DYERSVILLE SW STORMWATER IMPROVEMENTS CONCEPT DESIGN

OVERVIEW

Description

This project is a combination of four stormwater management practices in southwest Dyersville, in an area of the community experiencing residential growth and planning for continued development. The four proposed practices are:

A. Enhanced Drainage Basin
B. Drainageway Improvements and Connection to Tegeler Pond
C. Drainageway Abandonment
D. Tegeler Pond Outfall & Vegetated Swale

The goals of these stormwater improvements are to manage water quantity, add water quality benefits, add ecological benefits, increase accessibility and aesthetic appeal, and prepare for future development of the area. Additionally, the practices will provide a buffer between current residential development and future industrial development.

A conceptual design was created for the four stormwater management practices, and the design was used to prepare a conceptual opinion of probable cost. The conceptual design is based on aerial imagery, in-person site evaluation, LiDAR surface data, StreamStats data, typical sections, and standard sizing calculations. The attached plan sheets provide an overview of the conceptual design. Comprehensive design will include more detailed data collection and analysis, which will be used to refine the design and cost opinions.

Project Site

The project site is adjacent to 12th Avenue SW, 6th Avenue SW, and Tegeler Pond in an area experiencing rapid residential development. The proposed project area covers approximately 14.5 acres of previously disturbed land. Upstream of Tegeler Pond, the existing site is an open area containing a realigned and channelized drainageway. Tegeler Pond is manmade for use as a sand quarry, and it outlets to Bear Creek through two corrugated metal pipes and an eroded drainageway. The portion of this project that is downstream of Tegeler Pond is in the FEMA floodplain. Upon preliminary review, no wetlands appear to be present at the project site.

Construction Considerations

Constructing the practices in a single phase versus separate projects or phases will impact the construction cost. The construction costs are generally cumulative; however, combining construction has the potential to lower unit costs or lump sums of some items, such as mobilization. Most significantly, earthwork can be balanced across the cumulative projects (practices), whereas standalone projects involve extensive cut or fill (import/export of fill material). Table 1 summarizes the conceptual project cost with adjustments for the combined construction scenario. Details on each stormwater management practice, including individual opinions of probable cost, are described in the following sections.

Table 1: Quantities and Opinion of Probable Cost for Combined Projects

ITEM NO.	ITEM CODE	ITEM	UNIT	QUANT	UNIT PRICE	TOTAL
1	2010-C	CLEARING AND GRUBBING	LS	1	$ 8,000.00	$ 8,000.00
2	2010-D-1	TOPSOIL, ON-SITE	CY	8601	$ 5.00	$ 43,005.00
3	2010-E	EXCAVATION, CLASS 10	CY	3754	$ 30.00	$ 112,620.00
4	4020-A-1	STORM SEWER PIPE, 6" HDPE	LF	82	$ 40.00	$ 3,280.00
5	4020-A-1	STORM SEWER PIPE, 36" HDPE	LF	382	$ 80.00	$ 30,560.00
6	4020-A-1	STORM SEWER PIPE, 36" RCP	LF	120	$ 100.00	$ 12,000.00
7	6010-B	INTAKE DROP STRUCTURE	EA	1	$ 5,500.00	$ 5,500.00
8	6010-B	INTAKE STOPLOG STRUCTURE	EA	2	$ 7,500.00	$ 15,000.00
9	6010-G-2	CONNECTION TO EXISTING INTAKE	EA	1	$ 1,800.00	$ 1,800.00
10	8030-A	TEMPORARY TRAFFIC CONTROL	LS	1	$ 3,000.00	$ 3,000.00
11	9010-A	CONVENTIONAL SEEDING, AND MULCHING, TYPE 5	AC	10	$ 3,000.00	$ 30,000.00
12	9010-A	CONVENTIONAL SEEDING AND MULCHING, NATIVE	AC	8	$ 6,000.00	$ 48,000.00
12	9010-A	CONVENTIONAL SEEDING AND MULCHING, LAWN	AC	2	$ 4,000.00	$ 8,000.00
13	9030-B	PLANTS WITH WARRANTY, TREES (PRIMARY), 15-GALLON	EA	19	$ 250.00	$ 4,750.00
14	9040-A-1	SWPPP PREPARATION	LS	1	$ 8,000.00	$ 8,000.00
15	9040-A-2	SWPPP MANAGEMENT	LS	1	$ 16,000.00	$ 16,000.00
16	9040-E	TEMPORARY RECP, TYPE 3B	SY	2150	$ 5.00	$ 10,750.00
17	9040-F-1	WATTLE, STRAW, 12-INCH	LF	6100	$ 3.00	$ 18,300.00
18	9040-F-2	WATTLE, REMOVAL	LF	6100	$ 1.00	$ 6,100.00
19	9040-J	RIP RAP, CLASS E	TON	306	$ 90.00	$ 27,540.00
20	9040-J	RIP RAP, REMOVE STORE AND REUSE	LS	1	$ 2,500.00	$ 2,500.00
21	9040-N-1	SILT FENCE OR SILT FENCE DITCH CHECK	LF	7900	$ 2.00	$ 15,800.00
22	9040-N-2	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF SEDIMENT	LF	7900	$ 1.00	$ 7,900.00
23	9040-N-3	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF DEVICE	LF	7900	$ 1.00	$ 7,900.00
24	11020-A	MOBILIZATION	LS	1	$ 45,695.00	$ 45,695.00
		ESTIMATED CONSTRUCTION COST				**$ 492,000.00**
		ADMINISTRATION, LEGAL, AND ENGINEERING				$ 100,000.00
		CONTINGENCY AND UNDEFINED DESIGN ELEMENTS				$ 100,000.00
		TOTAL ESTIMATED PROJECT COST				**$ 692,000.00**

