



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

CROW BUTTE RESOURCES, INC.

(Marsland Expansion Area)

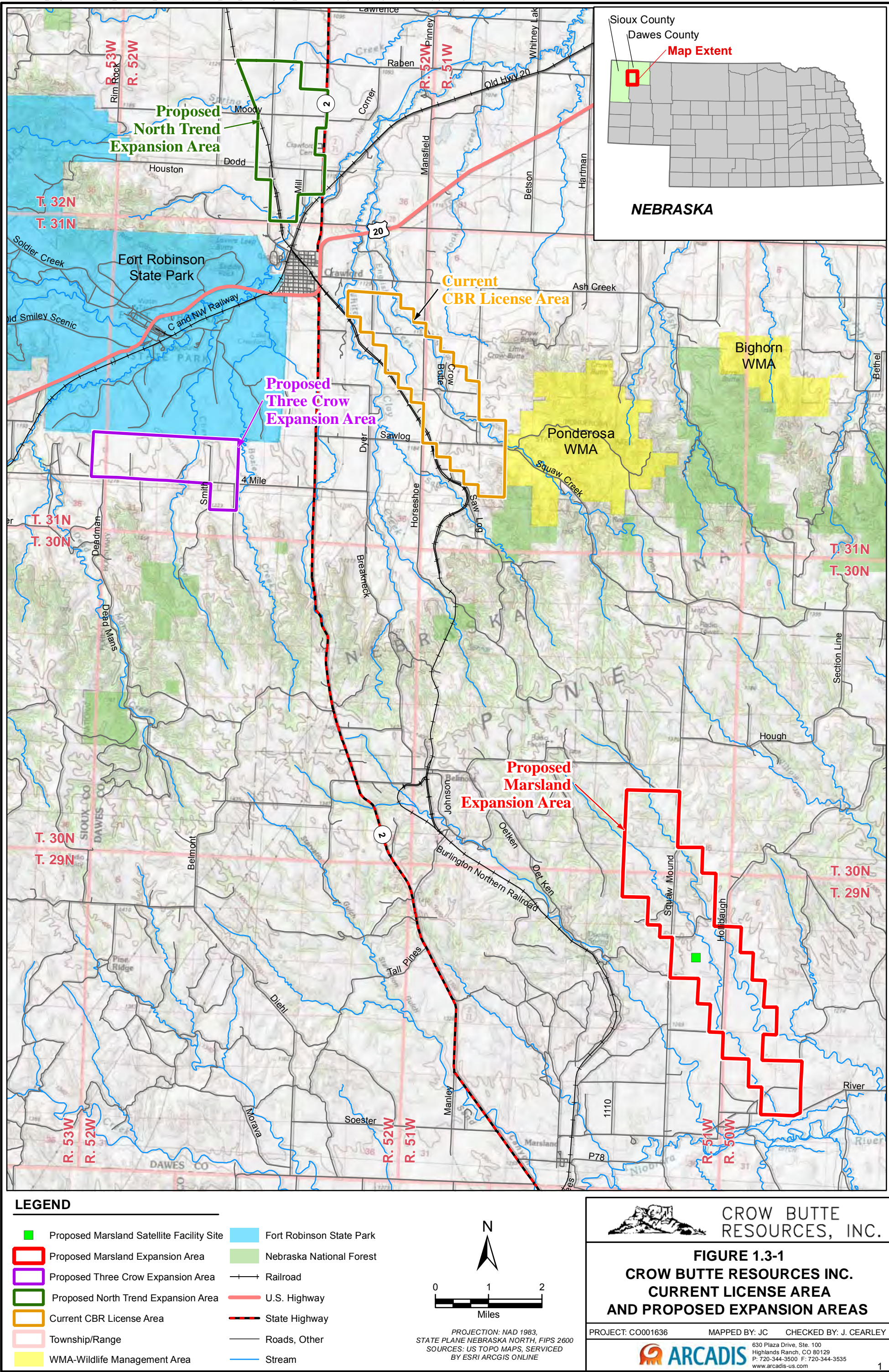
Docket No. 40-8943-MLA-2

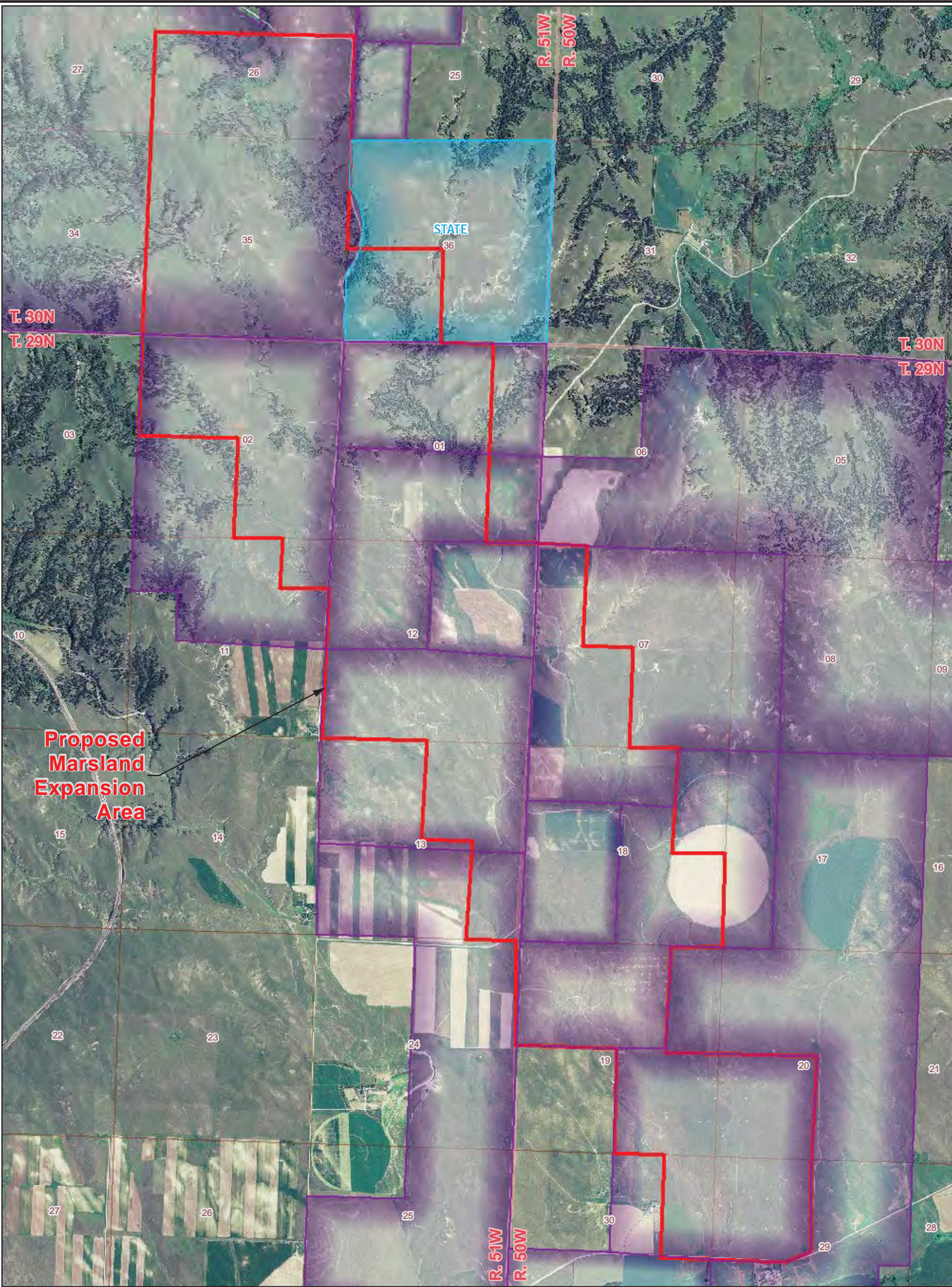
ASLBP No. 13-926-01-MLA-BD01

Hearing Exhibit

Exhibit Number:

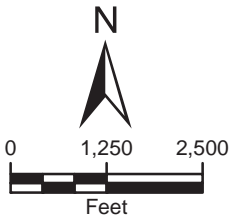
Exhibit Title:





LEGEND

-  Proposed Marsland Expansion Area
-  Private Land
-  State Land



PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010



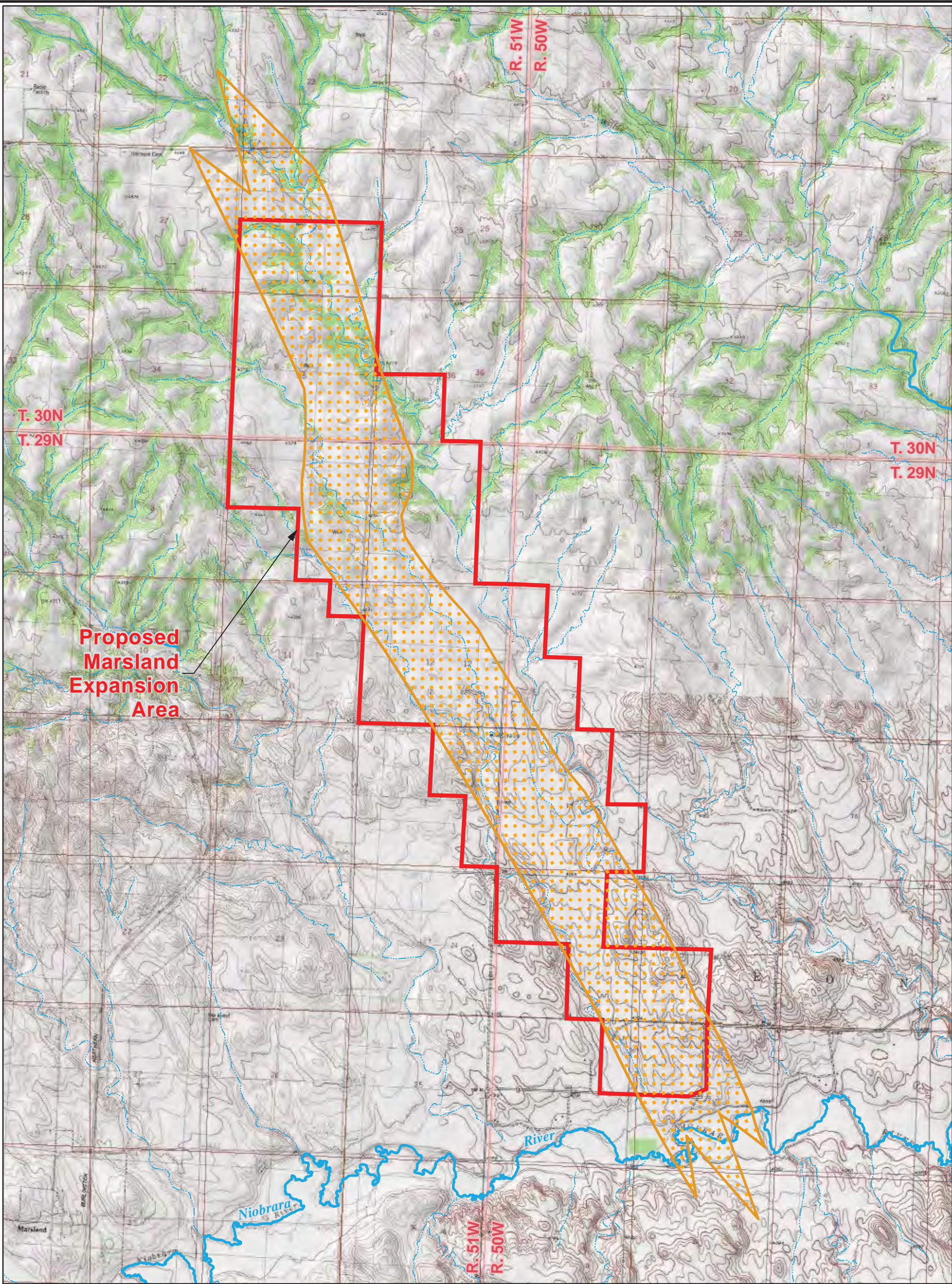
CROW BUTTE
RESOURCES, INC.

FIGURE 1.3-2
MARSLAND EXPANSION AREA
LAND OWNERSHIP

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: MS



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LEGEND

Estimated Ore Body

Proposed Marmland Expansion Area

Perennial Stream/River

Intermittent Stream/River

0

1,750

3,500

Feet

PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USA TOPO MAPS, SERVICED
BY ESRI ARCGIS ONLINE

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FIGURE 1.4-1
MARSLAND EXPANSION AREA
ESTIMATED ORE BODY

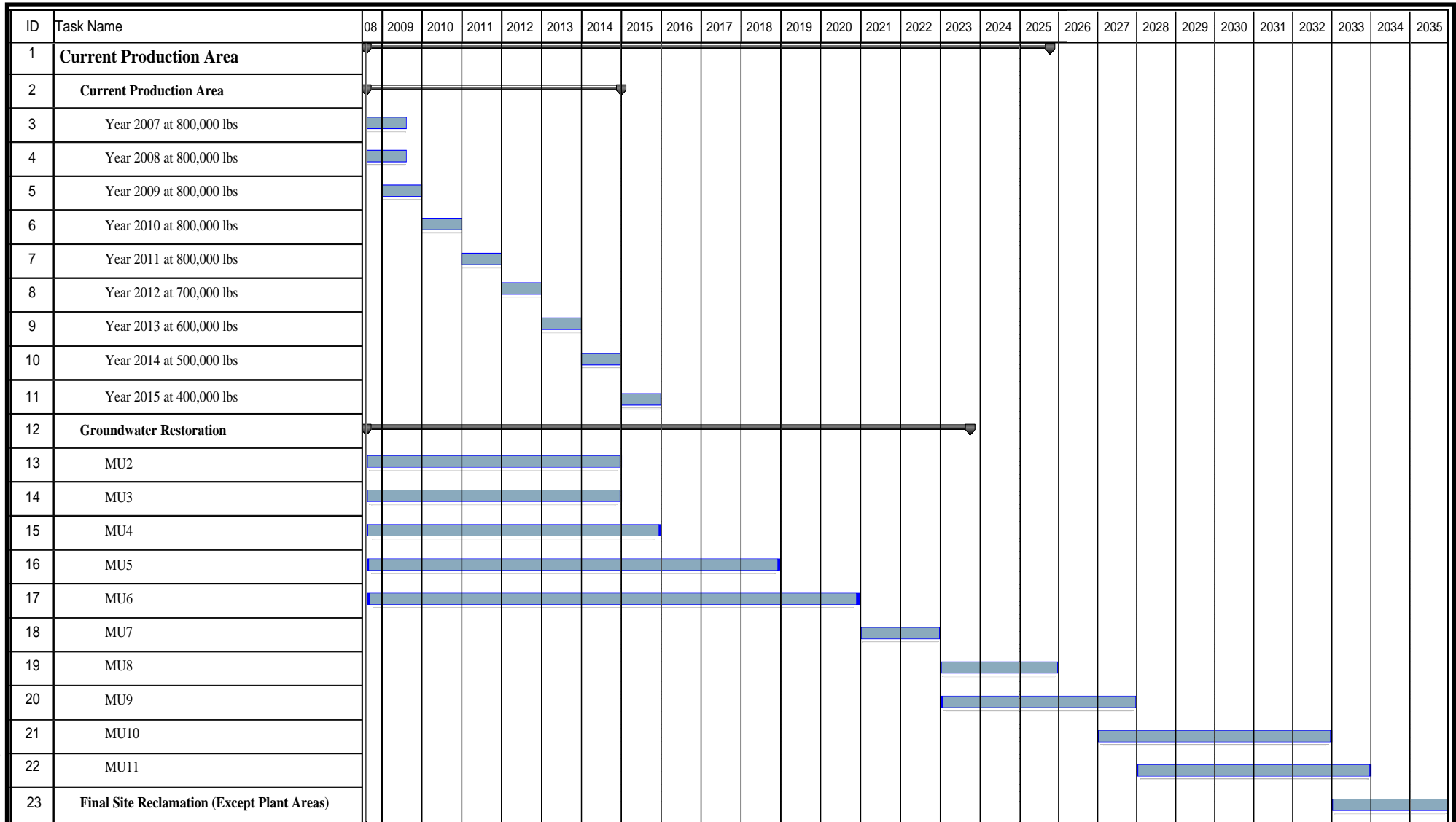
PROJECT: CO001636

MAPPED BY: JC

CHECKED BY: MS

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3



Task



Group By Summary



**CROW BUTTE
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**FIGURE 1.7-1
CURRENT PRODUCTION AREA
MINE UNIT TIMELINE
EFFECTIVE AS OF JULY 1, 2013**

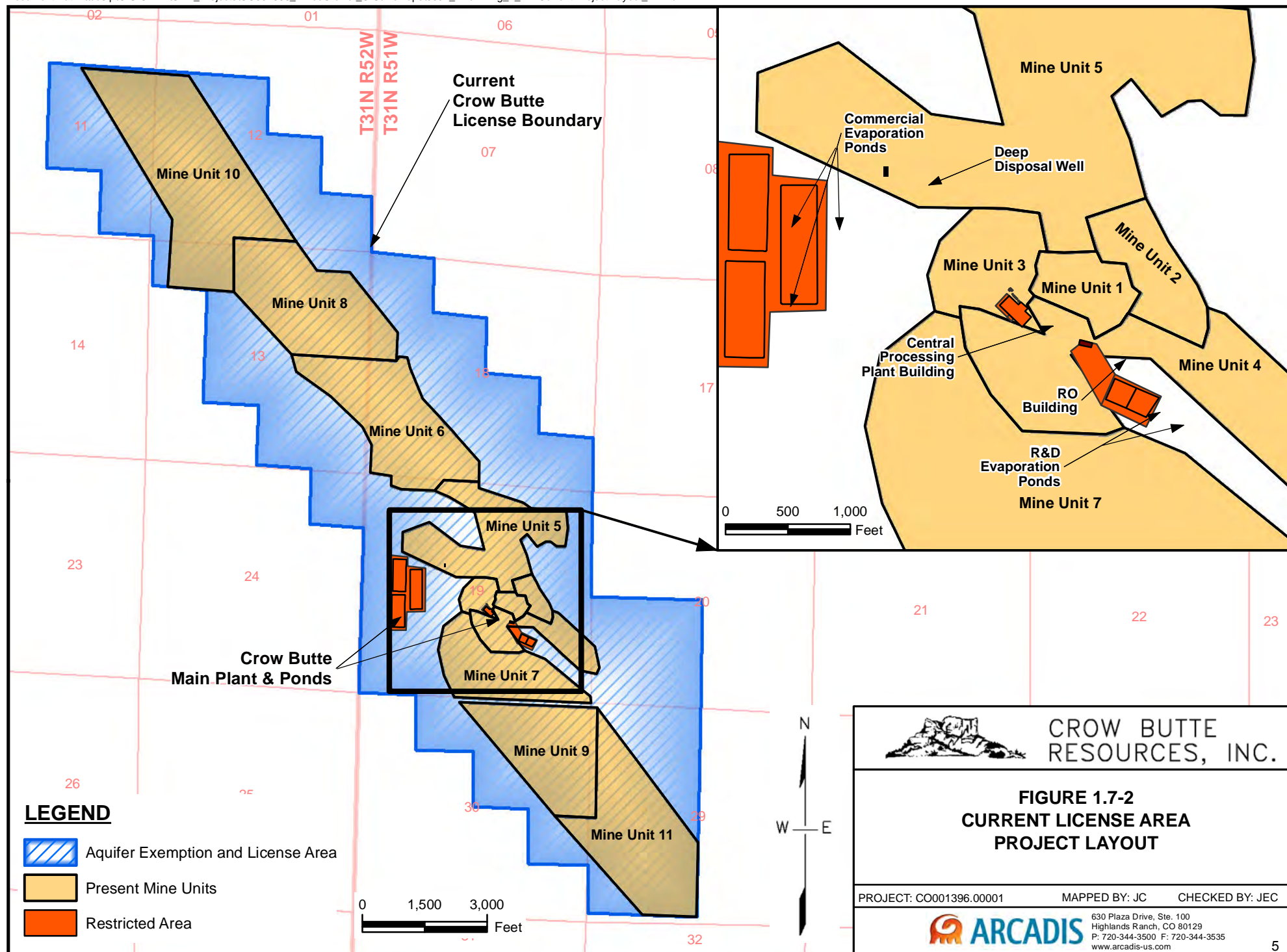
PROJECT: CO001636.00001

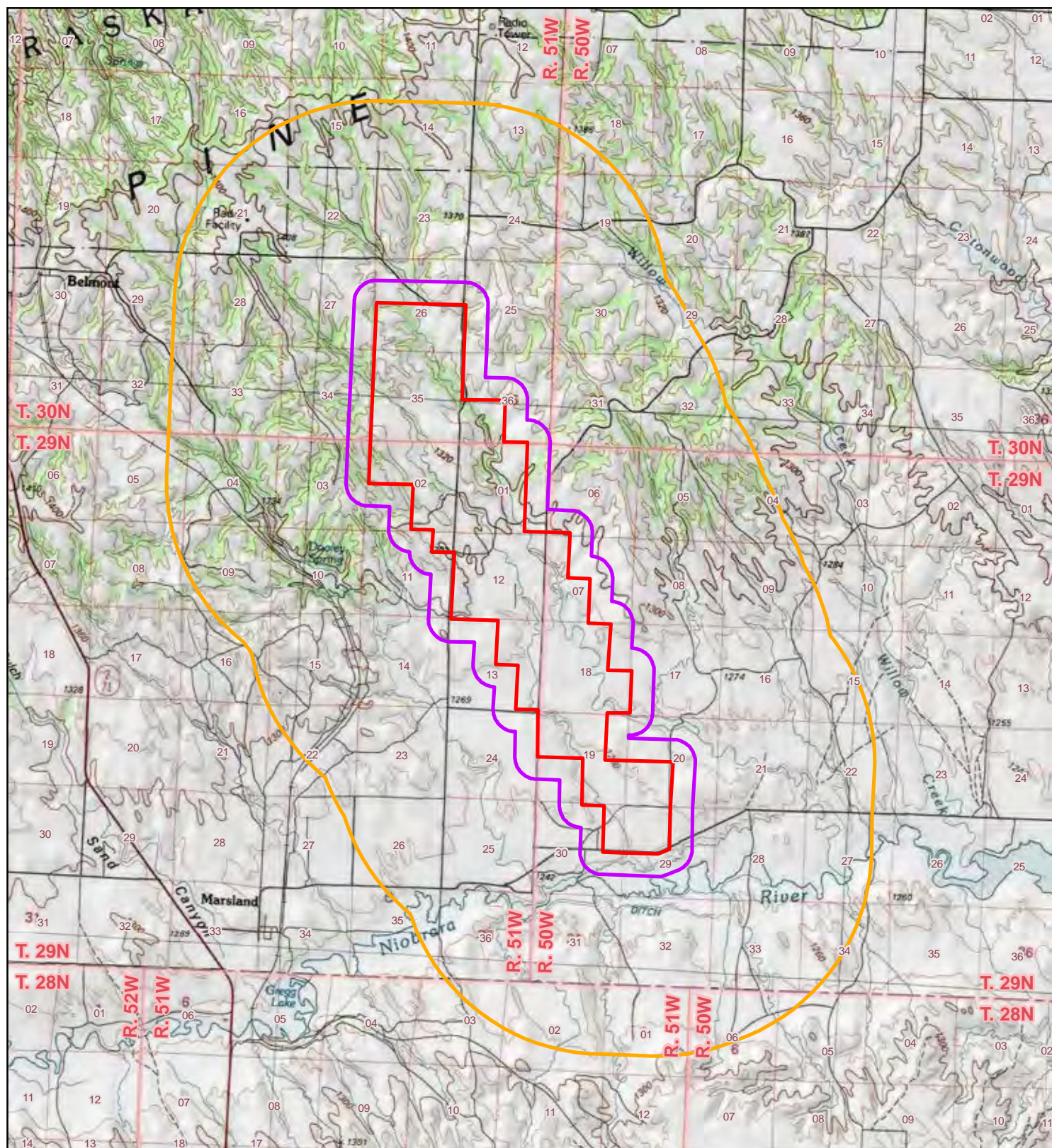
MAPPED BY: JC

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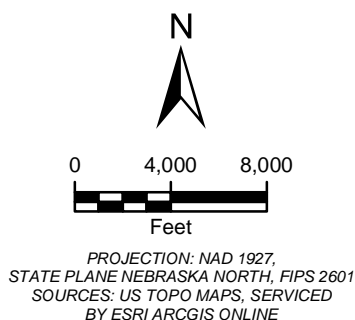




LEGEND

- Proposed Marsland Expansion Area
- ZOEI Boundary (1/4-mile fixed radius)
- AOR Boundary (2-mile fixed radius)

ZOEI = Zone of Endangering Influence
AOR = Area of Review



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FIGURE 1.7-3 PROJECT LOCATION MAP ZOEI AND AOR

PROJECT: CO001636

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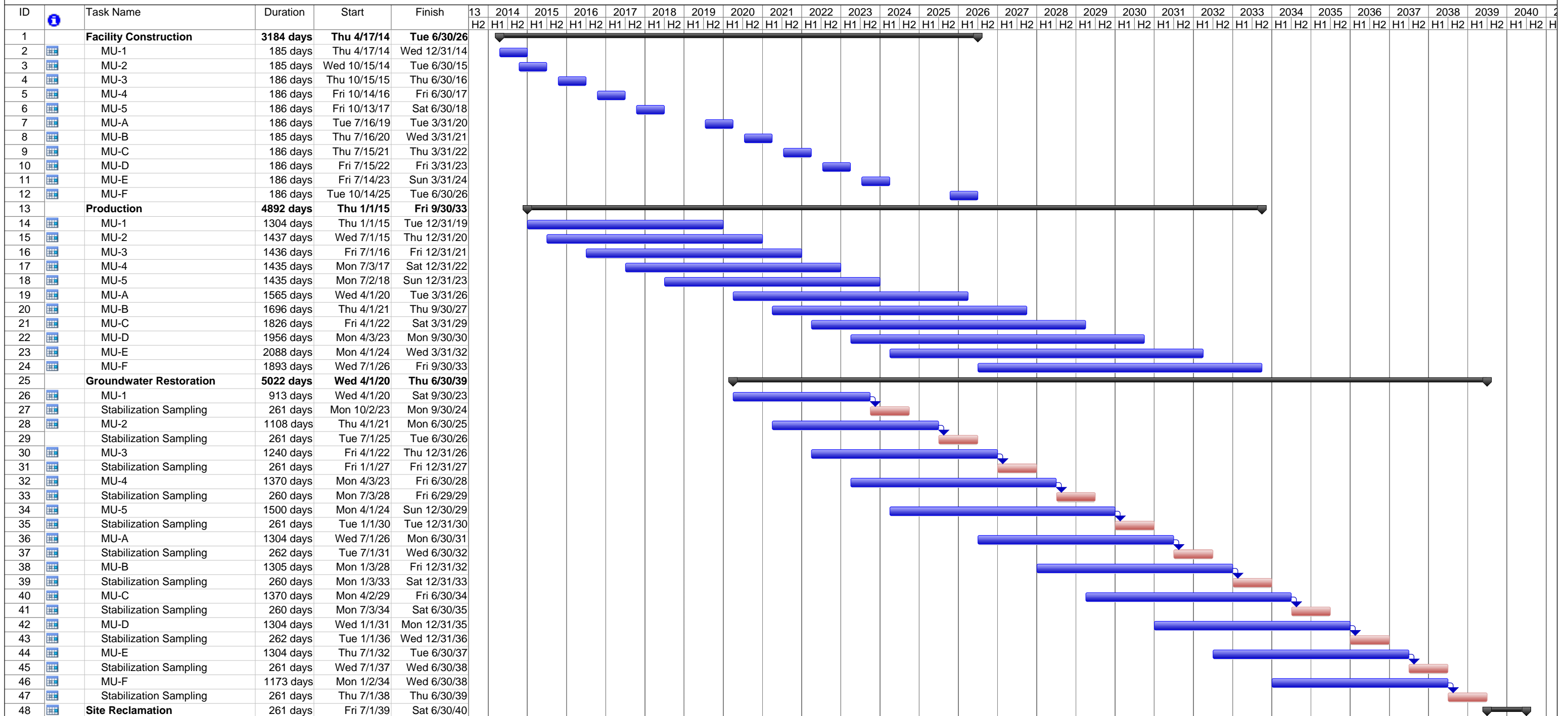
CHECKED BY: J. CEARLEY









