

ORNATE BOX TURTLE HABITAT ASSESSMENT AND MITIGATION ACTION PLAN: NORTH LIBERTY PHASE II WASTE WATER TREATMENT PLANT IMPROVEMENTS NORTH LIBERTY, IOWA

GES-15-559

March 27, 2015



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**ORNATE BOX TURTLE HABITAT ASSESSMENT AND MITIGATION ACTION PLAN,
PHASE II WASTE WATER TREATMENT PLANT IMPROVEMENTS
NORTH LIBERTY, JOHNSON COUNTY, IOWA**

GES PROJECT NO. 15-559

MARCH 27, 2015

1.0 INTRODUCTION

The purpose of this report is to assess the effects of the proposed City of North Liberty Phase II Waste Water Treatment Plant Improvements Project on the state-threatened Ornate Box Turtle (*Terrapene ornata*) (OBT) and its habitat.

The City of North Liberty (City) has proposed, planned, designed, and is preparing to let a contract to begun construction of several facility improvements to its Waste Water Treatment Plant (WWTP). The project includes expansion from the existing 10.5-acre footprint to a newly acquired 35-acre parcel located directly to the east. The purpose of the project is to meet the needs of the rapids growing city and region. The 35-acre expansion is composed entirely of open grass and clover fields currently used for hay production. This area provides marginally suitable habitat for OBT. This specific area will be referred to as the OBT Potential Habitat Area and is delineated on Figure 1.

An initial assessment was completed on March 13, 2015, to determine if suitable OBT habitat was present within the project limits. An assessment of existing vegetation was completed, but a thorough soils investigation was not due to frozen ground. Because several of the site soils are mapped as having sandy components (Chelsea-Lamont-Fayette complex primarily), and with an abundance of caution in regard to potential impacts to the species, the project area is considered marginally suitable habitat for OBT. Several ground level photographs are provided in Appendix A.

This report has been prepared for review and concurrence by the Iowa Department of Natural Resources (DNR) to aid in their evaluation of the project in regard to Iowa Code Chapters 481A and B. The investigation and report were completed by Kevin M. Griggs PWS, CWB, Environmental Consultant.

2.0 PROJECT DESCRIPTION

The WWTP Improvement Project will involve several progressive stages (Stage One through Stage Seven) of construction and are listed here in respect to activities that may affect the OBT:

Stage One began the week of March 9, 2015 and consisted of tree cutting within the project construction limits. A related sewer line extension project (Section 404 Authorization CEMVR-OD-P-2013-1557) required any trees providing potentially suitable Indiana bat (*Myotis sodalis*) habitat be cut prior to April 1st. As such, the City was authorized to begin tree clearing portion of that project. For convenience, trees within the project limits of the WWTP Improvements were also cleared by the same contractor. Trees within the project limits were cut by chainsaw at or near ground level and left on site for latter chipping and/or removal. The activity was done while there was still frost in the ground, and all roots systems were left intact. The activity did not cause any below-ground disturbance.

Stage Two includes the construction of a temporary perimeter barrier fence (silt fence) around the project work limits within the OBT Potential Habitat Area. The barrier fence will utilize standard silt fencing techniques and materials. This stage of work is anticipated to begin following contract award, which is anticipated to be late May or early June 2015.

Stage Three involves preliminary site grading including leveling a building pad site immediately east of the existing plant site and placing excess fill material on the far eastern portion of the property (see site design plans provided in Appendix A). This stage of work will not proceed in the OBT Potential Habitat Area until approval is granted by DNR. The construction contractor may work on other portions and stages of the project that will not affect potential OBT habitat.

Stage Four includes the construction of WWTP improvements on the expansion area such as a dewatered biosolids storage facility, roadways, utilities, and other infrastructure. This stage of construction will be limited to the primarily construction site immediately east of the existing facility.

Stage Five involves final grading of the project area and seeding of all disturbed areas and is anticipated to begin in the fall of 2016 or spring of 2017.

Stage Six involves removal of the perimeter barrier fence and construction of a permanent chain link fence following the re-establishment of permanent vegetative cover and is anticipated during the fall of 2016 or spring of 2017.

Stage Seven follows all construction activities and involves the period of time the newly constructed facilities are under operation, including regular access for maintenance inspections and mowing.

Figure 1 shows the limits of the OBT Potential Habitat Area. Appendix B contains project plans for the area of concern.

Anticipated future work within the area also includes the construction of a new city roadway connection, Forevergreen Road, as well as further expansion of the WWTP.

Construction of these projects is not currently scheduled and will not be addressed in this report.

Conservation measures to avoid direct impacts to OBT include the following:

- A thorough pre-construction survey (5-meter transect visual search encounter) will be completed by a qualified environmental consultant (Consultant) approximately 30 days prior to beginning any soil-disturbing activities within the OBT Potential Habitat Area. It is anticipated this survey will be completed during the time OBT are most active after emergence and prior to nesting, from mid-April to mid-May (Bernstien and Black 2005).
- Construction of the perimeter silt fence. The silt fence will meet Iowa Department of Transportation Standard Specification 4196.01 and be installed according to Iowa Statewide Urban Design and Specifications (SUDAS) 9040.119 (copies of both are provided in Appendix C), including 36-inch tight woven (600 micron) engineering fabric installed with minimum 12 inches buried below the ground surface. Standard silt fencing techniques appear to provide an adequate barrier for OBT for several reasons. Although we are not aware of literature evidence to support the theory, we do not believe OBT can climb and overcome the vertical above-ground portion of the fence. Further, their nature to only dig to shallow depths and in sandy soils outside the hibernation season suggests they are unlikely to burrow under the fence (LeClere 2013).
- The OBT Potential Habitat Area will be kept mowed (6 inches or less) throughout the project construction period, as necessary, to facilitate OBT observations.
- Any individual OBT's encountered will be reported to DNR (along with GPS coordinates) and moved outside the project limits by the Consultant.
- Training in OBT identification, ecology, and mitigation will be provided by the Consultant to a City-employed site inspector (Inspector).
- Daily site inspections will be completed by the inspector at the beginning of the work day of all areas to be disturbed that day and a daily log kept to document changing site conditions, environmental factors, and any OBT encounters. A sample daily log is provided in Appendix D. The daily logs will be submitted weekly to the Consultant, who will coordinate project actions directly with DNR.

3.0 ACTION AREA

The OBT Potential Habitat Area is located in the far southeast portion of the City of North Liberty in Johnson County, Iowa in the N ½ of Section 19, Township 80-North, Range 6-West (Newport Township) (Figure 2). The Universal Transverse Mercator (UTM) coordinate for the center of the OBT Potential Habitat Area is X=617438, Y=4620147 (UTM Zone 15, Meters, NAD83). The Latitude and Longitude coordinate is 41.724, -91.588. The entire 35-acre parcel is within the identified OBT Potential Habitat Area. This area provides marginally suitable OBT habitat.

The property is currently owned by the City, having been purchased specifically for the Phase II WWTP Improvements Project. The site is hilly (greater than 50 feet of elevation change) property previously used for hay production. Approximately two-thirds of the

site is planted with a fescue-type grass. The remaining one-third, consisting of the lower and flatter portions of the area, are planted to red clover. Due to previous hay production and harvest, the entire property consists to low herbaceous cover less than 4 inches in height. Much of the surrounding property consists of established forest cover, with one area bordering a row crop production field.

