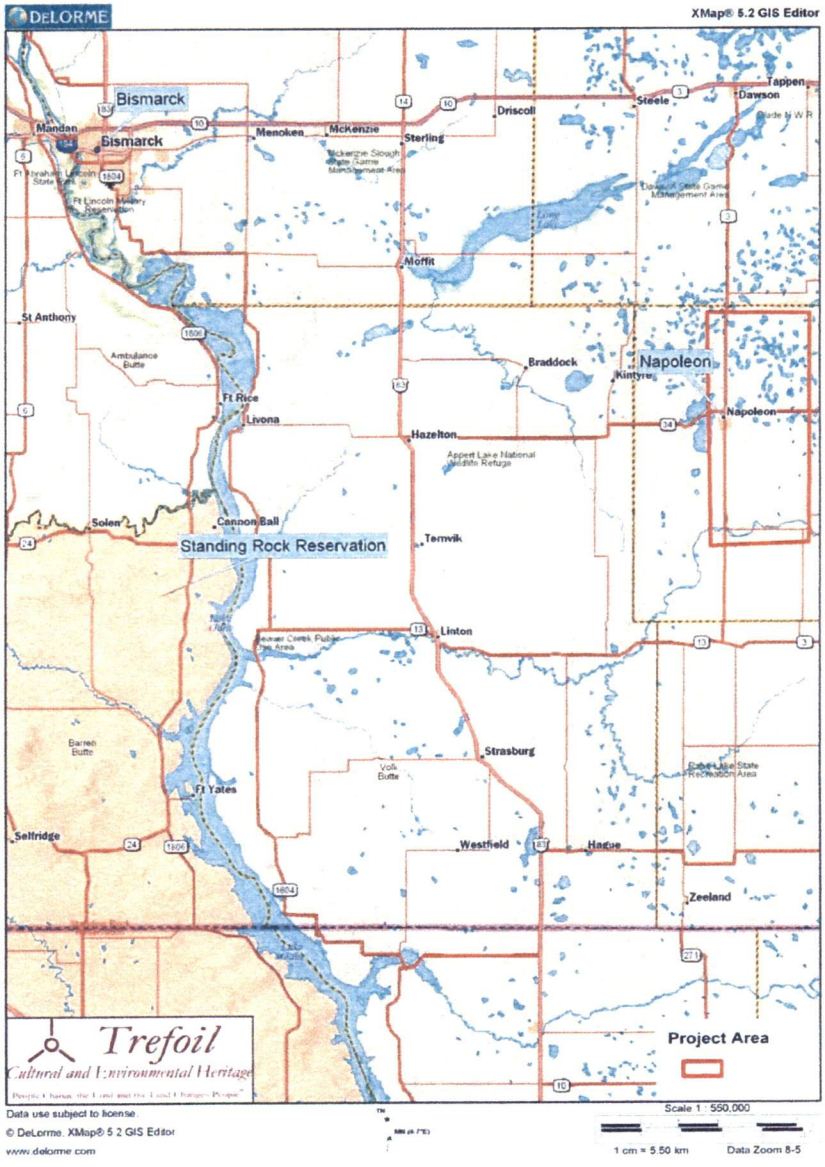
DeLORME
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Bismarck
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Ft Rice
Livona
Braddock
Kintyre
Napoleon
Napoleon
Hazelton
Aspert Lake National Wildlife Refuge
Solen
Cannon Ball
Standing Rock Reservation
Ternvik
Linton
Barren Butte
Strasburg
Volk Butte
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Westfield
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Cultural and Environmental Heritage
Project Area
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Scale 1 : 550,000
1 cm = 5.50 km
Data Zoom 8-5

Cultural Resources Survey Methodology

1. Visual inspection of a 200m x 200m area at each turbine location for above ground indicators and landscape features that may indicate earthworks, burial mounds or cemeteries.
2. Pedestrian survey of project APE by experienced crew members where surface visibility was moderate to excellent (30% to 100% ground surface exposure) using parallel transects not more than 15 meters apart. Pedestrian survey was conducted to locate artifacts, features, architectural remains and other evidence of human occupation or utilization. Pedestrian survey was not conducted in areas with extremely steep slopes (>15%), or in areas covered with standing water.
3. Manual ¾ inch soil probes and/or shovel testing at each turbine location to confirm adequacy of pedestrian survey. Subsurface testing was used to assess landform, assess soil integrity, and to check for buried soil horizons in areas covered by pedestrian survey. Basic stratigraphy of soils was recorded. Presence of buried soil horizons was taken as an indicator that pedestrian survey was an insufficient survey technique. Areas visibly eroded to subsoil were determined suitable for pedestrian survey with minimal of subsurface testing.
4. One to four shovel tests at turbine locations not suited to pedestrian survey because of low visibility or presence of buried soils and in areas considered high potential by investigators. Shovel tests were typically 35 to 40 centimeters (cm) in diameter, and were excavated to culturally sterile subsoil. Sterile subsoil is defined as subsolum or C-horizon, ranging from 10 to 90 centimeters in depth. All shovel test soil was screened through ¼ inch hardware cloth and examined for artifacts and ecofacts. Soil descriptions, generalized colors and basic stratigraphy were recorded for each test, and the test holes were immediately back filled. Artifacts were photographed, identified and left in the field. Shovel tests were not placed in areas with steep slopes (>15%), or in areas covered with standing water.
5. All tests and survey areas were mapped using GPS with an accuracy of 6m or more.
6. Identification of site boundaries (if any) using appropriate Phase I methodologies, including, but not limited to, surface collection and shovel testing.

Stone Features Survey Protocol

Stone features are a particular concern in North Dakota as they can represent archaeological sites as well as Native American traditional use areas. For this reason a special protocol is used for these features. Stone features are any human constructed pile of stones and can include, but are not limited to stone circles, tipi rings, cairns (piles), linear features, and enclosures.

1. Field stone piles that are obviously of recent agricultural nature are excluded from this protocol. Such piles are identified by size (generally larger than 10 feet by 10 feet), presence of extremely large blocks (boulders), presence of large rocks scarred by machinery, and location on field edges or in enclosures. Absence of lichen or stones embedded in sod is not in and of itself sufficient to indicate a stone pile is of recent origin. Historic or prehistoric features that have been mechanically disturbed should not be categorized as field stone piles.
2. Stone features are not to be disturbed by moving or displacing stones. Assume the feature has traditional use or burial significance unless determined otherwise.
3. Shovel testing should not be conducted on the landform containing the stone feature. If the landform cannot be clearly defined, shovel testing should not be conducted within 250 feet of the stone feature.
4. Stone features should be photographed from several angles including a photograph that illustrates their setting in the landscape.
5. Maximum, minimum and average size of stones composing the feature should be measured.
6. Lichen growth, presence of sod build-up around stone and other indicators of aging should be made. No assumptions about age should be made, however.
7. Features should be measured and orientation noted. Sketch map should be made. If feature has figural elements (e.g. a "medicine wheel") a scale plan should be made.
8. GPS measurement of center of feature should be made. If the feature is large, multiple GPS measurements including center and perimeter should be made.
9. Identify the land owner or user and collect information as appropriate.
10. Locational and descriptive information should be treated as confidential. Do not reveal the location of these features.

EXHIBIT J: GLO SURVEY (1883)

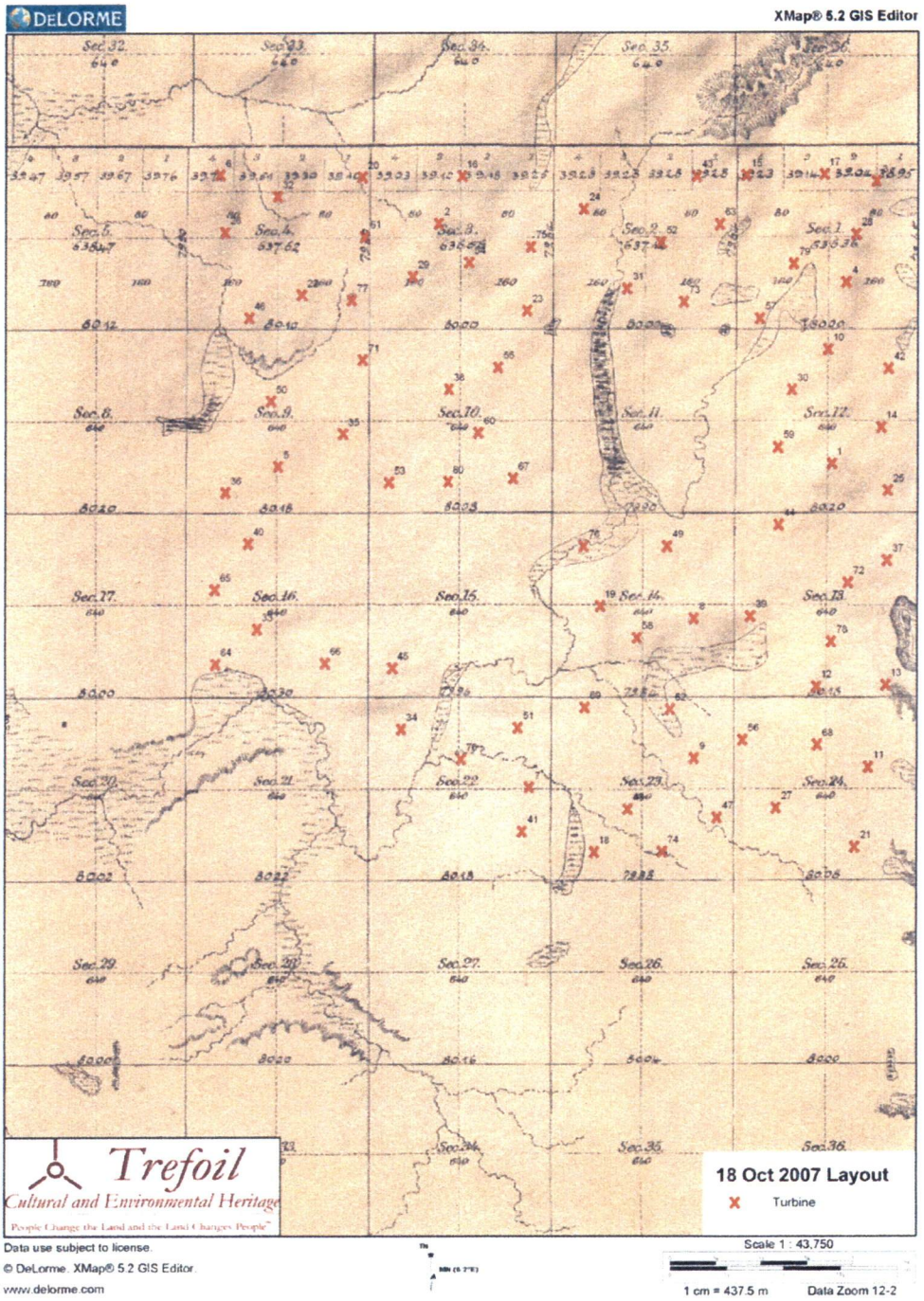


EXHIBIT K: ANDREAS ATLAS (1885)

