



BURLEIGH GROWTH 2015
BURLEIGH COUNTY LAND USE PLAN

Methodology for Developing the
Land Use Map

APPENDIX
one



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The first steps in developing the Burleigh County Land Use Map included data collection, analysis and developing the study methodology. The project’s Steering Committee and the KLJ team committed to a transparent, fact-based process with ample opportunities for community engagement. Throughout the process the commitment to develop a Land Use Plan and the related Land Use Map that would protect/enhance property values, reflect community character, encourage economic development and ensure land use compatibility was emphasized. The process generally includes five stages, each answering a question.

WHERE ARE WE NOW?

Planning Area Base Mapping

Base Map

The base map includes all of the townships in the Planning Area and depicts roadways, waterbodies and public lands.

Constraints Maps

This mapping includes a series of maps plus a composite map indicating factors that pose a constraint for future development. The darker colors on Figure A1-1 indicate more physical constraints to development. Factors that were mapped include:

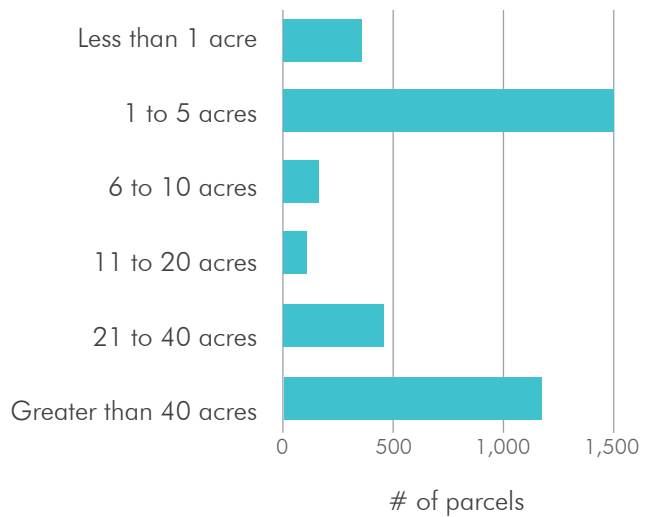
- High – NWI Wetlands, FEMA 100-year floodplain, steep slopes (over 20%)
- Moderate – Hazus⁸ 100-year flood plain, FEMA 500-year floodplain, steep slopes (10%-20%)
- Minor hydric soils, prime farmland

Figures A1-2, A1-3, A1-4 and A1-6 illustrate Land Cover, Topography, Floodplains and Prime Farmland.

Existing Development Maps

This series of maps, included in the July community meeting presentations, depict the current distribution of parcels of various sizes including existing homes, parcels under 5 acres, parcels 20 to 39 acres, and parcels over 40 acres. Figure A1-7 depicts the current distribution of parcels size “Business as Usual”. It shows that more than 50% of these parcels are less than five acres in size and more than 30% of the parcels are over 40 acres in size.

Figure A1-7 – Parcel Size Considerations

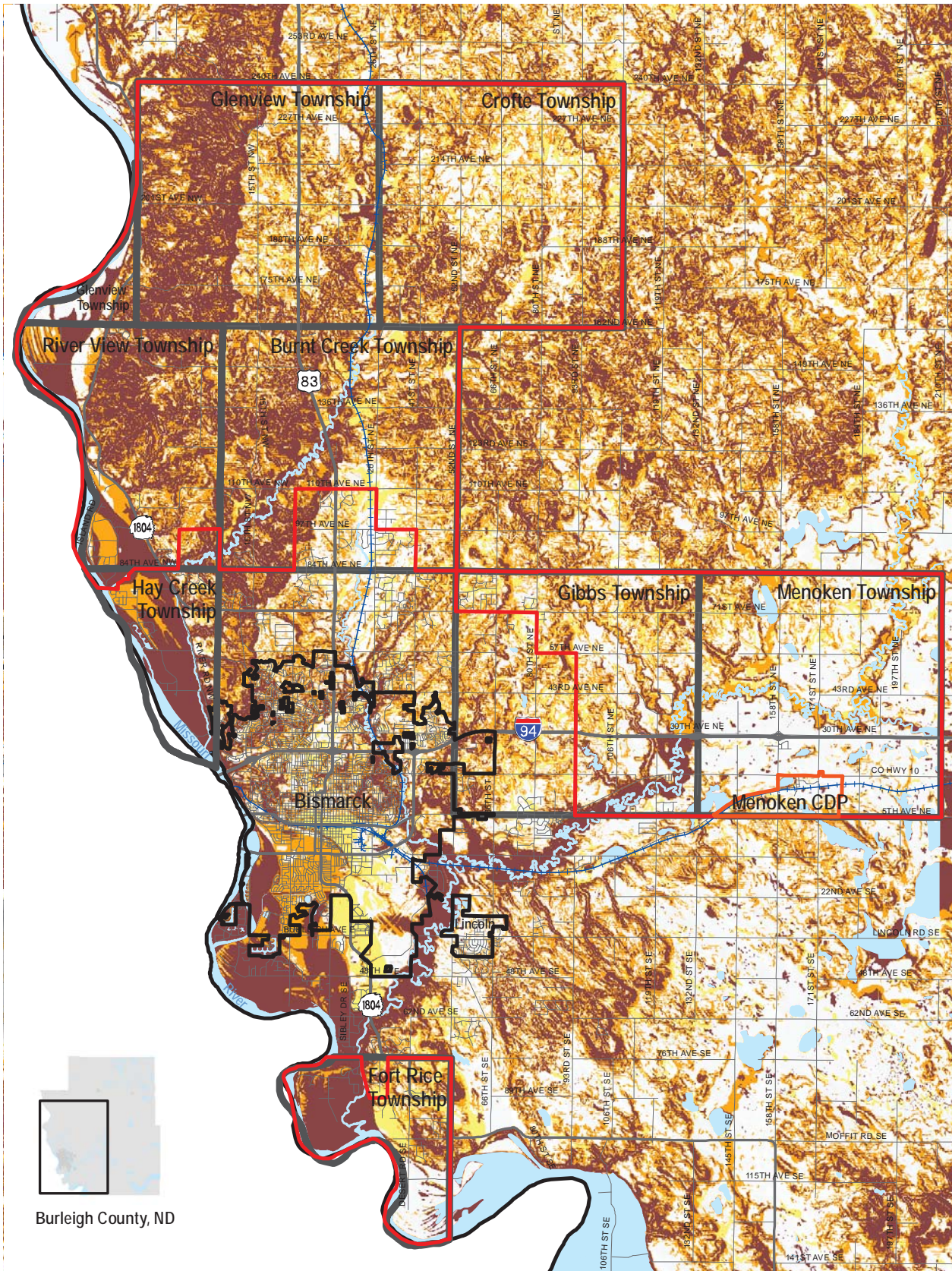


In order to determine the appropriate acreage needed for each land use category in the year 2040, the acreage of existing land uses is used as a basis or starting point. Empirically, it can be expected that acreage requirements for all uses, particularly residential uses, will increase as the Planning Area grows. Acreage for non-residential uses will increase correspondingly. As acreage requirements for these land uses increase, a decrease will occur in others, particularly agricultural uses. Also mapped are the commute distances (Figure A1-8).

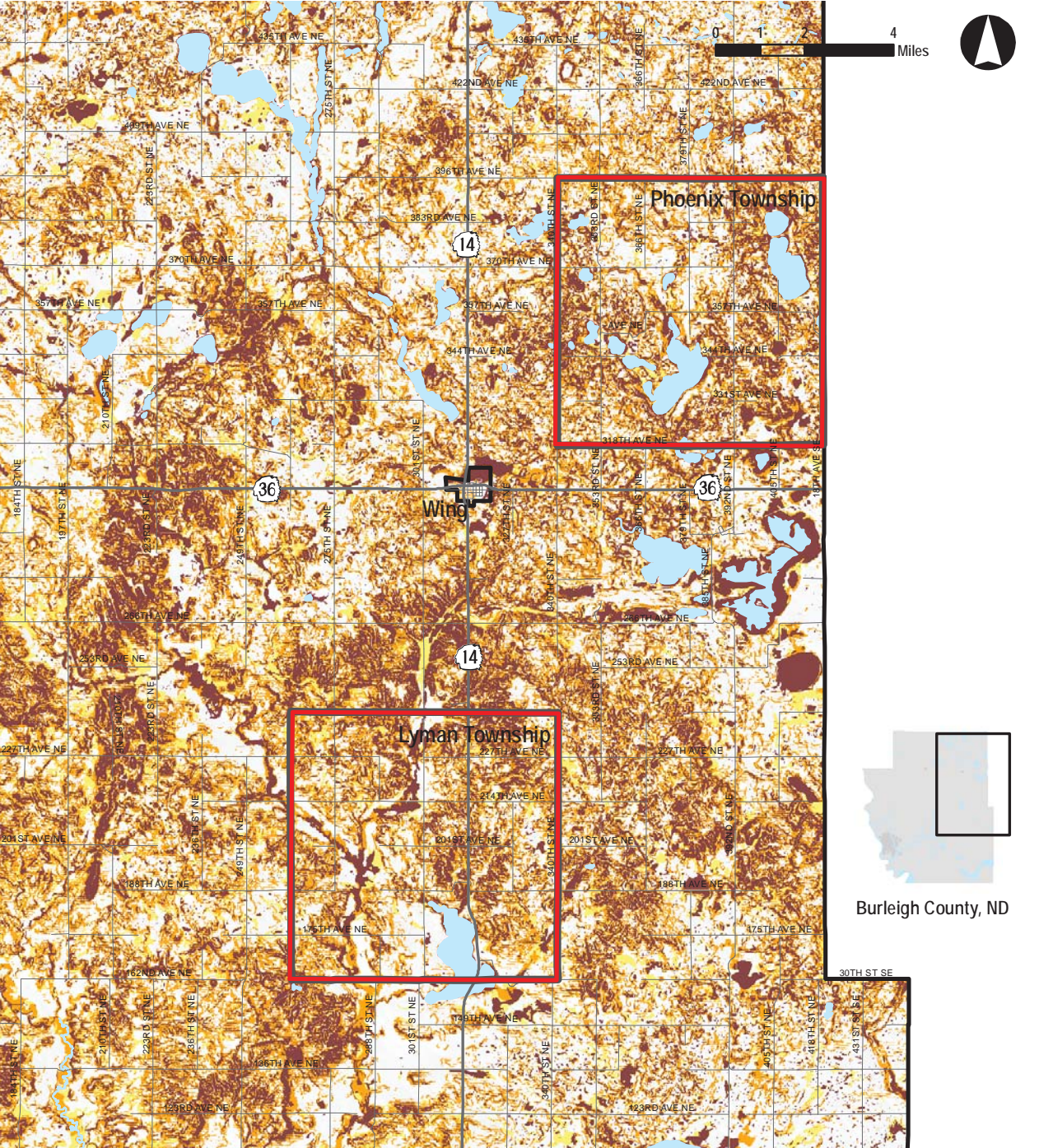
⁸ Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods and hurricanes. For this Land Use Plan it was used to estimate potential flooding in areas that do not have FEMA Flood Insurance Rate Maps.