Site soils area mapped primarily as Chelsea-Lamont-Fayette complex with lesser areas of Bassett loam, Ely silt loam, Ansgar silt loam, and Sparta loamy fine sand. Due to frozen ground conditions during the March 13, 2015 site visit, no confirmation of soil types was possible.

All of the described OBT Potential Habitat Area will be affected by Stage One through Stage Seven of the construction project. Stages One through Six involve site preparation and primary construction of the WWTP facilities. Stage Seven involves the regular operation, inspection, and maintenance of the facilities, including pedestrian, equipment, and vehicle access.

4.0 SPECIES/CRITICAL HABITAT CONSIDERED

The species considered for this Habitat Assessment and Mitigation Action Plan is the state threatened (571 Iowa Code Chapter 77.2) Ornate Box Turtle, *Terrapene ornate*. The OBT is Iowa's only fully terrestrial turtle known to favor sandy open prairie and shrub edges (Bernstien and Black 2005; LeClere 2013).

The OBT (*Terrapene ornata*) has a domed, round or oval carapace (upper shell) that is dark brown to reddish-brown, often with a yellow stripe running down the center. The species occurs in the United States and Mexico. *T. ornata ornata* occurs in western Indiana and eastern Wyoming, south to south-western Louisiana and eastern New Mexico, and *T. ornata luteola* ranges from Texas and southeastern Arizona south into north-eastern Sonora and northern Chihuahua, Mexico. The OBT is considered a 'prairie turtle', inhabiting treeless, sandy plains and gently rolling country with grass and scattered low brush. For shelter, they burrow into soil (e.g., under plants such as yucca) (Converse et al. 2002) or enter burrows made by other species. Winter burrow depths of 0.5 to 1.8 meters have been noted in Wisconsin populations (Doroff and Keith 1990) and 7 to 120 centimeters (average depth 54 cm) for Nebraska populations (Converse et al. 2002). In Wisconsin, hatchlings often were near or under rocks in dense vegetation (Doroff and Keith 1990). Eggs are laid in nests dug in soft, well-drained soil in open area (Converse et al. 2002; Legler 1960). The species is also known to enter woodlands, particularly along wooded stream corridors. The species feeds mainly on insects (mainly beetles, caterpillars and grasshoppers), berries, carrion, other small animals (amphibian larvae or the eggs or chicks of ground-nesting birds), grasses, and other food sources (Legler 1960, Ernst et al. 1994). Except for juvenile dispersion, populations are largely non-migratory.

Both sexes of OBT can reach up to 15.4 cm carapace length (CL). Most males mature at about 10 to 11 centimeters plastron length (PL), and females at PL of about 11 to 13 centimeters at ages of eight to nine (Legler 1960). Average clutch size is 4.7 eggs in

Kansas (Legler 1960) and 3.5 in Wisconsin (Doroff and Keith 1990), with extremes of two to eight eggs. Depending on location and environmental conditions, some females may produce a two clutches in a year, but may females skip reproduction for one or two years (Legler 1960, Doroff and Keith 1990). Hatchlings measure about 30 millimeters (range 28 to 32 millimeters). The oldest animal in a studied Kansas population was estimated to be 28 years old, and the population was estimated to have almost complete turnover in 25 years (Metcalf and Metcalf 1985). Ernst et al. (1994) reported a captive female of about 42 years of age (Ernst and Lovich 2009).

Home range for observed Kansas populations averaged about 2 hectares (Legler 1960), and home range for Texas groups averaged about 100 meters (Blair 1976). In Wisconsin, the home range was 0.2 to 58.1 hectares, with an average 9 hectares for adults, 1.5 hectares for 3 to 7-year olds, and 16 square meters for hatchlings. In various Midwest states, observed adult annual survival rates range from 81 to 97 percent (Bowen et al. 2004; Doroff and Keith 1990; Iverson 1991). Populations of OBTs can be numerous, reaching densities of 6.4 to 15.6 animals per hectare (Legler 1960).

Most OBT activity occurs from March to November, with a shorter season (April to September or October) in the northern part of the range (Ernst and Barbour 1972, Legler 1960, Doroff and Keith 1990). OBT generally are active during daylight hours, but nesting activity may extend into darkness (Legler 1960). Above-ground movements often are stimulated rainfall. Interestingly enough, this species is active at lower temperatures in the north than in the south (Copeia 1993).

The species is threatened by a combination of gradual habitat degradation, fragmentation, and loss; vehicle encounters; other human-caused accidental mortality; and urbanization. The situations is worsened due to species' slow growth and very limited reproductive capacity, which suggest the species will continue if not accelerate its gradual decline across much of its range. Eventually, the species will probably become restricted to large stretches of protected or low-impact land. The species is currently listed as Near Threatened with the International Union of Conservation of Nature's Red List.

Populations of OBT in Iowa are limited to two relatively large (greater than 600 individuals) populations in Johnson and Muscatine Counties and several small (less than 100 individuals) remnant populations, scattered throughout Iowa where habitat conditions remain (Richtsmeier et al 2008). The large Johnson County population is located approximately 7.5 miles northwest of the project area.

At least one individual OBT was located on the Beaumont property as a photograph was submitted as evidence in a district court case (Weinman v. City of North Liberty 2015). However, the exact location, timing, and other circumstances are unclear.

The OBT Potential Habitat Area is composed of a mix of restored tall-grass prairie transitioning to floodplain forest. During the March 13 site assessment, it was noted that portions of the restored prairie had been recently burned (likely fall 2014) and contained little standing vegetation.

Because OBT emerge from hibernation and become active during the month of April there is potential for project construction activities to conflict with OBT use of the area (Bernstien and Black 2005; Converse, et al 2002).

5.0 EFFECTS ANALYSIS

Effects to OBT due to project construction may include the following:

Stage One: The project construction limits were cleared of trees in early March, while the ground was still frozen to the surface. Trees were dropped by cutting with chainsaws and stacked to facilitate chipping. The activity did not include any subsurface work, so no impacts to OBT, if present, were possible as they were still hibernating.

Stage Two: The installation of perimeter silt fence is not likely to cause harm to the species due to the slow and rather manual nature of the work (small tractor or skid loader operating a silt fence plow and driving steel posts). However, this work will be completed following OBT emergence from hibernation and during a period of high OBT activity (Converse et al, 2002). As such, the Inspector shall be present during perimeter silt fence installation.

Stage Three: Should individual OBT occur within the project limits during grading activities, it is possible that individuals could be run over by equipment. To mitigate this potential effect, a daily site inspection will be completed prior to beginning each day's operations within the OBT Potential Habitat Area. Daily construction activities shall not begin prior to completion of that day's inspection and verbal notification from the Inspector. The inspection will be completed by a trained City-employed inspector. If any individual OBT are located within the day's project work limits, the Consultant will be immediately notified for discussion of next actions. The Consultant will ensure any OBT located within the project area are photographed; location marked by GPS coordinates; and then moved to an area of similar safe habitat condition outside the project limits. Construction in this stage of the project is expected to extend for several months.