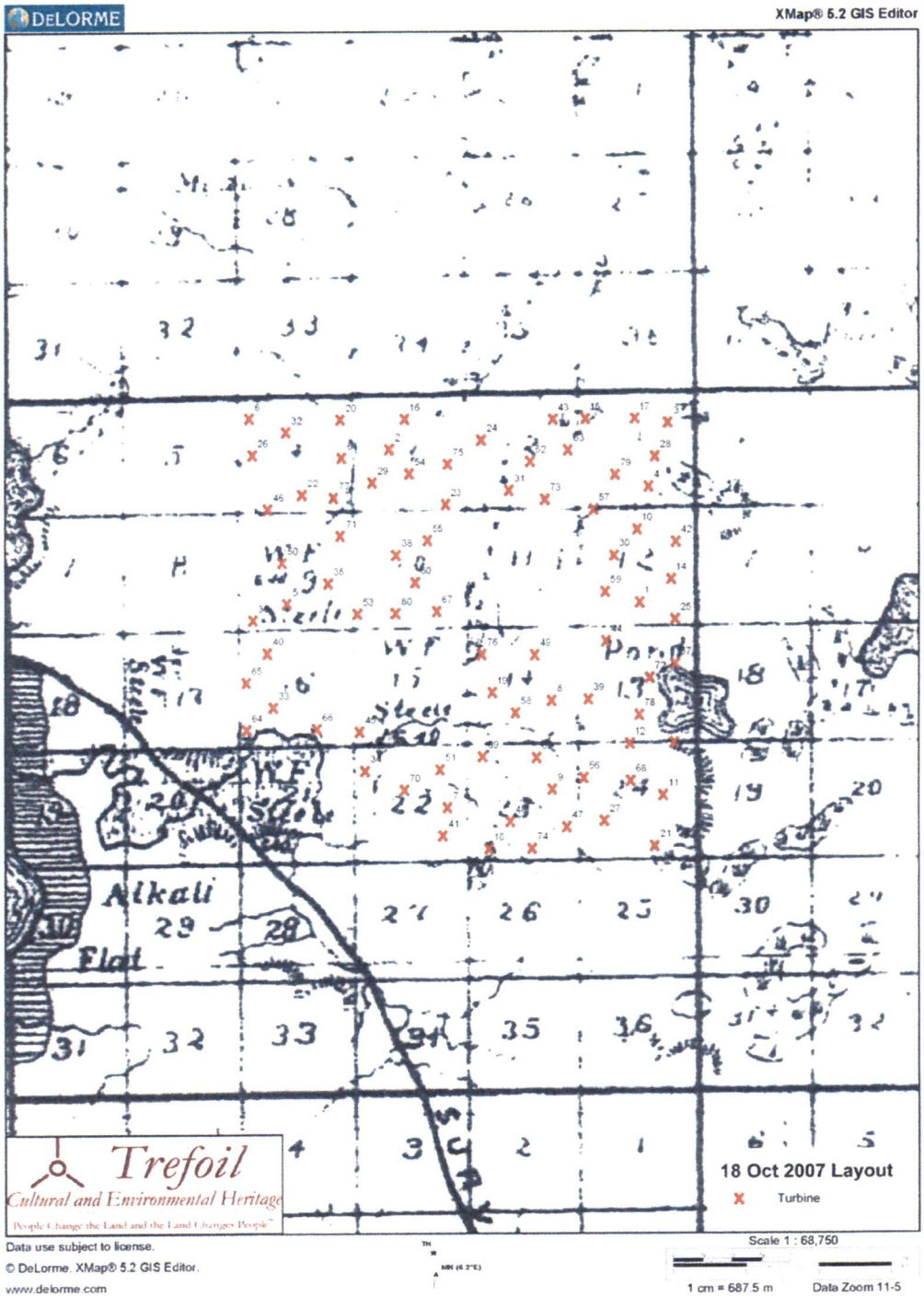


EXHIBIT L: 1916 PLAT MAP

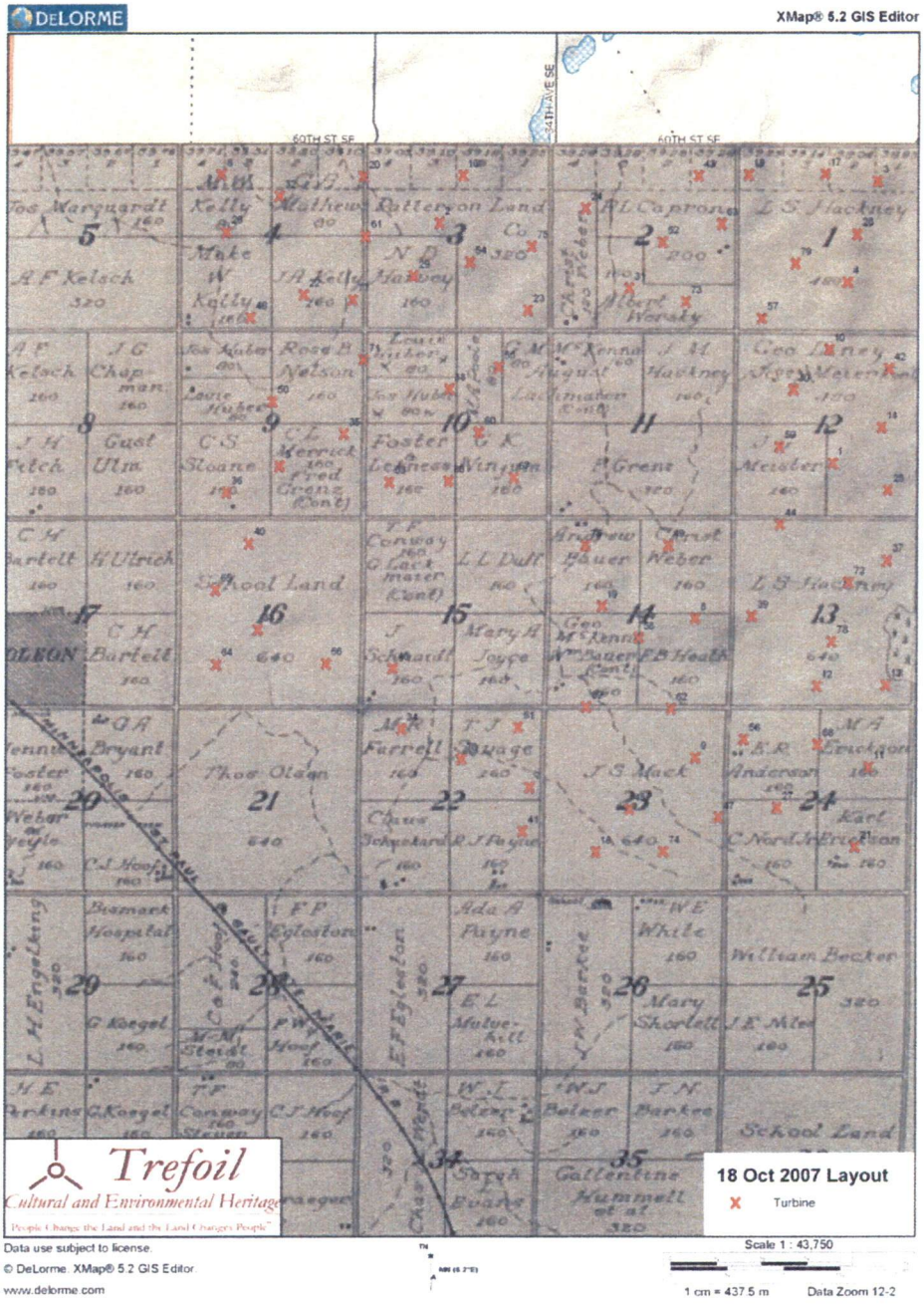


EXHIBIT M: PEDESTRIAN SURVEY

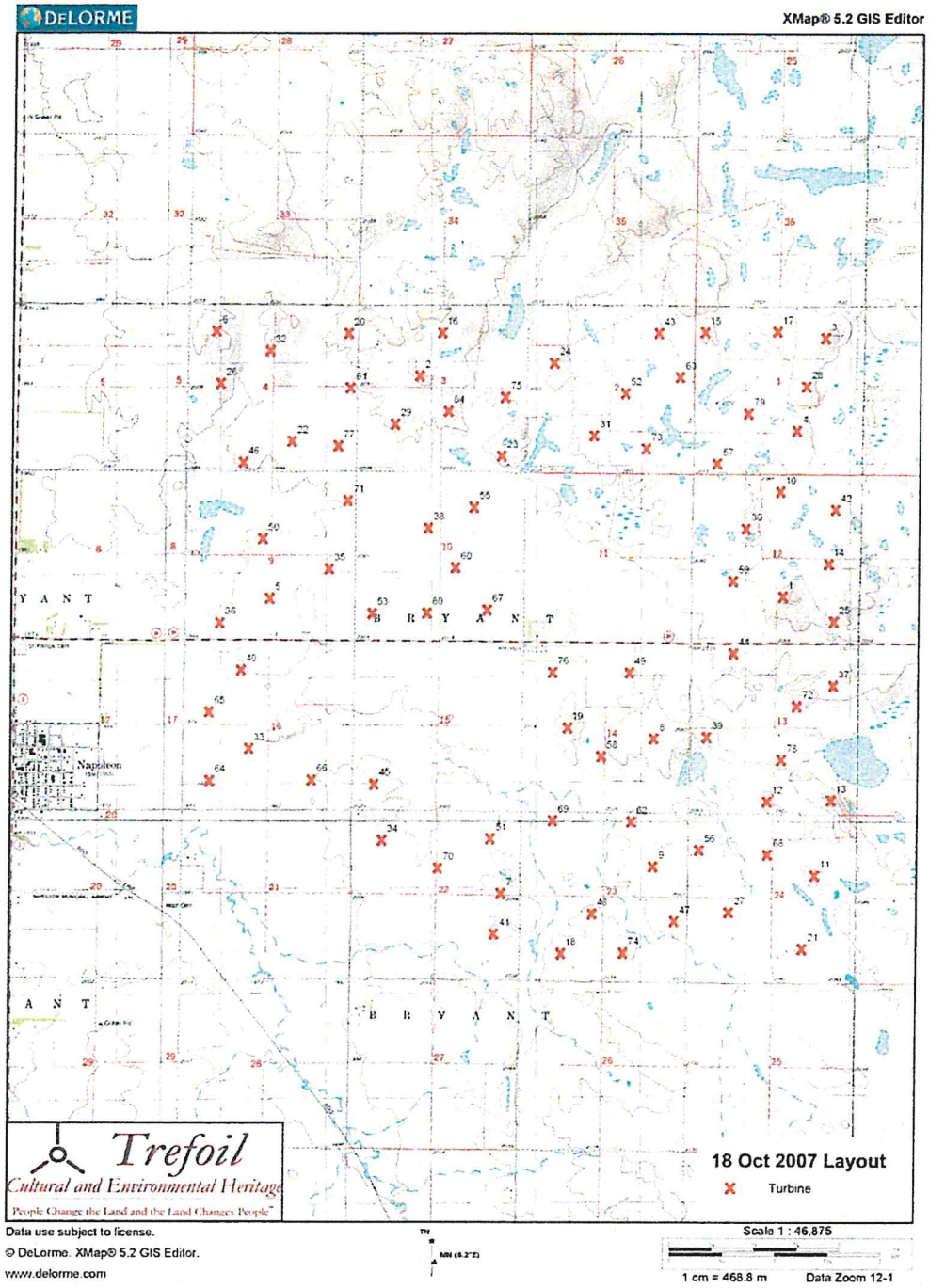


EXHIBIT N: SOIL PROBES

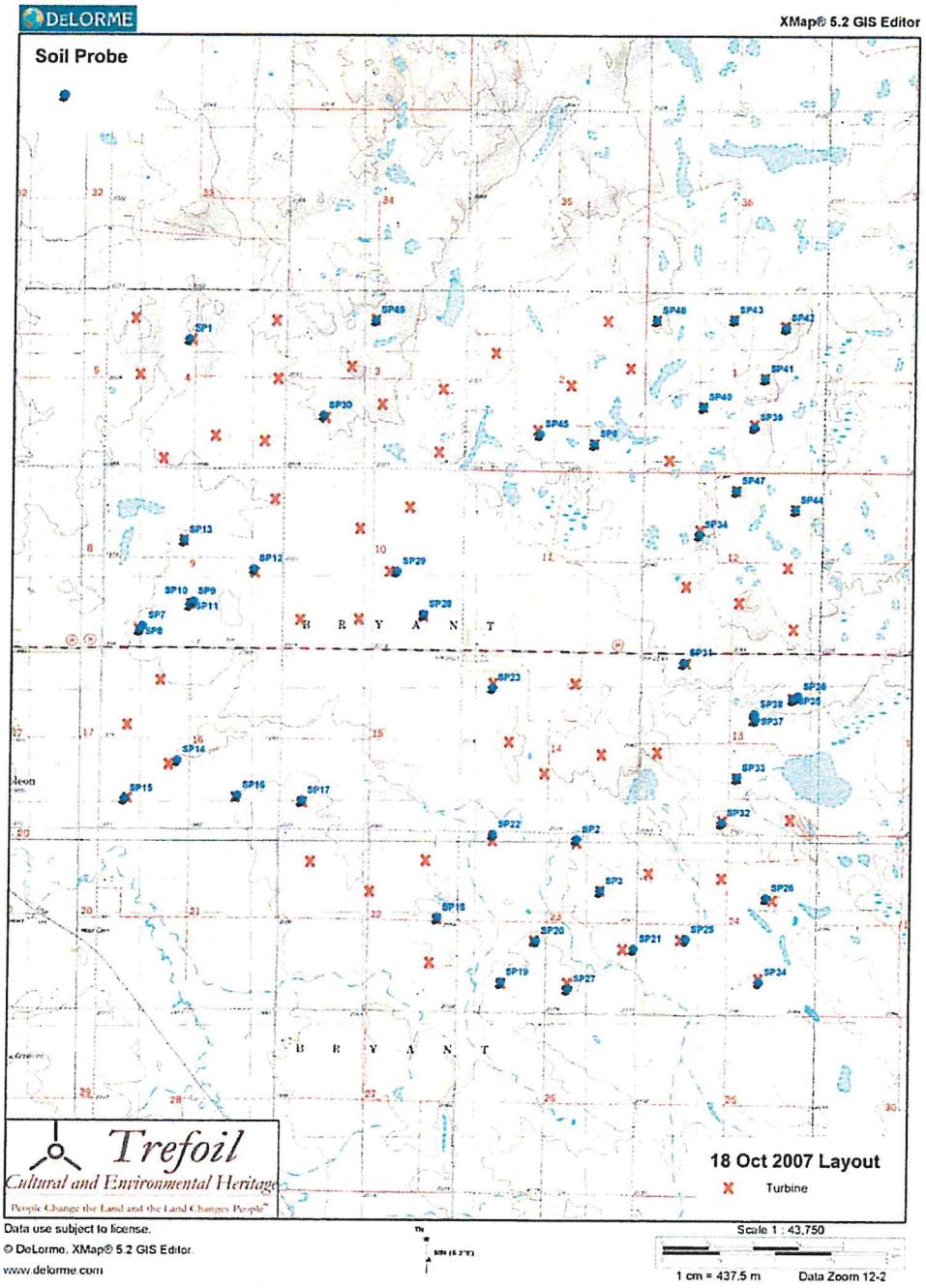


EXHIBIT O: SOIL PROBE LOG

SP #	Sediments	Comment
SP1	44-80 pale loam/silt loam and gravel	Continued from ST2, close interval surface survey 60m out from ST2 to west
SP2	0-12 brown silt loam 12-28 red brown silt loam, heavily oxidized 28-40 gray silt loam, silt with pebbles	Field recently cultivated and plowed, low color contrast hinders visibility somewhat, abundant cobbles in field
SP3	0-15 brown silt loam 15-40 gray silt loam, silt heavily oxidized	
SP4	0-30 dark brown silt loam 30-60 tan silt loam/silt, hard packed	Too close to trans. Line probably 1/3 of area in grass, poor visibility, focused on wheat field in N 80-90% visibility
SP5	0-20 brown silt loam 20-30 brown silt loam transitional 30-60 gray silt loam/silt hard pack some gravel	Turbine is in grass, used freshly tilled field to east, 80-90% visibility
SP6	0-20 brown silt loam 20-30 brown silt loam transitional 30-60 gray silt loam/silt hard pack some gravel	Turbine is in grass, used freshly tilled field to east, 80-90% visibility
SP7	0-19 pale brown silt loam 19-25 transitional to gray silt loam, silt with gravel 25-35 gray silt loam/silt gravel can not penetrate	
SP8	0-14 dark brown silt loam 14-26 transitional as in SP7 26-40 as in SP7	Pedestrian survey negative
SP9	0-15 light brown silt loam 15-25 transitional 25-35 tan silt/silt loam, abundant gravel	
SP10	0-15 light brown silt loam 15-25 transitional 25-35 tan silt/silt loam, abundant gravel	
SP11		Very distinct gravel layer, drainage? Pedestrian survey negative, sunflower stubble visibility 70-80%
SP12	0-20 light brown silt loam, abundant gravel 20-30 tan silt/silt and gravel layer	Pedestrian survey negative, sunflower stubble excellent visibility
SP13	0-20 brown silt loam, gravel 20-25 transitional 25-40 gray silt/silt loam abundant	

	gravel	
SP14	0-25 brown silt loam, few pebbles 20-25 transitional 25-40 gray silt/silt loam, abundant gravel	Unharvested sunflower, pedestrian survey negative, visibility excellent
SP15	0-20 brown silt loam 25-30 transitional 30-35 tan silt/silt loam hard packed	Unharvested sunflower, visibility excellent
SP16	0-30 brown silt loam, some gravel 30-40 tan silt/silt loam, gravel, very hard packed	Pasture land
SP17	0-15 brown silt loam 15-25 transitional 25-40 tan silt loam/silt, some pebbles	Pasture land, used as "utilitarium" for farm, some disturbance
SP18	0-25 brown silt loam 25-30 transitional 30-40 tan silt, hard packed	Pedestrian survey negative, nice spot good visibility, approach .5 N from field edge E
SP19	0-30 brown silt loam 30-40 hard packed tan silt/silt loam	Tilled grain field visibility excellent
SP20	0-13 brown silt loam 13-16 transitional 16-20 red tan silt loam/ silt (oxidized) 20-25 transitional 25-40 gray silt loam/silt with tan mottling	Pedestrian survey negative, grain field tilled