ENHANCED DRAINAGE BASIN

Design Data

- Drainage Area = 90 acres
- Existing Basin Area (from CAD) = 3.12 acres
- Existing Low Elevation = 955
- Proposed Low Elevation = 953 (middle pool)
- Existing Basin Volume (from LiDAR and CAD) = 7,895 yd^3, all one pool
- Proposed Storage Volume = 8,186 yd^3, split into three pools
- Net Earthwork = 97 CY fill (1.35 fill factor)

Concept Design

The proposed drainage basin is designed to match or exceed the storage capacity of the existing drainage basin while providing enhanced functionality. Using LiDAR surface data and CAD, the existing storage capacity was estimated to be 7,895 cubic yards. This volume is held entirely in one large pool with an approximate rim elevation of 959 and floor elevation of 955. The existing pool is entirely filled in with cattails, and there is some woody brush growing along the downstream rim. Proposed grading was created in CAD to reconfigure the pool within the existing footprint, making it more accessible and aesthetically pleasing. The proposed drainage basin has a storage capacity of 8,186 cubic yards, divided between three pools. The north and south pools have the same floor elevation of 955; the middle pool is proposed to be excavated an additional two feet to a floor elevation of 953. Not only does this extra depth increase storage, but it also allows for more variety in vegetation because plants that can tolerate extended inundation can be planted in the deeper areas. The proposed grading incorporates shallow side slopes, 10-foot-wide berms, and flat benches for access and easy maintenance. The concept design also includes native vegetation and trees for shade, biodiversity, and aesthetic value.

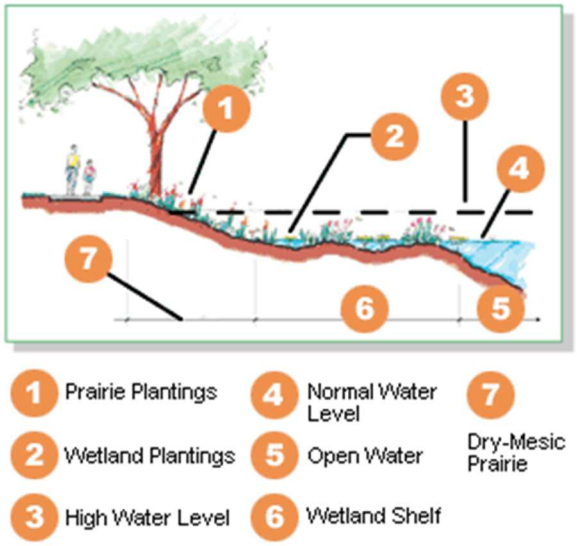

Figure 1: Schematic of a Naturalized Detention Basin with Varied Pool Elevations and Plantings
(Image from https://www.chicago.gov/city/en/depts/water/supp_info/conservation/green_design/naturalized_detentionbasins.html)

Conceptual Cost Information

Construction of the enhanced drainage basin primarily involves earthwork and vegetation establishment, along with the installation of stoplog structures and the associated pipe. The stoplog structures allow for temporary dewatering for vegetation management. Earthwork within the project site is nearly balanced, which helps with the construction cost since minimal hauling or excess fill material is needed. Table 2 details the quantities and costs for the proposed enhanced drainage basin.