Stage Four: Construction activities in this stage will be limited to the immediate work site for the proposed building pad will also be similar to those described for Stage Three and will be addressed in a similar manner.

Stage Five: Potential effects due to final grading and seeding operations are expected to be similar to those described for Stage Three and will be addressed in a similar manner.

Stage Six: The perimeter silt fence is anticipated to be removed and the permanent chain link fence installed during the spring of 2017 following the initial soil thaw and prior to OBT emergence. As such, no effects to OBT are anticipated.

Stage Seven: Ongoing operation, inspection, and maintenance activities (including mowing) at the completed facility are anticipated indefinitely. Given the area will be reseeded to a cool-season grass mix, no significant barrier to OBT movement is expected.

Long-term effects of this specific activity on OBT are possible and are best mitigated through basic awareness.

The anticipated response of any OBT within the project limits is difficult to predict. If present, responses may range from no response to abandonment of the area, decreased foraging success, reduced fecundity, injury, or death (Cureton and Deaton, 2012). Every effort will be made to identify and relocate any OBT located within the project limits to avoid any direct impacts to the species.

The cumulative effects of the proposed project to OBT and their associated habitat are expected to be moderate. The construction of a perimeter chain link fence may act as an exclusion barrier to OBT movement and ultimately eliminate the area for potential use. All disturbed areas will be seeded with appropriate permanent vegetative cover. With the exception of regular maintenance mowing and occasional visual inspections of the facility, no other long-term effects are expected.

6.0 CONCLUSION AND DETERMINATION OF EFFECT

Based on the evaluation of the proposed activities on OBT and their associated potential habitat within the project limits, as well as the proposed mitigation actions, direct and indirect impacts to the species are not reasonably expected. Prior to completing a thorough pre-construction survey to determine the presence or absences of OBT within the project area, we conclude the project “may affect, but is not likely to adversely affect” OBT.

On behalf of the Iowa Department of Natural Resources, I hereby concur with the following:

“This project may affect, but is not likely to adversely affect” the Ornate Box Turtle.

Signature

Title

Date

7.0 LITERATURE CITED, CONSULTED, AND REFERENCED

General Information Source/Field Guide:

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- Encyclopedia of Life: Ornate Box Turtle. <http://eol.org/pages/1055219/details>
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- HerpNet: Iowa Herpetology

Magazine Sources:

- Iowa Department of Natural Resources ornate box turtle factsheet
- Iowa Outdoors 2007 "Death on the Dunes"
- Iowa Outdoors 2013 "Recovery in the Land of the Lost"
- The Iowan (Unknown year) "Found: Ornate Box Turtle"

Literature:

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Legal/Courts:

- Weinman, Gary v. City of North Liberty. 2015. Johnson County District Court No. CVCV077032.

8.0 LIST OF CONTACTS MADE AND PREPARERS

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Conservation and Recreation Division
Iowa Department of Natural Resources

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FIGURES

Figure 1. Limits of Ornate Box Turtle Potential Habitat.

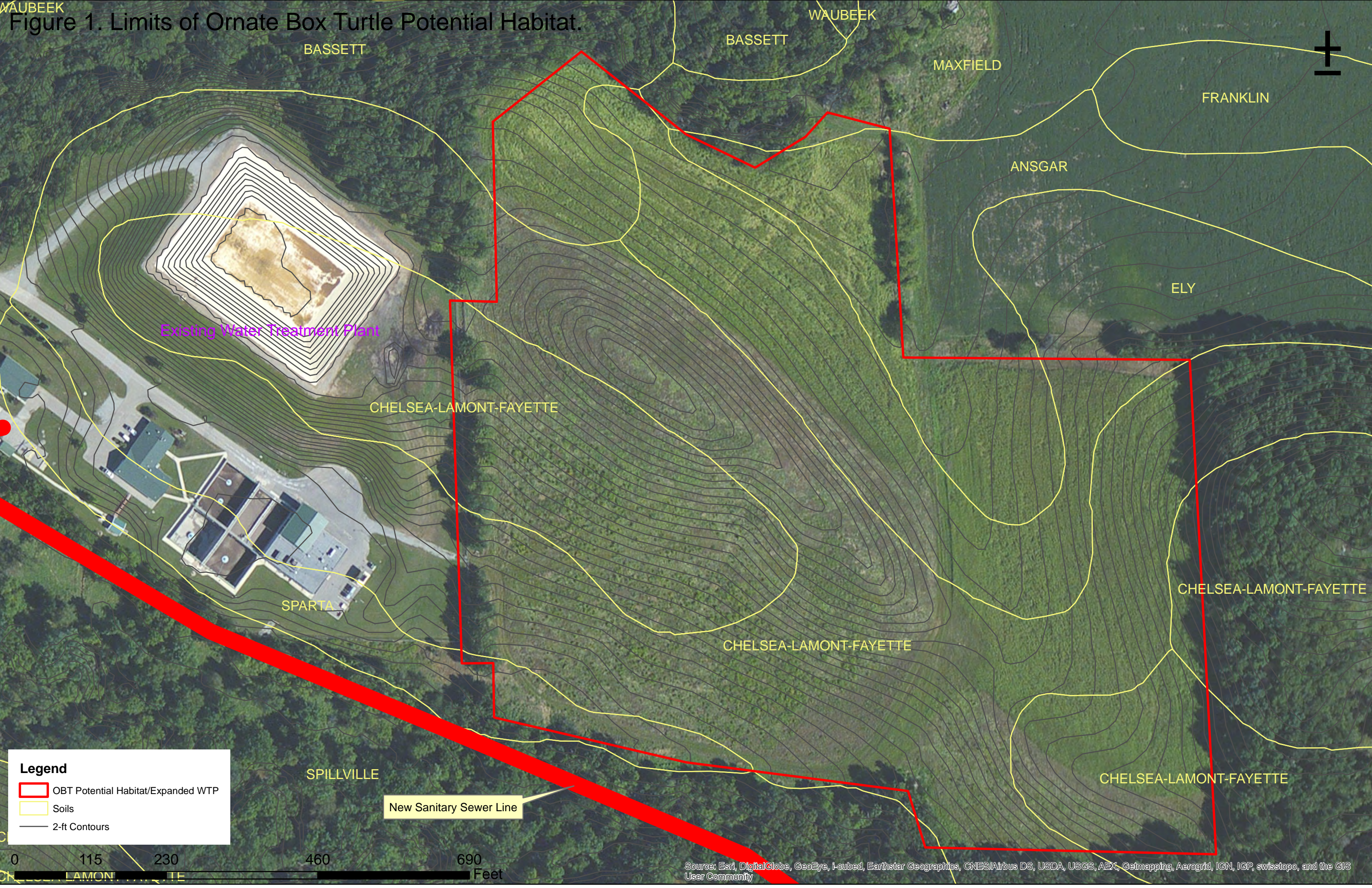
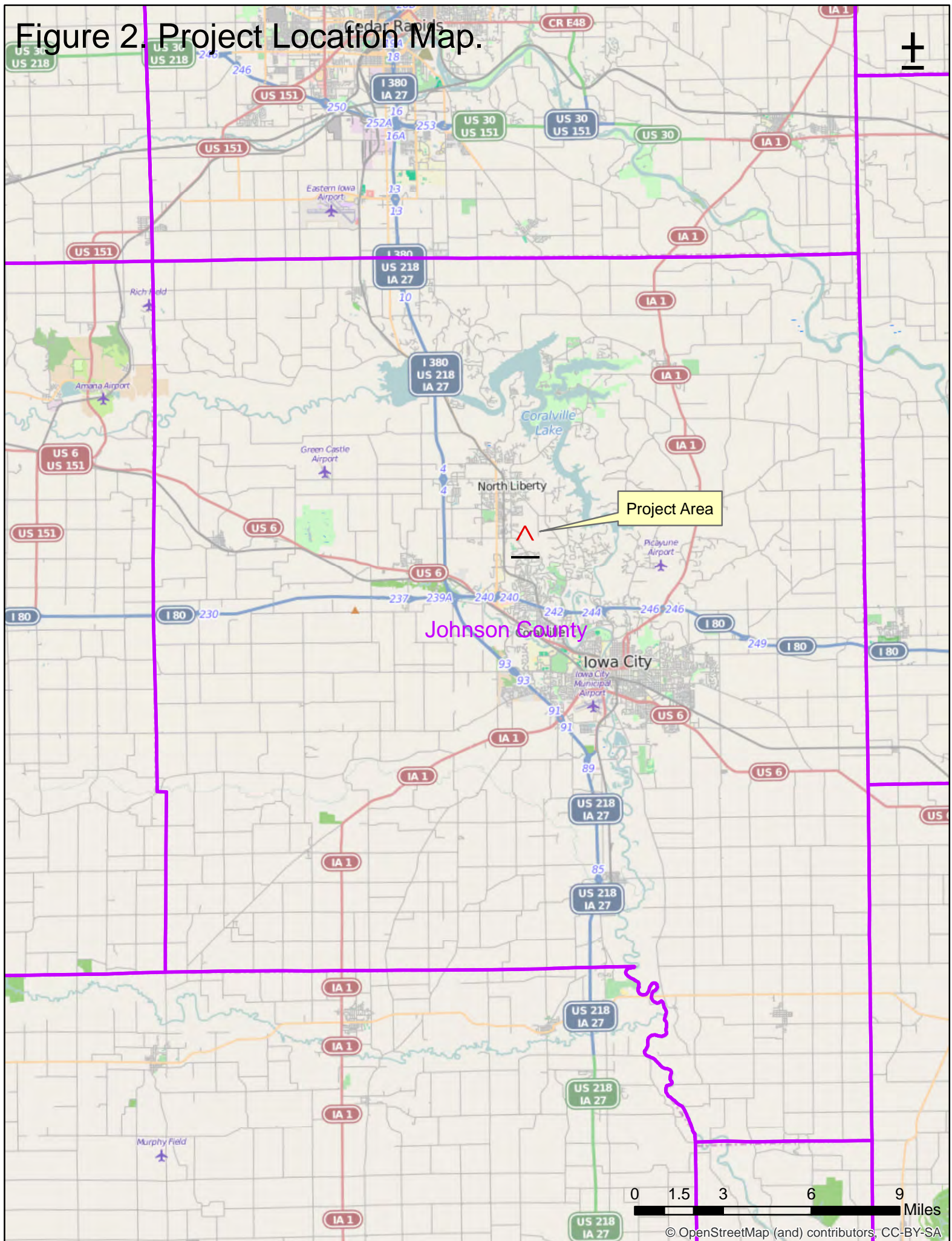


