft)	40	IA-21, IA-45
6" Perforated CPT (ft) Buffer Tile Line	425	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN

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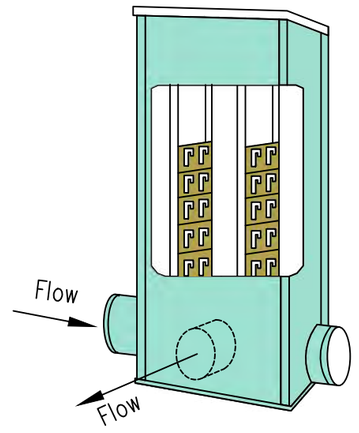

IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

DATE
DESIGNED BY BEN REINHART 08/01/23
DRAWN BY BEN REINHART 08/01/23
CHECKED BY ANDY CRAIG, PE, TSP 08/02/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

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LANDOWNER		LOCATION	SECTION 36 - T80N - R5W

DESIGNED BY BEN REINHART 08/01/23
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APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

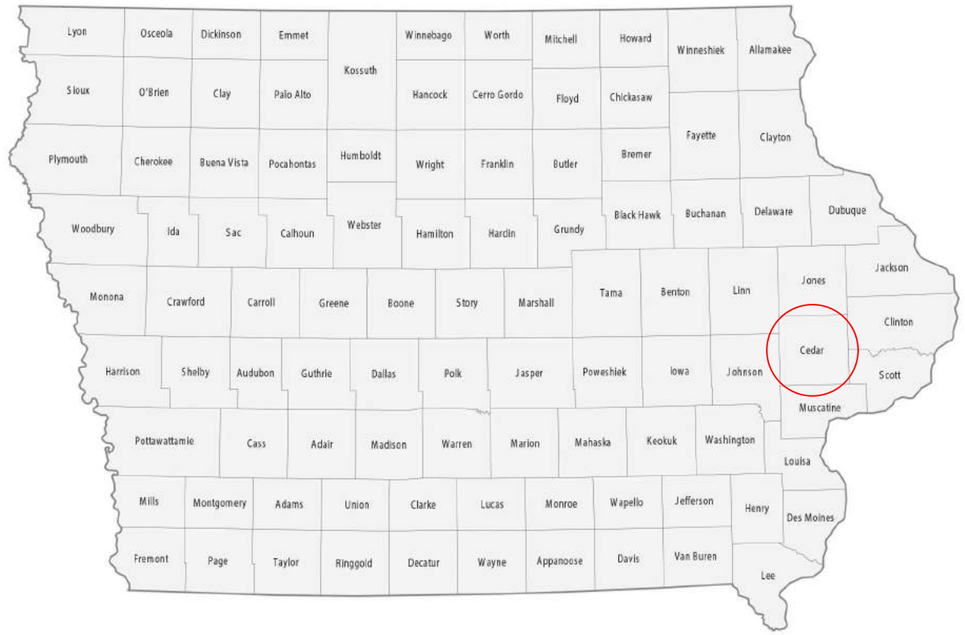
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 33 - T79N - R4W



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LICENSED PROFESSIONAL ENGINEER Andy J. Craig 20832 IOWA

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07/28/2023

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ENGINEERING CLASS 2

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APPROVED BY		

ESE Ecosystem Services Exchange *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 7

PLAN VIEW

Existing 8" Tile

Existing 6" Tile

Existing 8" and 6" tile connected into 10" non-perforated outlet

Proposed 10" CMP Outlet with Rodent Guard

Existing 6" Tile

Proposed 6" CMP Outlet with Rodent Guard

1200' of 6" CPT at 0.0% Grade

Buffer Cross Section, See Sheet 3

Existing 4" Tile Outlet

Located near Staking Point 10. It is likely too deep to incorporate into buffer design. The distribution line should cross this tile with 10-feet of 6-inch non-perforated tile on the upstream and downstream sides.

Benchmark:
Top of Lath Hub (NAD83, Iowa South, US Survey Feet)
Northing: 590861.645
Easting: 2238550.906
Elevation: 669.6

0 100 200 Feet

N

Staking Control Points (NAD83, Iowa South, US Survey Feet)

Point	Description	Northing	Easting	Elevation
1	Benchmark	590861.645	2238550.906	669.6
2	West Control Structure	590920.169	2238503.338	668.1
3	East Control Structure	590607.487	2238866.146	668.2
4	Distribution Line	590850.429	2238580.209	668.5
5	Distribution Line	590781.315	2238657.650	668.7
6	Distribution Line	590714.845	2238737.377	668.8
7	Distribution Line	590517.037	2238977.877	668.8
8	Distribution Line	590451.777	2239058.598	668.7
9	Distribution Line	590386.977	2239139.689	668.5
10	Distribution Line	590323.559	2239221.782	668.3
11	Distribution Line	590271.069	2239311.334	667.6
12	Distribution Line	590181.506	2239446.671	666.1

Legend

- Existing 8" CPT Main
- Existing 6" CPT Main
- Proposed 8" Non-Perforated CPT Connection
- Proposed 10" Non-Perforated CPT
- Proposed 10" CMP Outlet
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Proposed 6" Perforated CPT Distribution Line
- Proposed Water Control Structure
- Benchmark
- Staking Points
- 2' Contours

DATE
DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

PLAN MAP

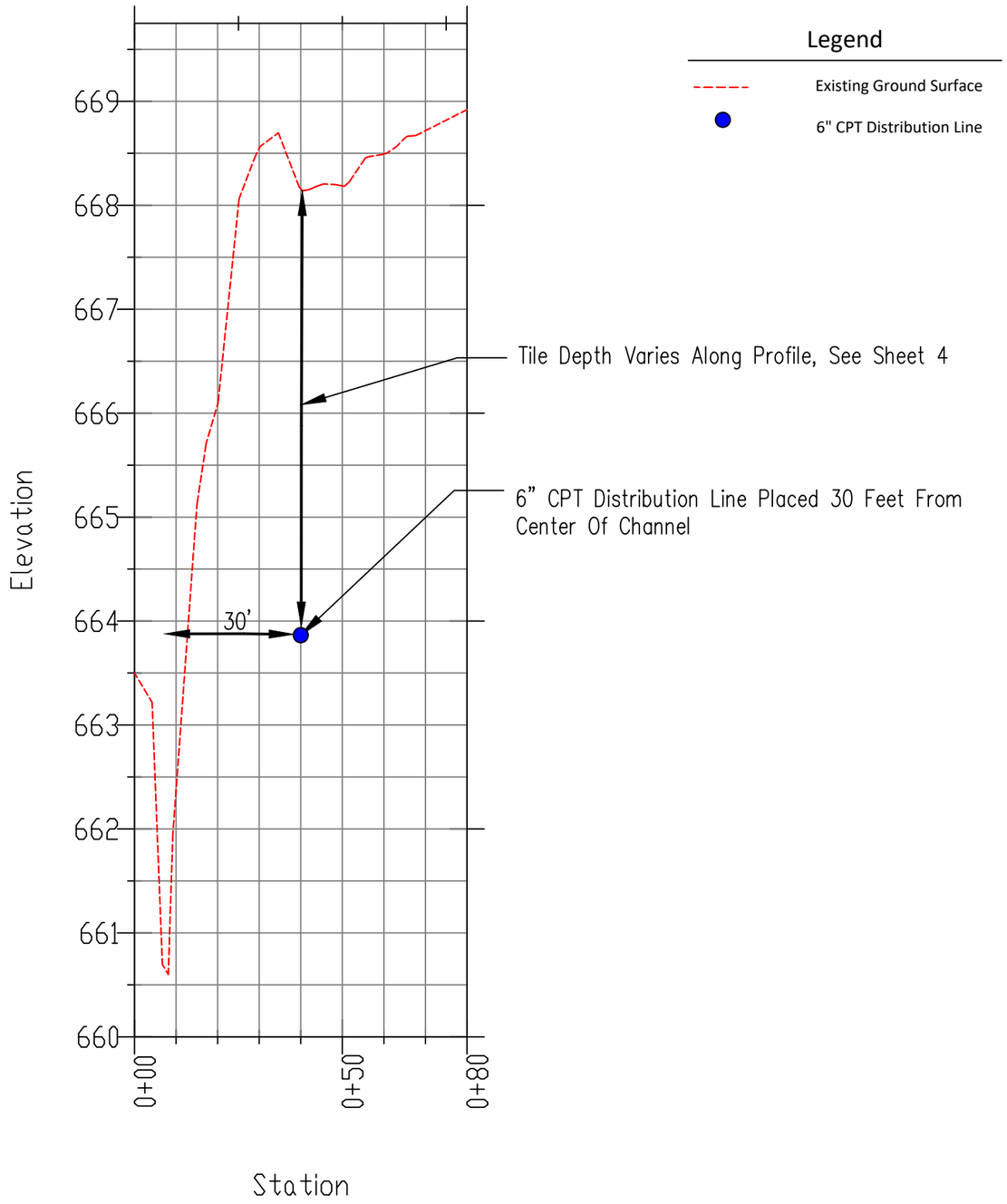
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 7

LANDOWNER | LOCATION | SECTION 33 - T79N - R4W

Buffer Cross Section



LANDOWNER		LOCATION	SECTION 33 - T79N - R4W

DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

BUFFER AND BANK CROSS SECTION

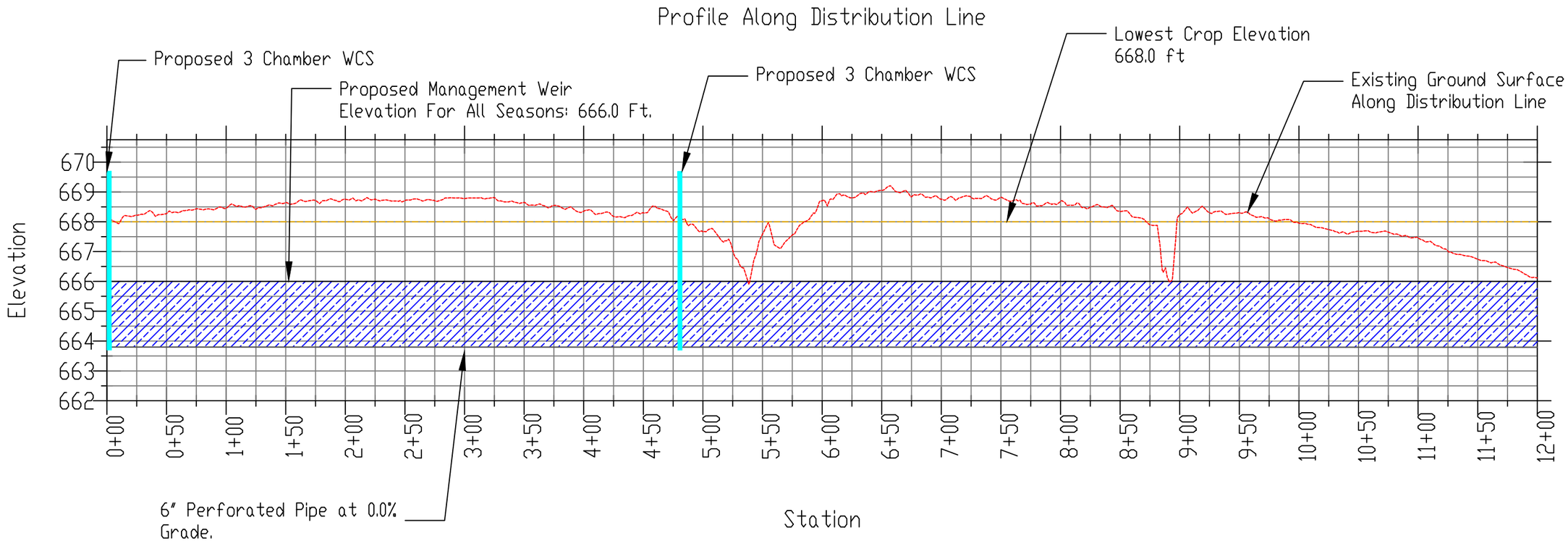
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
Bk

DRAWING SET
SHEET 3 OF 7

Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Crop Elevation



LANDOWNER		LOCATION	SECTION 33 - T79N - R4W

DATE
DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
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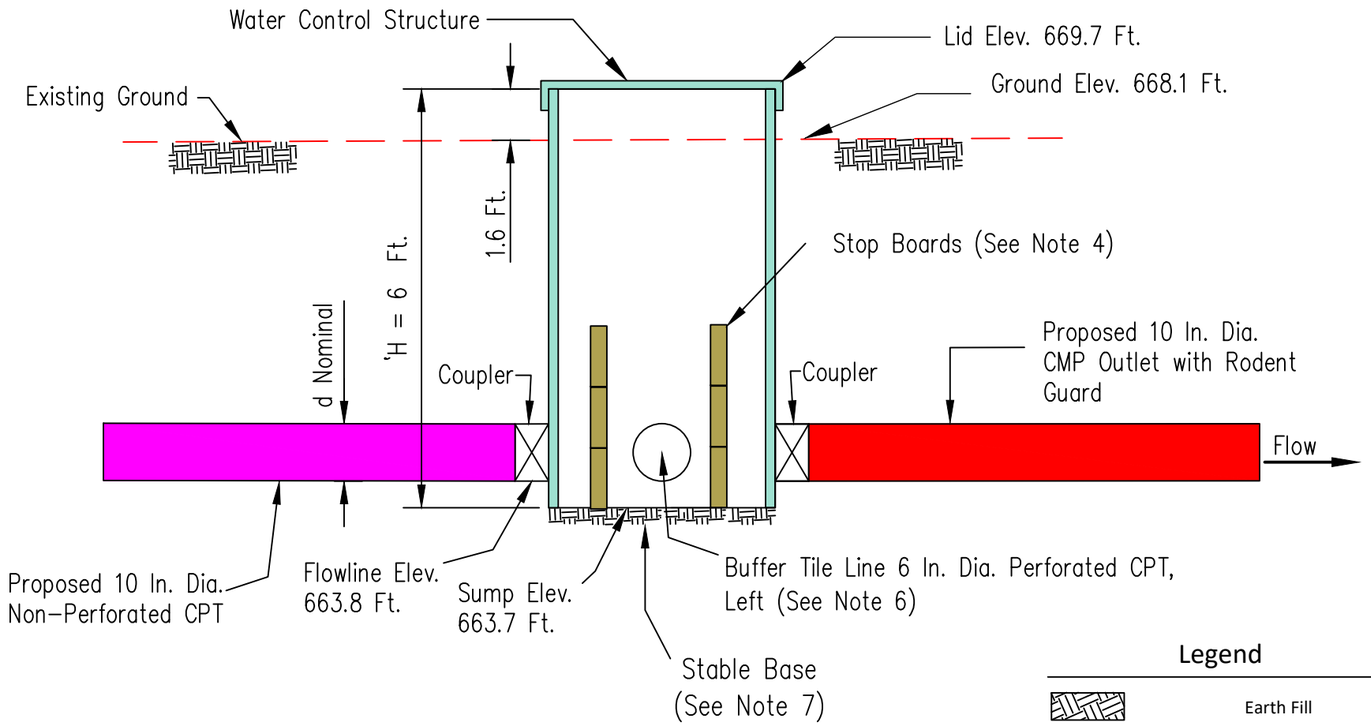
PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange
Valuing Conservation

FILE NAME
B

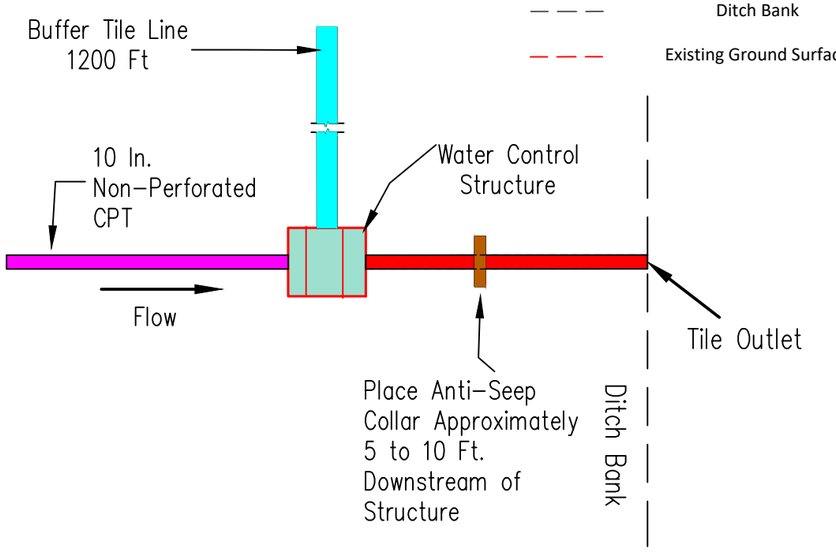
DRAWING SET
SHEET 4 OF 7



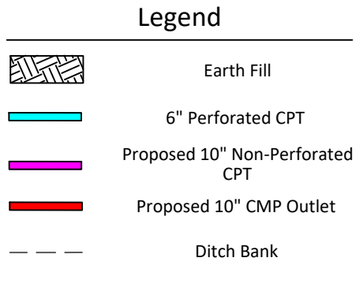
TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3- Compartment H = 6 ft. d = 10 in.	1	IA-21, IA-26, CPS-587
10" Non-perforated CPT (ft)	20	IA-21, IA-45
10" CMP Outlet with Rodent Guard	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	1180	IA-21, IA-45, IA-46
6" Non-perforated CPT (ft) Buffer Tile Line (see Plan Map, Pg 2)	20	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587
8" Non-perforated CPT (ft) Connection Tile (see Plan Map, Pg 2)	40	IA-21, IA-45

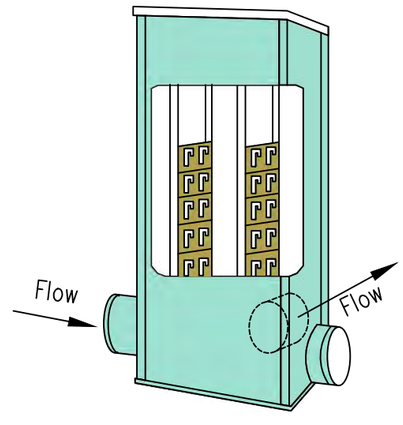
*Quantities Do Not Include Couplers



PLAN



NOTES:
1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual-wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non-perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t-post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN-LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 33 - T79N - R4W

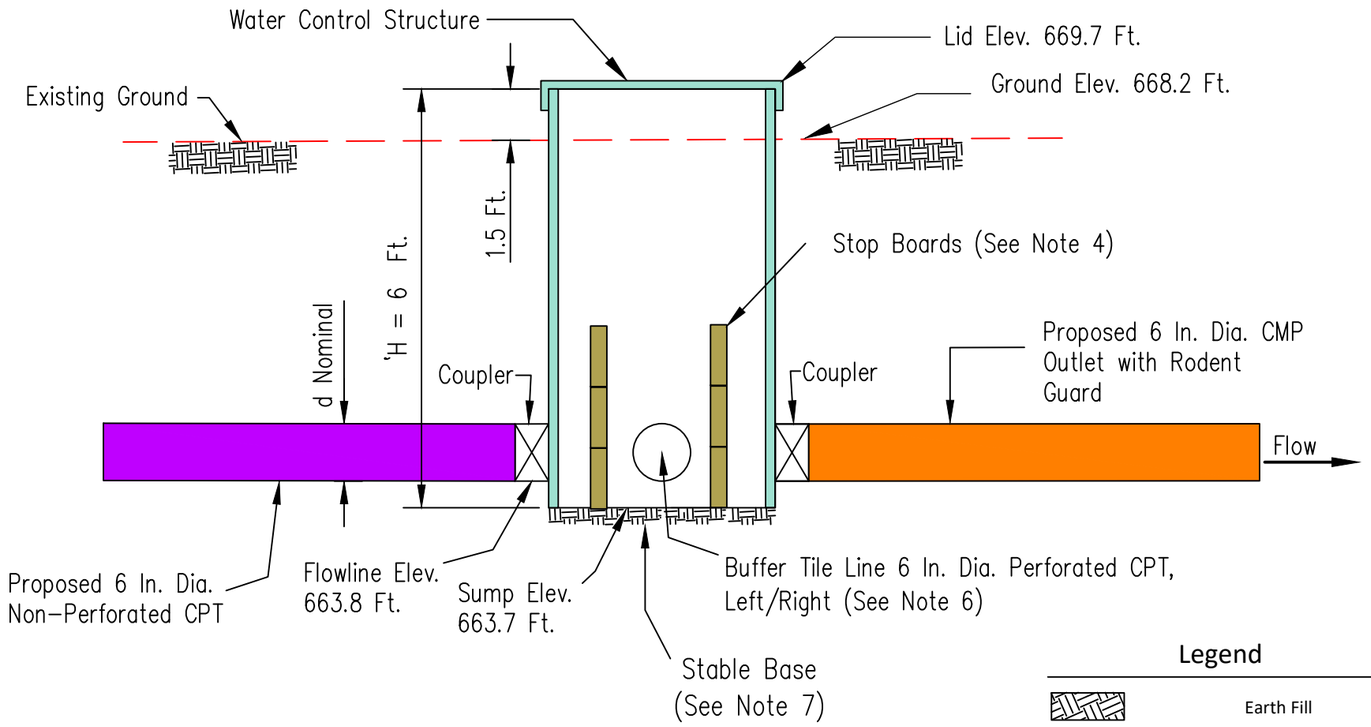
DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL (WEST)

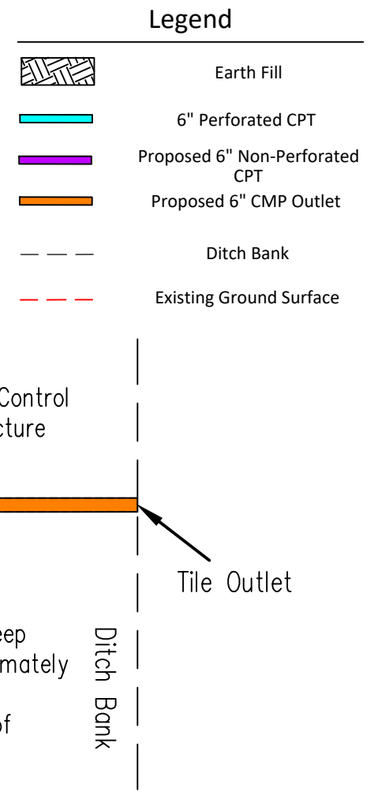
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 7

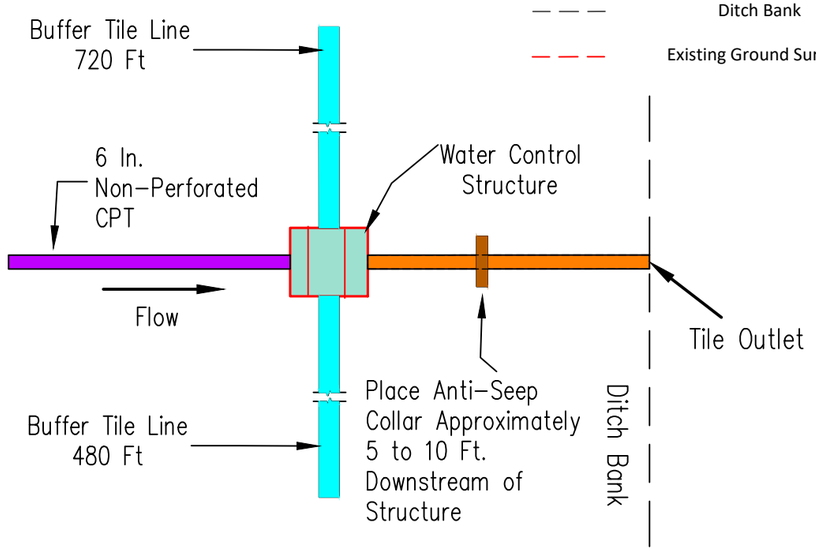


TYPICAL SECTION



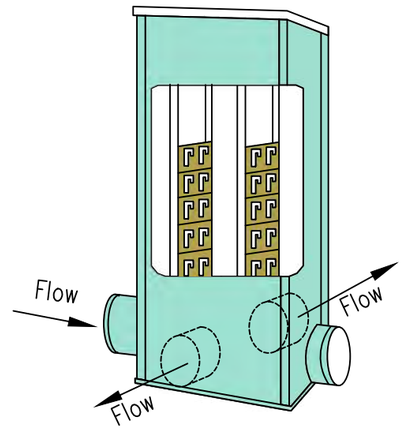
QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 6 in.	1	IA-21, IA-26, CPS-587
6" Non–perforated CPT (ft)	20	IA-21, IA-45
6" CMP Outlet with Rodent Guard	20	IA-604, IA-620
Buffer Tile Line Quantities Listed on West Structure Detail, Pg 5	-	-
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 33 - T79N - R4W

DATE
DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL (EAST)

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 6 OF 7

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
3. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion. Contact ESE for assistance with construction inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the existing tile and setting WCS.
   b. Distribution pipe has been laid and capped.
4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 33 - T79N - R4W

DESIGNED BY BEN REINHART 07/28/23
DRAWN BY BEN REINHART 07/28/23
CHECKED BY ANDY CRAIG, PE, TSP 07/28/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

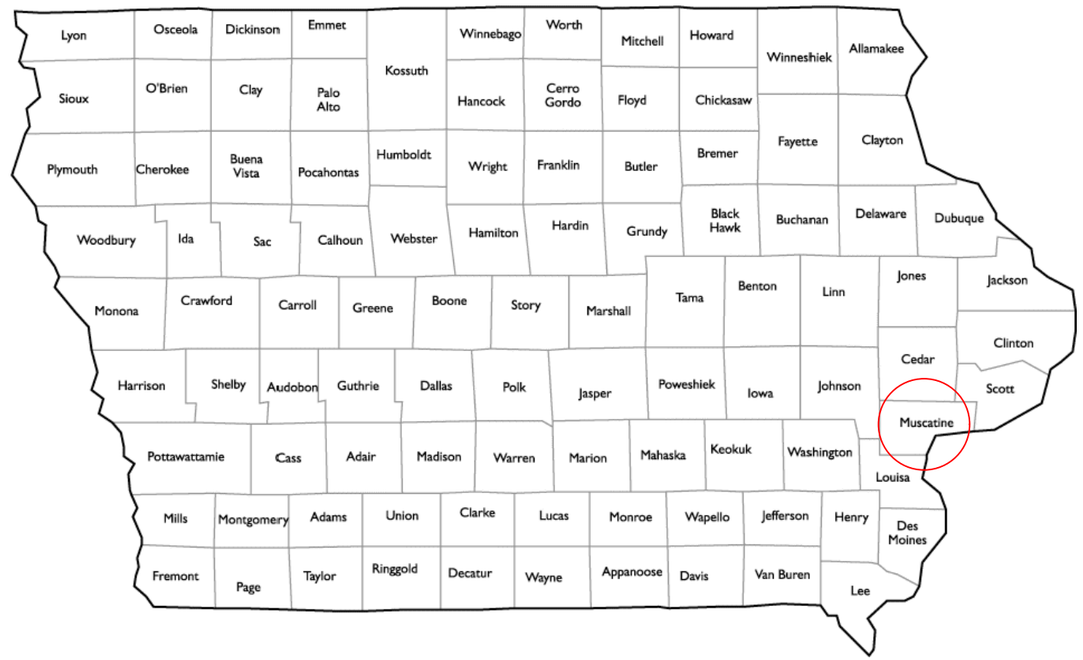
FILE NAME

DRAWING SET
SHEET 7 OF 7

SATURATED BUFFER CONSTRUCTION PLANS

MUSCATINE CO, IOWA

SECTION 12 - T78N - R1E



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

7/28/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	7/27/2023
DRAWN BY	ANDREW MACKRILL	7/27/2023
CHECKED BY	ANDY CRAIG, PE, TSP	7/28/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

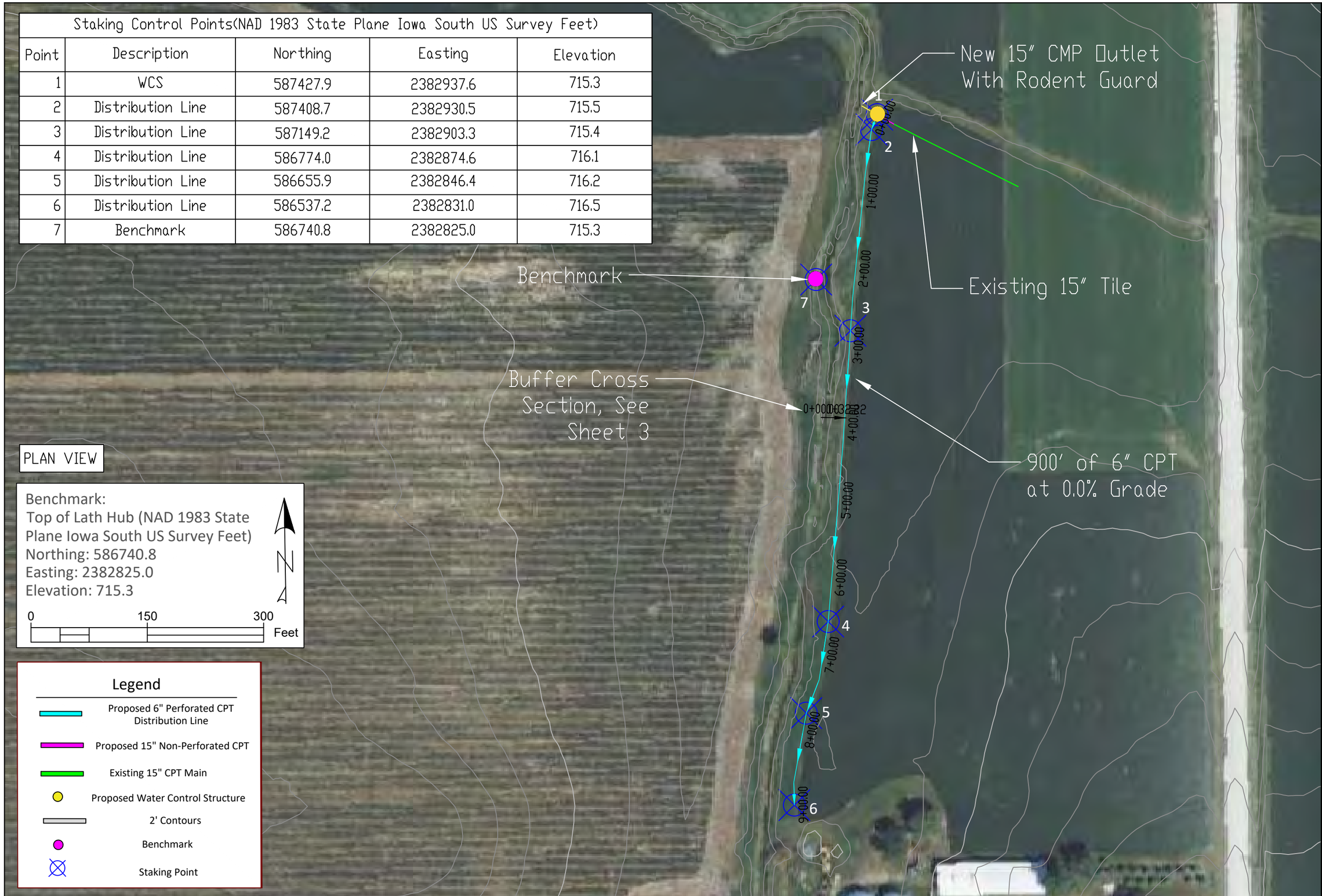
COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	587427.9	2382937.6	715.3
2	Distribution Line	587408.7	2382930.5	715.5
3	Distribution Line	587149.2	2382903.3	715.4
4	Distribution Line	586774.0	2382874.6	716.1
5	Distribution Line	586655.9	2382846.4	716.2
6	Distribution Line	586537.2	2382831.0	716.5
7	Benchmark	586740.8	2382825.0	715.3



PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 586740.8
Easting: 2382825.0
Elevation: 715.3

N

0 150 300 Feet

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 15" Non-Perforated CPT
- Existing 15" CPT Main
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

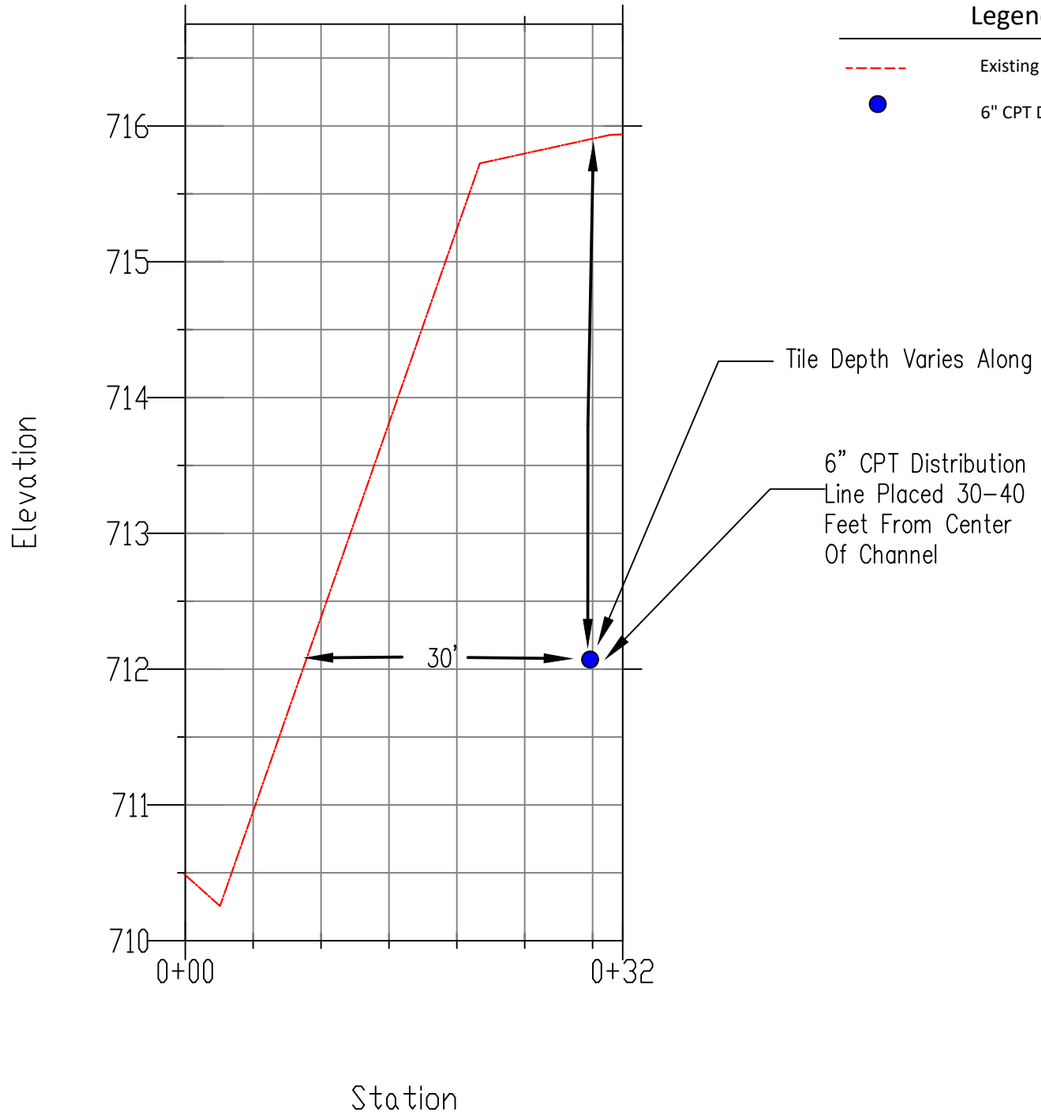
PLAN MAP

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

Buffer Cross-Section



LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL DATE 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

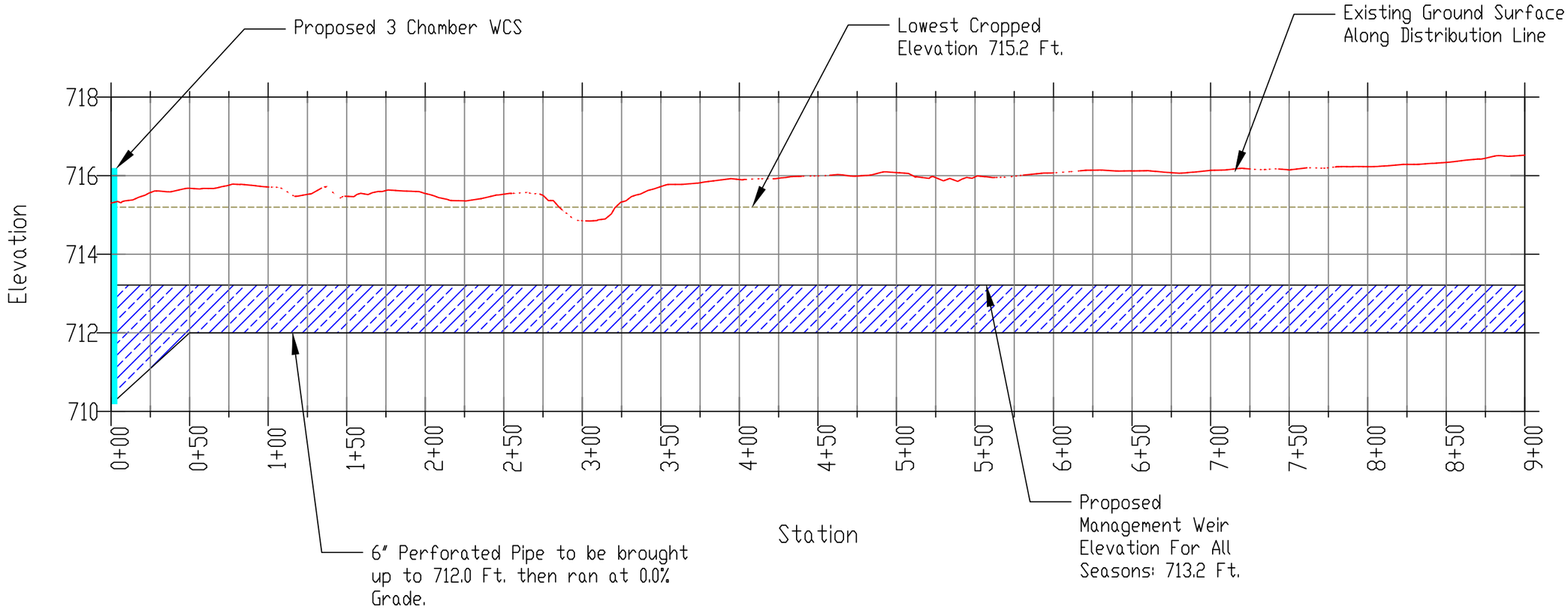
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
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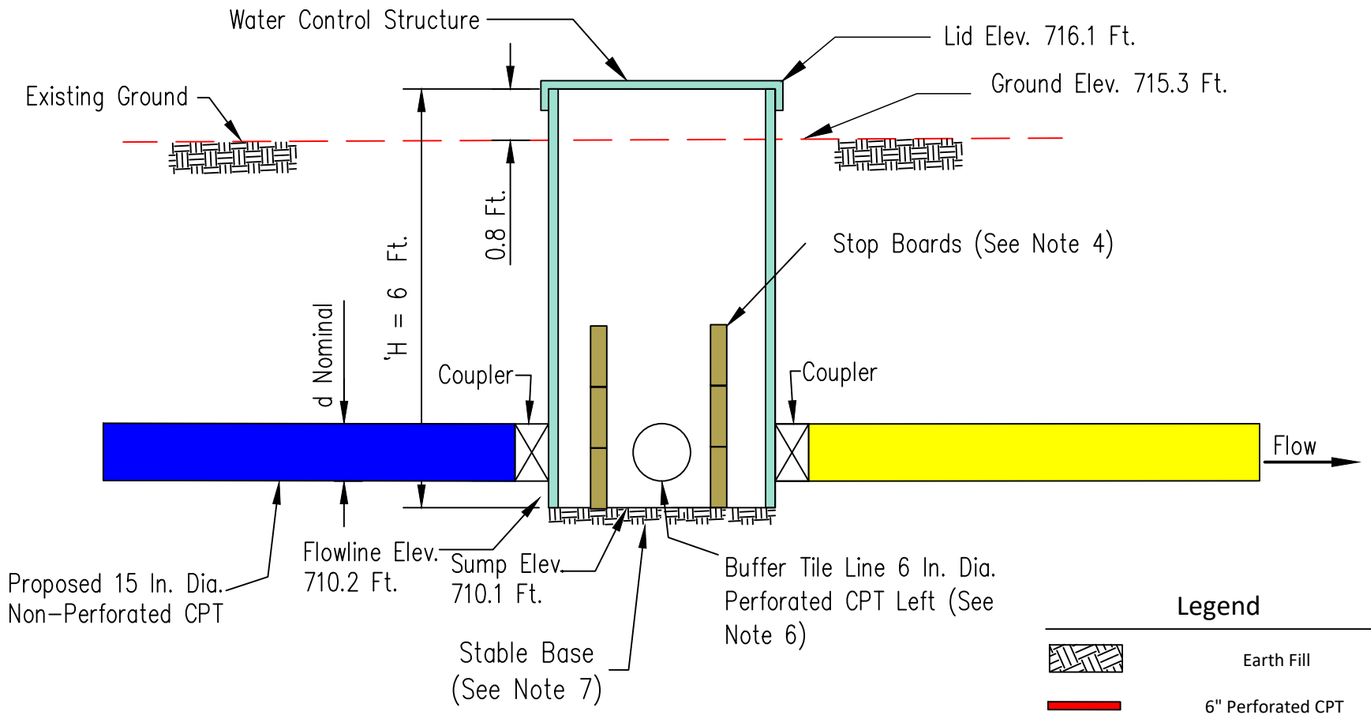
PROFILE ALONG DISTRIBUTION LINE