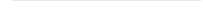











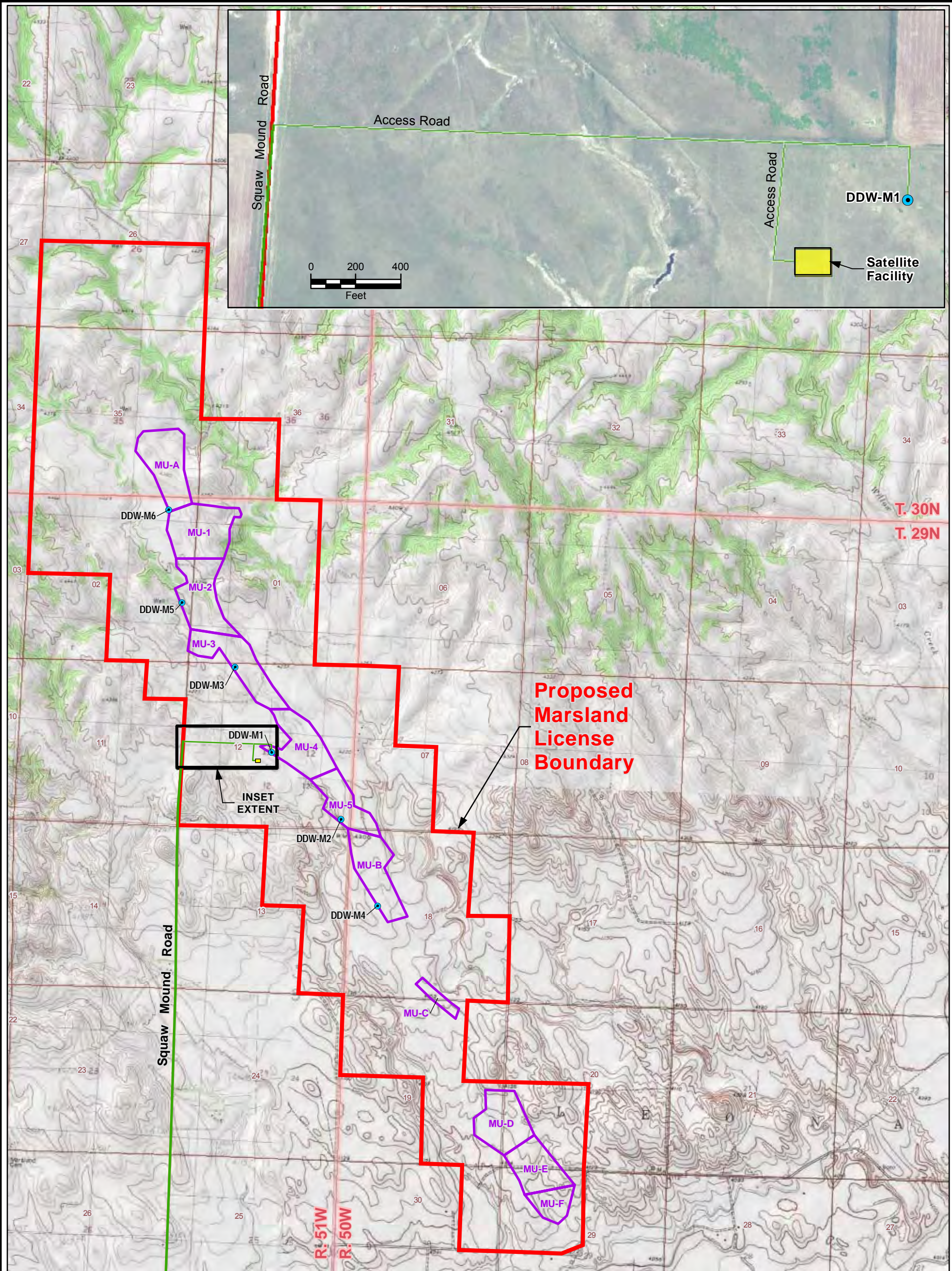
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Figure 1.7-4 Marland Expansion Area Mining and Restoration Timeline

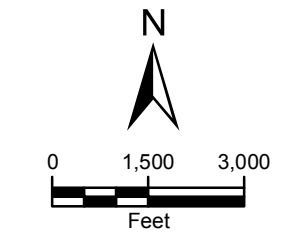


Project: Marsland Expansion Area Date: Wed 5/22/13	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
	Split		External Tasks		Inactive Summary		Manual Summary		Deadline	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			



LEGEND

- Proposed Deep Disposal Well
- Squaw Mound Road
- Access Road
- Satellite Facility (Restricted Area)
- Mine Unit
- Proposed Marsland License Boundary



PROJECTION: NAD 1983, STATE PLANE
NEBRASKA NORTH, FIPS 2600
SOURCES: US TOPO MAPS, SERVICED
BY ESRI ARCGIS ONLINE



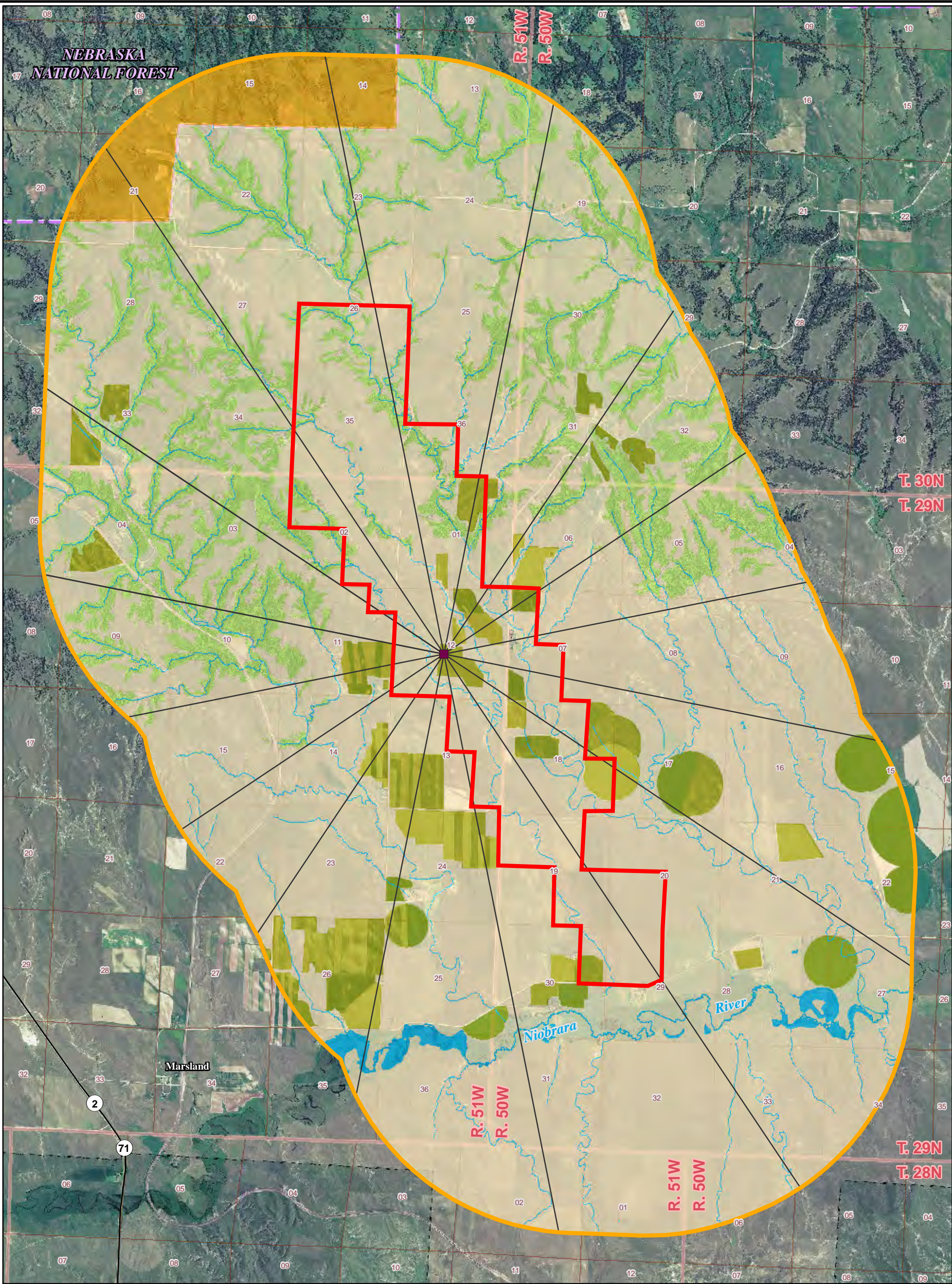
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FIGURE 1.7-5
GENERAL ARRANGEMENT
SATELLITE FACILITY VIEW

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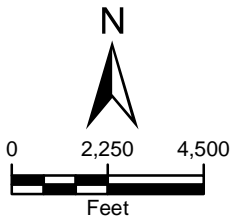
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LEGEND

- | | |
|--|----------------------------|
| Proposed Marsland Satellite Plant Centroid | Land Use* |
| Compass Sector Boundary | Cropland |
| Proposed Marsland Expansion Area | Drainage/Potential Wetland |
| Area of Review | Forest Land |
| Nebraska National Forest Boundary | Rangeland |
| | Recreational Land |

* Land use data were interpreted from aerial image. The delineation of "Drainage/Potential Wetland" type also referenced NHD Flowlines and NWI Wetland Dataset.



PROJECTION: NAD1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: USDA NAIP IMAGERY 2010



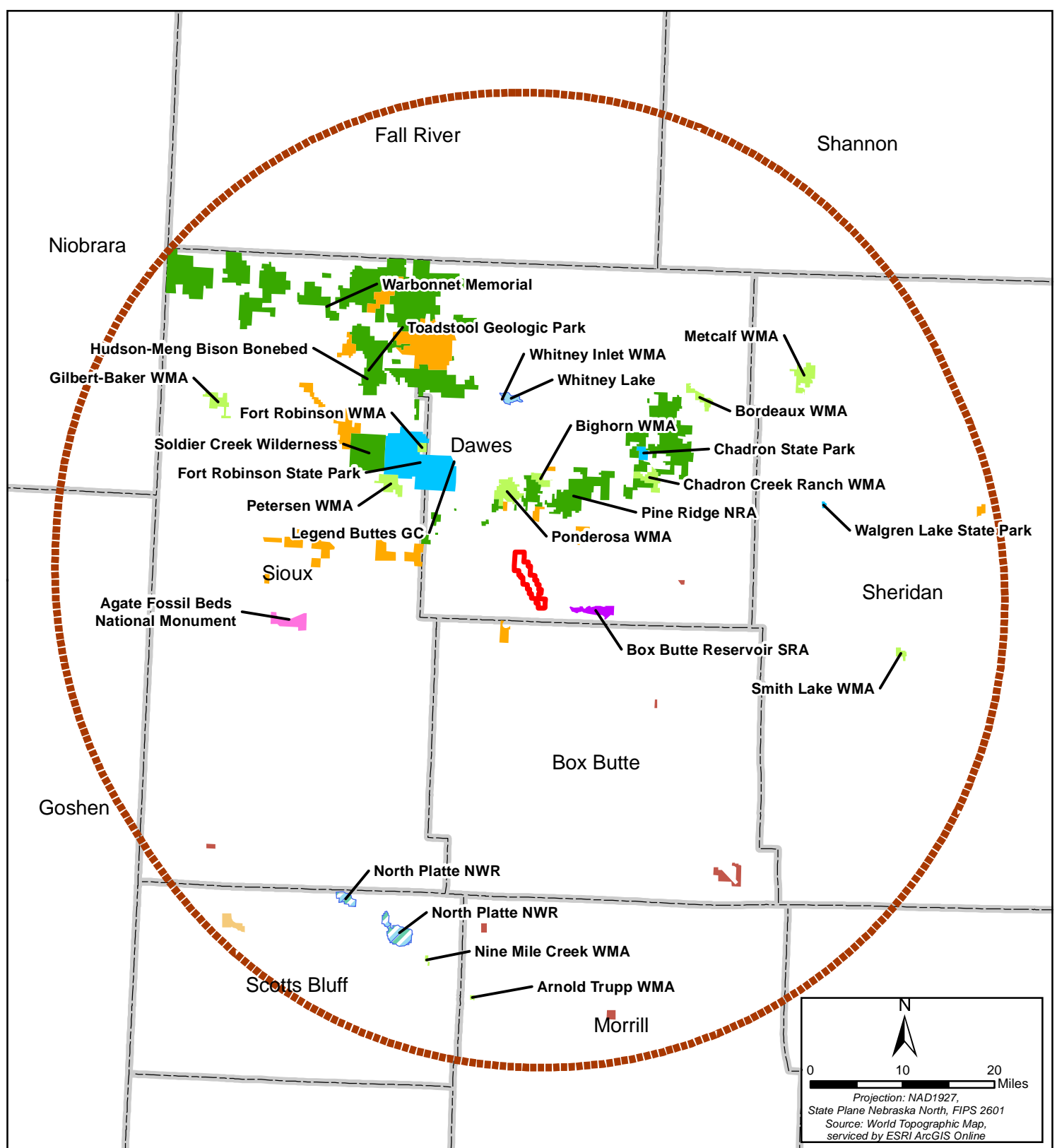
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**FIGURE 2.2-1
MARSLAND EXPANSION AREA
LAND USE**

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LEGEND

- | | |
|-------------------------------------|--------------------------------|
| Agate Fossil Beds National Monument | Conservation Partner Lands |
| Proposed Marland Expansion Area | Natural Resource District Area |
| 50 Mile Radius | Nebraska National Forest |
| Wildlife Management Area | National Wildlife Refuge |
| State Recreation Area | Open Fields and Waters |
| State Park; Walgren Lake State Park | Whitney Lake |



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FIGURE 2.2-2 MARSLAND EXPANSION AREA PROXIMITY TO RECREATION AREAS AND WILDLIFE MANAGEMENT AREAS

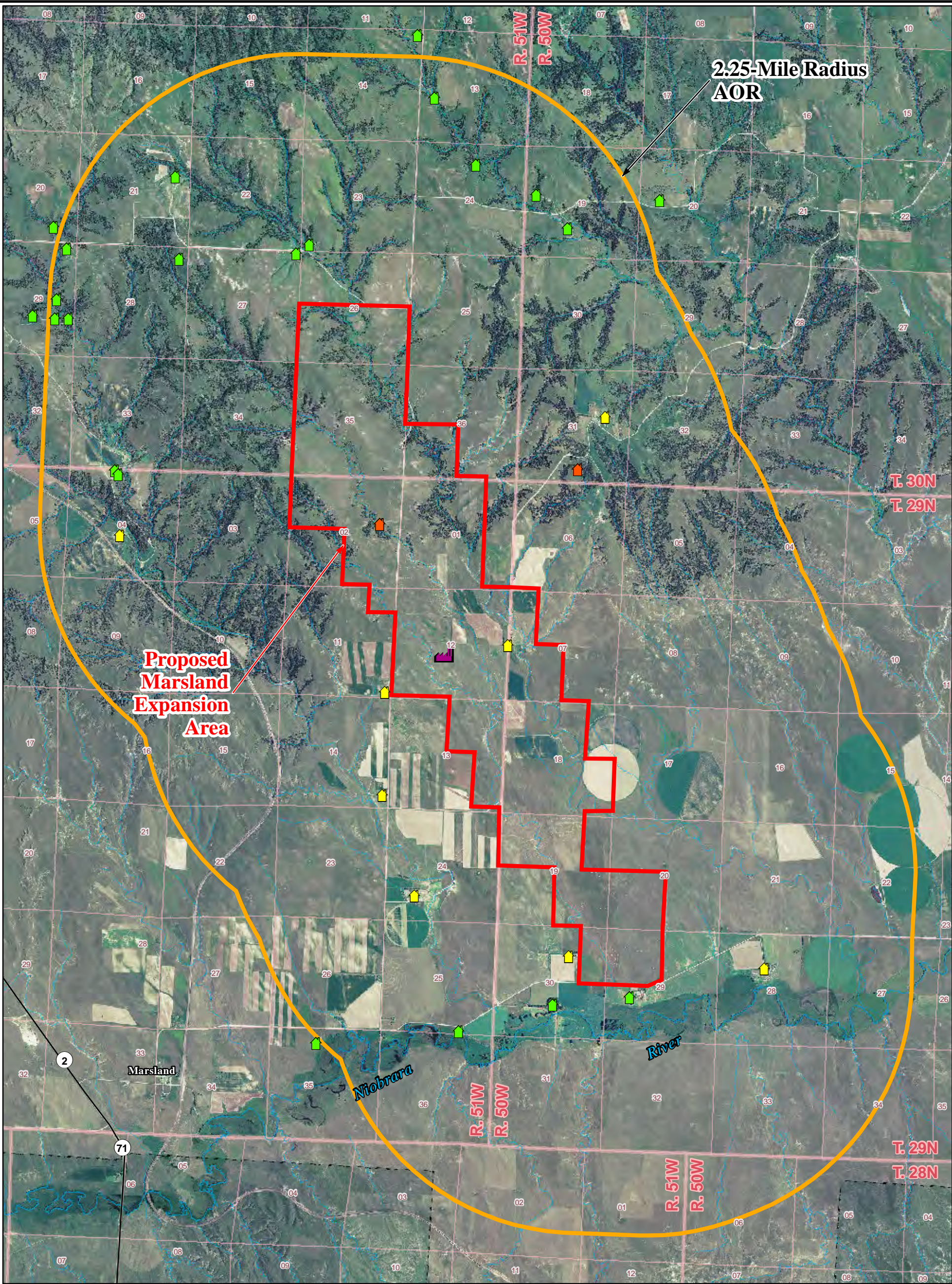
PROJECT: C0001636

MAPPED BY: JC

CHECKED BY: CM



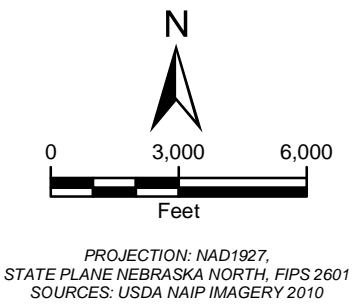
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LEGEND

- Structure
- Satellite Plant
- Occupied Residence
- Unoccupied Residence
- Proposed Marsland Expansion Area
- Area of Review (AOR)

- Intermittent Stream/River
- Perennial Stream/River






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FIGURE 2.2-3
**AERIAL PHOTO DEPICTING LOCATION OF
RURAL RESIDENCES AND OTHER LAND
FEATURES IN THE AREA OF REVIEW**

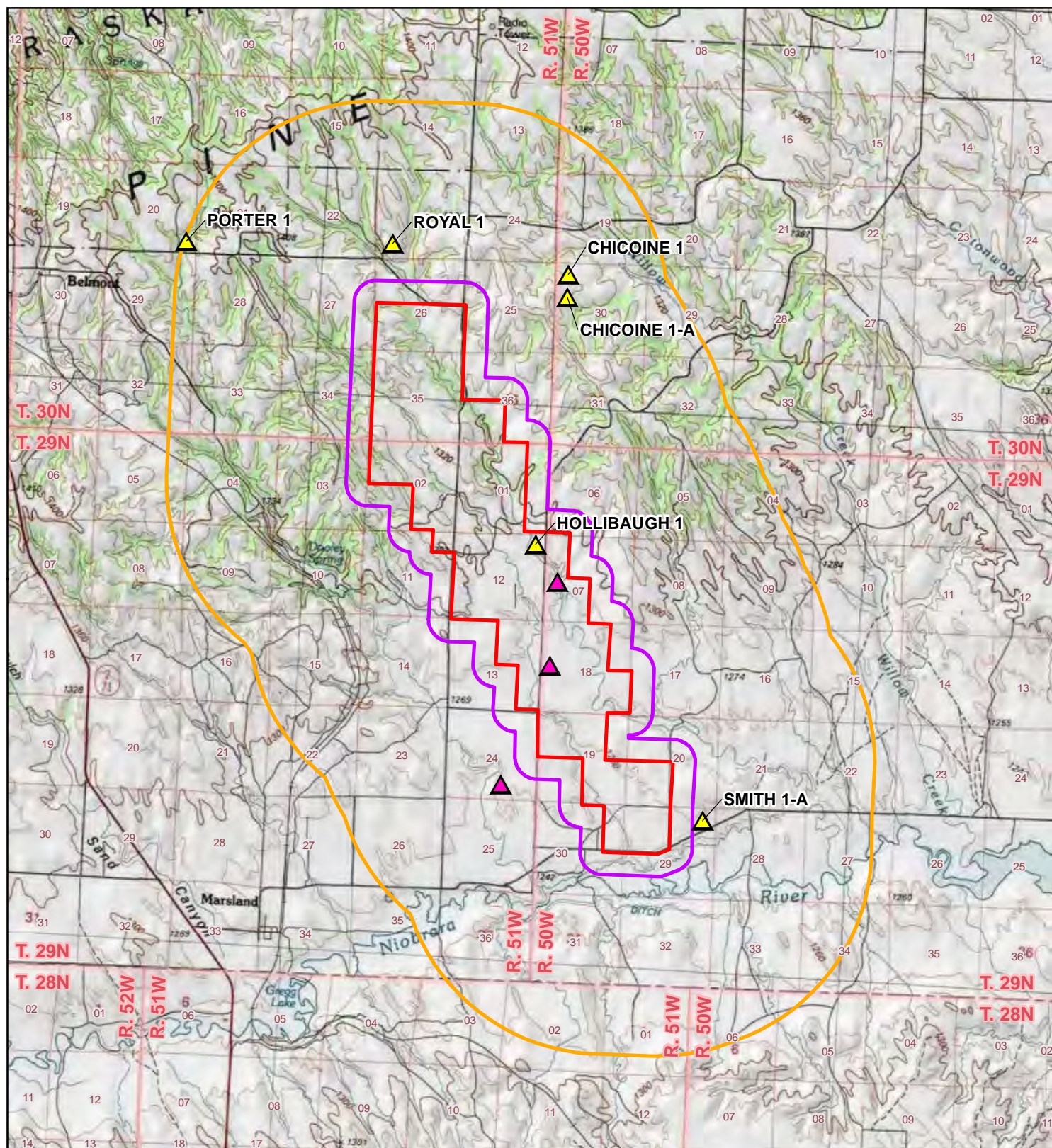
PROJECT: CO001636

MAPPED BY: JC

CHECKED BY: J. CEARLEY



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LEGEND

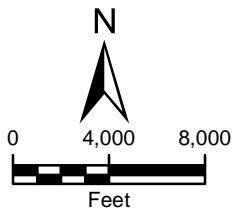
- Sand/Gravel Pit, Inactive
- Dry Hole, Dry and Abandoned
- Proposed Marlsand Expansion Area
- ZOEI Boundary (1/4-mile fixed radius)
- AOR Boundary (2-mile fixed radius)

Sources for Sand/Gravel Pits

1. Dawes County, (<http://dawes.assessor.gisworkshop.com/Assessor/index.jsp>), Accessed on 08/03/2011, and
2. Burchett, R.R. 1971. Directory of Nebraska Quarries, Pits and Mines. Resource Report Number 5. University of Nebraska Conservation and Survey Division, Lincoln. March.