Maintenance costs for this project primarily address vegetation establishment and adaptive management. These costs can include general maintenance, prescribed fire, mowing, tree establishment, and invasive species monitoring and maintenance. Keeping cattail growth under control will require diligence. Typically, maintenance is more intensive during the initial years of growth, and it becomes more self-sustaining as vegetation establishment progresses.

Additional Amenities

Amenities associated with the enhanced drainage basin may include a walking trail; benches; bird blinds; bird and/or plant identification signage; large stones for crossing, climbing, and sitting; and access points for exploration.

Figure 2: Examples of Retrofitted Stormwater Detention Basins

(Images 1 and 2 from https://www.stormwaterpa.org/basin_retrofit/retrofitted.html; Image 3 from Philadelphia Water Department Stormwater Management Guidance Manual)

Table 2: Quantities and Opinion of Probable Cost for Enhanced Drainage Basin

ITEM NO.	ITEM CODE	ITEM	UNIT	QUANT	UNIT PRICE	TOTAL
1	2010-C	CLEARING AND GRUBBING	LS	1	$ 3,000.00	$ 3,000.00
2	2010-D-1	TOPSOIL, ON-SITE	CY	1708	$ 18.00	$ 30,744.00
3	2010-E	EXCAVATION, CLASS 10, BORROW	CY	97	$ 30.00	$ 2,910.00
4	4020-A-1	STORM SEWER PIPE, 6" HDPE	LF	82	$ 40.00	$ 3,280.00
5	6010-B	INTAKE STOPLOG STRUCTURE	EA	2	$ 7,500.00	$ 15,000.00
6	8030-A	TEMPORARY TRAFFIC CONTROL	LS	1	$ 750.00	$ 750.00
7	9010-A	CONVENTIONAL SEEDING AND MULCHING, TYPE 5	AC	2	$ 4,000.00	$ 8,000.00
8	9010-A	CONVENTIONAL SEEDING AND MULCHING, NATIVE	AC	2	$ 6,000.00	$ 12,000.00
9	9030-B	PLANTS WITH WARRANTY, TREES (PRIMARY), 15-GALLON	EA	4	$ 250.00	$ 1,000.00
10	9040-A-1	SWPPP PREPARATION	LS	1	$ 2,000.00	$ 2,000.00
11	9040-A-2	SWPPP MANAGEMENT	LS	1	$ 4,000.00	$ 4,000.00
12	9040-F-1	WATTLE, STRAW, 12-INCH	LF	100	$ 7.00	$ 700.00
13	9040-F-2	WATTLE, REMOVAL	LF	100	$ 4.00	$ 400.00
14	9040-N-1	SILT FENCE OR SILT FENCE DITCH CHECK	LF	1200	$ 3.00	$ 3,600.00
15	9040-N-2	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF SEDIMENT	LF	1200	$ 1.00	$ 1,200.00
16	9040-N-3	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF DEVICE	LF	1200	$ 1.00	$ 1,200.00
17	11020-A	MOBILIZATION	LS	1	$ 9,216.00	$ 9,216.00
		ESTIMATED CONSTRUCTION COST				**$ 99,000.00**
		ADMINISTRATION, LEGAL, AND ENGINEERING				$ 20,000.00
		CONTINGENCY AND UNDEFINED DESIGN ELEMENTS				$ 20,000.00
		TOTAL ESTIMATED PROJECT COST				**$ 139,000.00**

DRAINAGEWAY IMPROVEMENTS AND CONNECTION TO TEGELER POND

Design Data

- Drainage Area = 250 ac
- Q_{peak} = 490 cfs (from Iowa Runoff Chart)
- Q_{design} = 294 cfs (100-year storm event)
- Bankfull Width = 32 ft
- Average Bankfull Depth = 1.1 ft
- Maximum Bankfull Depth = 1.6 ft
- Belt Width = 96 ft (min.)
- Net Earthwork = 12,557 CY cut (1.35 fill factor)

Concept Design

The proposed drainageway improvements involve reconfiguring the existing drainageway into a two-stage ditch. This includes realigning the channel to provide more natural sinuosity, widening the bankfull bench for additional floodplain storage, and incorporating check dams to create pools and add habitat complexity throughout the drainageway. The drainageway is designed to safely convey the 100-year flow, which was determined using a simplified version of the Rational Method. The Iowa Bankfull Regional Curves were then used to develop the hydraulic geometry, i.e. cross-sectional area, width, and depth. Shallow side slopes aid in erosion control and vegetation establishment during construction, and they allow easy access for recreation and exploration post-construction. The pools created by the check dams will create more habitat for aquatic vertebrates and invertebrates, which are present in the existing stream, and the proposed 6-inch check dam height will allow fish passage. For conceptual design purposes, the check dams are all assumed to be rock; however, they can be a mix of rock, tree, and earthen berms for added variety. The drainageway improvements also include tree plantings to provide shade and protection to the stream, stability for the banks, and a visual buffer between the residential and industrial areas. The conceptual design places the planted trees along the east edge of the drainageway to act as a screen while also being accessible from the residential area.