Figure 2. Project Location Map.



APPENDIX A: GROUND LEVEL PHOTOGRAPHS



PHOTO 1 – VIEW OF PROJECT AREA FROM SITE HIGH POINT FACING NORTH.



PHOTO 2 – VIEW OF PROJECT AREA FROM SITE HIGH POINT FACING EAST.





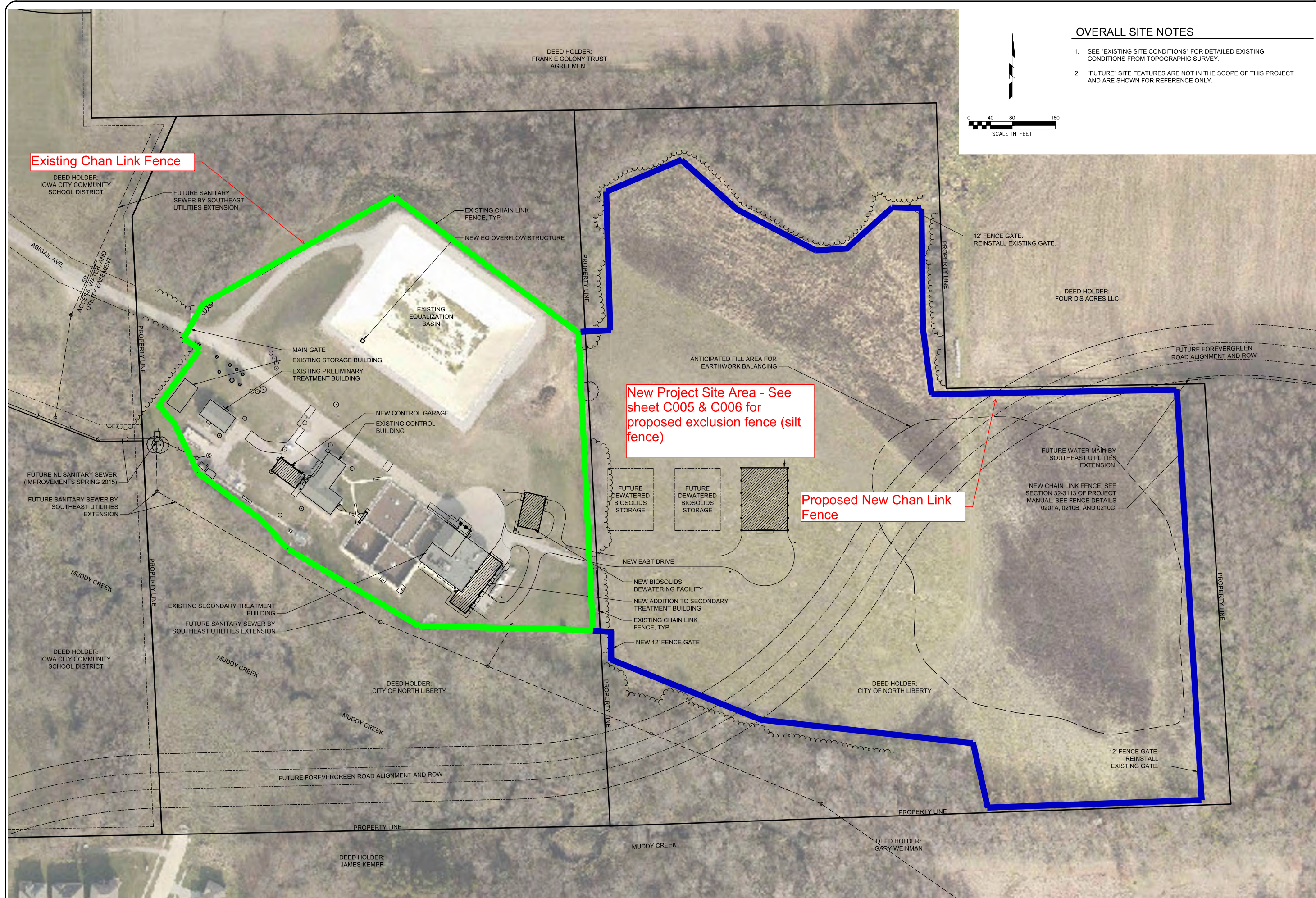
PHOTO 3 – VIEW OF PROJECT AREA FROM SITE HIGH POINT FACING SOUTH.