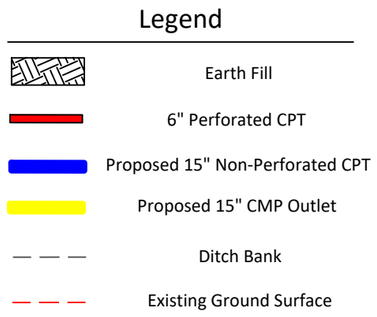
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION



NOTES:
1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual-wall PT, or CMP.
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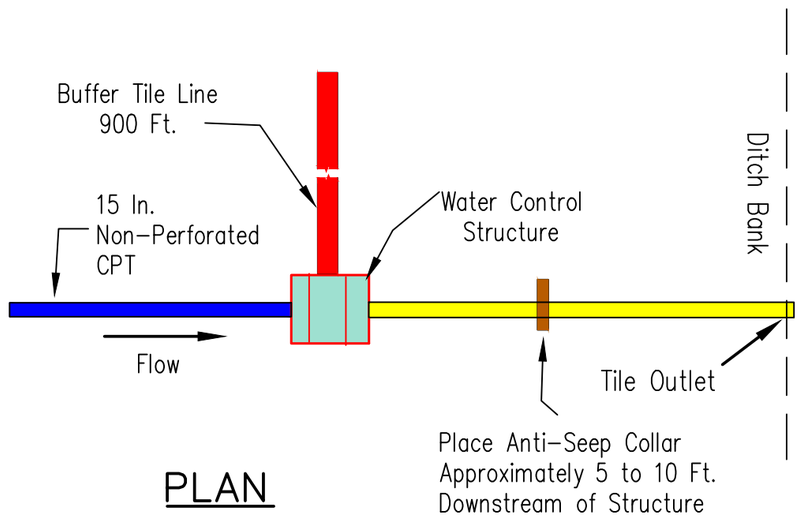
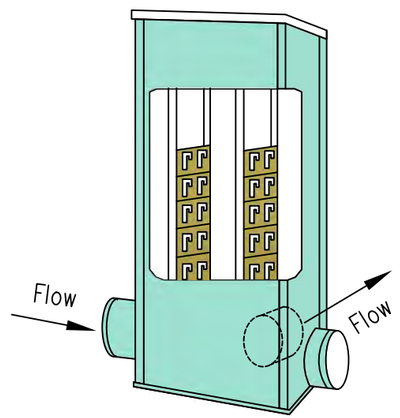
QUANTITIES*		NRCS SPEC
Water Control Structure 3- Compartment H = 6 ft. d = 15 in.	1	IA-21, IA-26, CPS-587
15" Non-perforated Pipe (ft)	20	IA-21, IA-45
15" CMP Outlet Pipe With Rodent Guard (ft)	30	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	900	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN



IN-LINE CONTROL STRUCTURE

DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

LANDOWNER | LOCATION | SECTION 12 - T78N - R1E

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
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   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
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Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DATE
DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

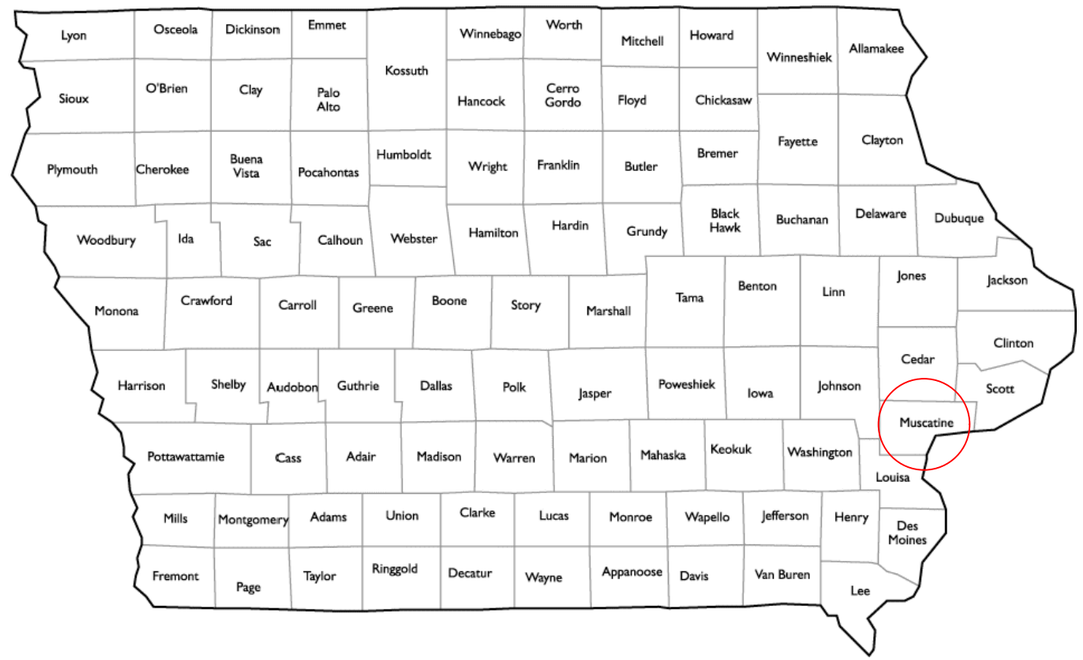
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

MUSCATINE CO, IOWA

SECTION 12 - T78N - R1E



INDEX OF SHEETS

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LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

7/28/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	7/27/2023
DRAWN BY	ANDREW MACKRILL	7/27/2023
CHECKED BY	ANDY CRAIG, PE, TSP	7/28/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

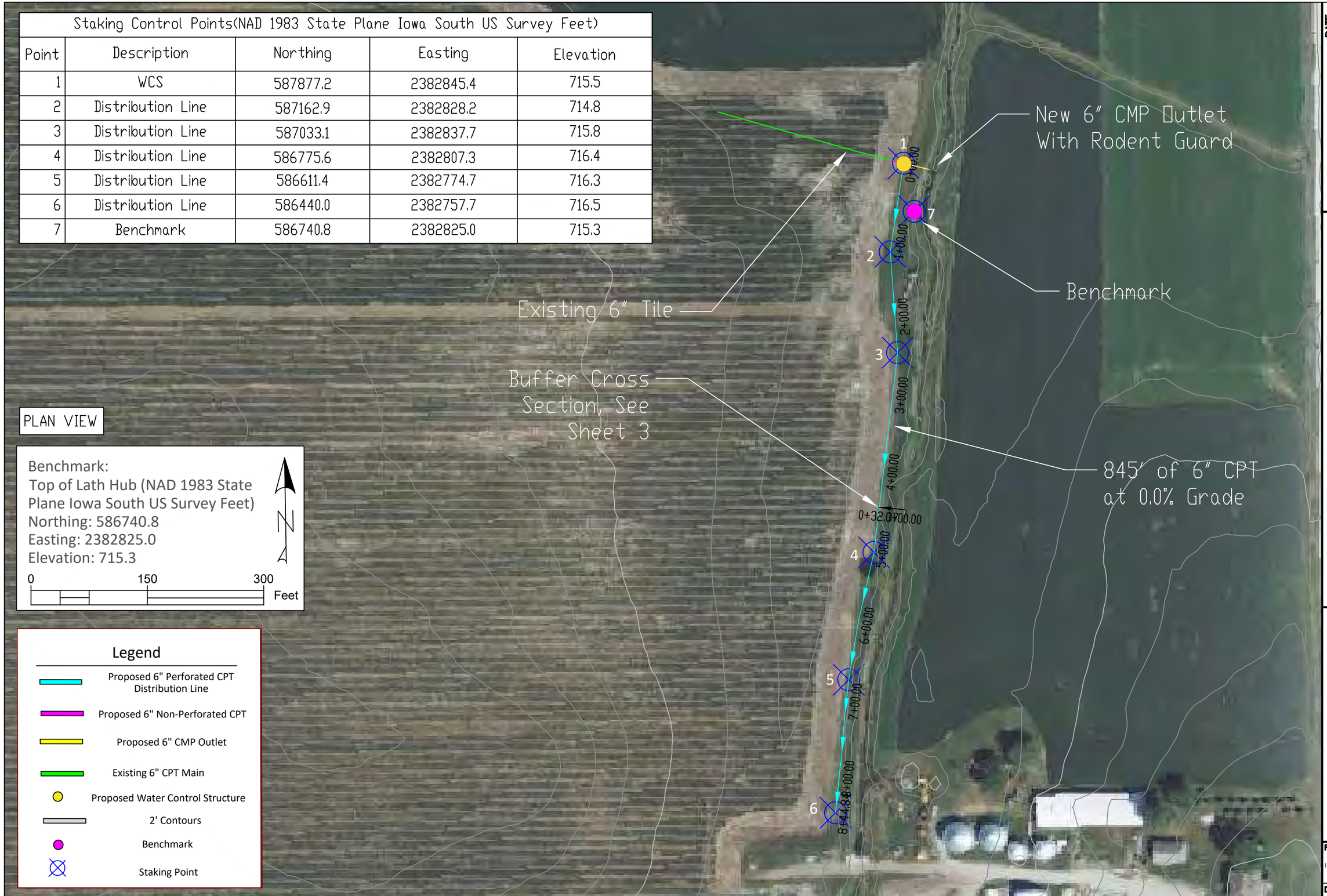
COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	587877.2	2382845.4	715.5
2	Distribution Line	587162.9	2382828.2	714.8
3	Distribution Line	587033.1	2382837.7	715.8
4	Distribution Line	586775.6	2382807.3	716.4
5	Distribution Line	586611.4	2382774.7	716.3
6	Distribution Line	586440.0	2382757.7	716.5
7	Benchmark	586740.8	2382825.0	715.3



PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 586740.8
Easting: 2382825.0
Elevation: 715.3

0 150 300 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Existing 6" CPT Main
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

DATE
DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

PLAN MAP

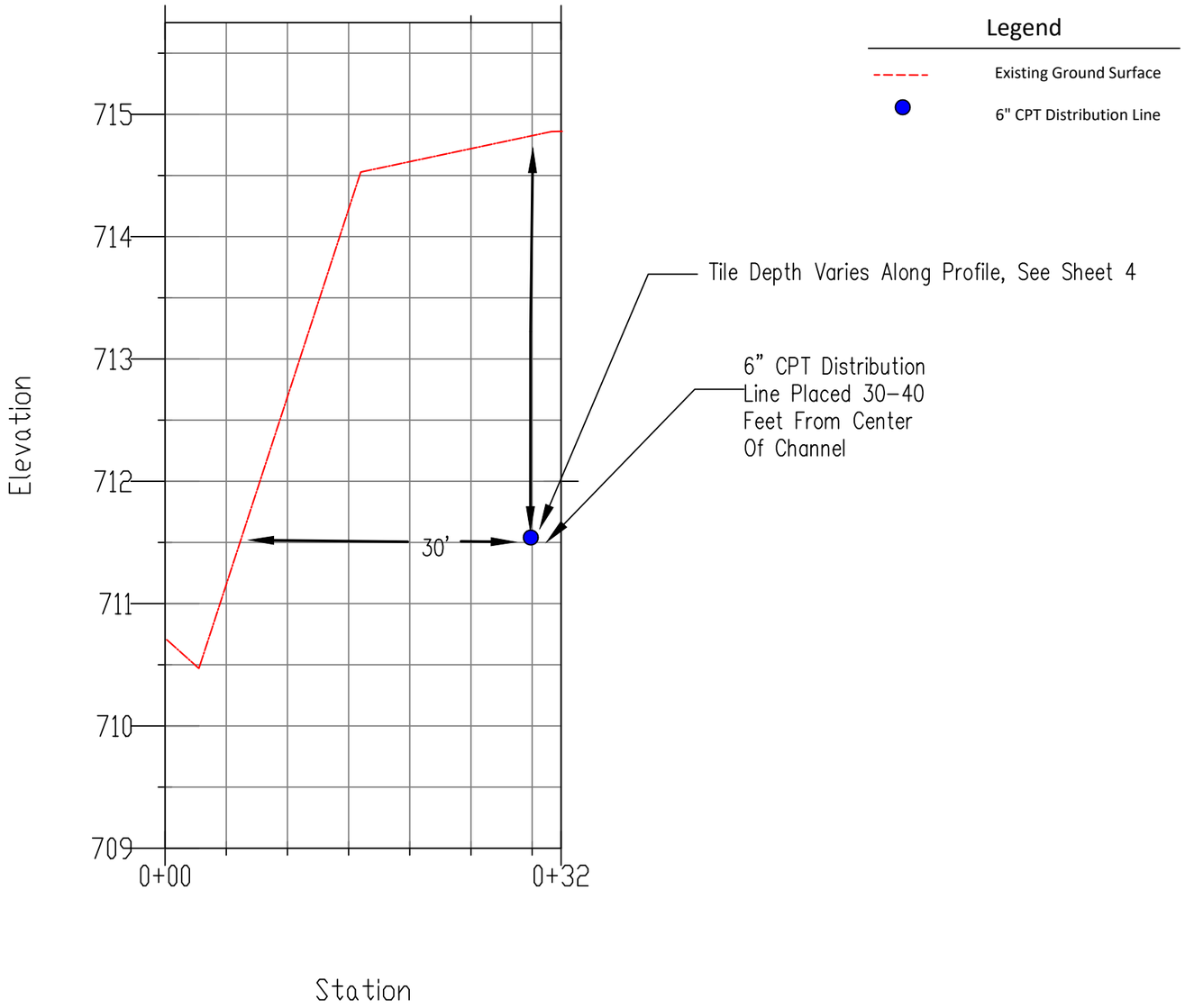
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

Buffer Cross-Section



LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

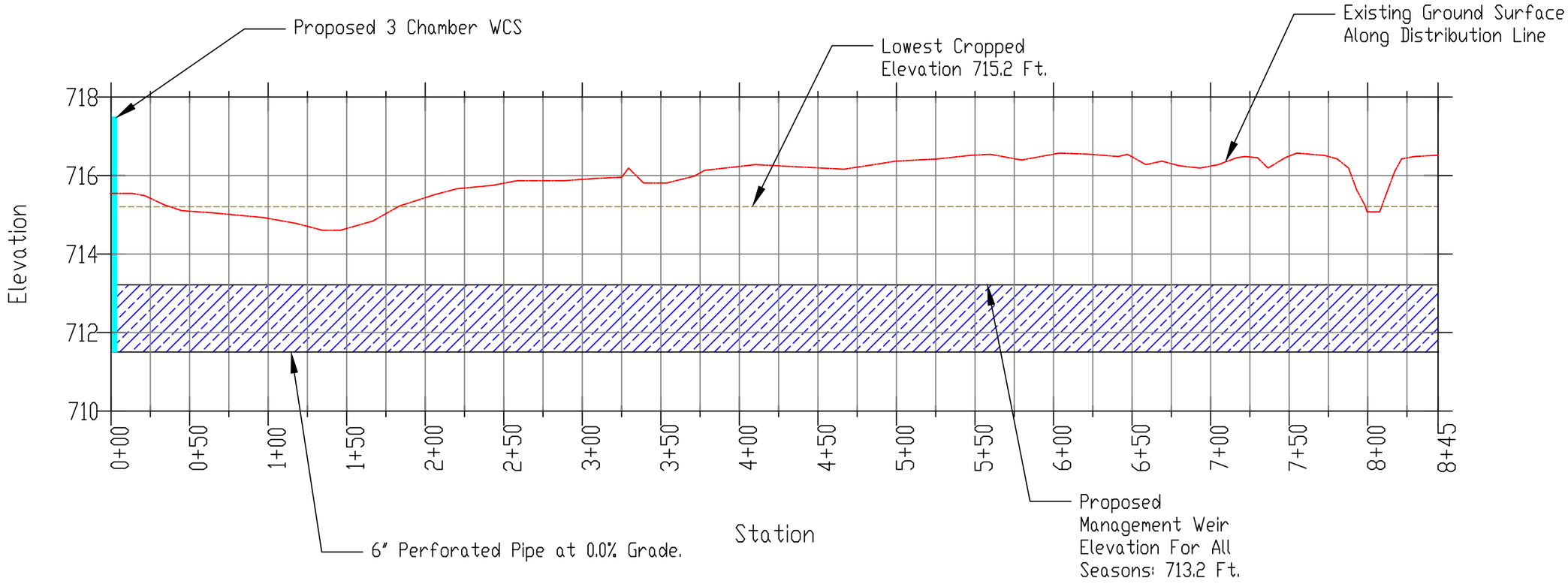
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

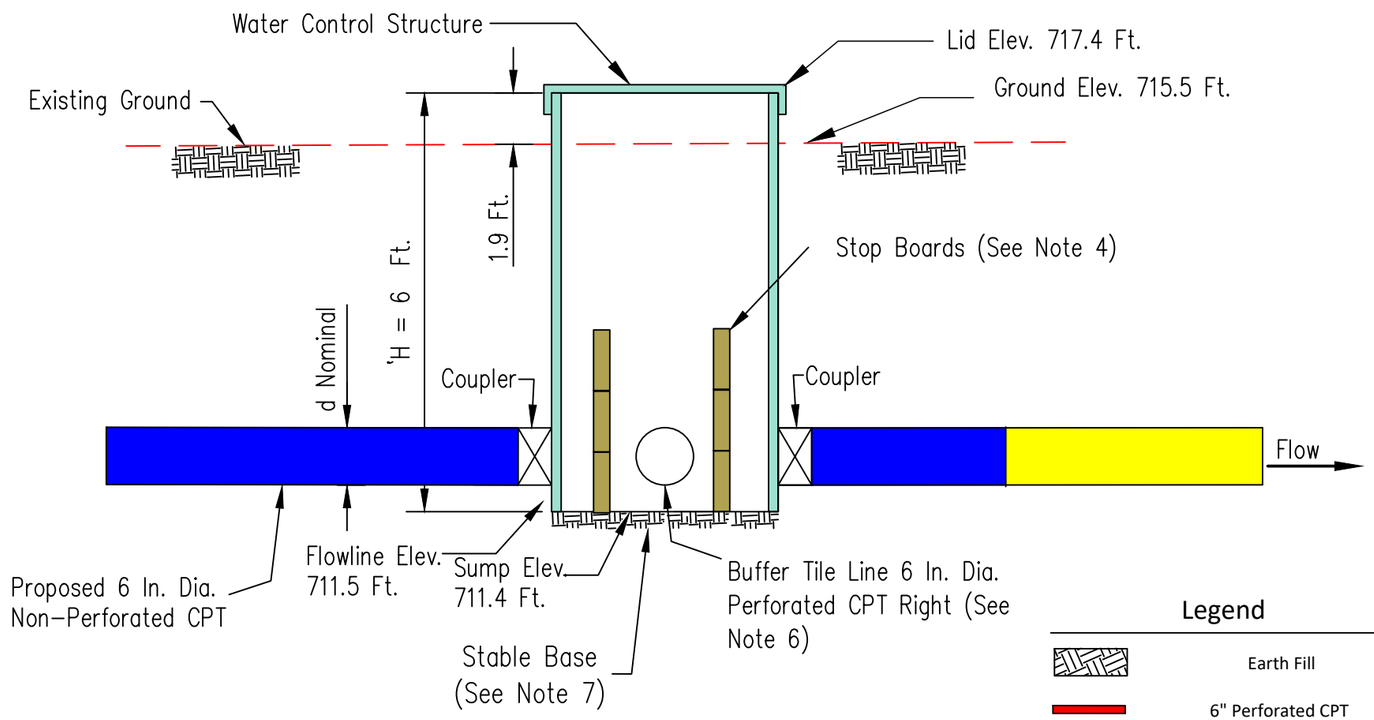
DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

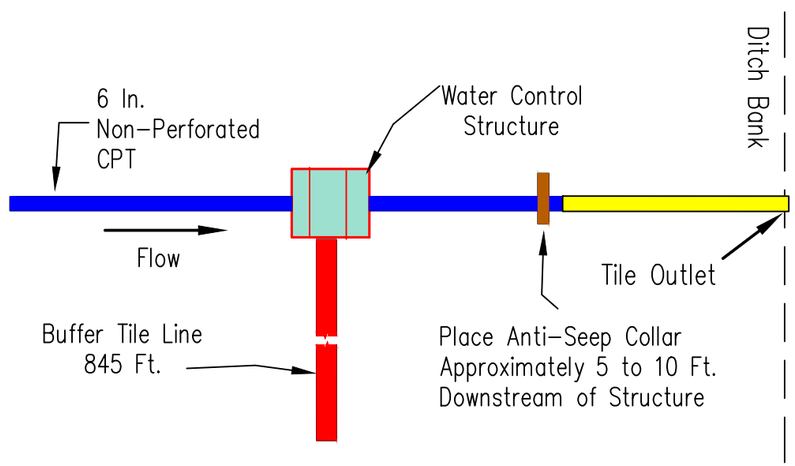
DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 6 in.	1	IA-21, IA-26, CPS-587
6" Non–perforated Pipe (ft)	30	IA-21, IA-45
6" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	845	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



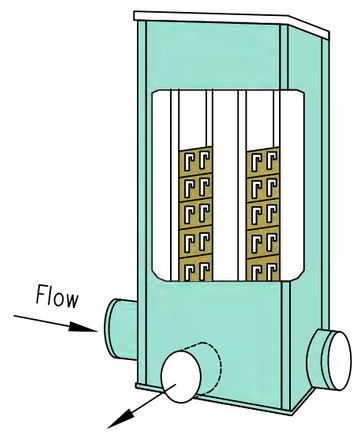
PLAN

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:

1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DATE
DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
3. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion. Contact ESE for assistance with construction inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the existing tile and setting WCS.
   b. Distribution pipe has been laid and capped.
4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/27/23
DRAWN BY ANDREW MACKRILL 7/27/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

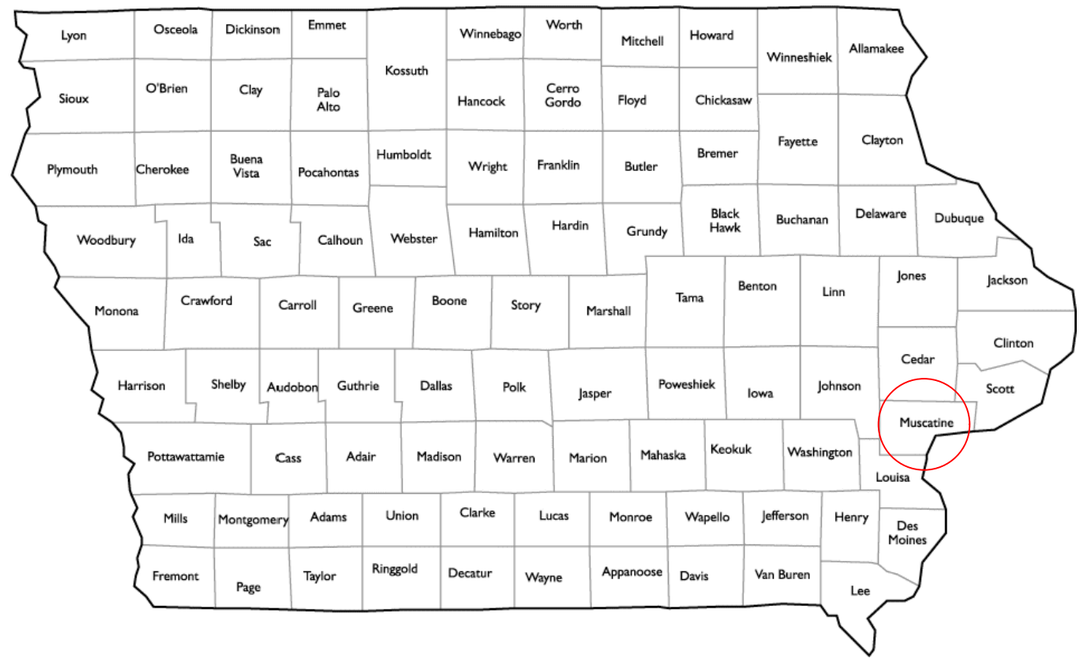
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

MUSCATINE CO, IOWA

SECTION 12 - T78N - R1E



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
Andy J. Craig
20832
IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

7/28/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	7/28/2023
DRAWN BY	ANDREW MACKRILL	7/28/2023
CHECKED BY	ANDY CRAIG, PE, TSP	7/28/2023
APPROVED BY		

ESE Ecosystem Services Exchange
Valuing Conservation

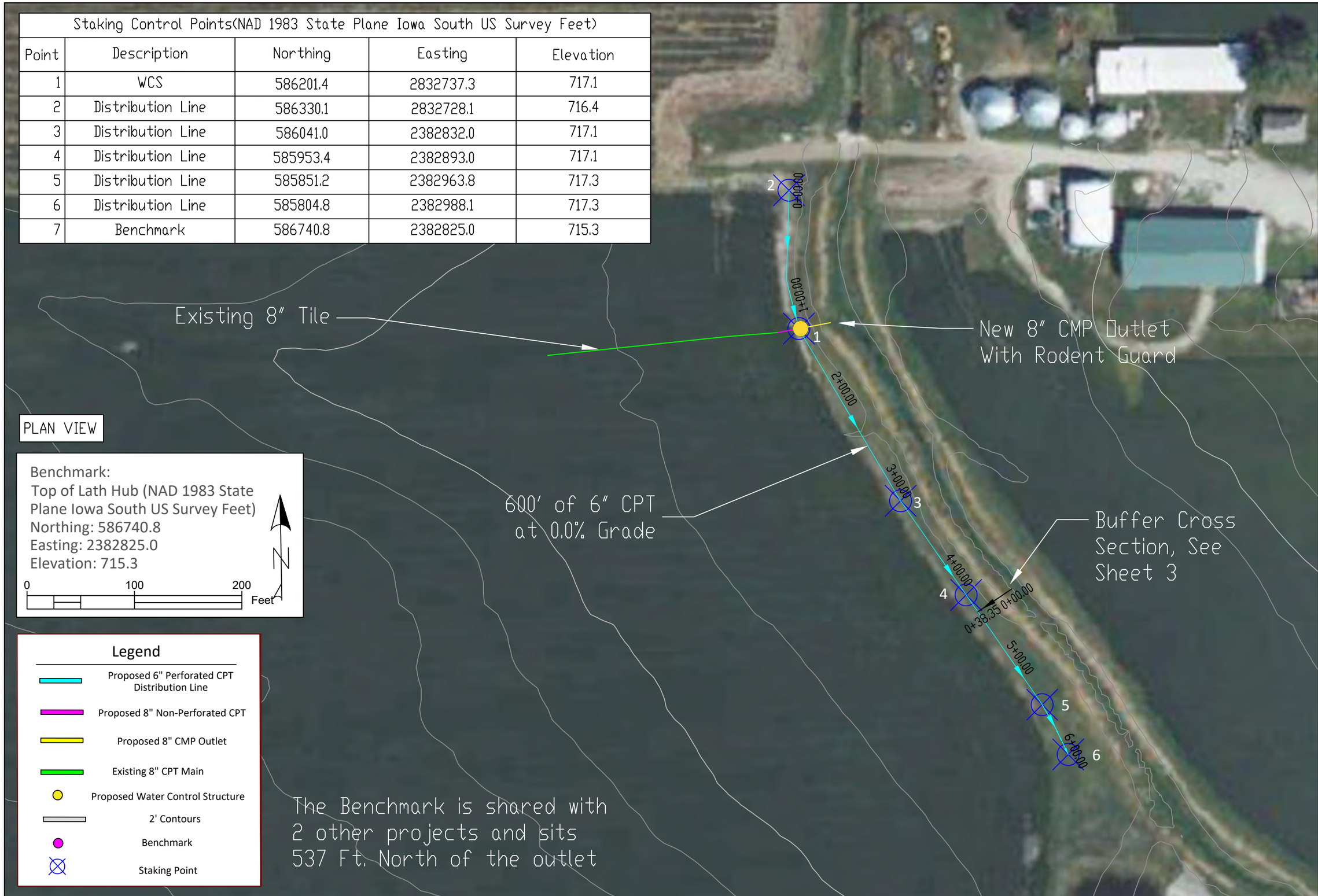
COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	586201.4	2832737.3	717.1
2	Distribution Line	586330.1	2832728.1	716.4
3	Distribution Line	586041.0	2382832.0	717.1
4	Distribution Line	585953.4	2382893.0	717.1
5	Distribution Line	585851.2	2382963.8	717.3
6	Distribution Line	585804.8	2382988.1	717.3
7	Benchmark	586740.8	2382825.0	715.3



PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 586740.8
Easting: 2382825.0
Elevation: 715.3

0 100 200 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Existing 8" CPT Main
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

The Benchmark is shared with
2 other projects and sits
537 Ft. North of the outlet

LANDOWNER | LOCATION | SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/28/23
DRAWN BY ANDREW MACKRILL 7/28/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

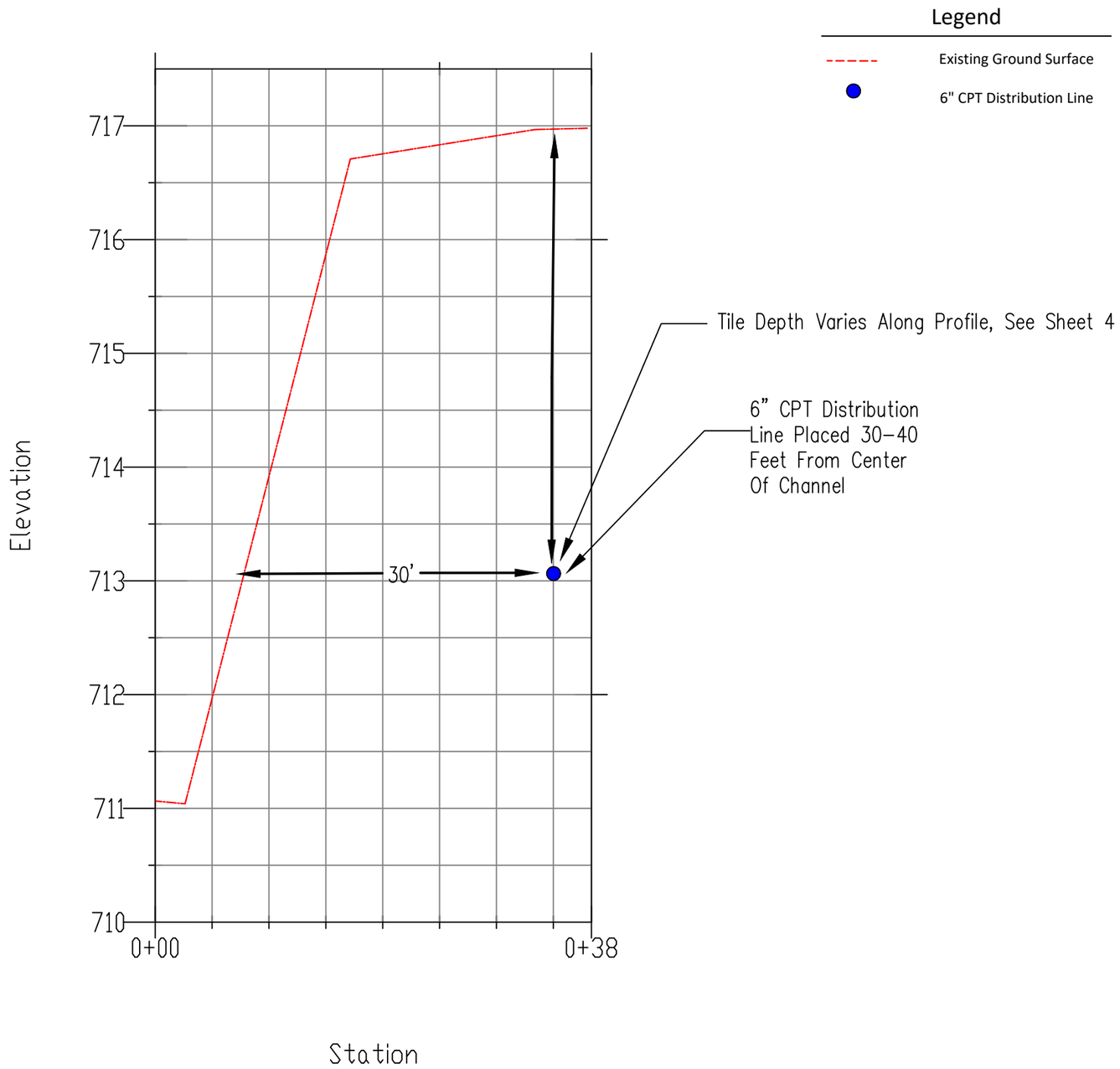
PLAN MAP

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

Buffer Cross-Section



LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/28/23
DRAWN BY ANDREW MACKRILL 7/28/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

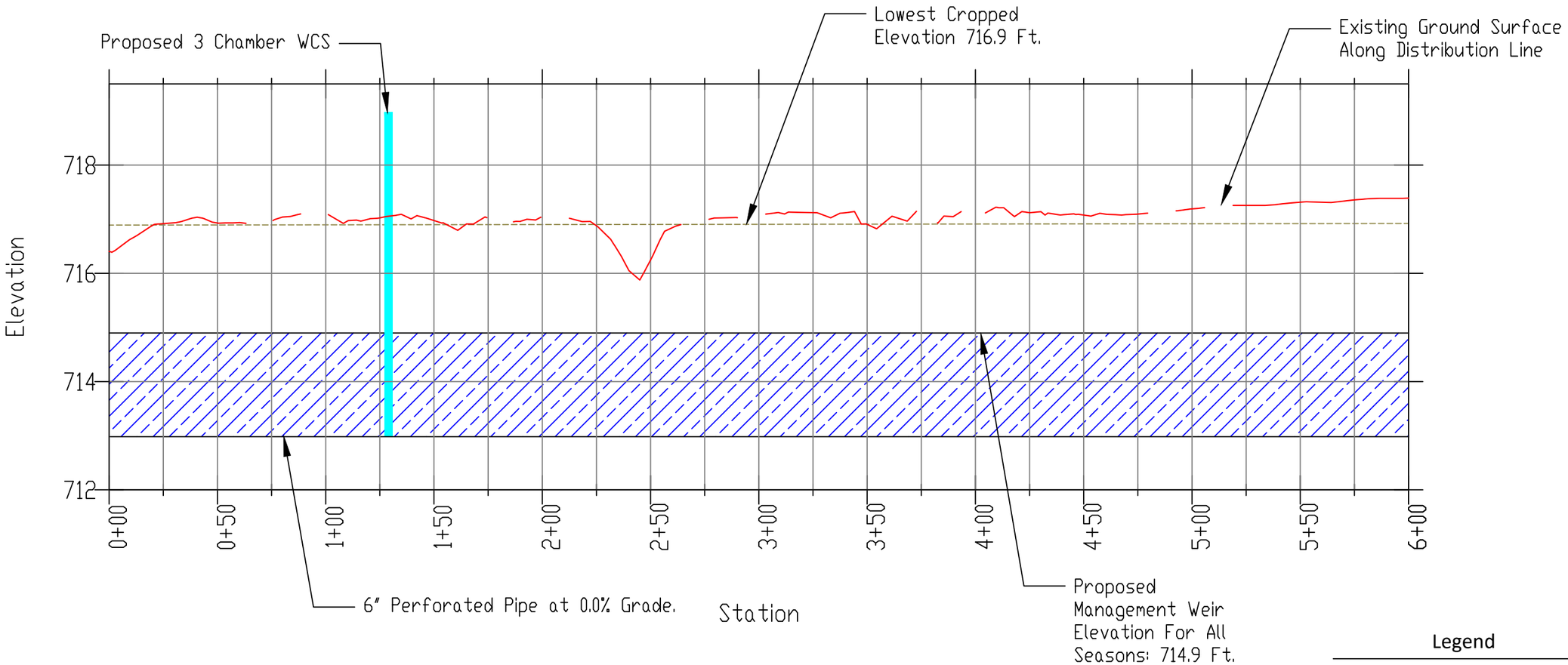
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