Sources for Oil/Gas Test Holes

Nebraska Oil and Gas Conservation Commission, (<http://www.nogcc.ne.gov/NOGCCPublications.aspx>), Accessed on 08/01/2011



PROJECTION: NAD 1927,
STATE PLANE NEBRASKA NORTH, FIPS 2601
SOURCES: US TOPO MAPS, SERVICED
BY ESRI ARCGIS ONLINE



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FIGURE 2.2-4 MARSLAND EXPANSION AREA LOCATIONS OF GRAVEL PITS AND OIL/GAS TEST HOLES

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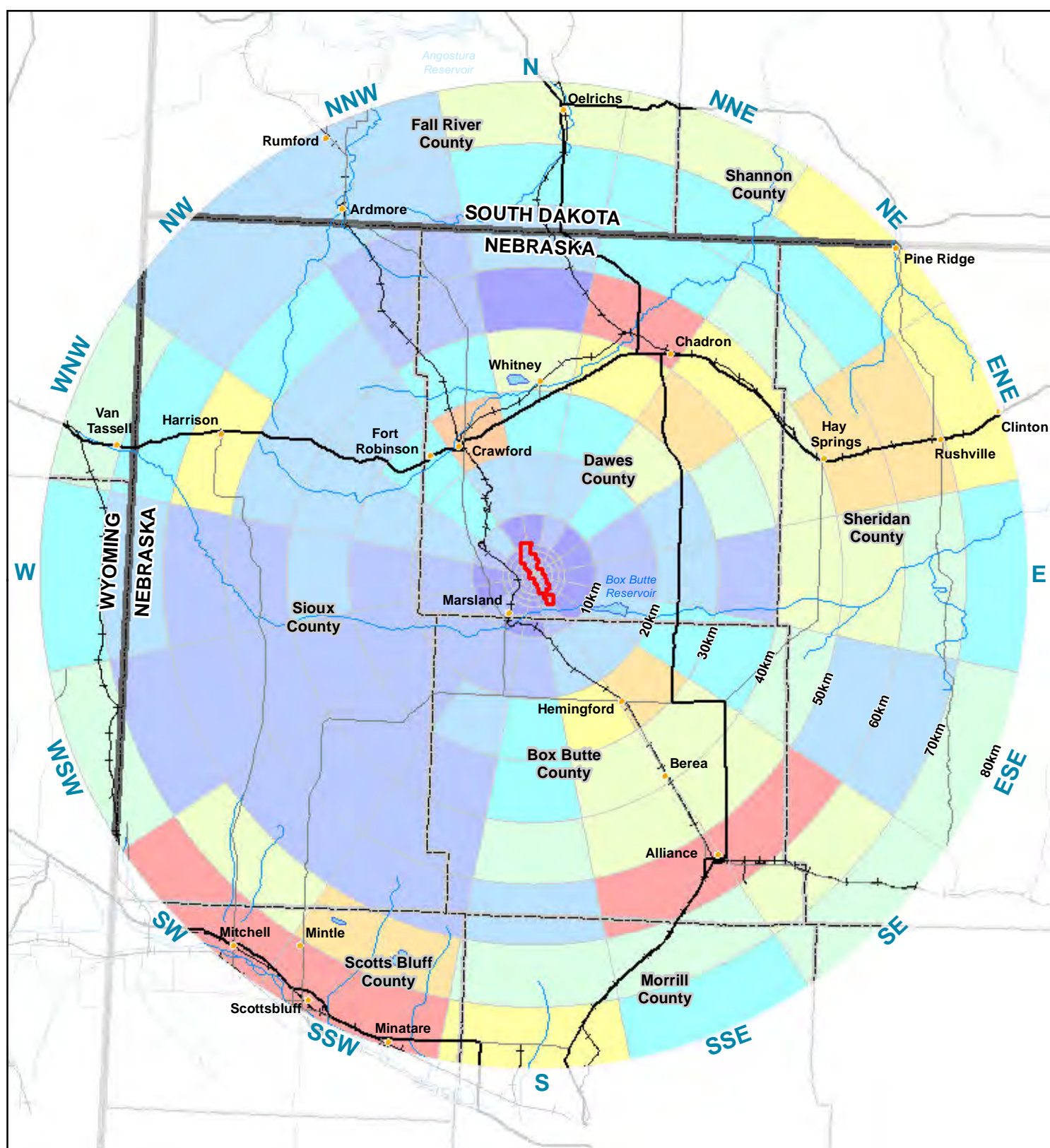
MAPPED BY: JC

CHECKED BY: J. CEARLEY



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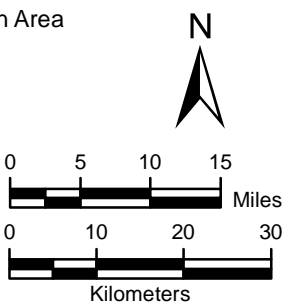
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LEGEND

 Proposed Cameco/Marlsand Expansion Area
Population (Census 2010)

0 - 6	86 - 208
7 - 18	209 - 523
19 - 31	524 - 1,101
32 - 51	1,102 - 2,997
52 - 85	2,998 - 19,150



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FIGURE 2.3-1
SIGNIFICANT POPULATION CENTERS
WITHIN AN 80-Km (50 mi) RADIUS
OF THE MARSLAND SITE

PROJECT: CO001636

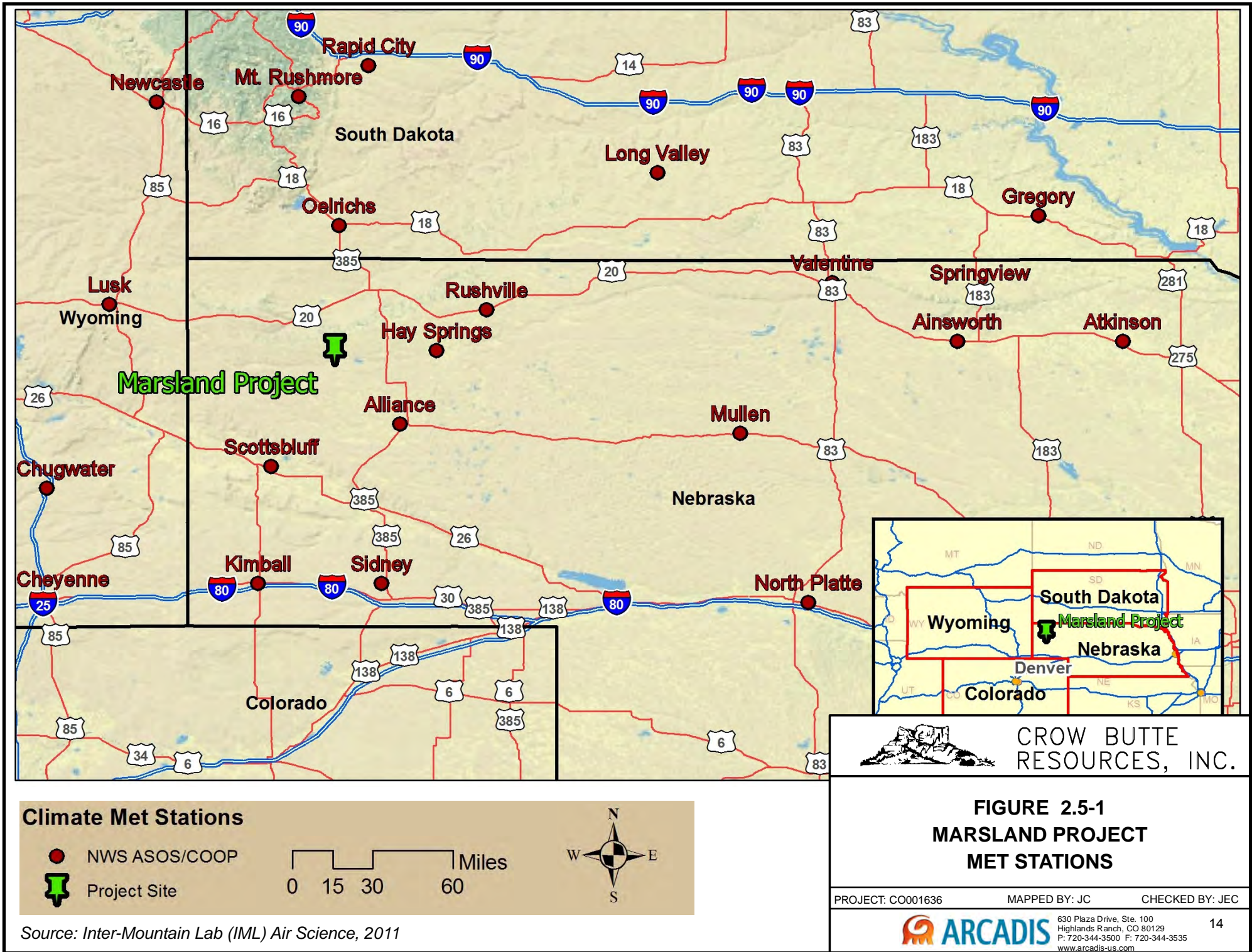
MAPPED BY: JC

CHECKED BY: CM

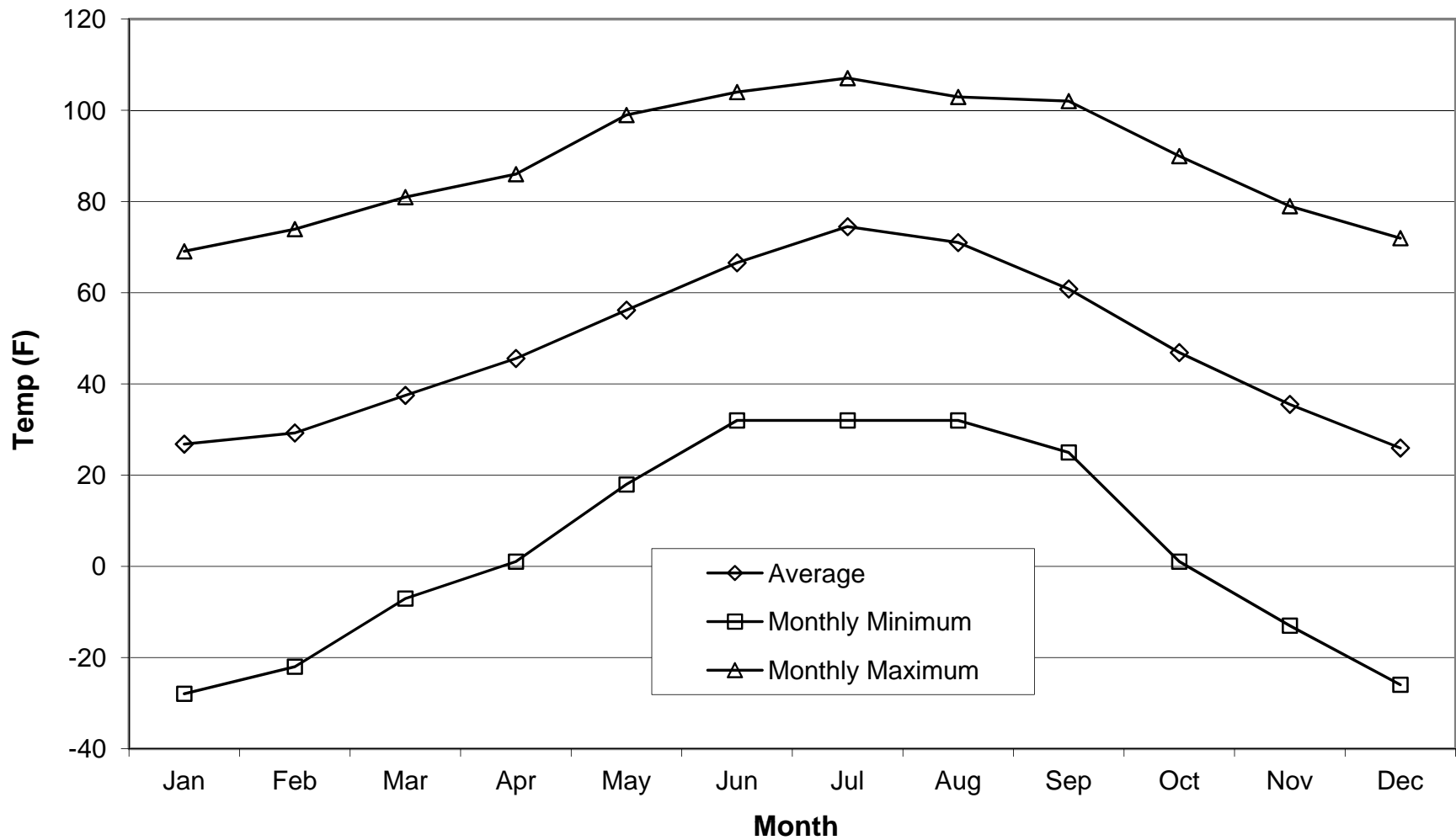


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Source: Inter-Mountain Lab (IML) Air Science, 2011



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**FIGURE 2.5-2
SCOTTSBLUFF AP
MONTHLY TEMPERATURES**

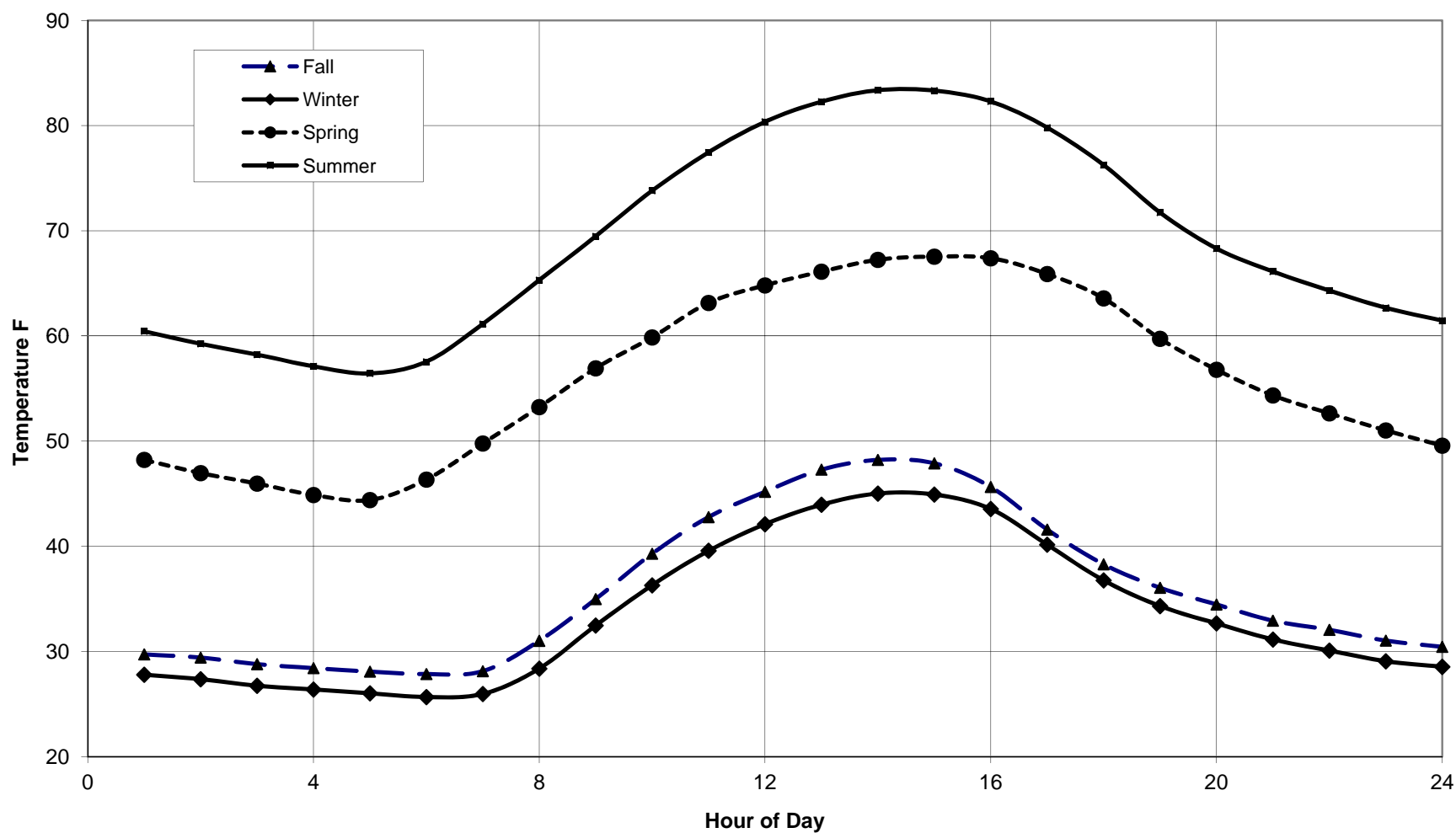
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FIGURE 2.5-3
SCOTTSBLUFF AP SEASONAL
DIURNAL TEMPERATURE VARIATIONS

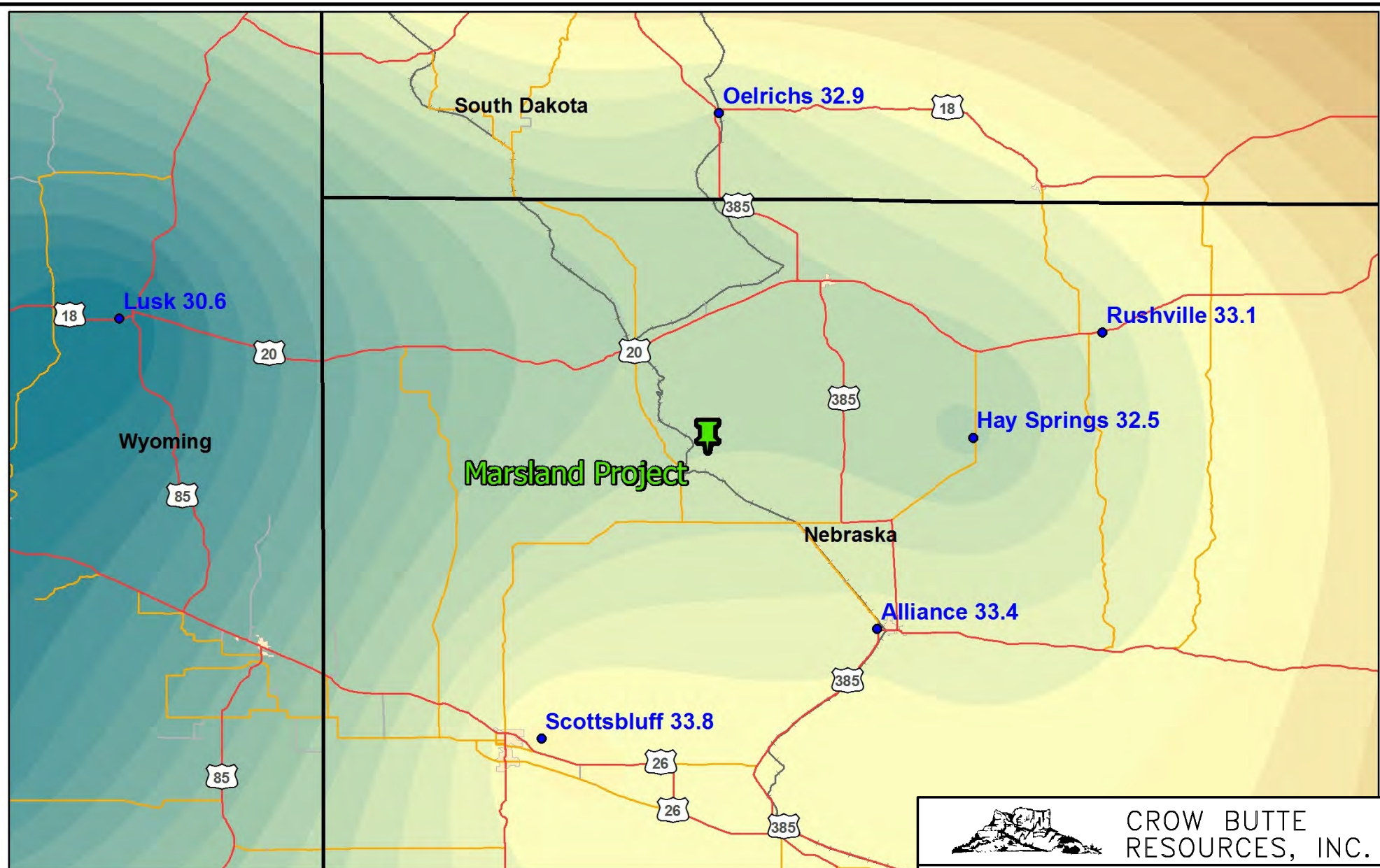
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CHECKED BY: JEC



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Average Annual
Minimum Temperature (°F)



0 5 10 20 Miles



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**FIGURE 2.5-4
REGIONAL ANNUAL AVERAGE
MINIMUM TEMPERATURES**

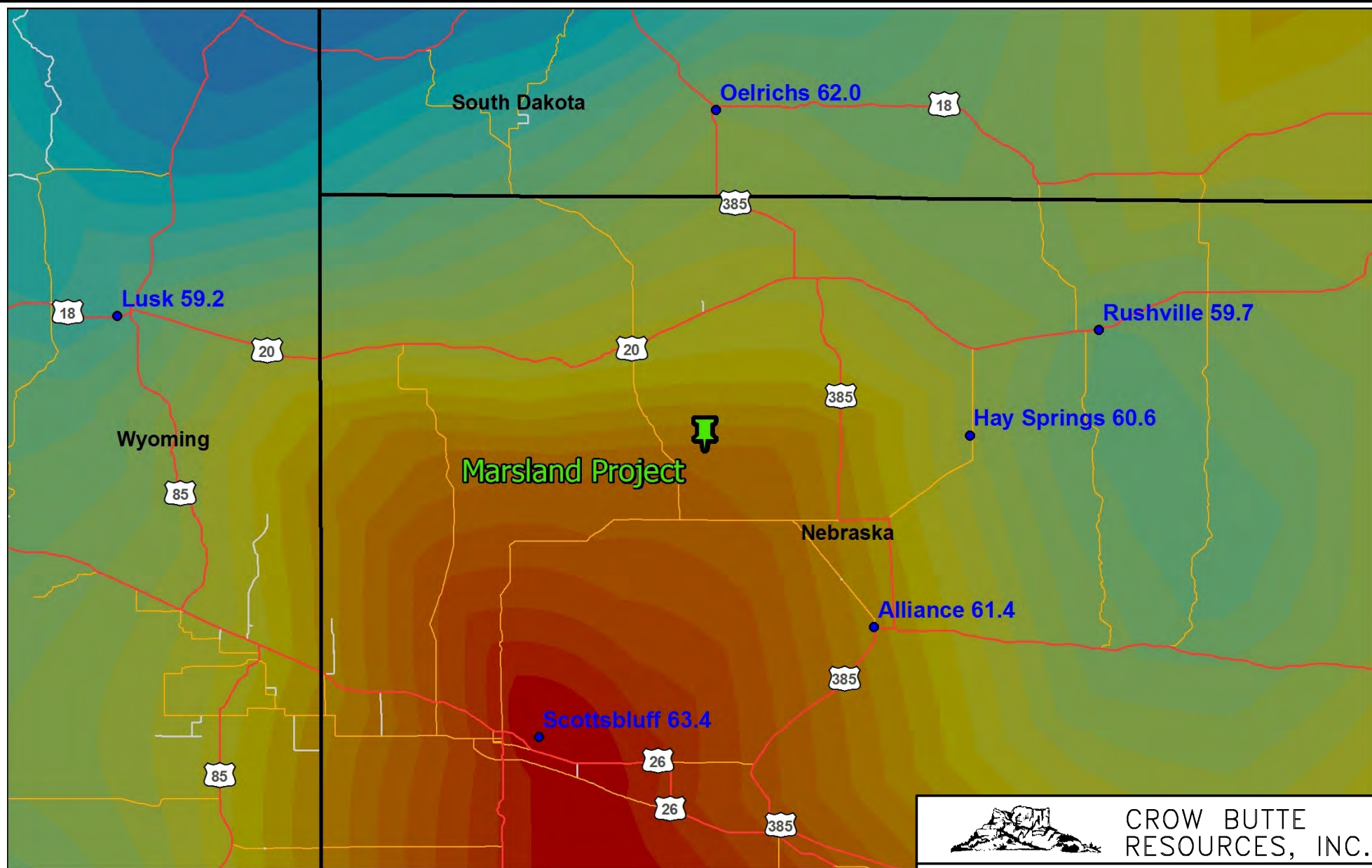
PROJECT: CO001636

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Average Annual
Maximum Temperature (°F)



0 5 10 20 Miles



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**FIGURE 2.5-5
REGIONAL ANNUAL AVERAGE
MAXIMUM TEMPERATURES**

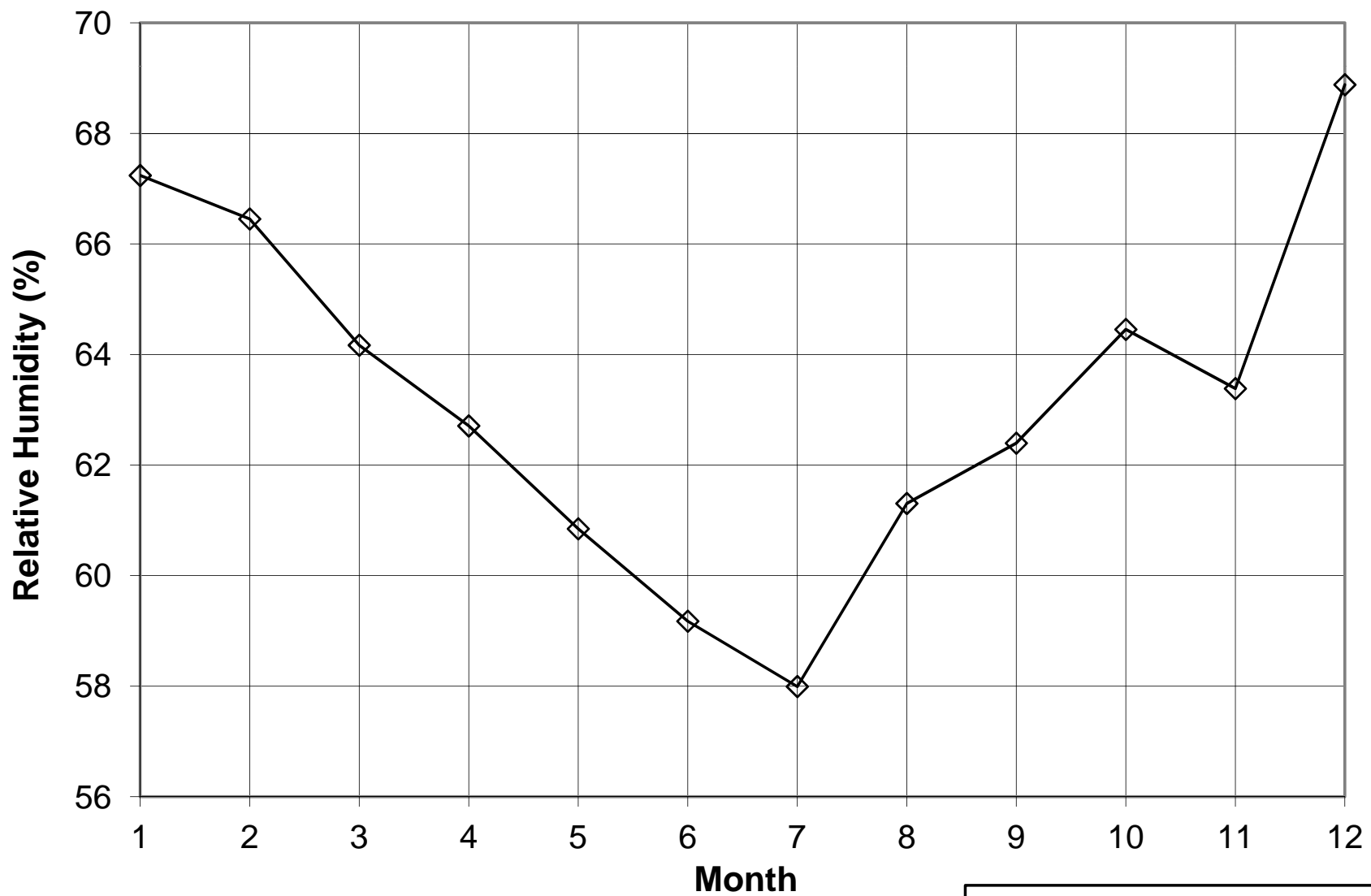
PROJECT: CO001636

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FIGURE 2.5-6
MONTHLY RELATIVE HUMIDITY
STATISTICS FOR SCOTTSBLUFF AP

