

# Oil Rush Urbanism

a plan for when the landscape is quiet again



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Landscape Architecture Design Thesis  
North Dakota State University

# OIL RUSH URBANISM

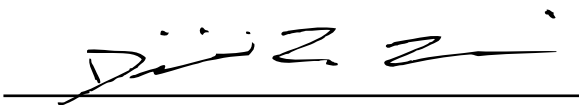
planning for when the landscape is quiet again

Design Thesis Submitted to the  
Department of Architecture and Landscape Architecture  
of North Dakota State University

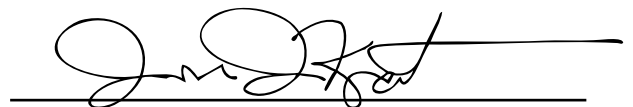
By

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In Partial Fulfillment of the Requirements  
for the Degree of  
Bachelor of Landscape Architecture



Primary Thesis Advisor



Thesis Committee Chair

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Art Link was governor of North Dakota during the oil rush in the 1970's. Governor Link insisted that North Dakota's energy development was in accord with values deeper than mere economics. He celebrated stewardship, the agrarian ideal, the integrity of rural communities.

On October 11, 1973, Governor Link delivered what is widely regarded as North Dakota's "Gettysburg Address." This speech is known by its opening phrase: "When the landscape is quiet again."

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“ We do not want to halt progress. We do not plan to be selfish and say “North Dakota will not share its energy resource.”

No, we simply want to insure the most efficient and environmentally sound method of utilizing our precious coal and water resources for the benefit of the broadest number of people possible.

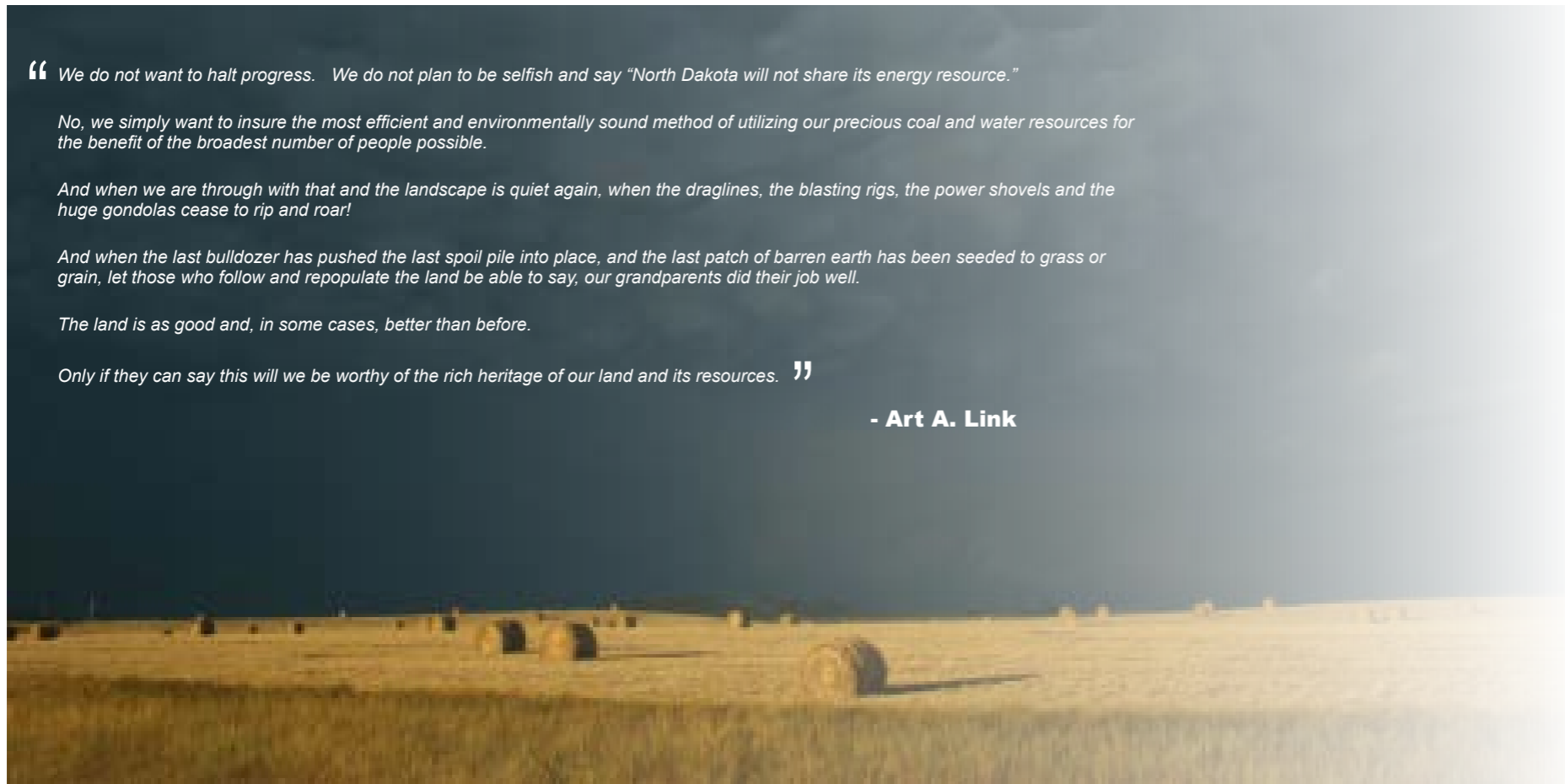
And when we are through with that and the landscape is quiet again, when the draglines, the blasting rigs, the power shovels and the huge gondolas cease to rip and roar!

And when the last bulldozer has pushed the last spoil pile into place, and the last patch of barren earth has been seeded to grass or grain, let those who follow and repopulate the land be able to say, our grandparents did their job well.

The land is as good and, in some cases, better than before.

Only if they can say this will we be worthy of the rich heritage of our land and its resources. ”

- Art A. Link



# Abstract

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Williston, ND and surrounding counties are experiencing a tremendous influx of people from all over the United States. Throughout the Williston basin the consequences of over production of infrastructure and housing associated with past boom periods have slowed the response to the current development and growth. As a result of this lag in response, some communities in western North Dakota, including Williston, ND find themselves in a reactionary position where they are now desperately trying to catch up as the demand of the current oil boom has far overtaken supply of infrastructure, housing and community services.

Resource-extraction growth has the potential to give the community the resources to revitalize a downtown, and build new schools. However, if proper planning and foresight are not considered and if the oil industry becomes the dominant factor in communities growth decisions, the community will be left with detriments instead of benefits when accelerated growth subsides and returned to normal rates.

This thesis project examines how design decisions affect the viability and sustainability of the community in the long-term, and what should be considered in order to ensure resiliency to future energy development growth and decline.

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# Problem Statement

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How can oil boom communities develop as smart, sustainable and resilient places?

## KEYWORDS |

**Growth Management | Decline Strategies | Adaptive Infill | Highway Conversion | Commercial Retrofit | Boomtown | Energy Development Impacts | Socio-Economic Disruption |**

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# Statement of Intent

Project Typology | Claim | Theoretical Premise/Unifying Idea | Project Justification

## Project Typology | Smart Growth and Decline

**Claim** | Areas rich in energy resources tend to go through dramatic energy development cycles, this cycle, of growth and decline, directly influences communities that host the energy development industry.

## Theoretical Premise/Unifying Idea

During boom growth, steps must be taken in order to prevent communities from collapsing when the boom ends. Communities that grow unmanaged during times of accelerated growth, will be left with sprawled development when population declines and housing is abandoned as needs shrink.

However, population loss does not have to be a bad thing for the community. It can mean more open space and recreational opportunities or lower student-to-teacher ratios in the classroom. (Hollander, 2011)

## Project Justification

A growth/decline plan that focuses on how a community will physically change when it's population fluctuates would create a sustainable and resilient community.

This thesis is focused on the results of population change on communities and what it is that Landscape Architects can do to manage that change.



<http://www.runningwithoil.com/?tag=traffic>

# Narrative

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Western North Dakota sits, acres of quiet rolling hills traversed by miles of dirt roads. Farmsteads dot the landscape. People are friendly, there are no strangers. Pace is slow, life is modest.

.... then arrives the renewed prospects of oil.

The companies and workforce that service the oil industry and the promise of economic growth are welcomed enthusiastically into the quiet community. Soon, however, consequences are noticed. The expansive prairie is now covered with oil derricks and natural gas flares. Roads built for lower traffic counts deteriorate from an unrelenting flow of oil-related traffic. Past deserted mobile homes fill up, and motels are booked years into the future. Tent and camper settlements pop up in parking lots, while fast food restaurants offer \$12 dollars an hour as a starting wage.

As population grows at boom rates, existing local services fall short of need. School classrooms, retail options, housing, and the number of physicians in the community do not grow as rapidly as the number of people increases. Housing shortages and high costs of living make it difficult to attract needed teachers, health professionals and construction workers to the community.

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The higher cost of living especially effects the most vulnerable in the area—eg. Seniors living on fixed income, low-income residents, those with limited ability to relocate and/or earn higher income. Many people’s recreational requirements are not satisfied by the available opportunities. The quality of life in the community degrades.

The City of Williston, ND has responded to shortages in housing and services and resulting consequences by adapting more land into the city limits in the hopes that the private sector will have more options to build and provide the needed services.

However, energy development is dependent on volatile commodity prices and available technology factors, thus development can stop or even quickly reverse on a moments notice, and the threat of overbuilding becomes a reality as growth was allowed to happen unmanaged within a large city boundary.

My research explored this narrative and looks at how a city can respond to housing shortages while looking into the future and preparing for when housing and industrial needs will once again shrink to typical demand.

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# Thesis Proposal

Client Description | User Description | Major Project Elements |

## Client Description | The City of Williston, North Dakota

The City of Williston is located in the epi-center of activity within the Bakken/Three Forks oil field. The city has become a regional hub. Rapid and reactionary growth needs to be managed to ensure the community can remain viable and resilient in the future.

## User Description |

### Immediate Users

petroleum industry workforce (temporary/ single status), displaced elderly, displaced residents looking for affordable housing, in-migrating service population (single & married status), customers and business owners of commercial & industrial properties

### Future long-term Users

permanent petroleum industry workforce and their families (new residents) , transition from high levels of single status individuals to families with children, fluctuating numbers of industrial owners and customers

## Major Project Elements |

### Adaptable Housing

Due to accelerated growth the City of Williston is experiencing a housing shortage. Housing that can adapt and fluctuate the number of dwelling units it offers will ensure long-term viability. Housing diversity ensures resilient neighborhoods and allows residents to age in place as their needs change.

### Greenway Network

HWY 2 will be converted into a boulevard. Existing hydrology systems should be protected and lands should be used as an extension of a greenway networks.

### Retrofit of Existing Commercial

existing commercial is fronted by parking lots, parking will be kept. infill to the rear of existing commercial area will increase commercial density making it a walkable destination and will allow city to grow without increasing the cities footprint



# Site Information | region

Regional Scale | Williston Basin | Oil Producing Geological Formations

The Williston basin, a roughly circular depression, lies beneath parts of Manitoba, North Dakota, South Dakota, Montana, and Saskatchewan. The massive oil shale deposits within the Williston Basin are now known to be the largest oil resource in the continental United States. The City of Williston, North Dakota sits at the epicenter of a tremendous oil boom.