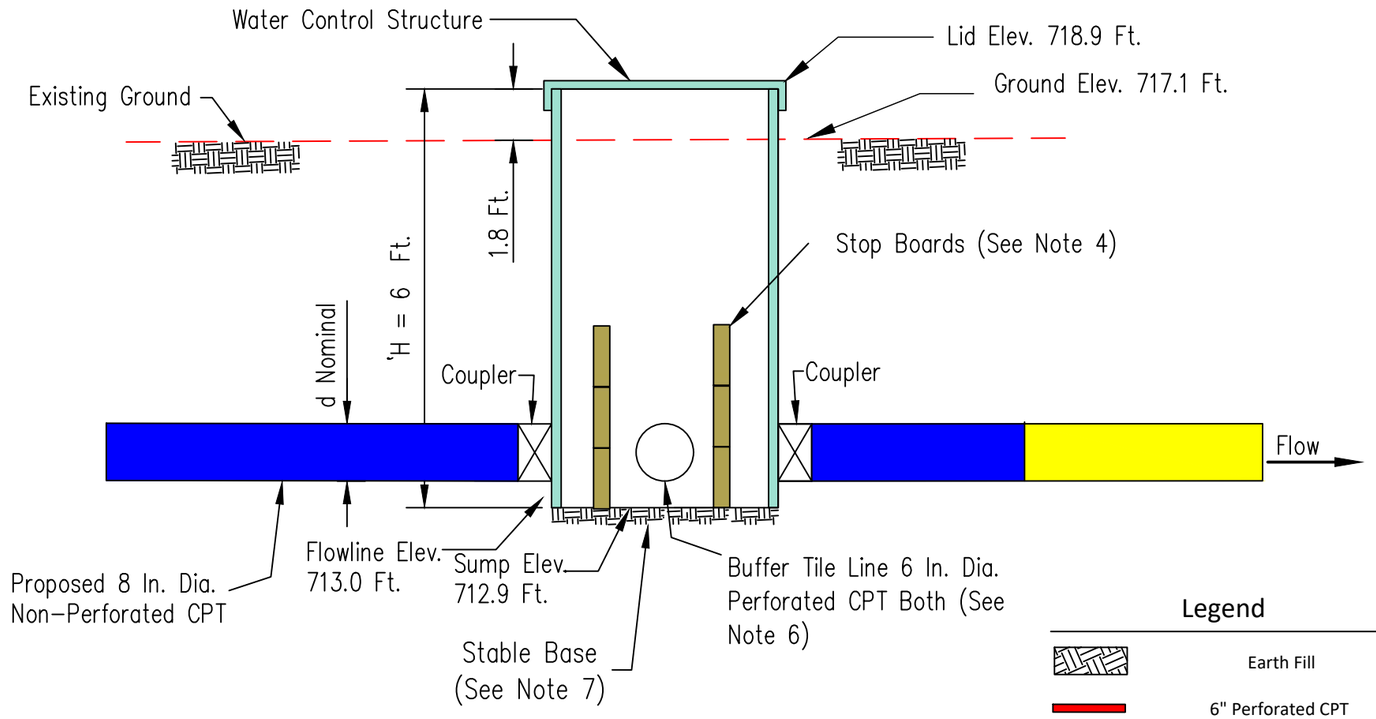
DESIGNED BY ANDREW MACKRILL 7/28/23
DRAWN BY ANDREW MACKRILL 7/28/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 4 OF 6



TYPICAL SECTION

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Ditch Bank
- Existing Ground Surface

NOTES:
1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual-wall PT, or CMP.
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QUANTITIES*		NRCS SPEC
Water Control Structure 3- Compartment H = 6 ft. d = 8 in.	1	IA-21, IA-26, CPS-587
8" Non-perforated Pipe (ft)	30	IA-21, IA-45
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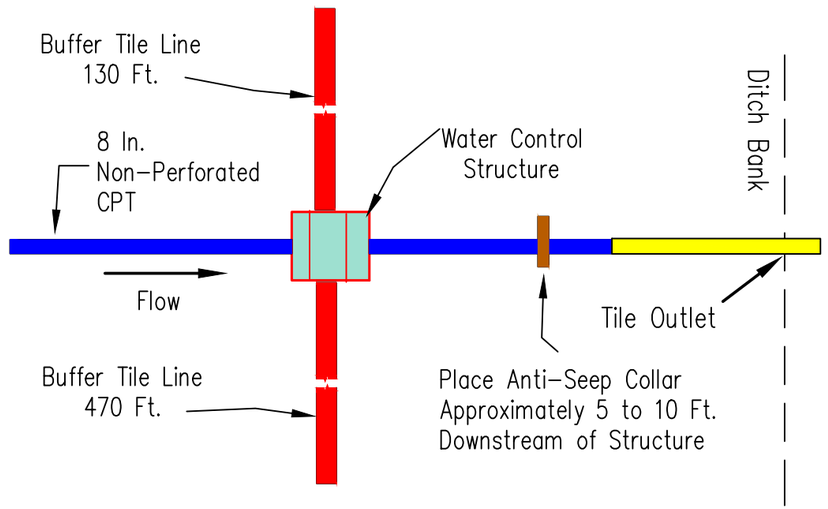
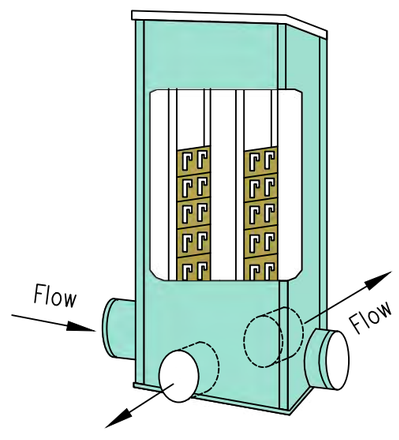
6" Perforated CPT (ft) Buffer Tile Line	600	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN



IN-LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DESIGNED BY ANDREW MACKRILL 7/28/23
DRAWN BY ANDREW MACKRILL 7/28/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY
DATE

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
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Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 12 - T78N - R1E

DATE
DESIGNED BY ANDREW MACKRILL 7/28/23
DRAWN BY ANDREW MACKRILL 7/28/23
CHECKED BY ANDY CRAIG, PE, TSP 7/28/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
'

DRAWING SET
SHEET 6 OF 6

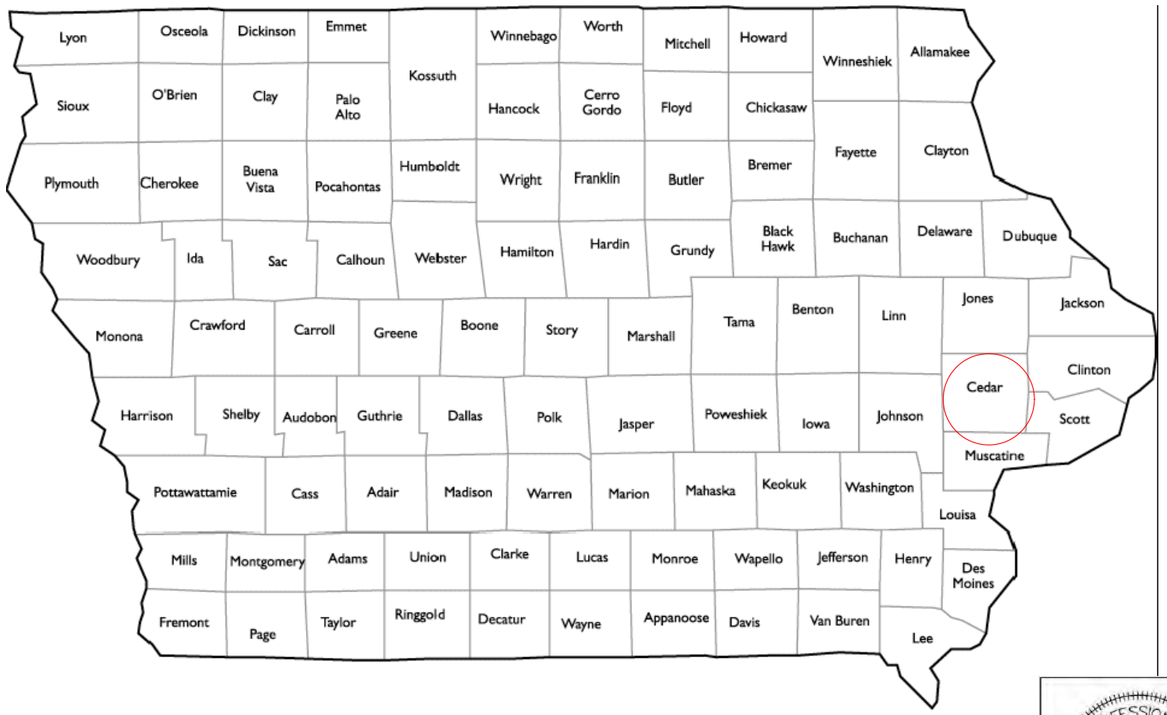
DENITRIFYING BIOREACTOR CONSTRUCTION PLANS

CEDAR COUNTY, IOWA

SECTION 4- T79N - R4W

811 Know what's **below.** **Call** before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION



INDEX OF SHEETS

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

09/14/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 4

		DATE
DESIGNED BY	BEN REINHART	09/12/2023
DRAWN BY	BEN REINHART	09/12/2023
CHECKED BY	ANDY CRAIG, PE	09/14/2023
APPROVED BY		

ESE Ecosystem Services Exchange
Valuing Conservation

COVER SHEET

FILE NAME

DRAWING SET

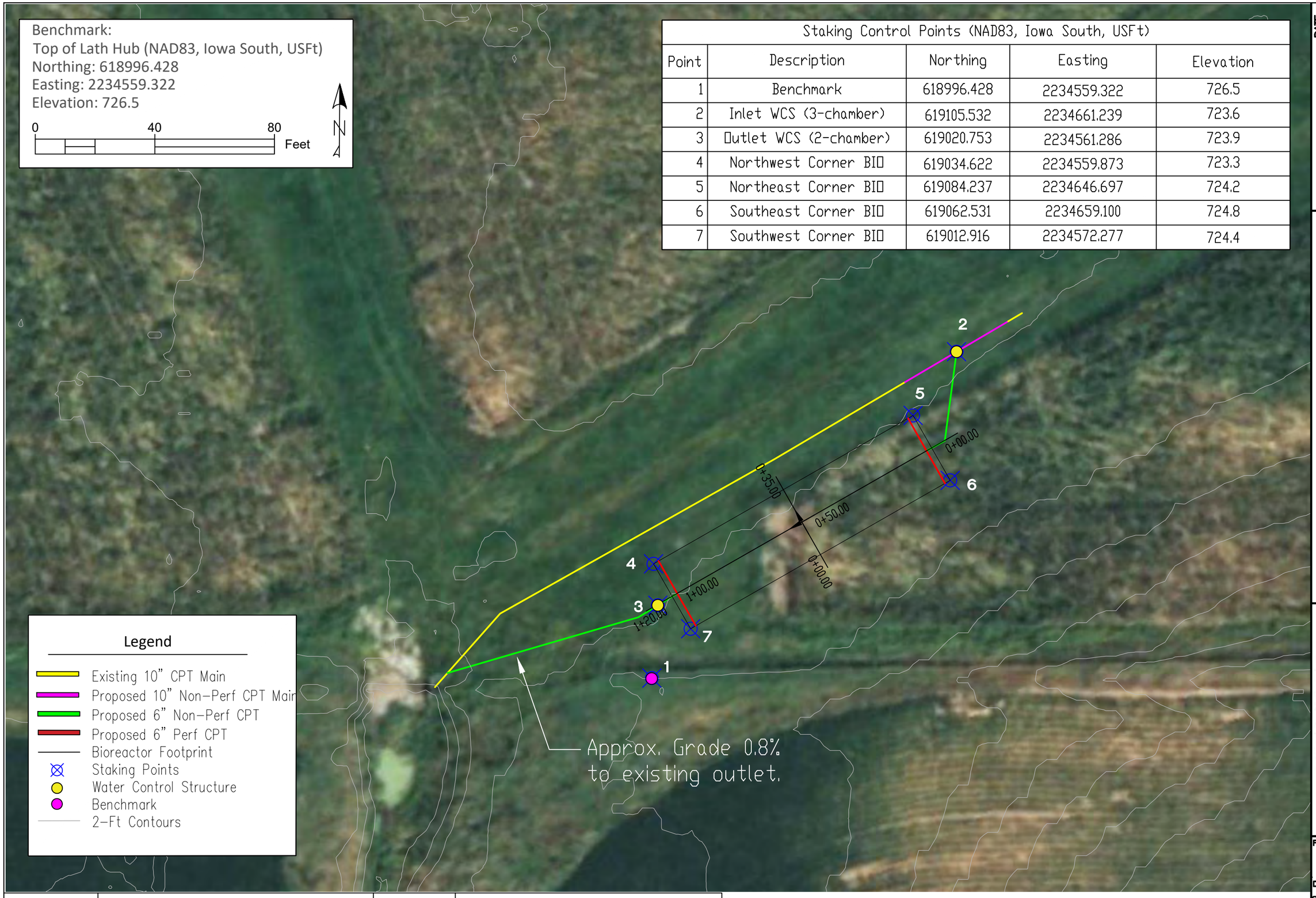
SHEET 1 OF 7

Benchmark:
Top of Lath Hub (NAD83, Iowa South, USFt)
Northing: 618996.428
Easting: 2234559.322
Elevation: 726.5

0 40 80 Feet

N

Staking Control Points (NAD83, Iowa South, USFt)				
Point	Description	Northing	Easting	Elevation
1	Benchmark	618996.428	2234559.322	726.5
2	Inlet WCS (3-chamber)	619105.532	2234661.239	723.6
3	Outlet WCS (2-chamber)	619020.753	2234561.286	723.9
4	Northwest Corner BIO	619034.622	2234559.873	723.3
5	Northeast Corner BIO	619084.237	2234646.697	724.2
6	Southeast Corner BIO	619062.531	2234659.100	724.8
7	Southwest Corner BIO	619012.916	2234572.277	724.4



Legend

- Existing 10" CPT Main
- Proposed 10" Non-Perf CPT Main
- Proposed 6" Non-Perf CPT
- Proposed 6" Perf CPT
- Bioreactor Footprint
- Staking Points
- Water Control Structure
- Benchmark
- 2-Ft Contours

LANDOWNER	[redacted]	LOCATION	SECTION 4 - T79N - R4W

DESIGNED BY BEN REINHART 09/12/23
DRAWN BY BEN REINHART 09/12/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

DATE

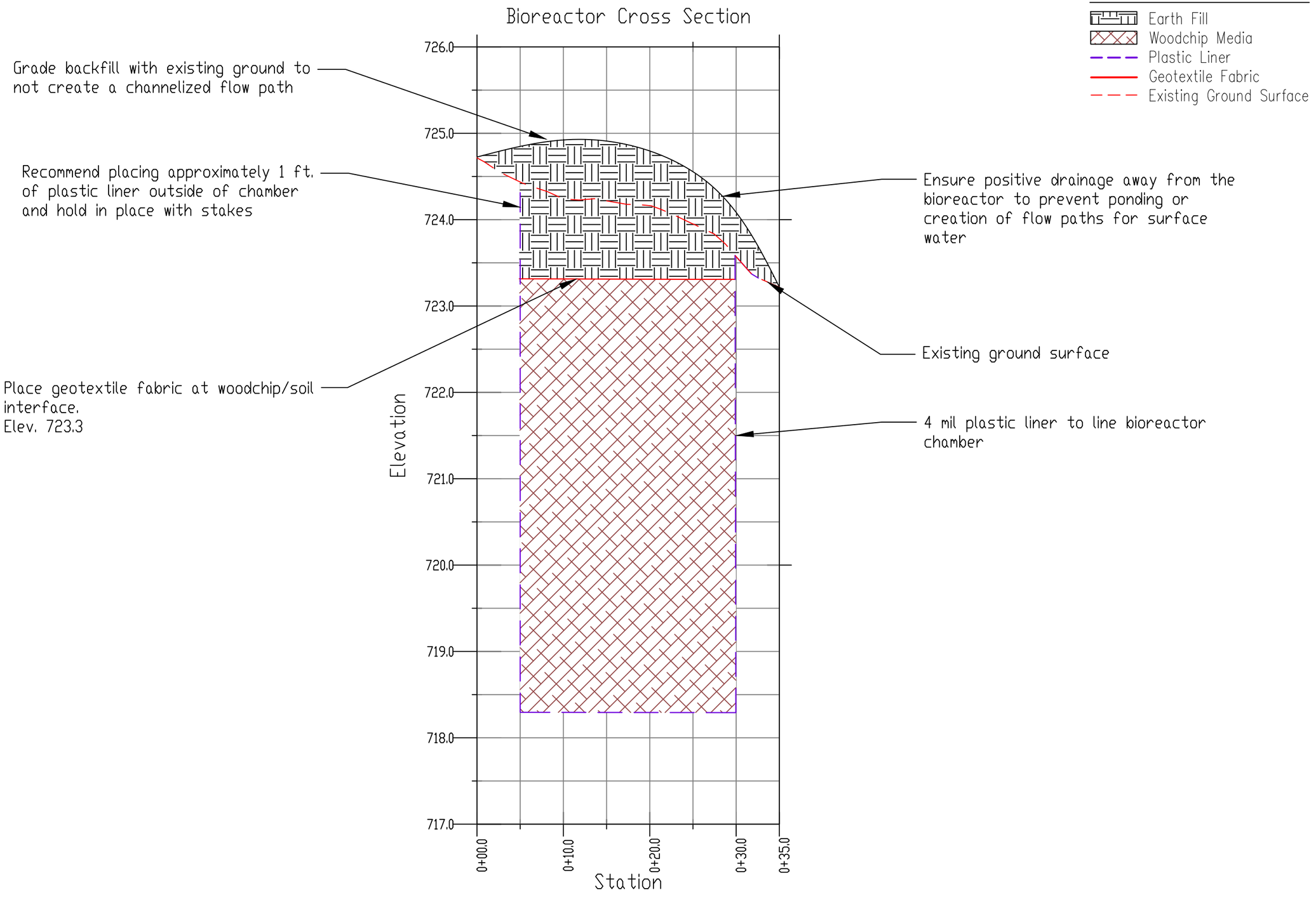
PLAN MAP

ESE Ecosystem Services Exchange
Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 7

Bioreactor Cross Section



LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

DESIGNED BY BEN REINHART 09/12/23
DRAWN BY BEN REINHART 09/12/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

CROSS SECTION VIEW

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
‹

DRAWING SET
SHEET 3 OF 7

Profile Along Centerline

Grade backfill with existing ground to not create a channelized flow path

Mound backfill approximately 1 ft. to allow for settling and shed water

Lowest Cropped Elev 725.0

Inlet WCS Lid Elev. 725.5
*Located approx. 40 ft. N of bioreactor at surface elevation of 723.6. see Plan Map, Pg 2

Earth fill

Outlet WCS Lid Elev. 726.0

Existing ground surface

Inlet WCS stoplog Elev. 722.8

Inlet WCS Sump Elev. 719.5

6" perforated CPT distribution manifold

Sta. 0+10 Elev. 718.5

Place geotextile fabric at woodchip/soil interface.

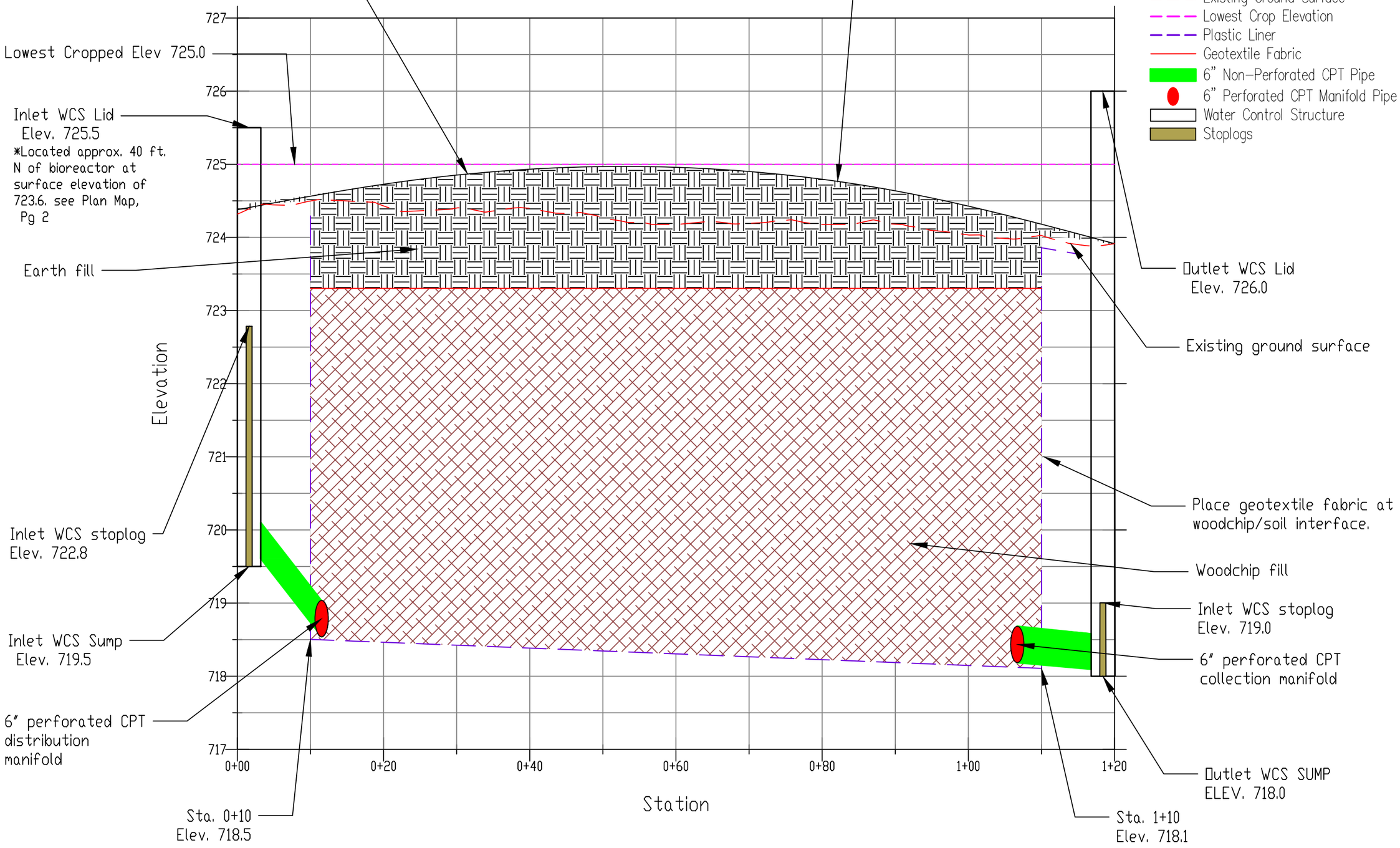
Woodchip fill

Inlet WCS stoplog Elev. 719.0

6" perforated CPT collection manifold

Outlet WCS SUMP ELEV. 718.0

Sta. 1+10 Elev. 718.1



Legend

- Earth Fill
- Woodchip Media
- Existing Ground Surface
- Lowest Crop Elevation
- Plastic Liner
- Geotextile Fabric
- 6" Non-Perforated CPT Pipe
- 6" Perforated CPT Manifold Pipe
- Water Control Structure
- Stoplogs

	DATE
DESIGNED BY BEN REINHART	09/12/23
DRAWN BY BEN REINHART	09/12/23
CHECKED BY ANDY CRAIG, PE	09/14/23
APPROVED BY	

PROFILE ALONG CENTERLINE

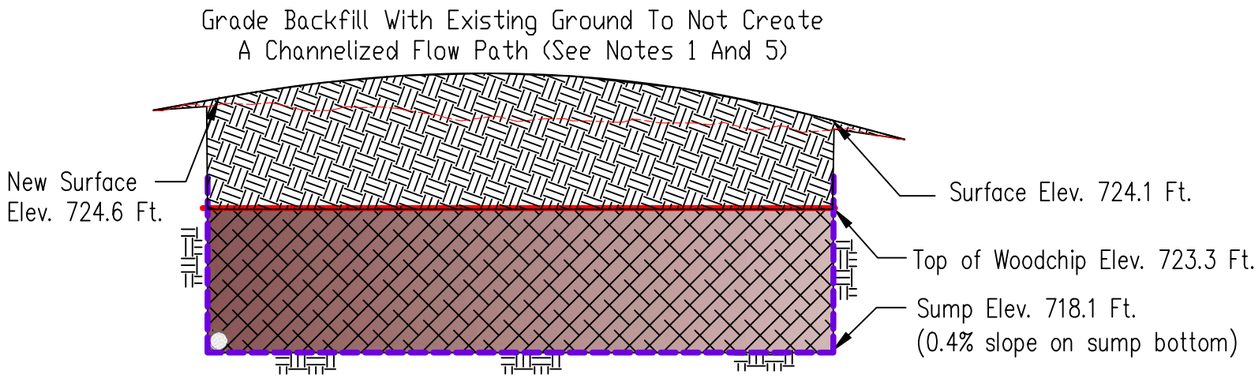
ESE Ecosystem Services Exchange — Valuing Conservation

FILE NAME

DRAWING SET
SHEET 4 OF 7

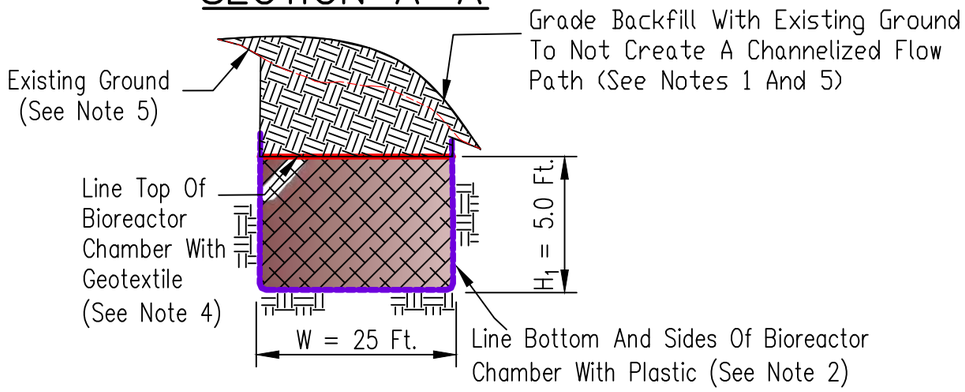
LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

ELEVATION



PLAN

SECTION A–A

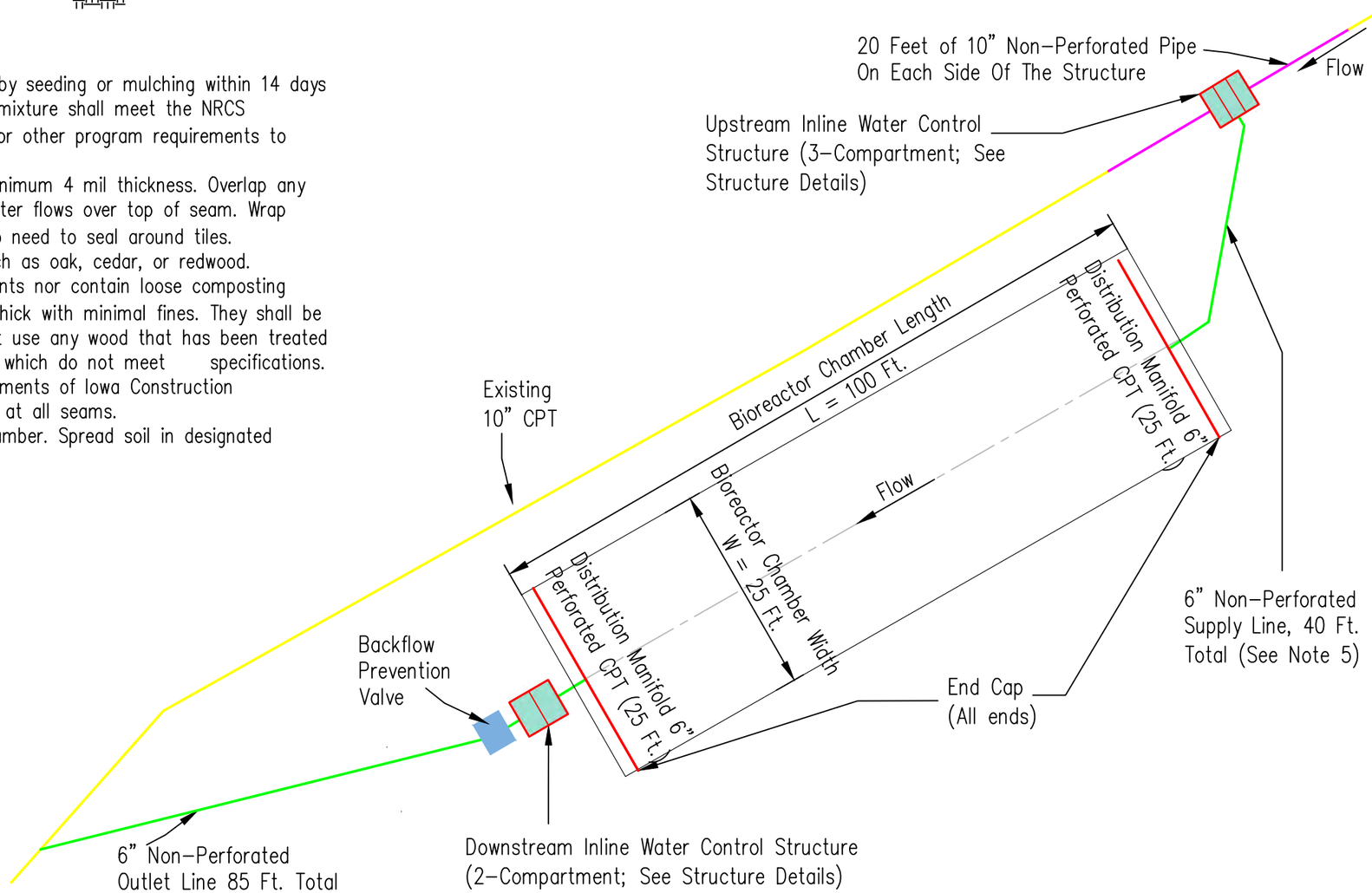


NOTES:

1. All disturbed non–crop construction areas shall be stabilized by seeding or mulching within 14 days of conclusion of construction activities. This seeding and seed mixture shall meet the NRCS Conservation Practice Standard IA–342 (Critical Area Seeding) or other program requirements to replace previous grass stand.
2. Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Lap seams in direction of flow so water flows over top of seam. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
3. Woodchips shall not contain woods known to have tannin, such as oak, cedar, or redwood. Woodchips shall be reasonably free of soil and other contaminants nor contain loose composting materials. Wood chips shall be around 1–inch long by ½–inch thick with minimal fines. They shall be processed through a chipper and not through a grinder. Do not use any wood that has been treated for ground contact. ESE has the right to reject any woodchips which do not meet specifications.
4. Geotextile shall be non–woven, Class II, and meet the requirements of Iowa Construction Specification IA–95, Geotextile. Overlap a minimum of 6 inches at all seams.
5. Grade site for positive drainage away from the bioreactor chamber. Spread soil in designated location away from bioreactor.
6. See Plan Map for benchmark coordinates.

Legend

- Earth Fill
- Woodchip Media
- Existing 10" Perf CPT Main
- Proposed 10" Non–Perf CPT
- Proposed 6" Non–Perf CPT
- Proposed 6" Perf CPT
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- Bioreactor Footprint



DATE	
DESIGNED BY BEN REINHART	09/12/23
DRAWN BY BEN REINHART	09/12/23
CHECKED BY ANDY CRAIG, PE	09/14/23
APPROVED BY	

BIOREACTOR DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

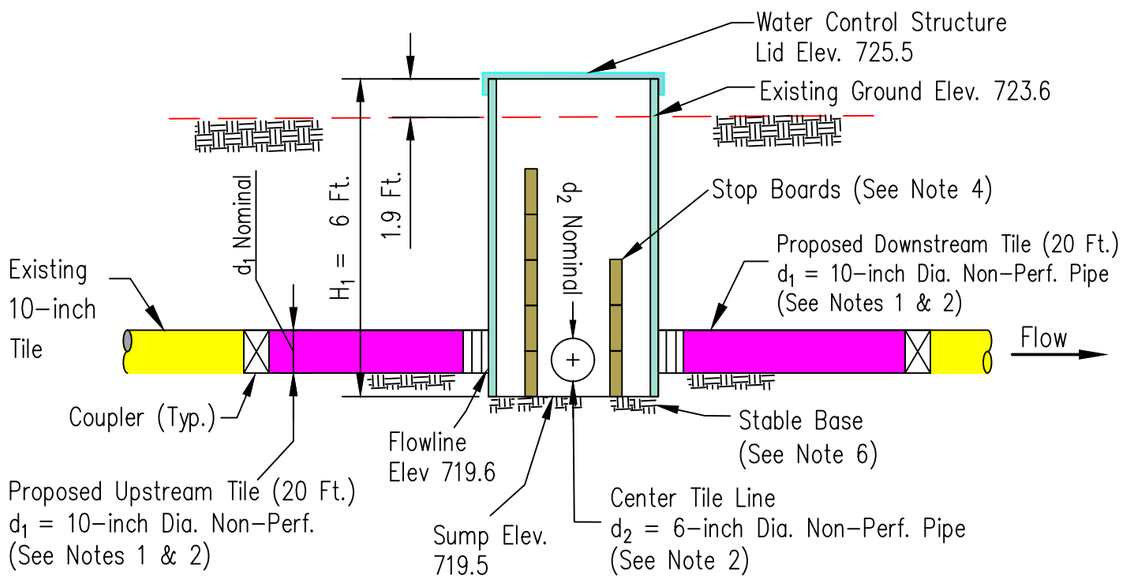
FILE NAME

DRAWING SET

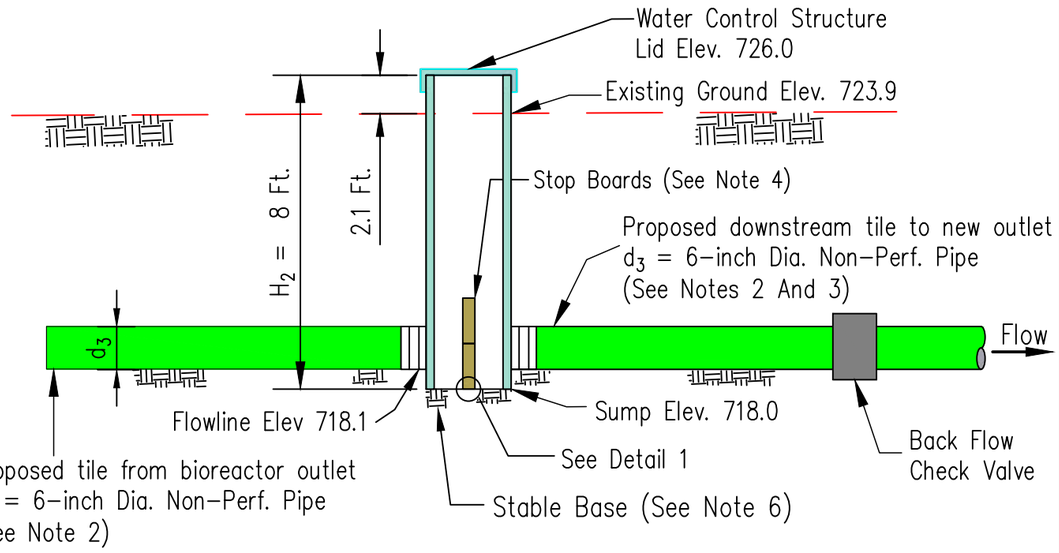
SHEET 5 OF 7

LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

TYPICAL SECTION
UPSTREAM 3–COMPARTMENT STRUCTURE



TYPICAL SECTION
DOWNSTREAM 2–COMPARTMENT STRUCTURE



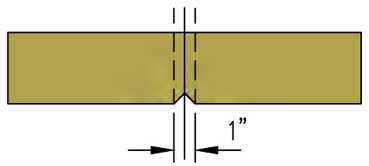
QUANTITIES*	
Water Control Structure, 3 Chamber (H_1 = 6 ft. | d_1 = 10 in. | d_2 = 6 in.)	1
Water Control Structure, 2 Chamber (H_2 = 8 ft. | d_3 = 6 in.)	1
10" Non–perforated Pipe (ft)	40
6" Non–perforated Pipe (ft)	125
6" Perforated CPT (ft)	50
6" End Cap (each)	4
Wood Chips (cu. yd.)	510
4 Mil Plastic (sq. yd.)**	484
Geotextile (sq. yd.)	278
Excavation (cu. yd.)	602
Earth Fill (cu. yd.)	186
6" Backflow Check Valve (each)	1

* Quantities do not include tile/pipe couplers or extra material for geotextile/plastic overlap
** Accounts for 1 ft. overhang around perimeter

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, on all lines: upstream, downstream and center. Pipe must be PVC, dual–wall CPT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745. Check valve must conform to ASTM D 3034 with SDR35 pipe or stronger.
3. Couplings between the water control structures and the non–perforated tile must be watertight.
4. Stop boards must provide must tight seals under a minimum of 1 foot pressure head (except notched board).
5. Appropriately mark bioreactor perimeter to avoid vehicle, implement, or livestock traffic.
6. Place structure and pipe coupler on a stable base. A stable base may be compacted earth, compacted fill sand, or a concrete pad. Extend the stable base no less than 1 foot beyond structure.
7. Excavated material placed around structure and pipes shall be hand compacted in 4" lifts.