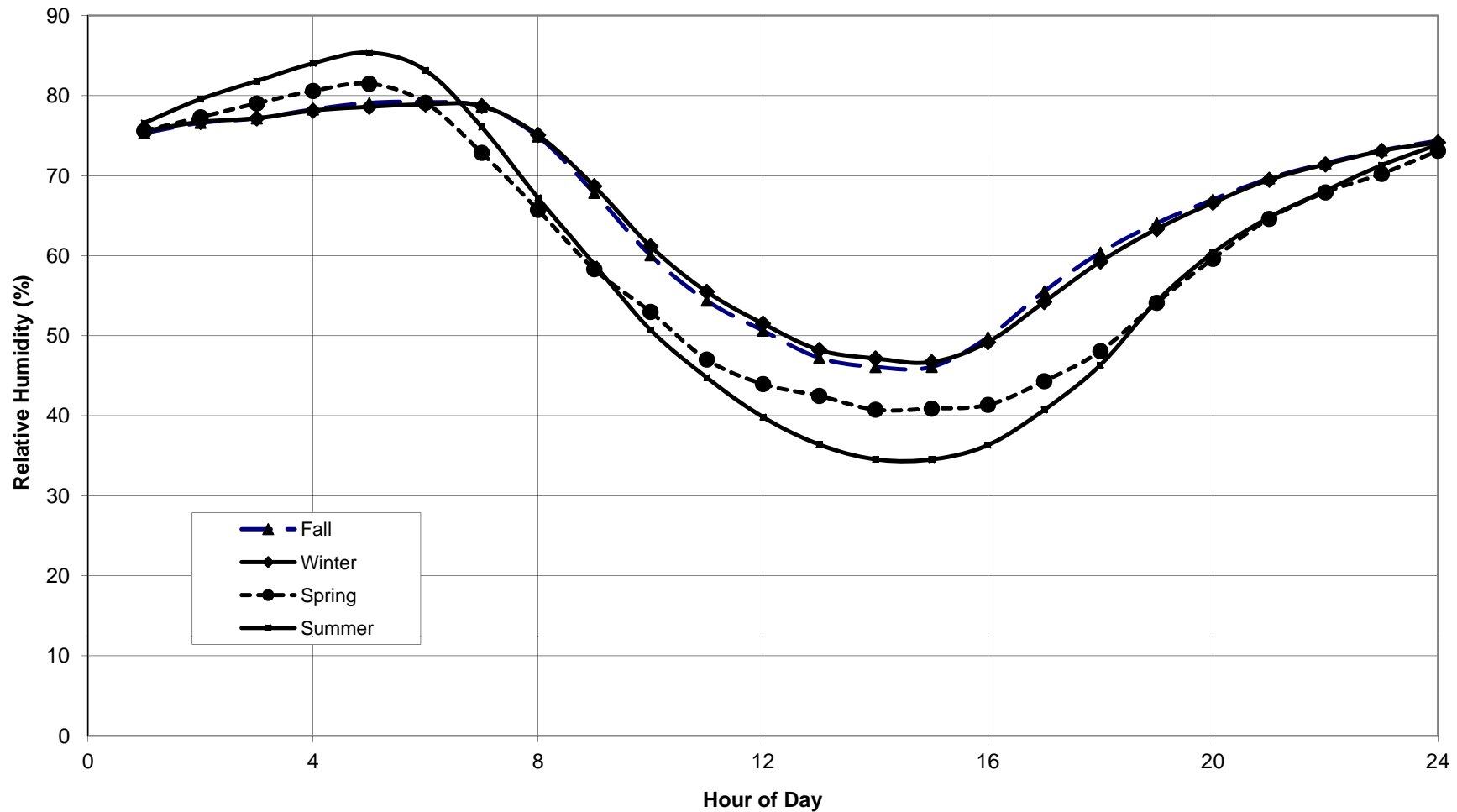
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FIGURE 2.5-7
DIURNAL VARIATION IN RELATIVE
HUMIDITY FOR SCOTTSBLUFF
BY SEASON

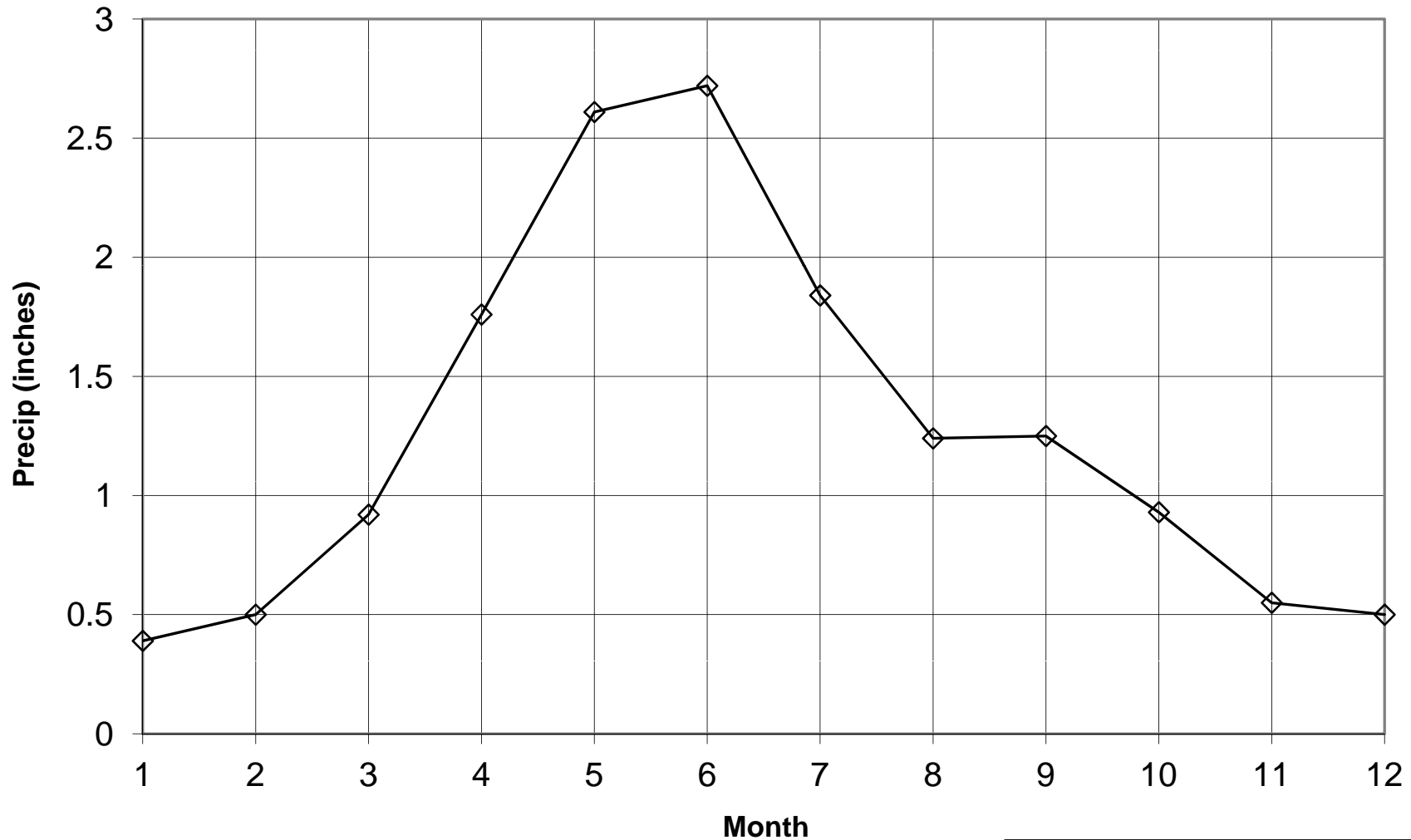
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FIGURE 2.5-8
SCOTTSBLUFF AP
MONTHLY AVERAGE PRECIPITATION

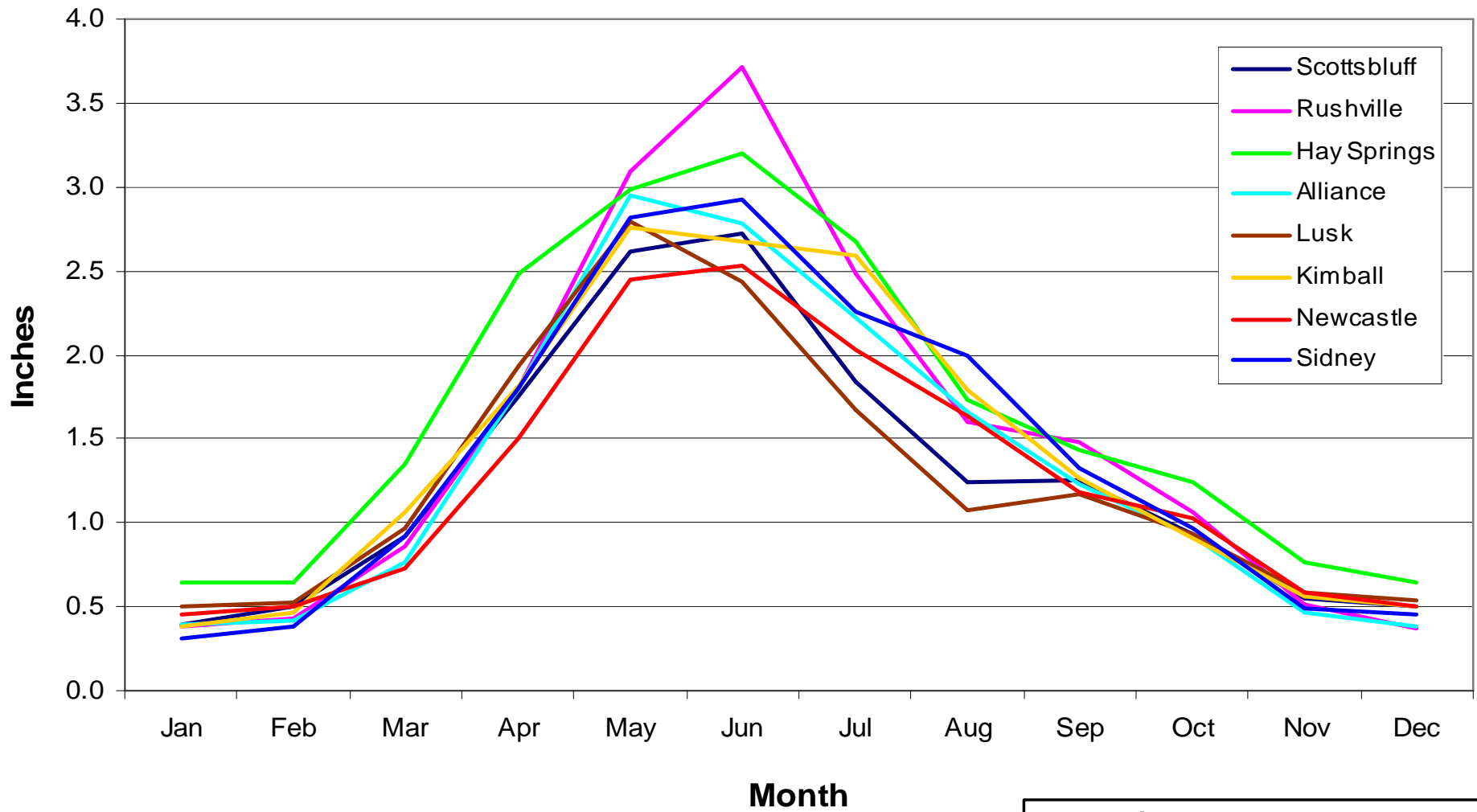
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**FIGURE 2.5-9
REGIONAL
MONTHLY AVERAGE PRECIPITATION**

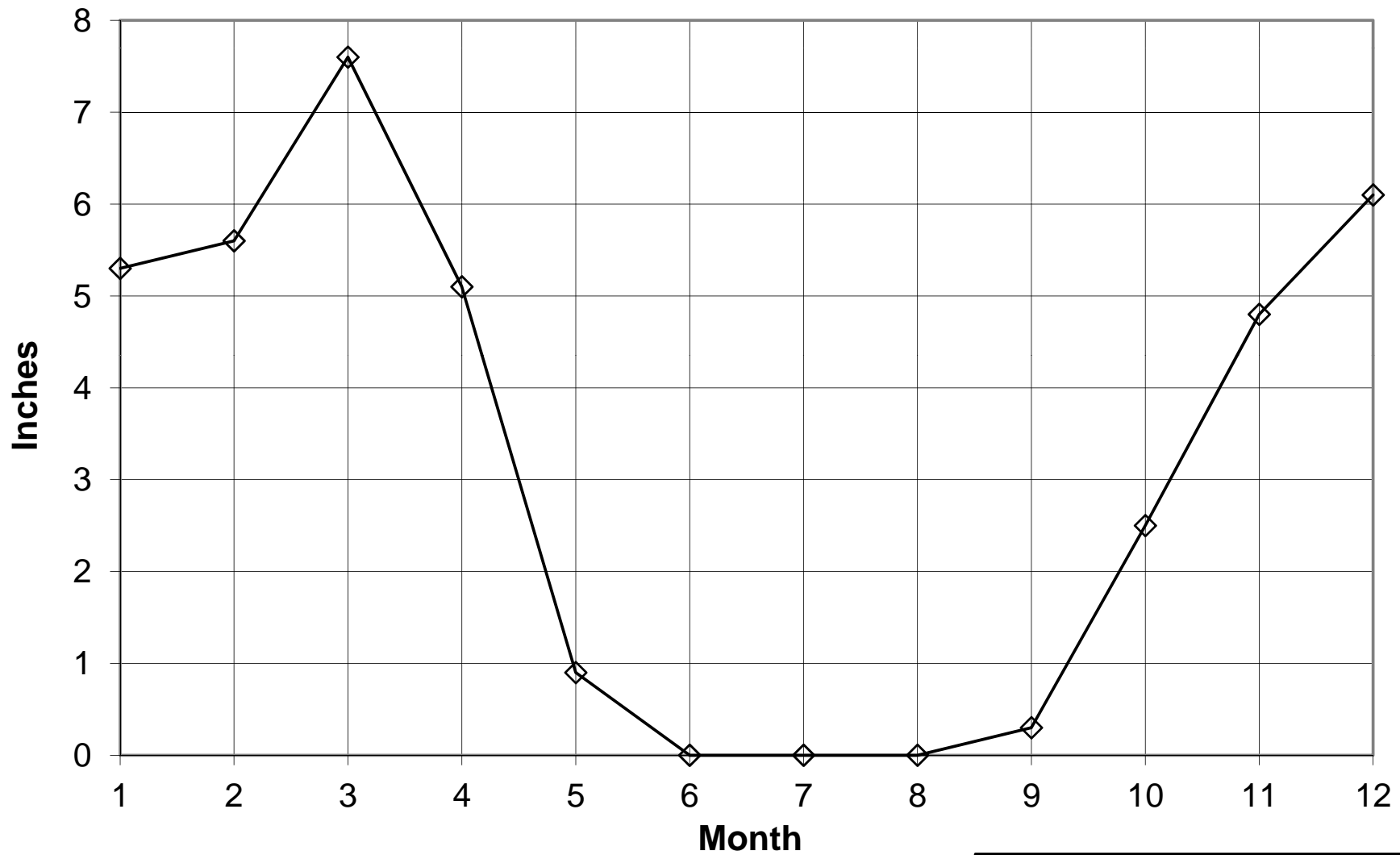
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**FIGURE 2.5-10
SCOTTSBLUFF AP
MONTHLY SNOWFALL**

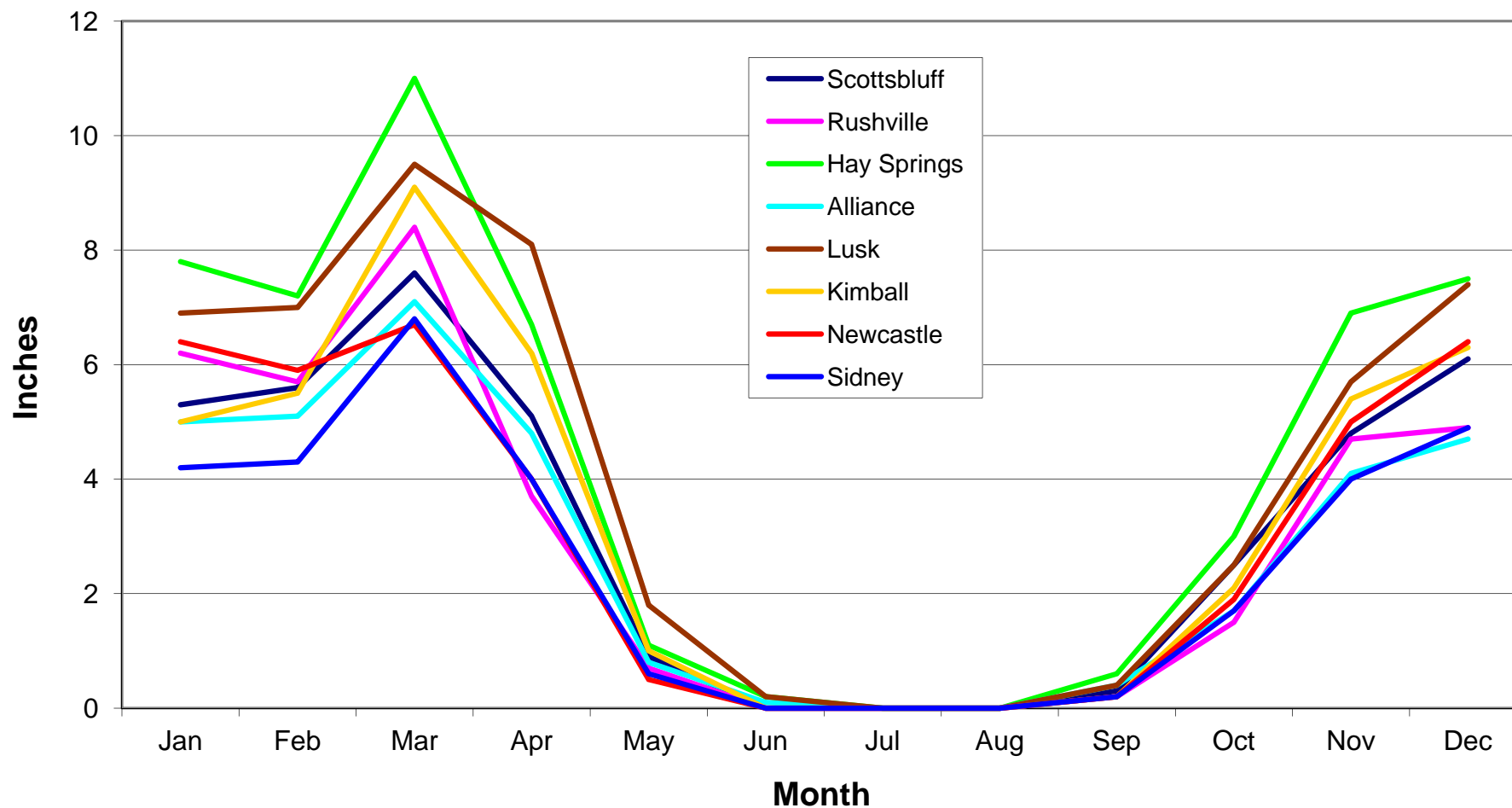
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**FIGURE 2.5-11
REGIONAL
MONTHLY AVERAGE SNOWFALL**

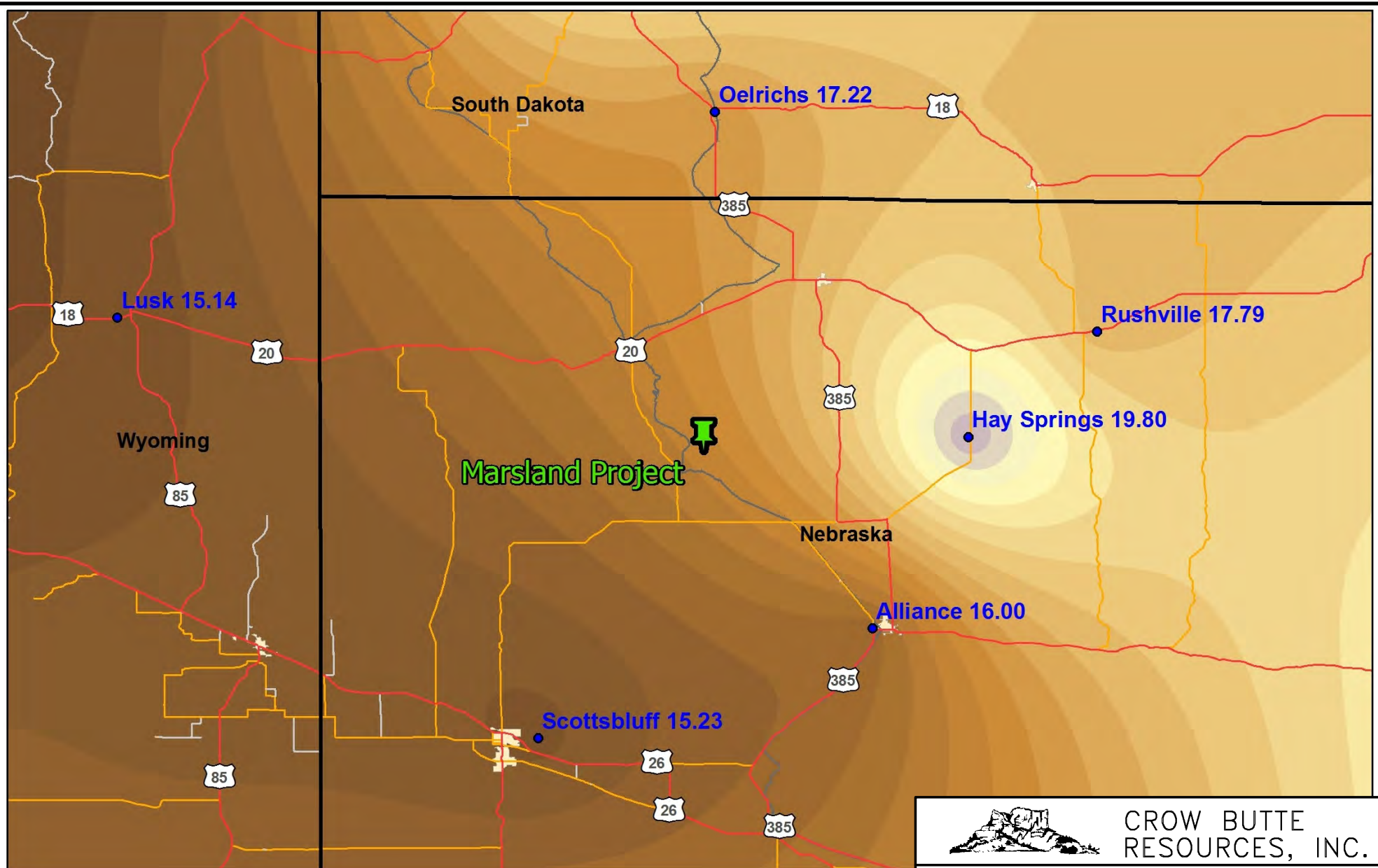
PROJECT: CO001636

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CHECKED BY: JEC



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Average Annual
Precipitation (in)

Max: 23.2
Min: 14.8

0 5 10 20 Miles



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**FIGURE 2.5-12
REGIONAL ANNUAL AVERAGE
PRECIPITATION**

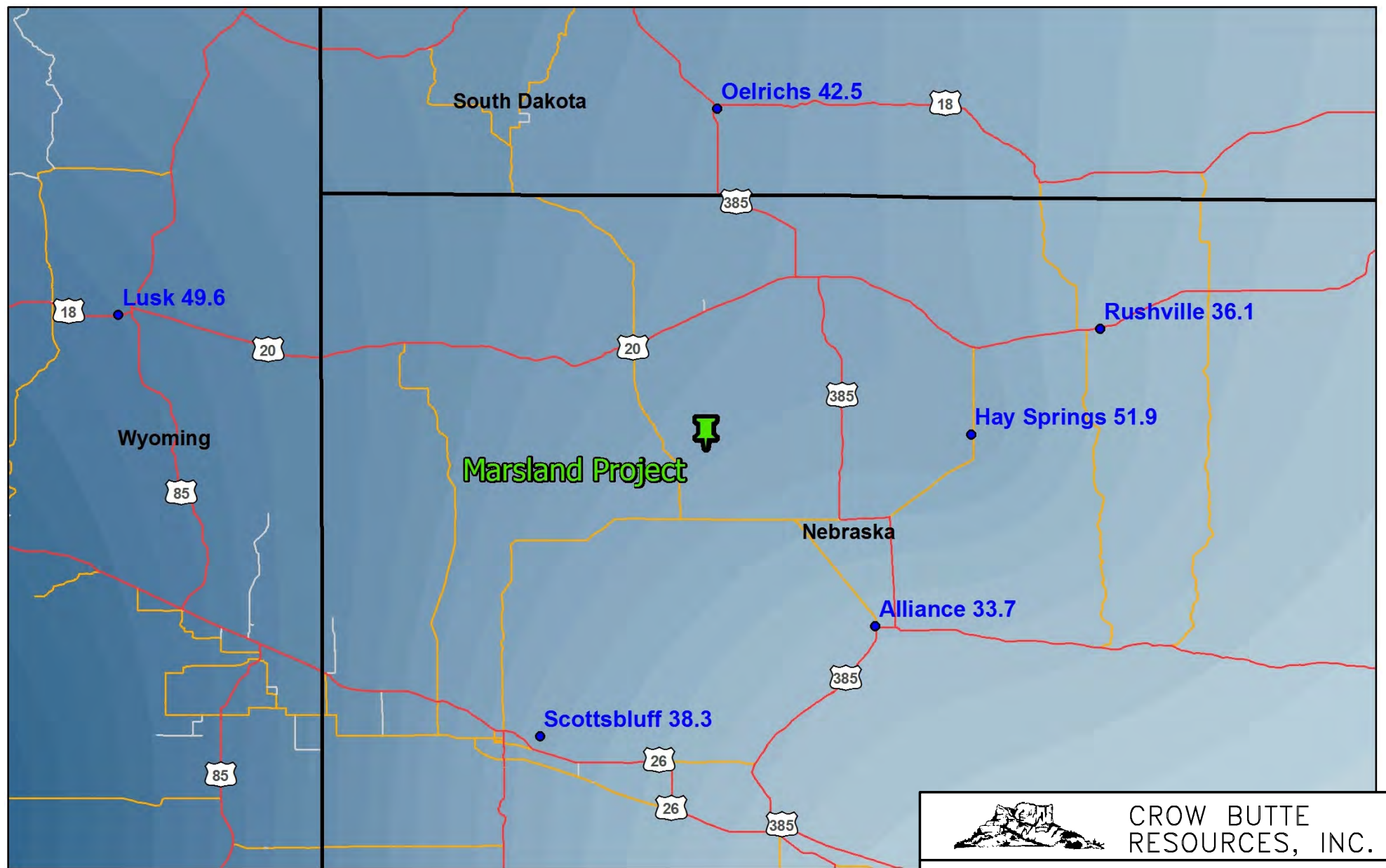
PROJECT: CO001636

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Average Annual
Snowfall (in)