Figure A1-1 – Constraint Map



Burleigh County, ND



Development Constraints









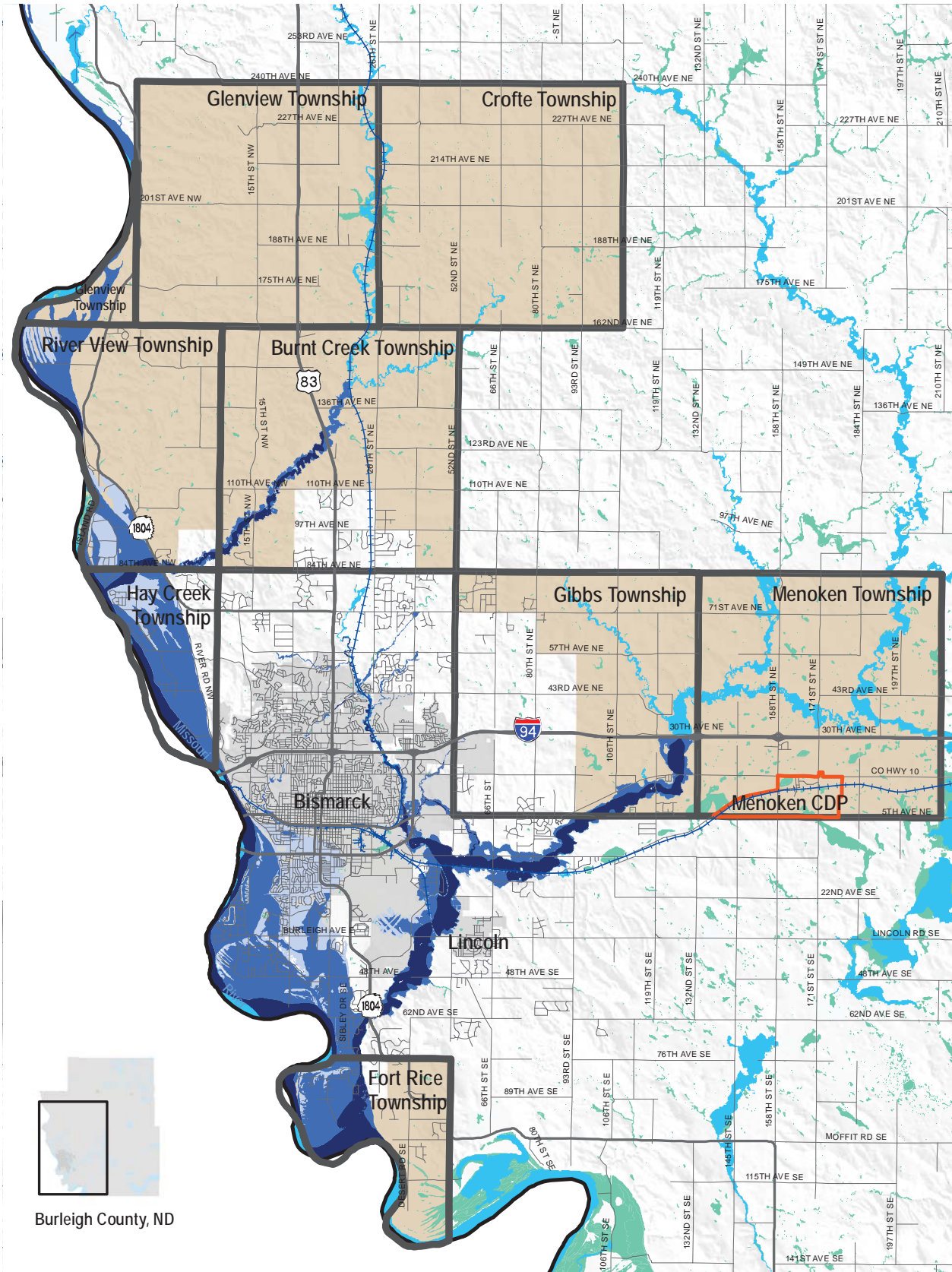
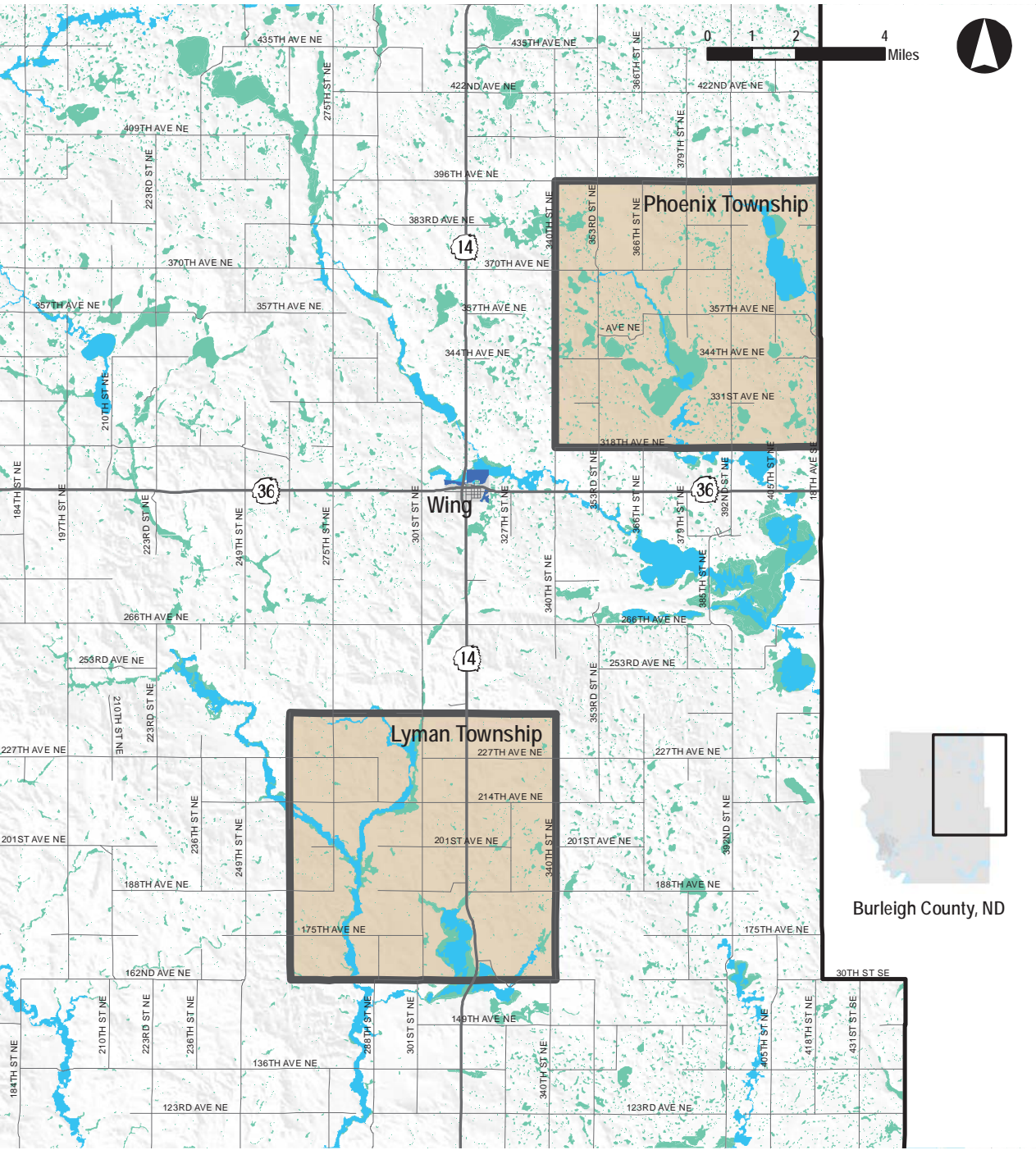
-  High Consideration
 - NWI Wetlands
 - FEMA 100-Year Floodplain
 - Steep Slopes (>20%)
-  Moderate Consideration
 - Hazus-MH 100-Year Floodplain
 - FEMA 500-Year Floodplain
 - Steep Slopes (10-20%)
-  Minor Consideration
 - Hydric Soils
 - Prime Farmland
-  Water
-  Planning Area
-  Township Boundary
-  Incorporated City
-  Census Designated Place (CDP)



Figure A1-2 – Floodplains



Burleigh County, ND



Hydrology

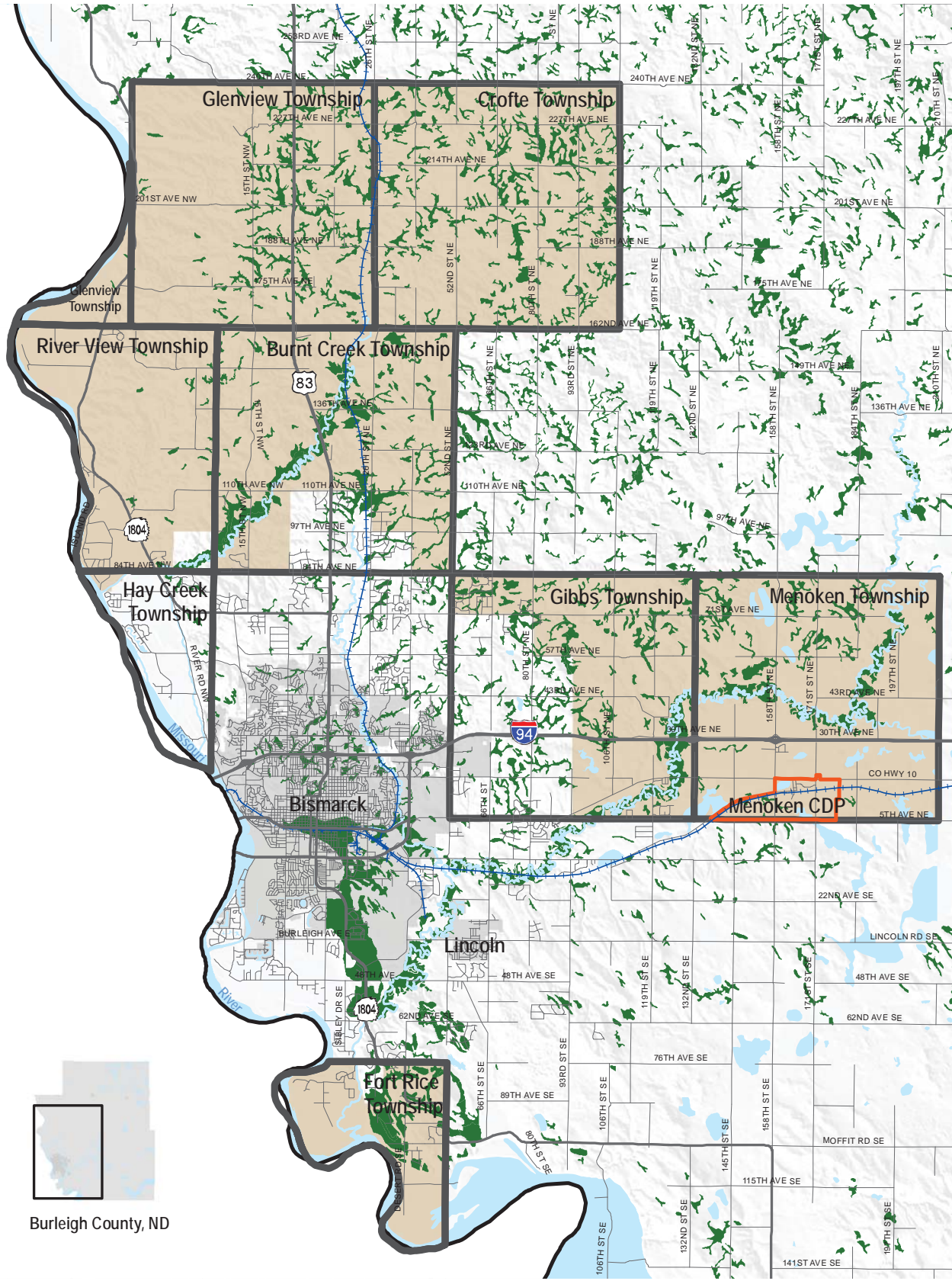
FEMA DFIRM 8-4-2014
 Hazus-MH 2.1
 National Wetlands Inventory