PHOTO 4 – VIEW OF PROJECT AREA FROM SITE HIGHT POINT FACING WEST.

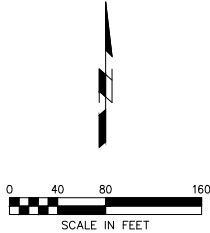


APPENDIX B: PROJECT PLAN SHEETS



OVERALL SITE NOTES

1. SEE "EXISTING SITE CONDITIONS" FOR DETAILED EXISTING CONDITIONS FROM TOPOGRAPHIC SURVEY.
2. "FUTURE" SITE FEATURES ARE NOT IN THE SCOPE OF THIS PROJECT AND ARE SHOWN FOR REFERENCE ONLY.



DATE	BY	DESIGNED	DRAWN	CHECKED	LAST UPDATE
	MDK	MDK	MDK		02/20/15

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414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

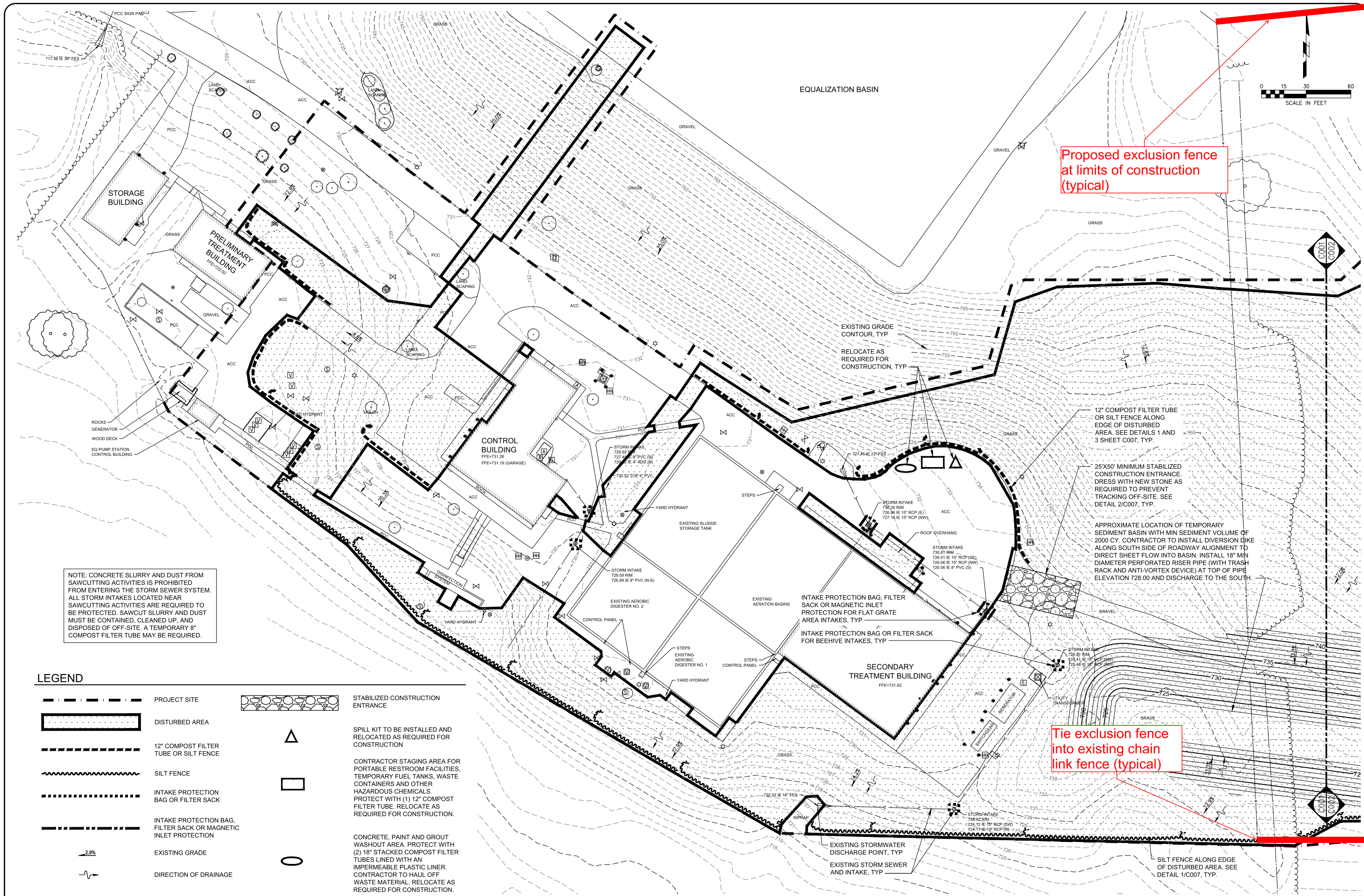


OVERALL SITE PLAN
PHASE II WWTP IMPROVEMENTS
CITY OF NORTH LIBERTY
NORTH LIBERTY, IA

PROJECT NO.
2489-11A

SHEET

C101

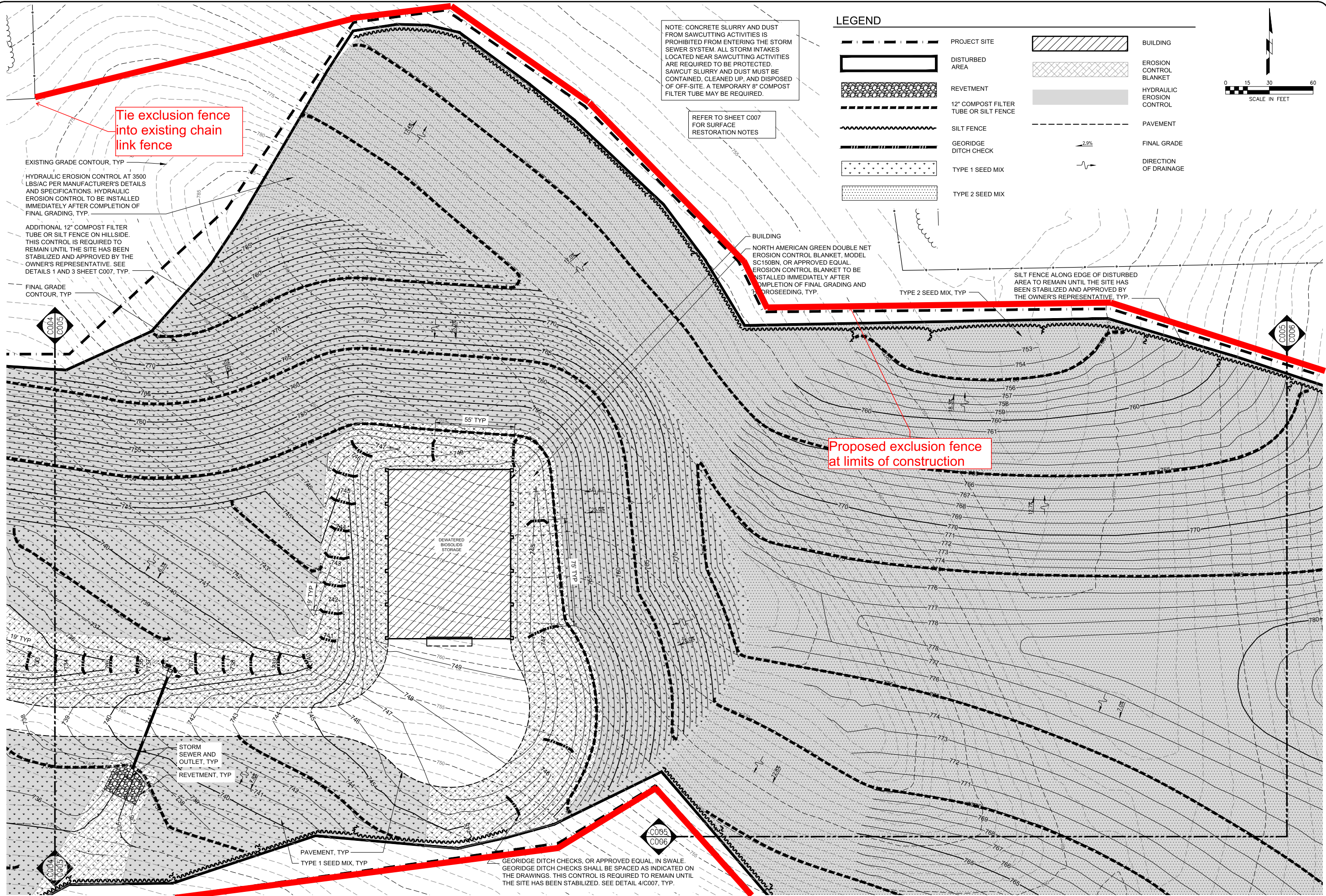


LEGEND

- | | | | |
|--|---|--|--|
| | PROJECT SITE | | STABILIZED CONSTRUCTION ENTRANCE |
| | DISTURBED AREA | | SPILL KIT TO BE INSTALLED AND RELOCATED AS REQUIRED FOR CONSTRUCTION |
| | 12" COMPOST FILTER TUBE OR SILT FENCE | | CONTRACTOR STAGING AREA FOR PORTABLE RESTROOM FACILITIES, TEMPORARY FUEL TANKS, WASTE CONTAINERS AND OTHER HAZARDOUS CHEMICALS. PROTECT WITH (1) 12" COMPOST FILTER TUBE. RELOCATE AS REQUIRED FOR CONSTRUCTION. |
| | SILT FENCE | | CONCRETE, PAINT AND GROUT WASHOUT AREA. PROTECT WITH (2) 18" STACKED COMPOST FILTER TUBES LINED WITH AN IMPERMEABLE PLASTIC LINER. CONTRACTOR TO HAUL OFF WASTE MATERIAL. RELOCATE AS REQUIRED FOR CONSTRUCTION. |