In preparation for future development, the City of Dyersville wishes to connect the drainageway to Tegeler Pond instead of routing it east and north to Bear Creek. There is development in progress along 6th Avenue, including new roads, utility installations, and house foundations. Sanitary sewer is also installed extending east from 6th Avenue, and further construction and residential development is planned. To connect to the pond, the stormwater will need to be conveyed under the existing road and adjacent to the foundations. The conceptual design proposes connecting the drainageway to the existing storm sewer intakes via an intake structure, piping the water under the road and past the foundation, and providing a stable outlet at the pond. Manning's equation was used to determine the pipe configuration that meets capacity requirements, and the outlet protection was designed according to SUDAS Chapter 7 – Erosion and Sediment Control Section 7E-10 – Rip Rap. Two parallel 36-inch pipes at 2.9% slope were selected for the conceptual design. The configuration may be modified during the design process to best accommodate the surrounding development.

Note: Eocene reached out to the developer's engineer but was unable to acquire any information on the current or proposed construction. Design elevations and slopes will need to be confirmed during the design process.

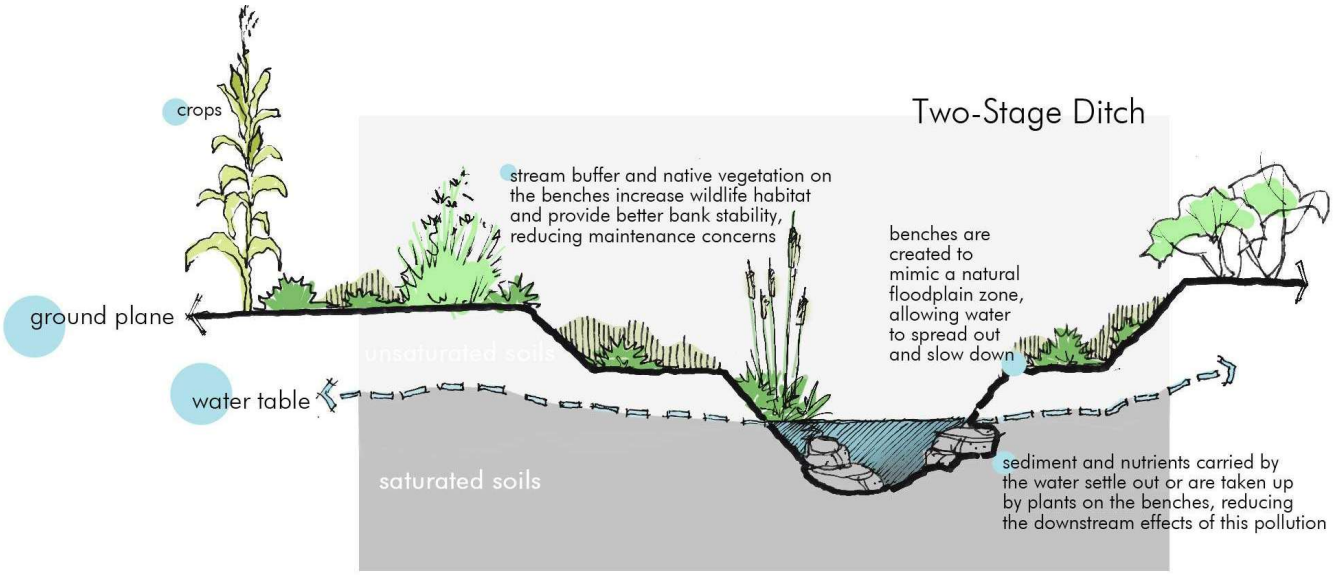

Figure 3: Schematic of a Two-Stage Ditch

(Image from https://www.greenwood.in.gov/division/blocks.php?structureid=234)

Figure 4: Examples of Two-Stage Ditches with Meandered Main Channel

(Images from Minnesota Two-Stage Drainage Ditch Fact Sheet)

Conceptual Cost Information

Construction of the drainageway improvements primarily involves earthwork, check dam installation, pipe installation, and vegetation establishment. Realigning the channel and widening the bankfull bench entails a large amount of excavation. The cost for excavating and hauling material can be managed by including some earthen berms, incorporating excess material into other proposed practices as part of the larger project, or coordinating with future development. Depending on availability, using tree material for some of the check dams may also reduce cost. Table 3 details the quantities and costs for the proposed drainageway improvements and connection to Tegeler Pond.