- Flood Zones**
- FEMA Floodway
 - FEMA Zones A, AE & AH (1 Percent Annual Chance)
 - FEMA Zone X (0.2 Percent Annual Chance)
 - Hazus-MH Floodplain (1 Percent Annual Chance)

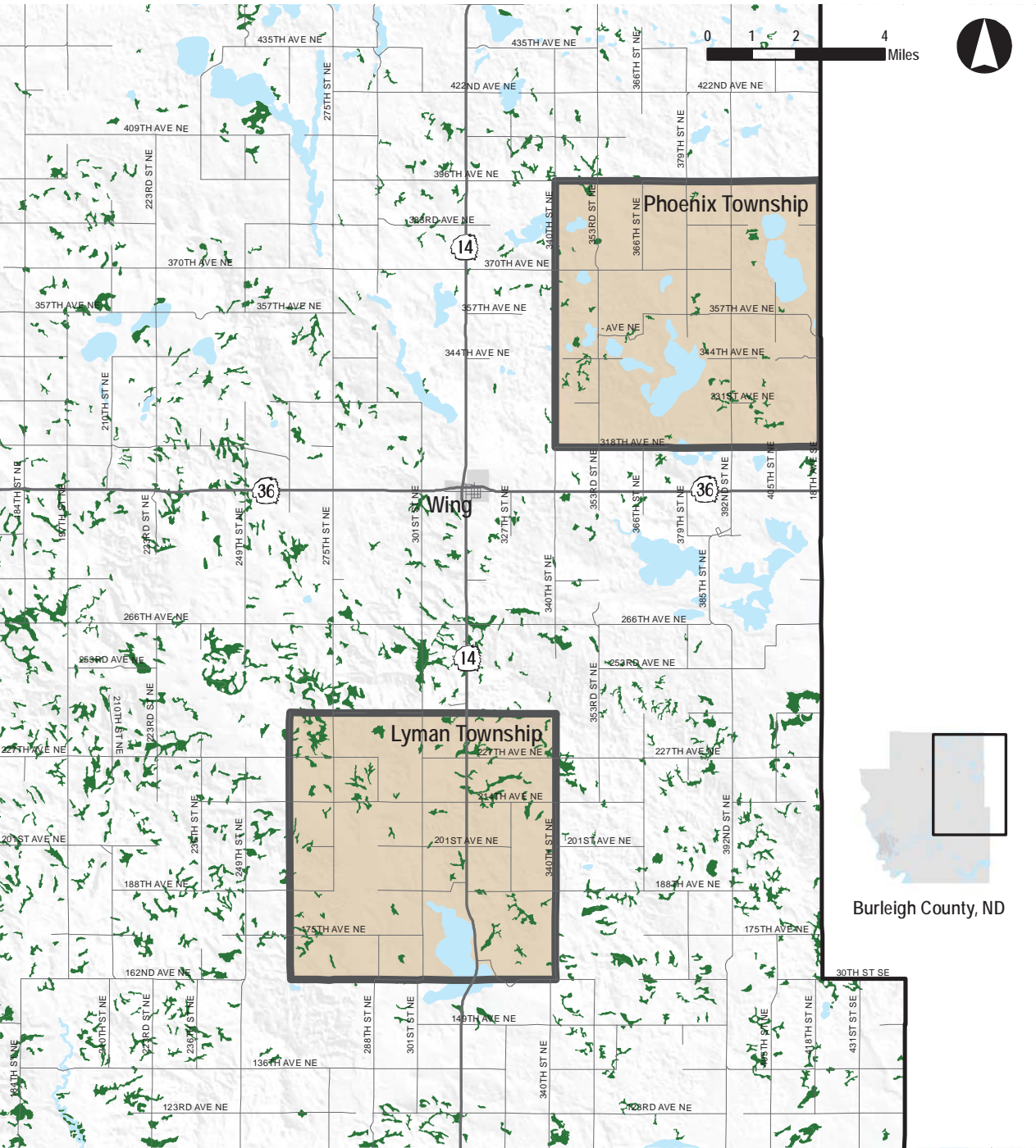
- NWI Wetlands
- Planning Area
- Incorporated City
- Census Designated Place (CDP)
- Township Boundary



Figure A1-3 – Prime Farmland



Burleigh County, ND



Prime Farmland

USDA Natural Resources Conservation Service






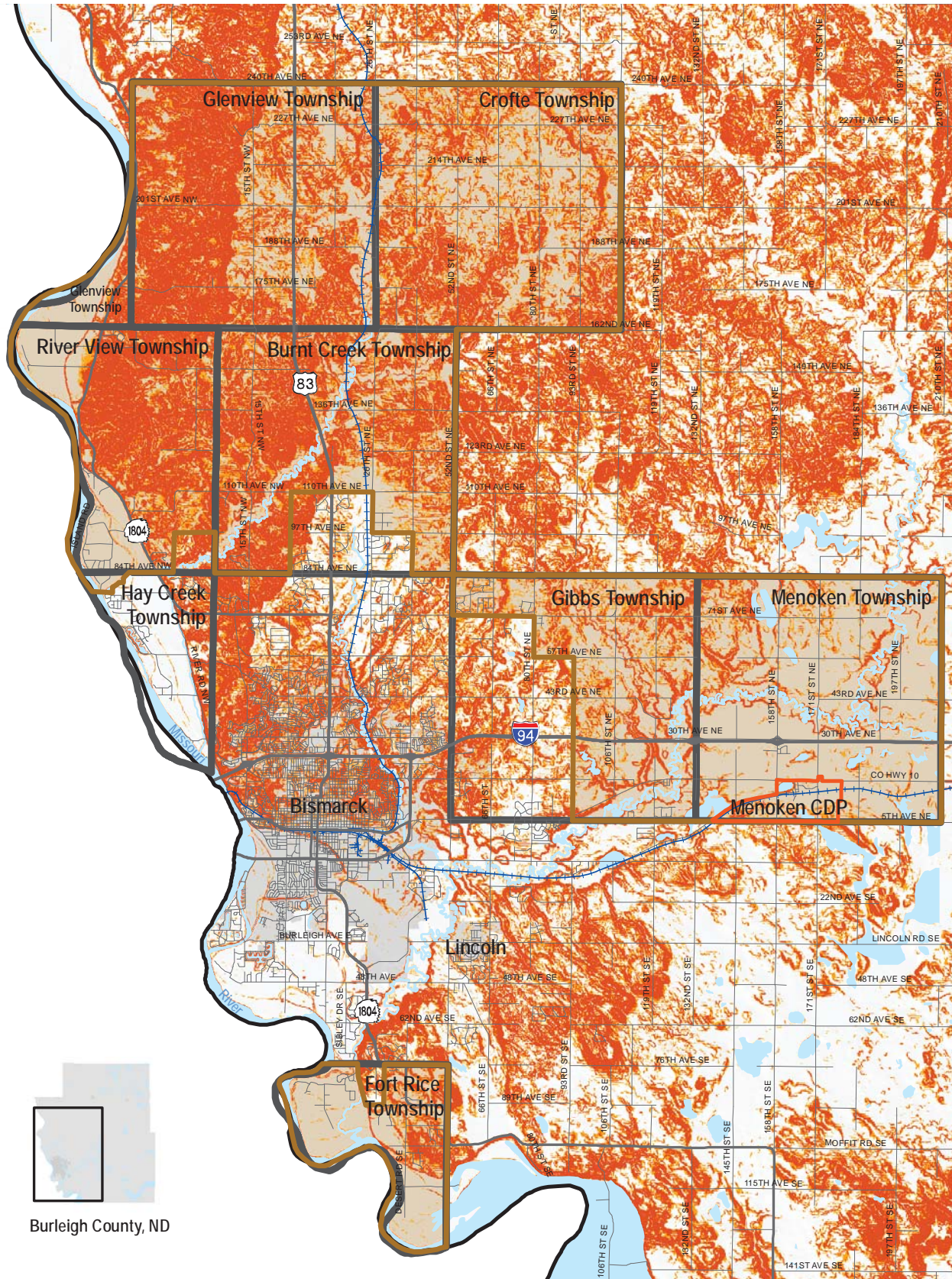
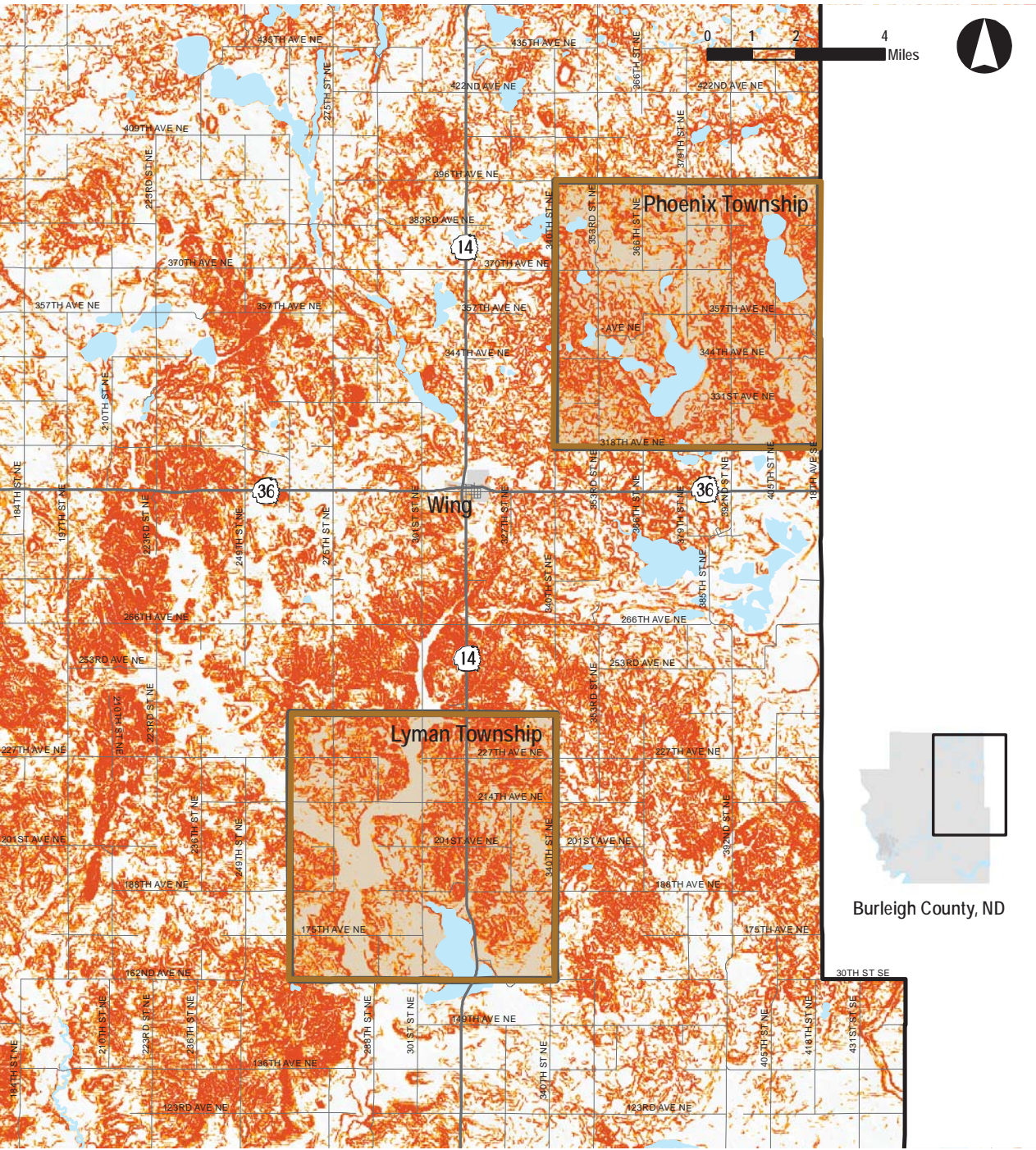
-  Prime Farmland
-  Planning Area
-  Incorporated City
-  Census Designated Place (CDP)
-  Township Boundary