Max: 61.8



Min: 32.3

0 5 10 20 Miles



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**FIGURE 2.5-13
REGIONAL ANNUAL AVERAGE
SNOWFALL**

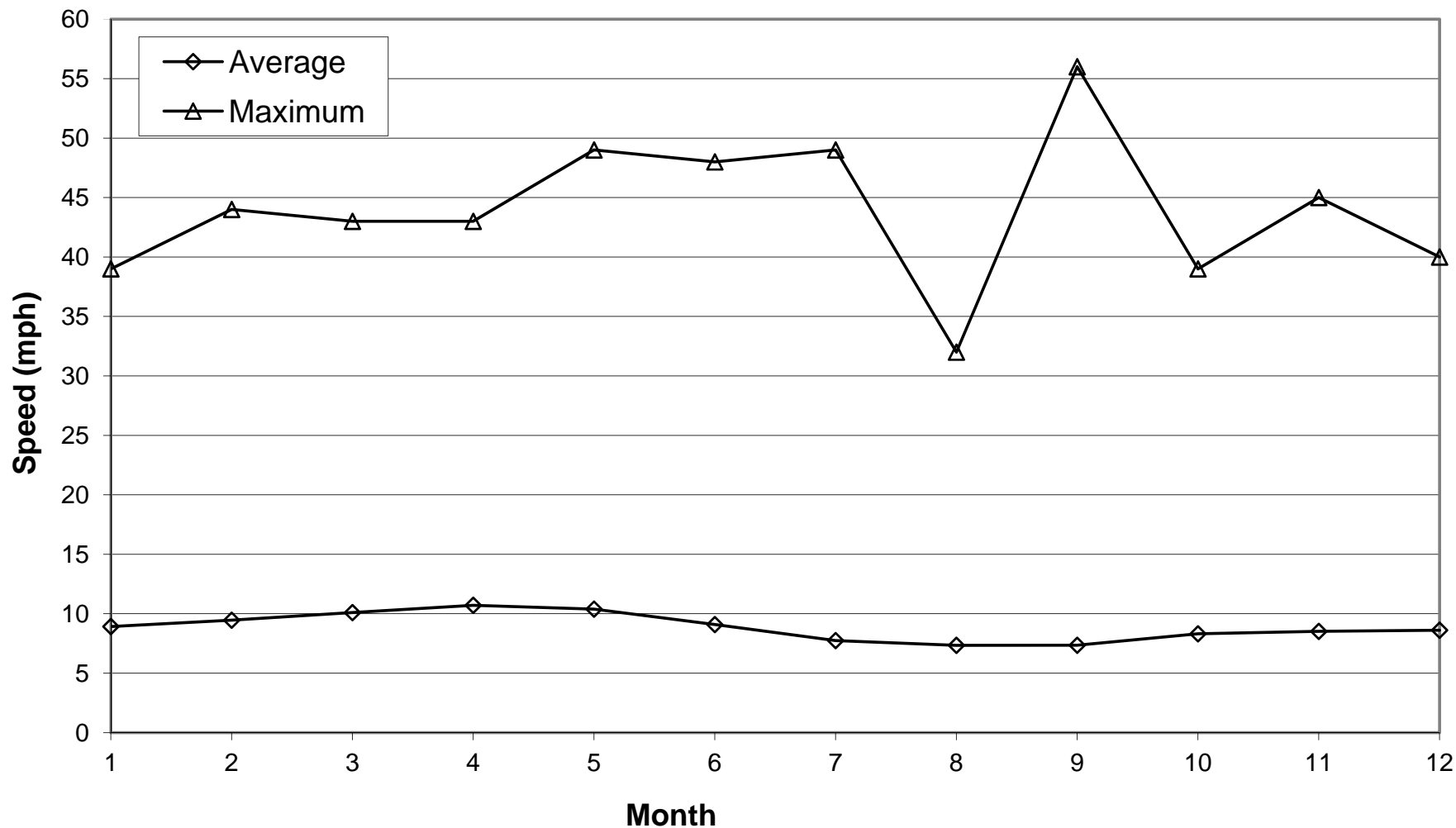
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FIGURE 2.5-14
SCOTTSBLUFF AP
15-YEAR WIND SPEEDS

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MAPPED BY: JC

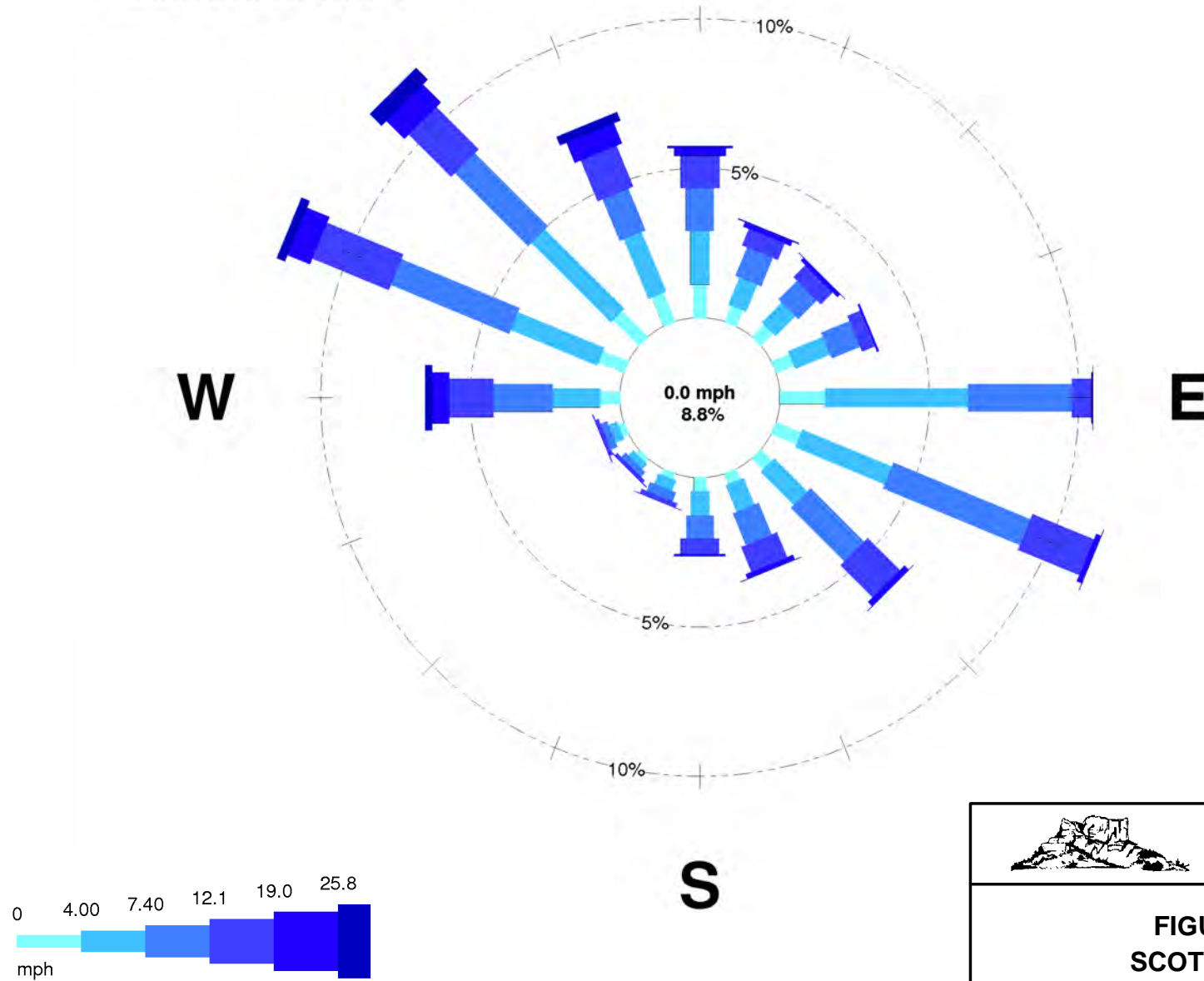
CHECKED BY: JEC



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Wind Rose Scottsbluff Airport

Scottsbluff, NE
11/1/1996 Hr. 1 to 8/31/2011 Hr. 23



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**FIGURE 2.5-15
SCOTTSBLUFF AP
15-YEAR WIND ROSE**

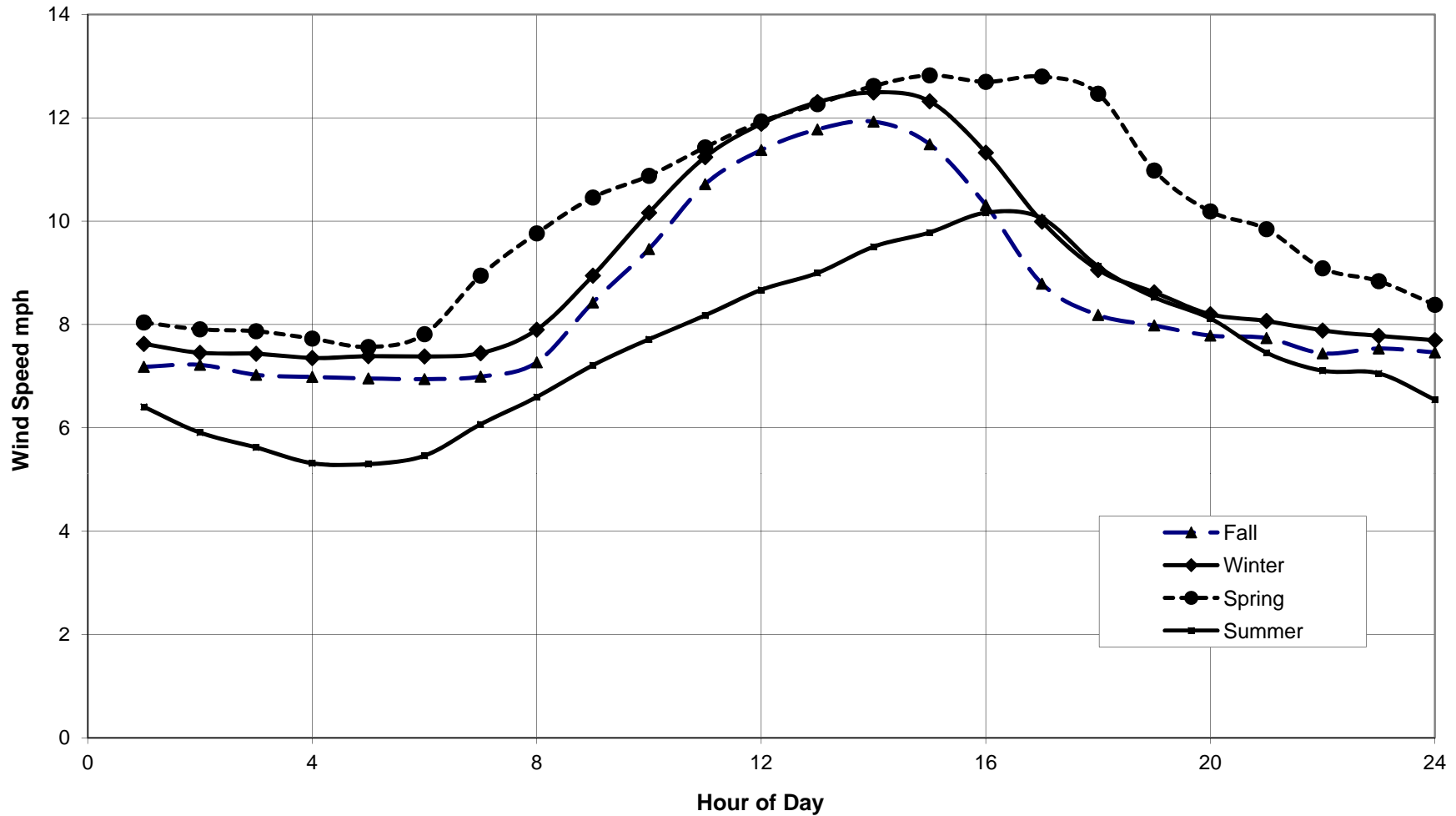
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**FIGURE 2.5-16
SCOTTSBLUFF AP
DIURNAL WIND SPEEDS BY SEASON**

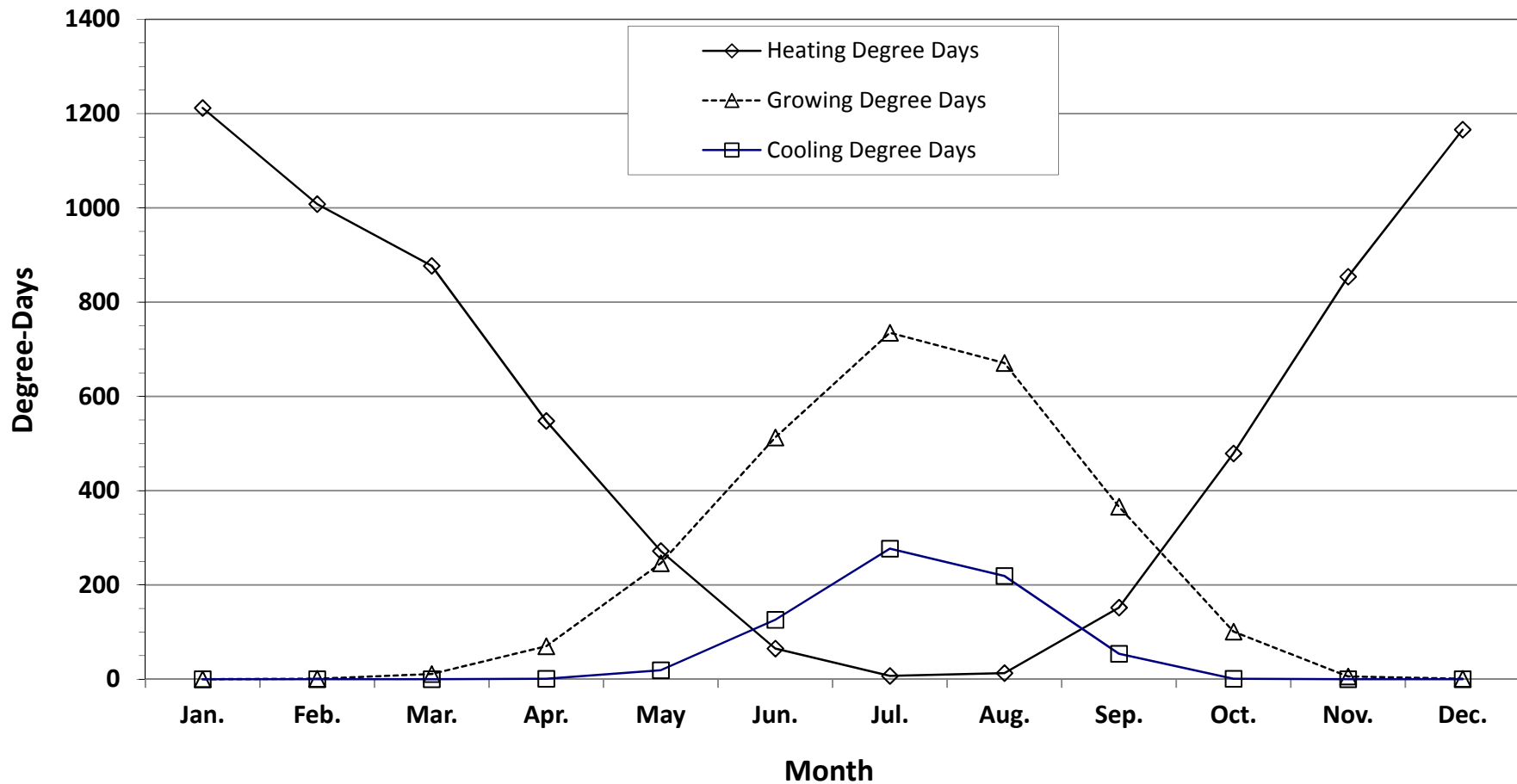
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**FIGURE 2.5-17
SCOTTSBLUFF AP
COOLING, HEATING, AND GROWING
DEGREE DAYS**

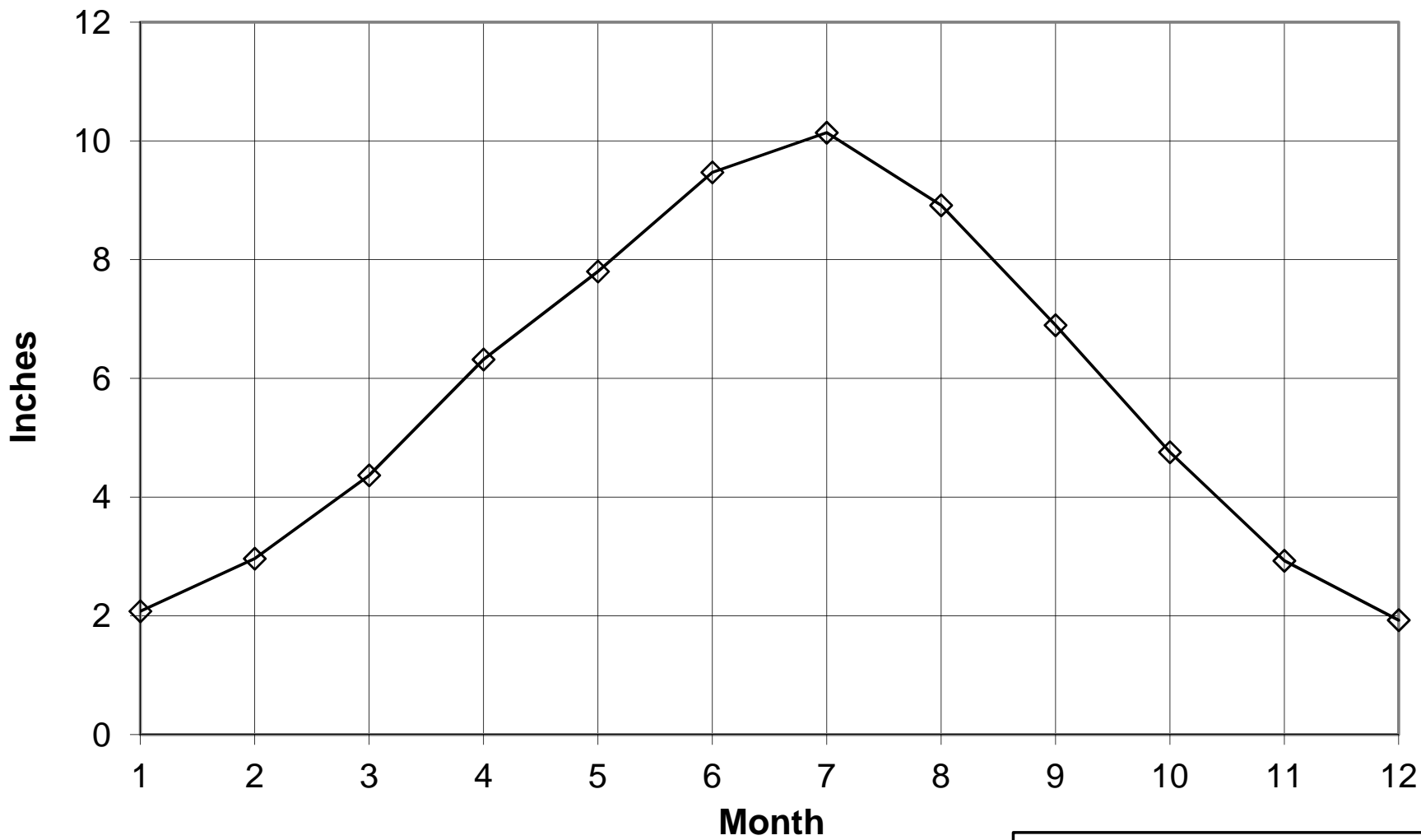
PROJECT: CO001636

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FIGURE 2.5-18
SCOTTSBLUFF AP
POTENTIAL EVAPOTRANSPIRATION

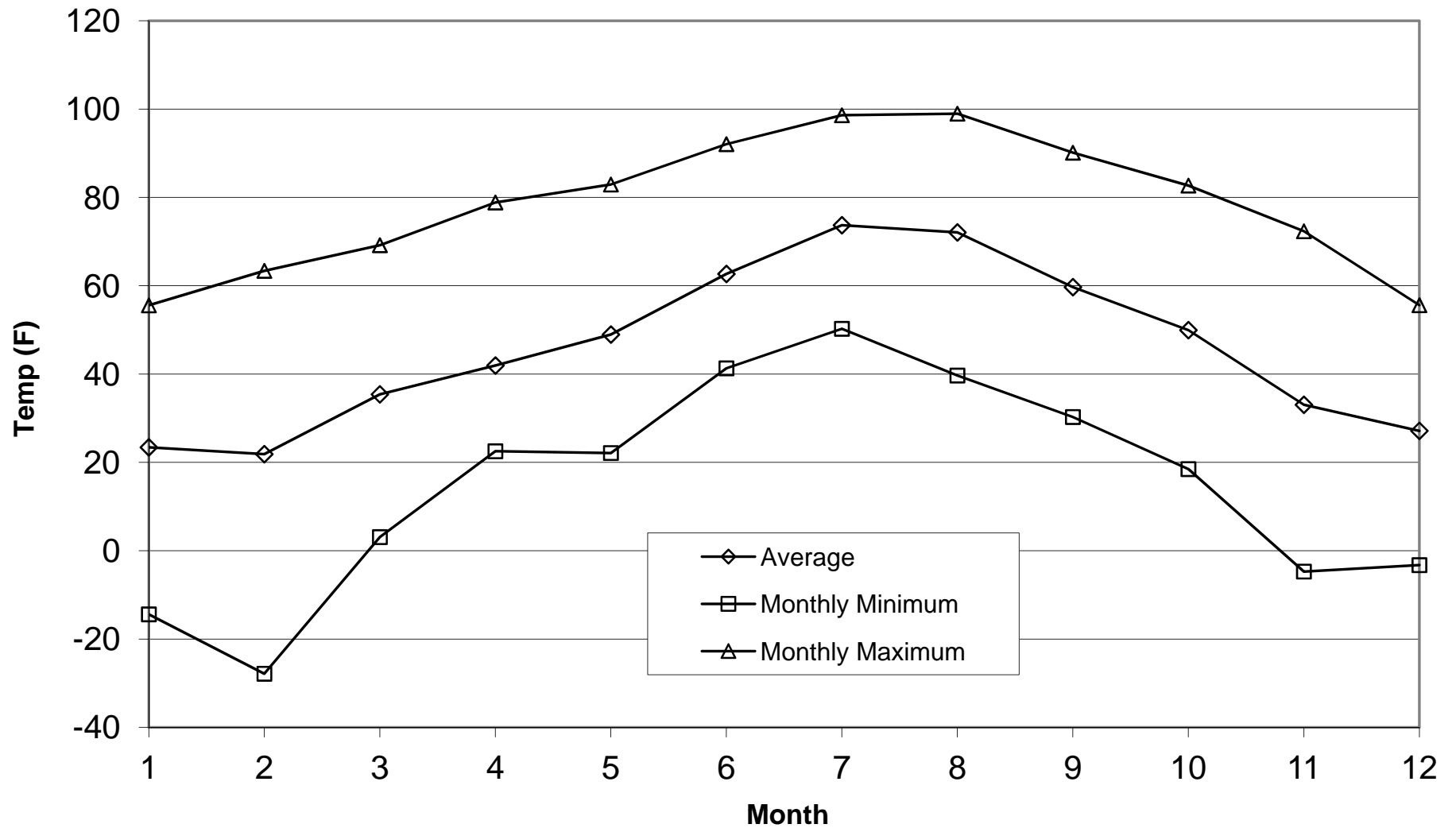
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**FIGURE 2.5-19
MARSLAND EXPANSION AREA
MONTHLY TEMPERATURES**

PROJECT: CO001636

MAPPED BY: JC

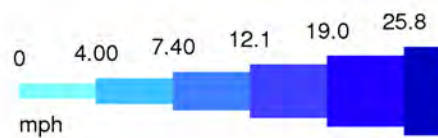
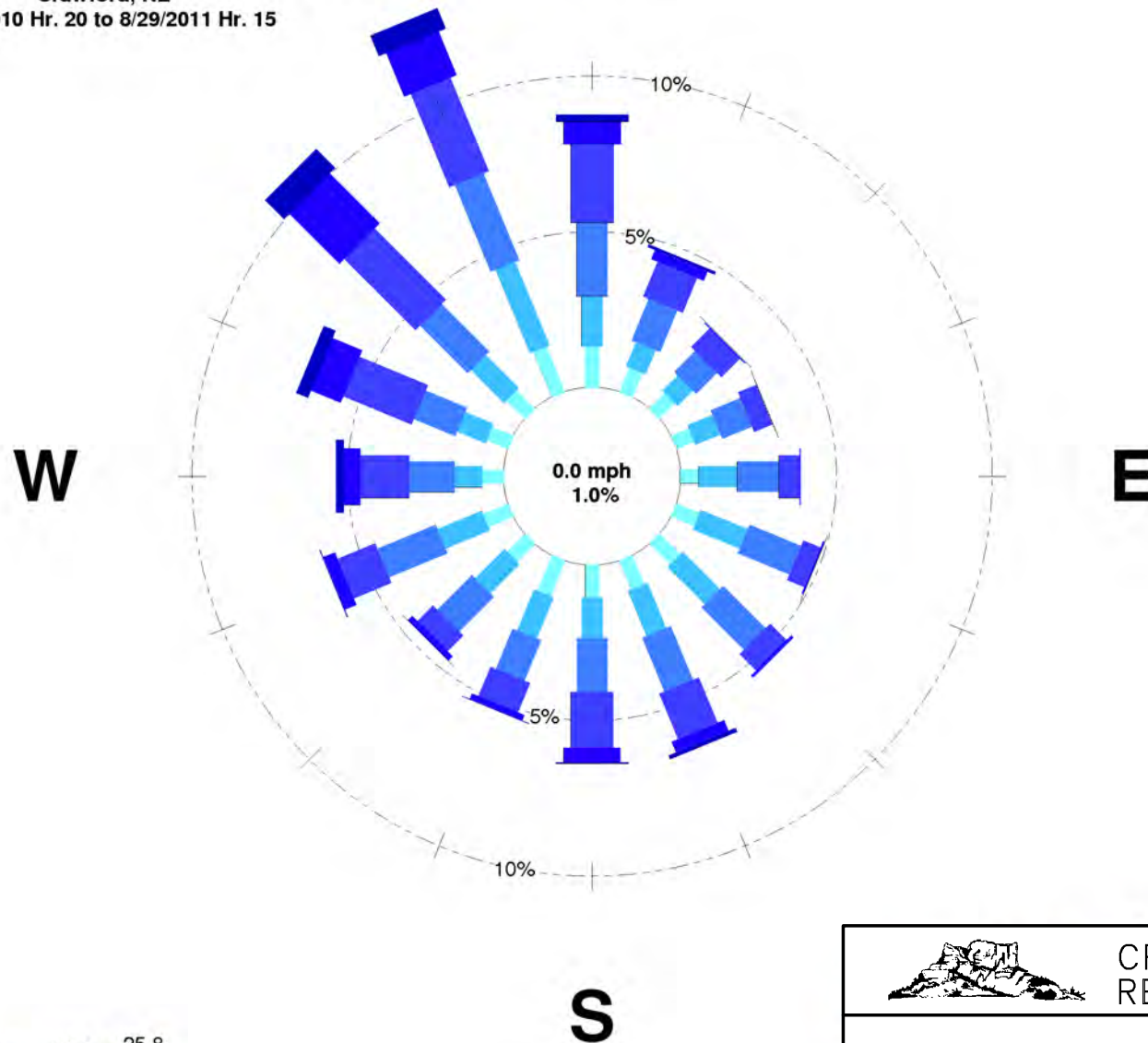
CHECKED BY: JEC