Current development of the petroleum sector in the Williston Basin started in the mid-2000s when the union of horizontal drilling and hydraulic fracturing coinciding with high prices for oil, made it economically viable to extract unconventional oil from the Bakken formation. Initial expansion was modest, resulting in about 300 wells enter-

ing production annually from 2005 through 2007. (Bangsund & Hodur, 2012) However, drilling since that time has expanded rapidly and led to a current estimate of 2,000 wells entering production annually, as made by the Department of Mineral Resources' Oil and Gas Division. Most of the counties within the Williston Basin are rural in nature

and the impact of rapid expansion of the petroleum sector has prompted unprecedented economic and population growth. (Nordeng, 2010) The influx of population and industry has created infrastructure shortages from both an industry perspective relating to oil transportation and processing capacities to local public infrastructure

shortages of roads, water, sewage treatment, school facilities, housing, and the delivery of public services. (Bangsund & Hodur, 2012) These problems have left individual communities, as well as the state, unable to manage the growth and frantically trying to meet demands.

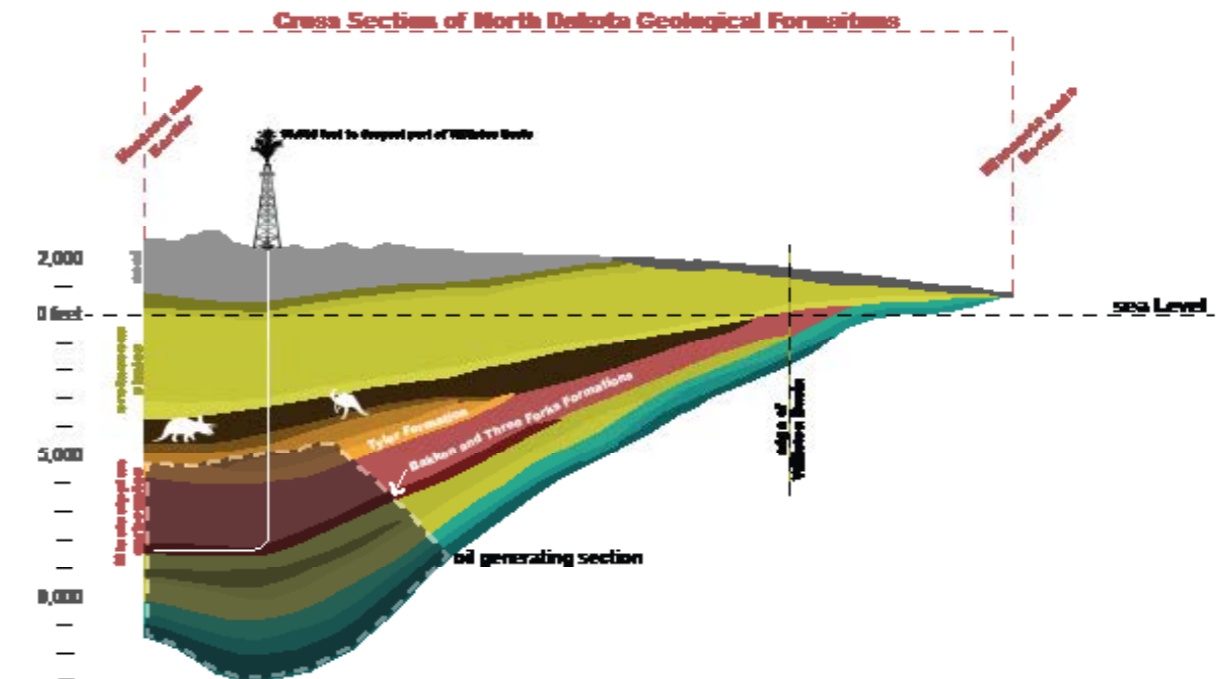


IMAGE 1  
Cross Section of Williston Basin of North Dakota.

States within the boundary of the Williston Basin are currently in the exploration phase of a tremendous oil boom. (Macke & Gardner, 2012) The region has been a well-known oil production region for decades. (Angster, 2010) Within the subsurface of the Williston Basin, lay many oil producing geological formations. About 1 billion years ago, long before the dinosaurs roamed the earth, sediment accumulated within the Williston basin. Heat and pressure matured certain layers of the sediments into layers of shale. One of these layers is now buried 2 miles beneath what is now western North Dakota. This stratigraphic layer, called the Bakken formation, reaches a maximum thickness of only 160 feet. (Vlahos, 2012)

Currently a large majority (95% as of April 2013) of oil producing wells of western North Dakota are extracting from the Bakken Formation. (Nordeng, 2010) However, the Three Forks formation located below the Bakken formation has been determined to be just as promising of an oil deposit and is currently being targeted. The U.S. Geological Survey calls the Bakken/Three Forks formation the largest continuous oil accumulation it has ever assessed. The Tyler formation, located 2,000 feet above the Bakken formation currently is being explored, but the extent of economic feasibility of these deposits have not yet been determined. (Nesheim, 2012)



# Site Information | state

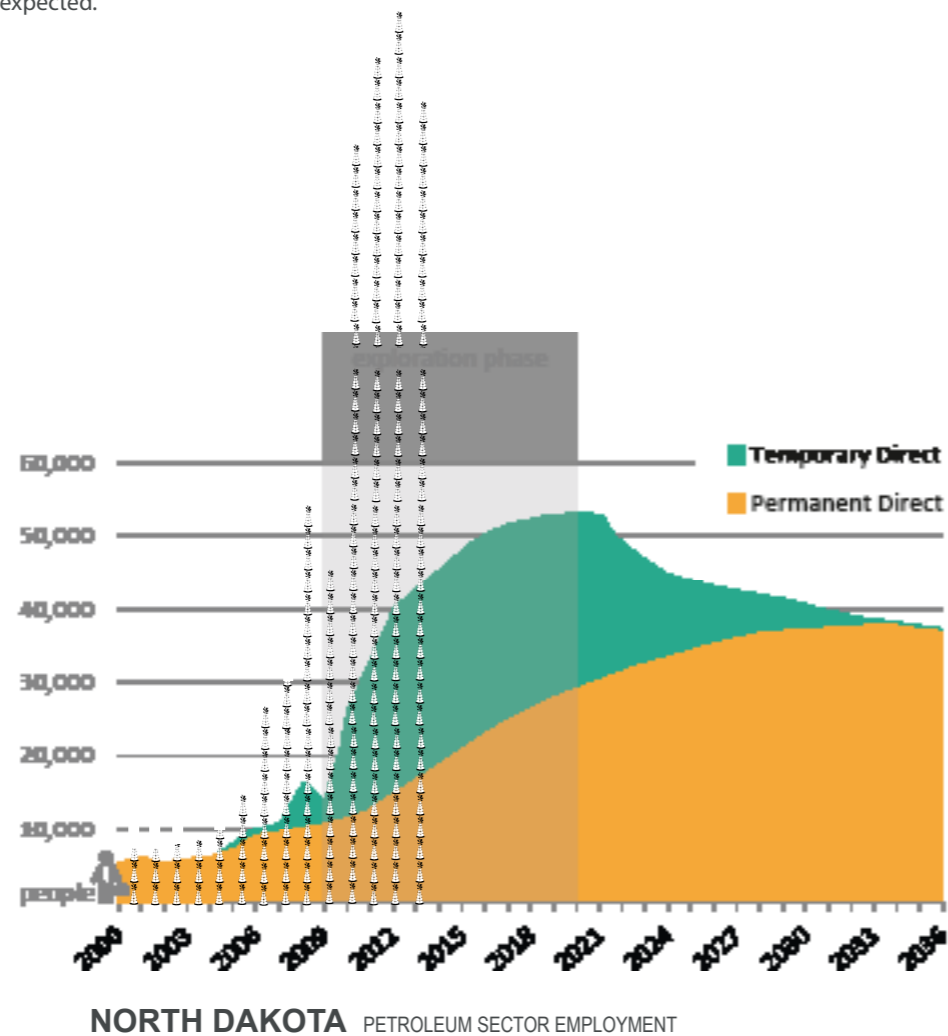
State Scale | County-to-County Comparison | State Petroleum Sector Projections

North Dakota has several ecoregions, including: Grass Prairies, deciduous forests, and semi-arid badlands and River Breaks.

Northwestern North Dakota is unlike most areas of North Dakota. The annual precipitations is often less than that of other regions within the state. However, the state can receive well over 100 inches of annual snowfall.

## Population Projections of the state

Current estimates are there will be around 40,000 wells in production in North Dakota when development of the current boom is complete. This graph shows that temporary population will peak and slowly transition into a permanent workforce. Understanding this peak in population followed by a decline is central to planning for a resilient community. Rig counts peaked at 218 in May of 2012, the decline may come sooner than expected.

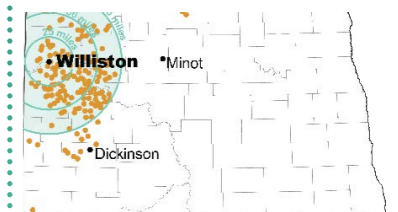


## Williams County, North Dakota

Williams county has been North Dakota's oil industry leader since 1951. The US census bureau ranks Williams county as the fastest growing US county from April 1, 2010 to July 1, 2012. Energy development in the region is responsible for fluctuating economic conditions and periods of accelerated growth and decline.

## WILLIAMS COUNTY

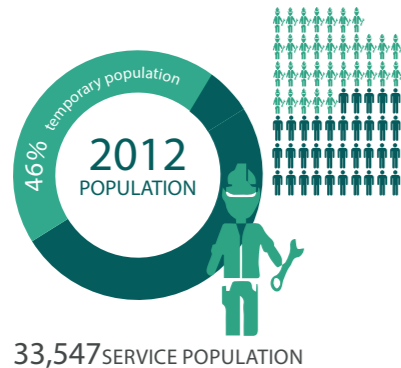
in comparison to other ND counties



The City of Williston is located in Williams County in the northwest part of the State of North Dakota, approximately 55 miles south of the United States/Canada border. The Williston area is located at the center of the drilling activity for the Bakken/Three Forks formation. The city of Williston is actively embracing this growth and is investing over \$182 million in capital improvements, such as new wastewater treatment facility and major road expansions. (Williston Economic Development, 2012) In recent months oil industry companies have hired between 300-500 additional employees per month, with an average salary in the \$80,000 per year range. (Bangsund & Hodur, 2012) Because of this major influx of jobs and lack of housing supply, Williston apartments, hotels and temporary crewcamps are operating at full capacity at nearly all times and demand for new product is very high. Data on growth projects, temporary workforce projection, and projected duration of boom was collected for the site. Published in August of this year, Bangsund and Hodur of the NDSU Agribusiness and Applied Economics Department released a new model for projecting direct and secondary employment in the petroleum sector in North Dakota. In literature the terms 'Williston metro area' and 'Williams County' are used interchangeably.