Figure A1-4 – Topography



Burleigh County, ND



Topography

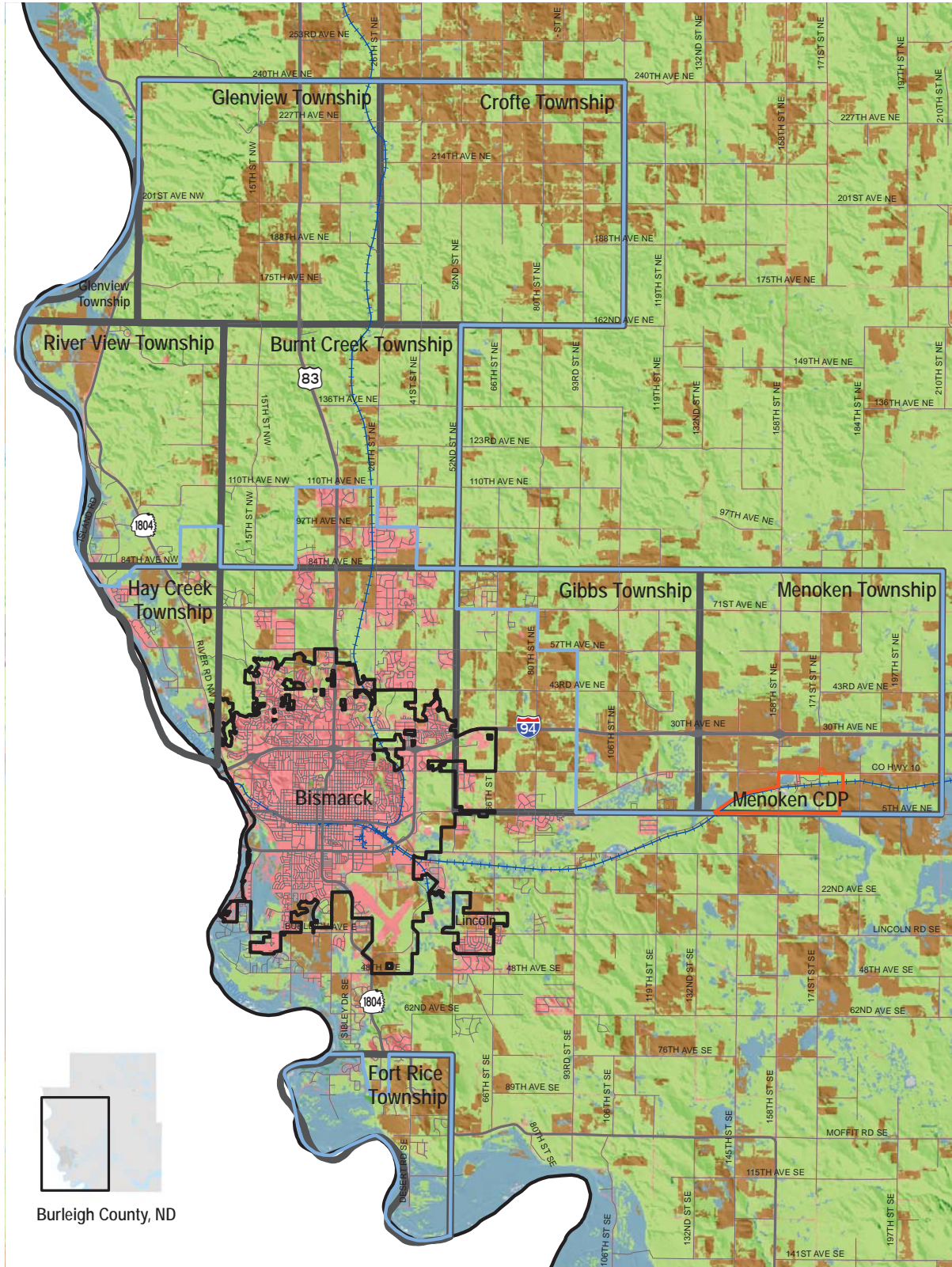
USGS Digital Elevation Model
(1/3-arc-second, 10 meters)

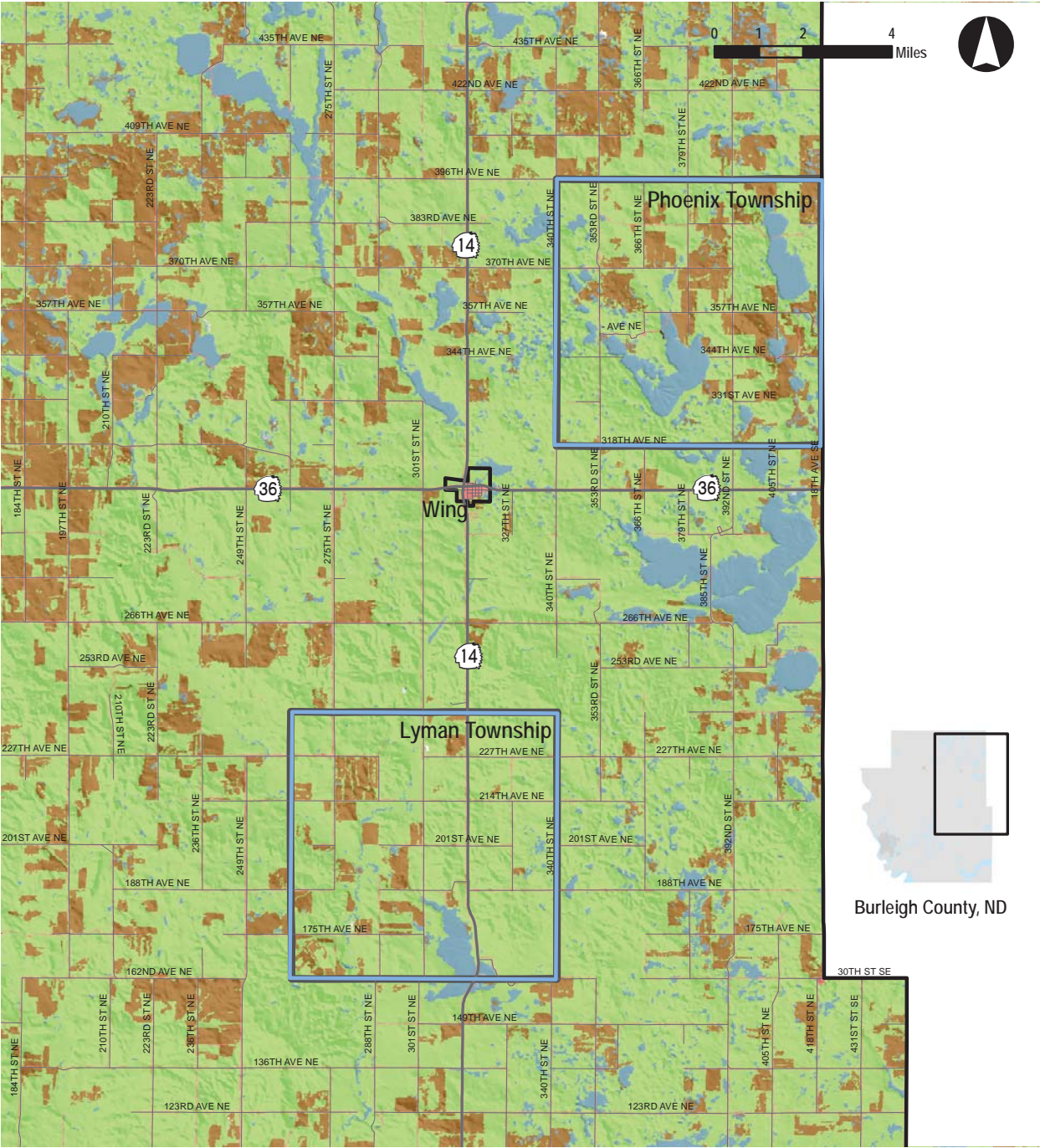
- Steep Slopes (>15%)
- Steep Slopes (>10%)

- Planning Area
- Incorporated City
- Census Designated Place (CDP)
- Township Boundary