DETAIL 1

Cut 1" Notch In Bottom Of The Bottom Board On The Downstream Structure

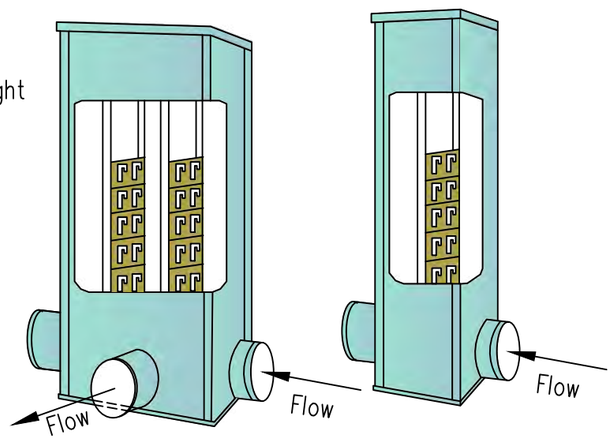


Legend

- Earth Fill
- Existing 10" Perf CPT Main
- Proposed 10" Non–Perf CPT
- Proposed 6" Non–Perf CPT
- Existing Ground
- Control Structure Stoplogs

IN–LINE CONTROL STRUCTURES

Side Port Is On The (Circle One) Left/Right Side Of Structure, Looking Downstream



DESIGNED BY BEN REINHART	DATE 09/12/23
DRAWN BY BEN REINHART	09/12/23
CHECKED BY ANDY CRAIG, PE	09/14/23
APPROVED BY	

STRUCTURE DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
‹

DRAWING SET
SHEET 6 OF 7

LANDOWNER		LOCATION	SECTION 4 – T79N – R4W

CONSTRUCTION NOTES

1. Tile elevations are based on Maverick tile probe depths and are to be considered accurate within margin of error of the instrument.
2. If any surface inlets are currently attached to the tile main or plan to be in the future, they shall be replaced with water quality inlets to minimize trash entry into the tile line before construction of the bioreactor begins.
3. Avoid excessive disturbance of any buffers or grassed water ways during construction. However, if re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded within 14 days according to NRCS Conservation Practice Standard IA-342 Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
4. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion.
5. All carbon media to be placed in the bioreactor shall come from an ESE approved vendor or approved with ESE staff prior to transportation and placement.
6. Contact an ESE representative for inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the bioreactor chamber and tile line trenches
   b. After placing the water control structures and bioreactor manifolds
   c. After placement of carbon media, before backfilling with soil
   d. After connections to existing tile and final grading
7. Any product planned for use in construction must be approved by ESE prior to construction. Save and provide documentation to an ESE representative of all materials used in construction including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths
   b. Photos and invoices for quantity and quality of woodchips/carbon media
   c. Photos and invoices or product information to detail quantity and quality of plastic and geotextile fabric
   d. Photos and invoices or product information for water control structures
8. Construction tolerances are +/-0.5ft on bioreactor chamber dimensions, and +/-0.1 ft. on all elevations. Outlet WCS sump (bottom) must be below the elevation of the bioreactor chamber at the outlet end. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by a representative from ESE and will be noted in the as-built plan.
9. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.
10. All work shall be performed according to the IA construction and practice specifications in the table below.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-95	Geotextile
IA-605	Denitrifying Bioreactor
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

DESIGNED BY BEN REINHART 09/12/23
DRAWN BY BEN REINHART 09/12/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
‹

DRAWING SET
SHEET 7 OF 7

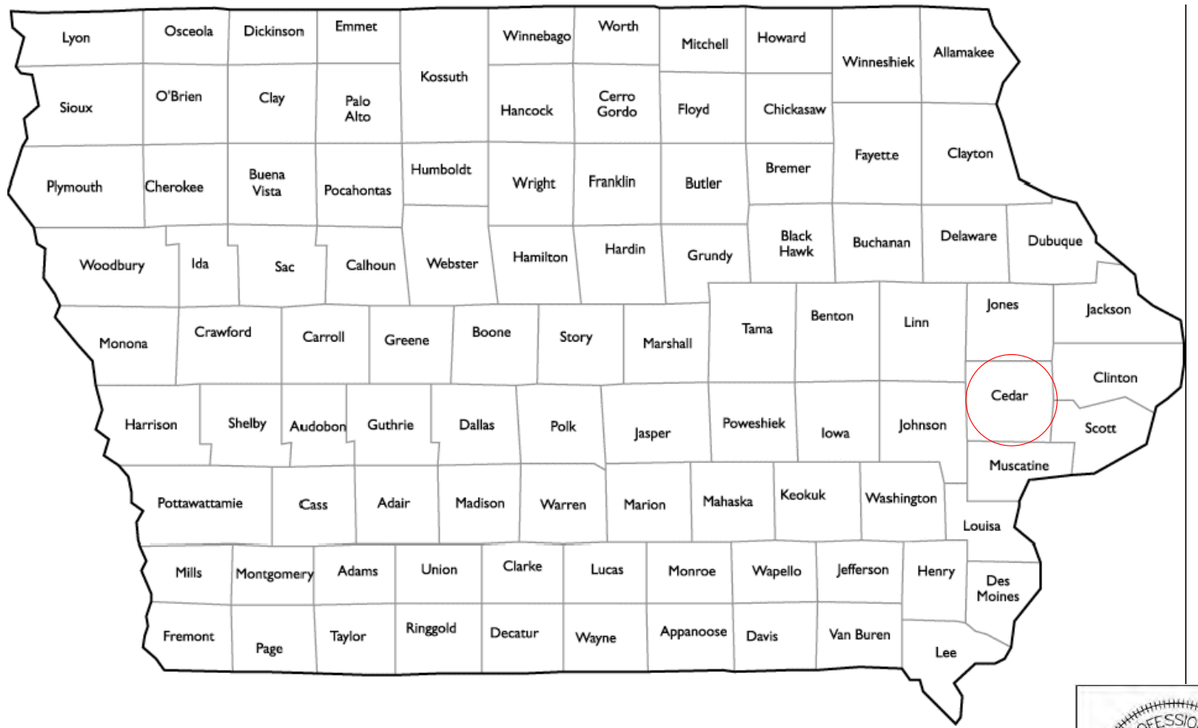
DENITRIFYING BIOREACTOR CONSTRUCTION PLANS

CEDAR COUNTY, IOWA

SECTION 4- T79N - R4W

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION



INDEX OF SHEETS

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

09/14/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31,2023.
Pages or sheets covered by this seal: All

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

ENGINEERING CLASS 4

		DATE
DESIGNED BY	BEN REINHART	09/14/2023
DRAWN BY	BEN REINHART	09/14/2023
CHECKED BY	ANDY CRAIG, PE	09/14/2023
APPROVED BY		

ESE Ecosystem Services Exchange
Valuing Conservation

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 7

Benchmark:
Top of Lath Hub (NAD83, Iowa South, USFt)
Northing: 618996.428
Easting: 2234559.322
Elevation: 726.5

0 30 60 Feet

N

Staking Control Points (NAD83, Iowa South, USFt)				
Point	Description	Northing	Easting	Elevation
1	Benchmark	618996.428	2234559.322	726.5
2	Inlet WCS (3-chamber)	619119.514	2234392.012	724.1
3	Outlet WCS (2-chamber)	619016.535	2234414.909	723.8
4	Northwest Corner BIO	619105.941	2234359.858	724.2
5	Northeast Corner BIO	619116.421	2234382.556	724.1
6	Southeast Corner BIO	619025.632	2234424.477	723.6
7	Southwest Corner BIO	619015.152	2234401.779	723.9

0+00.00
0+50.00
0+35.00
1+00.00
1+20.00

Approx. Grade 3.5%
to existing outlet.

Legend

- Existing 12" CPT Main
- Proposed 12" Non-Perf CPT Main
- Proposed 6" Non-Perf CPT
- Proposed 6" Perf CPT
- Bioreactor Footprint
- Staking Points
- Water Control Structure
- Benchmark
- 2-Ft Contours

DATE
DESIGNED BY BEN REINHART 09/14/23
DRAWN BY BEN REINHART 09/14/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

PLAN MAP

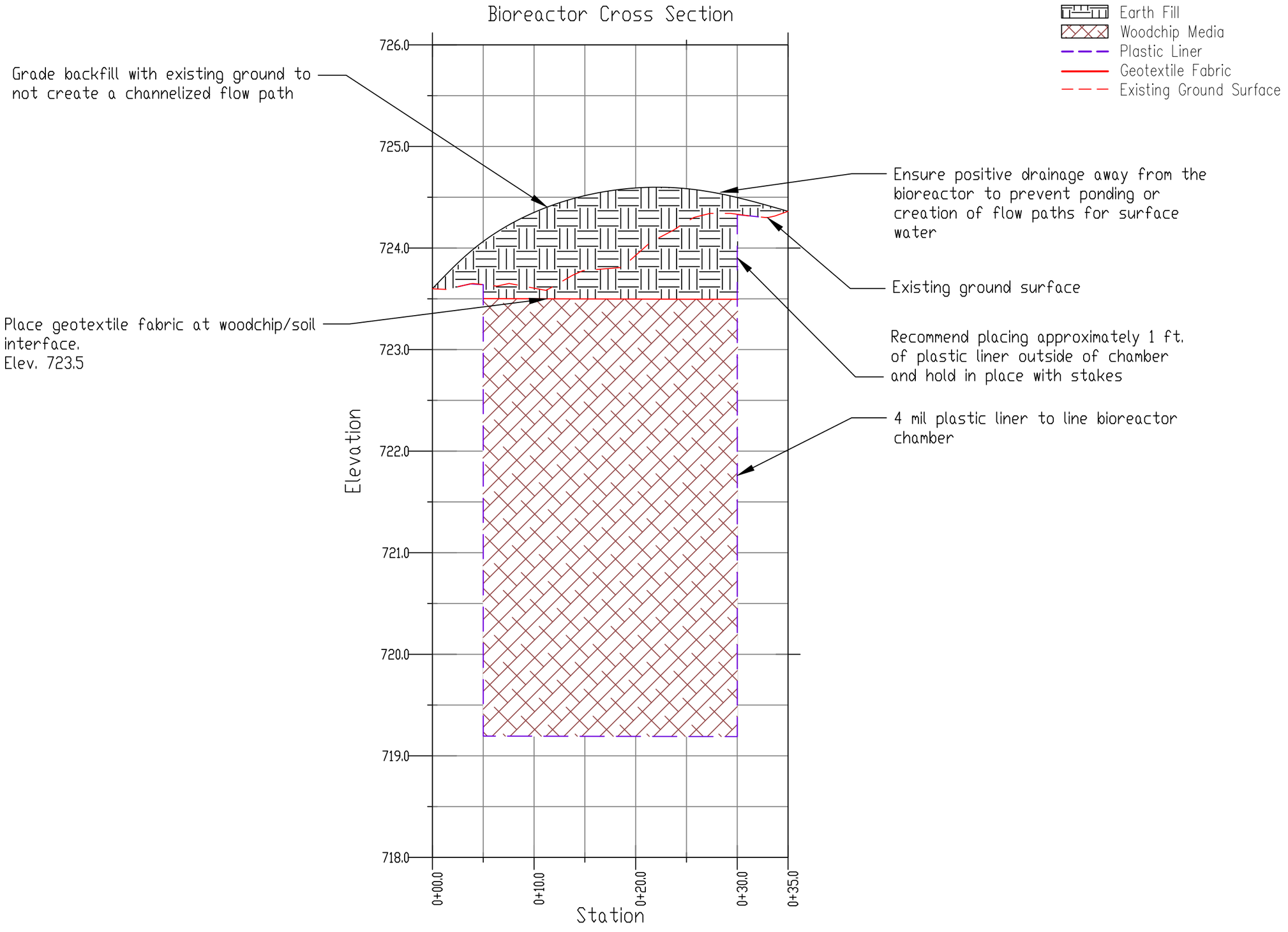
ESE Ecosystem Services Exchange
Valuing Conservation

FILE NAME
GN

DRAWING SET
SHEET 2 OF 7

LANDOWNER | LOCATION | SECTION 4 - T79N - R4W

Bioreactor Cross Section



LANDOWNER	[illegible]	LOCATION	SECTION 4 - T79N - R4W

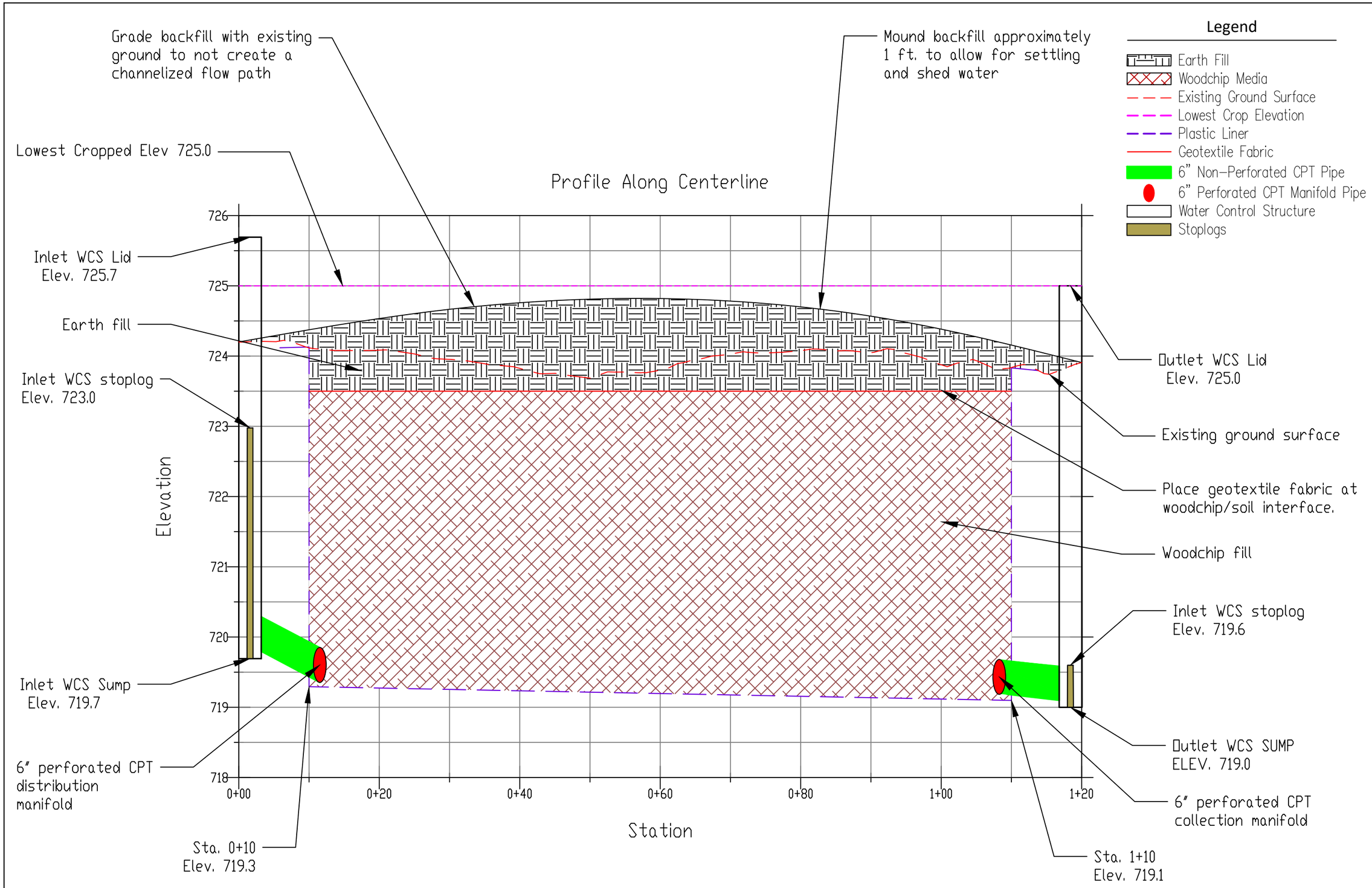
DESIGNED BY BEN REINHART 09/14/23
DRAWN BY BEN REINHART 09/14/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

CROSS SECTION VIEW

ESE Ecosystem Services Exchange
Valuing Conservation

FILE NAME
a

DRAWING SET
SHEET 3 OF 7



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PROFILE ALONG CENTERLINE

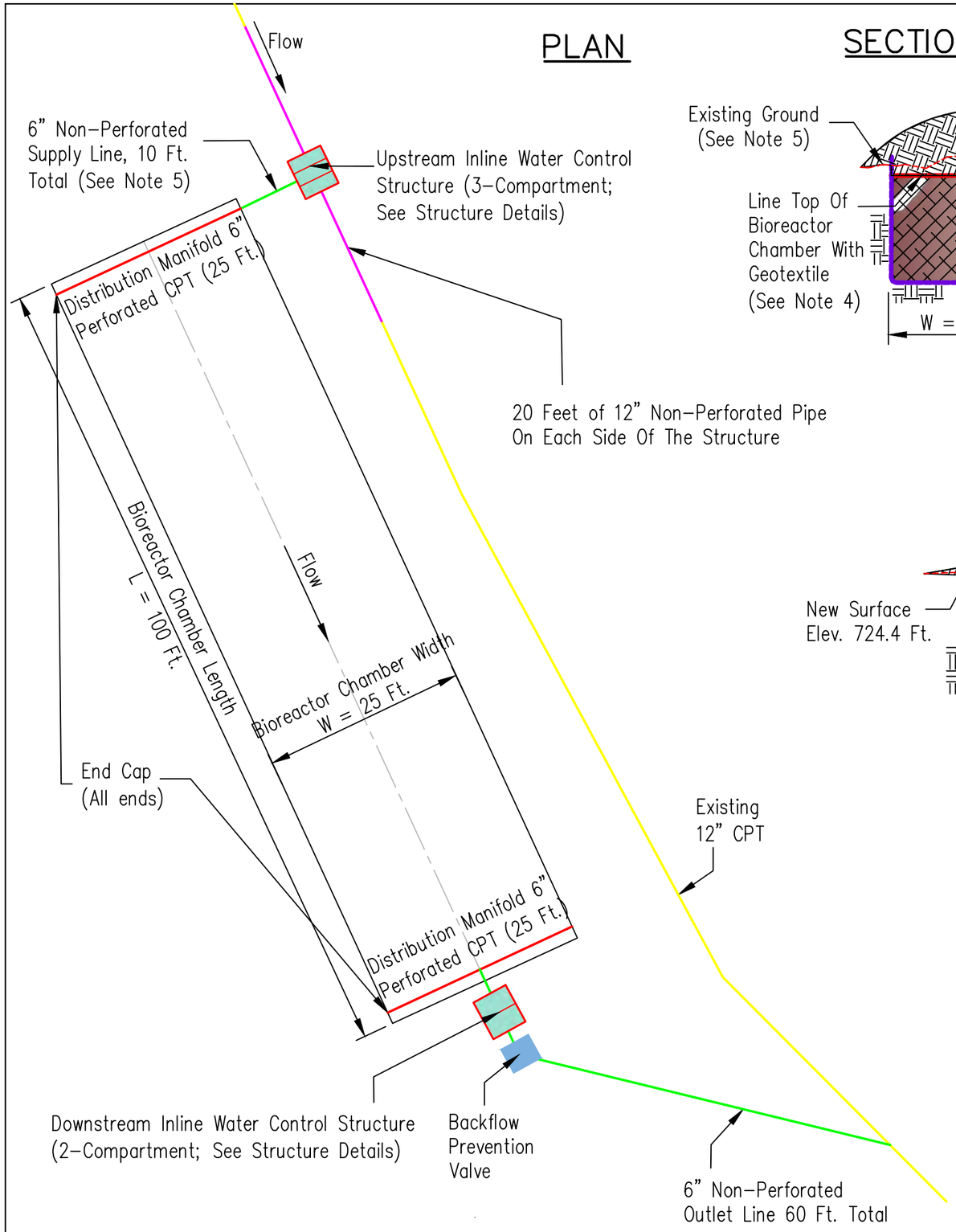
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

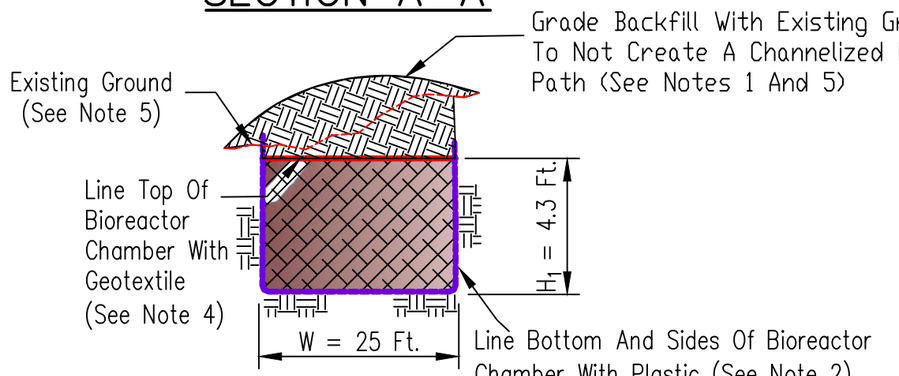
DRAWING SET
SHEET 4 OF 7

LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

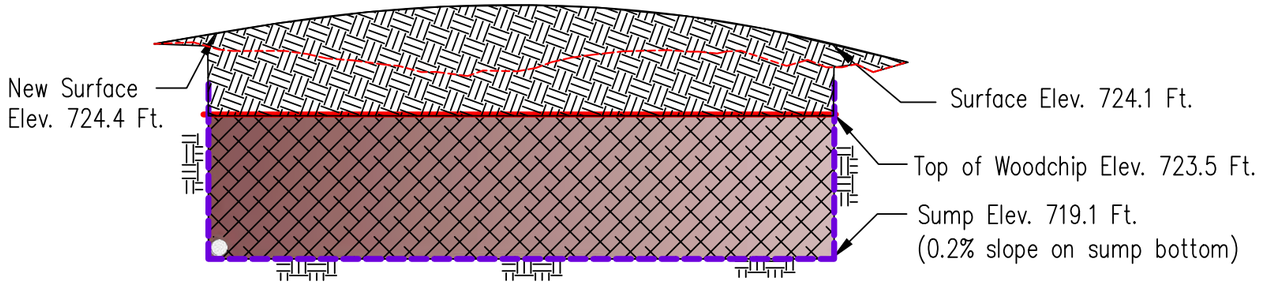
PLAN



SECTION A–A



ELEVATION



Legend

- Earth Fill
- Woodchip Media
- Existing 12" Perf CPT Main
- Proposed 12" Non-Perf CPT
- Proposed 6" Non-Perf CPT
- Proposed 6" Perf CPT
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- Bioreactor Footprint

NOTES:

1. All disturbed non-crop construction areas shall be stabilized by seeding or mulching within 14 days of conclusion of construction activities. This seeding and seed mixture shall meet the NRCS Conservation Practice Standard IA-342 (Critical Area Seeding) or other program requirements to replace previous grass stand.
2. Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Lap seams in direction of flow so water flows over top of seam. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
3. Woodchips shall not contain woods known to have tannin, such as oak, cedar, or redwood. Woodchips shall be reasonably free of soil and other contaminants nor contain loose composting materials. Wood chips shall be around 1-inch long by ½-inch thick with minimal fines. They shall be processed through a chipper and not through a grinder. Do not use any wood that has been treated for ground contact. ESE has the right to reject any woodchips which do not meet specifications.
4. Geotextile shall be non-woven, Class II, and meet the requirements of Iowa Construction Specification IA-95, Geotextile. Overlap a minimum of 6 inches at all seams.
5. Grade site for positive drainage away from the bioreactor chamber. Spread soil in designated location away from bioreactor.
6. See Plan Map for benchmark coordinates.

DATE	
DESIGNED BY BEN REINHART	09/14/23
DRAWN BY BEN REINHART	09/14/23
CHECKED BY ANDY CRAIG, PE	09/14/23
APPROVED BY	

BIOREACTOR DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

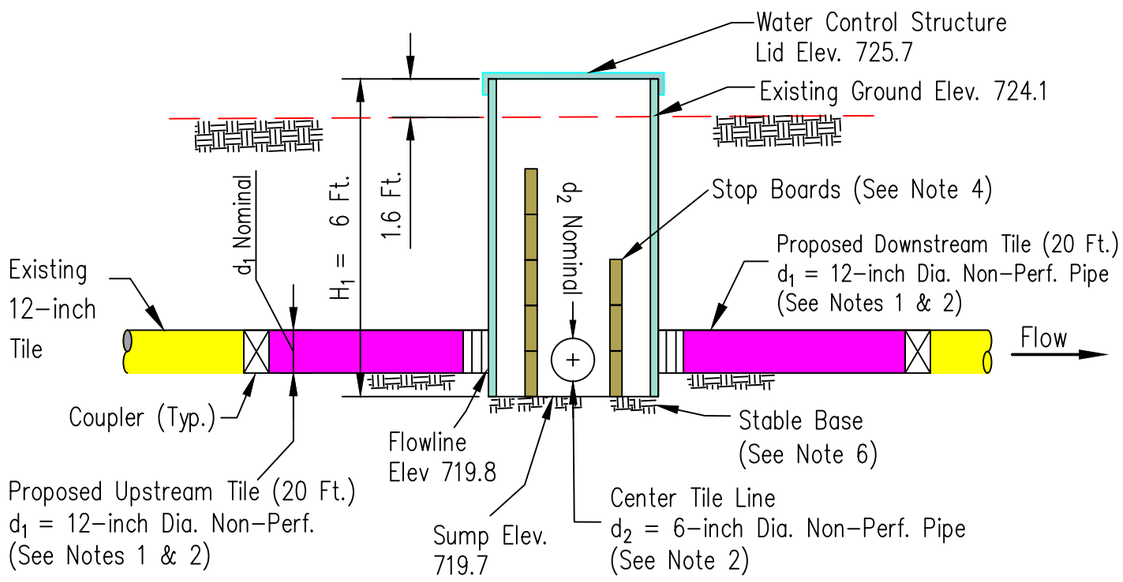
FILE NAME

DRAWING SET

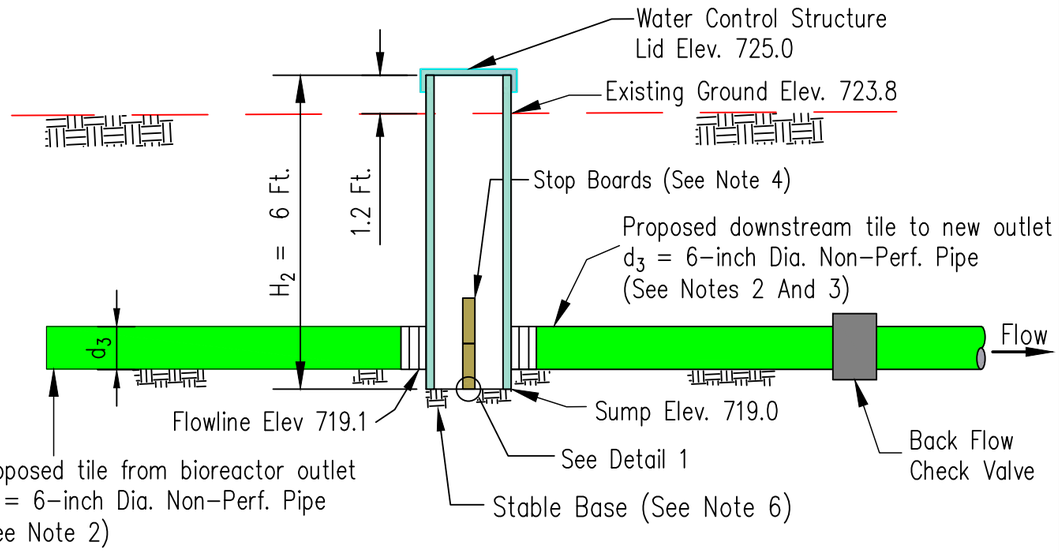
SHEET 5 OF 7

LANDOWNER		LOCATION	SECTION 4 - T79N - R4W

TYPICAL SECTION
UPSTREAM 3–COMPARTMENT STRUCTURE



TYPICAL SECTION
DOWNSTREAM 2–COMPARTMENT STRUCTURE



QUANTITIES*	
Water Control Structure, 3 Chamber (H_1 = 6 ft. | d_1 = 12 in. | d_2 = 6 in.)	1
Water Control Structure, 2 Chamber (H_2 = 6 ft. | d_3 = 6 in.)	1
12" Non–perforated Pipe (ft)	40
6" Non–perforated Pipe (ft)	70
6" Perforated CPT (ft)	50
6" End Cap (each)	3
Wood Chips (cu. yd.)	438
4 Mil Plastic (sq. yd.)**	460
Geotextile (sq. yd.)	278
Excavation (cu. yd.)	491
Earth Fill (cu. yd.)	139
6" Backflow Check Valve (each)	1

* Quantities do not include tile/pipe couplers or extra material for geotextile/plastic overlap
** Accounts for 1 ft. overhang around perimeter

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, on all lines: upstream, downstream and center. Pipe must be PVC, dual–wall CPT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745. Check valve must conform to ASTM D 3034 with SDR35 pipe or stronger.
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4. Stop boards must provide must tight seals under a minimum of 1 foot pressure head (except notched board).
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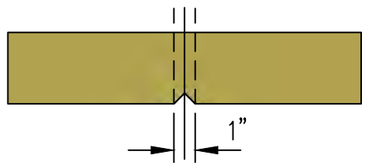
6. Place structure and pipe coupler on a stable base. A stable base may be compacted earth, compacted fill sand, or a concrete pad. Extend the stable base no less than 1 foot beyond structure.
7. Excavated material placed around structure and pipes shall be hand compacted in 4" lifts.

DETAIL 1

Cut 1" Notch In Bottom Of The Bottom Board On The Downstream Structure



Legend

- Earth Fill
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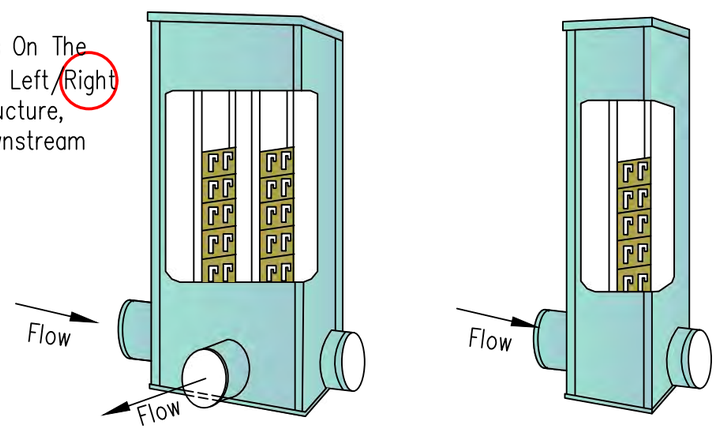
- Proposed 12" Non–Perf CPT
- Proposed 6" Non–Perf CPT
- Existing Ground
- Control Structure Stoplogs

IN–LINE CONTROL STRUCTURES

Side Port Is On The (Circle One) Left/Right Side Of Structure, Looking Downstream



LANDOWNER		LOCATION	SECTION 4 – T79N – R4W

DESIGNED BY BEN REINHART 09/14/23
DRAWN BY BEN REINHART 09/14/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

STRUCTURE DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
c

DRAWING SET
SHEET 6 OF 7

CONSTRUCTION NOTES

1. Tile elevations are based on Maverick tile probe depths and are to be considered accurate within margin of error of the instrument.
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   c. Photos and invoices or product information to detail quantity and quality of plastic and geotextile fabric
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IA-620	Underground Outlet

LANDOWNER	[illegible]	LOCATION	SECTION 4 - T79N - R4W

DESIGNED BY BEN REINHART 09/14/23
DRAWN BY BEN REINHART 09/14/23
CHECKED BY ANDY CRAIG, PE 09/14/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

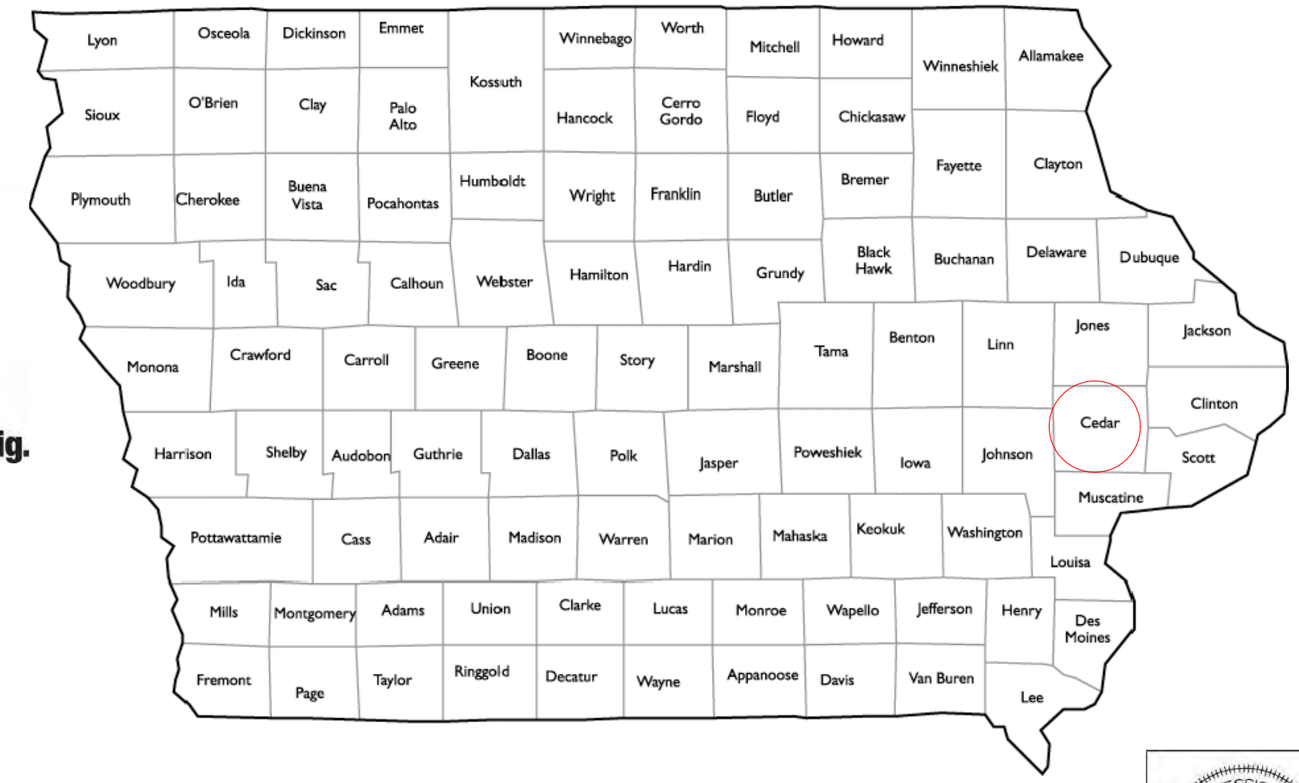
FILE NAME
ch

DRAWING SET
SHEET 7 OF 7

DENITRIFYING BIOREACTOR CONSTRUCTION PLANS

CEDAR COUNTY, IOWA

SECTION 06- T79N - R03W



INDEX OF SHEETS

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I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

9/5/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

ENGINEERING CLASS 3

		DATE
DESIGNED BY	ANDY MACKRILL, TSP	9/5/2023
DRAWN BY	ANDY MACKRILL, TSP	9/5/2023
CHECKED BY	ANDY CRAIG, PE, TSP	9/11/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 7

Benchmark:
Top of Outlet (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 619551.1
Easting: 2259833.2
Elevation: 735.5

0 25 50 Feet

N

Staking Control Points (NAD 1983 State Plane Iowa South US SURVEY FEET)				
Point	Description	Northing	Easting	Elevation
1	Southeast Corner BIO	619465.6	2259892.4	740.6
2	Southwest Corner BIO	619465.3	2259872.3	740.6
3	Northwest Corner BIO	619545.5	2259871.4	741.0
4	Northeast Corner BIO	619545.7	2259891.4	740.6
5	Inlet WCS (3-chamber)	619565.8	2259894.3	740.8
6	Outlet WCS (2-chamber)	619467.0	2259867.2	740.5
7	Benchmark	619551.1	2259833.2	735.5

New 10" CMP Outlet With Rodent Guard

Approx. Grade 0.5% Connecting to Existing Outlet.