Maintenance costs for this project primarily address vegetation establishment and adaptive management. These costs can include general maintenance, prescribed fire, mowing, tree establishment, and invasive species monitoring and maintenance. Typically, maintenance is more intensive during the initial years of growth, and it becomes more self-sustaining as vegetation establishment progresses.

Additional Amenities

Amenities associated with the drainageway improvements may include a walking trail; benches; bird blinds; bird and/or plant identification signage; large stones for crossing, climbing, and sitting; and access points for exploration.

Figure 5: A Mother and Grandkids Exploring a Waterway
(Photo Taken by Mike Fisher)

Table 3: Quantities and Opinion of Probable Cost for Drainageway Improvements and Connection to Tegeler Pond

ITEM NO.	ITEM CODE	ITEM	UNIT	QUANT	UNIT PRICE	TOTAL
1	2010-C	CLEARING AND GRUBBING	LS	1	$ 1,000.00	$ 1,000.00
2	2010-D-1	TOPSOIL, ON-SITE	CY	4688	$ 7.00	$ 32,816.00
3	2010-E	EXCAVATION, CLASS 10	CY	12557	$ 15.00	$ 188,355.00
4	4020-A-1	STORM SEWER PIPE, 36" HDPE	LF	382	$ 80.00	$ 30,560.00
5	6010-B	INTAKE DROP STRUCTURE	EA	1	$ 5,500.00	$ 5,500.00
6	6010-G-2	CONNECTION TO EXISTING INTAKE	EA	1	$ 1,800.00	$ 1,800.00
7	8030-A	TEMPORARY TRAFFIC CONTROL	LS	1	$ 750.00	$ 750.00
8	9010-A	CONVENTIONAL SEEDING AND MULCHING, TYPE 5	AC	5	$ 4,000.00	$ 20,000.00
9	9010-A	CONVENTIONAL SEEDING AND MULCHING, NATIVE	AC	5	$ 6,000.00	$ 30,000.00
10	9030-B	PLANTS WITH WARRANTY, TREES (PRIMARY), 15-GALLON	EA	15	$ 250.00	$ 3,750.00
11	9040-A-1	SWPPP PREPARATION	LS	1	$ 2,000.00	$ 2,000.00
12	9040-A-2	SWPPP MANAGEMENT	LS	1	$ 4,000.00	$ 4,000.00
13	9040-E	TEMPORARY RECP, TYPE 3B	SY	2150	$ 5.00	$ 10,750.00
14	9040-F-1	WATTLE, STRAW, 12-INCH	LF	2400	$ 4.00	$ 9,600.00
15	9040-F-2	WATTLE, REMOVAL	LF	2400	$ 2.00	$ 4,800.00
16	9040-J	RIP RAP, CLASS E	TON	126	$ 90.00	$ 11,340.00
17	9040-J	RIP RAP, REMOVE STORE AND REUSE	LS	1	$ 2,500.00	$ 2,500.00
18	9040-N-1	SILT FENCE OR SILT FENCE DITCH CHECK	LF	3000	$ 3.00	$ 9,000.00
19	9040-N-2	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF SEDIMENT	LF	3000	$ 1.00	$ 3,000.00
20	9040-N-3	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF DEVICE	LF	3000	$ 1.00	$ 3,000.00
21	11020-A	MOBILIZATION	LS	1	$ 37,479.00	$ 37,479.00
		ESTIMATED CONSTRUCTION COST				**$ 412,000.00**
		ADMINISTRATION, LEGAL, AND ENGINEERING				$ 83,000.00
		CONTINGENCY AND UNDEFINED DESIGN ELEMENTS				$ 83,000.00
		TOTAL ESTIMATED PROJECT COST				**$ 578,000.00**

DRAINAGEWAY ABANDONMENT

Design Data

- Net Earthwork = 10,176 CY fill (1.35 fill factor)

Concept Design

Once the drainageway is routed to Tegeler Pond, the section extending east and then north to Bear Creek can be removed. Removing the ditch will allow the area to be graded in preparation for future development or restoration. The proposed design is not complex; it involves grading the ditch to a flat surface and reseeding with a lawn seed mix. It is recommended to construct this project in conjunction with the drainageway improvements project to balance the earthwork.