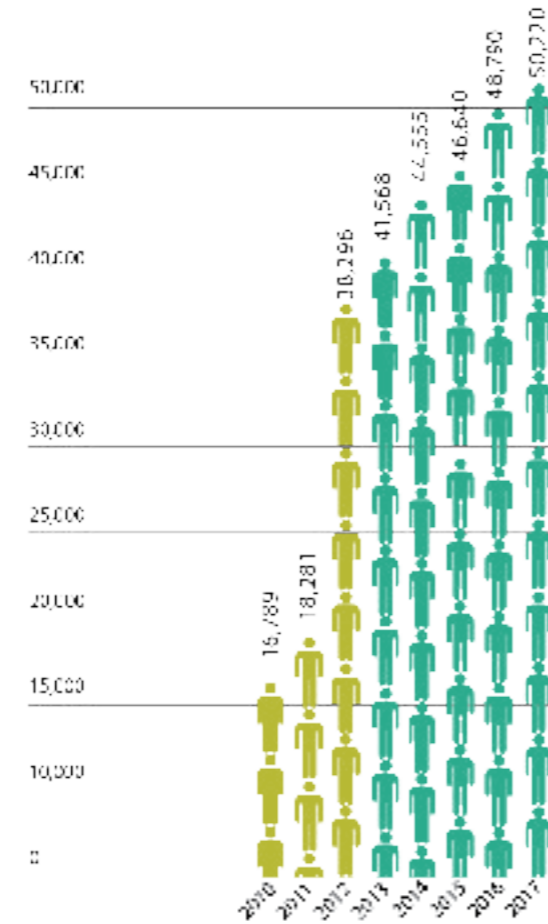
PERMANENT POPULATION  
TEMPORARY POPULATION

**CITY OF WILLISTON**  
5-YEAR POPULATION PROJECTION

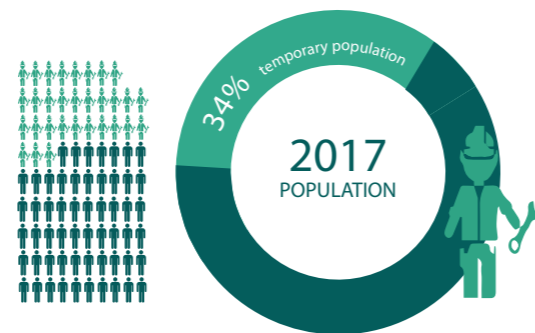


**Population Growth Projections**

City of Williston Population Study



43,993 SERVICE POPULATION



**Population**

The local population increased from 12,512 to 14,716 between 2000 and 2010; a 17.6% increase in population. Between 2010 and 2012 the population increased by 6,873, a 46% increase to a total population of 21,589.

**Permanent Housing**

The total number of housing units increased from 5,940 units to 6,824 between 2000 and 2010. An estimated 1,384 total residential permits were issued for 2011, up from 476 in 2010 and 197 in 2009. The most mobile home permits issued in one year occurred in 2010, with 384 total mobile home permits. Rent averages have increased by 250% between 2010 and 2012, just a two year period. The dominant approach of County and City governments has been to rely on market forces to deliver housing outcomes with minimal direct government intervention. Direct intervention has been in the form of the non-market provision of social housing, and financial assistance to lower-income households through the North Dakota Housing Incentive Fund. The government does, however, exert considerable indirect influence on housing outcomes through policy of the comprehensive plan, taxation, and land use planning and zoning projects approved.

**Temporary Housing**

To supplement the permanent housing, a significant amount of temporary housing has been set in to place to accommodate the high volume. The table provided is a breakdown of these temporary housing solutions. The miscellaneous section includes people living in RV's in the parking lots, living in parking lots, living in vehicles, living in private rental rooms, ect. In total, there are estimated 5,263 temporary units being utilized providing temporary housing to 15,342 people.

- 2010 City Limits (7.42 square miles)
- 2011 City Limits (12.66 square miles)
- 2012 City Limits (20.26 square miles)
- water

**Employment Trends**

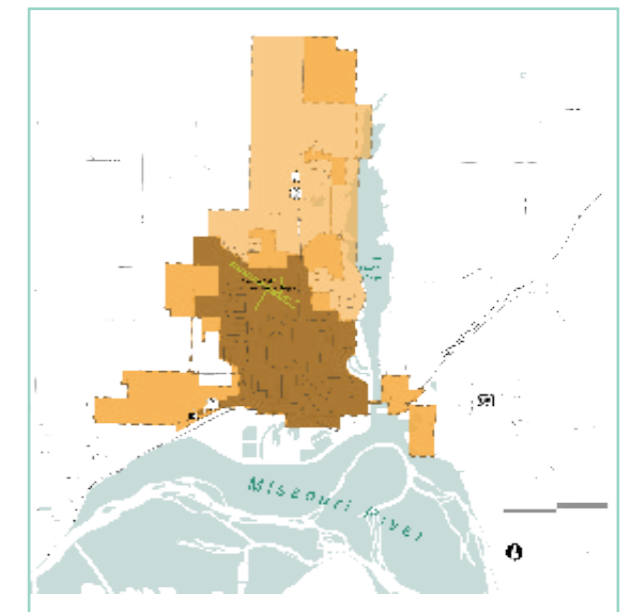
Over the last decade, Williston metro area has added 1,145 jobs on an annual basis. The number of jobs added annually increased dramatically between 2008 and 2011, with an average annual increase of 2,457 new jobs. Job growth reached a 20% growth rate last year, with the addition of 1,000 jobs in the county.

**City Limits Boundary**

The city of Williston has grown by 12.84 square miles since 2010, almost tripling the size of the city limits.

**Local Waterways**

The Little Muddy and Missouri Rivers are the main water channels through the city of Williston. The Missouri river is an obvious growth limitation to the south, while the Little Muddy River and the steep topography of its eastern bank are growth limitations to the east. The Missouri river's flood stage is 22'. In 2011, it brok the previous height record when it crested at 29.29'.

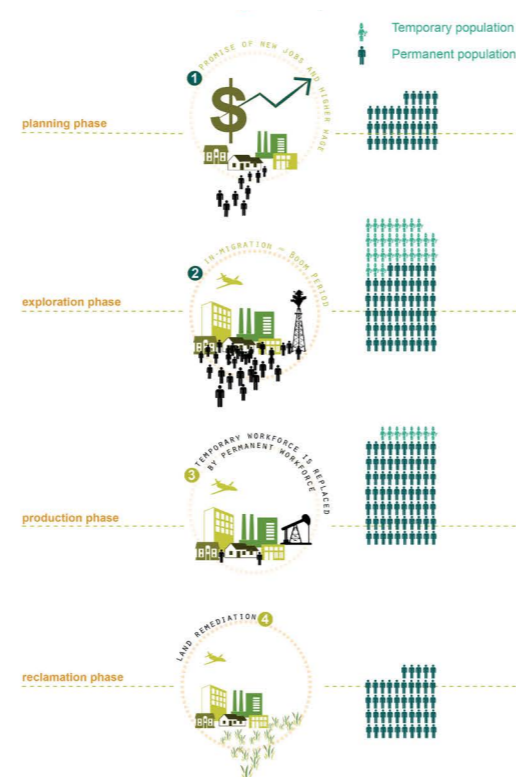


# Project Emphasis

This design thesis examines how individual communities are affected by an oil boom economy. Special attention is paid to how the built environment influences the community well-being and viability.

Specifically, this project address the question, " How can oil boom communities develop as smart, sustainable and resilient places? "

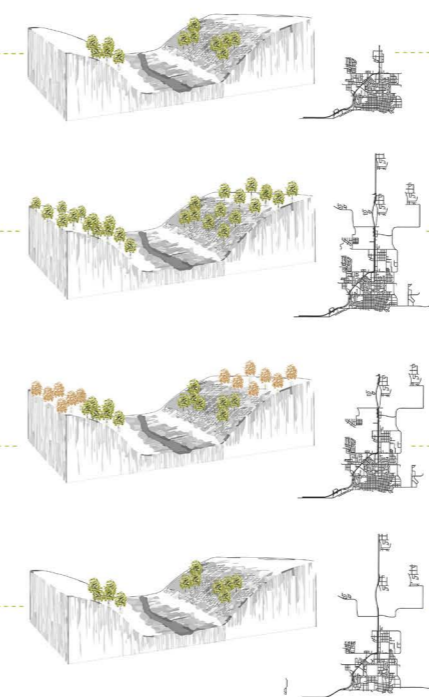
This project responds to this question by referencing how landscapes in the region endure the extreme weather climates, and proposes that the urban environment should respond in a similar way to the economic climates of energy development.



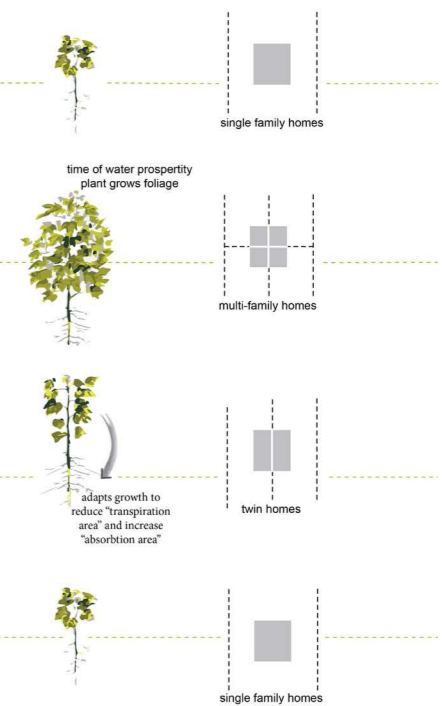
Focus has first been given to the city scale, creating a framework for development ,that will allow the city to be resilient in future fluctuating economic conditions. Following this urban analysis, focus is then given to the building blocks of city form: the neighborhood. The use of adaptive infill for an existing site becomes an example of how to create resilient neighborhoods, and in turn, resilient communities.

A strong emphasis is placed on the physical change of communities as a result of boom growth, as this is the panacea for many of the social and economic consequences of accelerated growth.

**Species that sprawl during prosperous times perish when climates return to drought conditions**  
cities that sprawl during rapid growth are left with sparse development of no greater quality than when they started



**Drought hardy species adapt to survive in volatile climates**  
housing should be adaptable to respond to changing economic climates



# Plan for Proceeding

Research Direction | Methodology | Research Merit |

## Aims and objectives of the research |

How does large-scale resource development affect local communities? Specifically, local governance and culture, both in real time and in the FUTURE? How can the 'built environment' mitigate these affects on existing communities near the epicenter of the North Dakota oil boom?

## Research Design | research direction

### Oil Industry

In order to understand the complexities of how the oil industry affects local communities, it will be necessary to comprehend current methods of oil extraction: from initial land speculation and acquisition to the prevailing process of drilling, elevating and transporting crude oil. A better understanding of the current development of the Bakken/Three Forks formation in the Williston Basin and how current activity compares to previous boom-bust cycles is essential to the decision make process. Accordingly, this study was undertaken to examine how the petroleum industry might influence employment, housing and population in the city of Williston. Findings were used as inputs to the design portion process.

### Temporary Population

It will be vital to understand the nature of nomadic populations in order to address and accommodate their needs. Specifically; the social distancing and lack of social support of the transient population due to the nature of a nomadic lifestyle (Parkins & Angell, 2011); the alteration of the meaning of home, community and permanence (Hostetter, 2011); and increased disorder and serious crime (Ruddell, 2011). Among this topic it will be necessary to study nomadic architecture and how the built environment can respond to a transient population.

### Boomtowns

It will be crucial to recognize the common forces and patterns of boomtowns, both historical natural resource boomtowns as well as financial resource boomtowns. It will be essential to identify the historical cycle of anticipation, development, plateau, bust and recovery (Ruddel 2011) in order to identify in which stages the built environment can diminish the adverse effects of rapid growth resulting from resource development.

### Regional Governance

It will be essential to identify with the challenges for regional governments as a result of rapid growth. This includes infrastructure, social structures and institutions, and increased disorder and serious crime.

## Research Merit |

This research will explore theories and design solutions for resource development growth, a highly contemporary issue. My research will be filling a gap of how the built environment can mitigate consequences of accelerated growth. This thesis project will be the culmination of my education in Landscape Architecture and will, therefore, clearly demonstrate my understanding of the built environment and its application to contemporary issues.

In order to understand the complexities of how the oil industry affects local communities, it was necessary to realize the unique situation of the Williston Basin and comprehend the prevailing methods of oil extraction and the required duration and resources this extraction requires.

Western North Dakota is currently experiencing an oil boom. The growth and expanding needs of the petroleum sector have led to the emergence of 'boomtowns'—the rapid and extreme growth of population in communities adjacent to resource extraction (Harper, 2010) – across western North Dakota. As the rate of change begins to accelerate, boomtowns face a range of impacts, both intended and rippled across the economy and community.