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Wind Rose Marsland Expansion Met Station

Crawford, NE
8/28/2010 Hr. 20 to 8/29/2011 Hr. 15



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**FIGURE 2.5-20
MARSLAND EXPANSION AREA
WIND ROSE**

PROJECT: CO001636

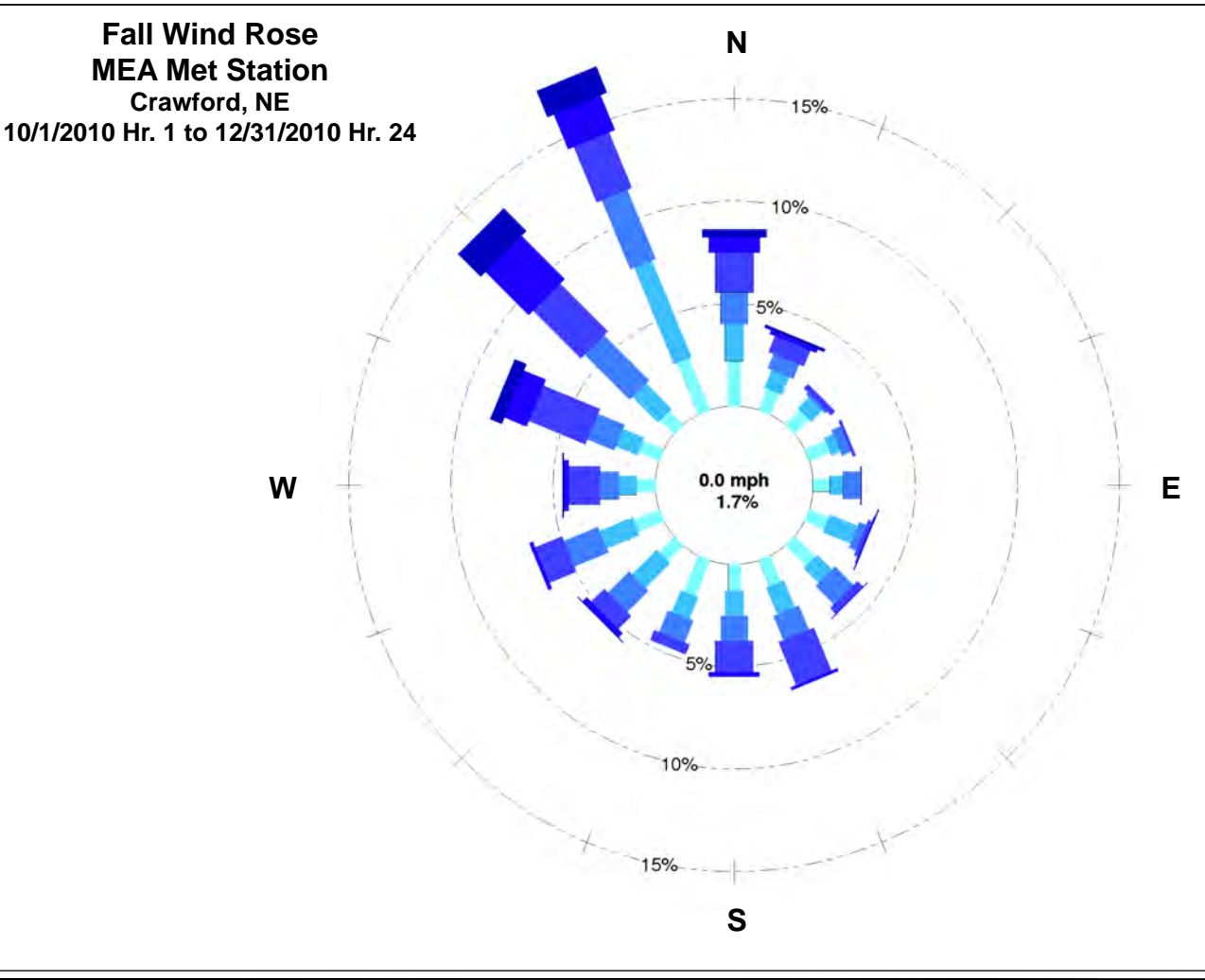
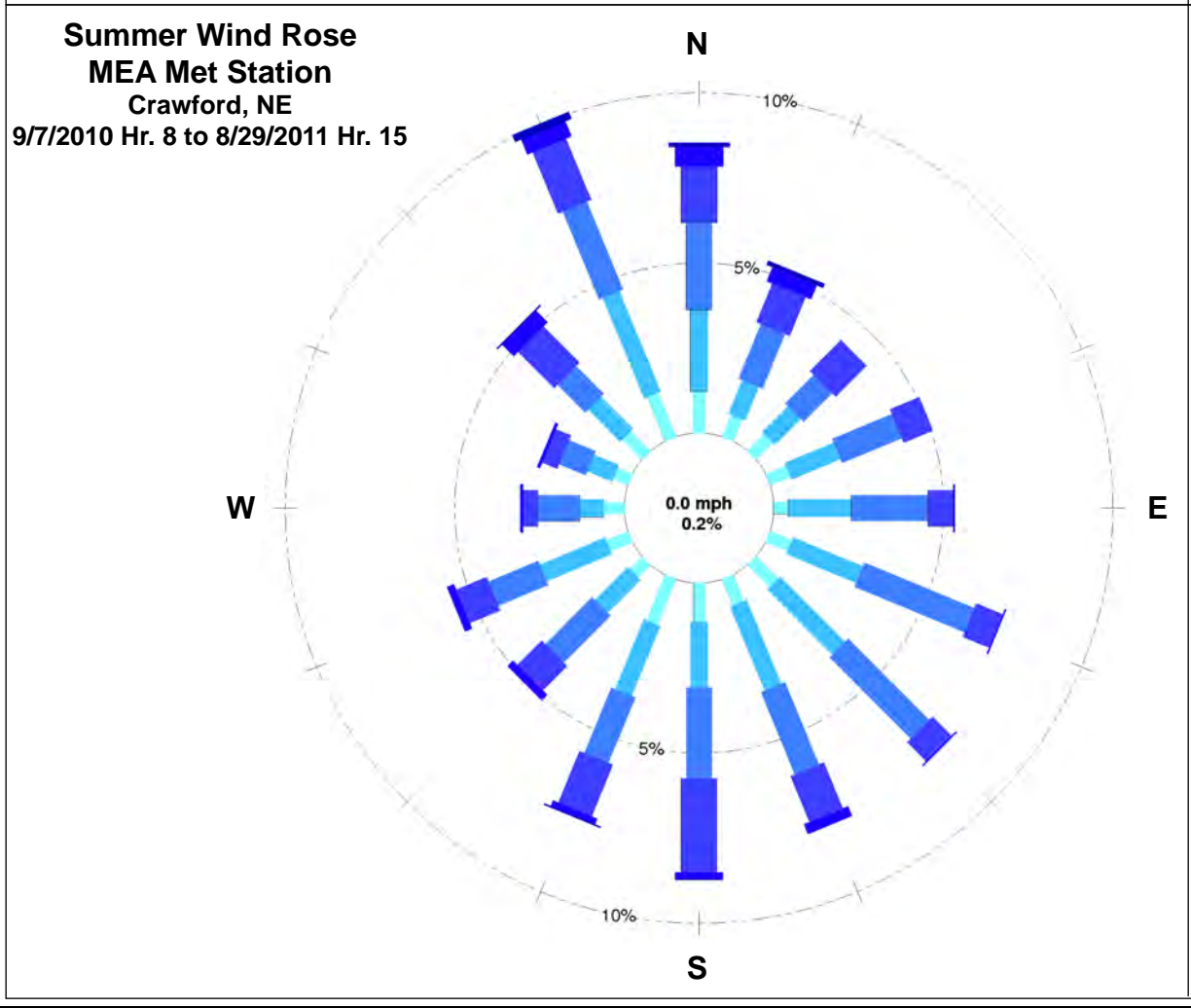
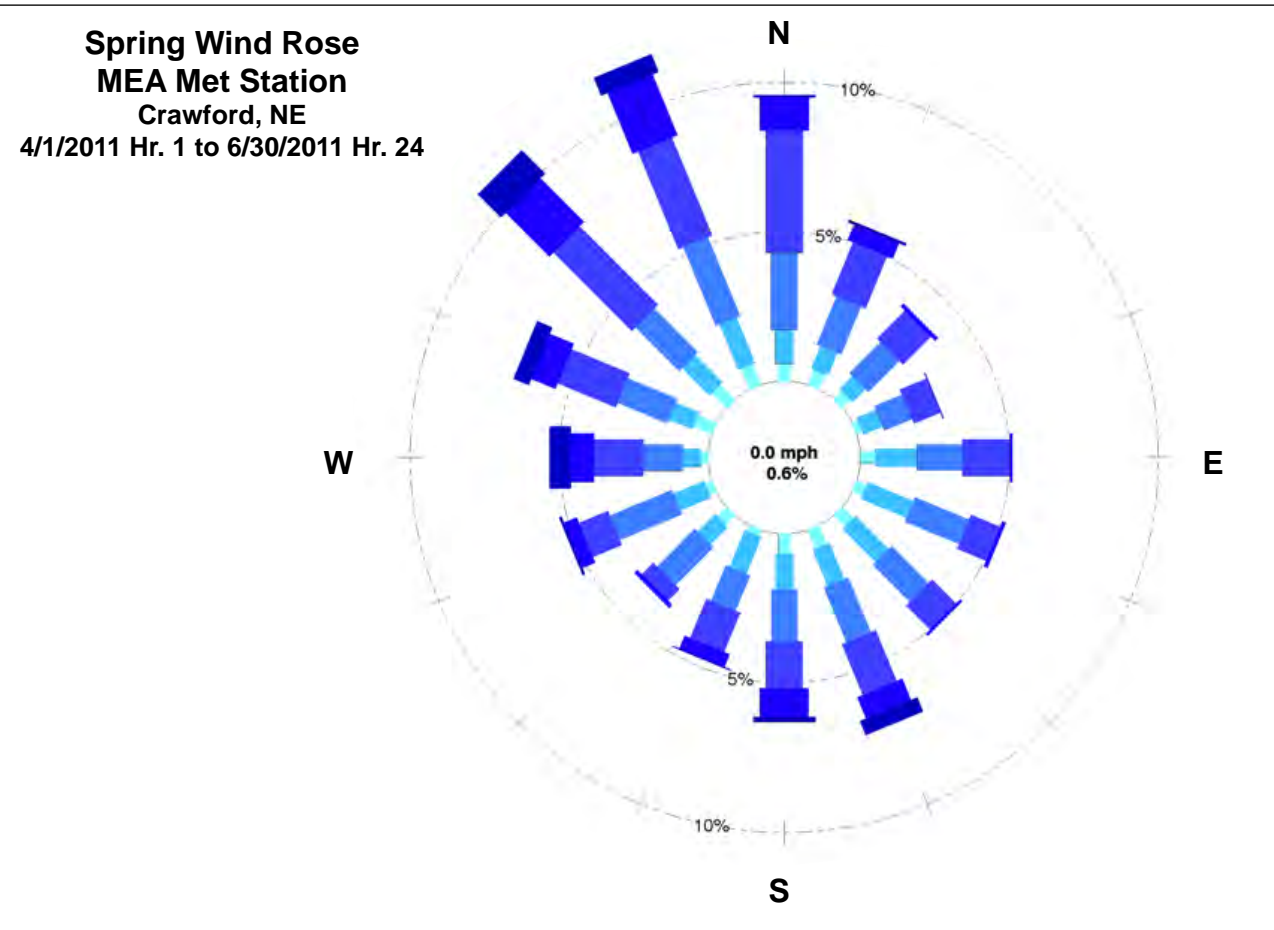
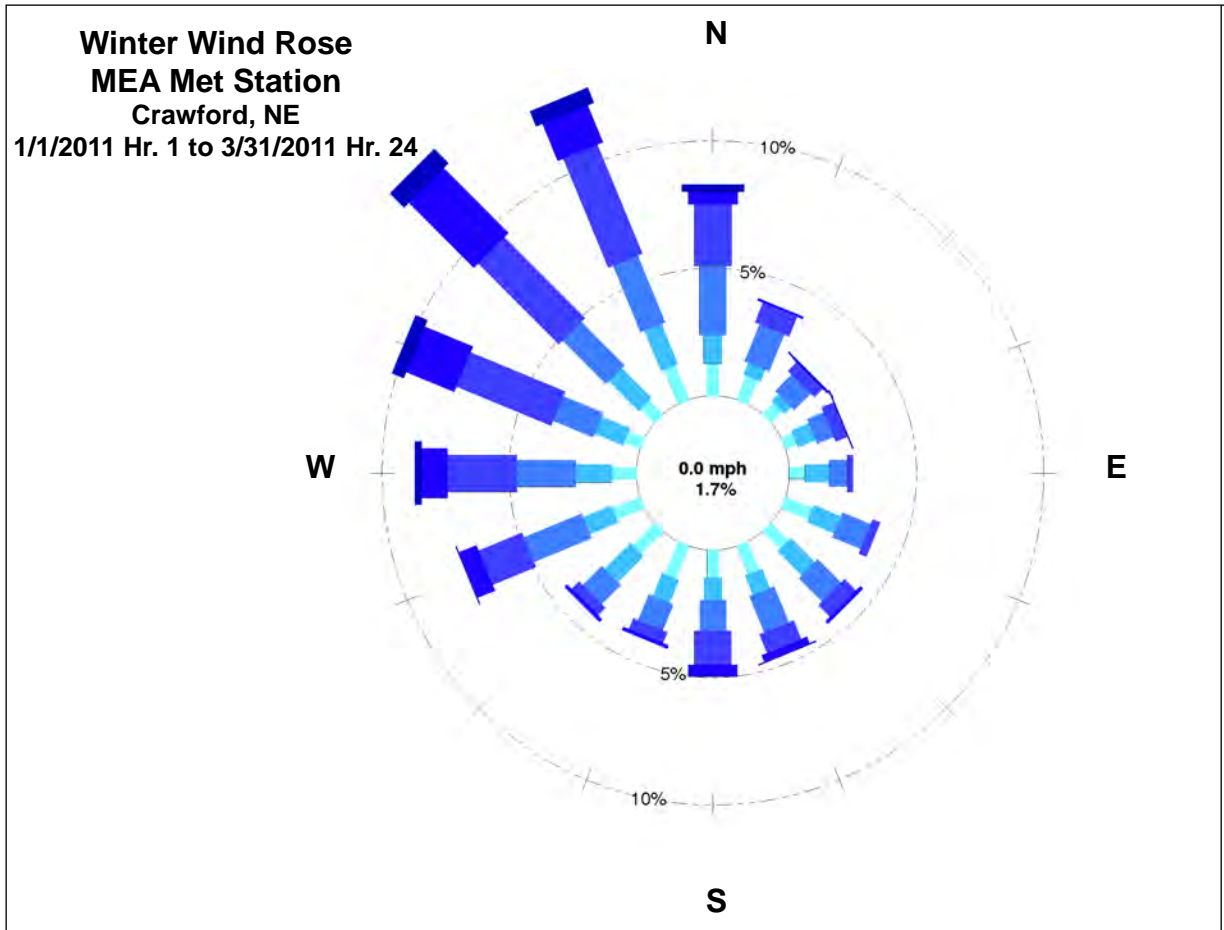
MAPPED BY: JC

CHECKED BY: JEC

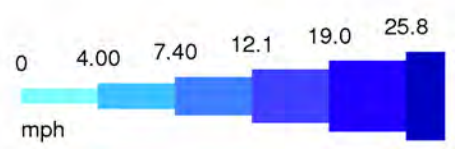


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K:\CBR_Projects\CO001636_Marland\3_IMAGES\Illustrator\TR Figure 2.5-21 Marland Expansion Area Seasonal Wind Roses_11x17.ai @ 10/17/2011



Note: The “summer” wind rose represents the 3rd calendar quarter, which includes July, August and September. Because the monitoring year spans parts of two calendar years, the summer wind rose software program utilized all of the available summer data from both years. This turned out to be September of 2010 (beginning with the 7th), July of 2011, and August of 2011 (up to the 29th). So the summer months are extracted from the stated date range.




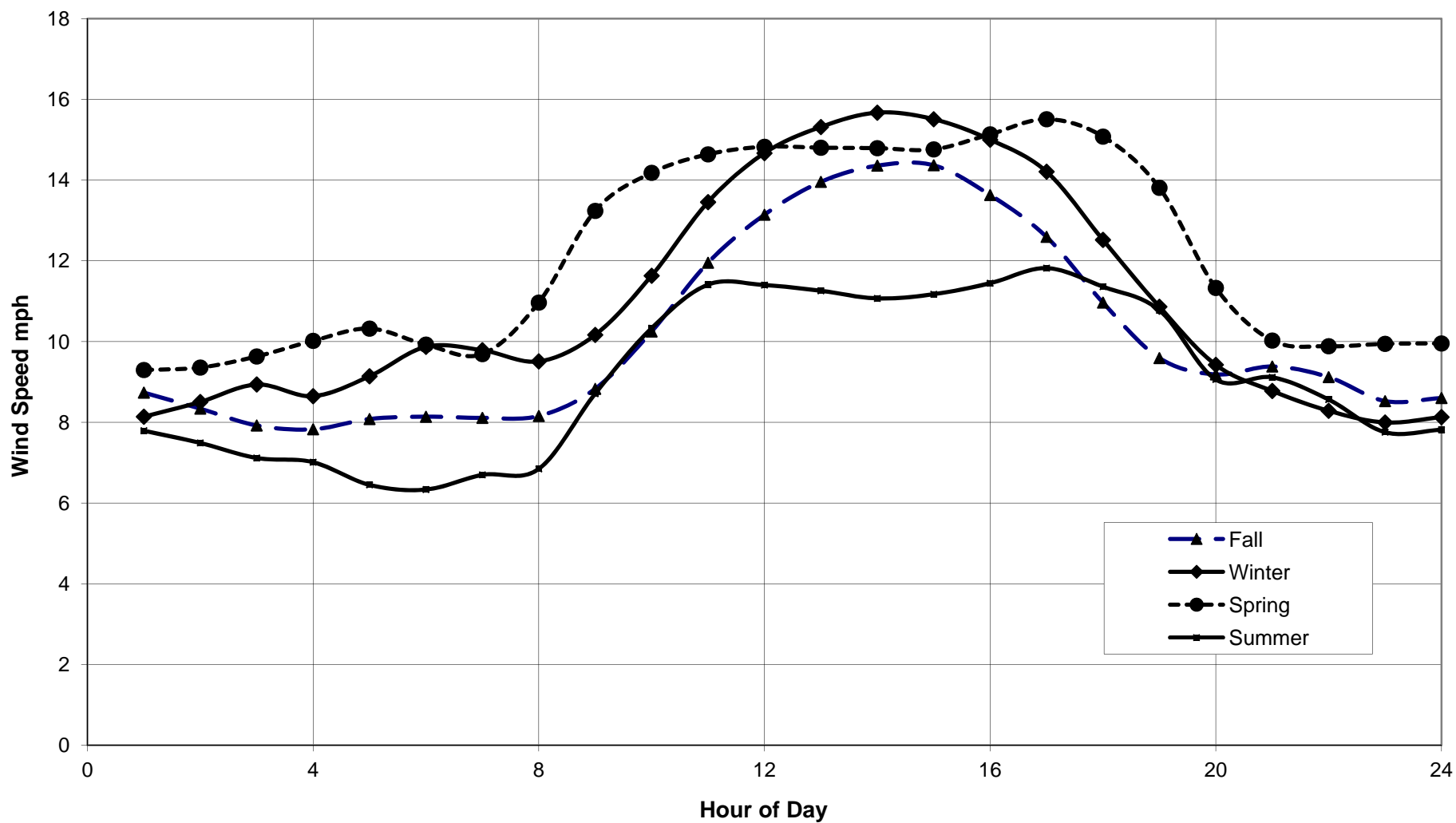
Source:
Inter-Mountain Lab (IML) Air Science, 2011

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**FIGURE 2.5-21
MARSLAND EXPANSION AREA
SEASONAL WIND ROSES**

PROJECT: CO001636 MAPPED BY: JC CHECKED BY: JEC

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FIGURE 2.5-22
MARSLAND EXPANSION AREA
DIURNAL WIND SPEEDS

PROJECT: CO001636

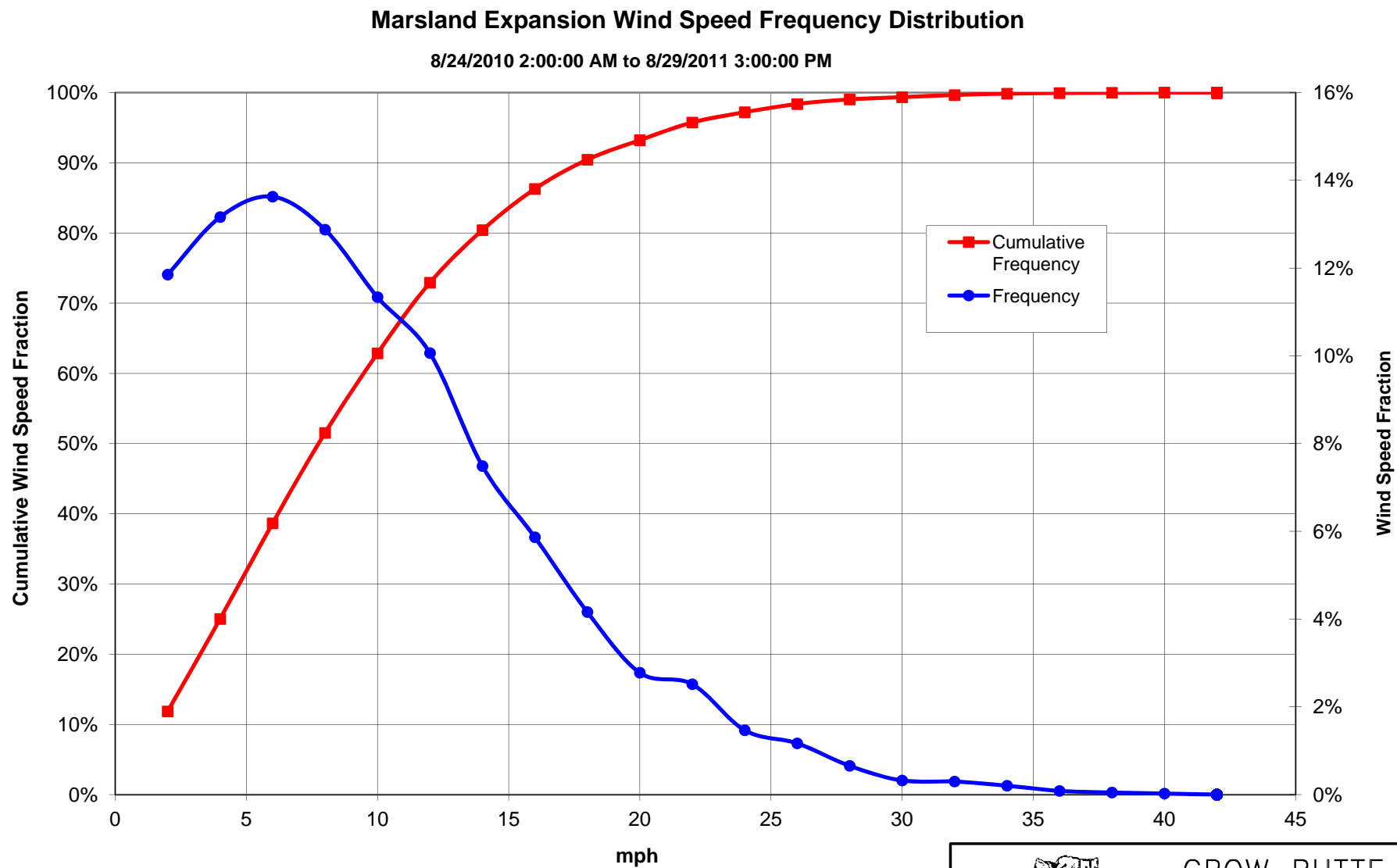
MAPPED BY: JC

CHECKED BY: JEC



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K:\CRR_P\Projects\CO001636_Marland\3_IMAGES\Illustrator\TR Figure 2_5-23 MEA Wind Speed Distribution.ai @ 11/08/2011