SP21	0-18 brown silt loam 18-22 transitional 22-40 gray scale/silt loam	Heavy corn, but harvested strips, adjacent to road substituted 200x5m
SP22	0-20 brown silt loam 20-25 transitional 25-40 tan silt loam/silt	Heavy corn, surveyed harvested strip adjacent to road as substitute, pedestrian survey negative
SP23	0-30 brown silt loam 30-40 transitional 40-60 gray silt/silt loam 60-? Hard rock, gray silt	On edge of heavy corn
SP24	0-25 brown silt loam 25-30 transitional 30-40 tan silt/silt loam, hard packed	Awful close to house, harvested sunflower, pedestrian survey negative great visibility
SP25	0-20 brown silt loam 20-25 transitional 25-35 tan silt loam hard packed	Pedestrian survey negative, visibility good (some snow)
SP26	0-25 brown silt loam 25-35 transitional/mixed	Pedestrian survey negative, moderate visibility

	35-45 tan silt/silt loam hard packed	
SP27	0-15 brown silt loam 15-20 transitional 20-40 gray silt loam	Pedestrian survey negative, in corn had to walk, visibility good
SP28	0-20 brown silt loam 20-25 transitional 25-40 tan silt/silt loam (soft until 40)	In prairie/pasture, 0% visibility
SP29	0-15 brown silt loam 15-25 transitional 25-40 tan silt/silt loam	Pedestrian survey negative, harvested sunflower good visibility
SP30	0-20 brown silt loam 20-40 tan silt/silt loam, abundant oxidization	Harvested sunflower good visibility pedestrian survey negative
SP31	0-3 brown silt loam 3-? Hard pack tan silt, abundant gravel	Area 1/3 cultivated, 2/3 grasses, visibility excellent in 1/2
SP32	0—5 brown silt loam 5-? Gravel, rocks, gray silt	Area not suitable for shovel testing
SP33	0-5 brown silt loam 5-? Gray silt and gravel	Surface visibility good, area heavily grazed, rock pile has modern trash 1950+
SP34	0-5 brown silt loam 5-? Gray silt and gravel	Area not suitable for shovel testing
SP35	0-25 brown silt 25-50 tan silt/silt loam	In a low lying area
SP36	0-5 brown silt loam 5-20 tan silt/silt loam and gravel	On slope
SP37	0-5 brown silt loam 5-20 tan silt and gravel	
SP38	0-15 brown silt loam 15-30 tan silt/silt loam and gravel	Overgrazed, good visibility
SP39	0-15 brown silt loam 15-40 gray silt and gravel	
SP40	0-20 brown silt loam 20-40 gray silt/silt loam and gravel	Access road is from the wet, heavily grazed visibility good
SP41	0-15 brown silt loam 15-30 gray silt/silt loam	Visibility is moderate to poor
SP42	0-5 brown silt loam 5-40 gray silt and gravel	Area has little soil, very rocky, not suitable for shovel testing
SP43	0-5 brown silt loam 5-30 gray silt loam/silt and gravel	Too rocky, too little soil to shovel test
SP44	0-10 brown silt loam 10-40 gray silt/silt loam	
SP45	0-15 brown silt loam 15-20 transitional 20-30 tan silt/silt loam	Intact soils

	30-50 gray silt/silt loam	
SP46	0-20 brown silt loam 20-30 transitional 30-40 gray silt/silt loam	Grain field, excellent visibility
SP47	0-10 brown silt loam 10-40 gray silt/silt loam	Not suitable for shovel testing
SP48	0-5 brown silt loam 10-30 gray silt/silt loam	Not suitable for shovel testing
SP49	0-5 brown silt loam 5-20 gray silt/silt loam	Area is pasture heavily grazed, visibility is moderate, also walked, visibility moderate except the top where poor