Figure 6: Existing Drainageway to be Abandoned
(Photo Taken by Bailey Kelsay on March 13, 2025)

Conceptual Cost Information

The drainageway abandonment primarily involves earthwork and vegetation establishment. The cost for fill material can be managed by coordinating construction with other proposed practices as part of the larger project. Table 4 details the quantities and costs for the proposed drainageway abandonment.

Maintenance costs for this project primarily address vegetation establishment and adaptive management. At most, these costs can include general maintenance, prescribed fire, mowing, tree establishment, and invasive species monitoring and maintenance. Typically, maintenance is more intensive during the initial years of growth, and it becomes more self-sustaining as vegetation establishment progresses. If lawn seeding is selected instead of native seeding, the up-front costs of maintenance during the first few years of establishment will likely be less than native seeding. However, over the long-term, a native planting will require less cost than traditional lawn.

Table 4: Quantities and Opinion of Probable Cost for Drainageway Abandonment

ITEM NO.	ITEM CODE	ITEM	UNIT	QUANT	UNIT PRICE	TOTAL
1	2010-C	CLEARING AND GRUBBING	LS	1	$ 1,000.00	$ 1,000.00
2	2010-D-1	TOPSOIL, ON-SITE	CY	1605	$ 20.00	$ 32,100.00
3	2010-E	EXCAVATION, CLASS 10, BORROW	CY	10176	$ 15.00	$ 152,640.00
4	8030-A	TEMPORARY TRAFFIC CONTROL	LS	1	$ 750.00	$ 750.00
5	9010-A	CONVENTIONAL SEEDING AND MULCHING, TYPE 5	AC	2	$ 4,000.00	$ 8,000.00
6	9010-A	CONVENTIONAL SEEDING AND MULCHING, LAWN	AC	2	$ 4,000.00	$ 8,000.00
7	9040-A-1	SWPPP PREPARATION	LS	1	$ 2,000.00	$ 2,000.00
8	9040-A-2	SWPPP MANAGEMENT	LS	1	$ 4,000.00	$ 4,000.00
9	9040-F-1	WATTLE, STRAW, 12-INCH	LF	2400	$ 4.00	$ 9,600.00
10	9040-F-2	WATTLE, REMOVAL	LF	2400	$ 2.00	$ 4,800.00
11	9040-N-1	SILT FENCE OR SILT FENCE DITCH CHECK	LF	2500	$ 2.00	$ 5,000.00
12	9040-N-2	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF SEDIMENT	LF	2500	$ 1.00	$ 2,500.00
13	9040-N-3	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF DEVICE	LF	2500	$ 1.00	$ 2,500.00
14	11020-A	MOBILIZATION	LS	1	$ 24,110.00	$ 24,110.00
		ESTIMATED CONSTRUCTION COST				**$ 257,000.00**
		ADMINISTRATION, LEGAL, AND ENGINEERING				$ 52,000.00
		CONTINGENCY AND UNDEFINED DESIGN ELEMENTS				$ 52,000.00
		TOTAL ESTIMATED PROJECT COST				**$ 361,000.00**

TEGELER POND OUTFALL & VEGETATED SWALE

Design Data

- Drainage Area = 552 ac
- Q_{design} = 42.26 cfs per pipe culvert (100-year cumulative storm for Delaware County, Iowa, with a total rainfall amount of 7.51 in using a SCS Type II 24-hr storm distribution)
- L = 555 ft
- ΔE = 5 ft
- Net Earthwork = 1,470 CY cut (1.35 fill factor)

Concept Design

The proposed pond outfall and vegetated swale system is designed to safely convey storm sewer flow from the residential development and overflow from the principal spillway of Tegeler Pond to Bear Creek. The system is sized to manage the 100-year flow from the entire watershed, quantified using a simplified Rational Method and conceptualized using Autodesk's Storm and Sanitary Analysis (SSA) software. The conceptual design is divided into two components: outfall pipes and a vegetated swale.