Figure A1-5 – Land Cover





Land Cover

National Land Cover Database










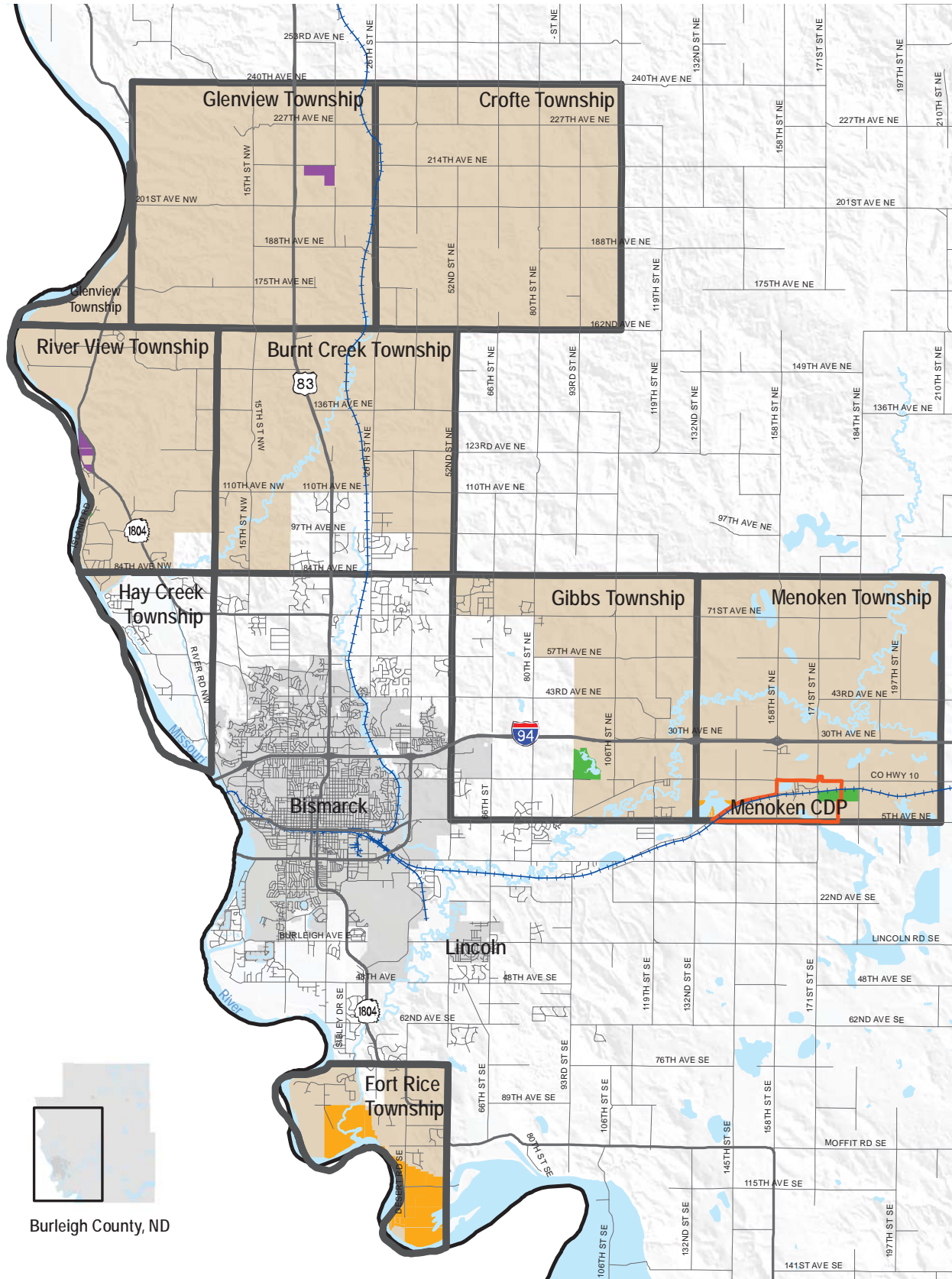
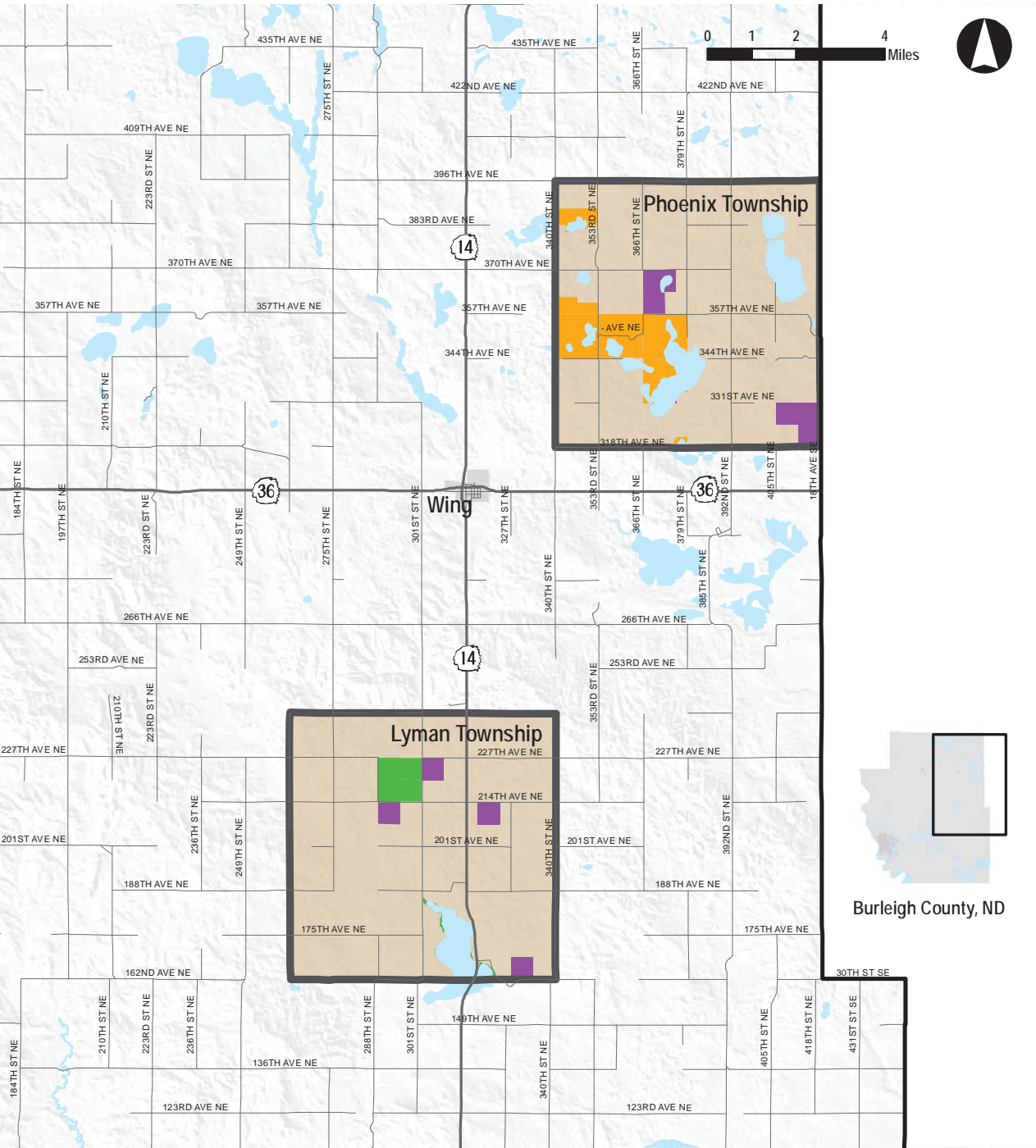
- | | | | |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-------------------------------|
|  | Cultivated Crops |  | Planning Area |
|  | Forest |  | Township Boundary |
|  | Developed |  | Incorporated City |
|  | Water |  | Census Designated Place (CDP) |
|  | Hay/Pasture | | |