EXHIBIT P: SHOVEL TESTS

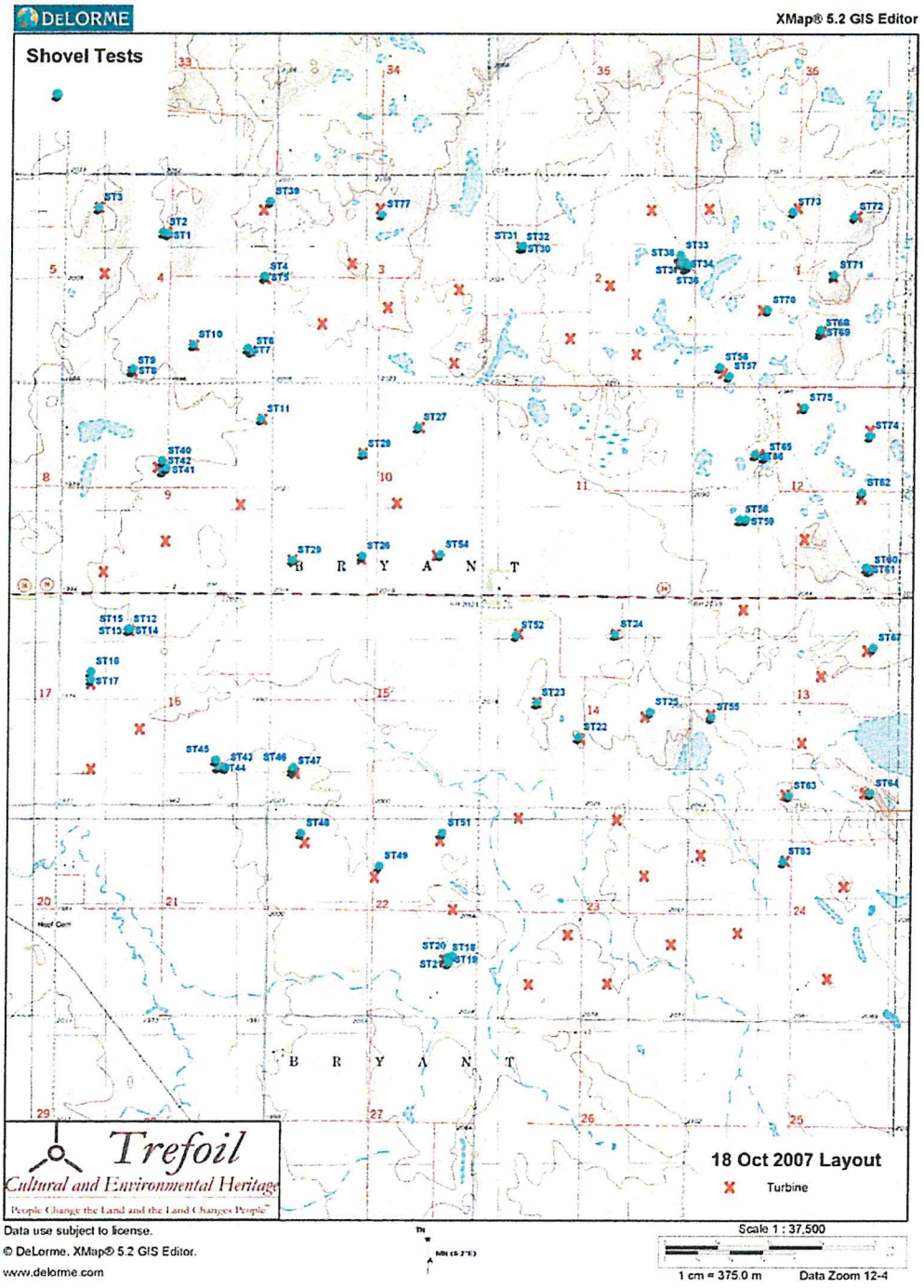


EXHIBIT Q: SHOVEL TEST LOG

ST #	Sediments	Cultural (Y/N)	Prehistoric (Y/N)	Historic (Y/N)	Comment
ST1	0-18 dark brown soil 18-35 tan silt loam	N	N	N	
ST2	0-20 dark brown silt loam 20-27 transitional, mixed 27-44 pockets of pale loam/silt loam and tan loam/silt loam	N	N	N	Continued with soil probe
ST3	0-18 dark brown silt loam with gravel and cobble 18-36 mixed tan loam/silt loam and gravel, oxidization of sediments 36-45 same, less oxidized	N	N	N	Close interval surface survey 150m sq. 40-50% visibility
ST4	0-35 brown silt loam, heavy gravel	N	N	N	Terminated, too rocky
ST5	0-35 brown silt loam and gravel 35-70 tan sand with gravel, extensive oxidization	N	N	N	
ST6	0-45 brown silt loam, few pebbles 45-60 transitional to tan silt loam 60+ gravelly	N	N	N	
ST7	0-20 brown silt loam with gravel 20-60 gray silt loam, few gravel, heavy limestone	N	N	N	
ST8	0-15 brown silt loam 15-30 hard pack tan clay	N	N	N	Silty clay, some pebble, some cobbles
ST9	0-15 brown silt loam 15-30 hard pack tan clay	N	N	N	0% visibility
ST10	0-15 brown silt loam 15-30 hard pack tan clay	N	N	N	Clay is very hard packed
ST11	0-15 brown silt loam 15-35 very hard packed tan clay	N	N	N	Some pebbles, some cobbles, 0% visibility
ST12	0-20 brown silt loam 20-70 loose gray loam	N	N	N	Silt loam with multiple pebbles
ST13	0-20 brown silt loam 20-70 loose gray loam	N	N	N	Same as ST12, 10 ft. spacing to east of ST12
ST14	0-20 brown silt loam 20-70 loose gray loam	N	N	N	Same as ST12, 10 ft. spacing to east of ST12
ST15	0-20 brown silt loam 20-70 loose gray loam	N	N	N	Same as ST12, 10 ft. spacing to east of ST12
ST16	0-20 20-40 dark brown silty loam	N	N	N	No pebbles

	40-60 tan/gray silty loam				
ST17	0-20 20-40 dark brown silty loam 40-60 tan/gray silty loam	N	N	N	Additional testing may be prudent in this area
ST18	0-30 dark brown sandy loam 30-70 gray loam/silt loam	N	N	N	Very few pebbles
ST19	0-20 dark brown silt loam 20-40 lighter brown silt loam 40-70 gray loam	N	N	N	
ST20	0-24 dark brown silt loam 24-45 tan silt loam, Very hard pack	N	N	N	
ST21	0-20 dark brown silt loam 20-39 light brown silt loam 39-60 gray silt loam/silt	N	N	N	
ST22	0-20 dark brown silt 20-35 light brown silt loam/silt 35-50 gray silt loam/silt	N	N	N	
ST23	0-15 pale brown silt loam 15-28 light brown silt loam/silt 28-35 tan silt loam/silt, Very hard pack	N	N	N	
ST24	0-7 dark brown silt loam 7-25 tan silt/clay with pebbles and cobble	N	N	N	Native grasses
ST25	0-20 brown silt loam 20-35 tan silt/silt loam	N	N	N	large cobbles and boulders, surveyed 200m of plowed fire break 4m to east
ST26	0-20 brown part silt loam 20-30 tan silt loam/silt 30-70 gray silt loam/silt and gravel	N	N	N	Walked 200x200m 50-60% visibility
ST27	0-15 dark brown silt loam 15-25 tan silt loam/silt 25-50 gray silt loam	N	N	N	Walked 200x200m 30-40% visibility
ST28	5-20 dark brown silt loam 20-30 tan silt loam/silt 30-60 gray silt loam/silt and gravel	N	N	N	200x200m 60-70% visibility
ST29	5-20 dark brown silt loam 20-30 tan silt loam/silt 30-60 gray silt loam/silt and gravel	N	N	N	200x200m 60-70% visibility
ST30	0-20 dark brown silt loam 20-40 tan silt loam/loam, very hard packed	N	N	N	Some boulders, did 3 shovel tests in cluster in packet of soil
ST31	0-20 dark brown silt loam 20-40 tan silt loam/loam, very	N	N	N	Some boulders, did 3 shovel tests in cluster in packet of

	hard packed				soil
ST32	0-20 dark brown silt loam 20-40 tan silt loam/loam, very hard packed	N	N	N	Some boulders, did 3 shovel tests in cluster in packet of soil
ST33	0-25 dark brown silt loam/loam 25-40 gray silt loam/silt	N	N	N	Area grassy, poor visibility, multiple burrows as substitute, 3 burrows + 1 shovel test in lower area
ST34	0-25 dark brown silt loam/loam 25-40 gray silt loam/silt	N	N	N	Area grassy, poor visibility, multiple burrows as substitute, 3 burrows + 1 shovel test in lower area
ST35	0-25 dark brown silt loam/loam 25-40 gray silt loam/silt	N	N	N	Area grassy, poor visibility, multiple burrows as substitute, 3 burrows + 1 shovel test in lower area
ST36	0-25 dark brown silt loam/loam 25-40 gray silt loam/silt	N	N	N	Area grassy, poor visibility, multiple burrows as substitute, 3 burrows + 1 shovel test in lower area
ST37	0-40 gray silt loam/silt, gravel	N	N	N	
ST38	0-40 gray silt loam/silt, gravel	N	N	N	
ST40	0-20 brown silt loam, gravel 20-25 transitional 25-40 gray silt/silt loam abundant gravel	N	N	N	Pedestrian survey negative, good visibility, used rodent burrows
ST41	0-20 brown silt loam, gravel 20-25 transitional 25-40 gray silt/silt loam abundant gravel	N	N	N	Pedestrian survey negative, good visibility, used rodent burrows
ST42	0-20 brown silt loam, gravel 20-25 transitional 25-40 gray silt/silt loam abundant gravel	N	N	N	Pedestrian survey negative, good visibility, used rodent burrows
ST43		N	N	N	Substitute animal burrows
ST44		N	N	N	Substitute animal burrows
ST45		N	N	N	Substitute animal burrows
ST46	0-20 brown silt loam 20-40 very hard pack tan silt	N	N	N	
ST47	0-20 brown silt loam 20-35 very hard packed tan silt loam with cobbles	N	N	N	
ST48	0-25 brown silt loam 25-40 tan silt loam some cobbles	N	N	N	Excellent visibility, difficult survey standing corn
ST49	0-20 brown silt loam 20-30 transitional, some gravel 30-50 tan silt loam, hard packed	N	N	N	Corn, excellent visibility walked in from N

ST51	0-20 brown silt loam 20-45 tan/gray silt, loam/silt mix	N	N	N	Standing corn, walked in from N
ST52	0-20 brown silt loam, gravelly 20-39 tan silt/ silt loam 39-70 gray silt/silt loam very gravelly	N	N	N	
ST53	0-20 brown silt loam 20-30 tan silt loam mixed with brown silt loam 30-50 gray silt/silt loam	N	N	N	Visibility poor(snow)
ST54		N	N	N	Used 3 rodent mounds as substitute
ST55	Little soil on hilltop, in place tan silt and gravel	N	N	N	Too much rock to subsurface test, substitute animal burrow
ST56	0-5 brown silt loam 5-? Gray silt and gravel	N	N	N	Area not suitable for shovel testing, substitute animal burrow (50% of burrows are false starts) did visual inspection
ST57	0-5 brown silt loam 5-? Gray silt and gravel	N	N	N	Area not suitable for shovel testing, substitute animal burrow (50% of burrows are false starts) did visual inspection
ST58	0-5 brown silt loam 5-? Gray silt and gravel	N	N	N	Area not suitable for shovel testing, substitute animal burrow (50% of burrows are false starts) did visual inspection
ST59	0-5 brown silt loam 5-? Gray silt and gravel	N	N	N	Area not suitable for shovel testing, substitute animal burrow (50% of burrows are false starts) did visual inspection
ST60	0-22 brown silt loam 22-32 transitional 32-50 gray silt/silt loam	N	N	N	
ST61	0-20 brown silt loam 20-35 gray silt/silt loam	N	N	N	Large animal burrow, walkover of area negative, some soil here could be tested
ST62	5-10 brown silt loam 10-? Gray silt/silt loam	N	N	N	Shallow soil expect rock, some pockets of soil, not suitable for shovel testing substitute 3 animal burrows, did thorough walkover