| | INTAKE PROTECTION BAG OR FILTER SACK | | |
| | INTAKE PROTECTION BAG, FILTER SACK OR MAGNETIC INLET PROTECTION | | |
| | EXISTING GRADE | | |
| | DIRECTION OF DRAINAGE | | |

STORMWATER POLLUTION PREVENTION PLAN - PRE/DURING-CONSTRUCTION

DATE	BY	DESIGNED	REVISION	DATE
	CMB	CMB		
		DRAWN		
		CHECKED		
		MDK		
LAST UPDATE: 02/20/15				
SHIVE-HATTERY ARCHITECTURE + ENGINEERING				
2839 Northgate Dr. Iowa City, IA 52245 www.shive-hattery.com				
319.354.3040 fax 319.354.5921 www.shive-hattery.com				
Iowa Illinois Indiana Missouri				
S-H Project No. 1133790				
FOX Engineering Associates, Inc.				
414 South 17th Street, Suite 107				
Ames, Iowa 50010				
Phone: (515) 233-0000				
FAX: (515) 233-0103				
FOX Engineering				
STORM WATER POLLUTION PREVENTION PLAN				
PHASE II WWTP IMPROVEMENTS				
CITY OF NORTH LIBERTY				
NORTH LIBERTY, IA				
PROJECT NO.				
2489-11A				
SHEET				
C001				



STORMWATER POLLUTION PREVENTION PLAN - POST-CONSTRUCTION

REVISION		DATE	
BY	DATE	BY	DATE
CHB		CHB	
CHB		CHB	
MDK		MDK	

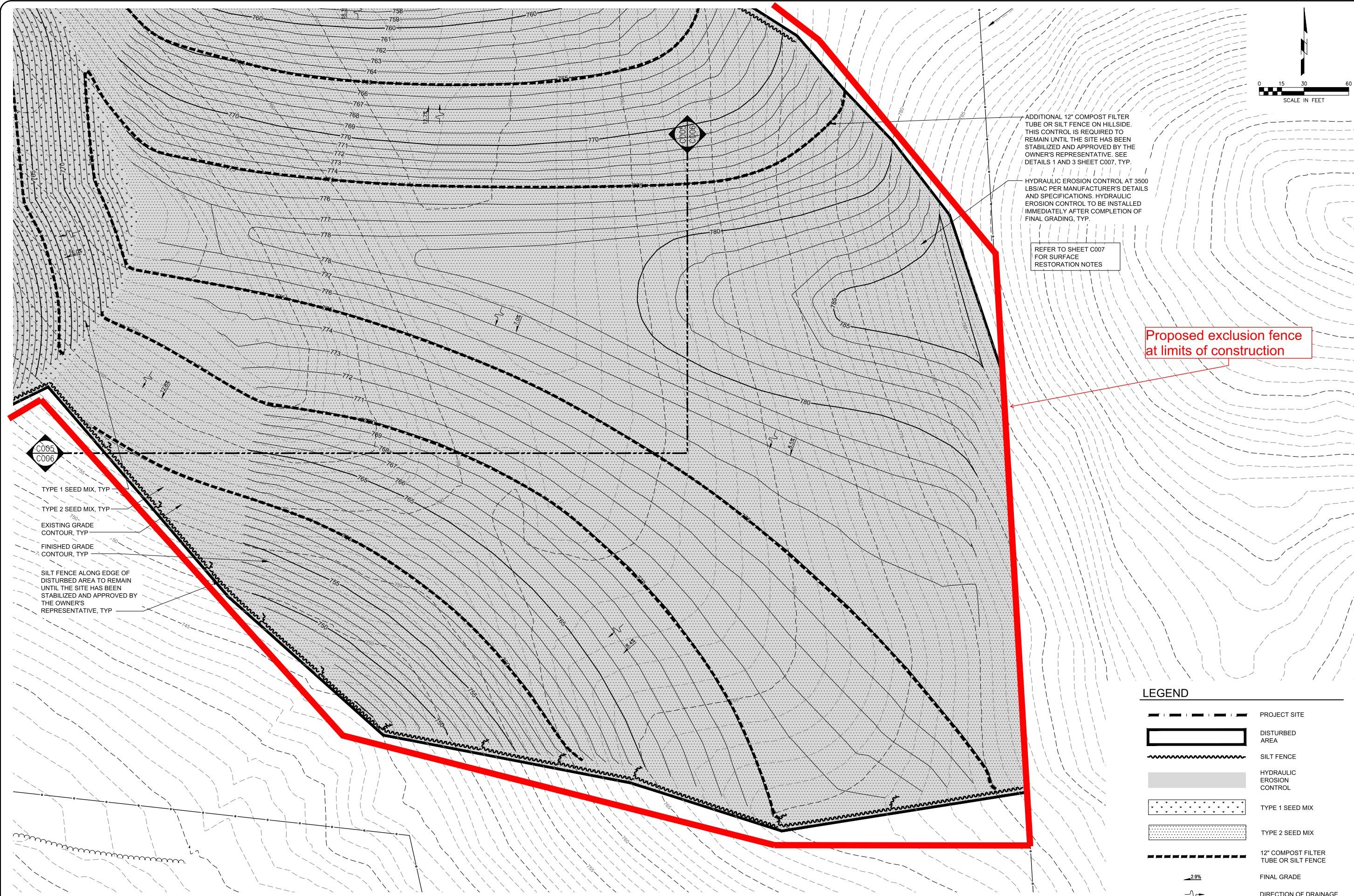
SHIVE-HATTERY
ARCHITECTURE + ENGINEERING
2839 Northgate Dr. | Iowa City, IA 52245
319.354.3060 | Fax 319.354.5921 | www.shive-hattery.com
Iowa | Illinois | Indiana | Missouri | S-H Project No. 1133790