The potential effects of rapid growth on the rural communities of western North Dakota can be better understood through review of research literature on energy boomtowns and an understanding of the uniqueness of the current situation in the Williston Basin.

### The Unique Situation of the Williston Basin

Unique Situation. In a 1982 review of the social disruption literature, the authors, Albrecht and Finsterbusch, outline five reasons why energy-development in the western states should be considered a unique phenomenon. Upon examination I adapted some of these same differences to be applied to the current situation in the Williston Basin. (1) The rate of growth is unprecedented. (2) The geographic isolation of the communities means that workers will not be able to live in a nearby urban center. (3) The demographic history of the impacted communities is often quite unique. For example, many of the local communities had larger populations in the 1910 and 1920 than they did in 1970. Proposed development will reverse historical patterns of decline quickly and dramatically. (4) The social and cultural homogeneity of many of the communities does not prepare them to deal with the rapid flux of a different population. (5) Finally, the virtual absence of a well-developed local infrastructure in the form of adequate schools, medical facilities and personnel, law enforcement, recreation facilities, and so on increases the potential of severe impacts, at least during the early stages of growth.

It should be recognized that the commencement of the current boom happened at the same time as the commencement of the current economic recession. As a result, this boom has attracted in-migration from all over the United States.

### Natural Resource Development Cycle

A key aspect to understanding the impacts of the petroleum sector on the local host communities is to identify and quantify the amount of short-term labor and long-term labor requirements within the industry, as this is what is generating the boom. The terms 'temporary' and 'permanent' are often used interchangeably with 'short-term' and 'long-term'. In order to understand labor dynamics of the industry, it is vital to comprehend the various stages of natural resource development. Each phase requires different workforces that require different employment durations and employment types; therefore they require dissimilar requirements on housing and services. A 2012 article published by the Center for Rural Entrepreneurship outlines a predictable four-phases energy development cycle. (Macke & Gardner, 2012)

#### Natural Resource Development Cycle

- ✓ **Planning Phase:** Mineral rights leasing begins. Permitting and land use planning activity increases. Energy companies conduct exploration and testing.
- ✓ **Development Phase:** With proven potential, development of the resource commences. Jobs are created in drilling, fracking, trucking, and distribution. Many jobs are filled by a temporary workforce in-migrating from outside the region. This in-migration usually generated accelerated growth rates, causing an economic and population boom.
- ✓ **Production Phase:** More wells come into full production; as wells and pipelines are completed temporary workforce declines and remaining workforce transitions as different work skills are needed. This transition stabilizes population and growth rates return to normal and manageable levels.
- ✓ **Reclamation Phase:** Wells are dismantled and capped, and well pads are remediated. Jobs created require different work skills than development or production phases.



The implications of rapid community growth have attracted research by sociologists since the classic sociological writings of Durkheim. Interestingly, the conclusions drawn by studies on the consequences of accelerated community growth are in disagreement and have evolved over time. It is important to review the research literature to develop an understanding of the potential social effects of rapid energy-related growth at the local level.

	negative consequences of rapid growth	Relevant Study
Infrastructure	Water	(Cortese, 1977)
	Sewage	(Cortese, 1977)
Services	Street & Road Construction	(Cortese, 1977)
	Schools	
	Medical Facilities	
	Airports	(Cortese, 1977)
	Indoor Recreation Options	(Goldenberg, 2010)
	Housing	
	Police & Fire Protection	(Cortese, 1977)
Local Economy	Mental Health Providers	(Cortese, 1977; Goldenberg, 2010)
	Education	
	Level attained • Children with new needs •	(Goldenberg, 2010)
Social Structures	Higher Cost of living	(Cortese, 1977)
	Inequalities in distribution of new wealth	(Cortese, 1977)
Health & Safety	Retired and Salaried Professionals •	(Lawrie, 2011)
	Commuter Work Arrangements •	
Social Structures	Fly-in/fly-out (FIFO)	
	Drive-in/Drive-out (DiDO)	
Social Structures	Occupational Responsibilities	(Cortese, 1977)
	Resident's Expectations of Government	(Cortese, 1977)
Social Structures	Community satisfaction	(Brown, 1989, 2005)
	Neighboring	
Social Structures	Friends in the community •	(Cortese, 1977; Berry, 1990)
	Borrowing with neighbors •	(Brown, 1989,
Health & Safety	Levels of crime	
	Marital breakdown/ marital instability	(Hunter, 2002)
Health & Safety	Drug and alcohol abuse	
	Mental health conditions	
Health & Safety	Suicide •	
	breakdown •	

Table 1: Social Disruption Hypothesis Research

### “Gillette Syndrome”

In a 1974 sociological paper by Eldean Kohrs, a clinical psychologist working in the boomtown of Gillette, WY, introduced the term “Gillette Syndrome”. The term became a well-known term throughout much of the United States, and at the time was commonly used in the mass media as a synonym for high crime rates and other undesirable social changes associated with rapid population growth. (Thompson, 1979) While his research would later be criticized by other sociologists for poor methodology (Wilkinson, 1982; Albrecht, 1982; Wilson, 2004), the study sparked a wave of social scientists to become much more interested in the topic.

A dominant theme in the subsequent studies was the ‘Social Disruption Model’, whereby rapid economic and demographic changes was understood to always lead inevitably to high crime rates and other undesirable social changes. (Lawrie, 2011) Research began to narrate an inevitable cycle:

*As the economy booms and higher wages are offered it becomes more difficult to fill jobs at the lower end of the wage scale—e.g., retail, lodging, entertainment, agriculture, and public services. As the population increases suddenly, available housing isn’t equal to demand and the cost of living increases. More expensive housing makes recruiting key professional such as teachers, healthcare providers, and other service personnel difficult. The higher cost of living especially effects the most vulnerable in the area—e.g. seniors living on fixed income, low-income residents, those with limited ability to relocate and/or earn higher income. Higher wages also attract temporary workers who come from different cultures and social structures. (Macke & Gardner, 2012) The influx of people changes the social structure of the community and eventually they change the character of the community. (Cortese & Jones, 1977)*

### Social Disruption Hypothesis

Interest in the relationship between accelerated growth and its effects on rural communities became especially prolific during the 1970s as a response to the increasing number of boomtown communities in areas hosting natural resource developments. These studies drew greater attention to the negative impacts and problematic nature of resource-dependent growth. “A dominant theme in these studies was the ‘social disruption’ hypothesis, whereby rapid economic and demographic changes associated with large-scale resource development was understood to lead inevitably to social and psychological dislocation and a breakdown of established community social structures” (Lawrie, 2011, p. 142). This early research, and subsequent research that follows this hypothesis, focuses on identifying the numerous socio-economic consequences experienced in boomtown communities as a result of rapid resource dependent growth. This body of literature shows that boomtowns can have disproportionate increases in social problems such as crime, substance abuse, mental health problems, community dissatisfaction, education shortfalls, and that these problems are understood to be the result of inadequate infrastructure and housing, insufficient services, and increased cost of living (Cortese, 1977; Goldenberg, 2010; Lawrie, 2011; Brown, 1989, 2005; Berry, 1990; Hunter, 2002).

### Challenging the “inevitable”

Starting in early 1980’s, an increasing group of criticizing reviews of the social disruption hypothesis research emerged that challenged the hypothesis (Wilkinson, 1982; Albrecht, 1982; Wilson, 2004). These reviews suggest that the question is not whether boomtowns experience social disruption, but rather, which specific aspects of a community are negatively impacted and to what extent. This shift from not merely identifying the social consequences, but exploring the degree of the effects, demonstrated the recognition that resource-dependent communities have considerable differences in a wide range of factors.

### Comparative Studies

- ✓ Freudenburg (1984) concludes that experience of community satisfaction, alienation, and opinions of growth are far more negative for adolescents than for their adult counterparts.
- ✓ Nord & Luloff (1993) suggests that the resource being extracted, technique of extraction, and the industry organization are key factors determining the impact of resource-extraction industry dependence on well-being.
- ✓ Wilson (2004) suggests that level of economic dependence on the industry, the geographic distribution of the workforce, and changes in prices of the resource being extracted affects socio-economic well-being of the communities.
- ✓ Stedman (2004) compared the relationship between well-being and resource dependence across different industries – agriculture, fisheries, mining, energy, forestry. They declare it is a mistake to think resource-dependence itself has a “typical” effect on community well-being, there exists a great deal of industry-based variation in these relationships.
- ✓ Goldberg (2010) focused on the effects of the in-migrant population, specifically the young population (ages 15-25). The study found education, addictions, and housing were the main negative consequences of working and living in a resource-development community. The authors identify social isolation-being away from support networks as being a major influence on these negative consequences.

One of the outcomes from moving away from the acceptance of the ‘social disruption’ hypothesis was the acknowledgment that many factors can either help or hinder social well-being during accelerated community growth. The work cited above suggests that the impacts of resource-development growth on rural communities may depend on a wide range of factors including; characteristics of the resource and extraction, region, structure and community involvement of companies, period of growth, duration of residency, age of residents, community dependence on industry, and local government and policy.

### Longitudinal Studies

- ✓ Brown (1989 & 2005) 24 years of longitudinal data on Delta, UT. The studies concluded that within approximately a decade of the end of the boom period most of the social disruption indicators returned to or exceeded levels prior to the boom. Nord & Luloff (1993) suggests that the resource being extracted, technique of extraction, and the industry organization are key factors determining the impact of resource-extraction industry dependence on well-being.
- ✓ Hunter (2002), using ‘fear of crime’ as the measurement, concludes the degree of social impacts to residents depends on whether the resident had lived in the community before the boom, had moved to the community as part of the boom, or moved to the community after the boom.

Planning literature has adapted Social Disruption Literature from narrative describing conditions to a set of limitations faced by local governments. Local governments are often caught unprepared by the waves of new growth and are at a disadvantage to mitigate potential growth problems. Some of these disadvantages include; volatile cycle of natural resources, lag of revenues, jurisdictional unevenness, conflict between long-term residents and new residents, severity of growth, and lack of information.

### Volatile Cycle of Natural Resources

The boom-bust cycle associated with energy development presents the local government with an uneven future path of public service demand. The area has a history of boom and bust cycles, reflecting industry exposure to international markets and fluctuations in demand and supply. The traditional boom/bust cycle of the past influences the government and private investors' confidence. (Karaim, 2012)

The steep production decline curve of unconventional wells of the Williston Basin means production of wells being drilled today will be minimal in 10 years, if oil prices were to collapse, production costs might exceed revenues, therefore wells could be capped, eliminating the workforce associated with well production. What would the implications be if the local communities were to rapidly lose these employment options? Increases in the number of formations being explored or a decrease in oil production due to economic feasibility needs to be a central emphasis when planning for boom related growth.

### Lag of revenues.

A common problem in mitigating the impacts of energy development on communities is the lag between when development occurs and when revenue is available for impact mitigation. (Headwaters Economics, 2012) Industrial activity and population growth occur at the time a well is drilled, during the development phase. However, revenue generated by the well occurs when oil is produced and sold, during the production phase. (Macke & Gardner, 2012)

### Jurisdictional Unevenness

Once wells are producing revenue, another major complication is that tax revenues are often accrued by counties or states. Yet, infrastructure and service demands of the petroleum sector occur in the communities that host the workforces, creating unevenness in the location of the impacts and revenue availability. (Macke & Gardner, 2012) The oil producing portions of the Williston Basin is spread across multiple jurisdictions, including two countries, 18 counties, and several native reservations. As a result, the problems it brings are more complicated to resolve. (Warnica, 2012) by the well occurs when oil is produced and sold, during the production phase. (Macke & Gardner, 2012)

### Conflict Between Long-term residents and New residents.

Joseph and Judith Davenport in an article entitled, Grits and other preventive measure for Boom Town Bifurcation, use the term "boom-town burification" to describe the we-they phenomenon as a result population influx. As in-migration increases, different attitudes, behaviors, expectations, values, and life styles are introduced into the community. The "indigenous" to the rural community tend to be conservative, homogenous, and slow to change. (Davenport, 1979) As new people enter the social structure, traditional roles are altered, wealth become relative and the socioeconomic hierarchy shifts and can equal resentment by those replaced on the hierarchy. This dichotomy leads to older residents opposing subsidizing new growth under uniform taxations.