0+00.00
0+30.00
1+00.00

Legend

- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" Non-Perf CPT Main
- Proposed 10" CMP Outlet
- Bioreactor Footprint
- Water Control Structure
- Benchmark
- 2 Foot Contours

DATE
DESIGNED BY ANDY MACKRILL 9/5/23
DRAWN BY ANDY MACKRILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

PLAN MAP

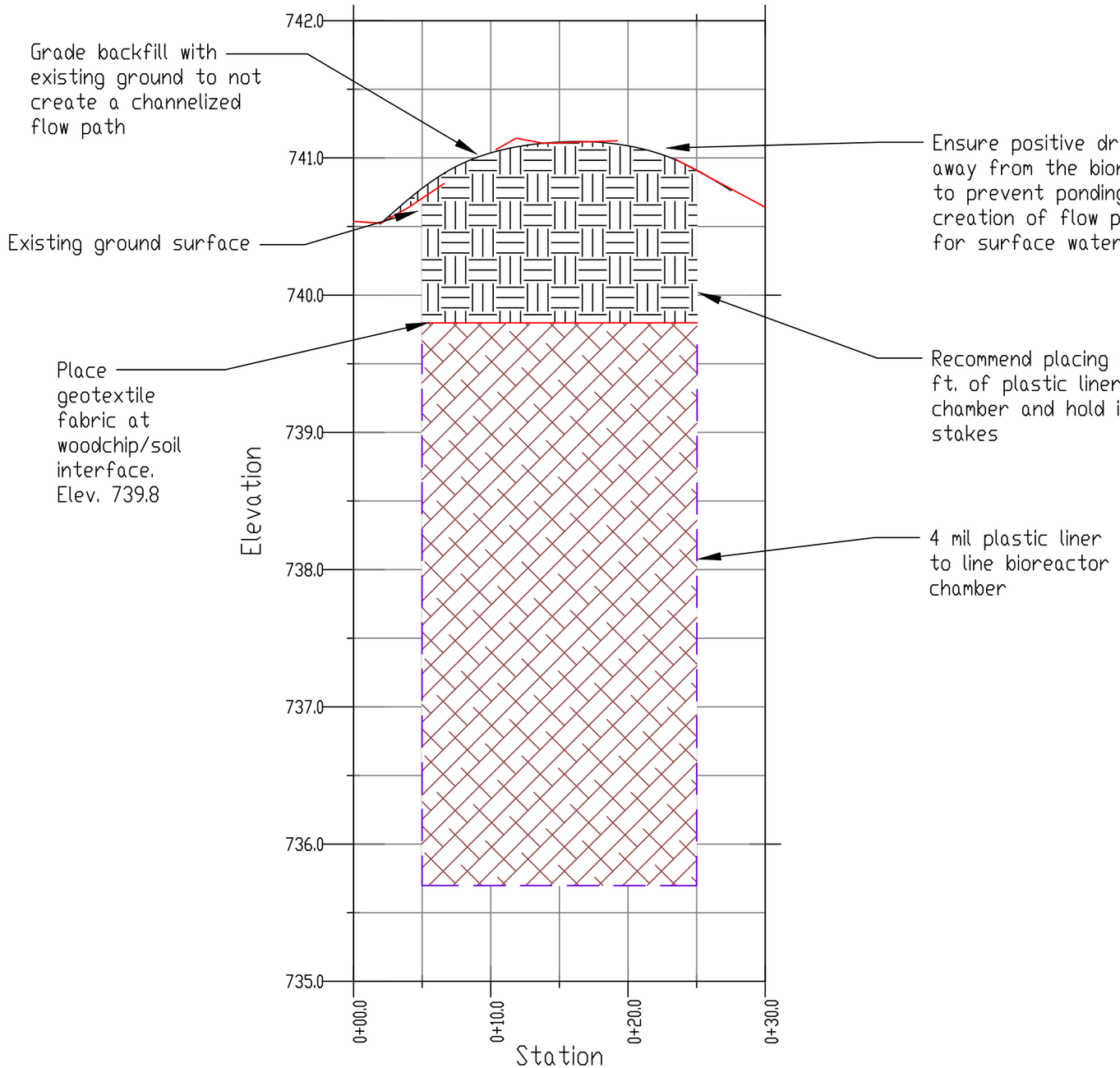
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 2 OF 7

LANDOWNER | LOCATION | SECTION 06 - T79N - R03W

Cross-Section



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface

LANDOWNER		LOCATION	SECTION 06 - T79N - R03W

DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

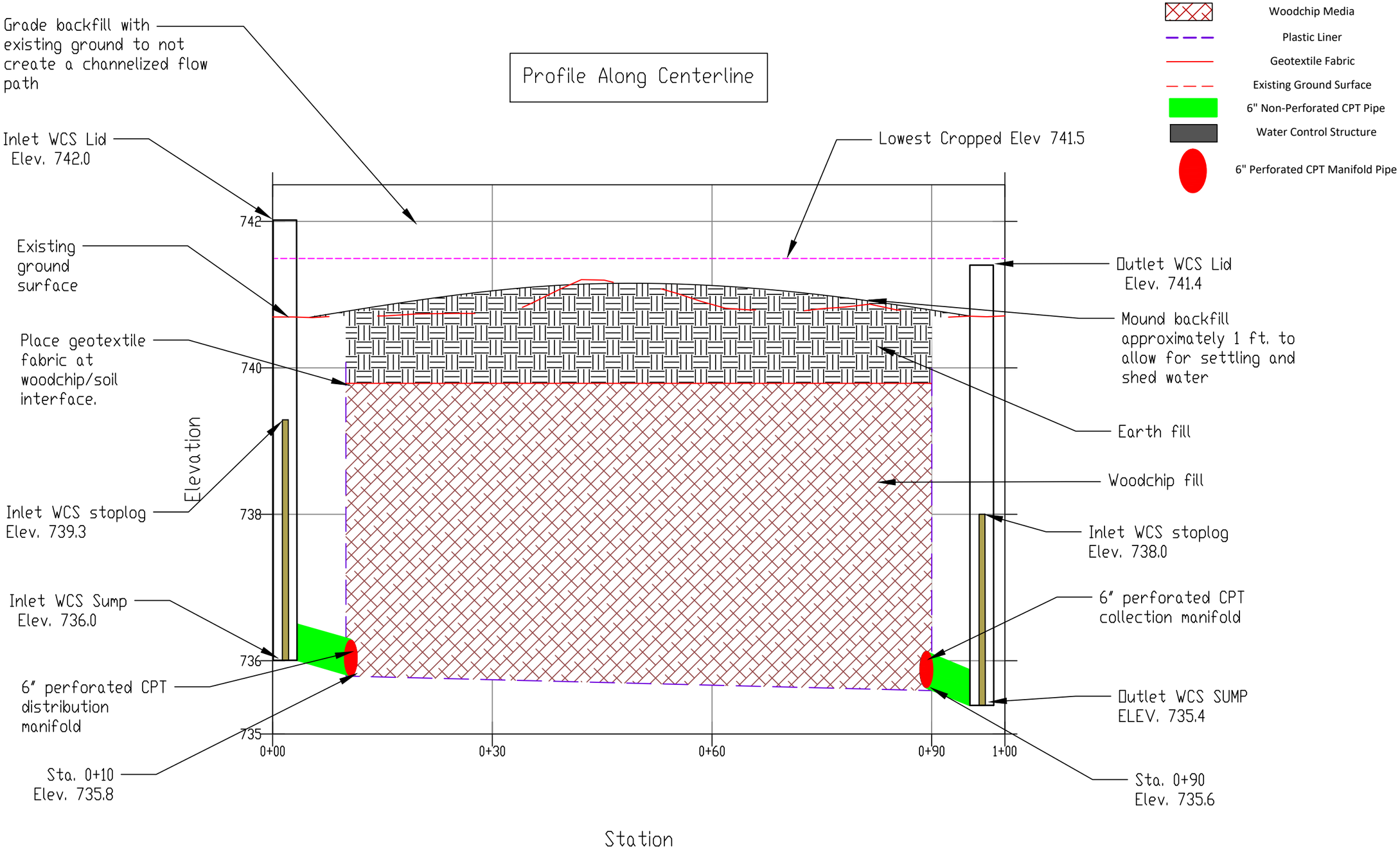
CROSS SECTION VIEW

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 3 OF 7

Profile Along Centerline



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- 6" Non-Perforated CPT Pipe
- Water Control Structure
- 6" Perforated CPT Manifold Pipe

DESIGNED BY ANDY MACKFILL	DATE 9/5/23
DRAWN BY ANDY MACKFILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

PROFILE ALONG CENTERLINE

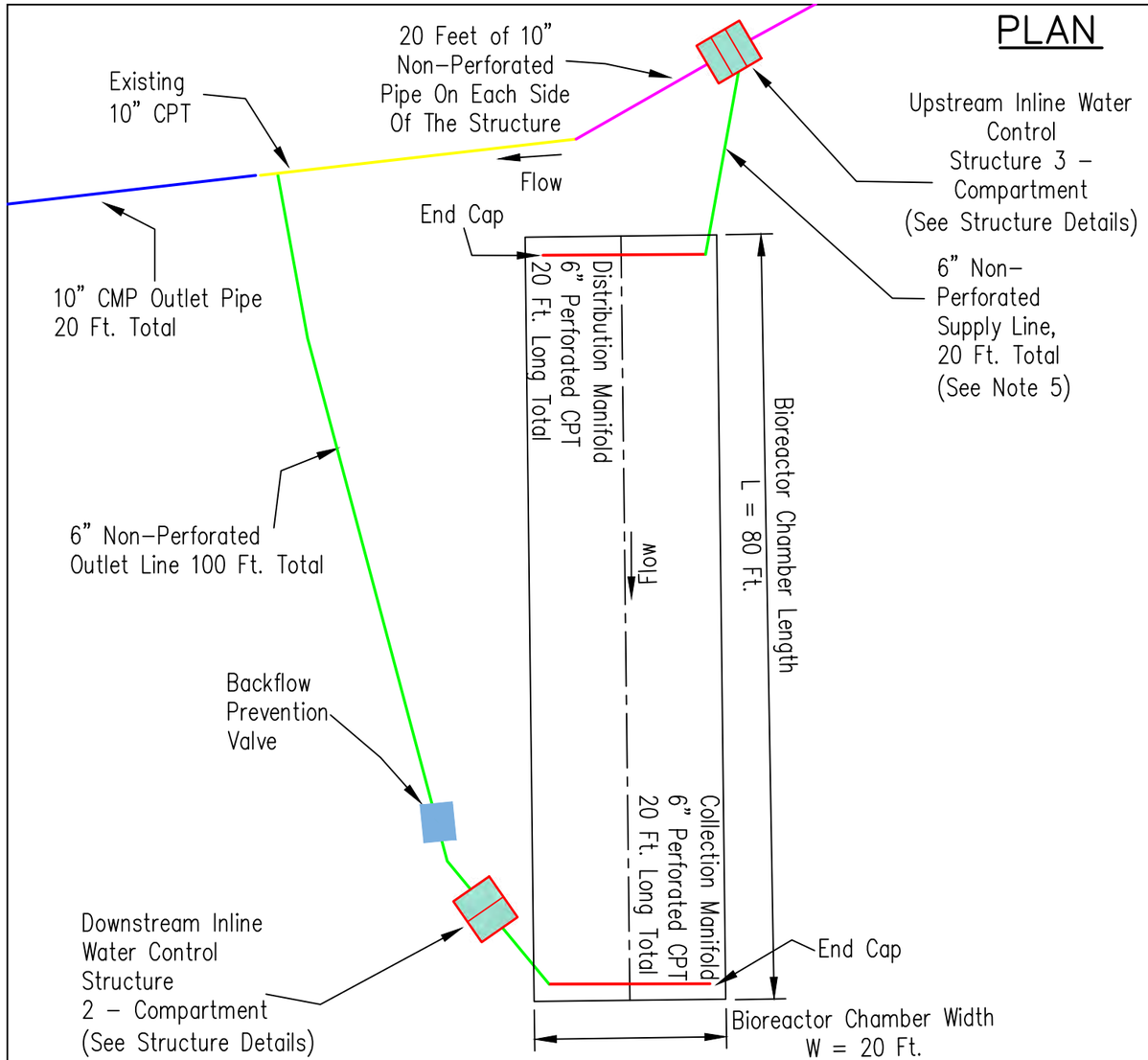
ESE Ecosystem Services Exchange *Valuing Conservation*

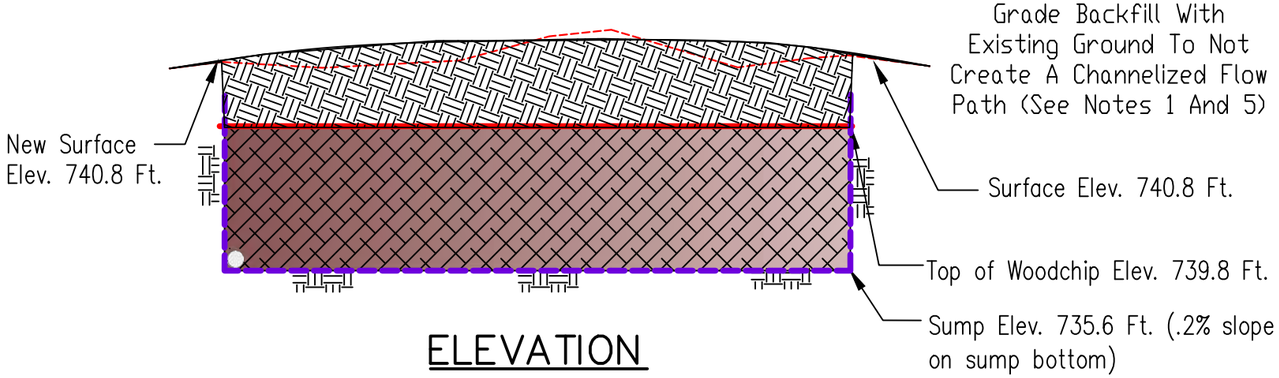
FILE NAME

DRAWING SET
SHEET 4 OF 7

LANDOWNER		LOCATION	SECTION 06 - T79N - R03W

PLAN





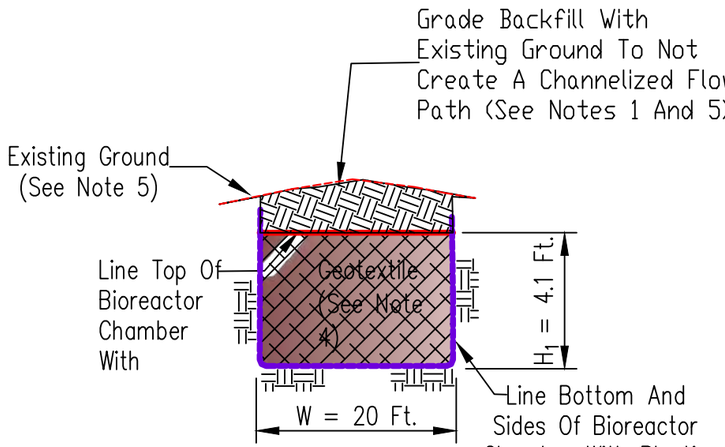
ELEVATION

Legend

- Earth Fill
- Woodchip Media
- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" Non-Perforated CPT
- Proposed 10" CMP Outlet
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- Bioreactor Footprint

NOTES:

1. All disturbed non-crop construction areas shall be stabilized by seeding or mulching within 14 days of conclusion of construction activities. This seeding and seed mixture shall meet the NRCS Conservation Practice Standard IA-342 (Critical Area Seeding) or other program requirements to replace previous grass stand.
2. Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Lap seams in direction of flow so water flows over top of seam. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
3. Woodchips shall not contain woods known to have tannin, such as oak, cedar, or redwood. Woodchips shall be reasonably free of soil and other contaminants nor contain loose composting materials. Wood chips shall be around 1"long by ½" thick with minimal fines. They shall be processed through a chipper and not through a grinder. Do not use any wood that has been treated for ground contact. ESE has the right to reject any woodchips which do not meet specifications.
4. Geotextile shall be non-woven, Class II, and meet the requirements of Iowa Construction Specification IA-95, Geotextile. Overlap a minimum of 6 inches at all seams.
5. Grade site for positive drainage away from the bioreactor chamber. Spread soil in designated location away from bioreactor.
6. See Plan Map for benchmark coordinates.



SECTION A-A

LANDOWNER		LOCATION	SECTION 06 - T79N - R03W

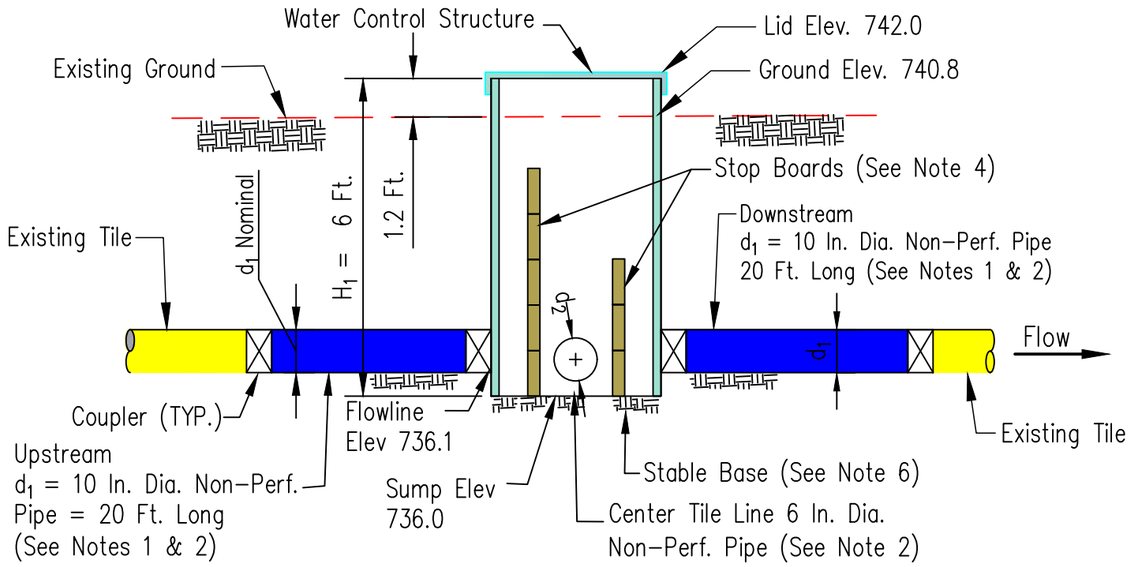
DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY
DATE

BIOREACTOR DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

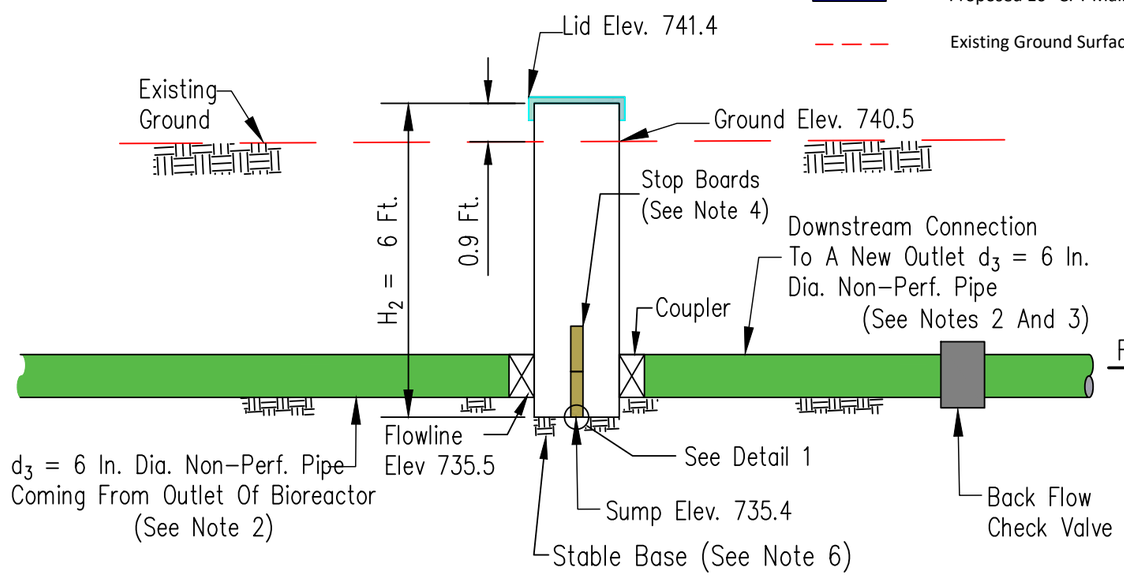
FILE NAME

DRAWING SET
SHEET 5 OF 7



TYPICAL SECTION
UPSTREAM STRUCTURE

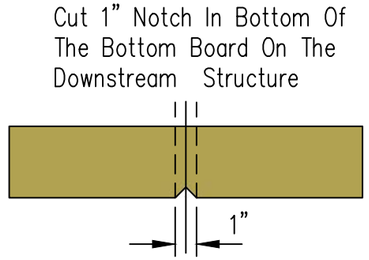
QUANTITIES*	
Water Control Structure, 3 Chamber H_1 = 6 ft. d_1 = 10 in. d_2 = 6 in.	1
Water Control Structure, 2 Chamber H_2 = 6 ft. d_3 = 6 in.	1
10" Non-perforated Pipe (ft)	40
10" CMP Outlet Pipe With Rodent Guard (ft)	20
6" Non-perforated Pipe (ft)	120
6" Perforated CPT (ft)	40
6" End Cap	2
Wood Chips (cu. yd.)	268
4 Mil Plastic (sq. yd.)**	318
Geotextile (sq. yd.)	178
Excavation (cu. yd.)	320
Earth Fill (cu. yd.)	107
6" Backflow Check Valve	1



TYPICAL SECTION
DOWNSTREAM STRUCTURE

* Quantities do not include tile/pipe couplers or extra material for geotextile/plastic overlap

** Accounts for 1 ft. overhang around perimeter



DETAIL 1

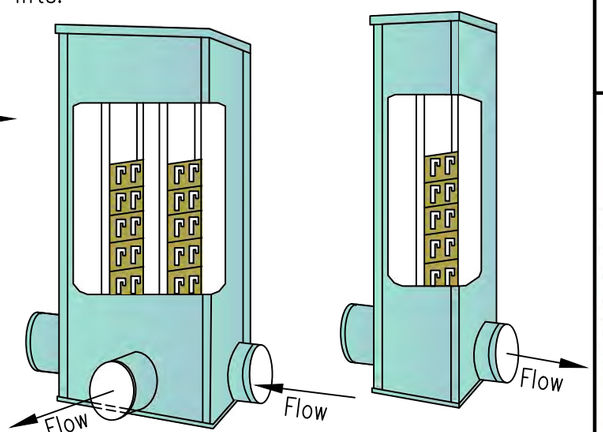
Legend

- Earth Fill
- 6" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" CPT Main
- Existing Ground Surface

Side Port Is On The
(Circle One) Left/Right
Side Of Structure,
Looking Downstream

NOTES:

1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, on all lines: upstream, downstream and center. Pipe must be PVC, dual-wall CPT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745. Check valve must conform to ASTM D 3034 with SDR35 pipe or stronger.
3. Couplings between the water control structures and the non-perforated tile must be watertight.
4. Stop boards must provide must tight seals under a minimum of 1 foot pressure head (except notched board).
5. Appropriately mark bioreactor perimeter to avoid vehicle, implement, or livestock traffic.
6. Place structure and pipe coupler on a stable base. A stable base may be compacted earth, compacted fill sand, or a concrete pad. Extend the stable base no less than 1 foot beyond structure.
7. Excavated material placed around structure and pipes shall be hand compacted in 4" lifts.



IN-LINE CONTROL STRUCTURES

DATE	
DESIGNED BY ANDY MACKRILL	9/5/23
DRAWN BY ANDY MACKRILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

STRUCTURE DETAIL

ESE Ecosystem Services Exchange — Valuing Conservation

FILE NAME

DRAWING SET
SHEET 6 OF 7

LANDOWNER		LOCATION	SECTION 06 - T79N - R03W

CONSTRUCTION NOTES

1. Tile elevations are based on Maverick tile probe depths and are to be considered accurate within margin of error of the instrument.
2. If any surface inlets are currently attached to the tile main or plan to be in the future, they shall be replaced with water quality inlets to minimize trash entry into the tile line before construction of the bioreactor begins.
3. Avoid excessive disturbance of any buffers or grassed water ways during construction. However, if re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded within 14 days according to NRCS Conservation Practice Standard IA-342 Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
4. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion.
5. All carbon media to be placed in the bioreactor shall come from an ESE approved vendor or approved with ESE staff prior to transportation and placement.
6. Contact an ESE representative for inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the bioreactor chamber and tile line trenches
   b. After placing the water control structures and bioreactor manifolds
   c. After placement of carbon media, before backfilling with soil
   d. After connections to existing tile and final grading
7. Any product planned for use in construction must be approved by ESE prior to construction. Save and provide documentation to an ESE representative of all materials used in construction including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths
   b. Photos and invoices for quantity and quality of woodchips/carbon media
   c. Photos and invoices or product information to detail quantity and quality of plastic and geotextile fabric
   d. Photos and invoices or product information for water control structures
8. Construction tolerances are +/-0.5ft on bioreactor chamber dimensions, and +/-0.1 ft. on all elevations. Outlet WCS sump (bottom) must be below the elevation of the bioreactor chamber at the outlet end. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by a representative from ESE and will be noted in the as-built plan.
9. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.
10. All work shall be performed according to the IA construction and practice specifications in the table below.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-95	Geotextile
IA-605	Denitrifying Bioreactor
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 06 - T79N - R03W

DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

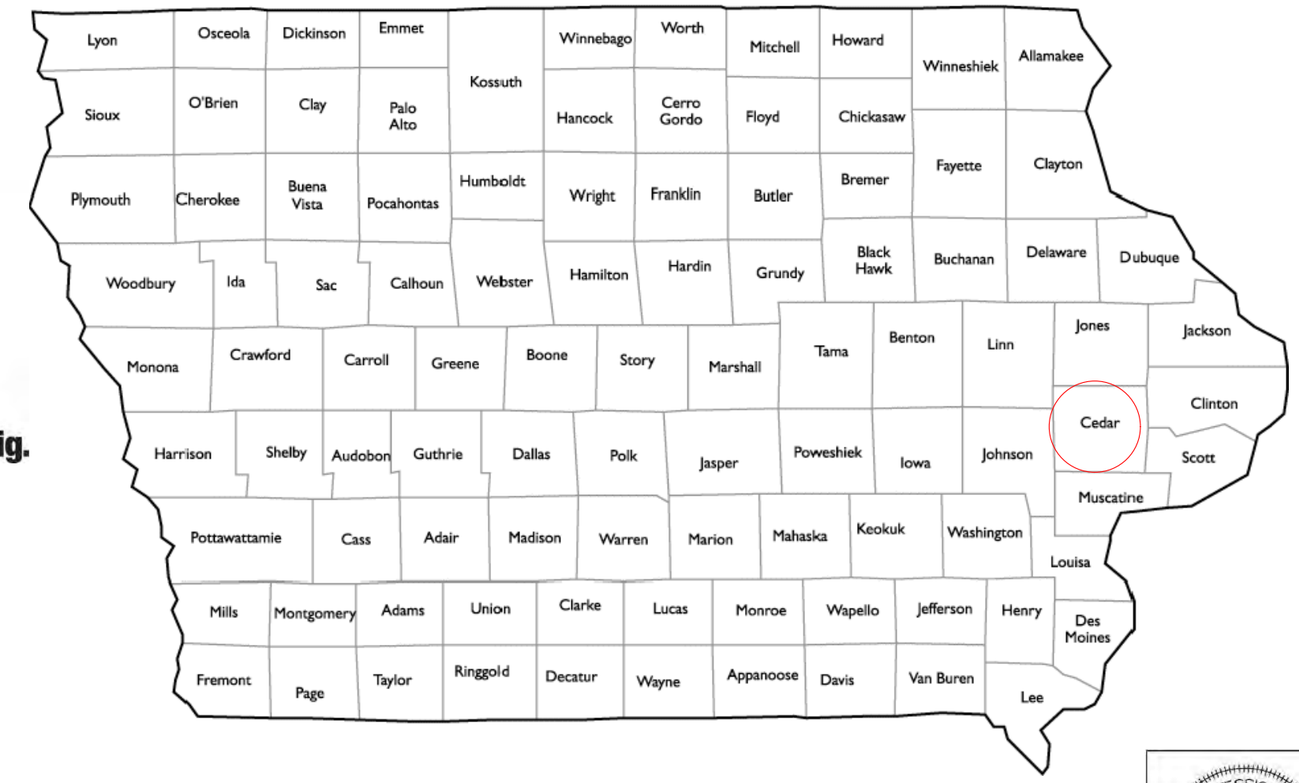
FILE NAME

DRAWING SET
SHEET 7 OF 7

DENITRIFYING BIOREACTOR CONSTRUCTION PLANS

CEDAR COUNTY, IOWA

SECTION 06- T79N - R03W



INDEX OF SHEETS

811 Know what's **below.** **Call** before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

ENGINEERING CLASS 3

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

9/15/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

		DATE
DESIGNED BY	ANDY MACKRILL, TSP	9/5/2023
DRAWN BY	ANDY MACKRILL, TSP	9/5/2023
CHECKED BY	ANDY CRAIG, PE, TSP	9/15/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 7

Benchmark:
Top of Outlet (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 619820.4
Easting: 2259799.3
Elevation: 736.0

0 25 50 Feet

N

Staking Control Points (NAD 1983 State Plane Iowa South US SURVEY FEET)				
Point	Description	Northing	Easting	Elevation
1	Southeast Corner BIO	619889.5	2259844.6	742.9
2	Southwest Corner BIO	619877.3	2259828.7	742.9
3	Northwest Corner BIO	619940.9	2259779.8	742.3
4	Northeast Corner BIO	619953.1	2259795.7	742.5
5	Inlet WCS (3-chamber)	619863.7	2259842.9	742.8
6	Outlet WCS (2-chamber)	619937.1	2259778.7	742.1
7	Benchmark	619820.4	2259799.3	736.0

1+00.00
0+00.00
0+30.00
0+00.00

Approx. Grade 0.5% Connecting to Existing Outlet.

New 10" CMP Outlet With Rodent Guard

Legend

- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" Non-Perf CPT Main
- Proposed 10" CMP Outlet
- Bioreactor Footprint
- Water Control Structure
- Benchmark
- 2 Foot Contours

DESIGNED BY ANDY MACKRILL 9/5/23
DRAWN BY ANDY MACKRILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY
DATE

PLAN MAP

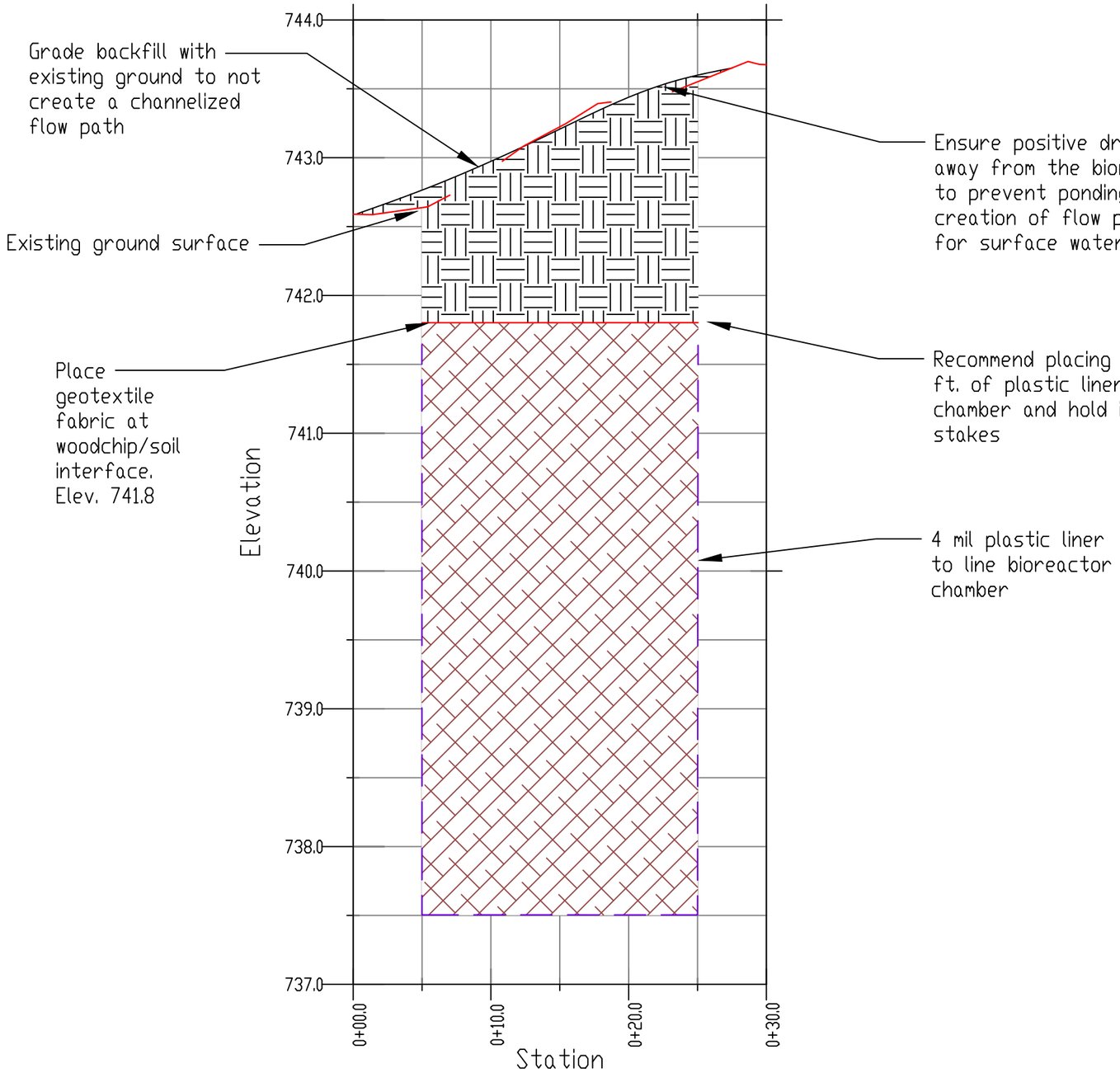
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 2 OF 7

LANDOWNER | LOCATION | SECTION 03 - T79N - R03W

Cross-Section



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface

DESIGNED BY ANDY MACKFILL	DATE 9/5/23
DRAWN BY ANDY MACKFILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

CROSS SECTION VIEW

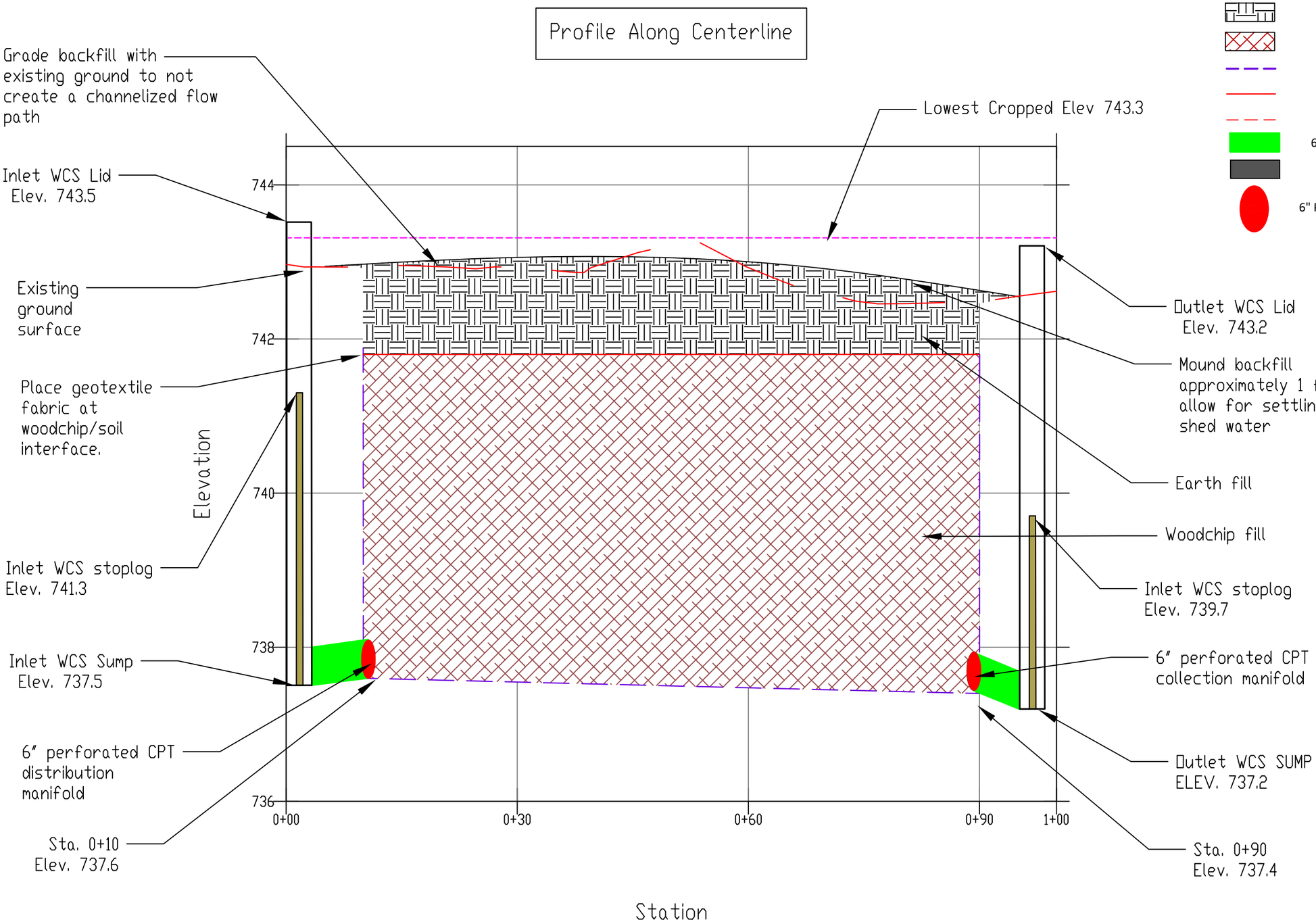
ESE Ecosystem Services Exchange — Valuing Conservation

FILE NAME
BC

DRAWING SET
SHEET 3 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

Profile Along Centerline



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- 6" Non-Perforated CPT Pipe
- Water Control Structure
- 6" Perforated CPT Manifold Pipe

DESIGNED BY ANDY MACKFILL	DATE 9/5/23
DRAWN BY ANDY MACKFILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

PROFILE ALONG CENTERLINE

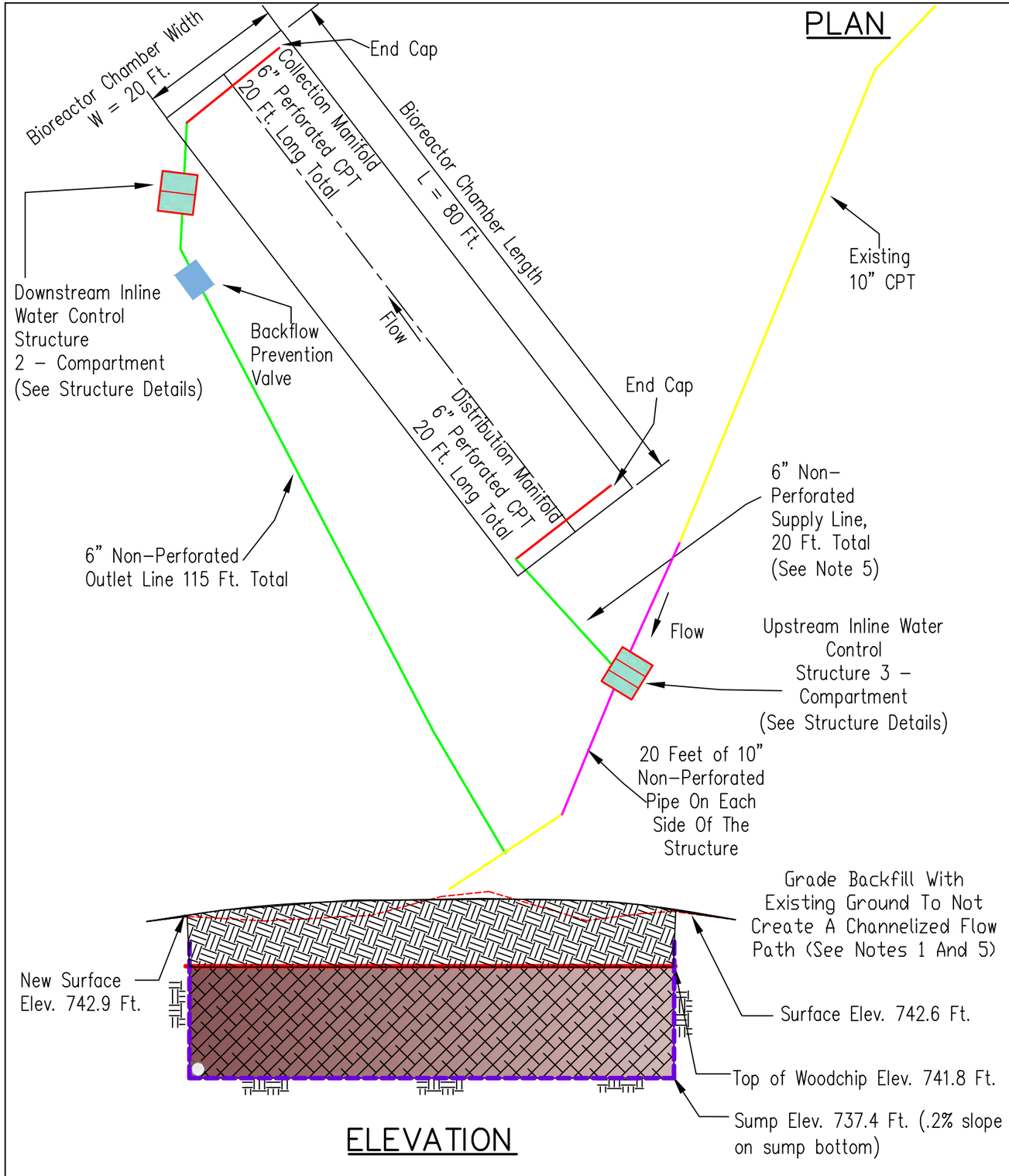
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET

SHEET 4 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

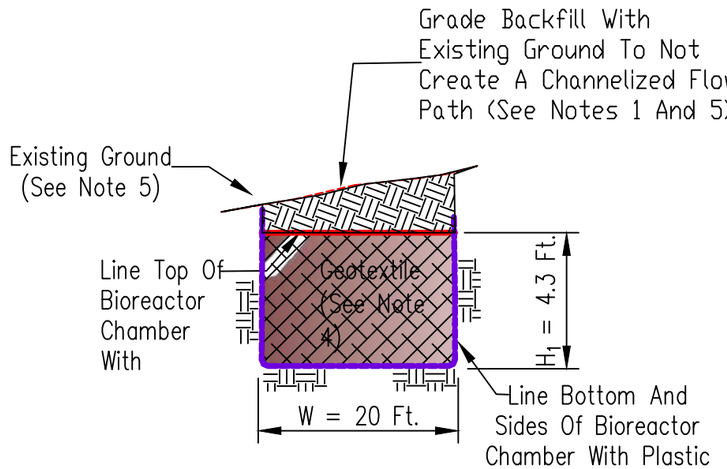


Legend

- Earth Fill
- Woodchip Media
- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 10" CPT Main
- Proposed 10" Non-Perforated CPT
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- Bioreactor Footprint

NOTES:

1. All disturbed non–crop construction areas shall be stabilized by seeding or mulching within 14 days of conclusion of construction activities. This seeding and seed mixture shall meet the NRCS Conservation Practice Standard IA–342 (Critical Area Seeding) or other program requirements to replace previous grass stand.
2. Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Lap seams in direction of flow so water flows over top of seam. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
3. Woodchips shall not contain woods known to have tannin, such as oak, cedar, or redwood. Woodchips shall be reasonably free of soil and other contaminants nor contain loose composting materials. Wood chips shall be around 1"long by ½" thick with minimal fines. They shall be processed through a chipper and not through a grinder. Do not use any wood that has been treated for ground contact. ESE has the right to reject any woodchips which do not meet specifications.
4. Geotextile shall be non–woven, Class II, and meet the requirements of Iowa Construction Specification IA–95, Geotextile. Overlap a minimum of 6 inches at all seams.
5. Grade site for positive drainage away from the bioreactor chamber. Spread soil in designated location away from bioreactor.
6. See Plan Map for benchmark coordinates.