Figure A1-6 – Public Lands





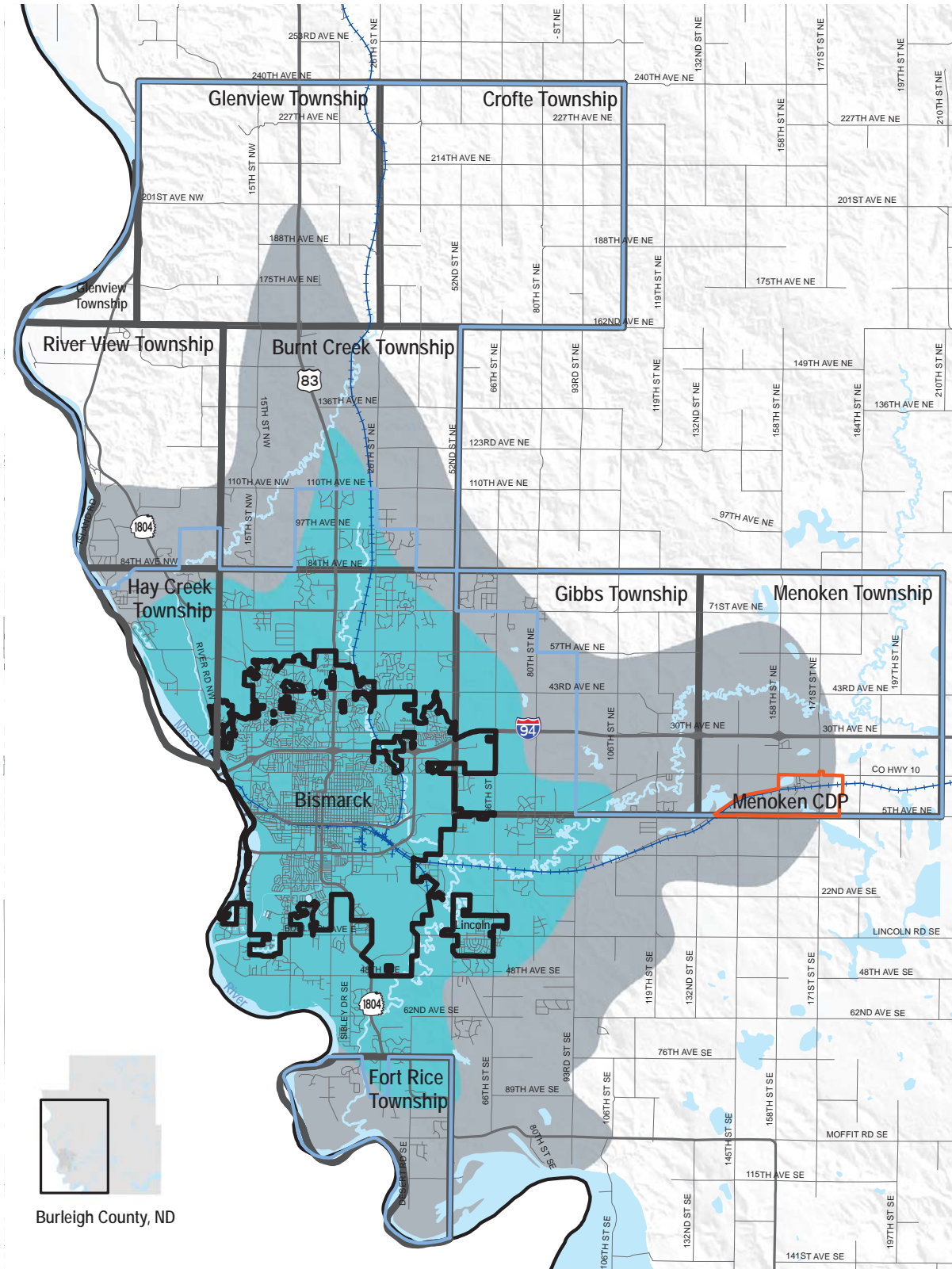
Public Lands

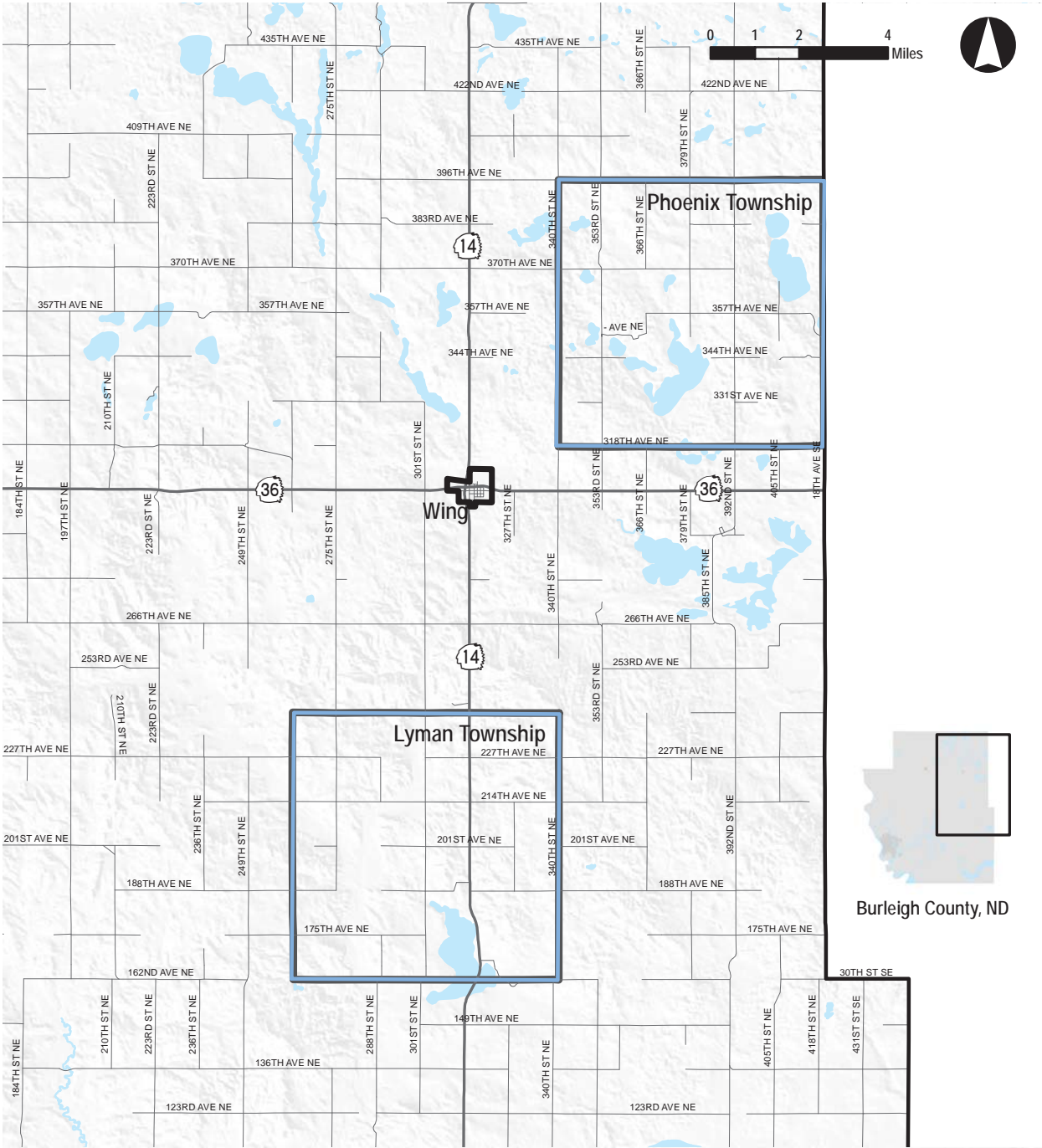
Only includes lands within planning area

- Burleigh County
- North Dakota
- United States
- Planning Area
- Incorporated City
- Census Designated Place (CDP)
- Township Boundary



Figure A1-8 – Commute Distance





Travel Time

Driving time from County Courthouse



15 minutes from County Courthouse



20 minutes from County Courthouse



Planning Area



Incorporated City



Census Designated Place (CDP)



Township Boundary



HOW SHOULD WE GROW AND HOW MUCH?

Alternative Growth Scenarios

To answer the question “How we should grow”, the KLJ team looked at three growth patterns seen across the country: Corridor Growth, Outward Growth and Focused Growth. Today the Planning Area is generally a combination of the Corridor Growth and Focused Growth. The rationale for this growth pattern may be the limited infrastructure available in the Planning Area. When polled at the September 29 and October 1 community meetings, participants selected a combination of growth corridors rather than any one pattern.

Population Projections

The first step in assessing how much growth should be depicted on a future land use map is establishing population projections or a range of projections for the area. The aggressive Burleigh County growth scenario adopted by the MPO was used to estimate 2040 population for the Planning Area. Two elements factor into utilizing these projections in projecting 2040 Planning Area population. The first element relates to the rate of growth in the Planning Area as compared to the overall county projections. The lower projection (5,400 people) in the Planning Area in 2040 reflects a constant percentage of the countywide projection; the higher projection (11,000 people) reflects the Planning Area’s higher growth rate than the overall county (Figure A1-9).

The second element is the number of persons per household. Consideration was given to adjust that figure. A higher figure would reflect more families with children moving into the Planning Area and a lower figure could reflect more retirees. Absent any convincing data, 2010 Census figure of 2.76 persons per household was used to estimate the number of households.

Population Accommodation

As residential uses are the major component affecting the acreage for all future land use types, the population accommodation analysis started there.



Residential Land Use

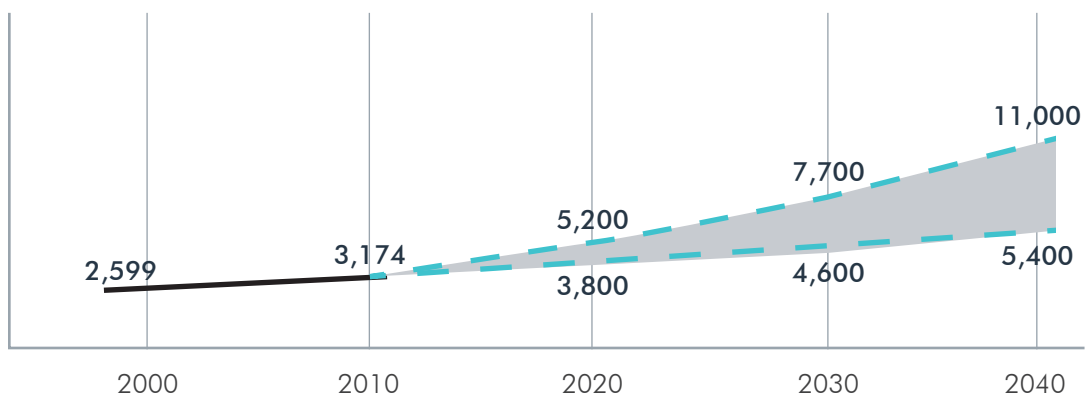
The following steps were taken to project future required acreage:

1. Utilize the projected number of new residents in the county in 2040.
2. Establish persons per dwelling unit in 2040 (discussion above).
3. Establish a population range for the Planning Area through 2040 (Figure A1-9).
4. Calculate the total number of additional dwelling units required for 2040.
5. Because of limited infrastructure (particularly wastewater service) expected in the Planning Area in 2040, all or at least virtually all residential units in the Planning Area are expected to be single-family in 2040. With that assumption, residential projections have focused on parcel size.
6. Establish a proportion of the projected households in the various parcel size groups based on the "Business as Usual" distribution (Figure A1-7). Polling completed on-line has not indicated preference for another distribution.
7. Assign expected proportion of the parcel size distribution to the number of households expected in the Planning Area and calculate residential acreage needed in 2040 (Table A1-1).



8. This yields the total additional acreage needed for residential land use. Typically land use plan maps depict more than the calculated needed acreage to accommodate flexibility and prevent a tight housing market. The additional acreage ranges from 25% to 100% of the calculated needed acres.

Figure A1-9 – Burleigh County Planning Area Population





2014 Residential Acres	3,400 acres
Additional Acres – Lower Projection + 25%	3,800 acres
Additional Acres – Lower Projection + 100%	8,200 acres
Additional Acres – Higher Projection + 25%	11,300 acres
Additional Acres – Higher Projection + 100%	20,100 acres
Land Use Map Residential Acres ¹⁰	60,100 acres

Source: KLJ

As demonstrated in Table A1-1, the Land Use Map includes significantly more acres designated for residential uses than is needed for 2040.

Commercial Land Use

To serve the increased 2040 population, more acreage will be required for commercial uses. The following steps were taken to project future required acreage:

1. Assume the number of establishments per person is constant and assume the average size of commercial establishments is constant.
2. Determine ratio of persons per establishment (existing) and multiply by number of projected new residents to determine projected number of establishments for 2040.
3. Take ratio of acreage required per establishment and multiply by the number of establishments projected for 2040. This is the additional acreage required for commercial use; this figure is added to existing acreage as no loss of acreage is expected in this category.

2014 Commercial Acres	200 acres
Additional Acres – Lower Projection + 25%	230 acres
Additional Acres – Lower Projection + 100%	480 acres
Additional Acres – Higher Projection + 25%	670 acres
Additional Acres – Higher Projection + 100%	1,190 acres
Land Use Map Commercial Acres ¹²	960 acres

Source: KLJ

As demonstrated in Table A1-2, the Land Use Map depicts twice the commercial acreage needed for the lower projections (with a 100% flexibility factor) and enough acreage to accommodate the higher projections plus a 80% flexibility factor.

Industrial Land Use

The importance of preserving and expanding lands available for industrial land use as a key economic engine for the county and the region is reflected in Burleigh County’s Comprehensive Plan.

“Coordinate plans to ensure an adequate supply of industrial . . . land in appropriate locations”.

*Burleigh County Comprehensive Plan
2014, page 15*

Compared to residential and commercial land uses, industrial sites have tighter constraints on where they can locate. The benefit to some industrial uses of locating on rail line is clear as is the availability of large fairly flat property. The analysis for this project focused on sites with features making them uniquely suitable for industrial land use. The Planning Area boundaries are invisible on the ground to potential industrial developers and currently the Planning Area has very little industrial facilities and a low population total. For those reasons, the calculations in Table A1-3 were completed using countywide ratios of current population to current industrial use as a base.

⁹ All of the “Additional Acres” includes residential parcels and related public facilities

¹⁰ Totals include Land Use Map Rural, Outlying Suburban and Suburban Land Use acreage

¹¹ All of the “Additional Acres” includes commercial parcels and related public facilities

¹² For this calculation, the six Neighborhood Activity Centers are assumed to total 160 acres each and to be 75% commercial and the Interchange, the one regional activity center, to be 320 acres with 75% commercial. Mapped commercial acreage does not include minor commercial uses.

As the population increases, industrial acreage is also expected to increase. Projected industrial use was accomplished by:

1. Utilize the countywide ratio of industrial acres to the number of households.
2. Multiply that percentage by the projected population number of households in the Planning Area to determine projected industrial acreage needed for 2040.

2014 Industrial Acres	215 acres
Additional Acres – Lower Projection + 25%	260 acres
Additional Acres – Lower Projection + 100%	530 acres
Additional Acres – Higher Projection + 25%	730 acres
Additional Acres – Higher Projection + 100%	1,300 acres
Land Use Map Industrial Acres	450 acres
Land Use Map Industrial Opportunities Overlay Acres	3,300 acres

Source: KLJ

As demonstrated in Table A1-3, there is very little industrial zoning in the Planning Area today. More than half of it is not being used for that purpose. The table also shows that the Land Use Map includes the possibility of significantly more industrial than is needed for 2040.

WHERE AND HOW DO WE WANT TO GROW?

The community meeting presentations phrased this activity as “Locational Considerations”. The answer to this question came from those participating in the project’s community engagement program and the results contributed to developing the Residential Suitability and Industrial Suitability maps (Figures A1-10 and A1-11). On-line surveys and community meeting polling results, meetings with business and development interests were all considered. See Appendix 3 for the on-line survey and meeting polling results. For example, Question 17 in the project’s on-line polling asked – “Should residential be located near industrial uses?” Over time, cumulative results of the polling varied but the final results indicate that 87% of participants voted “No”, 5% voted “Yes”, 8% voted “Need more information” and 1% voted “No opinion”. The Steering Committee’s Paired Comparison Analysis (also known as Pairwise Comparison) which considered the importance of the industrial suitability factors relative to one another, helped set the weighted values also factored in setting the weighted values used in developing the Industrial Suitability map (Figure A1-11).

WHERE IS MOST SUITABLE FOR GROWTH?