### Severity of Growth

Sheer numbers of people moving to a community, even if adequate housing was available, may be unassimilable without significant declines in quality of community life. (Markussen, 1978) Studies on the consequences of accelerated community growth are in disagreement on the growth threshold where governments become overwhelmed by new demand. Although it is acknowledged that communities will react differently depending on the size of community and capacity of infrastructure, it is accepted that rural communities as a group often have outdated infrastructure, facilities, and services, and lack proper resources and personnel to manage growth. (Little, 1977) Gilmore and Duff (1975) determined that five percent is as much growth as a small community can comfortably absorb, and that rates in excess of 15% will lead to "institutional breakdowns". publiis terortifex nimpl. Solutum actum non Itamquo et fui pl. Sent, mihilin cusque iae crion-sultor us conductu me corum ia morur hori, nitio vit;

### Lack of Needed Information.

Industry and regulatory agencies hold tremendous power over the pace of development and the amount of information that is available to decision makers. In a presentation given at the 2012 Bakken Housing Summit, THK Associates, Inc, highlighted some of the main constraints to development. They concluded that obstacles to data collection of confidential information and that North Dakota is a non-disclosure state was one of the main constraints of moving forward. (THK Associates, 2012)

### Employment and Population Prediction.

Accurate predictions on drilling, employment, and oil output in North Dakota over a long term scale are nearly impossible. Yet decisions are currently being made by state and local governments, many in a reactionary manner, to address service delivery, infrastructure, housing, and transportation issues in western North Dakota. Oftentimes, energy development is dependent on volatile commodity prices or other economic factors. The threat of overbuilding can further complicate planning efforts at a local level. (Bansgund & Hodur, 2012)

### Government and Community Reaction to boomtown Growth.

Problematic for planning is the changes in community attitudes toward growth. Gilmore (1976) and later Freudenburg (1981) found a number of similar stages when analyzing the social attitude of residents of boomtowns. These stages were further updated in 2012 by the Center for Rural Entrepreneurship for the current energy development projects of western North Dakota.

Initially, during the planning phase of development, the public is enthusiastic about the economic growth and the promise of new jobs and higher wages. However, as development begins, negative impacts come with the positive and uncertainty rises. As development accelerates rapidly, change is dramatic. The public demands housing and services, without proper resources and funding governments may have limited capacity to respond. Depending on the rates of growth and the resources available to the government, a crisis attitude may arise. (Macke & Gardner, 2012)

Multiple studies on energy boomtowns find that certain groups of people will have different social reactions to rapid growth, depending on their age, stature in community and how long they have been resident of the community. Freudenburg (1984) concludes that experience of community satisfaction, alienation, and opinions of growth are far more negative for adolescents than for their adult counterparts. Goldberg (2010) focused on the effects of the in-migrant population, specifically the young population (ages 15-25). The study found education, addictions, and housing were the main negative consequences of working and living in a resource-development community. The authors identify social isolation--being away from support networks-- as being a major influence on these negative consequences. Hunter (2002), using 'fear of crime' as the measurement, concludes the degree of social impacts to residents depends on whether the resident had lived in the community before the boom, had moved to the community as part of the boom, or moved to the community after the boom. This is central to the current thesis, in evaluating the needs of the community of Dickinson, it was necessary to recognize that public support and enthusiasm for development may vary, the solution needs to focus on meeting future needs, not current attitudes.



# Research Results |

## Economic Impacts on Boomtowns and housing

Economic impacts had little priority in the research on energy boomtowns. This is because most research and literature has been written by social researchers. However, it is accepted that employment, retail and population impacts vary dramatically from community-to-community. Stedman (2004) compared the relationship between well-being and resource dependence across different industries – agriculture, fisheries, mining, energy, forestry. They declare it is a mistake to think resource-dependence itself has a “typical” effect on economic success and community well-being, there exists a great deal of industry-based variation in these relationships. The larger more ‘urban’ communities in the region of energy development will attract the largest population influx—even when smaller communities are geographically closer to the project site. (Cortese, 1979) This means that Williston, ND being a central location should receive the largest influx of temporary workers.

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### Housing

A shortage of housing in boomtown communities is often a critical problem. Existing housing fills up rapidly and new housing takes years to manifest. A number of factors influence new housing creation, including high labor costs and shortages, high supply costs and shortages, as well as regulatory obstacles within local governments that are wary of allowing new developments that will further alter the community (Gilmore & Duff, 1975). The inadequate supply of housing for purchase or rent not only drives up prices, but prevents key worker relocation and stymies growth and investment in the area. Housing is increasingly viewed by government and resource companies as not only an economic supply commodity, but an economic driver, as new development is stymied by a lack of a local resident workforce. (Tolbert, 2006)

The impact of the resource boom on housing affordability affects a variety of other related socio-economic. The issues of housing interconnects with other economic, socio-cultural and environmental indicators, including health, education, the natural and built environment and social communities, which have important bearings on the quality of life and on the sustainability of communities. (Haslam McKenzie, 2009a) Appropriate housing must be physically, culturally and socially appropriate to context and cost-effective/affordable. Access to appropriate housing is affected by a range of economic factors, including affordability, type and amount of housing being provided, the means of delivering and maintaining housing, the physical conditions where the housing is located, and the cultural norms and expectations. (Haslam McKenzie, 2009b)

Lack of housing will invariably lead to spikes in housing prices; this in turn can be a substantial benefit for an existing home owner who is willing to capitalize on this assessment by either selling their property or renting it out. On the other hand, increased prices in the housing market can provide a misfortune for existing residents who are not home owners or plan to remain owner occupiers of their property. The greatest affordability problems occur, not unexpectedly, among low income households, such as social security recipients, unskilled workers, and retail, hospitality and other service industry workers, ultimately pushing this demographic out of the community. (Yates, Randolph, Holloway, 2006) Fixed income residents can be especially affected as property taxes rise. Because of escalating cost of housing, even gainfully employed people are having trouble finding affordable housing. (Danelak, 2012)

Crewcamps are re-locatable dwelling located in temporary sites, commonly on the outskirts of host communities to energy development sectors. They are appropriate for accommodating workers or contractors employed on time-limited contracts, for example during the construction phase of energy development. Crewcamps have attracted criticism from permanent local residents because the crewcamp occupants have a temporary mindset with no commitment to the place or the community. Concerns center on occupants’ usage of services with no investment in the community. (Haslam McKenzie, 2009a)

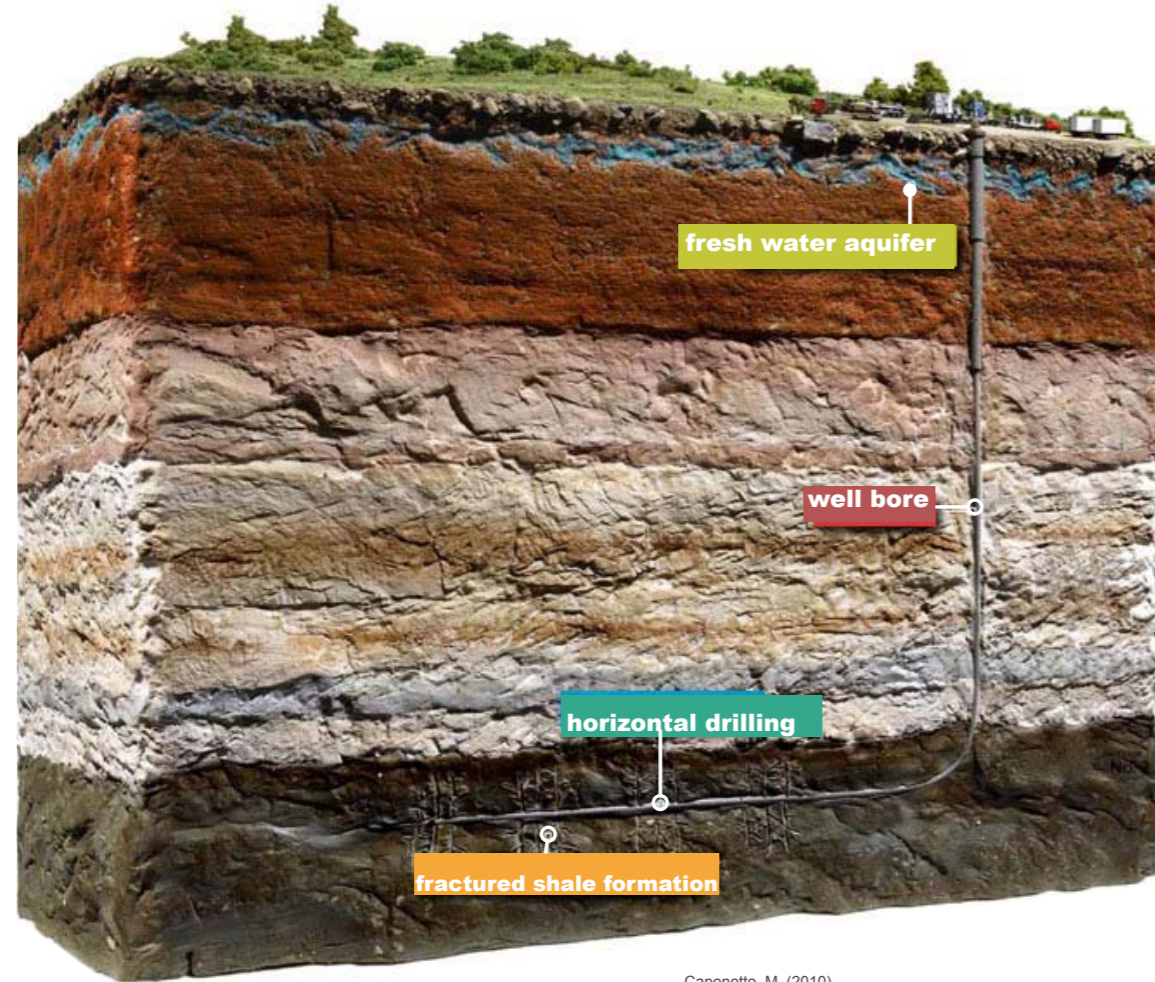
Fly-In /Fly-out (FIFO) and Drive-in/Drive-Out (DIDO) are now accepted practice in the petroleum sector and clearly have an ongoing role they play in the region. FIFO and DIDO become appropriate where the housing and other local infrastructure is unable to accommodate the required labor force, for example, where there is a time delay in providing housing. (Haslam McKenzie, 2009b)

### North Dakota Housing Incentive Fund

Shortage of affordable housing continues to be a major issue in North Dakota, thanks to the economic boom driven primarily by the oil and energy industries. In fact, according to a recent report released by the National Low Income Housing Coalition, there are only 45 affordable and available rental units for every 100 low-income renter household in North Dakota. Created by the North Dakota Legislature last year, allows taxpayers to contribute funds and in turn can claim their contributions the same tax year, or they can be carried forward for up to 10 years if the credits exceed a taxpayer’s tax liability for the tax year. The tax credit contributions are capped at \$15 million. Taxpayers can request that their contributions benefit a specific eligible housing project, community or area. Ninety per cent of funds are reserved for areas impacted by the oil booms or disaster areas. The housing Incentive Fund aims to help not only low- and fixed-income residents but also people who might not otherwise qualify for low-income housing. It helps households on fixed incomes, low-incomes, and helps people on Main Street – waitress, teachers, etc. – that keep the community thriving. This program gives those who aren’t huge earners the ability to stay where they are.