The concept plan includes lowering and upsizing the existing outfall pipes. The existing pipes are perched at an elevation of 936, well above the pond's normal pool elevation. The proposed pipes will be lowered to an elevation of 933, which is approximately one foot above normal pool elevation as determined by DEM elevation and water elevations collected on September 23rd, 2025. Additionally, the current 24-inch corrugated metal outfall pipes will be increased in size and upgraded to concrete. Two parallel 36-inch pipes at 1.1% slope were selected for the conceptual design, sized using preliminary modeling in SSA. Each pipe is capable of independently handling flow from a 100-year storm event, but, following standard spillway design guidance, a second pipe is included to provide system redundancy in case one pipe fails. During rain events, overflow from Tegeler Pond will discharge through these pipes.

Figure 7: Concrete pipe with apron
(Image from County Materials Corporation;
https://www.countymaterials.com/news/precast-end-treatments)

The outfall pipes spill onto a flat, armored area. This armored section is designed to dissipate energy and prevent scouring as the flow enters the vegetated swale. Water will then flow through a meandering channel lined with vegetation to control flow, promote infiltration, and prevent erosion. The conceptual design creates a 555-foot-long swale, including a 10-foot-wide channel bottom, a 1.1% longitudinal slope, and 10:1 side slopes, emptying into Bear Creek. The proposed vegetated swale generally follows the existing drainageway alignment, but it creates a more stable connection between the upland and lowland areas by evenly traversing the elevation change and introducing more manageable side slopes. The shallow side slopes allow easy access for maintenance and future construction. While no formal construction entrance is proposed, both sides of the swale will be easily accessible because of the shallow side slopes and smooth transitions.

Conceptual Cost Information

Construction of the outfall and vegetated swale system primarily involves earthwork, rip rap placement, and vegetation establishment. Constructing the vegetated swale requires a significant amount of excavation. The cost for excavating and hauling material can be managed by incorporating excess material into other proposed practices as part of the larger project or coordinating with future development. Table 5 details the quantities and costs for the proposed outfall updates and vegetated swale.

Maintenance costs for this project primarily address vegetation establishment and adaptive management. These costs can include general maintenance, prescribed fire, mowing, tree establishment, and invasive species monitoring and maintenance. In the early stages of vegetation establishment. Typically, maintenance is more intensive during the initial years of growth, and it becomes more self-sustaining as vegetation establishment progresses.

Additional Amenities

Amenities associated with the outfall and vegetation swale may include a grassed access path; benches; bird blinds; bird and/or plant identification signage; large stones for crossing, climbing, and sitting; and access points for exploration.

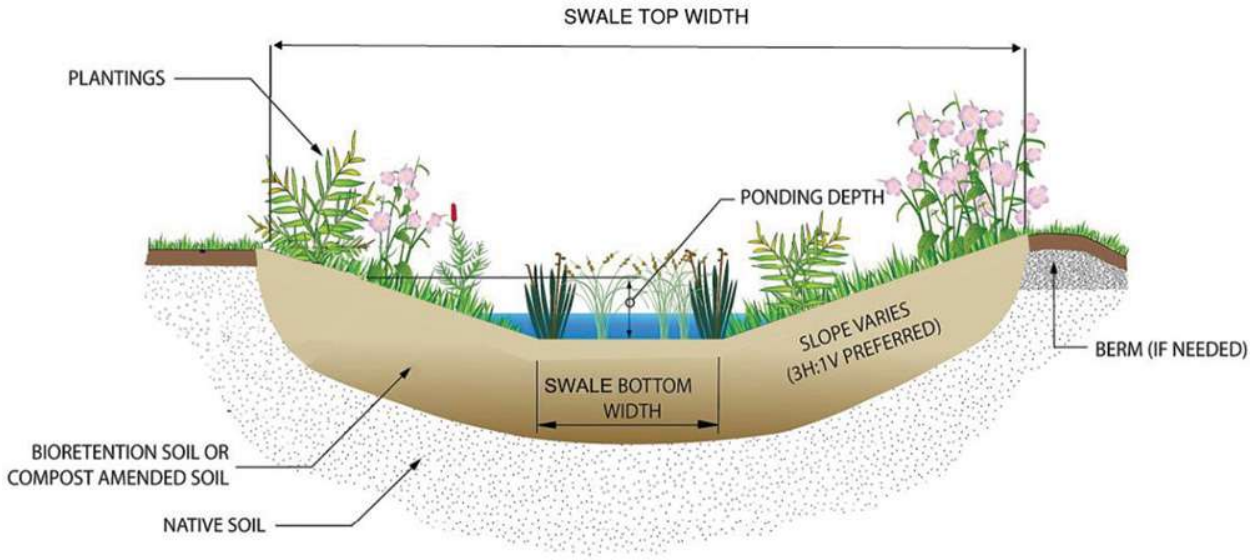

Figure 8: Cross-Section of a wet swale
(Image from Fairfax County, Virginia Public Works;

https://www.fairfaxcounty.gov/publicworks/stormwater/facility-fact-sheets/wet-swales)