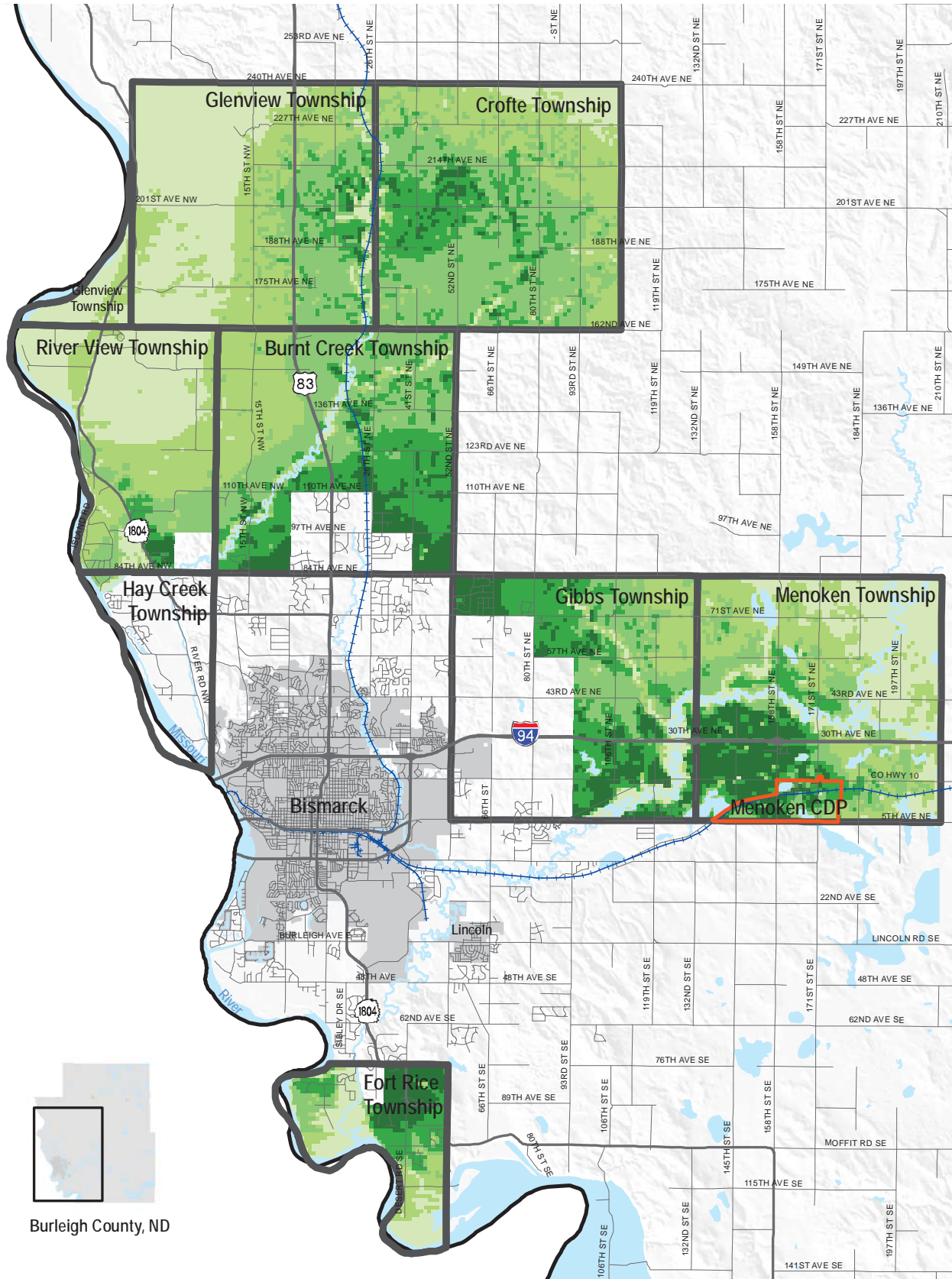
Land Suitability Analysis for Residential and Industrial Uses

Land suitability analysis in a GIS environment measures the appropriateness of an area for a specific condition or use. In developing the Burleigh County Future Land Use Plan, this analysis was used to identify locations most suitable for residential and industrial based on known features unique to the Planning Area. Physical features in and immediately surrounding the county were layered over grid cells in CommunityViz, and calculations performed to determine either percent overlap or proximity of features to individual grid cells. A normalized scale (between 0 and 100) was used to rank the grid cells from least to most suitable for development.

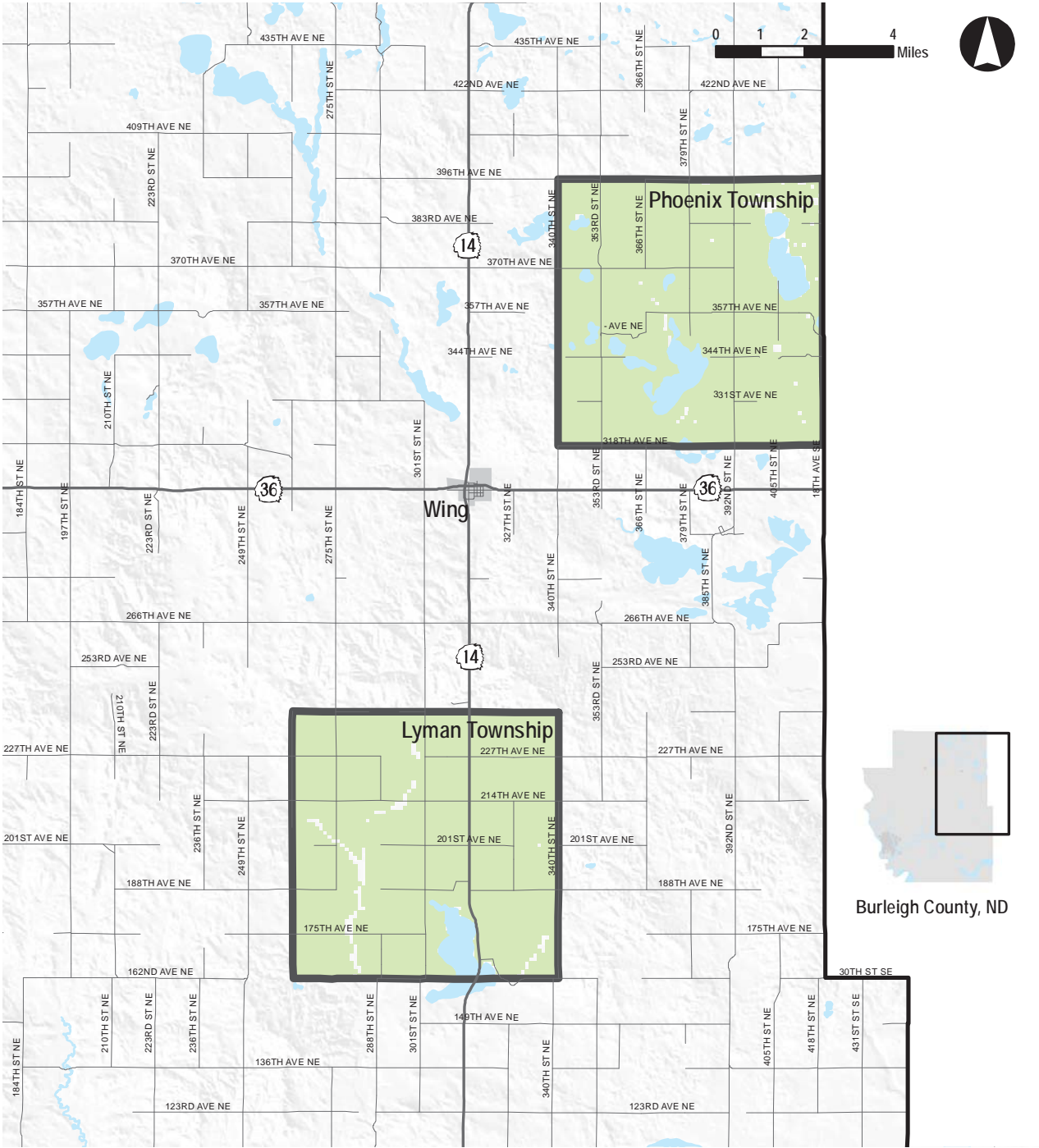
¹³ All of the “Additional Acres” includes industrial parcels and related public facilities. The calculations were also completed using countywide ratios of current population to current industrial use as a base.