# Research Results |

## unconventional oil in the Williston Basin | prevailing extraction techniques |



Caponetto, M. (2010)

Oil was discovered in the Williston Basin in 1951. (Key, 1962) However, until recently most of the oil in the subsurface formations of the Williston Basin was not economically recoverable because it was trapped tightly between rocky layers in shale beds, classifying the formations as unconventional oil plays. (Gordon, 2012)

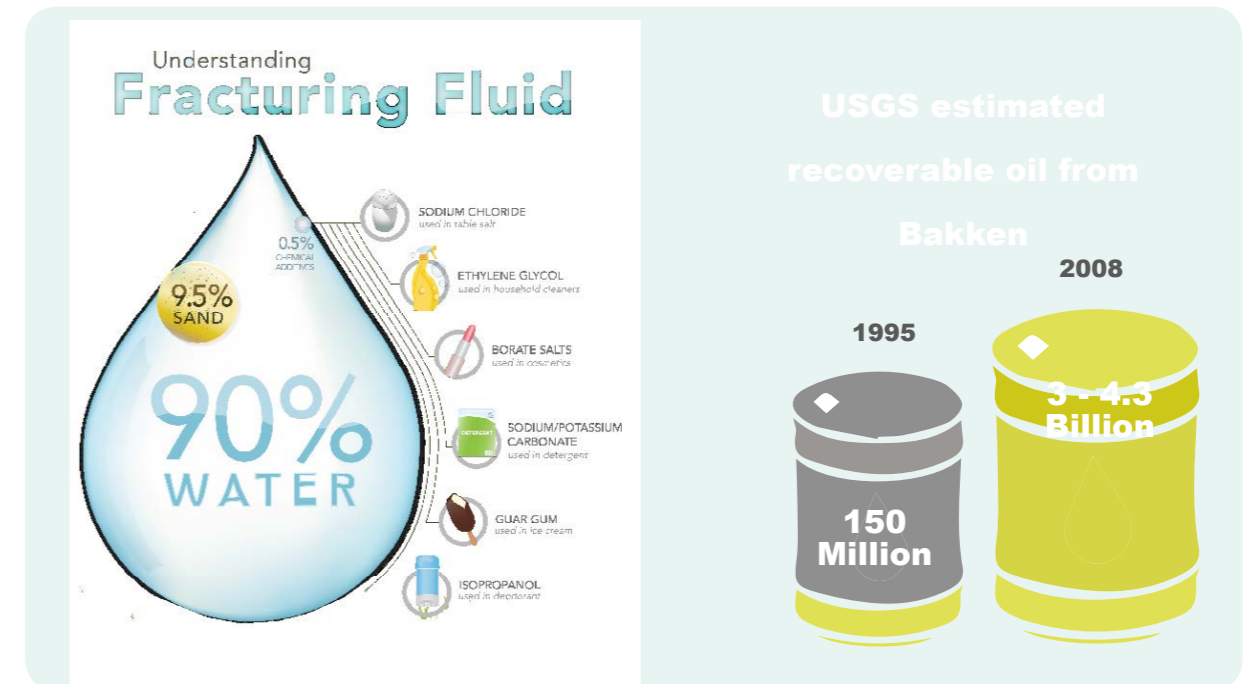
In conventional oil formations, oil accumulates in a pool under a dome or vault of impermeable rock and can be extracted much like “sticking a straw in the ground”. (Headwater Economics, 2012). In contrast, unconventional oil within the Bakken/Three Forks formation is tightly locked between layers of shale rock, making it impossible to extract in the same way. Extracting unconventional oil involves a much more complicated process, is less efficient, and has greater environmental impacts than conventional oil production. (Gordon, 2012)

Economically extraction of unconventional oil plays depends on available technology and prices of oil. In 1995, the USGS estimated that the Bakken formation contained about 150 million barrels of oil that could be extracted with the available technology. In April of 2008, based on new insights due to horizontal drilling, the agency increased that estimates saying 3 to 4.3 billion barrels of could be recovered from the Bakken formation – 25 times more than the 1995 estimate. (U.S. Geological Survey, 2008) On April 30th 2013 the day I turned in my final thesis presentation, the USGS again increased their estimate now guessing that there is over 7 billion barrels of recoverable oil found in the Bakken formation.

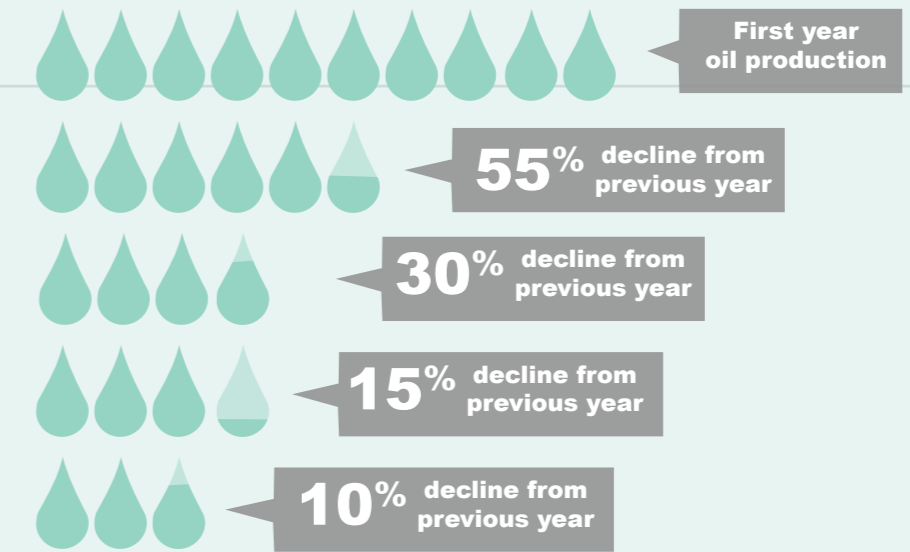
### Prevailing Extraction Techniques

The concurrent use of two technologies is responsible for making oil extraction from the shale rock of the Bakken/Three Forks formations possible. Part one is horizontal drilling, which oil companies began trying in the area in the late 1980s. (Vlahos, 2012) Drilling is started vertically, just as traditional drilling. But then, as the appropriate depth is achieved, in the case of the Bakken Formation this would be 2 miles, the drilling is guided on a graceful 90-degree turn. From there, drilling continues horizontally for another 2 miles, maximizing the well bore’s access the thin geological layer. (Vlahos, 2012)

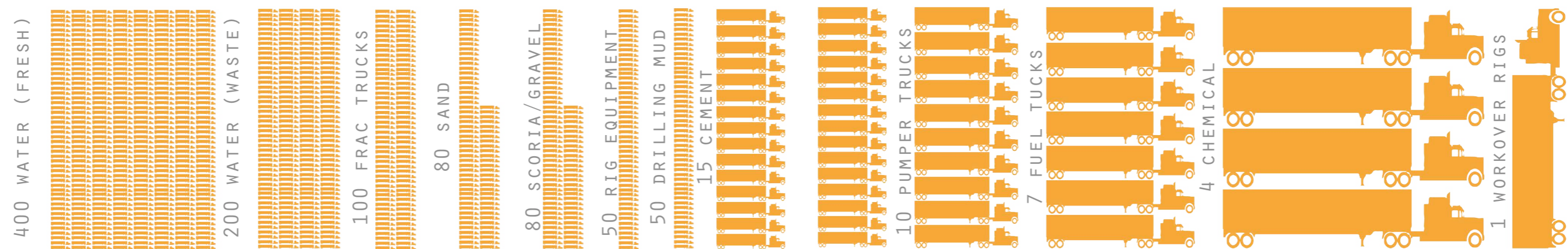
Part two is hydraulic fracturing—commonly known as ‘fracking’. This process consists of an initial detonation—called perforating, or perfining-- that creates a series of cracks that extend out from the well bore into the surrounding rock. Subsequently, thousands of gallons of fracking solution-- consisting mostly of water and sand as well as chemical—are pumped into the well. The fracking solution then pushes into the perforations, driving the cracks several hundred feet outward from the bore hole. Finally, tiny ceramic beads—called proppant—are added to the fracking solution. The proppant lodges into the fractures, holding them open so that oil can flow to the bore. (Vlahos, 2012)



### Bakken Well Production Curve



### Rig related Truckloads per Well = 2024



### Resources by the Truckload

Both drilling and fracking require an immense amount of supplies. In a 2012 presentation at the Bakken Housing Summit the Williston Economic Development estimated each rig requires 2,024 truckloads of resources—the image shows an accumulation of trucks during the fracturing of a well and summaries how this number was generated. This is responsible for the immense amounts of traffic congestion and deteriorating conditions of rural North Dakota roads that once saw only minimal use. (Williston Economic Development, 2012)

### Production Curve of Unconventional Oil

After the initial flood of oil a well produces, typically lasting about a year, unconventional wells drastically decline in productivity. A typical well in the Bakken formation will produce only 55 percent of oil in the second year of production compared to the first. This steep production decline curve of unconventional oil wells means large amounts of tax revenues will be received initially, but in the long run these revenues will diminish. (Headwater Economics, 2012) Planning and development projects that depend on these revenues should be planned accordingly.

In this thesis particular attention should be paid to the implications of extraction of unconventional oil and the associated demands it poses on local communities. Nord & Luloff (1993), an energy boomtown study, suggests that technique of extraction and the industry organization are key factors determining the impact on community well-being. The process of oil extraction within the Williston Basin is highly specialized—both for horizontal drilling and for fracking, the associated workforce should not be mistaken as unskilled labor. Specialized workforces are needed at each well for short periods of time, with 40,000 wells projected throughout North Dakota, this creates a transient workforce. The steep production decline curve

of unconventional wells means production of wells being drilled today will be minimal in 10 years, if oil prices were to collapse, production costs might exceed revenues, therefore wells could be capped, eliminating the workforce associated with well production. What would the implications be if the local communities were to rapidly lose these employment options? This design thesis should be adaptive to both rapid growth, and the possibility of rapid decline.



## Goals for the Design Solution |

Fortunately enough, accelerated growth and resulting boom towns are not a new occurrence in this region, nor is it unique to the petroleum sector. Insights were gained from the research into experiences in other landscapes across the U.S. and internationally. This thesis aims to use these findings as inputs to the design portion process.

Boom towns, despite the wealth generated by the associated resource-based industry, create a series of interconnected and cumulative problems. These problems go beyond the supply of housing and services, and impinge upon the sustainability of the community. Planning needs to focus on comprehensively addressing the overall situation, not just the various problems separately. An enduring challenge regarding the provision of services is the expected longevity of the boom. What happens when the boom period ends?

This thesis aims to comprehensively address the issues identified in the research and to give Williston, ND a "How" to solvinging these issues.