ST63	0-10 brown silt loam 10-30 gray silt/silt loam, gravel	N	N	N	Rodent burrow and downward slope substitute
ST64		N	N	N	Too little soil, too much rock, substitute 5 rodent burrows
ST65		Y	N	Y	Substitute animal burrows, several historic foundations near, all are recent 1940 or later and totally destroyed
ST66		Y	N	Y	Substitute animal burrows, several historic foundations near, all are recent 1940 or later and totally destroyed
ST67		N	N	N	Substitute animal burrows
ST68	0-20 brown silt loam 20-40 gray silt and gravel	N	N	N	
ST69	0-10 brown silt loam 10-30 gray silt and gravel	N	N	N	
ST70					3 rodent mounds, this is a midslope area protected from wind, IF2 – knife river flint
ST71	0-15 brown silt loam 15- gray silt loam	N	N	N	Substitute animal burrows, fence line runs directly through the turbine location
ST72		N	N	N	Substitute animal burrows
ST73		N	N	N	Substitute animal burrows
ST74		N	N	N	Not suitable for shovel testing, substitute animal burrows
ST75		N	N	N	Not suitable for shovel testing
ST76		N	N	N	Not suitable for shovel testing, substitute animal burrows
ST77		N	N	N	Not suitable for shovel testing, substitute animal burrows

EXHIBIT R: ARCHAEOLOGICAL SITES (2007)

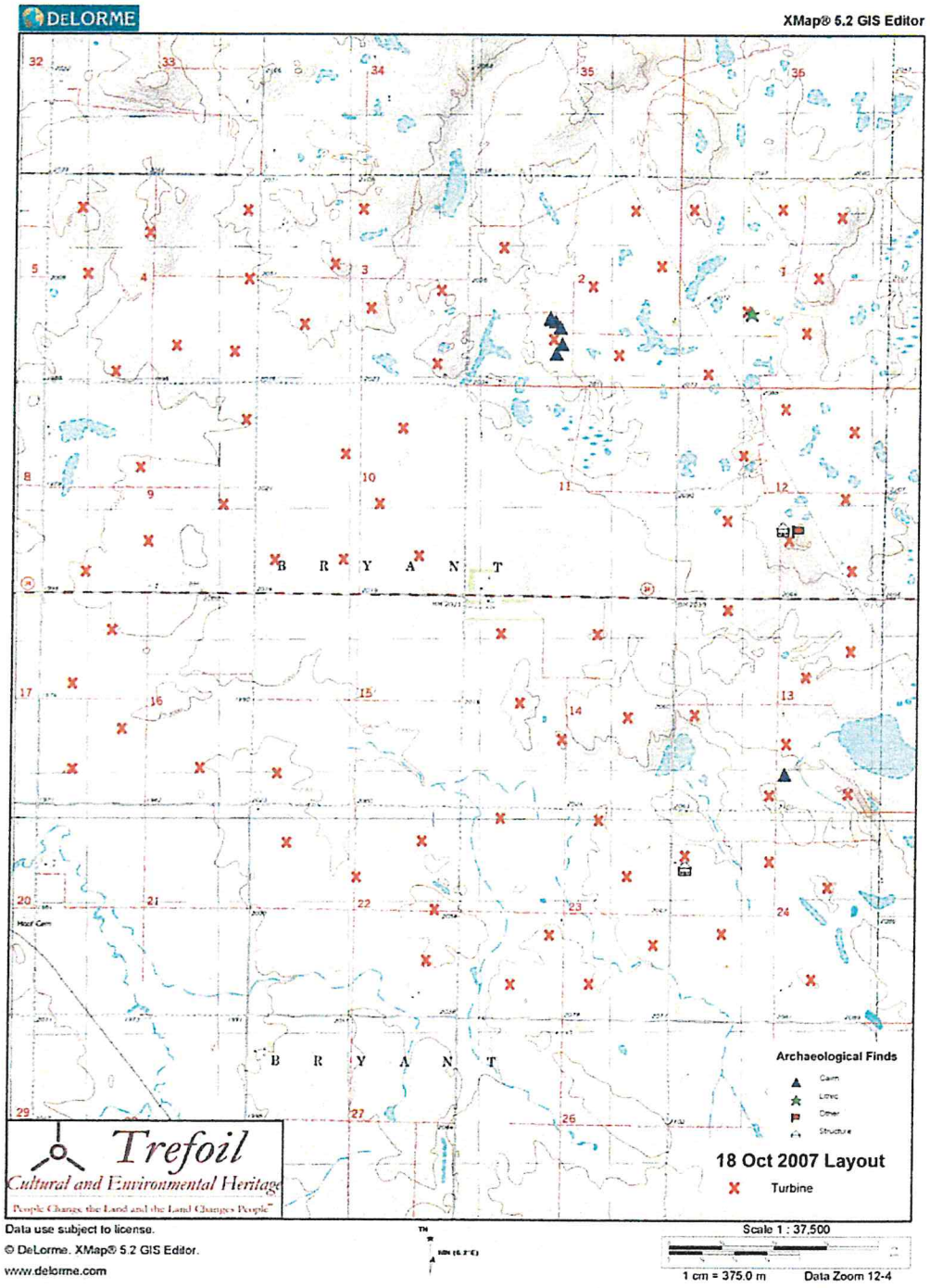
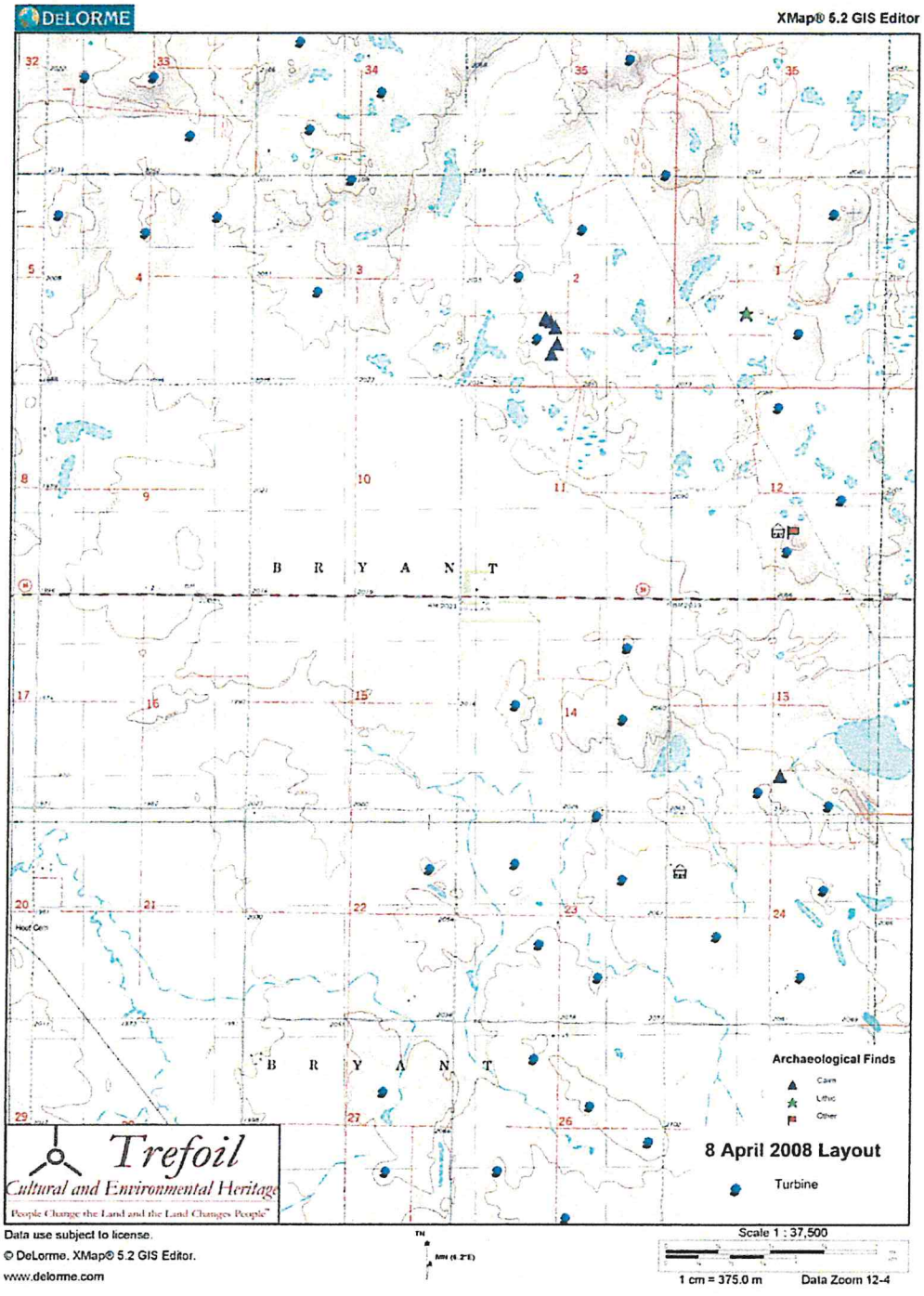


EXHIBIT S: ARCHAEOLOGICAL SITES AND 2008 TURBINE LOCATIONS



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Biological Resources
Affected Environment and Environmental Consequences

1.0 Introduction

Just Wind, LLC is proposing to construct a wind farm located in Logan County, North Dakota. The Logan County Wind Farm (LCWF) Project will be developed in two phases consisting of 150 Mitsubishi MWT 95/2.4 wind turbine generators with a nameplate wind generating capacity of approximately 360 megawatts.

The Mitsubishi MWT 95/2.4 wind turbine generators will be located in Bryant Township, Glendale Township and Starkey Township. A substation will be constructed as part of the project to accommodate 250 megawatts of power handling capacity. The substation will also be designed to accommodate a future expansion for an additional 250 megawatts of power handling capacity when the second phase is developed. The development of the LCWF Project will also include the associated underground power collection lines, the turbine access roads, underground telemeter communication system, and other associated equipment required for the successful operation of the wind farm.

The biological resource information will include a general description of the plant and animal communities for Phase I including the identification of any threatened and endangered species. This White Paper will deal with the affected environment and environmental consequences for the biological resources.

2.0 Vegetation

2.1 Affected Environment

The Phase I area for the proposed project includes a mix of cropland, pastureland, Natural Resources Conservation Reserve (NRCS) – Conservation Reserve Program (CRP) land, and a small urban area (see Attachment 1). The vast majority of the land is grassland/pasture and cultivated crops.

2.1.1 Native Vegetation

Native vegetation in the project area is mixed grass prairie of the Missouri Coteau and associated wetlands. This area is termed mixed grass because it contains a combination of tall grass species, typically found further east in the Drift Prairie region, and short grass species found further west in the Missouri Slope region. Native grass species in the mixed grass prairie typically consist of prairie junegrass, western wheat grass, blue gramma, green needlegrass, needle-and-thread, little bluestem and needle leaf sedge (National Cooperative Soil Survey). Tracts of woody vegetation are rare and limited to stands of aspen and willows. A more complete list of native vegetation commonly found in the region is listed below in Table 1.

Table 1. Predominant Natural Vegetation of the Mixed Grass Prairie (Missouri Coteau) (Hagen 2005).