Figure A1-10 – Residential Suitability



Burleigh County, ND



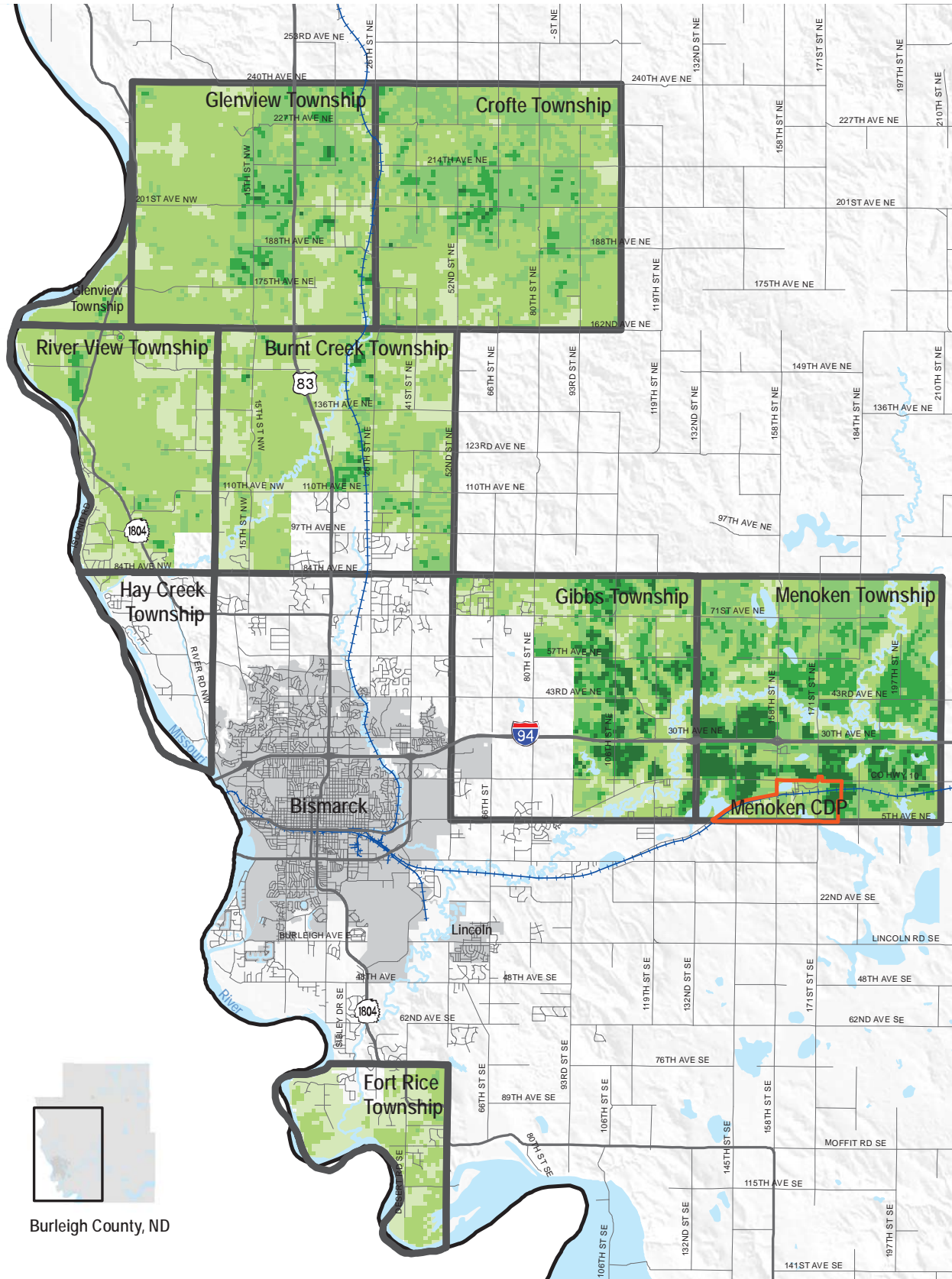
Residential Suitability

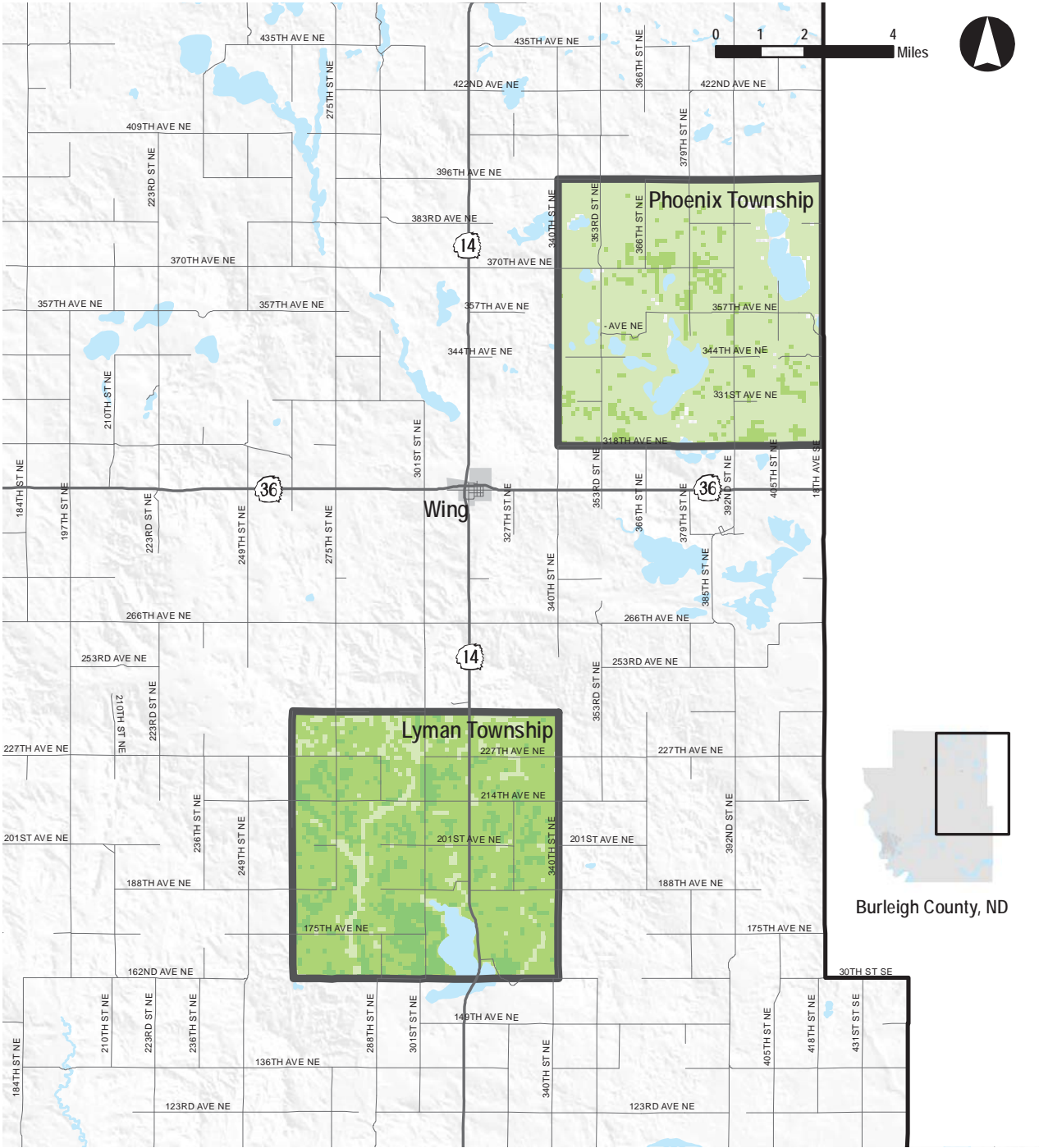
- Low Suitability
- Moderate Suitability
- High Suitability

- Township Boundary
- Incorporated City
- Census Designated Place (CDP)









Figure A1-11 – Industrial Suitability





Industrial Suitability

-  Low Suitability
-  Moderate Suitability
-  High Suitability

-  Township Boundary
-  Incorporated City
-  Census Designated Place (CDP)



A weighted multivariate suitability analysis combined the factors listed in Table A1-4 with a combined rating or score for each place (cell) on the residential and industrial maps.

Table A1-4 Residential and Industrial Suitability Factors ¹⁴	
Residential Suitability	Industrial Suitability
Proximity to residences	Proximity to arterial and collector roads
Proximity to existing subdivisions	Proximity to an interchange
Proximity to paved roads	Proximity to rail
Floodplains	Proximity to residences
Wetlands	Proximity to existing subdivisions
Prime farmland	Floodplains
Soil suitability for residences	Wetlands
Soil suitability for septic tanks	Prime farmland
Proximity to industrial uses	Steep slopes
Proximity to emergency services	Soil suitability
Proximity to an interchange	Proximity to existing industrial
	Minimum parcel size

This weighted suitability analysis places more importance on some factors and less on others, so that the combined rating more fairly represents the relative importance of each location criterion. Factors were weighted (using a scale of 0 – not important, to 10 – most important) to put more or less significance on one factor compared to others in the calculation. As discussed under Locational Considerations, on-line surveys and community meeting polling results, meetings with business and development interests were considered in setting the weighted values.

Figures A-10 and A-11 are the resulting Residential Suitability and Industrial Suitability maps. Each has five levels ranging from lower suitability to high suitability. The darker the green color, the more suitable for the use. The figures also show that there are areas, such as Menoken, that are very suitable for both residential and industrial uses.

It is important to note that this suitability analysis for residential and industrial will change with changing conditions. For example, if the county were to develop a new school in an area, that change would have a positive effect on the suitability results for property close to the school for residential uses. Similarly, a new residential subdivision would have a negative effect on the suitability

results for property close to that area for industrial uses.

Locating, Sizing and Prioritizing Activity Centers

Locating and sizing future commercial uses depends on a number of factors including site availability, size and cost; site suitability and land use compatibility; competing and/or complementary uses; existing and expected traffic counts; access and consumer buying power. The buying power of the surrounding area is usually calculated from the projected number of households, current and projected median and mean incomes, the estimated percentage of income spent on retail items, and the estimated annual expenditures per household. With the very limited information available for the Planning Area, this detailed analysis is not possible at this time.

The alternative approach is to identify those sites most suitable from a location aspect. Recent experience countywide has shown that some locations, which would have been prime locations for commercial uses, have been developed for residential uses. Developing those locations today for commercial uses includes razing homes. To avoid that scenario in the Planning Area, locations with the most suitability for future commercial uses have been designated on the Land Use Map as

¹⁴ These factors are not listed in weighted order.

Neighborhood Activity Centers; those with potential for commercial development even further in the future are shown as Future Activity Centers. Some commercial uses expected in the Planning Area will be related to nearby residential development, others will be more regional in nature. Neither an Activity Center designation or a Future Activity Center designation is a guarantee that commercial zoning would be approved; a detailed analysis of each site's suitability will be required at the time of a zoning request.

An Activity Center designation indicates that multiple complementary uses, including convenience goods and personal services and more dense residential than surrounding areas are possible. These activity centers are located at the intersection of an arterial and collector or two collectors, with the exception of the Activity Center located at the intersection of US 83 and 136th Avenue NE. This location was added to indicate the area's emerging mixed use development. The I-94 interchange in Menoken was mapped as a regional activity center.

Developing the Preliminary Land Use Maps

The September 29 and October 1 community meetings focused on the Preliminary Land Use Maps (Appendix 3). Prior to the presentation, participants had the opportunity to view the July exhibits and the new exhibits, the Residential and Industrial Suitability Maps and the Preliminary Residential, Industrial and Activity Center Land Use Maps which indicated the proposed limits of the KLJ team's further study. These maps were available for viewing on large display boards both before and after the presentation.

Enlarged Preliminary Land Use maps, superimposed on aerial photography to assist in locating specific sites, were available on the tables. Three members of the KLJ team, all certified planners and knowledgeable about the development of these preliminary maps, were available to answer participants' questions and capture their input regarding the exhibits.

The preliminary mapping titled "Preliminary/Expanded Mapping – Residential Focus" indicated two "Intensity/Proximity" levels and an area outside further consideration for future residential subdivisions. Areas closer to the inner edge of the study area were categorized as Intensity/Proximity 2. The "Preliminary/Expanded Mapping – Industrial Focus" exhibit showed three areas for further consideration for future industrial uses.

Other than general questions about the development of the Residential Focus Map, all other comments and requests were related to removing the opportunity for new residential subdivisions near participants' homes.

The meeting included two additional exhibits. A preliminary map of Potential Activity Centers included Neighborhood Activity Centers (mixed uses listed as including commercial and more dense residential than surrounding areas) and one Regional Activity Center (at the Menoken I-94 Interchange) with mixed uses listed as including industrial, commercial and more dense residential than surrounding areas. An exhibit was developed for Menoken which included an aerial photograph and enlargements of both the Industrial Focus and the Residential Focus clipped to the Menoken area.

Land Use Map

Information from the Residential Focus Map, Industrial Focus and Activity Centers maps was refined to reflect input from the September 29 and October 1 community meetings. Adjustments to the preliminary mapping that are reflected in the Land Use Map (Figure 3-1) include:

RESIDENTIAL FOCUS

- An additional residential category was added to distinguish property with moderately high suitability property from property with high suitability (the darker yellow on the Residential Focus map was divided into two areas).
- No other changes were made to the configuration of the residential category areas.
- The four categories were renamed to Agriculture, Rural, Outlying Suburban and Suburban to reflect their increasing level of intensity and proximity to current urban development.



INDUSTRIAL FOCUS

Adjustments to the Industrial Focus map responded to input from the community and adjust the total acreage to a more reasonable level.

- The Industrial designation was divided into Industrial, which reflects existing and/or rezoned industrial areas Industrial, and Industrial Opportunities Overlay areas.
- The northernmost Industrial area was deleted in response to a request from a couple identifying themselves as the property owners.
- The Menoken area was reevaluated in response to community comments and the industrial area was reconfigured.
- The Draft Land Use Map includes 450 acres of Industrial and 3,300 acres of Industrial Opportunities Overlay areas for a potential 3,750 total industrial acres (Table A1-3).

ACTIVITY CENTERS

- The Neighborhood Activity Centers were divided into two categories: “Neighborhood Activity Center” and “Future Activity Center”. That change will still provide an indication of the areas’ potential for mixed use activity centers but will also indicate that some of these activity centers are currently more suitable for development than others.
- The “Regional Center” is now shown as “Interchange”.

RURAL COMMUNITY

An asterisk was added to the Draft Land Use Map at Baldwin and Menoken indicating this designation.

This adjusted mapping was combined and included on the Draft Land Use Map, Figure 4-1.