1. Alleviate Housing Shortage & Service Shortages
2. Provide appropriate Housing for each Phase of development
3. Create meaningful places that will benefit Williston in the future
4. Develop contiguous growth within city limits
5. Use boom as an opportunity to address current problems
6. Prevent overproduction in anticipation of future decline



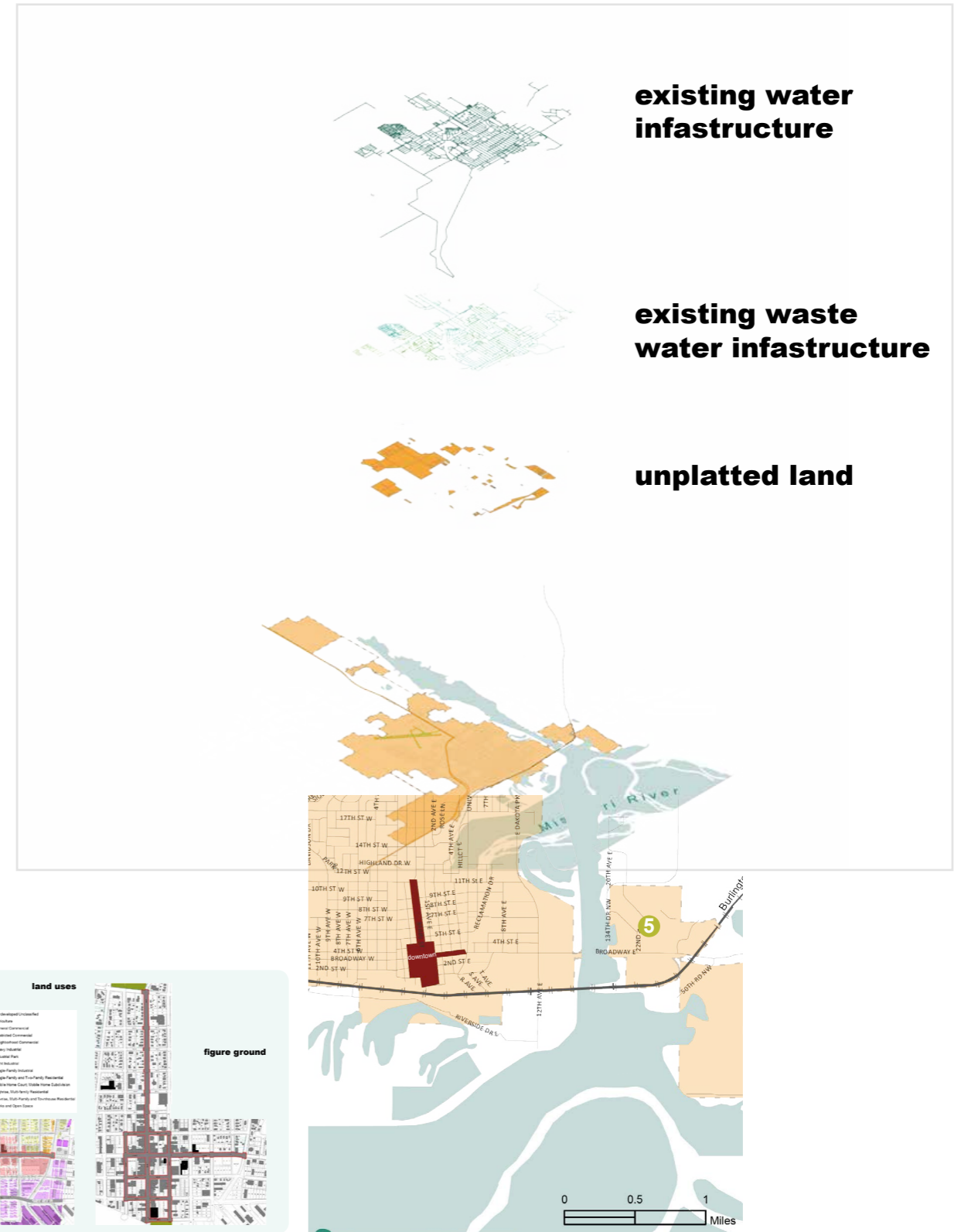
## Downtown Williston |

The economy had boomed and should also help to infill Williston's Downtown. Currently downtown is comparable in size to Fargo.

Kadmas, Lee & Jackson was hired in 2011 as a consultant to produce a Downtown Williston Streetscape Plan. The plan will be implemented in the near future. One of the main recommendations from this study that should be applied to other areas and to the current design thesis is "- apply a road diet to reduce all 4-lane streets to a three-lane section with a two way left turn lane to improve pedestrian safety and gain more space for parallel parking."

Some of the major weaknesses that citizens identified as part of this study are:

- lack of restaurants and retail
- lack of public space and amenities
- lack of public art
- aged infrastructure and sidewalks
- lack of trees and vegetation
- minimal residential living units



Kadmas Lee & Jackson, Downtown Williston Streetscape Plan, 2011.

# Site Analysis |

## City Scale | Analysis of city growth

### Green Network |

#### Protect & Utilize rivers, floodplains, wetlands, & streams

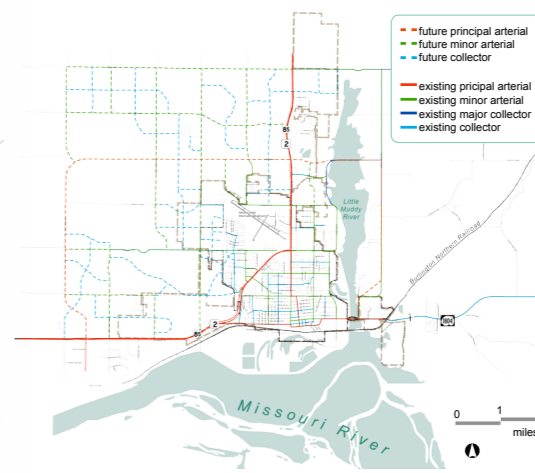
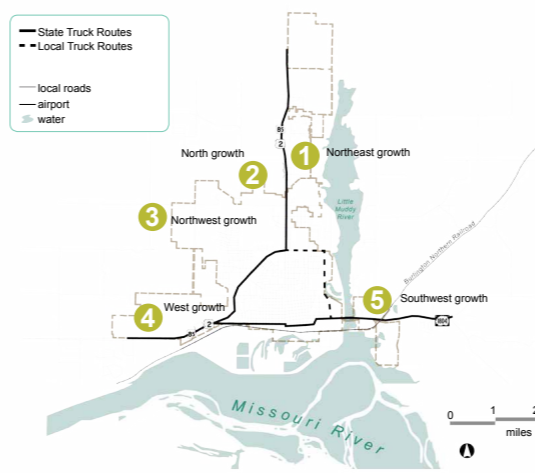
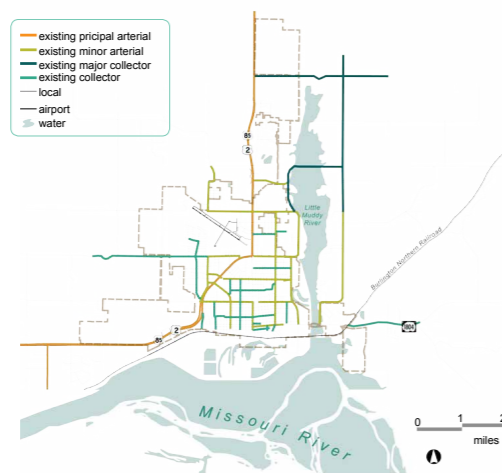
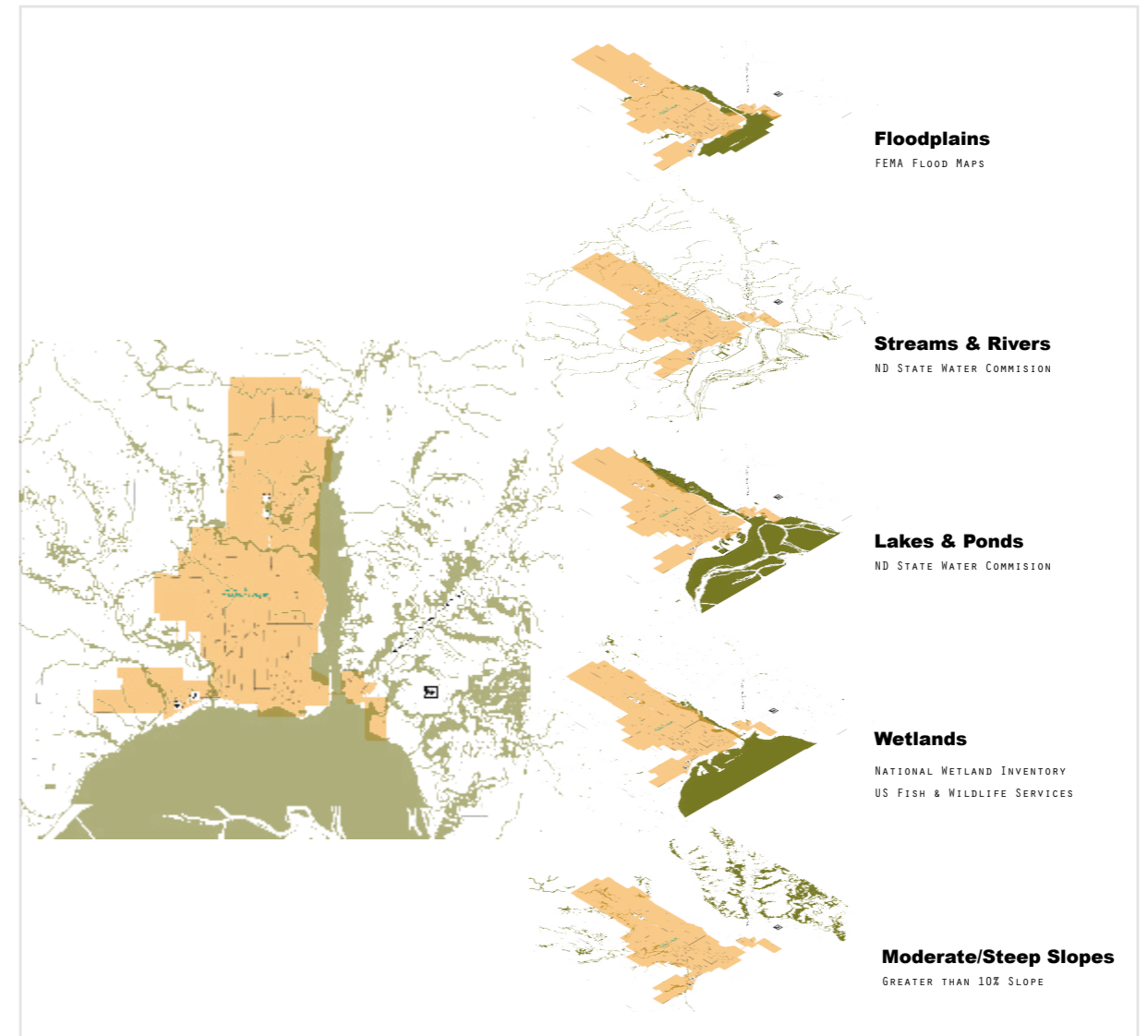
- Prohibit development within the Green Network
- use storm drainage channels for recreational trails
- daylight burried creek under airport and adjacent neighborhoods

### Existing Growth Limitations|

Williston's location presents some obvious barriers to physical growth. The Missouri river is a clear barrier to southerly growth. The Little Muddy River is a physical barrier to the east. The city has overcome this barrier to some degree through the extension of utilities across the river following the Hwy 1804 corridor. However, the steep topography of the land to the east of the river and old coal shafts between the river and county road 9 causing instability in the soil, both make development the east band undesirable. The presence of the landfill along the east side of county road 9 also makes development of residential land use undesirable.

### Circulation Patterns|

HWY 2 runs through the center of town and is the entrance for most visiting traffic. Gateways into the city should be provided.