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

STORM WATER POLLUTION PREVENTION PLAN
PHASE II WWTP IMPROVEMENTS
CITY OF NORTH LIBERTY
NORTH LIBERTY, IA

PROJECT NO.
2489-11A

SHEET
C005



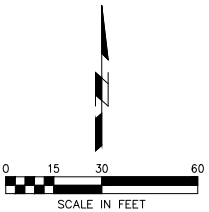
STORMWATER POLLUTION PREVENTION PLAN - POST-CONSTRUCTION

Proposed exclusion fence
at limits of construction

ADDITIONAL 12" COMPOST FILTER
TUBE OR SILT FENCE ON HILLSIDE.
THIS CONTROL IS REQUIRED TO
REMAIN UNTIL THE SITE HAS BEEN
STABILIZED AND APPROVED BY THE
OWNER'S REPRESENTATIVE. SEE
DETAILS 1 AND 3 SHEET C007, TYP.

HYDRAULIC EROSION CONTROL AT 3500
LBS/AC PER MANUFACTURER'S DETAILS
AND SPECIFICATIONS. HYDRAULIC
EROSION CONTROL TO BE INSTALLED
IMMEDIATELY AFTER COMPLETION OF
FINAL GRADING, TYP.

REFER TO SHEET C007
FOR SURFACE
RESTORATION NOTES



LEGEND

- PROJECT SITE
- DISTURBED AREA
- SILT FENCE
- HYDRAULIC EROSION CONTROL
- TYPE 1 SEED MIX
- TYPE 2 SEED MIX
- 12" COMPOST FILTER TUBE OR SILT FENCE
- FINAL GRADE
- DIRECTION OF DRAINAGE

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FOX engineering

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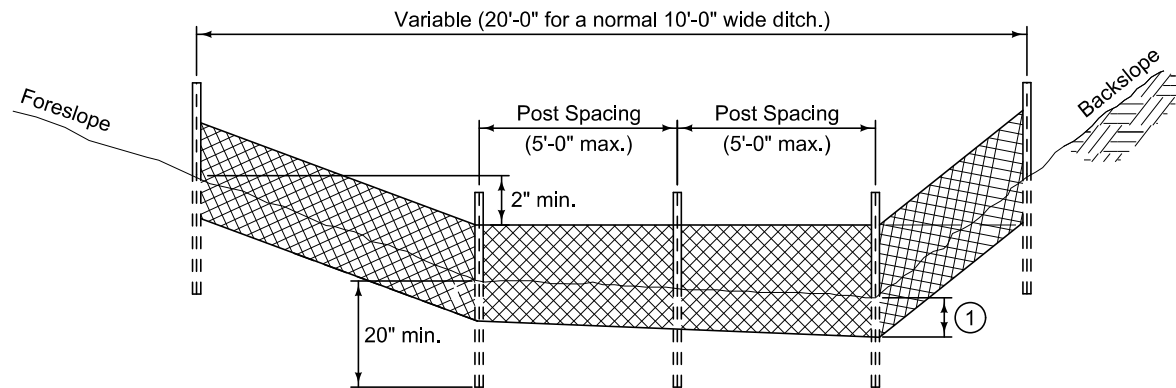
SHEET
C006

DATE	BY	REVISION
	CHB	DESIGNED
	CHB	DRAWN
	MDK	CHECKED
		LAST UPDATE: 02/20/15

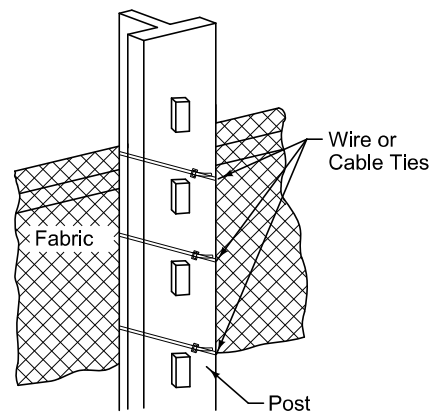
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APPENDIX C: SILT FENCE STANDARD AND SPEC