Grasses	**Forbs**
western wheat grass	Pasque flower
blue gramma	Torch flower
green needlegrass	Yarrow
needle-and-thread	Gumweed
Prairie junegrass	Golden aster
Little bluestem	Prairie rose
Porcupine grass	Missouri milkvetch
Priaire cordgrass	Purple loco
Northern reedgrass	Lead plant
Plains muhly	Indian breadroot
Kentucky bluegrass	Purple prairie-clover
	Gaura
	Hairy puccoon
	Harebell
	Goldenrod
	Smooth fleabane
	Perennial ragweed
	Purple coneflower
	Upland wormwood
	Green sage
	Fringed sage

2.1.2 Existing Vegetation

Agriculture is by far the dominant land use with the project area and surrounding region. The lands within the region are generally managed either as rangeland for livestock production, for forage production, or it is annually tilled for the production of small grains and row crops. In much of the rangeland the stands of grass are managed for beef cattle production. These prairie ecosystems now contain both native and introduced species. Smooth brome grass (*Bromis inermis*) is commonly encountered nonnative species. The most common crops grown in the region include durum wheat, spring wheat, corn, soybeans, barley, sunflowers, oats, safflower, flax, and grass-legume hay. The region does, however, still have a considerable amount of native prairie. About 53% of the project area (approximately 5,599 acres) is comprised of pasture/range land, fallow cropland, and clover/wildflowers. Approximately 21% is small grains and hay (see Attachment 1). The remaining lands are a mixture of other crops, wetlands and rural residences.

2.2 Environmental Consequences

2.2.1 Proposed Action

The proposed action will have minimal impacts on the vegetation except in the immediate areas where the turbines are located. These impacts will be localized and will not have significant impacts to the overall project areas.

3.0 Wildlife

3.1 Affected Environment

3.1.1 Wildlife

Wildlife species within the region include upland game bird species, waterfowl, large game mammals, reptiles, amphibians, and small game mammals. Upland game bird species commonly seen in the region include gray partridge, sharp-tailed grouse, mourning doves, and ring-necked pheasant. Waterfowl species frequently encountered within the region include puddle ducks such as mallards, teal, pintail, and the northern shoveler, and diving ducks such as redheads, bluebills, and canvasbacks. Geese found in

the region include primarily snowgeese and canada geese. Tundra Swans also migrate through the region.

Large game mammals found in the region include white-tailed deer and occasionally mule deer and antelope. Small game mammals that are commonly hunted include red fox, coyote, cottontail rabbit, and white-tailed jackrabbit. Small game mammals that are trapped include raccoon, beaver, muskrat, mink, and badger. Reptiles and amphibians common within the region include toads, leopard frogs, chorus frogs, the tiger salamander, painted turtles and garter snakes (Hoberg and Gause, 1992). A more complete list of wildlife commonly found in the region is listed below in Table 2.

Table 2. Characteristic Wildlife Species of the Mixed Grass Prairie (Missouri Coteau) (Hagen 2005).

Birds		**Mammals**	**Reptiles and Amphibians**
American wigeon	Horned lark	White-tailed jackrabbit	Great plains toad
Green-winged teal	American crow	Snowshoe hare	Woodhouse's toad
Mallard	Eastern bluebird	Thirteen-lined ground squirrel	Northern leopard frog
Blue-winged teal	Common yellowthroat	Northern pocket gopher	Chorus frog
Northern shoveler	Clay-colored sparrow	Olive-backed pocket mouse	Tiger salamander
Gadwall	American bittern*	Western harvest mouse	Plains garter snake
Lesser scaup	Northern pintail*	Deer mouse	Common garter snake
Red-tailed hawk	Northern harrier*	Northern grasshopper mouse	Yellowbelly racer
American kestrel	Swainson's hawk*	Prairie vole	Bullsnake
Gray partridge	Ferruginous hawk*	Meadow vole	Plains spadefoot*
Ring-necked pheasant	Sharp-tailed grouse*	Meadow jumping mouse	Canadian toad*
Spotted sandpiper	Willet*	Coyote	Smooth green snake*
Killdeer	Upland sandpiper*	Red fox	Western hognose snake*
Mourning dove	Marbled godwit*	Raccoon	
Common nighthawk	Wilson's phalarope*	Badger	

Birds		Mammals	Reptiles and Amphibians
Western kingbird	Short eared owl*	Striped skunk	
Eastern kingbird	Loggerhead shrike*	White tailed deer	
Grass hopper sparrow*	Sedge wren*	Richardson's ground squirrel*	
Baird's sparrow*	Sprague's pipit*		
Le Conte's sparrow*	Lark bunting*		
Nelson's sharp-tailed sparrow*	Chestnut-collared longspur*		
Vesper sparrow	Dickcissel*		
Savannah sparrow	Bobolink*		
Western meadowlark	Brown-headed cowbird		

* Species identified as a conservation priority by the North Dakota Game and Fish Department.

Wildlife habitats within the project area can be categorized into open grassland and cropland habitat, rangeland habitat, and wetland habitat. The most abundant type of wildlife habitat in the project area is the open grassland and cropland habitat. These areas consist mostly of agricultural fields, field edges, and road ditches. Vegetative species include mostly smooth brome, goldenrods and wild rose in the road ditches and small grains and row crops in the fields. Wildlife species attracted to these areas include gray partridge, ring-necked pheasant, red fox, cottontail rabbit, and white-tailed jackrabbit.

Supplementing this habitat type are field and farmstead windbreaks that have been planted to reduce soil erosion in cropland areas and provide shelter for farms and feedlots. Species within the farmstead windbreaks vary with the most common species including ash, poplar, cottonwood, siberian elm, and caraganna (siberian peashrub). Field windbreaks contain fewer species including mostly siberian elm and green ash. These areas of woody vegetation provide cover and travel corridors for many wildlife species.

Rangeland habitat includes pasture, hayland, set-aside, and coulees. These areas are generally steeper in slope and are mostly used for cattle or hay production. Vegetative

species includes shrubs and both native and nonnative herbaceous plants. Wildlife species attracted to these areas include white-tailed deer, mule deer, antelope, coyotes, and sharp-tailed grouse. The rangeland and wooded coulee habitat is present primarily in the north east part of the project area. Woody vegetation is sparse and mostly found on the north slopes in steeper topography. Species include buckbrush, buffaloberry, ash, boxelder, and aspen.

Wetland habitat includes deep marshes, shallow marshes and seasonally flooded basins. The deep marshes are usually not cropped, while the shallow marshes can be cropped or grazed in during drier periods. Marshes generally contain surface water for most of the growing season, while seasonally flooded basins are dry by early summer. Vegetation commonly found in the shallow and deep marshes are cattails, bulrushes, rushes, sedges, smartweeds, mints and grasses.

Seasonally flooded basins are often converted to agricultural production except during wet conditions. Vegetative species that are commonly encountered include smartweeds, wild millet, foxtail, ragweed and goosefoot. Wildlife species attracted to wetland habitats include ducks, geese, raccoon, beaver, muskrat, and mink. Wetland habitat is present throughout the project site.

High value fish and wildlife habitats have been identified by USFWS as native prairie, wetlands, wooded draws and riparian forests, (Towner, April 4, 2008). The proposed wind tower locations were evaluated in April of 2008 and the habitat types were identified, see Table 3. Riparian forests and wooded draw were not identified within the project area. Wetlands and native prairie areas were identified throughout the project areas. Approximately eleven tower locations were within parcels of native prairie. The native prairie parcels were all being used for livestock production. Most of the pastured prairie areas appeared to contain some remnant native species, however many also contained introduced species as well.

US Fish and Wildlife Service easements are present throughout central North Dakota. These easements offer permanent protection for wetlands and grasslands. A number of areas at the project site are currently under a USFWS easement, (see Attachment 2). USFWS wetland easements protect wetlands from draining and filling activities. The majority of the wetland easements are located in the eastern part of the project area. There are two grassland easement parcels located at the project site. They are in section 1 and 13 of Bryant Township. Twelve wind tower locations are located on easement parcels (see Table 3). Eleven of these are located on wetland easement parcels. The wetland easements offer protection for the wetland areas only, while the upland (nonwetland) areas are not regulated.

Table 3. Proposed Wind Turbine Locations April 2008

Wind Turbine Location	Land Use – (April 2008)	Federal Easement	High Value Habitat[1]
Section 1 SE	Pasture	Wetland Easement	Native Prairie
Section 1 NE	Pasture	Grassland Easement	Native Prairie
Section 2 SW	Pasture	Wetland Easement	Native Prairie
Section 2 W2	Grass Cover – CRP (Brome mix)	Wetland Easement	No
Section 2 N2	Cropland – Small Grains/Row Crops	None	No
Section 3 SW	Cropland – Small Grains/Row Crops	None	No
Section 3 NE	Pasture/Row Crops	Wetland Easement	Native Prairie
Section 4 NWNW	Cropland – Small Grains/Row Crops	None	No
Section 4 SENW	Cropland – Small Grains/Row Crops	None	No
Section 4 NE	Cropland – Small Grains/Row Crops	None	No
Section 5 NESW	Cropland – Small Grains/Row Crops	None	No
Section 5 SWSE	Cropland – Small Grains/Row Crops	None	No
Section 5 SENE	Cropland – Small Grains/Row Crops	None	No
Section 8 SWNW	Cropland – Small Grains/Row Crops	None	No
Section 8 NENW	Cropland – Small	None	No

[1] Includes Native mixed-grass priaire, Wetlands, Wooded Draws and Riparian Forests.

Wind Turbine Location	Land Use – (April 2008)	Federal Easement	High Value Habitat[1]
	Grains/Row Crops		
Section 8 NE	Cropland – Small Grains/Row Crops	None	No
Section 12 E2SE	Pasture	Wetland Easement	Native Prairie
Section 12 W2SE	Pasture	Wetland Easement	Native Prairie
Section 12 N2	Pasture	Wetland Easement	Native Prairie
Section 13 SE	Pasture	Wetland Easement	Native Prairie
Section 13 SW	Pasture	Wetland Easement	Native Prairie
Section 14 W2	Cropland – Small Grains/Row Crops	None	No
Section 14 NE	Grass Cover – CRP (Brome mix)	None	No
Section 14 SE	Grass Cover – CRP (Brome mix)	None	No
Section 22 NE	Cropland – Small Grains/Row Crops	None	No
Section 23 NW	Cropland – Small Grains/Row Crops	None	No
Section 23 SW	Cropland – Small Grains/Row Crops	None	No
Section 23 S2NE	Cropland – Small Grains/Row Crops	None	No
Section 23 N2NE	Cropland – Small Grains/Row Crops	None	No
Section 23 SE	Cropland – Small Grains/Row Crops	None	No
Section 24 SW	Cropland – Small Grains/Row Crops	None	No
Section 24 NE	Pasture	Wetland Easement	Native Prairie
Section 24 SE	Cropland – Small Grains/Row Crops	Wetland Easement	No
Interconnection Point – Section 13 NE	Pasture	Grassland Easement	Native Prairie
Interconnection Point – Section 2 SESE	Grass Hay Production	Wetland Easement	No

3.1.2 Fish Habitat

Fish habitat is not present at the project site; however there are some waterbodies that provide fish habitat in the region. The McKenna Lakes complex located just west of

Napoleon offers some fishing opportunities for yellow perch and northern pike. Other waterbodies offering fishing opportunities in the region include Beaver Lake and Rudolf Lake. Beaver Lake is part of Beaver Lake State Park which is a park facility managed by the North Dakota Parks and Recreation Department. Beaver Lake is located approximately ten miles south east of the project site. It is managed for yellow perch and northern pike. Rudolf Lake is located approximately eight miles east of the project site and contains walleye and yellow perch.

3.1.3 Wildlife Management Areas

The nearest National Wildlife Refuge (NWR) to the project site is the Long Lake National Wildlife Refuge located in Moffit, North Dakota. It consists of 22,310 acres located in Burleigh and Kidder Counties. It is located approximately 15 miles from the project site. Long Lake is an alkaline lake that is up to 2 miles wide and 16 miles long. The Refuge contains 22,300 acres, 16,000 of which are lake bottom. The remaining acres contain mixed-grass prairie grasslands, ravines, cultivated fields, small tree and shrub plantings, and seasonal wetland basins. The NWR provides significant breeding habitat for many species of birds, and also provides a rest area for spring and fall migrations.