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**FIGURE 2.5-23
MARSLAND EXPANSION AREA
WIND SPEED DISTRIBUTION**

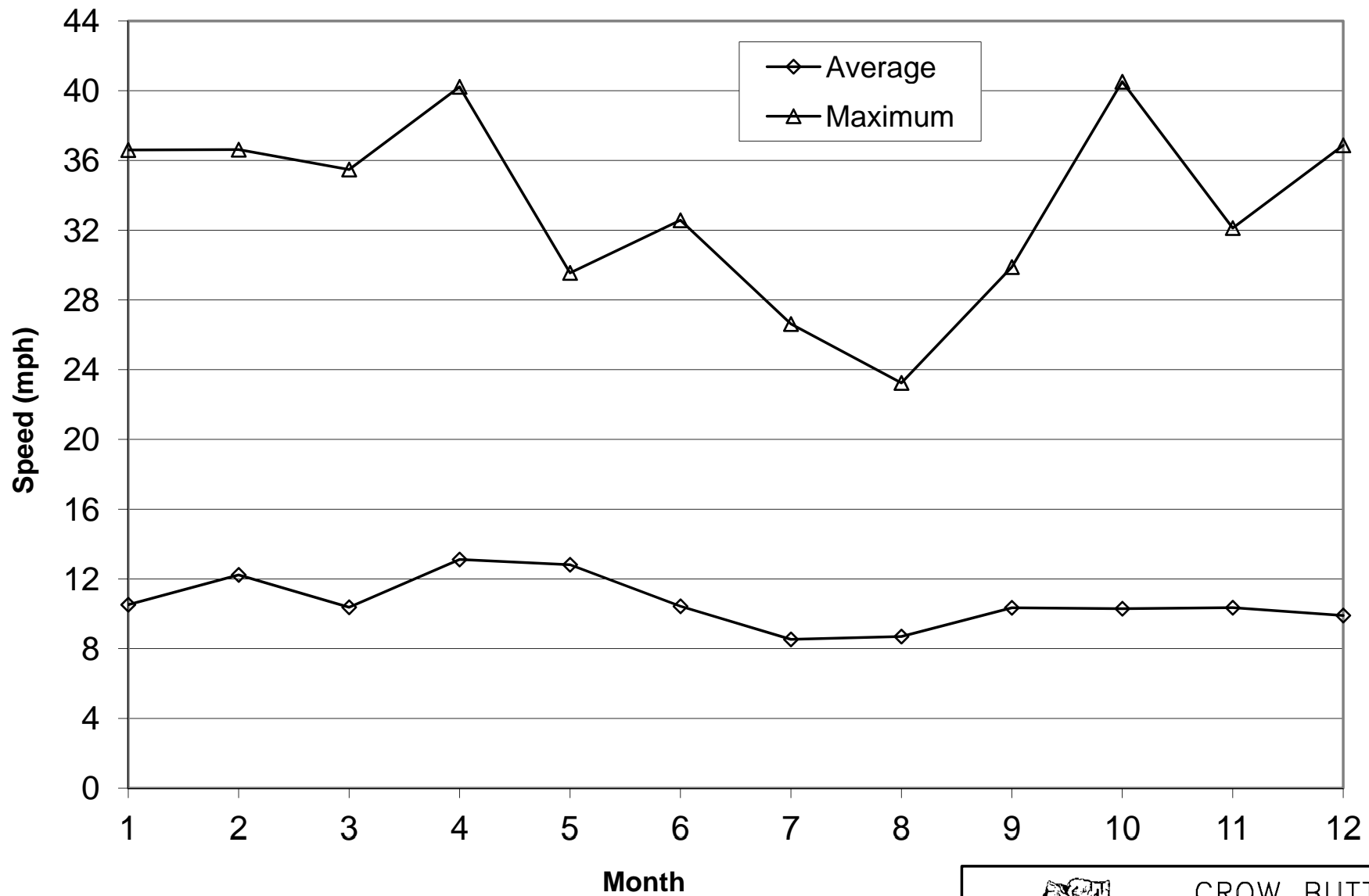
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**FIGURE 2.5-24
PROJECT AREA
MONTHLY AVERAGE WIND SPEEDS**

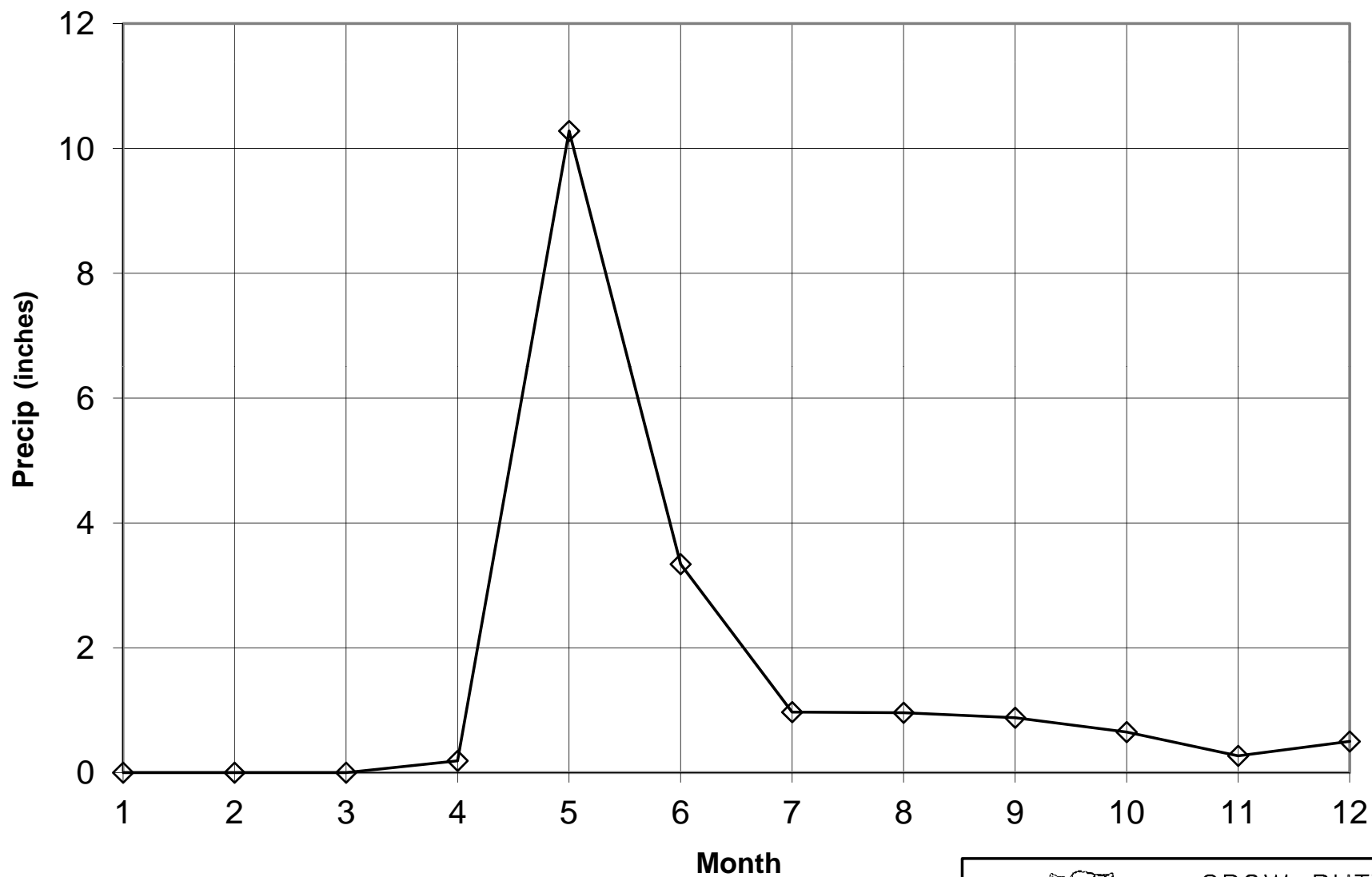
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FIGURE 2.5-25
MARSLAND EXPANSION AREA
TOTAL MONTHLY PRECIPITATION

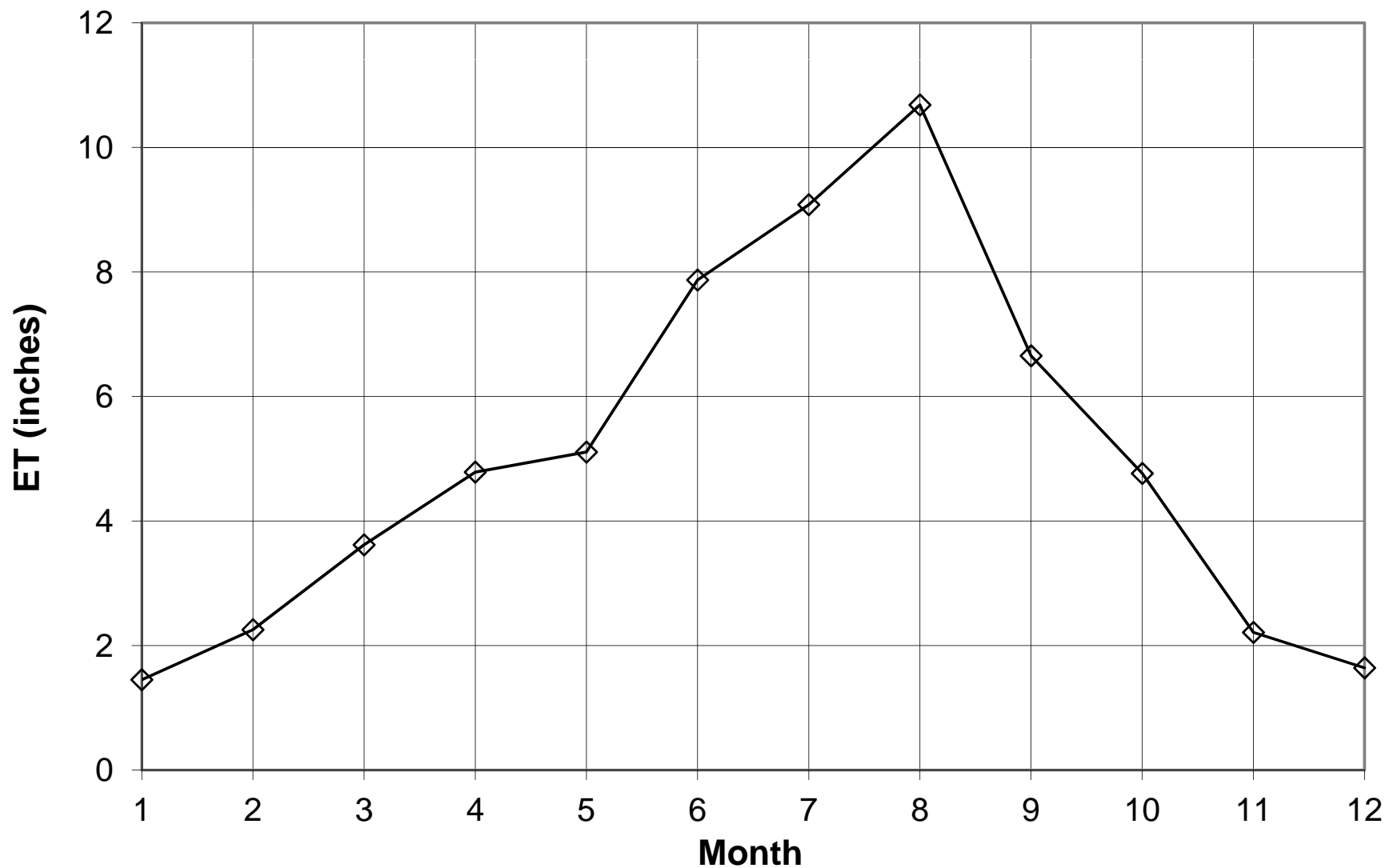
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Source:

Calculation based on Penman Equation, from data supplied by Cameco Resources, from 8/24/2010 to 8/29/2011.



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FIGURE 2.5-26
MARSLAND EXPANSION AREA
POTENTIAL MONTHLY
EVAPOTRANSPIRATION

PROJECT: CO001636

MAPPED BY: JC

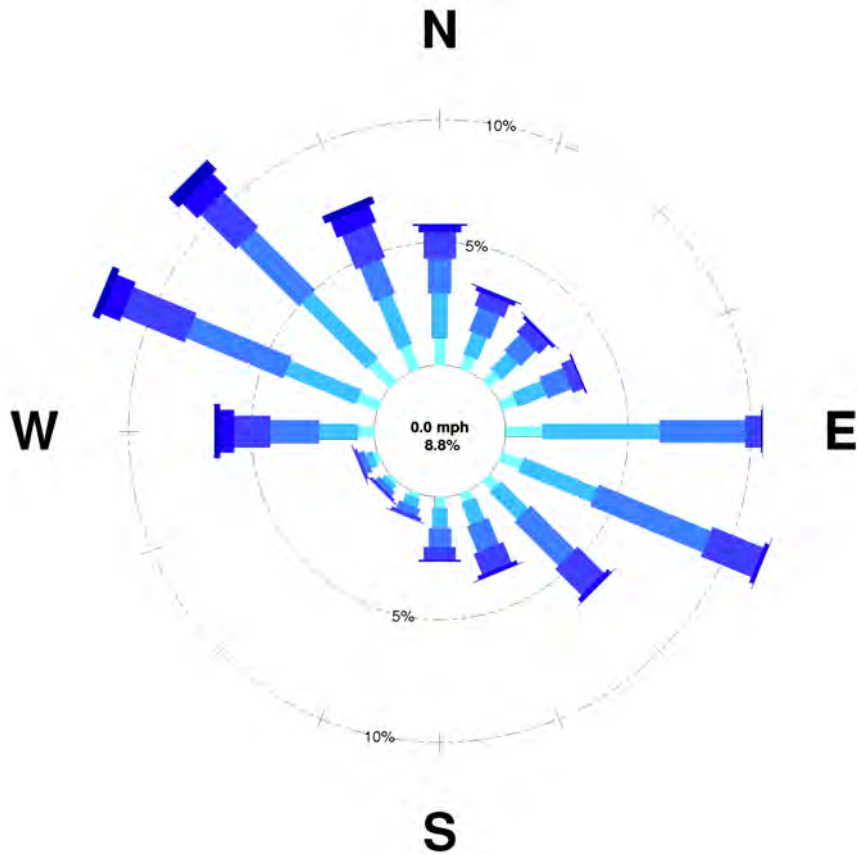
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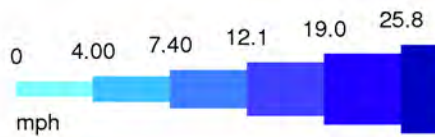
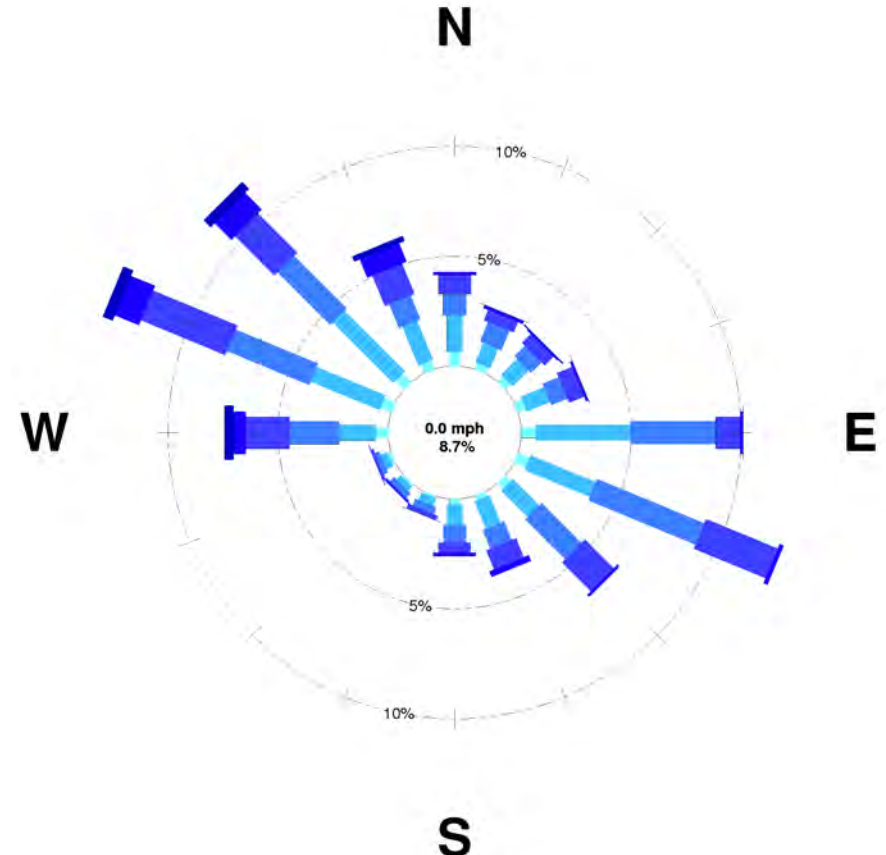
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Wind Rose
Scottsbluff Airport
Scottsbluff, NE
11/1/1996 Hr. 1 to 8/31/2011 Hr. 23



Wind Rose
Scottsbluff Airport
Scottsbluff, NE
8/24/2010 Hr. 2 to 8/29/2011 Hr. 15



Source: Inter-Mountain Lab (IML) Air Science, 2011



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FIGURE 2.5-27
SCOTTSBLUFF 15-YEAR vs
BASELINE YEAR WIND ROSES

PROJECT: CO001636

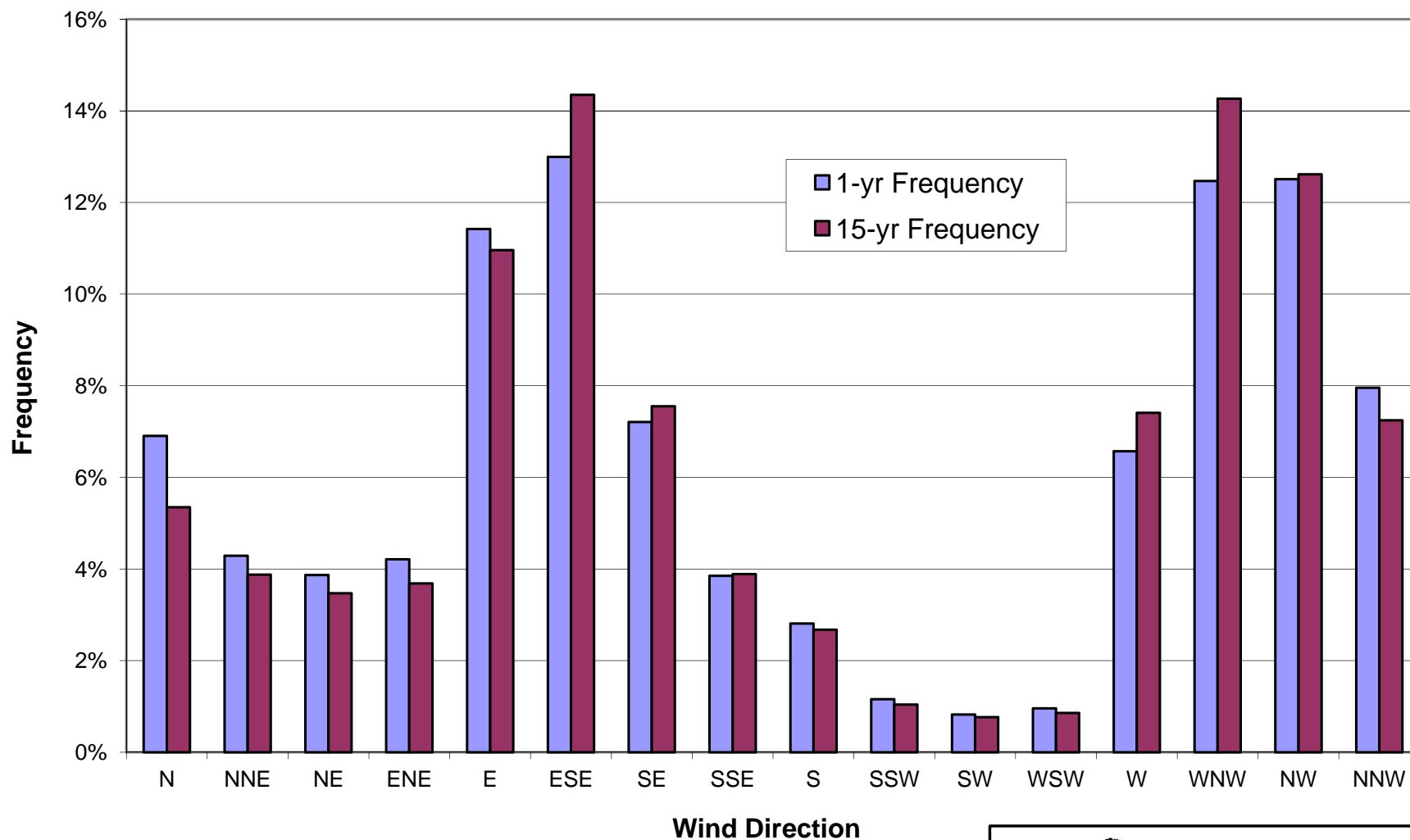
MAPPED BY: JC

CHECKED BY: JEC



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Scottsbluff Airport Wind Direction Distribution



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FIGURE 2.5-28
SCOTTSBLUFF 15-YEAR
VS BASELINE YEAR
WIND DIRECTIONS

PROJECT: CO001636

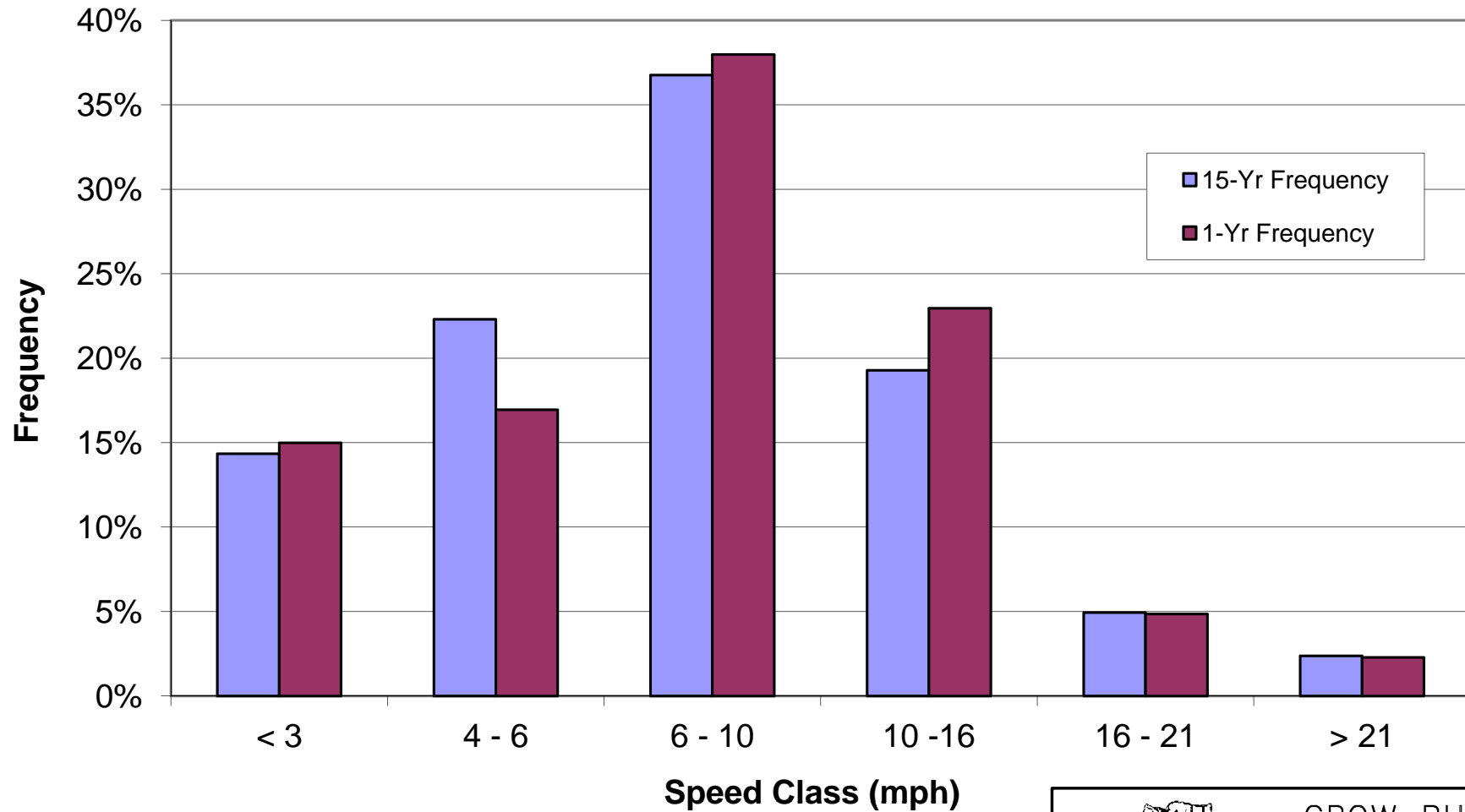
MAPPED BY: JC

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Scottsbluff Airport Wind Speed Distribution



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FIGURE 2.5-29
SCOTTSBLUFF 15-YEAR
VS BASELINE YEAR
WIND SPEEDS

PROJECT: CO001636

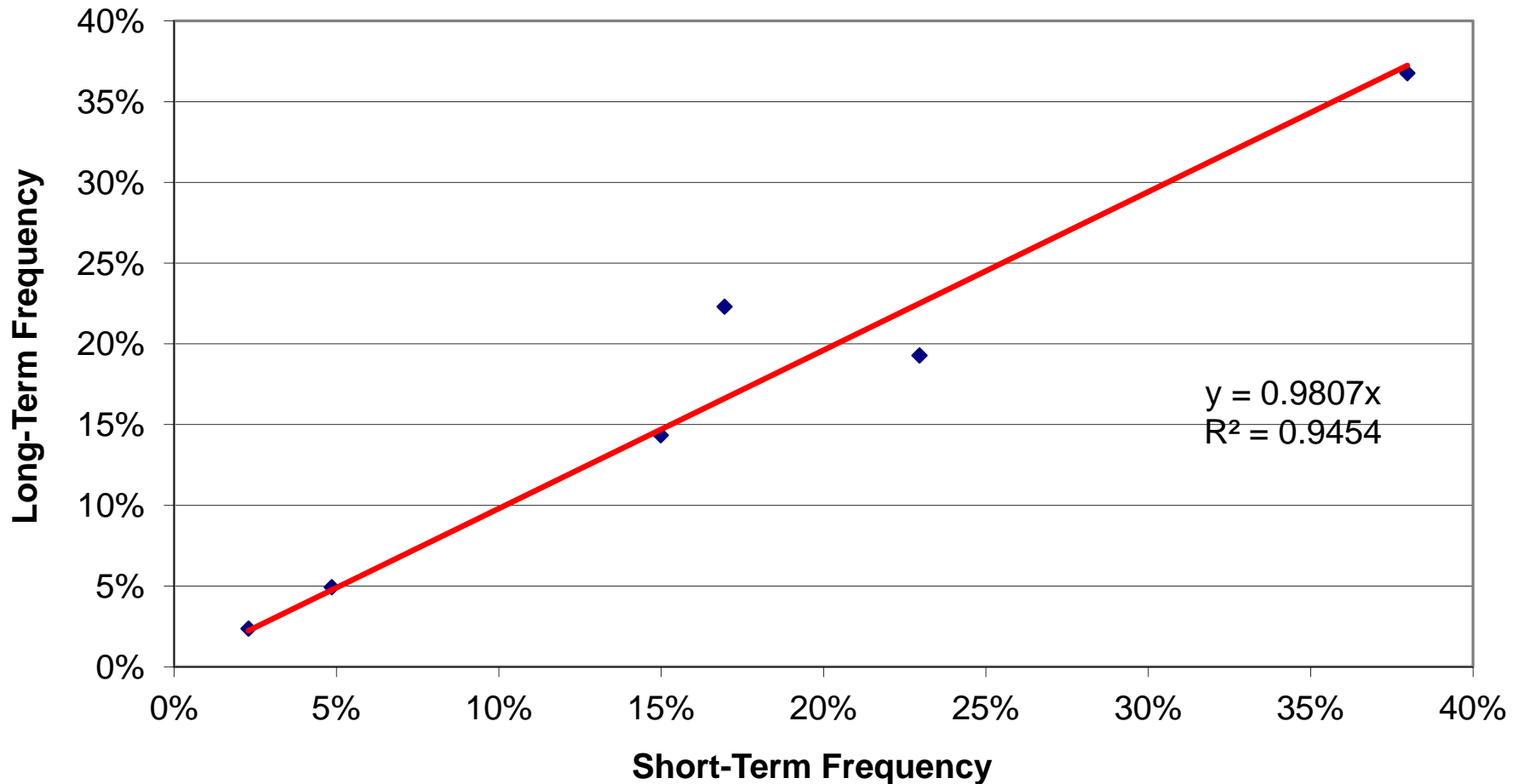
MAPPED BY: JC

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Scottsbluff Wind Speeds: Correlation Between Short and Long Term