SECTION A–A

DESIGNED BY	ANDY MACKFILL
DRAWN BY	ANDY MACKFILL
CHECKED BY	ANDY CRAIG
APPROVED BY	
DATE	9/5/23
	9/5/23
	9/15/23

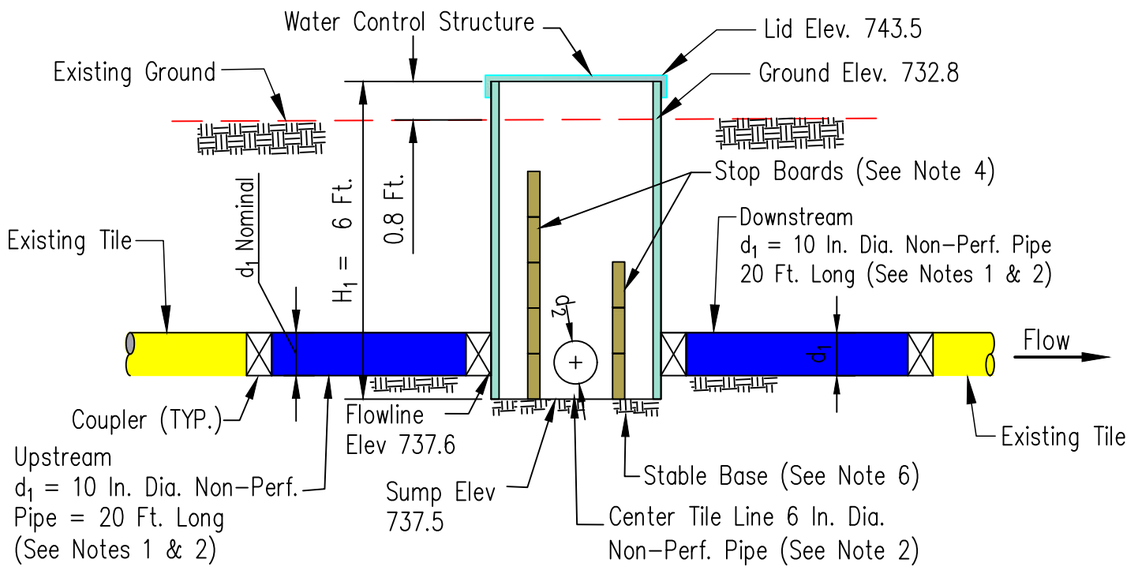
BIOREACTOR DETAIL

Ecosystem Services Exchange
Valuing Conservation

FILE NAME

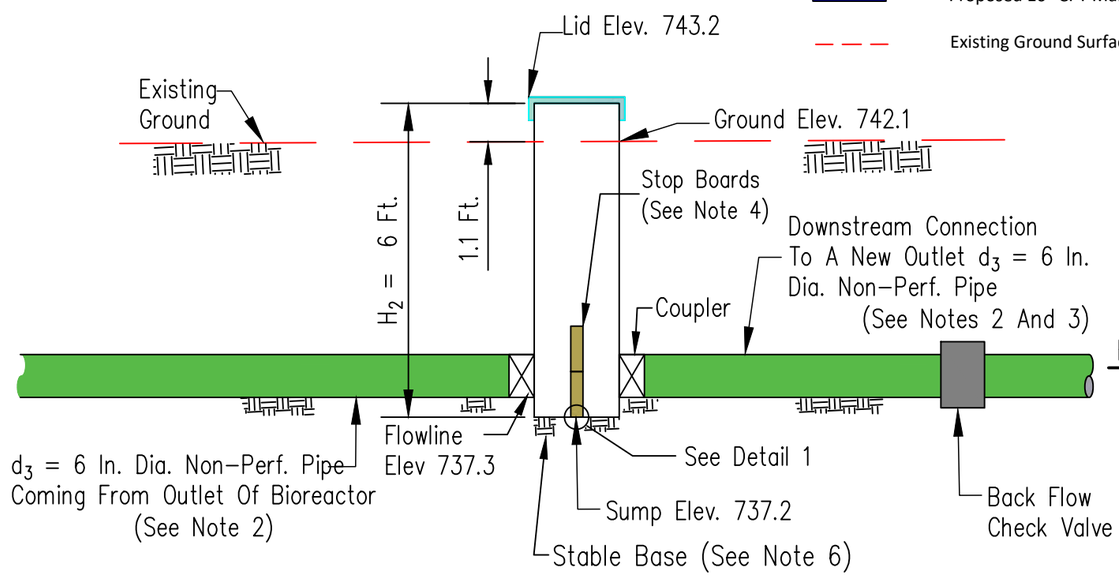
DRAWING SET
SHEET 5 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W



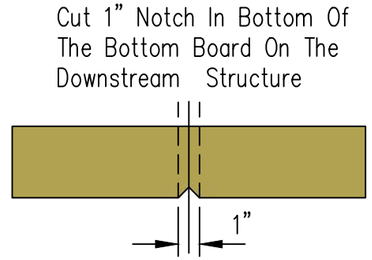
TYPICAL SECTION
UPSTREAM STRUCTURE

QUANTITIES*	
Water Control Structure, 3 Chamber H_1 = 6 ft. d_1 = 10 in. d_2 = 6 in.	1
Water Control Structure, 2 Chamber H_2 = 6 ft. d_3 = 6 in.	1
10" Non-perforated Pipe (ft)	40
10" CMP Outlet Pipe with Rodent Guard (ft)	20
6" Non-perforated Pipe (ft)	135
6" Perforated CPT (ft)	40
6" End Cap	2
Wood Chips (cu. yd.)	281
4 Mil Plastic (sq. yd.)**	324
Geotextile (sq. yd.)	178
Excavation (cu. yd.)	332
Earth Fill (cu. yd.)	107
6" Backflow Check Valve	1

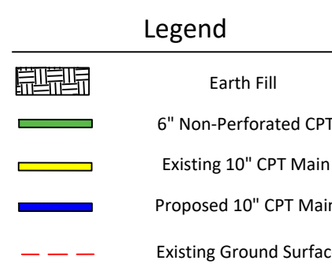


TYPICAL SECTION
DOWNSTREAM STRUCTURE

* Quantities do not include tile/pipe couplers or extra material for geotextile/plastic overlap
** Accounts for 1 ft. overhang around perimeter

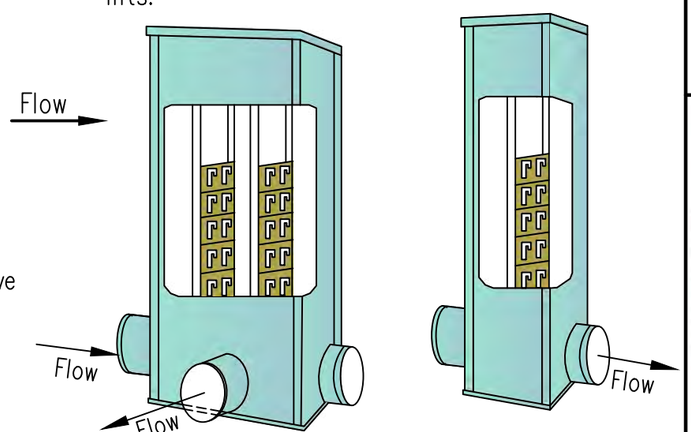


DETAIL 1



Side Port Is On The (Circle One) Left/Right Side Of Structure, Looking Downstream

NOTES:
1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, on all lines: upstream, downstream and center. Pipe must be PVC, dual-wall CPT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745. Check valve must conform to ASTM D 3034 with SDR35 pipe or stronger.
3. Couplings between the water control structures and the non-perforated tile must be watertight.
4. Stop boards must provide must tight seals under a minimum of 1 foot pressure head (except notched board).
5. Appropriately mark bioreactor perimeter to avoid vehicle, implement, or livestock traffic.
6. Place structure and pipe coupler on a stable base. A stable base may be compacted earth, compacted fill sand, or a concrete pad. Extend the stable base no less than 1 foot beyond structure.
7. Excavated material placed around structure and pipes shall be hand compacted in 4" lifts.



IN-LINE CONTROL STRUCTURES

DESIGNED BY ANDY MACKRILL	DATE 9/5/23
DRAWN BY ANDY MACKRILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

STRUCTURE DETAIL

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
B

DRAWING SET
SHEET 6 OF 7

LANDOWNER	[illegible]	LOCATION	SECTION 03 - T79N - R03W

CONSTRUCTION NOTES

1. Tile elevations are based on Maverick tile probe depths and are to be considered accurate within margin of error of the instrument.
2. If any surface inlets are currently attached to the tile main or plan to be in the future, they shall be replaced with water quality inlets to minimize trash entry into the tile line before construction of the bioreactor begins.
3. Avoid excessive disturbance of any buffers or grassed water ways during construction. However, if re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded within 14 days according to NRCS Conservation Practice Standard IA-342 Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
4. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion.
5. All carbon media to be placed in the bioreactor shall come from an ESE approved vendor or approved with ESE staff prior to transportation and placement.
6. Contact an ESE representative for inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the bioreactor chamber and tile line trenches
   b. After placing the water control structures and bioreactor manifolds
   c. After placement of carbon media, before backfilling with soil
   d. After connections to existing tile and final grading
7. Any product planned for use in construction must be approved by ESE prior to construction. Save and provide documentation to an ESE representative of all materials used in construction including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths
   b. Photos and invoices for quantity and quality of woodchips/carbon media
   c. Photos and invoices or product information to detail quantity and quality of plastic and geotextile fabric
   d. Photos and invoices or product information for water control structures
8. Construction tolerances are +/-0.5ft on bioreactor chamber dimensions, and +/-0.1 ft. on all elevations. Outlet WCS sump (bottom) must be below the elevation of the bioreactor chamber at the outlet end. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by a representative from ESE and will be noted in the as-built plan.
9. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.
10. All work shall be performed according to the IA construction and practice specifications in the table below.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-95	Geotextile
IA-605	Denitrifying Bioreactor
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

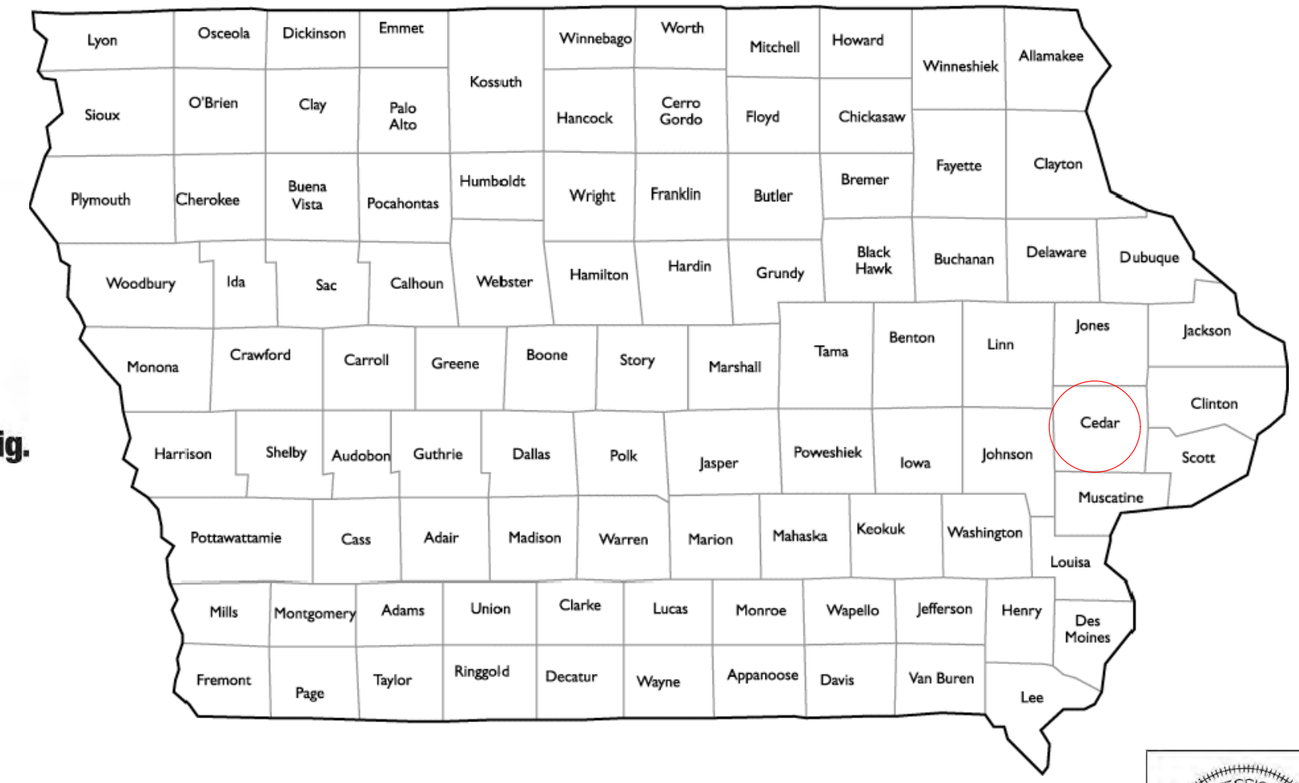
FILE NAME
sc

DRAWING SET
SHEET 7 OF 7

DENITRIFYING BIOREACTOR CONSTRUCTION PLANS

CEDAR COUNTY, IOWA

SECTION 06- T79N - R03W



INDEX OF SHEETS

811 Know what's **below.** **Call** before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

ENGINEERING CLASS 3

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

9/15/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

		DATE
DESIGNED BY	ANDY MACKRILL, TSP	9/5/2023
DRAWN BY	ANDY MACKRILL, TSP	9/5/2023
CHECKED BY	ANDY CRAIG, PE, TSP	9/15/2023
APPROVED BY		

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COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 7

Benchmark:
Top of Outlet (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 619356.3
Easting: 2259875.8
Elevation: 735.7

0 25 50 Feet

N

Staking Control Points (NAD 1983 State Plane Iowa South US SURVEY FEET)				
Point	Description	Northing	Easting	Elevation
1	Southeast Corner BIO	619417.7	2259780.1	740.8
2	Southwest Corner BIO	619417.5	2259760.0	741.2
3	Northwest Corner BIO	619497.7	2259759.2	741.8
4	Northeast Corner BIO	619497.9	2259779.3	741.0
5	Inlet WCS (3-chamber)	619359.2	2259785.7	741.2
6	Outlet WCS (2-chamber)	619495.9	2259782.8	740.8
7	Benchmark	619356.3	2259875.8	735.7

1+00.00
0+00.00
0+30.00
0+00.00

Approx. Grade 0.2% Connecting to Existing Outlet.

New 8" CMP Outlet With Rodent Guard

Legend

- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 8" CPT Main
- Proposed 8" Non-Perf CPT Main
- Proposed 8" CMP Outlet
- Bioreactor Footprint
- Water Control Structure
- Benchmark
- 2 Foot Contours

DATE
DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

PLAN MAP

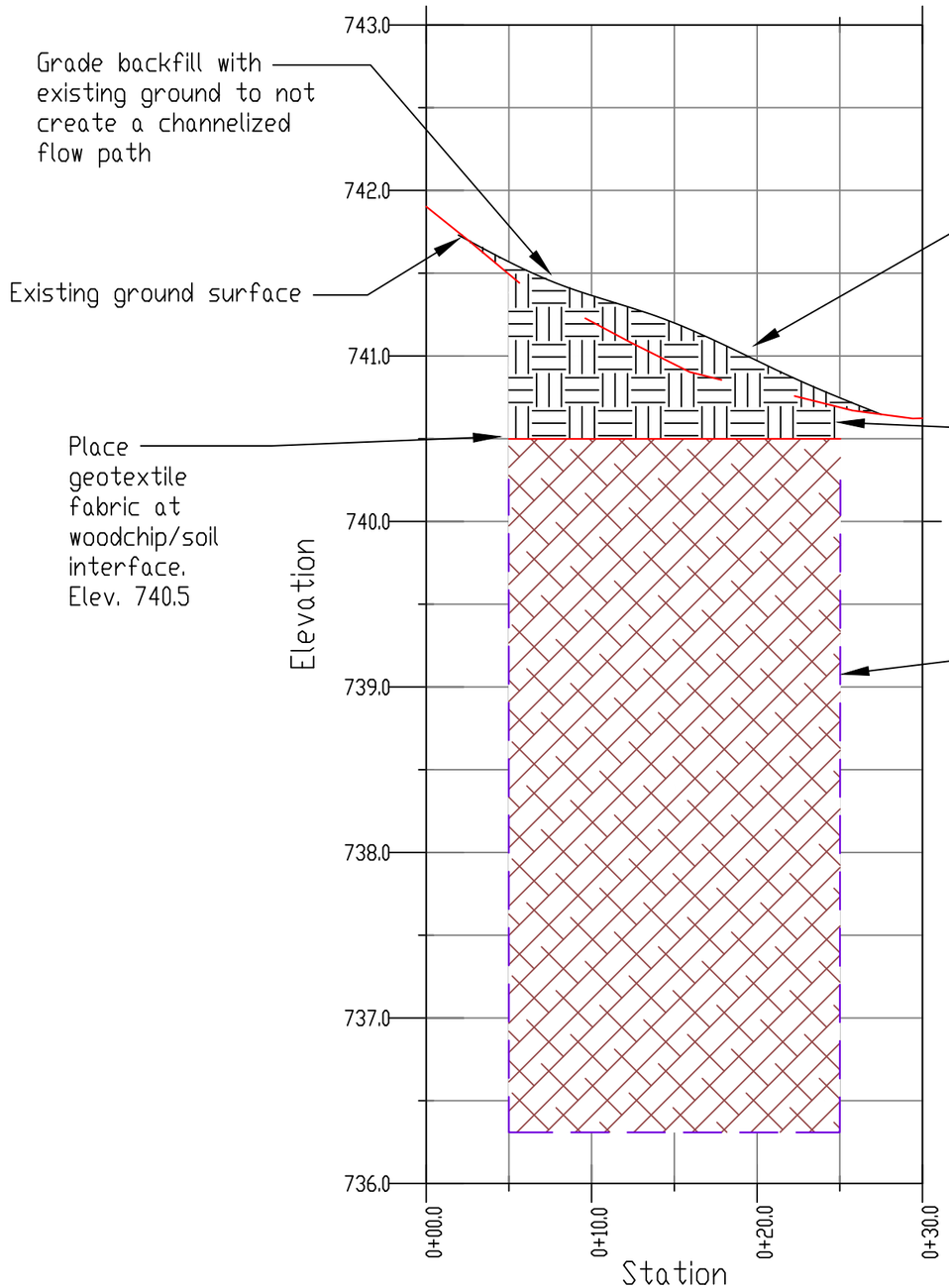
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 2 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

Cross-Section



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

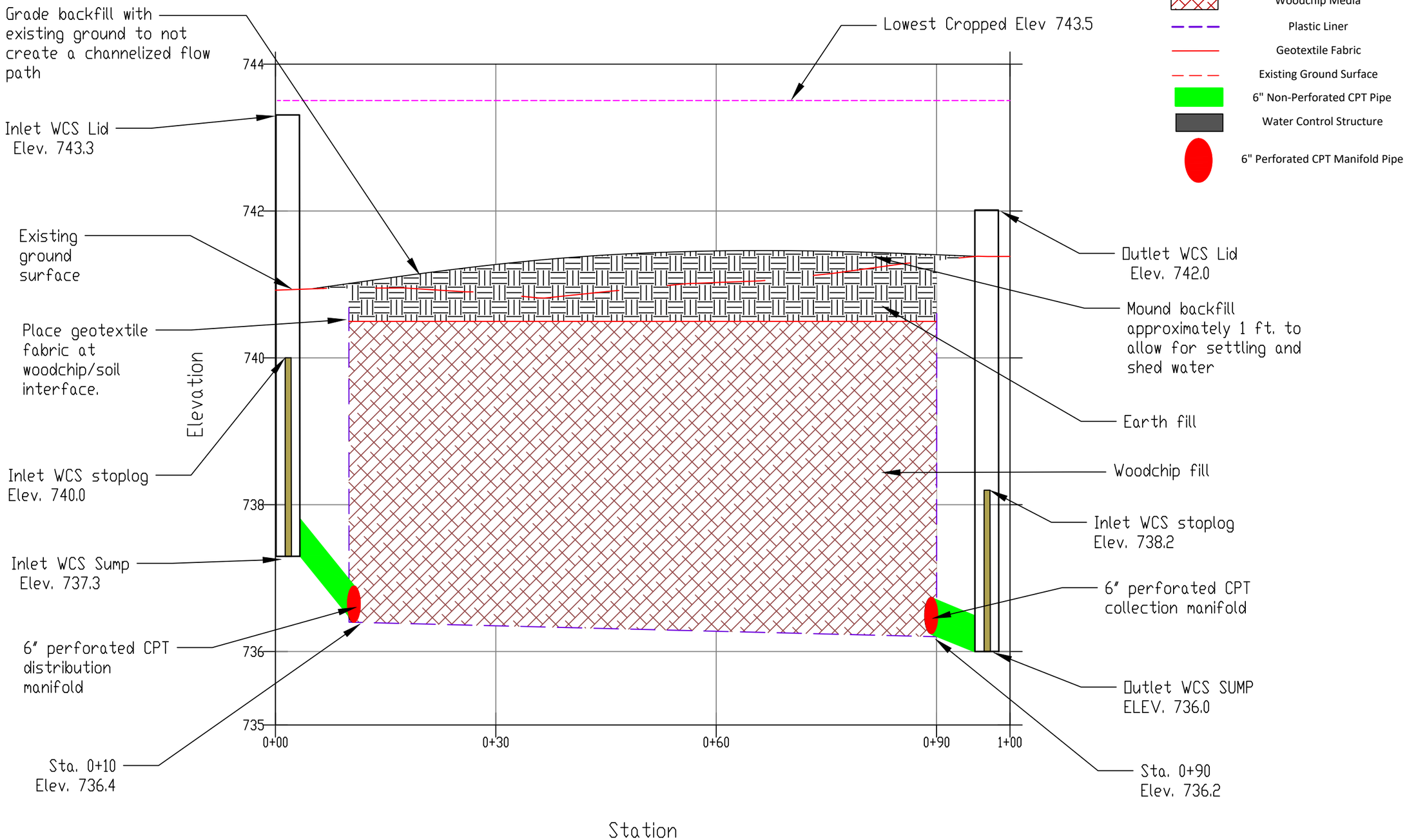
CROSS SECTION VIEW

ESE Ecosystem Services Exchange
Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 7

Profile Along Centerline



Legend

- Earth Fill
- Woodchip Media
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- 6" Non-Perforated CPT Pipe
- Water Control Structure
- 6" Perforated CPT Manifold Pipe

	DATE
DESIGNED BY ANDY MACKFILL	9/5/23
DRAWN BY ANDY MACKFILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

PROFILE ALONG CENTERLINE

ESE Ecosystem Services Exchange *Valuing Conservation*

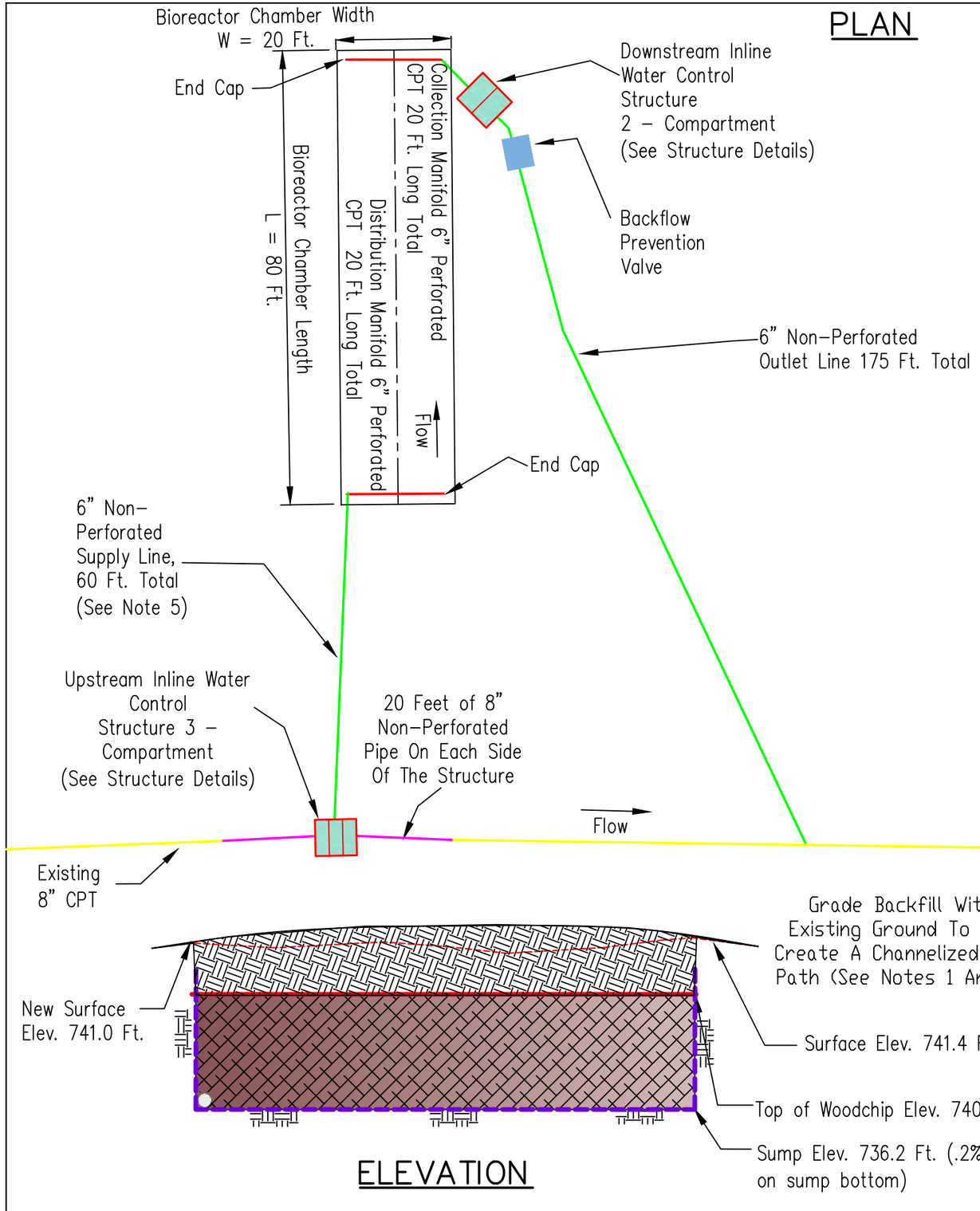
FILE NAME

DRAWING SET

SHEET 4 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

PLAN



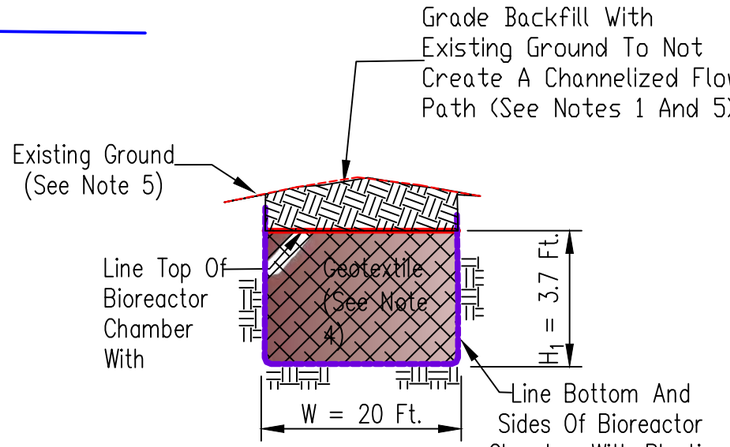
ELEVATION

Legend

- Earth Fill
- Woodchip Media
- Proposed 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Existing 8" CPT Main
- Proposed 8" Non-Perforated CPT
- Proposed 8" CMP Outlet
- Plastic Liner
- Geotextile Fabric
- Existing Ground Surface
- Bioreactor Footprint

NOTES:

1. All disturbed non–crop construction areas shall be stabilized by seeding or mulching within 14 days of conclusion of construction activities. This seeding and seed mixture shall meet the NRCS Conservation Practice Standard IA–342 (Critical Area Seeding) or other program requirements to replace previous grass stand.
2. Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Lap seams in direction of flow so water flows over top of seam. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
3. Woodchips shall not contain woods known to have tannin, such as oak, cedar, or redwood. Woodchips shall be reasonably free of soil and other contaminants nor contain loose composting materials. Wood chips shall be around 1"long by ½" thick with minimal fines. They shall be processed through a chipper and not through a grinder. Do not use any wood that has been treated for ground contact. ESE has the right to reject any woodchips which do not meet specifications.
4. Geotextile shall be non–woven, Class II, and meet the requirements of Iowa Construction Specification IA–95, Geotextile. Overlap a minimum of 6 inches at all seams.
5. Grade site for positive drainage away from the bioreactor chamber. Spread soil in designated location away from bioreactor.
6. See Plan Map for benchmark coordinates.



SECTION A–A

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

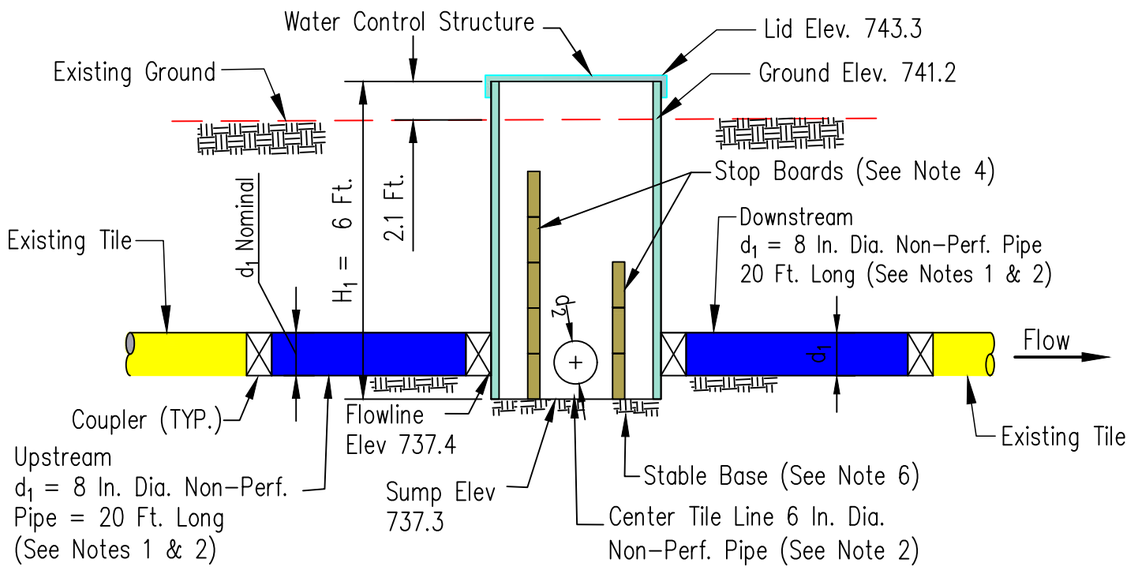
DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

BIOREACTOR DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

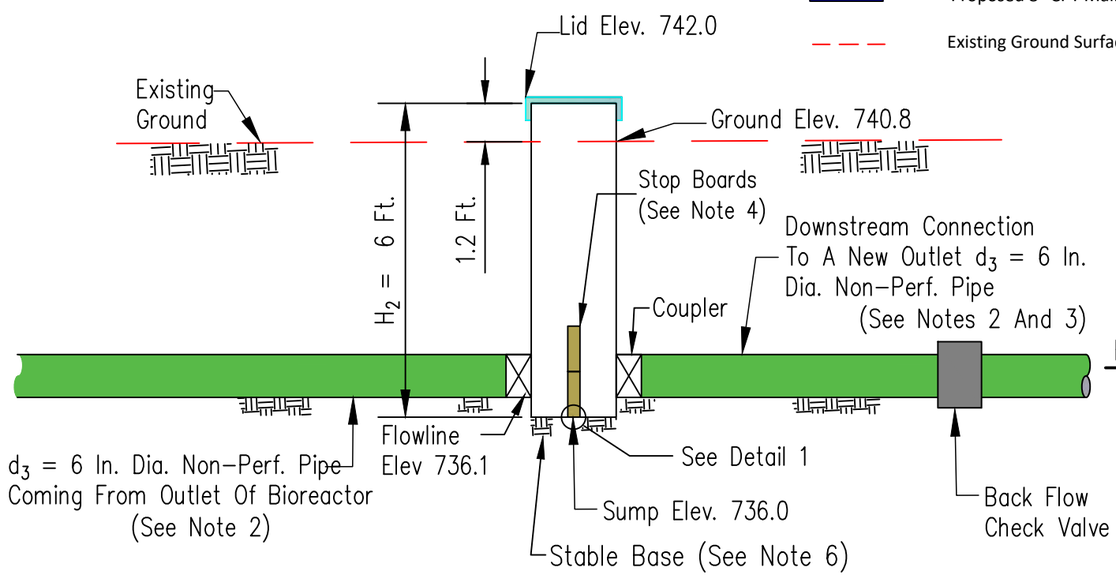
FILE NAME

DRAWING SET
SHEET 5 OF 7



TYPICAL SECTION
UPSTREAM STRUCTURE

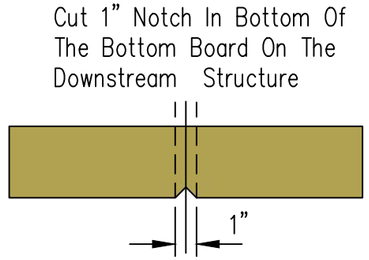
QUANTITIES*	
Water Control Structure, 3 Chamber H_1 = 6 ft. d_1 = 8 in. d_2 = 6 in.	1
Water Control Structure, 2 Chamber H_2 = 6 ft. d_3 = 6 in.	1
8" Non-perforated Pipe (ft)	40
8" CMP Outlet Pipe With Rodent Guard (ft)	20
6" Non-perforated Pipe (ft)	235
6" Perforated CPT (ft)	40
6" End Cap	2
Wood Chips (cu. yd.)	242
4 Mil Plastic (sq. yd.)**	307
Geotextile (sq. yd.)	178
Excavation (cu. yd.)	279
Earth Fill (cu. yd.)	89
6" Backflow Check Valve	1



TYPICAL SECTION
DOWNSTREAM STRUCTURE

* Quantities do not include tile/pipe couplers or extra material for geotextile/plastic overlap

** Accounts for 1 ft. overhang around perimeter



DETAIL 1

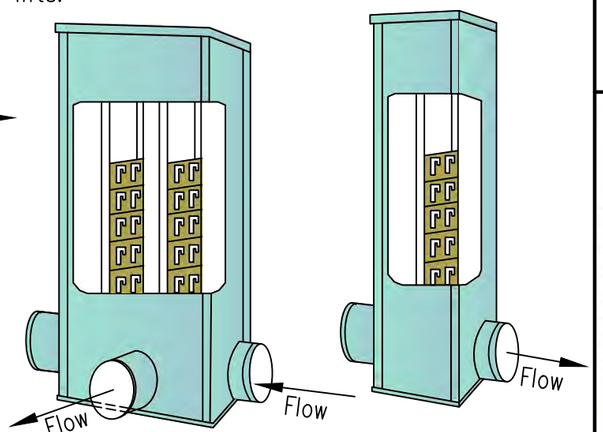
Legend

- Earth Fill
- 6" Non-Perforated CPT
- Existing 8" CPT Main
- Proposed 8" CPT Main
- Existing Ground Surface

Side Port Is On The
(Circle One) Left/Right
Side Of Structure,
Looking Downstream

NOTES:

1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, on all lines: upstream, downstream and center. Pipe must be PVC, dual-wall CPT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745. Check valve must conform to ASTM D 3034 with SDR35 pipe or stronger.
3. Couplings between the water control structures and the non-perforated tile must be watertight.
4. Stop boards must provide must tight seals under a minimum of 1 foot pressure head (except notched board).
5. Appropriately mark bioreactor perimeter to avoid vehicle, implement, or livestock traffic.
6. Place structure and pipe coupler on a stable base. A stable base may be compacted earth, compacted fill sand, or a concrete pad. Extend the stable base no less than 1 foot beyond structure.
7. Excavated material placed around structure and pipes shall be hand compacted in 4" lifts.



IN-LINE CONTROL STRUCTURES

DATE	
DESIGNED BY ANDY MACKRILL	9/5/23
DRAWN BY ANDY MACKRILL	9/5/23
CHECKED BY ANDY CRAIG	9/15/23
APPROVED BY	

STRUCTURE DETAIL

ESE Ecosystem Services Exchange — Valuing Conservation

FILE NAME

DRAWING SET
SHEET 6 OF 7

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

CONSTRUCTION NOTES

1. Tile elevations are based on Maverick tile probe depths and are to be considered accurate within margin of error of the instrument.
2. If any surface inlets are currently attached to the tile main or plan to be in the future, they shall be replaced with water quality inlets to minimize trash entry into the tile line before construction of the bioreactor begins.
3. Avoid excessive disturbance of any buffers or grassed water ways during construction. However, if re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded within 14 days according to NRCS Conservation Practice Standard IA-342 Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
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5. All carbon media to be placed in the bioreactor shall come from an ESE approved vendor or approved with ESE staff prior to transportation and placement.
6. Contact an ESE representative for inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the bioreactor chamber and tile line trenches
   b. After placing the water control structures and bioreactor manifolds
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7. Any product planned for use in construction must be approved by ESE prior to construction. Save and provide documentation to an ESE representative of all materials used in construction including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths
   b. Photos and invoices for quantity and quality of woodchips/carbon media
   c. Photos and invoices or product information to detail quantity and quality of plastic and geotextile fabric
   d. Photos and invoices or product information for water control structures
8. Construction tolerances are +/-0.5ft on bioreactor chamber dimensions, and +/-0.1 ft. on all elevations. Outlet WCS sump (bottom) must be below the elevation of the bioreactor chamber at the outlet end. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by a representative from ESE and will be noted in the as-built plan.
9. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.
10. All work shall be performed according to the IA construction and practice specifications in the table below.