3.2 Environmental Consequences

3.2.1 Proposed Action

Potential impacts to the wildlife in the Phase I area would be primarily a result of impacts to their habitat, and impacts to the bird species migratory routes. A Habitat Conservation Plan will be developed for the LCWF that addresses the impacts that may occur as a result of the Project and the measures that will be undertaken to monitor, minimize and mitigate such impacts.

4.0 Aquatic Resources

4.1 Affected Environment

4.1.1 Lakes

Surface waters in the project area consist of wetlands and shallow lakes. The Mc Kenna Lakes are located just a couple of miles west of the project area. The North and South

Lakes along with some adjacent wetlands result in over 3,000 acres of surface water. These lakes are generally known as a resting place for migratory waterfowl. One small lake is present in the project area. It is located in section 13 of Bryant Township and is approximately 73 acres in size. Both the Mc Kenna Lakes and the small lake in Section 13 are classified by the NWI as L2ABG – Lacustrine Littoral Aquatic Bed Intermittently Exposed basins. These types of basins are generally less than two meters (6.6 feet) in depth and contain surface water throughout the growing season.

4.1.2 Wetlands

There are numerous wetlands in this region (see Attachment 3) varying form large areas with big lakes to small temporary seasonal wetlands. A wetland is and area that is inundated or saturated by surface or ground water long enough to support vegetation typically adapted for life in saturated soil. Numerous wetland areas dot the project area. According to the National Wetland Inventory (NWI) wetlands comprise approximately 625 acres or 6% of the project area. Most are seasonally flooded basins (Palustrine Emergent Seasonally Flooded - PEMC). Other wetland types include temporarily flooded basins (Palustrine Emergent Temporarily Flooded - PEMA) and semipermanently flooded basins (Palustrine Emergent/Aquatic Bed Semipermanently Flooded - PEM/ABF). Wetlands in the northeast part of the project area tend to be smaller and more numerous, (Sections 1, 2, 3, 11, and 12 of Bryant Township). While the remaining parts of the project area contain fewer wetlands but they tend to be larger in size (i.e. Sections 15 and 9 of Bryant Township).

4.1.3 Rivers and Streams

Rivers and streams are not present at the project site, however there are some creeks and coulees located south and west of the project. Beaver Creek is the nearest to the project site. Beaver creek is located approximately ten miles south east of the project site. It begins as an outlet to Beaver Lake located in Beaver Lake State Park and flows west to the Missouri River west of Linton.

4.2 Environmental Consequences

4.2.1 Proposed Action

Potential impacts to aquatic resources would primarily be a result of direct impacts due to the placement of the turbines and associated equipment; or due to stormwater runoff during construction activities and throughout operation of the LCWF. Direct impacts will be avoided as much as possible by placing the turbines such that the aquatic resources are avoided or minimally impacted. Stormwater pollution prevention plans will be prepared for the project area to address the effects of stormwater runoff during construction and throughout the operation life of the LCWF.

5.0 Rare, Threatened and Endangered Species

A request was submitted on March 19, 2008, to Mr. Jeffrey K. Towner of the USFWS in Bismarck, North Dakota for information on threatened and endangered species (see Attachment 4) that may be present in the project area. The USFWS responded by identifying whooping cranes (*Grus americana*) and piping plovers (*Charadrius melodus*) as species that are found in Logan County, North Dakota, (Towner, Jeffry K., 2008). The Whooping Crane is listed as endangered and the piping plover is listed as threatened.

5.1 Endangered Species

The only self-sustaining natural populations of whooping cranes migrate through western and central North Dakota counties during the spring and fall. They breed in Wood Buffalo National Park in Alberta and the Northwest Territories of Canada, and winter along the Texas coast. Specific occurrences of whooping cranes at the project site were not identified; however whooping cranes have been documented using roosting habitat in the vicinity of the proposed project area. The project site is located within a 90-mile wide migration corridor (see Attachment 5) that has been identified in North Dakota, (Towner, Jeffry K., 2008).

5.2 Threatened Species

Critical habitat for the piping plover includes alkali wetlands, wetland areas devoid of vegetation and their upland areas adjacent to these types of wetlands. This species

primarily nests on sandbars of the Missouri and Yellowstone Rivers, (Towner, Jeffry K., 2008). Occurrences of the piping plover were not identified by the USFWS at the project site or in the vicinity of the project.

5.3 Environmental Consequences

5.3.2 Proposed Action

Potential impacts to the threatened and endangered resources would primarily be a result of impacts to their habitat, and impacts to their migratory routes. A Habitat Conservation Plan will be developed for the LCWF that addresses the impacts that may occur as a result of the Project and the measures that will be undertaken to monitor, minimize and mitigate such impacts.

Physical Resources
Affected Environment and Environmental Consequences

1.0 Introduction

Just Wind, LLC is proposing to construct a wind farm located in Logan County, North Dakota. The Logan County Wind Farm (LCWF) Project will be developed in two phases consisting of 160 Siemens MWT92/2.3 wind turbine generators with a nameplate wind generating capacity of approximately 360 megawatts.

The Siemens MWT92/2.3 wind turbine generators will be located in Bryant Township, Glendale Township and Starkey Township. A substation will be constructed as part of the project to accommodate 250 megawatts of power handling capacity. The substation will also be designed to accommodate a future expansion for an additional 250 megawatts of power handling capacity when the second phase is developed. The development of the LCWF Project will also include the associated underground power collection lines, the turbine access roads, underground telemeter communication system, and other associated equipment required for successful operation of the wind farm.

The physical resource information will include a general description of the physical setting for the Phase I and Phase II areas including the land cover types, and the site soils and geology. The groundwater resources and surface water resources will also be characterized for the area. In addition, the existing air quality for the area will be characterized based on the published data and previous testing.

2.0 Land Cover Types

2.1 Affected Environment

The Phase I and Phase II areas for the proposed project includes a mix of cropland, pastureland, wooded areas, Natural Resources Conservation Reserve (NRCS) - Conservation Reserve Program (CRP) land, and a small urban area (see Attachment 1). The vast majority of the land is CRP-fallow cropland, or in small grains, hay, and

sunflowers. The following table provides a breakdown of the land cover types for the Phase I and Phase II areas per NRCS.

Table 1 - Land Cover Types (NRCS)

Land Cover Types	Phase I (Acres)	Phase I (%)	Phase II (Acres)	Phase II (%)
Urban	485.5	4.57%	591.2	2.53%
Woods	39.4	0.37%	44.1	0.19%
Water	68.5	0.64%	1,212.2	5.18%
Wetlands	69.1	0.65%	526.4	2.25%
Pasture/Range/Non-Ag	879.2	8.27%	2,026.0	8.66%
Fallow Cropland/CRP	2,388.9	22.48%	5,038.8	21.53%
Other Small Grains & Hay	2,287.5	21.52%	2,785.1	11.90%
All Other Crops	170.6	1.61%	531.6	2.27%
Clover/Wildflowers	2,331.1	21.93%	7,880.8	33.68%
Corn	377.0	3.55%	638.4	2.73%
Soybeans	369.3	3.47%	175.7	0.75%
Sunflowers	1,161.5	10.93%	1,945.3	8.31%
Barren			4.0	0.02%
Total	10,627.5	100.00%	23,399.7	100.00%

A summary of the land cover types for the respective areas is included in the following table. The majority of the combined areas are currently used for CRP (21.53%), clover/wildflowers (33.68%), and crops (25.97%).

Table 2 - Land Use Summary

Land Cover Types	Phase I (Acres)	Phase I (%)	Phase II (Acres)	Phase II (%)
Urban	485.5	4.57%	591.2	2.53%
Woods	39.4	0.37%	44.1	0.19%
Water and Wetlands	137.6	1.29%	1,738.6	7.43%
Pasture/Range/Non-Ag	879.2	8.27%	2,026.0	8.66%
Fallow Cropland/CRP	2,388.9	22.48%	5,038.8	21.53%
Clover/Wildflowers	2,331.1	21.93%	7,880.8	33.68%
Crops (Corn, Soybeans, Sun-flowers, Hay and Small Grains)	4,365.9	41.08%	6,076.1	25.97%
Barren			4.0	0.02%
Total	10,627.7	100.00%	23,399.7	100.00%

2.2 Environmental Consequences

2.2.1 Proposed Action

The proposed action will have minimal impacts on the land cover types except in the immediate areas where the turbines are located. These impacts will be localized and will not generally affect land use in the overall project areas.

3.0 Geology and Minerals

3.1 Affected Environment

Construction activities associated with the development of the LCWF have the potential to impact soils and other geologic resources. The impacts can occur locally during excavation and grading activities at the turbine locations, or regionally as a result of the construction of the required infrastructure and inter-connection to the nearby transmission line. The impacts may vary for the individual turbine locations based on the specific geology in the immediate vicinity of the wind turbines.

3.1.1 Geologic Setting

The geologic setting of North Dakota has been shaped by periods where warm seas covered the state to periods where glaciers shaped the landscape. The most recent ice age, approximately 25,000 years ago, was responsible for many of the physiographic features that are observed today. South Central North Dakota contains four different physiographic units. These include the Glaciated Plains, the Missouri Coteau, the Coteau Slope and the Missouri Slope Upland (Bluemle, 2000). These different regions contain both erosional and glacial landforms. The Missouri Escarpment divides the Glaciated Plains from the Coteau Slope and the Missouri Coteau.

Approximately the western third of Logan County is located within the Coteau Slope District of the Glaciated Missouri Plateau of the Great Plains. The Coteau Slope is the westward flowing region located on the east side of the Missouri River. The Coteau Slope has a thin layer of glacial drift with few closed depressions with most of the drainage completely integrated and flowing westward to the Missouri River. The Missouri Coteau is located to the east and is characterized by a nonintegrated drainage

with numerous closed depressions. The Coteau Slope in Logan County is further divided into subdistricts. These include the Napoleon Subdistrict, the Beaver Creek Subdistrict, the Wishek Subdistrict and the Zeeland Subdistrict. The project area is located within the Napoleon Subdistrict. The Napoleon Subdistrict has the most remaining closed depressions with the least developed drainage patterns of the four subdistricts in Logan County. This subdistrict generally slopes westward towards the Missouri River, however, it still contains many closed basins that are characteristic of the Missouri Coteau.

3.1.2 Site Geology

Both bedrock and glacial deposits are observed in many areas of North Dakota. The glacial deposits are more recent compared to the bedrock (typically shale). The surface deposits at the project area are mapped as Quaternary age formation, of the Coleharbor group, formed by river deposits or glacier landforms. Bedrock geology formations are of the cretaceous age, primarily of the Hell Creek formation (Bluemle, 2000; see Attachment 2).

Lignite coal resources underlies much of the western two thirds of North Dakota. When these reserves lie close enough to the surface to be economically harvested they are considered strippable lignite resources. Strippable lignite resources have not been identified in Logan County (Bluemle, 2000). Oil production in North Dakota is currently limited to the western and north central parts of the state. Oil production facilities are not known to be active at the project site or in the surrounding area. Mineral deposits such as gemstones and gold are generally not considered an important economic resource in North Dakota. Deposits of these resources are not known within the project area.

3.1.3 Physiographic and Topographic Setting

The typical "prairie pothole" region of North Dakota is a result of the hummocky collapsed glacial topography that exists along the Missouri Coteau. The Missouri Coteau extends across the central part of the state of North Dakota generally from the northwest to the south central parts of the state. Although the project area is located in the Coteau Slope the project area contains undulating to rolling topography that is typical of

collapsed glacial topography (see Attachment 3). This is particularly evident in the northeast portion of the project area.