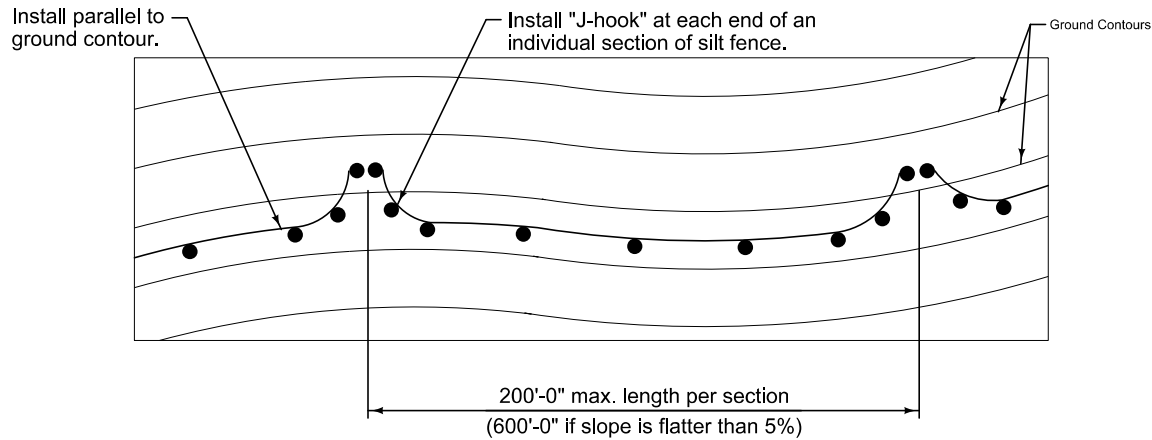
TYPICAL SILT FENCE DITCH CHECK



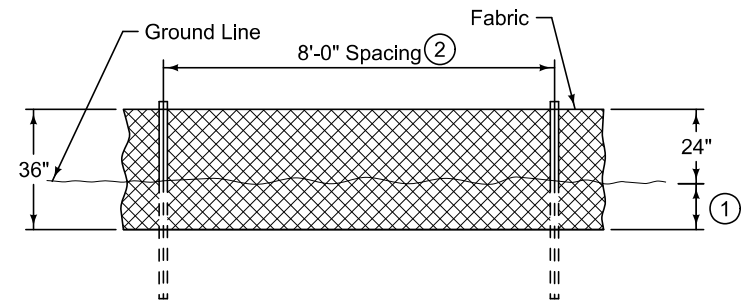
ATTACHMENT TO POST

- ① Insert 12 inches of fabric a minimum of 6 inches deep (fabric may be folded below the ground line).

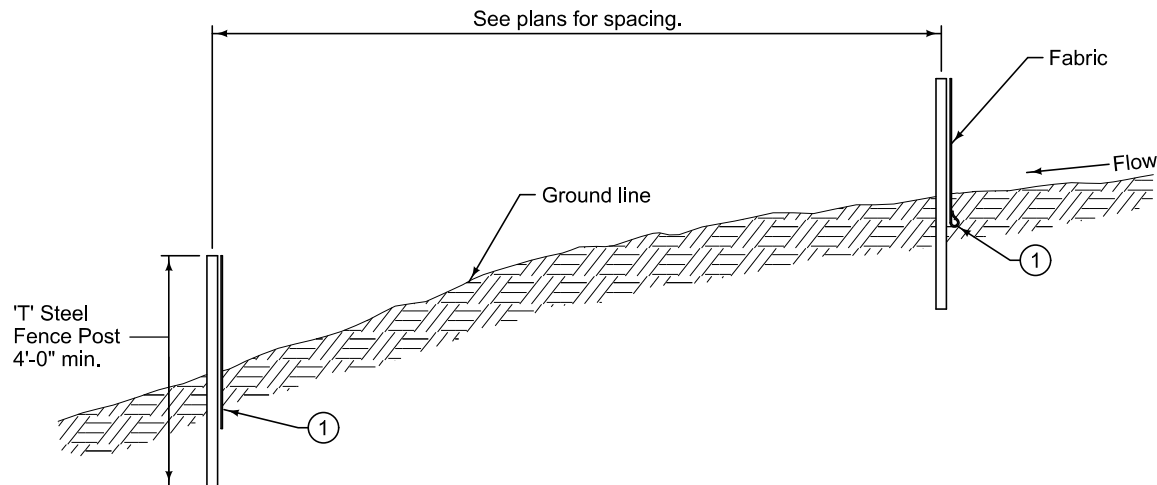
	REVISION	
	2	10-21-14
	9040.119	
	SHEET 1 of 2	
SUDAS Standard Specifications		
SILT FENCE		




TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Plan View)



DETAILS OF SILT FENCE ON LONGITUDINAL SLOPES



TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Profile View)

	REVISION	
	2	10-21-14
	9040.119	
	SHEET 2 of 2	
SUDAS Standard Specifications		
SILT FENCE		

Section 4196. Engineering Fabrics

4196.01 general requirements.

A. Meet the following requirements for engineering fabrics (known as geotextiles):

1. Permeable, synthetic textile materials suitable for use with soil, rock, or other geotechnical engineering related materials as an integral part of a highway project, structure, or system.
2. Mildew, rot, insect, and rodent resistant.
3. Inert to commonly encountered chemicals found in soil.
4. During all periods of shipment and storage, the fabric is maintained by wrapping in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, mud, dirt, dust, and debris.
5. Free of defects or flaws which significantly affect its physical properties.

B. Comply with [Materials I.M. 496.01](#) for inspection and acceptance of engineering fabrics. Label each roll of fabric in a shipment with a number or symbol to identify the production run. Meet the following additional fabric requirements for the specific applications:

1. Silt Fencing.

a. Meet the following requirements:

- 1) Woven material with a minimum width of 36 inches (0.9 m).
- 2) Top edge of the fabric hemmed or modified otherwise so that a braided cord or woven belt can be suitably attached for loop tying to fence posts.
- 3) The cord or belt of minimum tensile strength of 150 pounds (670 N).
- 4) Fabric and any reinforcing plastic netting contains or is treated with ultraviolet stabilizers, sufficient to prevent damaging deterioration for 2 years of outdoor exposure.
- 5) Has the properties listed in Table 4196.01-1.

b. The fabric may be reinforced with plastic netting of nominal 3/4 inch (19 mm) strand spacing and a minimum three strand grab strength of 40 pounds (180 N) and 15 pounds (70 N) after the same accelerated weathering as required for the fabric. Fabric that is reinforced in this manner may have lower grab strengths as indicated.

Table 4196.01-1: Silt Fencing Fabric Properties

Property	Value	Test Method No.
Grab Strength, dry, minimum average		
fill direction	100 lbs. (445 N)	ASTM D 4632
run direction ^(a)	150 lbs. (667 N)	
Ultraviolet Stability (Retained Strength)	70%	ASTM D 4355
Permittivity	0.05	ASTM D 4491
Apparent Opening Size, maximum	US mesh 30 (600 µm)	ASTM D 4751
(a) When plastic net reinforcing is used, ensure the minimum average grab strength requirement for fabric, before and after accelerated weathering, is 100 pounds (445 N) and 35 pounds (155 N), respectively. Apply the grab strength to both the fill and run direction.		

APPENDIX D: SAMPLE DAILY LOG FORM

Daily Log – Environmental Inspection – Ornate Box Turtle (OBT)

North Liberty East Growth Water and Sewer Expansion

Griggs Environmental Strategies, Inc. (GES)

Inspector: _____

Date: _____

Weather at Time of Inspection

Temperature: _____ °F

Approximate Precipitation over past 24 hours: _____ inches

Cloud Cover: Clear Partly cloudy Cloudy

Anticipated location of Today's Construction Activities: Stations _____ to _____

Project Corridor was inspected for OBT at: _____ am

OBT found in Project Area during Inspection: Yes or No

If Yes, GES contacted at: _____ am

GES arrived on-site at: _____ am/pm

If No, Contractor was given go ahead to begin activities at: _____ am

Today's Construction Activities ended at: _____ pm

OBT found in Project Area during the construction day: Yes or No

If Yes, GES contacted at: _____ am/pm

GES arrived on-site at: _____ am/pm

Comments: _____

Contact: Kevin Griggs at 515.230.7044 (cell) or Bill Martin at 515.230.9588 (cell)

Daily logs should be emailed or faxed at the end of each week to Kevin Griggs at kevin@griggs-es.com or 515.724.7018.