Figure 9: Examples of Vegetated Swales

(**Image 1** from Fairfax County, Virginia Public Works https://www.fairfaxcounty.gov/publicworks/stormwater/facility-fact-sheets/wet-swales; **Image 2** from Northwestern Indiana Regional Planning Commission https://www.rasmith.com/blog/not-your-everyday-stormwater-system/)

Table 5: Quantities and Opinion of Probable Cost for Tegeler Pond Outfall and Vegetated Swale to Bear Creek

ITEM NO.	ITEM CODE	ITEM	UNIT	QUANT	UNIT PRICE	TOTAL
1	2010-C	CLEARING AND GRUBBING	LS	1	$ 3,000.00	$ 3,000.00
2	2010-D-1	TOPSOIL, ON-SITE	CY	600	$ 20.00	$ 12,000.00
3	2010-E	EXCAVATION, CLASS 10	CY	1470	$ 30.00	$ 44,100.00
4	4020-A-1	STORM SEWER PIPE, 36" HDPE	LF	120	$ 100.00	$ 12,000.00
5	8030-A	TEMPORARY TRAFFIC CONTROL	LS	1	$ 750.00	$ 750.00
6	9010-A	CONVENTIONAL SEEDING AND MULCHING, TYPE 5	AC	1	$ 4,000.00	$ 4,000.00
7	9010-A	CONVENTIONAL SEEDING AND MULCHING, NATIVE	AC	1	$ 6,000.00	$ 6,000.00
8	9040-A-1	SWPPP PREPARATION	LS	1	$ 2,000.00	$ 2,000.00
9	9040-A-2	SWPPP MANAGEMENT	LS	1	$ 4,000.00	$ 4,000.00
10	9040-F-1	WATTLE, STRAW, 12-INCH	LF	1200	$ 6.00	$ 7,200.00
11	9040-F-2	WATTLE, REMOVAL	LF	1200	$ 2.00	$ 2,400.00
12	9040-J	RIP RAP, CLASS E	TON	180	$ 90.00	$ 16,200.00
13	9040-N-1	SILT FENCE OR SILT FENCE DITCH CHECK	LF	1200	$ 3.00	$ 3,600.00
14	9040-N-2	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF SEDIMENT	LF	1200	$ 1.00	$ 1,200.00
15	9040-N-3	SILT FENCE OR SILT FENCE DITCH CHECK, REMOVAL OF DEVICE	LF	1200	$ 1.00	$ 1,200.00
16	11020-A	MOBILIZATION	LS	1	$ 12,350.00	$ 12,350.00
		ESTIMATED CONSTRUCTION COST				**$ 132,000.00**
		ADMINISTRATION, LEGAL, AND ENGINEERING				$ 27,000.00
		CONTINGENCY AND UNDEFINED DESIGN ELEMENTS				$ 27,000.00
		TOTAL ESTIMATED PROJECT COST				**$ 186,000.00**

CONCLUSION

Constructing the proposed practices as a combined project offers the most economical approach to the Dyersville SW Stormwater Improvements. This approach minimizes mobilization for the contractor, decreases ongoing disruptions from construction, and allows the earthwork to be balanced across the project sites, which greatly reduces cost. Totaling the individual projects leads to an overall conceptual construction cost of $890,000. Combining the construction into one phase and adjusting the earthwork and mobilization bid items reduces the total by $198,000 to a conceptual construction cost of $692,000 (shown in Table 1). This reduction is primarily because excess excavation from the drainageway improvements and vegetated swale can be used as fill material for the drainageway abandonment, eliminating the need to haul excess material offsite and purchase fill separately.

The Dyersville SW Stormwater Improvements Concept Design presents a comprehensive and forward-thinking approach to managing stormwater in a growing urban area. By integrating enhanced drainage basins, naturalized drainageway improvements, strategic abandonment of outdated infrastructure, and a vegetated swale system, the project aims to significantly improve water quality, manage stormwater runoff, enhance ecological function, and provide meaningful public amenities. The proposed solutions balance engineering precision with environmental sensitivity and aesthetic value. As the project advances into final design and implementation, coordination with ongoing and future developments will be critical to achieving cost efficiency and ensuring long-term success. Together, these practices offer a resilient and sustainable model for stormwater management in Dyersville and beyond.