Runoff from the project area flows westward and is part of the Missouri River Drainage Basin. The James River Drainage Basin begins a few miles to the east bringing runoff eastward to the James River. According to the County Soil Survey, slopes within the project area range from 0-3% to 9-15% with an average of 5%. Elevations within the project area are at approximately 2000 feet above mean sea level.

3.2 Environmental Consequences

3.2.1 Proposed Action

The geologic resources will generally not be affected by the proposed project. If for example, the mineral deposits were harvested, the project could result in impacts to these geologic resources. However, these resources are not known to exist at the project site and the project is not expected to alter or deplete these resources.

4.0 Groundwater Resources

4.1 Affected Environment

Groundwater resources for the LCWF Project would require an assessment of the Project needs versus local availability and specific uses relative to the project features. Additionally, groundwater characteristics would need to be identified including depth to groundwater, groundwater quality, and availability.

4.1.1 Regional Hydrogeologic Setting

Groundwater resources in Logan County can be obtained from aquifers from both the Quaternary age and the Cretaceous age. The Quaternary age aquifers are formed in glacial drift and tend to have the highest yields. The aquifers can yield 200 to 1,300 gallons per minute. A number of aquifers have been delineated by the North Dakota Geological Survey within Logan County. The Napoleon aquifer is located near the community of Napoleon, ND and is closest to the project site. The Streeter aquifer is a large aquifer located approximately 12 miles north east of Napoleon. The Streeter and

Napoleon aquifers have the greatest potential for development within Logan County (Klausing, 1983).

4.1.2 Site Subsurface Conditions

The project area contains parts of the Napoleon aquifer. This aquifer is formed in glacial drift and is divided into two parts. These include the Napoleon buried-valley aquifer and the Napoleon outwash aquifer. The project area contains parts of the Napoleon outwash aquifer. The buried-valley aquifer contains the greater yield potential of the two with a potential yield of 1,000 to 1,500 gallons per minute. The outwash aquifer yields between 50 to 200 gallons per minute. USGS well data indicate that the groundwater gradient is essentially towards McKenna Lake (Klausing, 1983). This results in a westerly gradient for portions of the aquifer within the project area.

4.1.3 Groundwater Elevations

USGS observation well data indicate that water levels within the Napoleon outwash aquifer vary between 3 and 36 feet below the land surface and fluctuate on a seasonal basis. Generally the shallow groundwater levels are highest in early spring and at their lowest during the winter months (Klausing 1983).

4.2 Environmental Consequences

4.2.1 Proposed Action

Potential impacts to groundwater resources would be primarily a result of fuel spills from equipment during construction. However, stormwater pollution prevention plans (SWPPP's), should adequately address spills and runoff from the site during construction.

5.0 Surface Water Resources

5.1 Affected Environment

The surface water resources would need to be identified, both permanent and ephemeral surface water bodies, and assessed at the project level. Characteristics defined include water quality, water uses, and surface water runoff patterns.

5.1.1 Climate and Precipitation

The climate in south central North Dakota is characterized by very warm summers and very cold winters. July and August are the hottest months with average high temperatures of 82 and 81 degrees Fahrenheit respectively at Napoleon, ND. January is the coldest month with an average low temperature of -2 degrees Fahrenheit (www.weather.com). Logan county has an average annual precipitation of approximately 17 inches. Most of the rainfall occurs in the months of June and July with average monthly precipitation levels of 3.20 and 2.88 inches respectively. Average snowfall for Logan County is approximately 30 inches (Jensen). The average number of frost free days in Logan County is 120 days (Jensen).

5.1.2 Surface Water Features

Surface waters in the project area consist of wetlands and shallow lakes (see Attachment 1 and Attachment 4). The Mc Kenna Lakes are located just a couple of miles west of the project area. The North and South Lakes along with some adjacent wetlands result in over 3,000 acres of surface water. These lakes are generally know as a resting place for migratory waterfowl and have little value as a fishery. One small lake is present in the project area. It is located in section 13 of Bryant Township and is approximately 73 acres in size. Both the Mc Kenna Lakes and the small lake in Section 13 are classified by the NWI as L2ABG – Lacustrine Littoral Aquatic Bed Intermittently Exposed basins. These types of basins are generally less than two meters (6.6 feet) in depth and contain surface water throughout the growing season.

Numerous wetland areas also dot the project area. According to the National Wetland Inventory (NWI) wetlands comprise approximately 625 acres or 6% of the project area. Most are seasonally flooded basins (Palustrine Emergent Seasonally Flooded - PEMC). Other wetland types include temporarily flooded basins (Palustrine Emergent Temporarily Flooded - PEMA) and semipermanently flooded basins (Palustrine Emergent/Aquatic Bed Semipermanently Flooded - PEM/ABF). Wetlands in the northeast part of the project area tend to be smaller and more numerous, (Sections 1, 2, 3, 11, and 12 of Bryant Township). While the remaining parts of the project area contain

fewer wetlands but they tend to be larger in size (i.e. Sections 15 and 9 of Bryant Township).

5.1.3 Local Drainage Features and Runoff

Surface runoff within the project area south of Highway 34 runs to the west flowing just south of the city of Napoleon to the Mc Kenna Lakes. An intermittent flowage is evident beginning southeast of Napoleon flowing northwest to the south basin of the Mc Kenna Lakes. Surface runoff from north of Highway 34 flows towards a number of closed basins and is stored within these depressions in the landscape.

5.1.4 Regional Runoff and Flooding

Surface runoff within the regions is generally westward to the Missouri River. However, many closed basins are also present capturing runoff and providing storage. Floodplain studies have not been completed with the project area. The nearest completed floodplain study is for the community of Napoleon, just west of the project area. Both 100-year and 500-year floodplains are delineated within the community of Napoleon (see map).

5.1.5 Water Quality

The Clean Water Act (CWA) requires states to report to the Environmental Protection Agency on the quality of their waters approximately every two years. Section 303(d) of the CWA requires states to list waterbodies which are considered to have water quality problems. These waterbodies are termed "impaired" or "listed" waters. None of the waterbodies within the project area are currently listed on the 2006 Section 303(d) list of impaired waters. In addition the runoff form the project area currently does not enter a listed water. Beaver Creek and Beaver Lake, located approximately 15 miles south of the project area are the nearest listed waters. Beaver Lake is as threatened due to excessive nutrients and Beaver Creek is not supporting recreational uses due to excessive levels of Total Fecal Coliform Bacteria (Dwelle 2006).

5.2 Environmental Consequences

5.2.1 Proposed Action

Potential impacts to surface water resources would be primarily a result of fuel spills from equipment and stormwater runoff during construction. However, stormwater pollution prevention plans should adequately address spills and runoff from the site during construction. Runoff from project will not enter a waterbody that is currently considered impaired for water quality.

6.0 Air Quality

6.1 Affected Environment

Air quality tends to change with time, as does the regulatory programs associated with emissions from identified sources. Project specific information addressing the air quality for the LCWF area will be obtained as the project moves forward.

6.1.1 Winds

Generally wind speeds in North Dakota peak during late winter and early spring. Specifically the months of April and May have the highest average wind speeds across the state (Jensen). The average (mean) wind speed in Bismarck is 12.8 and 12.5 mile per hour for April and May respectively. The mean wind speed for Bismarck is 10.8 miles per hour (Jensen). The prevailing wind direction in Bismarck is from the north to northwest direction.

6.1.2 Air Quality

The air quality near the project area most likely meets the North Dakota air quality standards. The nearest North Dakota Department of Health (NDDH) air quality monitoring station is located in Bismarck, a distance of approximately 50 miles. Bismarck is one of ten sites that was sampled by the NDDH in 2006. There were no exceedances of either the state or federal ambient air quality standards measured at these sites in 2006 (Dwelle and Glatt, June 2007). The project site and the surrounding area is generally rural with agriculture being the dominant land use. No obvious air quality concerns or contaminant sources are present. Spring and fall tillage of the agricultural

fields may produce high levels of dust depending on the local moisture conditions and wind speeds.

6.2 Environmental Consequences

6.2.1 Proposed Action

Potential air quality impacts would be limited to the construction activities of the project. Dust and emissions from construction equipment will impact air quality. These impacts will be temporary and are not expected to exceed North Dakota Air Quality Standards.

7.0 Soil Units

7.1 Affected Environment

Construction activities associated with the development of the LCWF have the potential to impact the soils in the area. The impacts can occur locally during excavation and grading activities at the turbine locations, or regionally as a result of the construction of the required infrastructure and inter-connection to the nearby transmission line. The impacts may vary for the individual turbine locations based on the specific soil types in the immediate vicinity of the wind turbines.

7.1.1 Soil Use and Productivity

Farming and Ranching are the main agricultural enterprises within the project corridor and are also the main use of the soil resources. In much of the rangeland the stands of grass are managed for beef cattle production. These prairie ecosystems now contain both native and introduced species. The most common crops grown in the region include durum wheat, spring wheat, corn, soybeans, barley, sunflowers, oats, safflower, flax, and grass-legume hay.

7.1.2 Soils

Soils in and around the project site consist of grassland soils that are typical of the Missouri Coteau and Coteau Slope (see Attachment 5). Native grasses for these soils consist of western wheat grass, blue gramma, green needlegrass, and needle-and-thread. In addition to the grasses some forbs and sedges would also have been present (National Cooperative Soil Survey). Soils in the project generally consist of well drained to

excessively well drained soils formed in loamy alluvium and calcareous glacial till. In the northeast part of the project area the soil types are primarily Zahl-Williams loams. These soils are formed in calcareous glacial till and tend to have slopes of 6-15%. This soil type is very common throughout the Missouri Coteau. In the southwest part of the project area the soil types include mostly Bowdle-Lehr loams and the Wabek-Lehr complex. These soils types are formed in loamy alluvium and tend to have flatter slopes (1-6%). The depressions, however, do not contain well drained soils. Parnell silty clay loam is a poorly drained soil type that is present in most of the wetlands within the project. It comprises approximately two percent of the project area.

7.1.3 Prime Farmland Soil Units

Prime farmland, as described by the US Department of Agriculture, is:

> *land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.*
>
> *In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.*

Prime farmlands are listed by soil mapping unit for each county. In addition to the unit, some soils have limitations such as high water table or flooding, and may qualify for prime farmlands if these limitations are overcome by management methods. Also, in some cases a soil unit is mapped as a complex of two or three soil types. In many of these soil units, only part of the complex is listed as prime farmland. According the Logan County Soil Survey prime farmlands are not present in the project area. However some soil units are consider prime if a drainage system is in place to overcome wetness limitations. Prime farmlands within the project area are shown in Attachment 6.

Farmlands of Statewide Importance are lands that are nearly prime farmland in physical characteristics that can produce high yields of crops when managed according to acceptable farming methods. These lands are considered an important agricultural resource that does not meet the definition of Prime Farmlands. The project area contains a number of areas considered Farmland of Statewide Importance.

7.2 Environmental Consequences

7.2.1 Proposed Action

Soils will be disturbed during the construction of the tower structures and the access roads. These areas will also be taken out of agricultural production. These activities may permanently impact Farmlands of Statewide Importance and Prime Farmlands. Other impacts to soils would include soil erosion during construction. Construction impacts would be temporary in nature and will be addressed during the construction process. The implementation of the SWPPP and the use of general construction best management practices should reduce soil erosion during construction.