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FIGURE 2.5-30
SCOTTSBLUFF 15-YEAR
VS BASELINE YEAR
WIND SPEED DISTRIBUTIONS

PROJECT: CO001636

MAPPED BY: JC

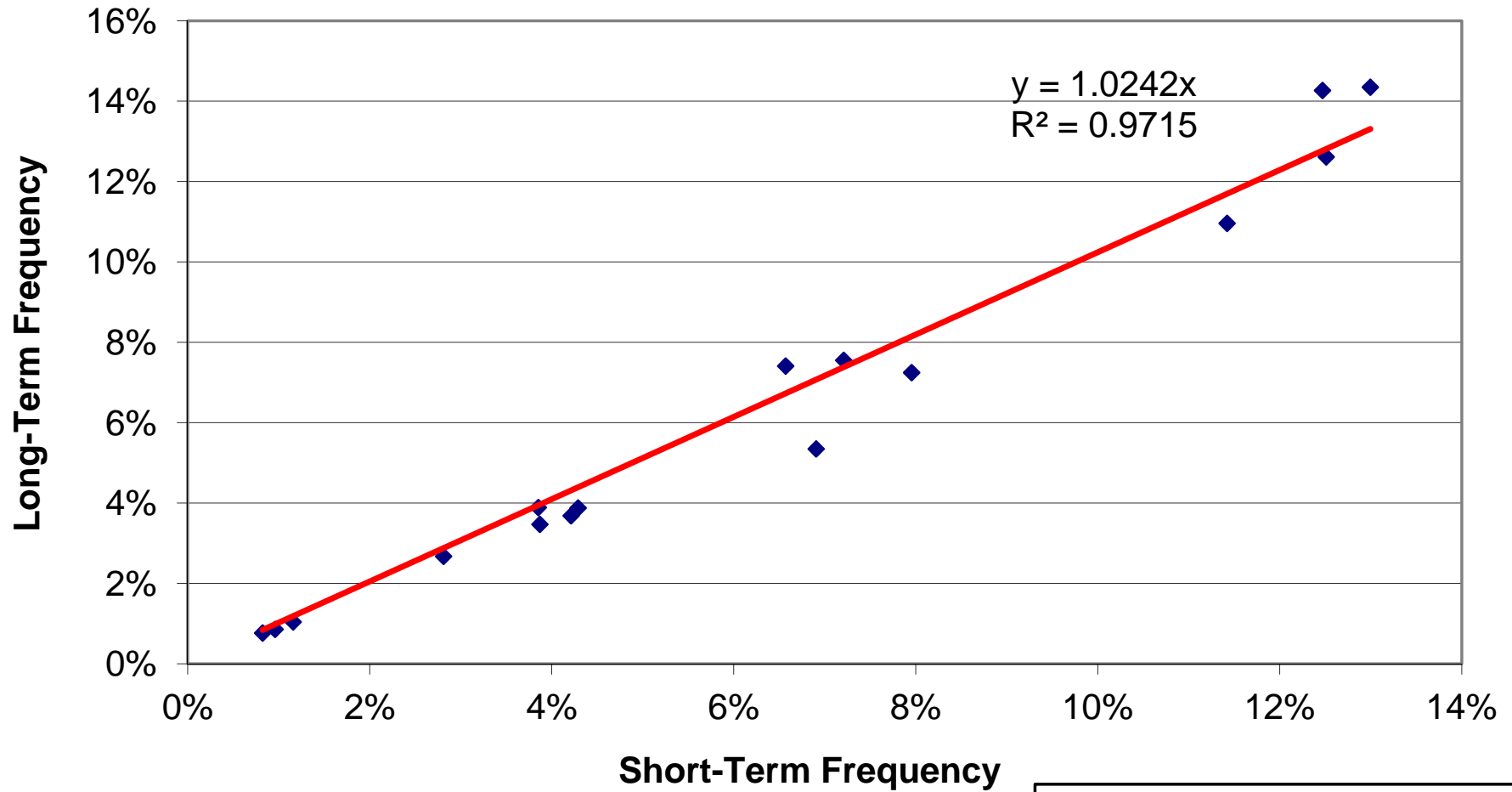
CHECKED BY: JEC



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Source:
Analysis by IML Air Science using hourly data supplied by National Climate Data Center,
from 1996 through 2011.

Scottsbluff Wind Direction: Correlation Between Short and Long Term



Source:

Analysis by IML Air Science using hourly data supplied by National Climate Data Center, from 1996 through 2011.



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FIGURE 2.5-31
SCOTTSBLUFF 15-YEAR
VS BASELINE YEAR
WIND DIRECTION DISTRIBUTIONS

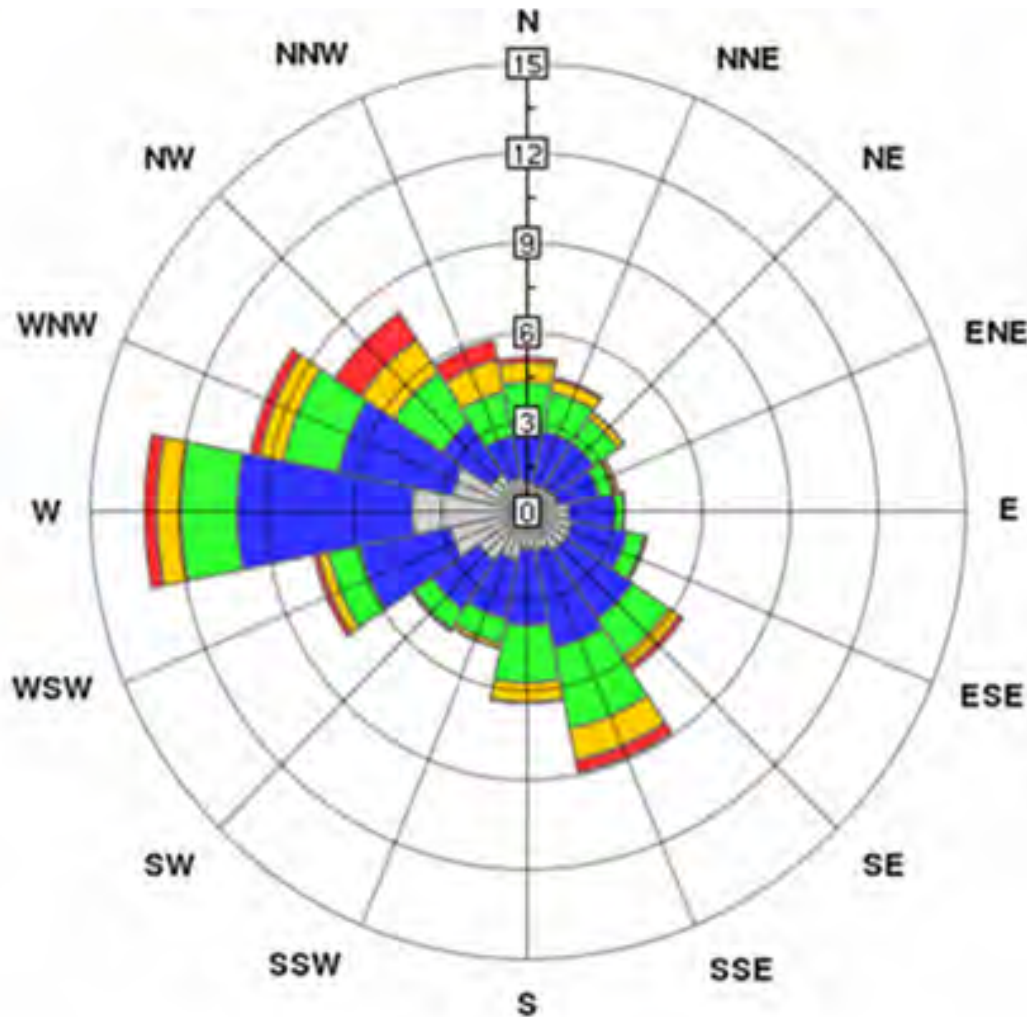
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Alliance West

Station ID: a250138

Location: 42.02, -103.13

Elevation: 3978 Feet



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FIGURE 2.5-32
ALLIANCE WEST 10-YEAR WIND ROSE
1996-2005

PROJECT: CO001636

MAPPED BY: JC

CHECKED BY: JEC

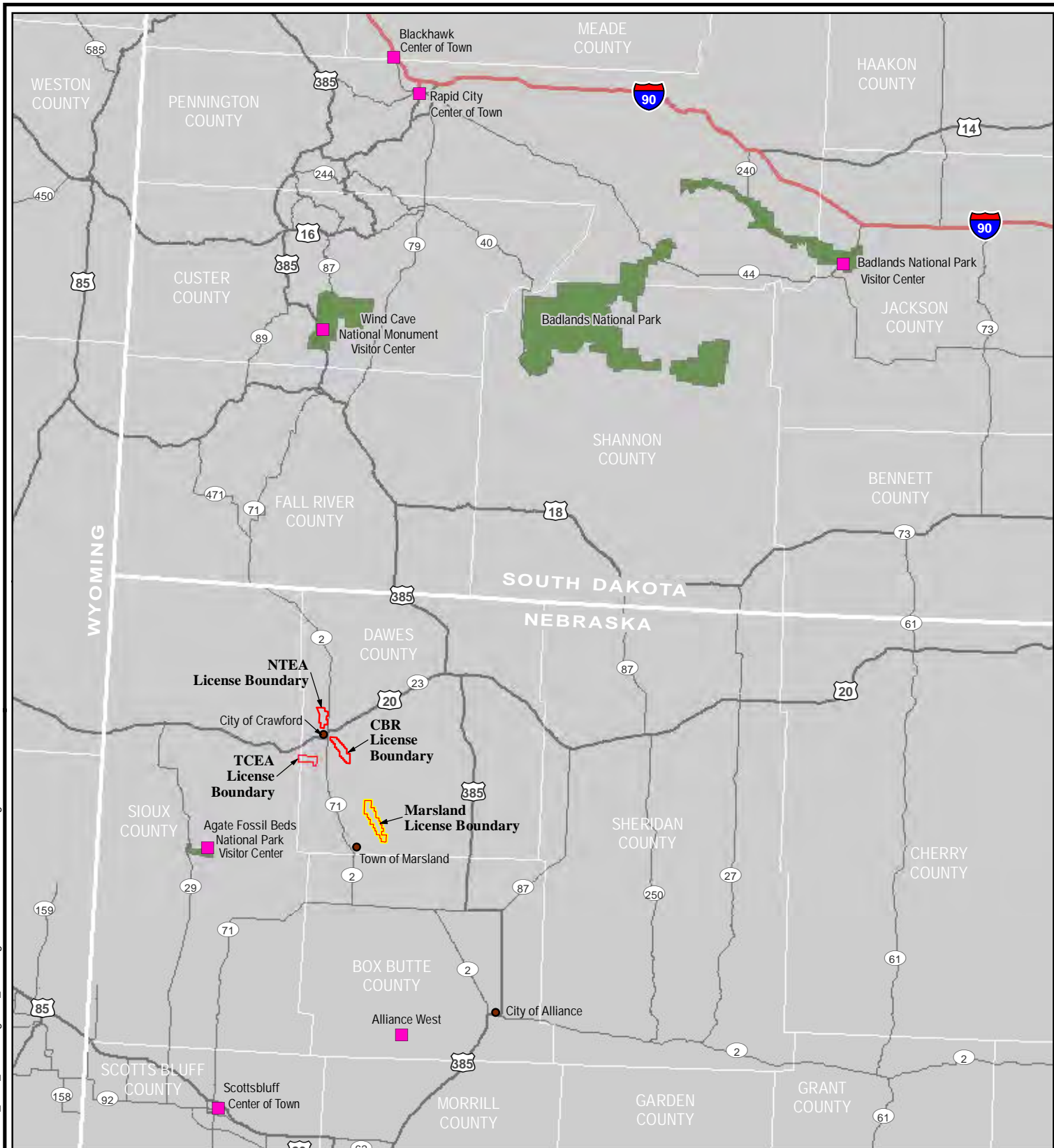


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Source: Smith 2013.



LEGEND

- City/Town of Interest
- Regional Ambient Air Monitoring Site
- ▭ Marlsand License Boundary
- ▭ Other License Boundary
- National Park/Monument
- Interstate Highway
- U.S. Route
- State Highway



0 10 20
Miles

PROJECTION:
NAD 1983 UTM ZONE 13N



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FIGURE 2.5-33 LOCATION OF REGIONAL AMBIENT AIR MONITORING SITES

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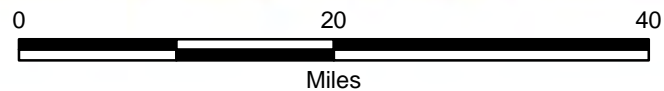
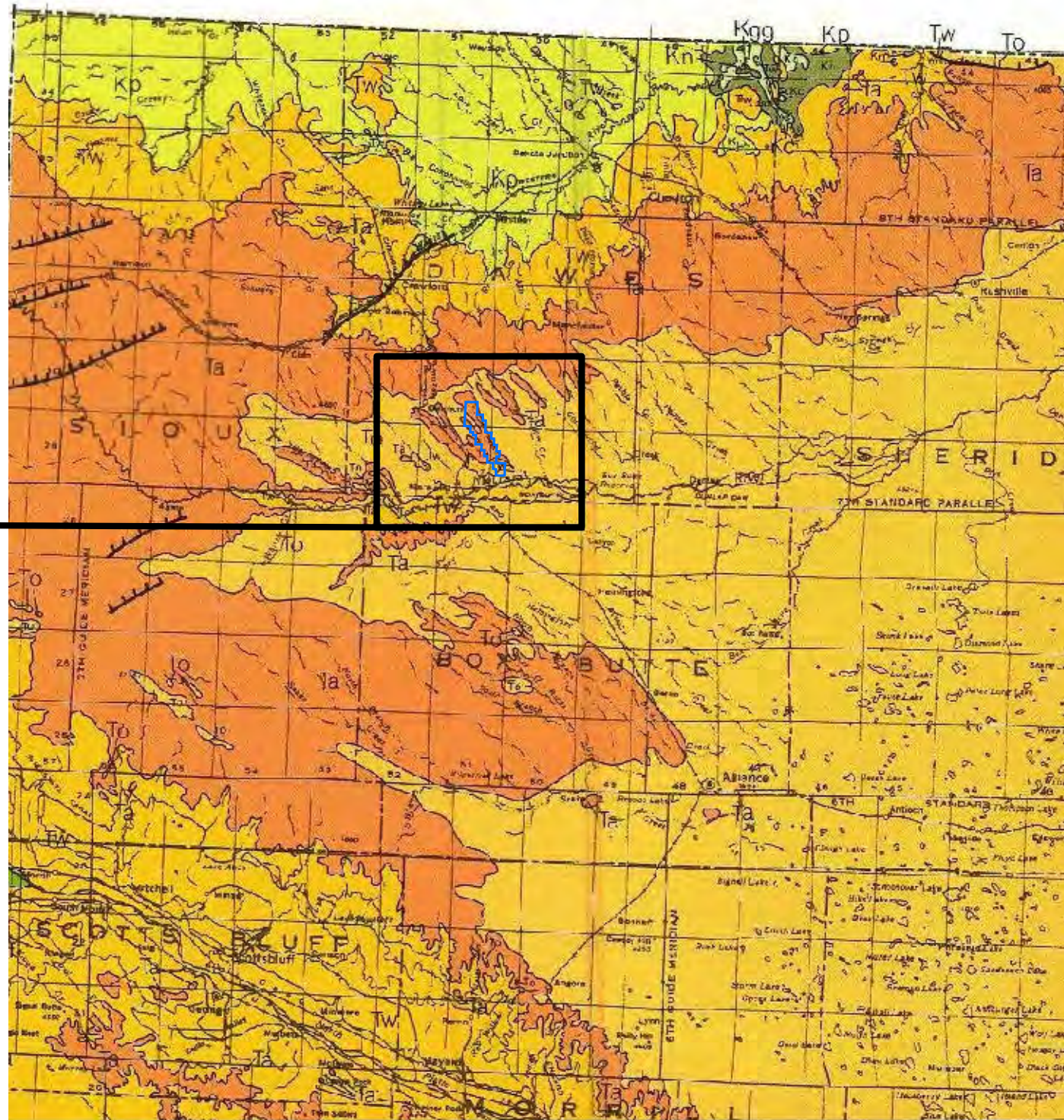
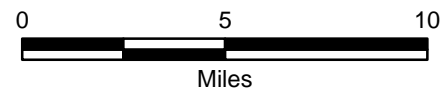
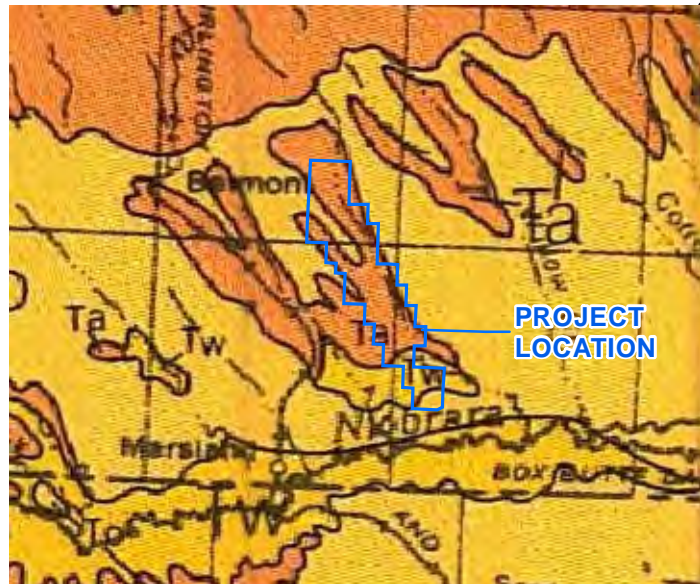
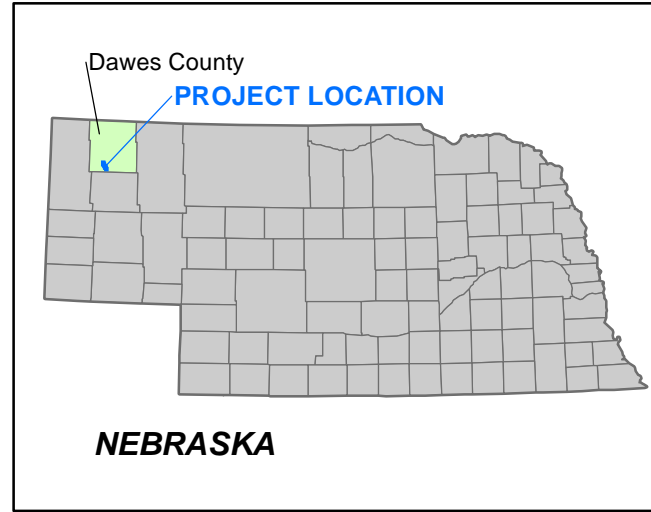
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46

K:\CBR_Projects\CO001636_Marlsand2_GIS\ArchMaps\0004_NRC_TRTR Figure 2.6-1 Bedrock Geology of the Marsland Expansion Area.mxd - 11/10/2011 @ 3:22:32 PM



LEGEND

GEOLOGIC PERIOD	SERIES	GROUP OR FORMATION
TERTIARY	MIOCENE	OGALLALA To
		ARIKAREE Ta
	OLIGOCENE	WHITE RIVER Tw
CRETACEOUS	UPPER CRETACEOUS	MONTANA { Fox Hills Kf
		Pierre Kp
		Niobrara Kn
	LOWER CRETACEOUS	COLORADO { Carlile Kc
		Greenhorn-Graneros Kgg
		DAKOTA Kd
JURASSIC		
PERMIAN	BIG BLUE	CHASE Pc
		COUNCIL GROVE Pcg
		ADMIRE Pa
		WABAUNSEE IPw
		SHAWNEE Ips
PENNSYLVANIAN	VIRGIL	DOUGLAS IPd
		LANSING IPi
		KANSAS CITY IPkc
	MISSOURI	
	DES MOINES	MARMATON IPm
MISSISSIPPIAN		
DEVONIAN		
SILURIAN		
ORDOVICIAN (Middle & Upper)		
CAMBRIAN & ORDOVICIAN (Lower)		
PRECAMBRIAN		

Source:
Burchett, R.R., 1986, *Geologic bedrock map of Nebraska*:
University of Nebraska Conservation and Survey Division,
Geologic Maps and Charts 1, scale 1:1000000.



PROJECTION: NAD 1927, STATE PLANE
NEBRASKA NORTH FIPS 2601



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FIGURE 2.6-1
BEDROCK GEOLOGY OF THE MARSLAND EXPANSION AREA

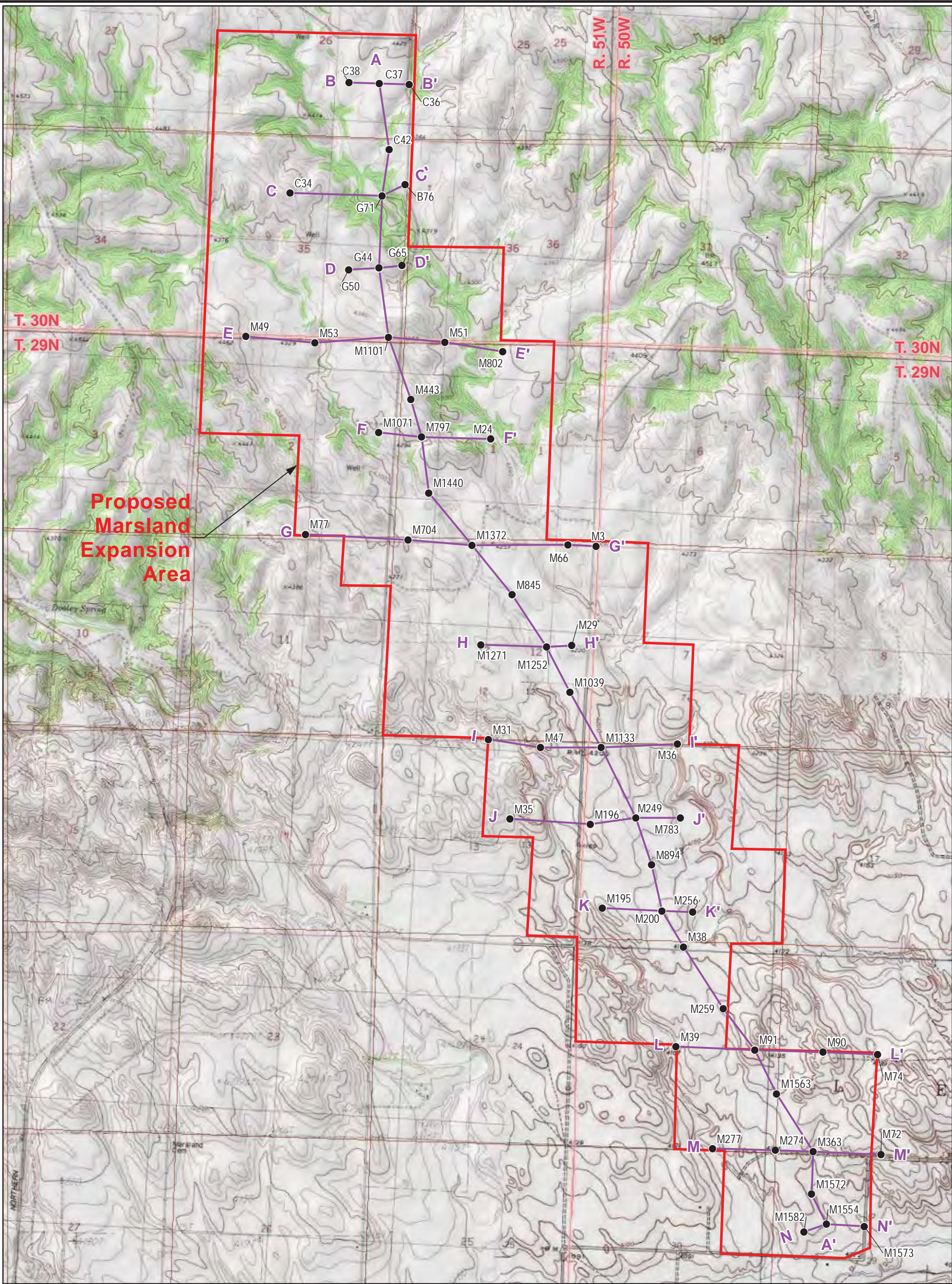
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LEGEND

- Borehole
- Cross Section Line
- ▭ Proposed Marland Expansion Area

N

0 1,500 3,000

Feet

PROJECTION: NAD 1927, STATE PLANE
NEBRASKA NORTH, FIPS 2601
SOURCES: US TOPO MAPS, SERVICED
BY ESRI ARCGIS ONLINE



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FIGURE 2.6-2
MARSLAND CROSS-SECTION MAP
SHOWING ARTIFICIAL PENETRATIONS

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