Iowa Construction and Practice Specifications	
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IA-6	Seeding and Mulching for Protective Cover
IA-95	Geotextile
IA-605	Denitrifying Bioreactor
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 03 - T79N - R03W

DESIGNED BY ANDY MACKFILL 9/5/23
DRAWN BY ANDY MACKFILL 9/5/23
CHECKED BY ANDY CRAIG 9/15/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

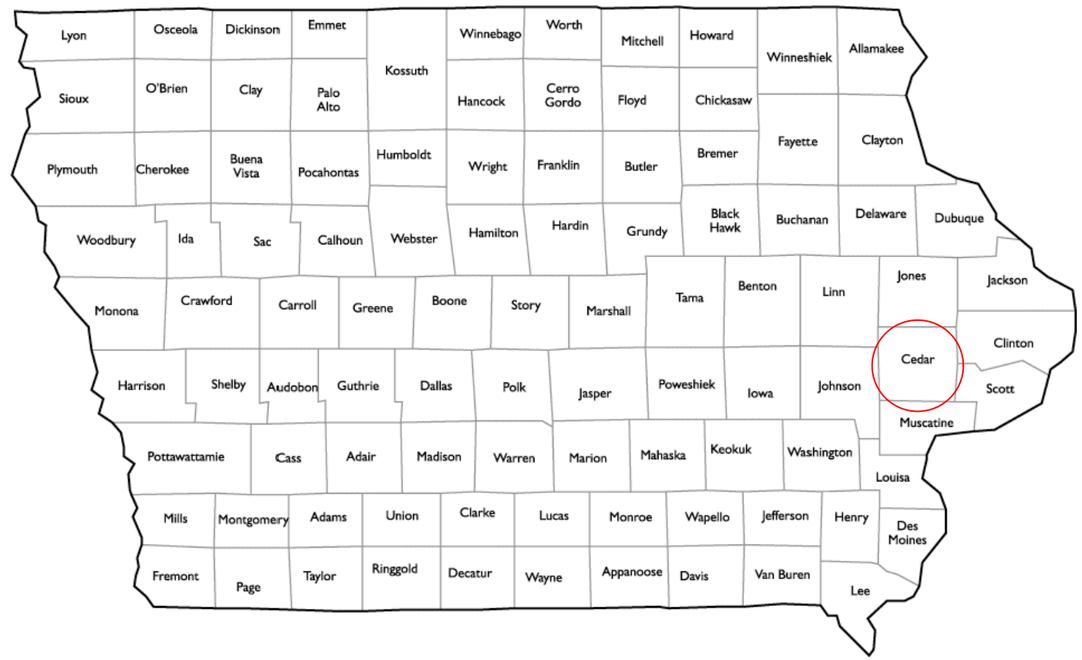
FILE NAME

DRAWING SET
SHEET 7 OF 7

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 03 - T79N - R4W



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

8/10/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	8/10/2023
DRAWN BY	ANDREW MACKRILL	8/10/2023
CHECKED BY	ANDY CRAIG, PE, TSP	8/10/2023
APPROVED BY		

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COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
1	WCS	620747.0	2243014.6	714.8
2	Distribution Line	620833.5	2243050.5	714.6
3	Distribution Line	620955.0	2243042.1	714.8
4	Distribution Line	621018.9	2243002.3	714.8
5	Distribution Line	621297.6	2242971.6	715.5
6	Distribution Line	621599.4	2242938.5	716.3
7	Benchmark	621088.2	2243032.1	716.1

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 621088.2
Easting: 2243032.1
Elevation: 716.1

0 100 200 Feet

N

875' of 6" CPT at 0.0% Grade Gas Line Under the Ditch to be Located Prior to Construction

Benchmark

Buffer Cross Section, See Sheet 3

Existing 6" Tile

New 6" CMP Outlet With Rodent Guard

8+75.50
8+00.00
7+00.00
6+00.00
5+00.00
4+00.00
3+00.00
2+00.00
1+00.00
0+00.00
0+45.16
0+00.00

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Existing 6" CPT Main
- Gas Pipeline
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

DATE
DESIGNED BY ANDREW MACKRILL 8/10/23
DRAWN BY ANDREW MACKRILL 8/10/23
CHECKED BY ANDY CRAIG, PE, TSP 8/10/23
APPROVED BY

PLAN MAP

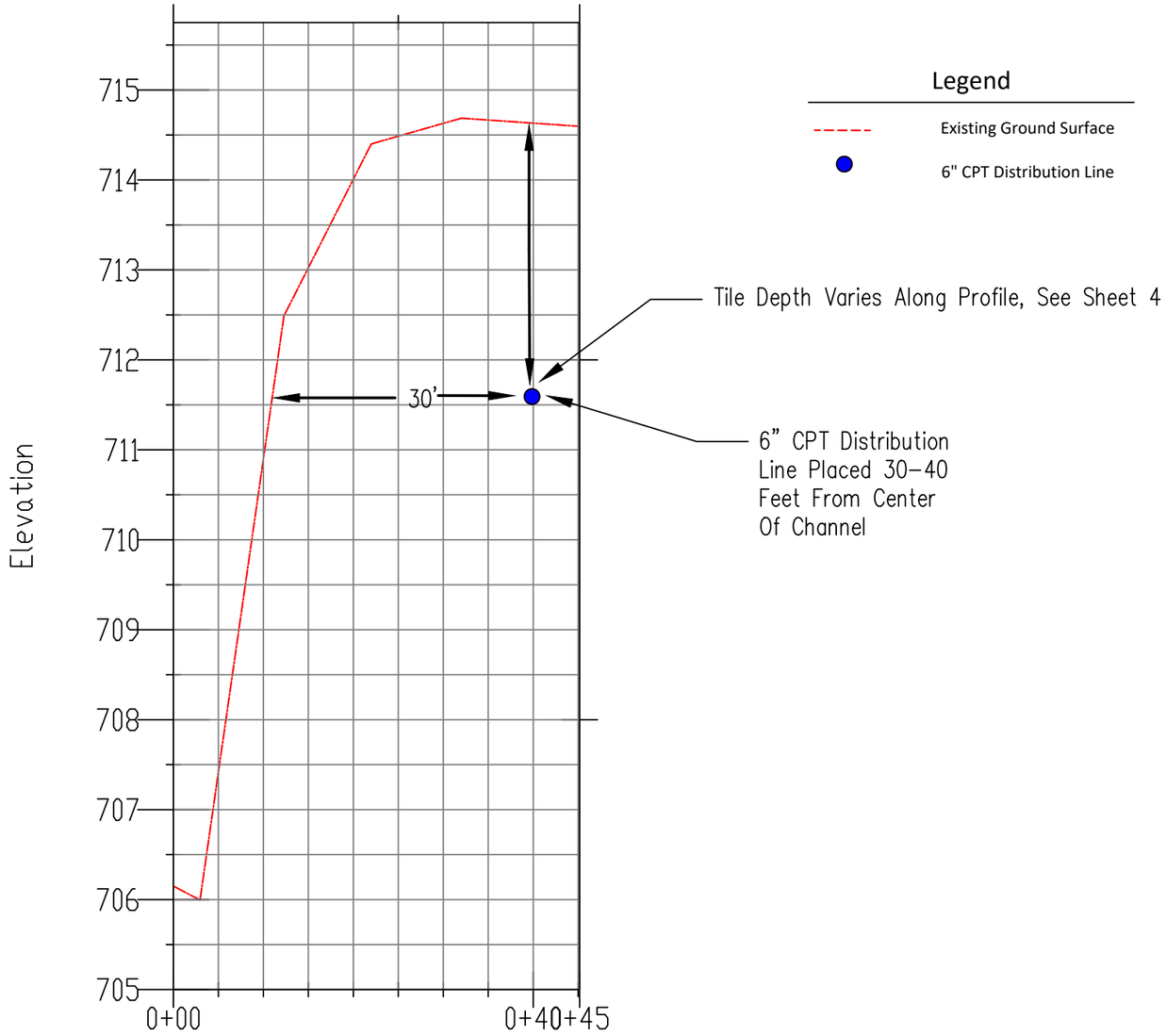
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 03 - T79N - R4W

Cross-Section



LANDOWNER		LOCATION	SECTION 03 - T79N - R4W

DESIGNED BY ANDREW MACKRILL 8/10/23
DRAWN BY ANDREW MACKRILL 8/10/23
CHECKED BY ANDY CRAIG, PE, TSP 8/10/23
APPROVED BY

BUFFER AND BANK CROSS SECTION

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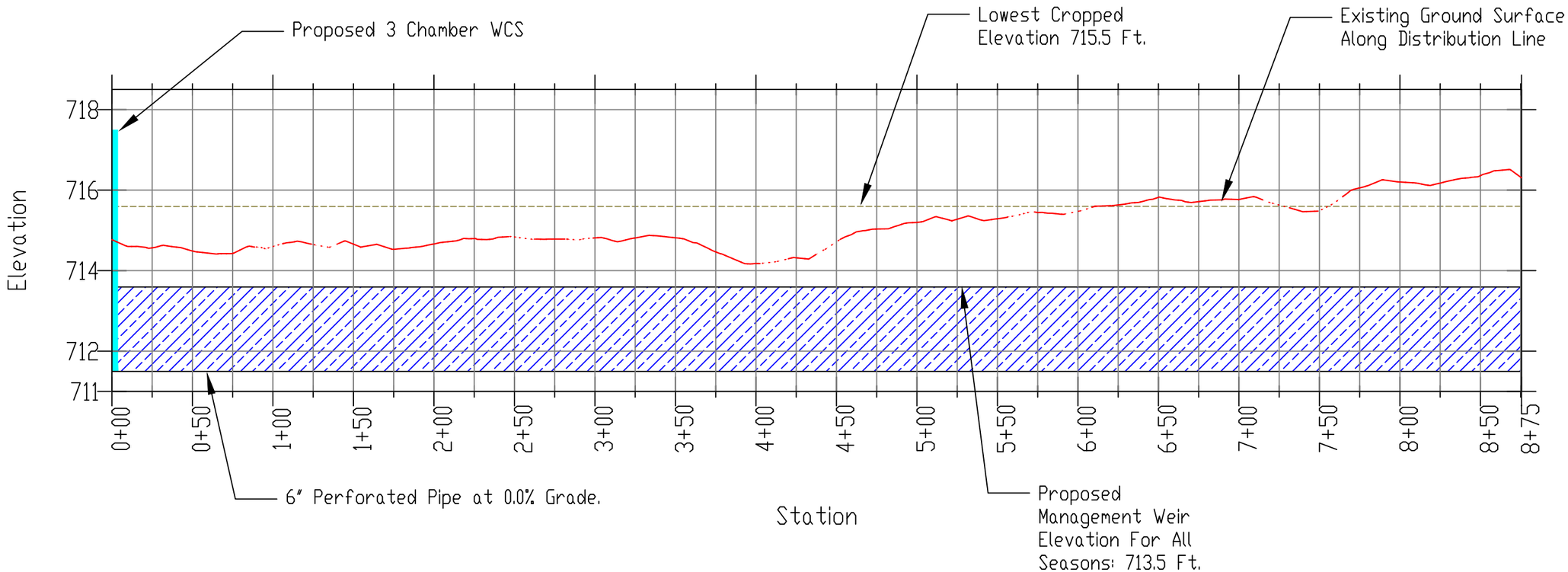
FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 03 - T79N - R4W

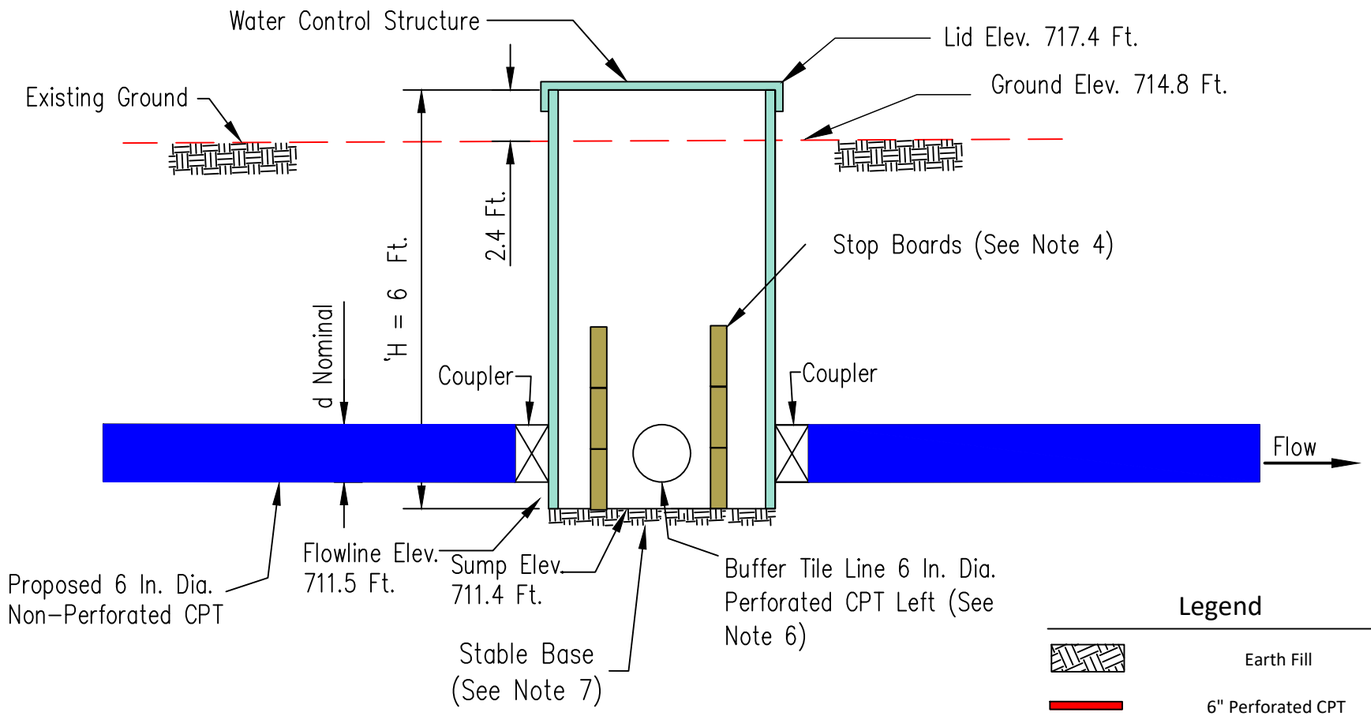
DESIGNED BY ANDREW MACKRILL 8/10/23
DRAWN BY ANDREW MACKRILL 8/10/23
CHECKED BY ANDY CRAIG, PE, TSP 8/10/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

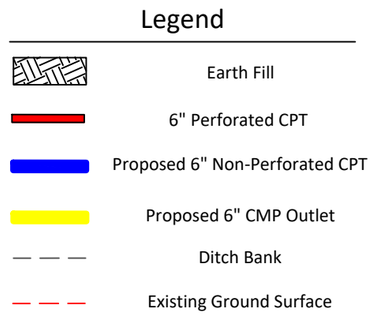
ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME
a

DRAWING SET
SHEET 4 OF 6

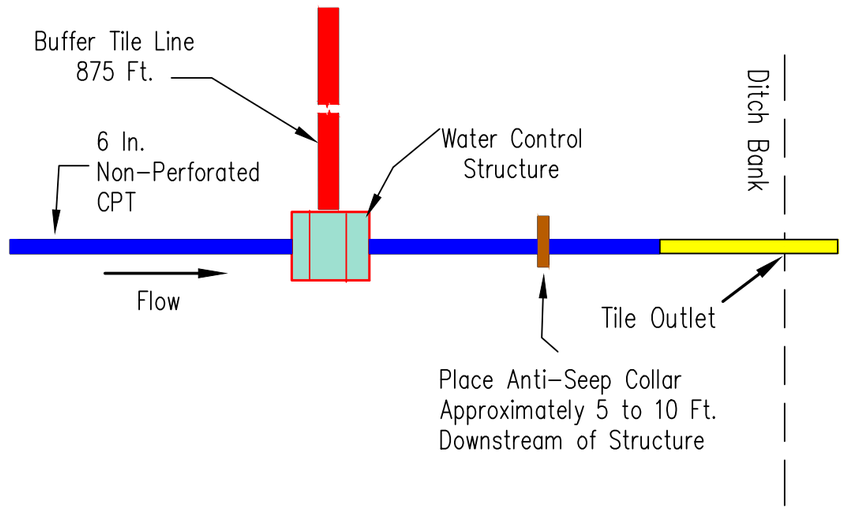


TYPICAL SECTION



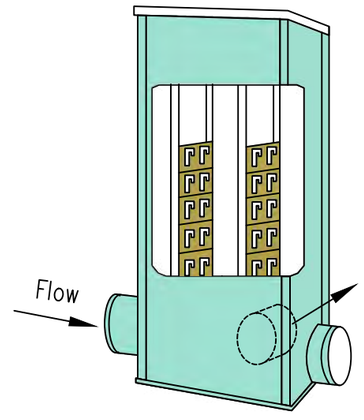
QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 6 in.	1	IA-21, IA-26, CPS-587
6" Non-perforated Pipe (ft)	40	IA-21, IA-45
6" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	875	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers



PLAN

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 03 - T79N - R4W

DATE
DESIGNED BY ANDREW MACKRILL 8/10/23
DRAWN BY ANDREW MACKRILL 8/10/23
CHECKED BY ANDY CRAIG, PE, TSP 8/10/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME
ca

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
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   a. After excavating the existing tile and setting WCS.
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4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
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5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 03 - T79N - R4W

DESIGNED BY ANDREW MACKRILL 8/10/23
DRAWN BY ANDREW MACKRILL 8/10/23
CHECKED BY ANDY CRAIG, PE, TSP 8/10/23
APPROVED BY

CONSTRUCTION NOTES

ESE Ecosystem Services Exchange *Valuing Conservation*

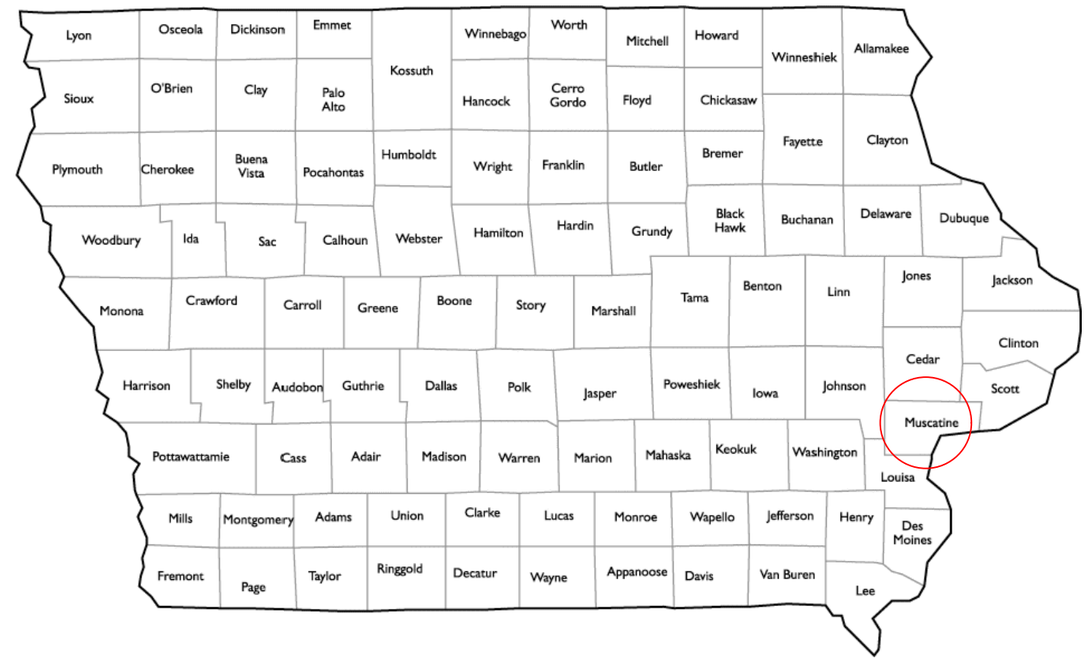
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

MUSCATINE CO, IOWA

SECTION 03- T78N - R4W



INDEX OF SHEETS

811 Know what's below. Call before you dig.

THE CONTRACTOR IS RESPONSIBLE FOR CALLING IOWA ONE CALL AT 1-800-292-8989 AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER — Andy J. Craig 20832 — IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

6/21/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	6/21/2023
DRAWN BY	ANDREW MACKRILL	6/21/2023
CHECKED BY	ANDY CRAIG, PE, TSP	6/21/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Existing 6" CPT Main
- 2 Foot Contours
- Proposed Water Control Structure

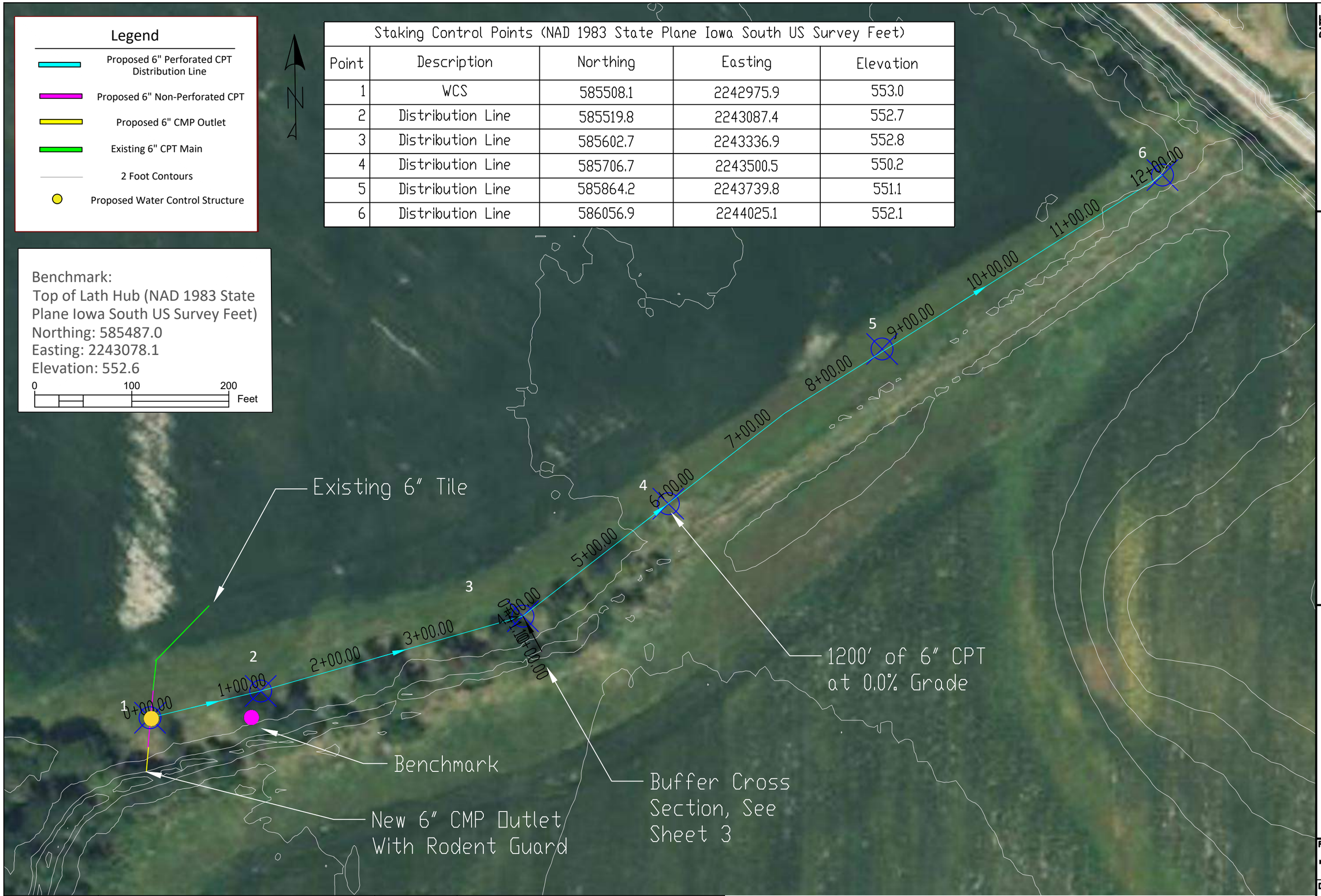
Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 585487.0
Easting: 2243078.1
Elevation: 552.6

0 100 200 Feet

N

Staking Control Points (NAD 1983 State Plane Iowa South US Survey Feet)

Point	Description	Northing	Easting	Elevation
1	WCS	585508.1	2242975.9	553.0
2	Distribution Line	585519.8	2243087.4	552.7
3	Distribution Line	585602.7	2243336.9	552.8
4	Distribution Line	585706.7	2243500.5	550.2
5	Distribution Line	585864.2	2243739.8	551.1
6	Distribution Line	586056.9	2244025.1	552.1



DESIGNED BY ANDREW MACKRILL DATE 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

PLAN MAP

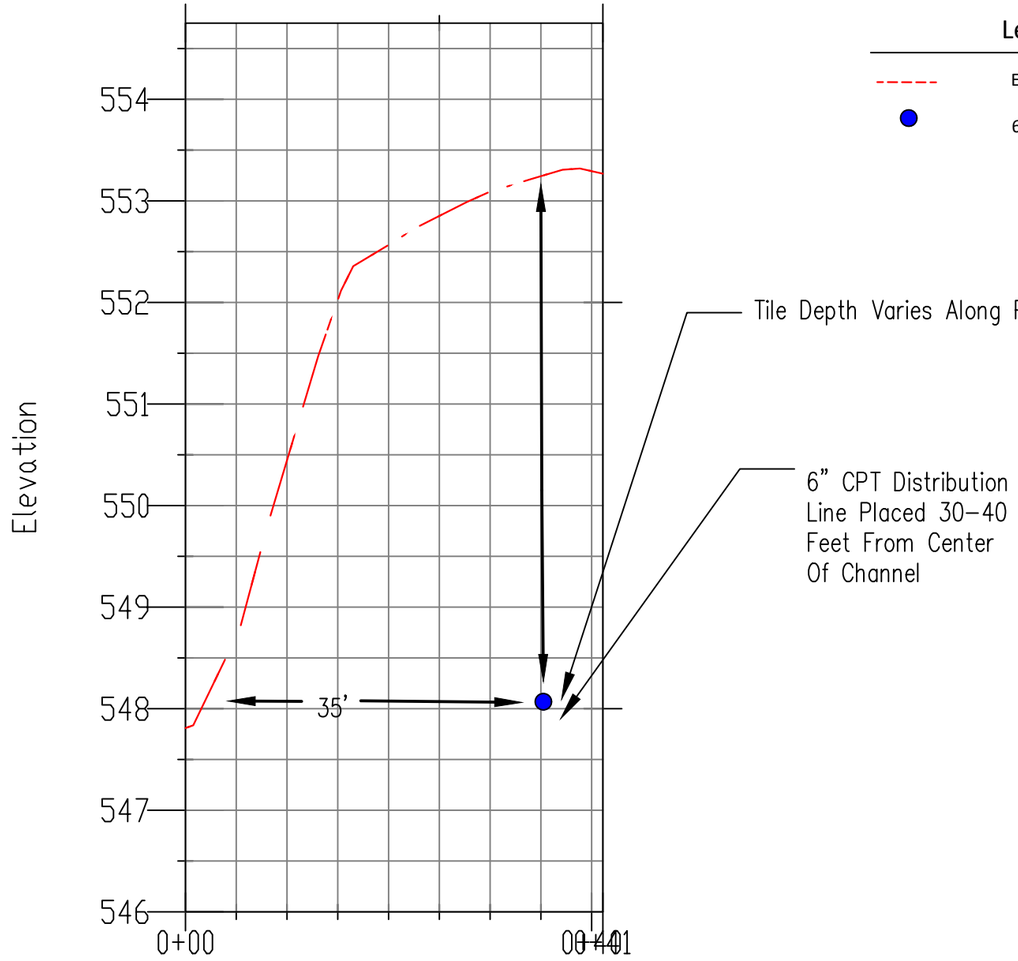
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 03 - T78N - R4W

Cross-Section



LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

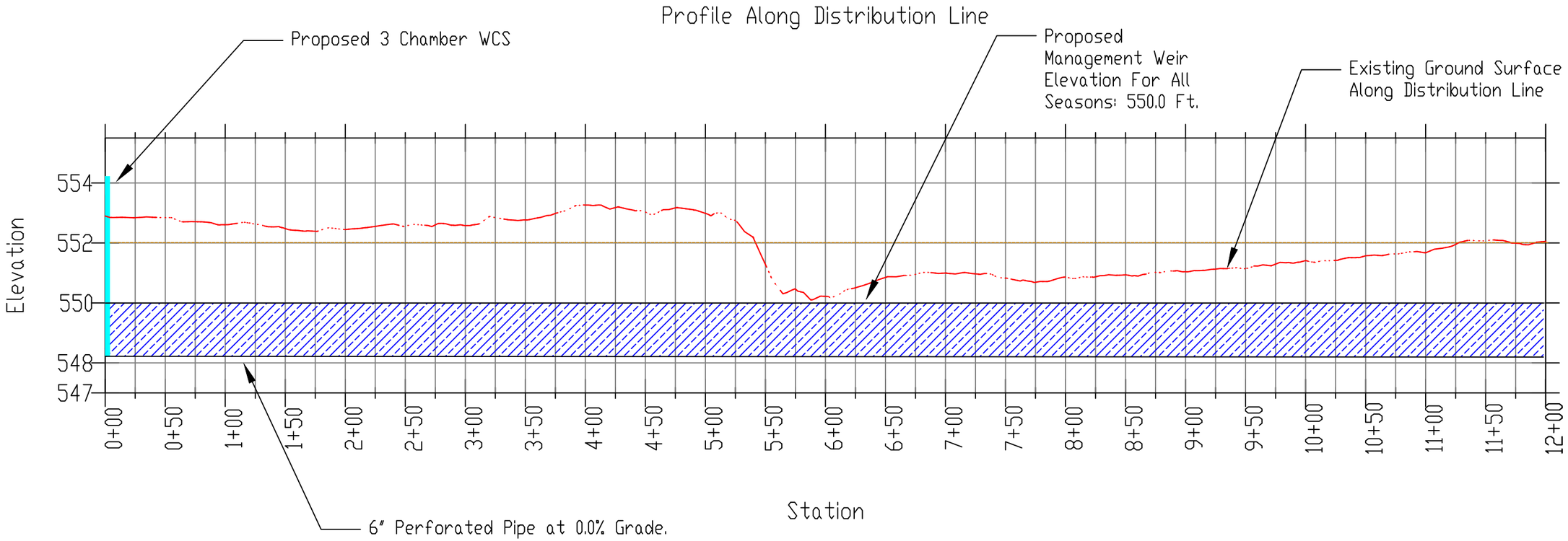
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Crop Elevation

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

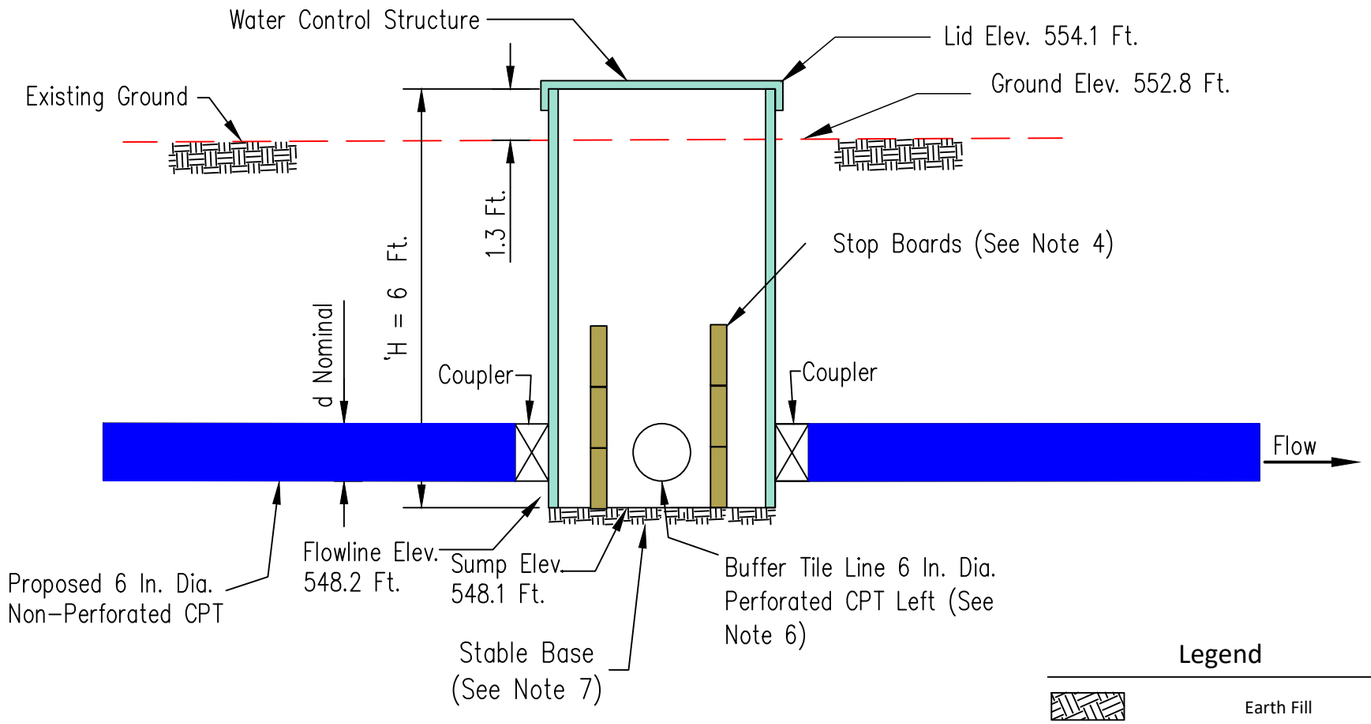
DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 4 OF 6



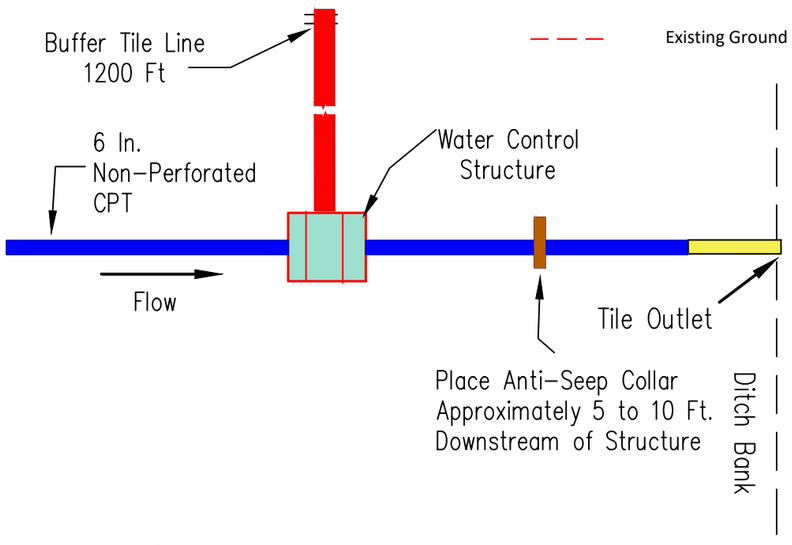
TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 6 in.	1	IA-21, IA-26, CPS-587
6" Non-perforated Pipe (ft)	40	IA-21, IA-45
6" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	1200	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers

Legend

- Earth Fill
- 6" Perforated CPT
- Proposed 6" Non-Perforated CPT
- Proposed 6" CMP Outlet
- Ditch Bank
- Existing Ground Surface



PLAN

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
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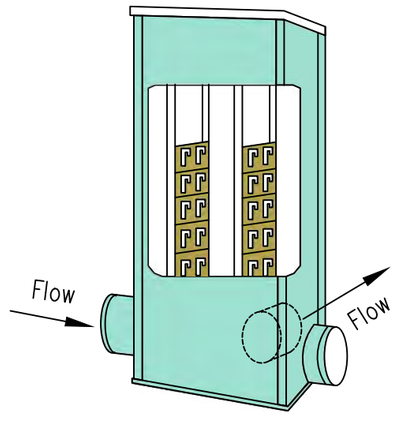
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DATE
DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

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Specification No.	**Specification Description**
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IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

CONSTRUCTION NOTES

Ecosystem Services Exchange
Valuing Conservation

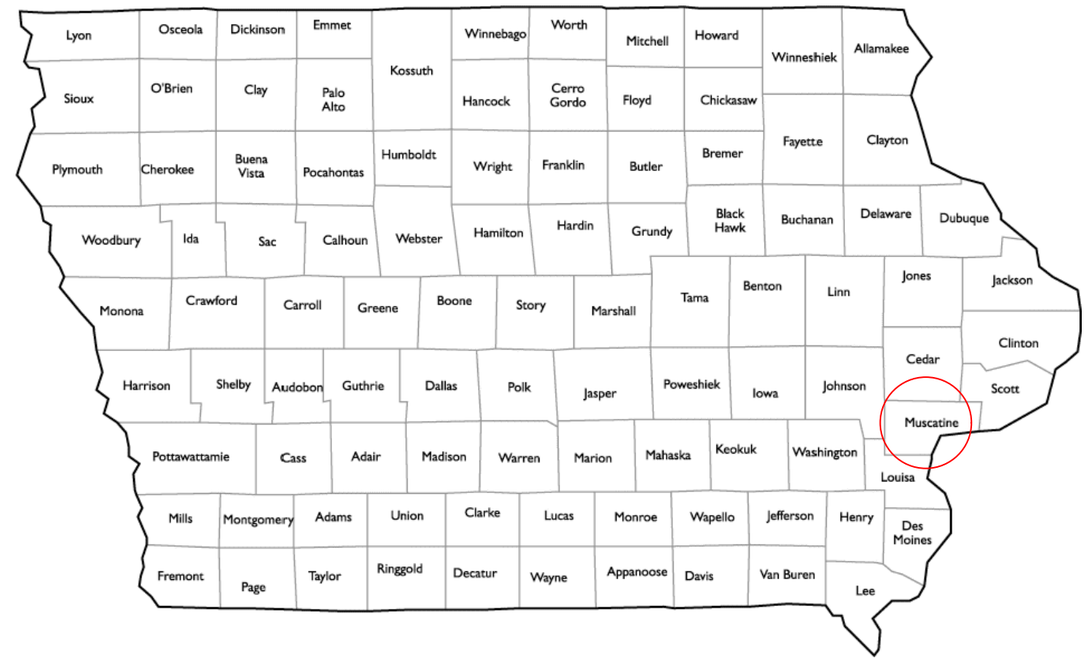
FILE NAME
-

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

MUSCATINE CO, IOWA

SECTION 03- T78N - R4W



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LICENSED PROFESSIONAL ENGINEER
Andy J. Craig
20832
IOWA

I hereby certify that to the best of my professional knowledge, judgement and belief, these plans meet applicable NRCS conservation practice standards, that this engineering document was prepared by me or under my direct personal supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa

6/14/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	6/21/2023
DRAWN BY	ANDREW MACKRILL	6/21/2023
CHECKED BY	ANDY CRAIG, PE, TSP	6/21/2023
APPROVED BY		

ESE Ecosystem Services Exchange
Valuing Conservation

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 12" Non-Perforated CPT
- Existing 12" CPT Main
- Proposed 12" CMP
- 2 Foot Contours
- Proposed Water Control Structure

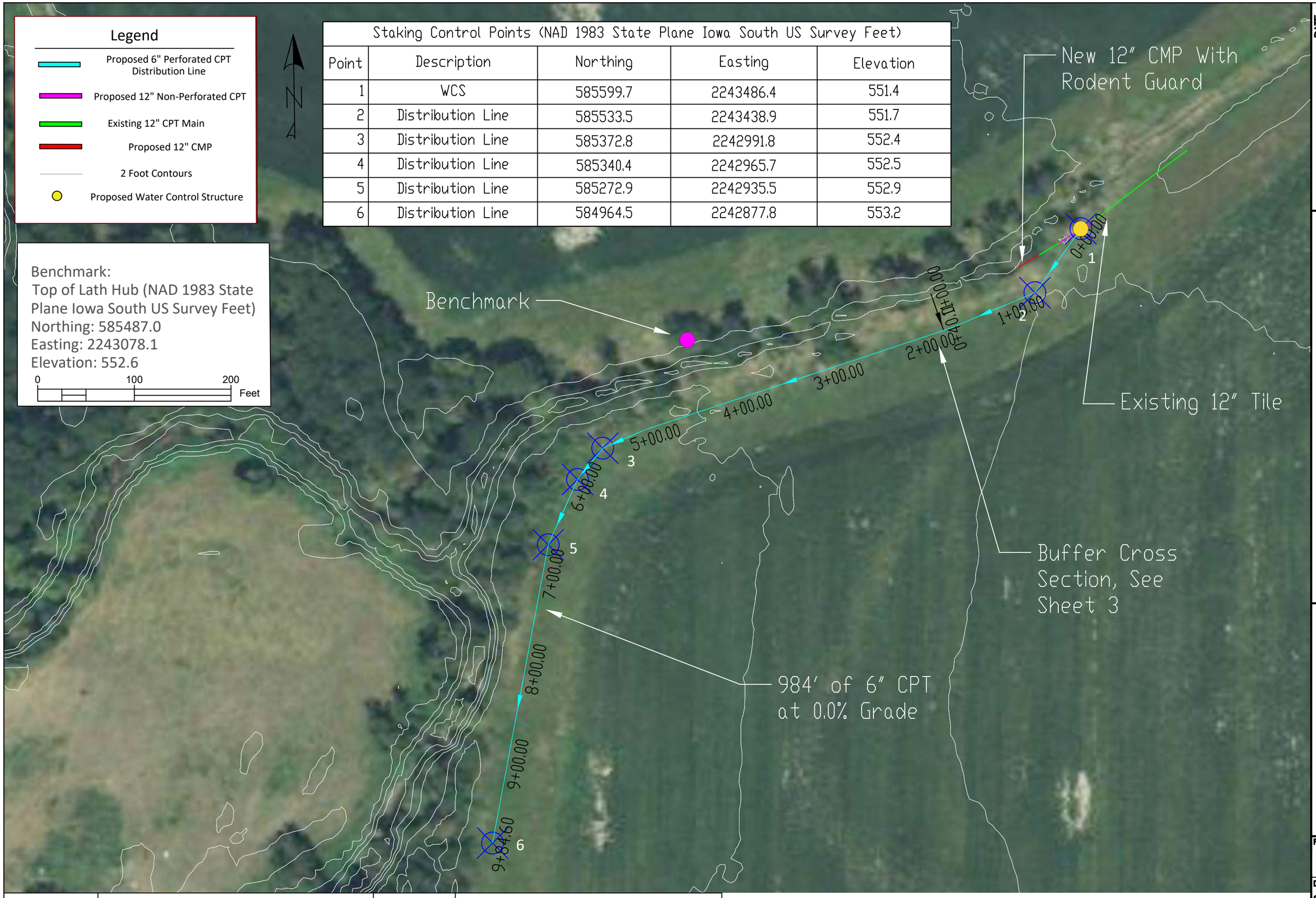
Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 585487.0
Easting: 2243078.1
Elevation: 552.6

0 100 200 Feet

N

Staking Control Points (NAD 1983 State Plane Iowa South US Survey Feet)

Point	Description	Northing	Easting	Elevation
1	WCS	585599.7	2243486.4	551.4
2	Distribution Line	585533.5	2243438.9	551.7
3	Distribution Line	585372.8	2242991.8	552.4
4	Distribution Line	585340.4	2242965.7	552.5
5	Distribution Line	585272.9	2242935.5	552.9
6	Distribution Line	584964.5	2242877.8	553.2



DESIGNED BY ANDREW MACKRILL DATE 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

PLAN MAP

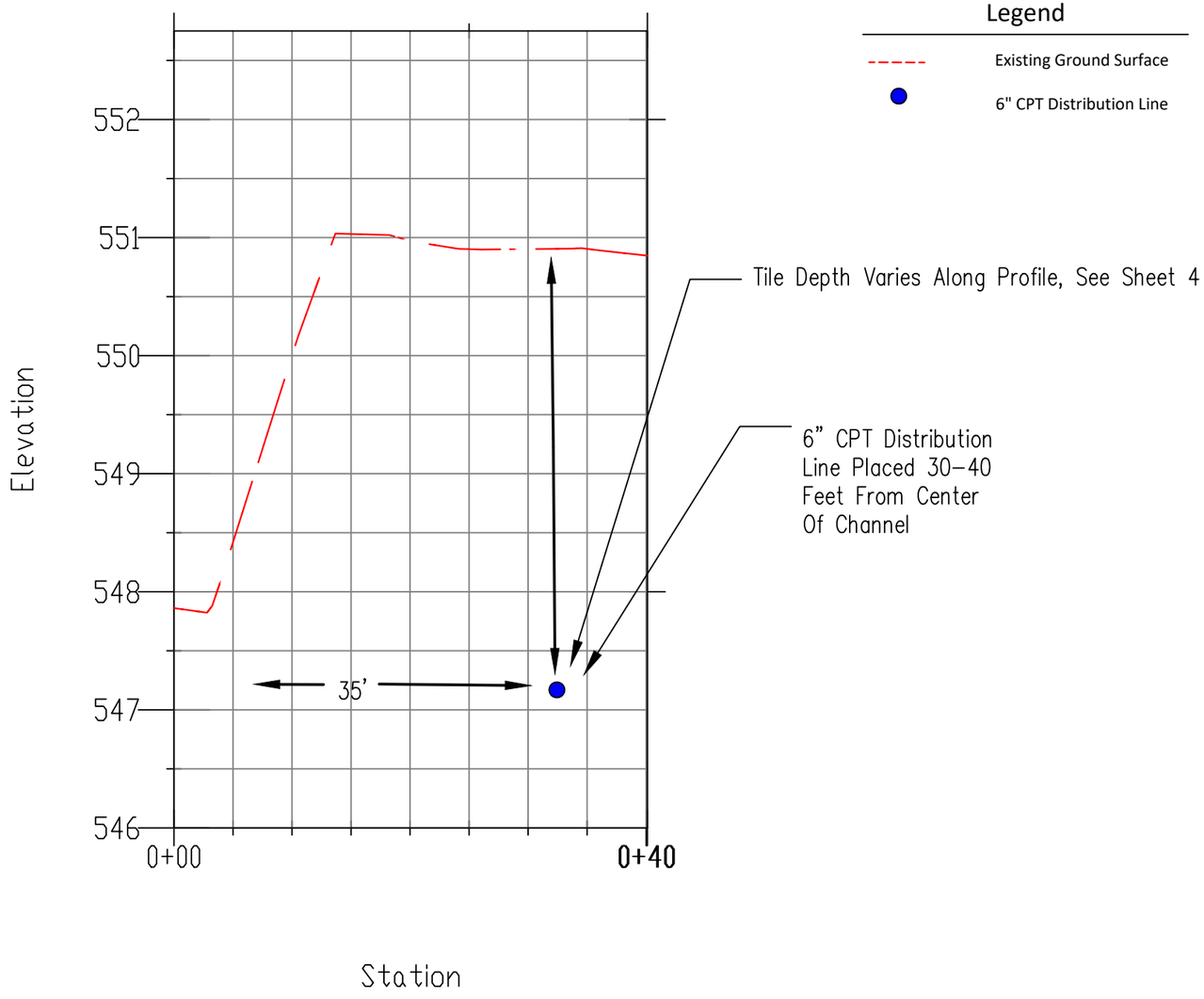
ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 2 OF 6

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W	

Cross-Section



LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

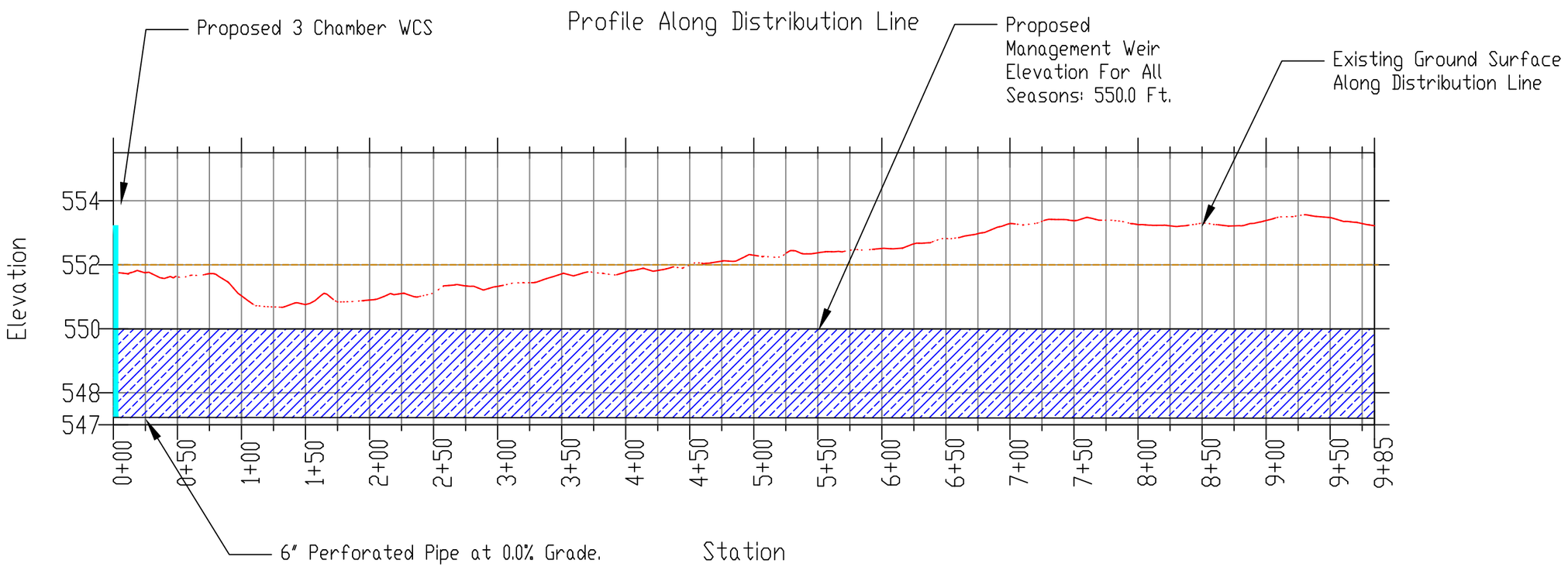
BUFFER AND BANK CROSS SECTION

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Crop Elevation

LANDOWNER	[illegible]	LOCATION	SECTION 03 - T78N - R4W

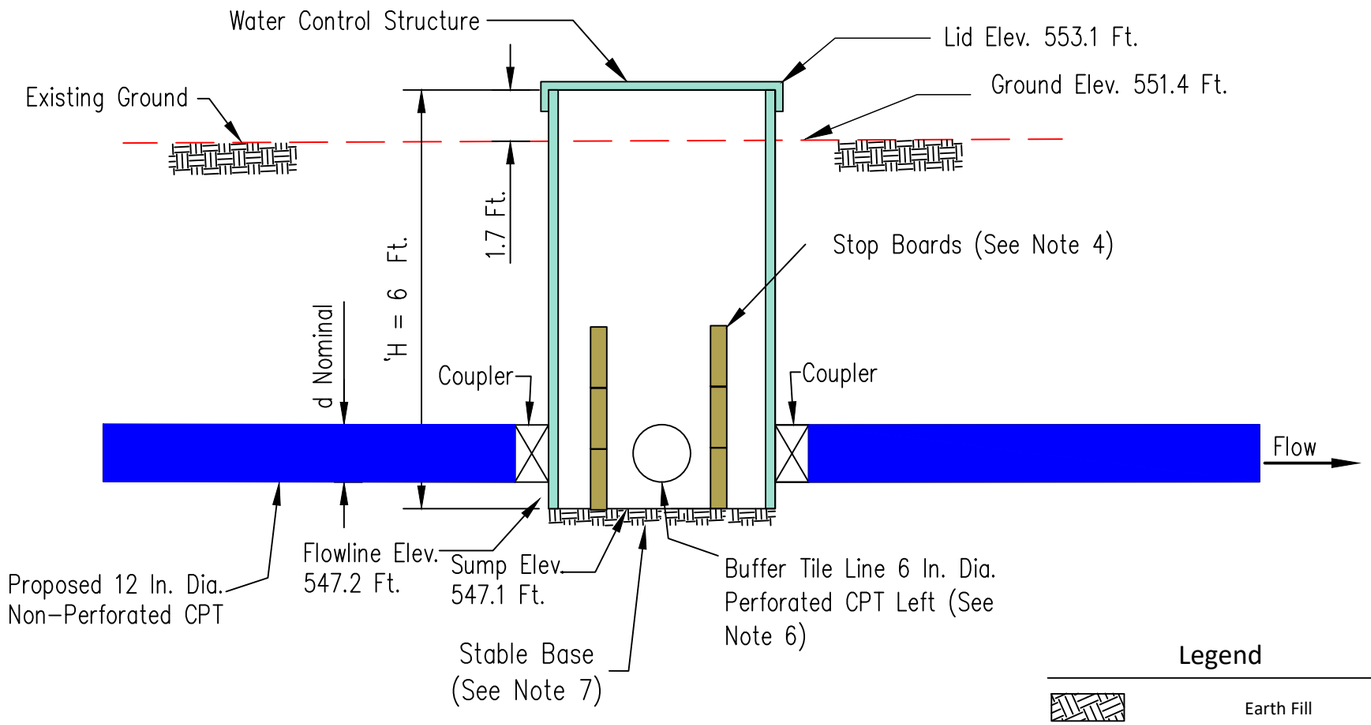
DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

PROFILE ALONG DISTRIBUTION LINE

ESE Ecosystem Services Exchange *Valuing Conservation*

FILE NAME

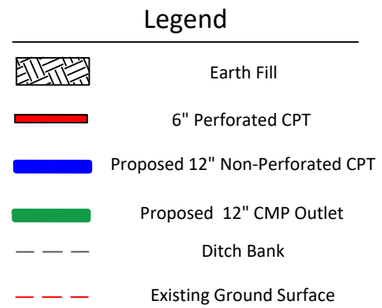
DRAWING SET
SHEET 4 OF 6

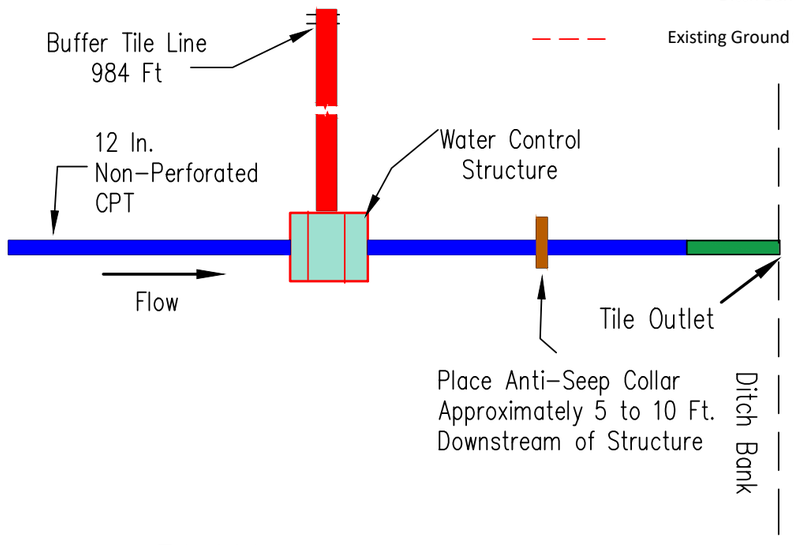


TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 12 in.	1	IA-21, IA-26, CPS-587
12" Non-perforated Pipe (ft)	40	IA-21, IA-45
12" CMP Outlet Pipe With Rodent Guard (ft)	20	IA-604, IA-620
6" Perforated CPT (ft) Buffer Tile Line	984	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

*Quantities Do Not Include Couplers





PLAN

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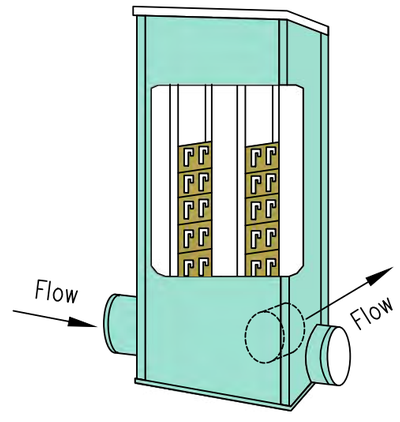

IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY
DATE

3 CHAMBER STRUCTURE DETAIL

ESE Ecosystem Services Exchange Valuing Conservation

FILE NAME

DRAWING SET
SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
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IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 03 - T78N - R4W

DESIGNED BY ANDREW MACKRILL 6/21/23
DRAWN BY ANDREW MACKRILL 6/21/23
CHECKED BY ANDY CRAIG, PE, TSP 6/21/23
APPROVED BY

CONSTRUCTION NOTES

Ecosystem Services Exchange
Valuing Conservation

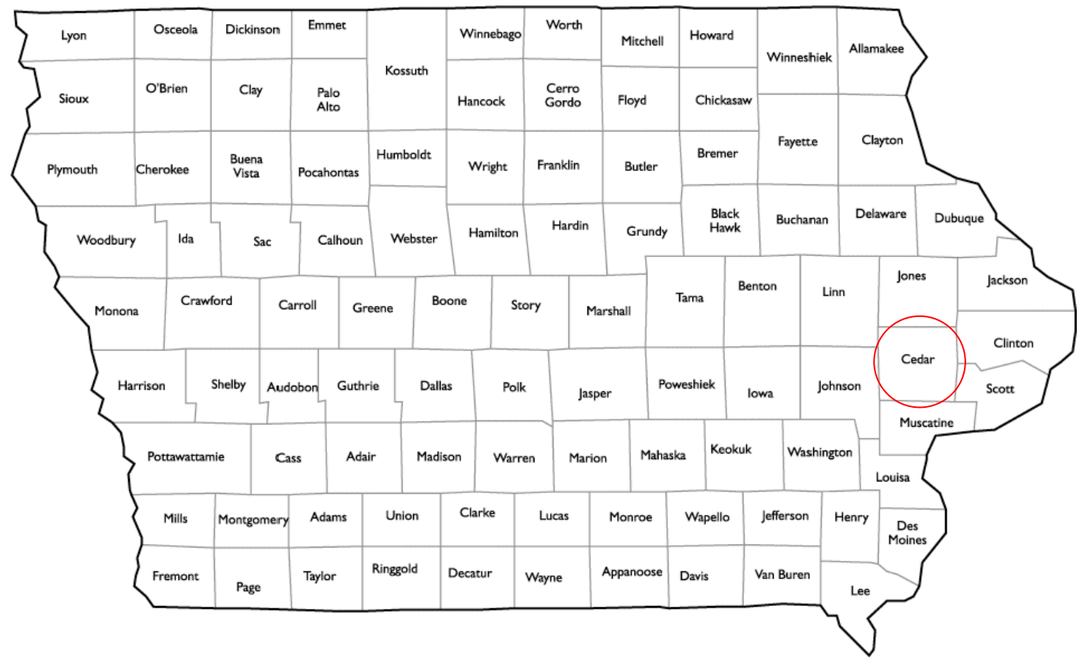
FILE NAME

DRAWING SET
SHEET 6 OF 6

SATURATED BUFFER CONSTRUCTION PLANS

CEDAR CO, IOWA

SECTION 18 - T79N - R4W



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6/30/2023

Andy J. Craig, P.E.
License number: 20832
My license renewal date is December 31, 2025.
Pages or sheets covered by this seal: All

ENGINEERING CLASS 2

		DATE
DESIGNED BY	ANDREW MACKRILL	6/27/2023
DRAWN BY	ANDREW MACKRILL	6/27/2023
CHECKED BY	ANDY CRAIG, PE, TSP	6/30/2023
APPROVED BY		

ESE Ecosystem Services Exchange — *Valuing Conservation*

COVER SHEET

FILE NAME

DRAWING SET

SHEET 1 OF 6

Staking Control Points(NAD 1983 State Plane Iowa South US Survey Feet)				
Point	Description	Northing	Easting	Elevation
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2	Distribution Line	606085.5	2228449.3	591.8
3	Distribution Line	606380.9	2228455.0	592.7
4	Distribution Line	606626.1	2228459.6	593.0
5	Distribution Line	606915.9	2228465.0	593.0
6	Distribution Line	607258.9	2228471.4	593.7
7	Benchmark	605598.3	2228463.9	595.6

PLAN VIEW

Benchmark:
Top of Lath Hub (NAD 1983 State Plane Iowa South US Survey Feet)
Northing: 605598.3
Easting: 2228463.9
Elevation: 595.6

0 150 300 Feet

N

Legend

- Proposed 6" Perforated CPT Distribution Line
- Proposed 12" Non-Perforated CPT
- Proposed 12" CMP Outlet
- Existing 8" CPT Main
- Proposed 8" Non-Perforated CPT
- Proposed Water Control Structure
- 2' Contours
- Benchmark
- Staking Point

Buffer Cross Section, See Sheet 3

New 12" CMP Outlet With Rodent Guard

1600' of 6" CPT at 0.0% Grade

Existing 8" Tile

8" Non-Perf Diversion

Benchmark

0+00.00 7+00.00 8+00.00 9+00.00 10+00.00 11+00.00 12+00.00 13+00.00 14+00.00 15+00.00 15+39.91

1 2 3 4 5 6

DATE
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DRAWN BY ANDREW MACKRILL 6/27/23
CHECKED BY ANDY CRAIG, PE, TSP 6/30/23
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PLAN MAP

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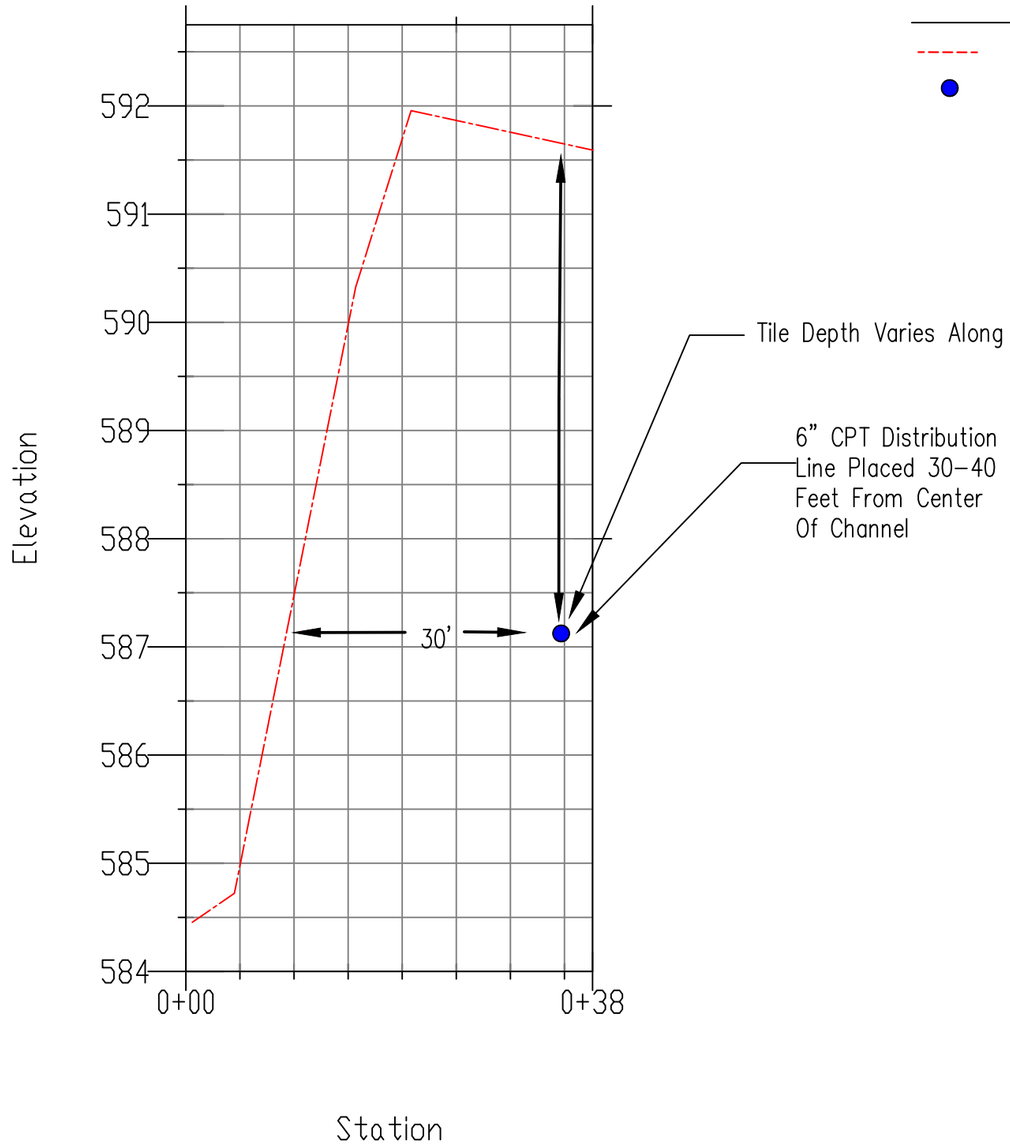
SHEET 2 OF 6

LANDOWNER | LOCATION | SECTION 18 - T79N - R4W

Cross-Section



LANDOWNER		LOCATION	SECTION 18 - T79N - R4W

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BUFFER AND BANK CROSS SECTION

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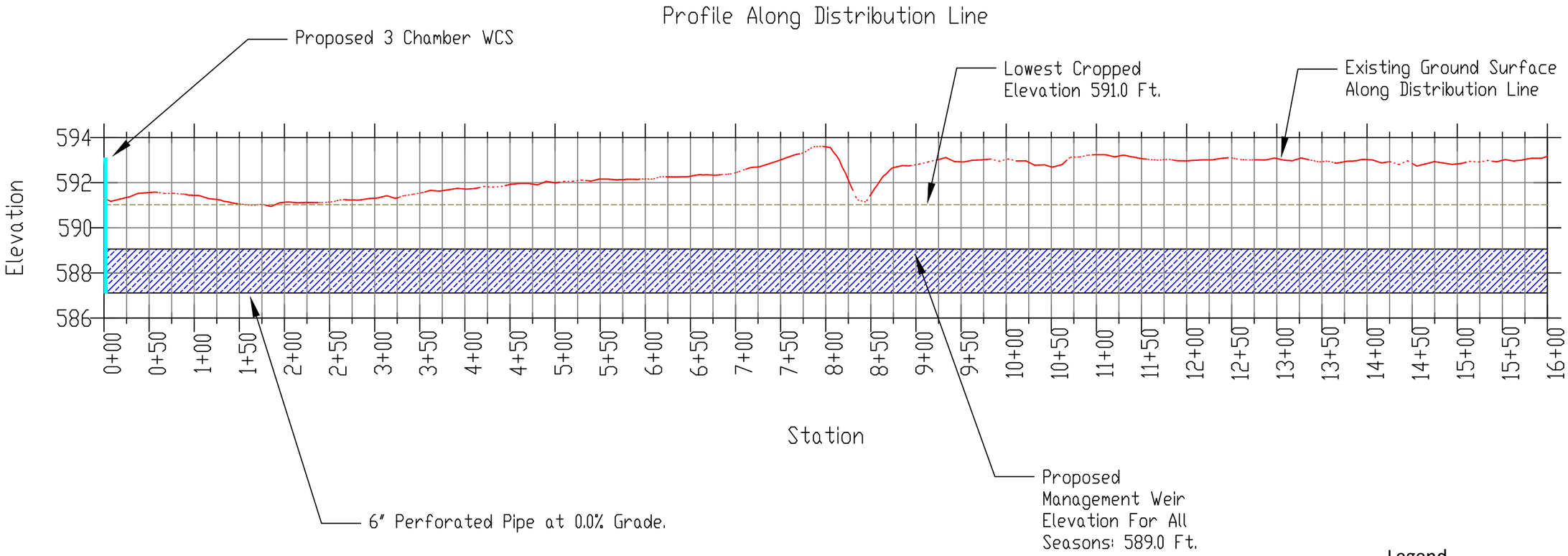
SHEET 3 OF 6

Profile Along Distribution Line



Legend

- All Season Water Table
- Proposed Water Control Structure
- Proposed 6" CPT Distribution Line
- Existing Ground Surface
- Lowest Farmed Elevation

LANDOWNER		LOCATION	SECTION 18 - T79N - R4W

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DATE	6/30/23
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DATE	

PROFILE ALONG DISTRIBUTION LINE

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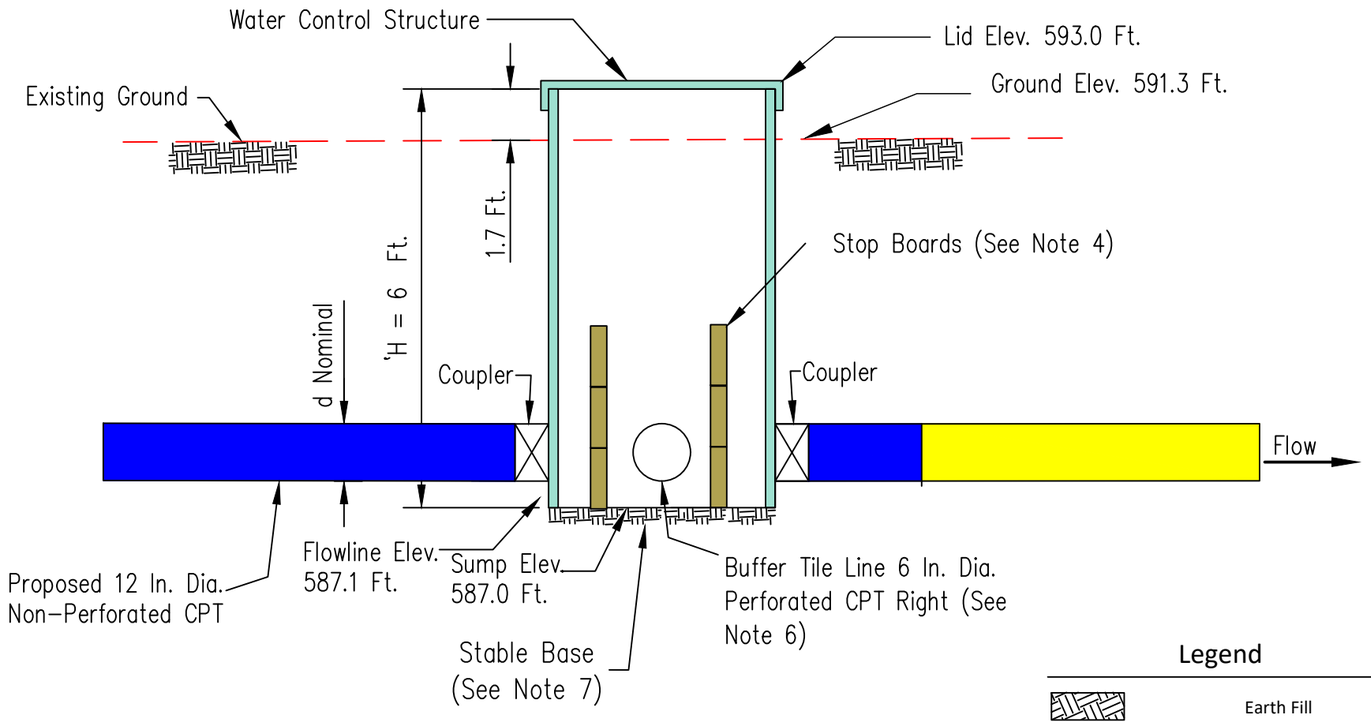
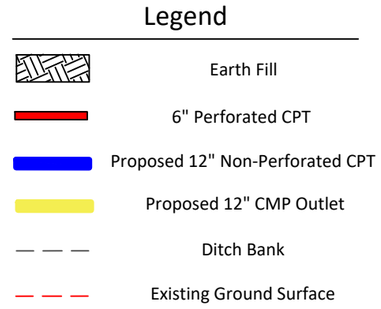
SHEET 4 OF 6

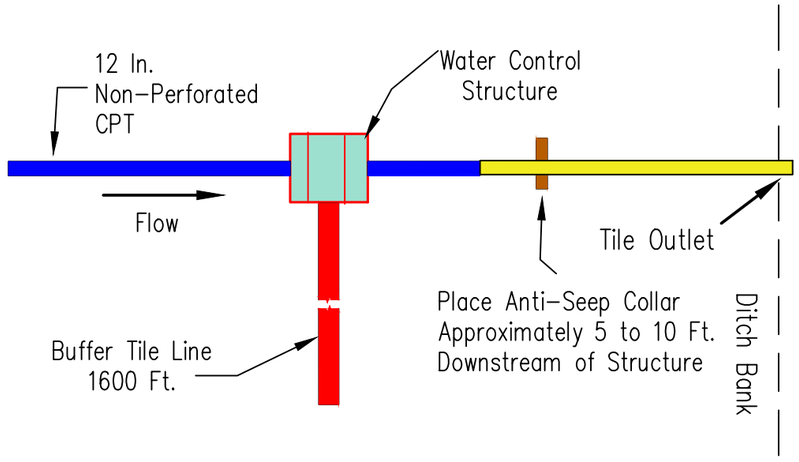


TYPICAL SECTION

QUANTITIES*		NRCS SPEC
Water Control Structure 3– Compartment H = 6 ft. d = 12 in.	1	IA-21, IA-26, CPS-587
12" Non-perforated Pipe (ft)	25	IA-21, IA-45
12" CMP Outlet Pipe with Rodent Guard (ft)	20	IA-604, IA-620
8" Non-perforated Pipe (ft)	50	IA-21, IA-45
6" Perforated CPT (ft) Buffer Tile Line	1600	IA-21, IA-45, IA-46
3'x3' Anti Seep Collar	1	CPS-587

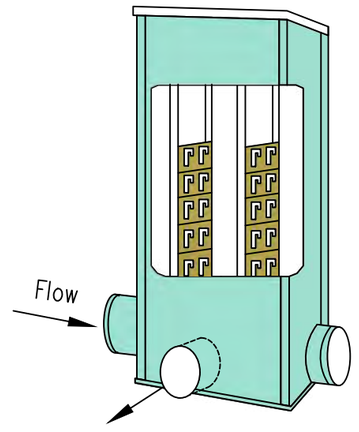
*Quantities Do Not Include Couplers





PLAN

NOTES:
1. Install a minimum of 20 feet of non–perforated pipe adjacent to the water control structure, both upstream, and downstream. Pipe shall be PVC, dual–wall PT, or CMP.
2. PVC pipe shall conform to ASTM Standard D2241 or D1785, with material 1120 or 1220. Dual wall CPT must conform to ASTM Standard F2306 or F2648. CMP must conform to ASTM Standard A760 or B745.
3. Couplings between the water control section and the non–perforated tile shall be water tight.
4. Stop boards shall provide water tight seals under a minimum of 1 foot pressure head.
5. Mark location of structure using steel t–post or manufactured marker flag for safety in the field.
6. Install buffer tile parallel to ditch or stream, according to profile provided with the construction plans. Pipe shall remain on grade and drain towards the WCS.
7. Place structure and pipe coupler on a stable base. A stable base may be compacted earth or compacted fill sand.
8. Excavated material placed around structure and pipes must be hand compacted in 4" lifts.



IN–LINE CONTROL STRUCTURE

LANDOWNER		LOCATION	SECTION 18 - T79N - R4W

DATE
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3 CHAMBER STRUCTURE DETAIL

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SHEET 5 OF 6

CONSTRUCTION NOTES

1. Tile elevations are based Maverick Tile Finder probe depths. A fiberglass cable with imbedded wire is fed into the outlet and located with a utility device. These values may not be exact, but are believed to be accurate. Factors such as sediment in the pipe, flowing water in the pipe, and wire location within the pipe may affect depth readings. Notify ESE at least 48 hours before conducting the investigation so that a qualified ESE representative can be onsite during the investigation.
2. Avoid excessive disturbance of buffers or grassed water ways during construction. If re-vegetation is needed, contact the local NRCS Field Office for guidance. All disturbed areas that will not be cropped shall be seeded according to NRCS Conservation Practice Standard 342 – Critical Area Planting. Seeding adjacent to the grassed waterway shall match the waterway seeding to the closest extent practical.
3. Excavated material not used for backfill shall be removed from the site or spoiled in such a manner as to prevent flow disruption, channelizing, or erosion. Contact ESE for assistance with construction inspection after the following activities to ensure minimal effort is needed to correct potential errors:
   a. After excavating the existing tile and setting WCS.
   b. Distribution pipe has been laid and capped.
4. Any product planned for use in construction must be approved by ESE prior to construction. Provide documentation to ESE of all materials used in construction, including:
   a. Tile tags, invoices, or photos detailing the product type and manufacturer, ASTM designations, and total lengths.
   b. Photos and invoices or product information for water control structures.
5. Construction tolerances are +/-0.5ft on distribution line location, and +/-0.1 ft. on all elevations. If circumstances during construction change dimensions or elevations outside of these tolerances they must be approved by ESE and will be noted in the as-built plan.
6. When installing the distribution line, pay special attention so that other outlets in the buffer are not damaged or broken. Although an investigation of the buffer will have already been completed, not all outlets are able to be located depending on site conditions at the time. If another tile line or outlet is encountered, contact an ESE representative for consultation. They will decide if the tile line is able to be incorporated into the system, or if a section of the distribution line needs to be replaced as non-perforated pipe to prevent water loss.
7. Proper cultural resources documentation shall be completed by the local NRCS office prior to construction. If any cultural resources are identified during construction, work will stop immediately and the NRCS Archeologist will be notified.

Iowa Construction and Practice Specifications	
Specification No.	**Specification Description**
IA-1	Site Preparation
IA-5	Pollution Control
IA-6	Seeding and Mulching for Protective Cover
IA-604	Saturated Buffer
IA-620	Underground Outlet

LANDOWNER		LOCATION	SECTION 18 - T79N - R4W

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CONSTRUCTION NOTES

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FILE NAME

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SHEET 6 OF 6