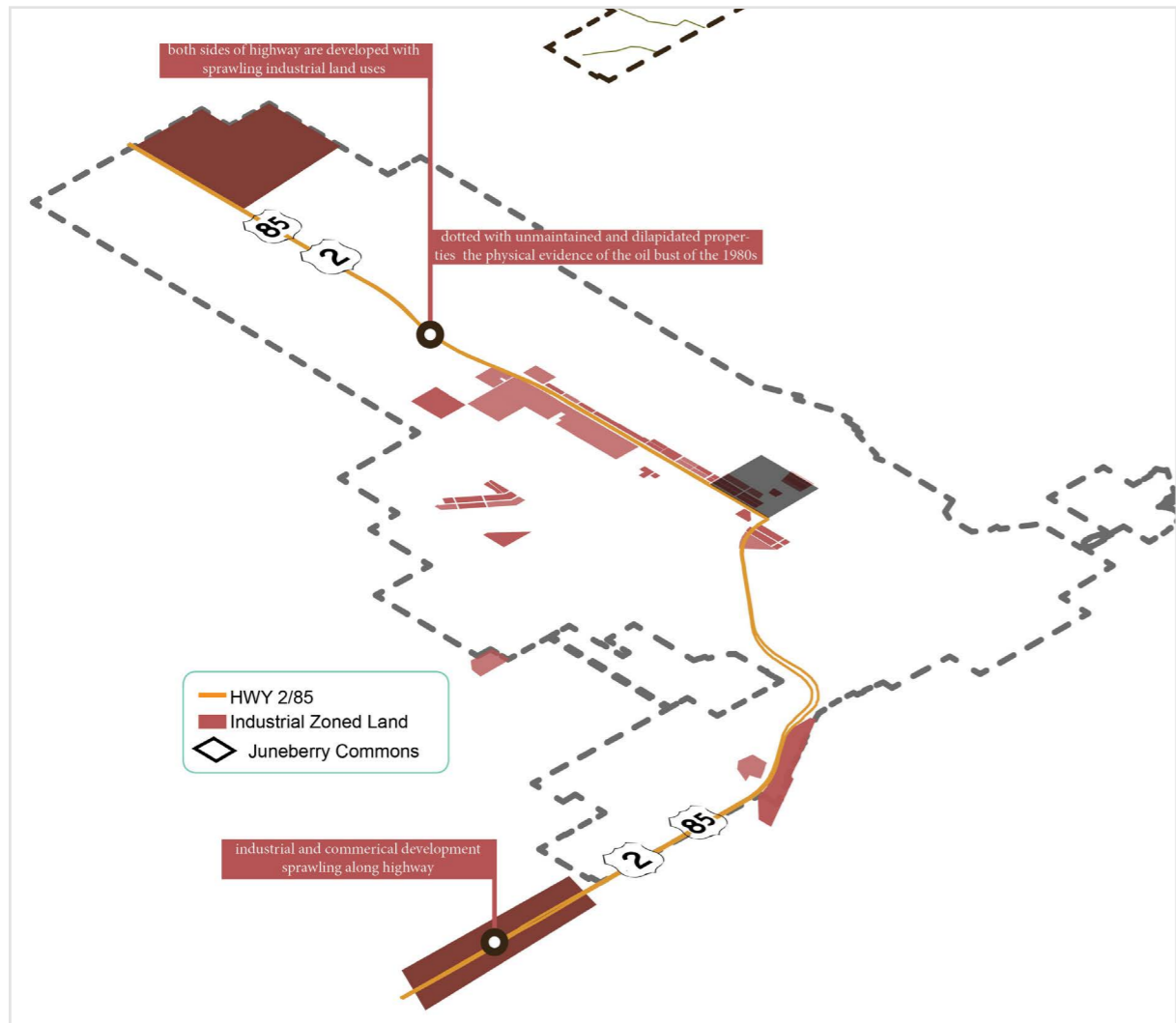


# Site Analysis |

City Scale | Analysis of city growth

## HWY 2 Conversion | redesign highway into boulevard & greenway corridor

In a repeat of history, presently a significant amount of industrial and commercial development has occurred west of the city along the US Hwy 2 Corridor. The sprawling nature of development threatens to produce another deserted expanse when energy development subsides. It is necessary to recognize there is currently a higher than usual demand for industrial land.

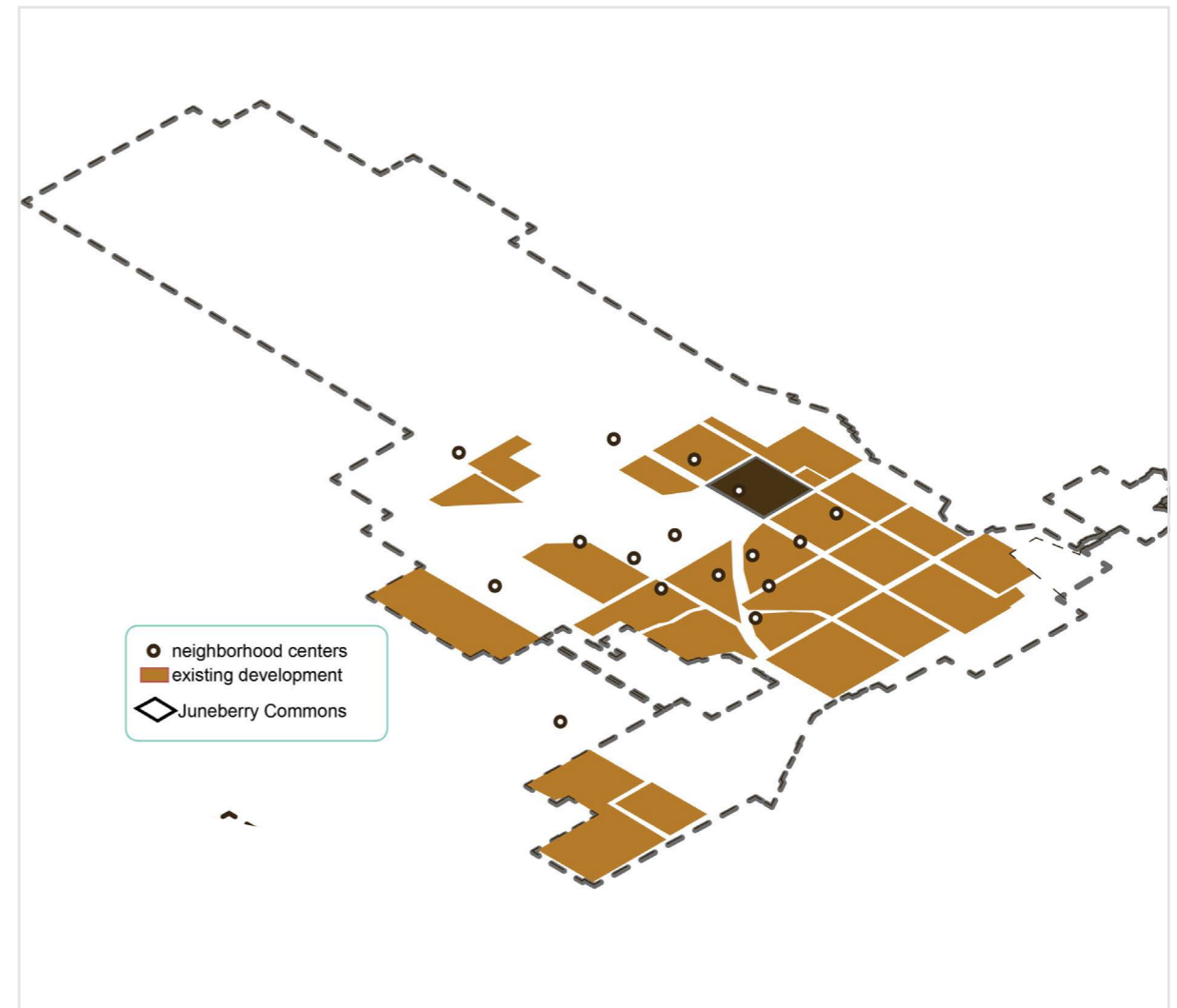


## Existing Neighborhoods |

605 Acres of Undeveloped open space in existing developed lands  
Use infill to create complete neighborhoods

use growth momentum to create Neighborhood Centers That can be connected by public transit

- Corner store, Coffee Shop
- bus shelter & signage for wait
- neighborhood bulletin board
- seating
- Bike Racks
- Clock
- waste receptacles
- neighborhood bulletin board
- neighborhood map
- City owned off-street parking
- drinking fountain





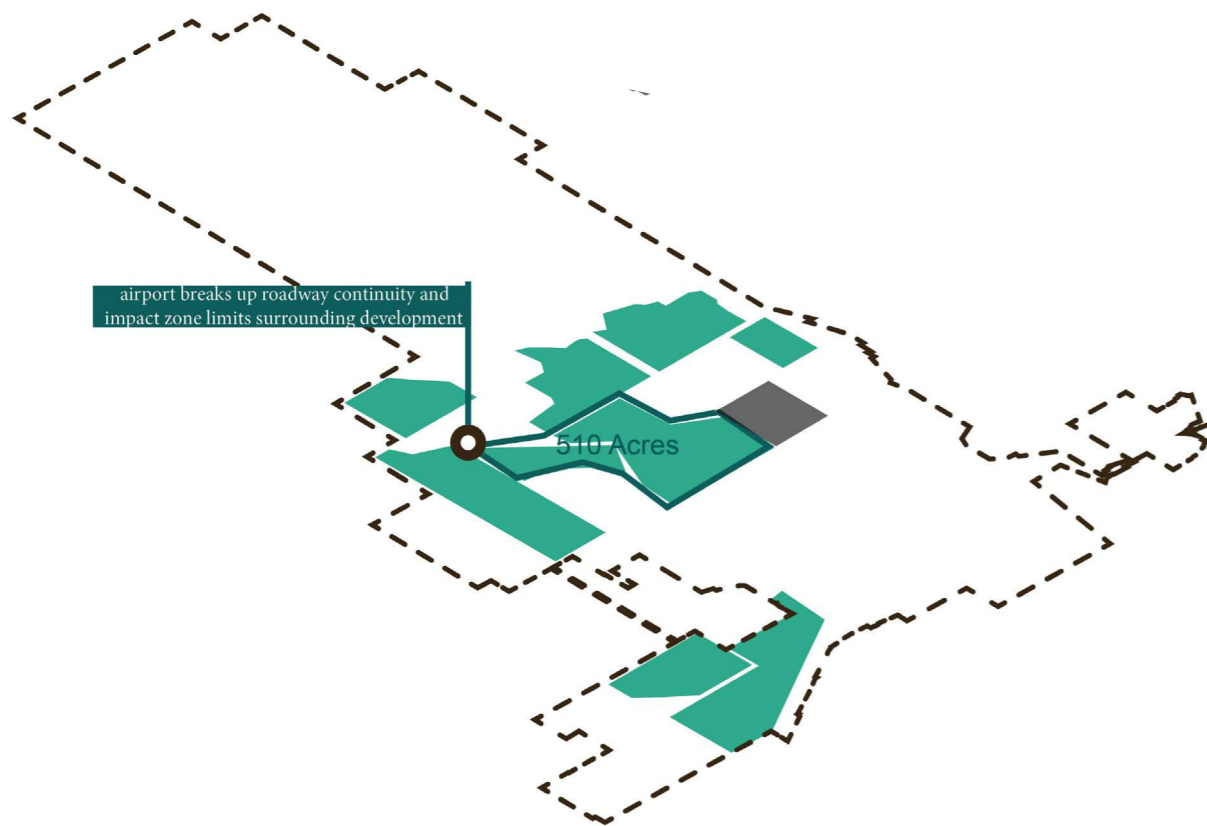
## Build Complete Neighborhoods |

1,977 Acres of undeveloped open space on lands adjacent to current development

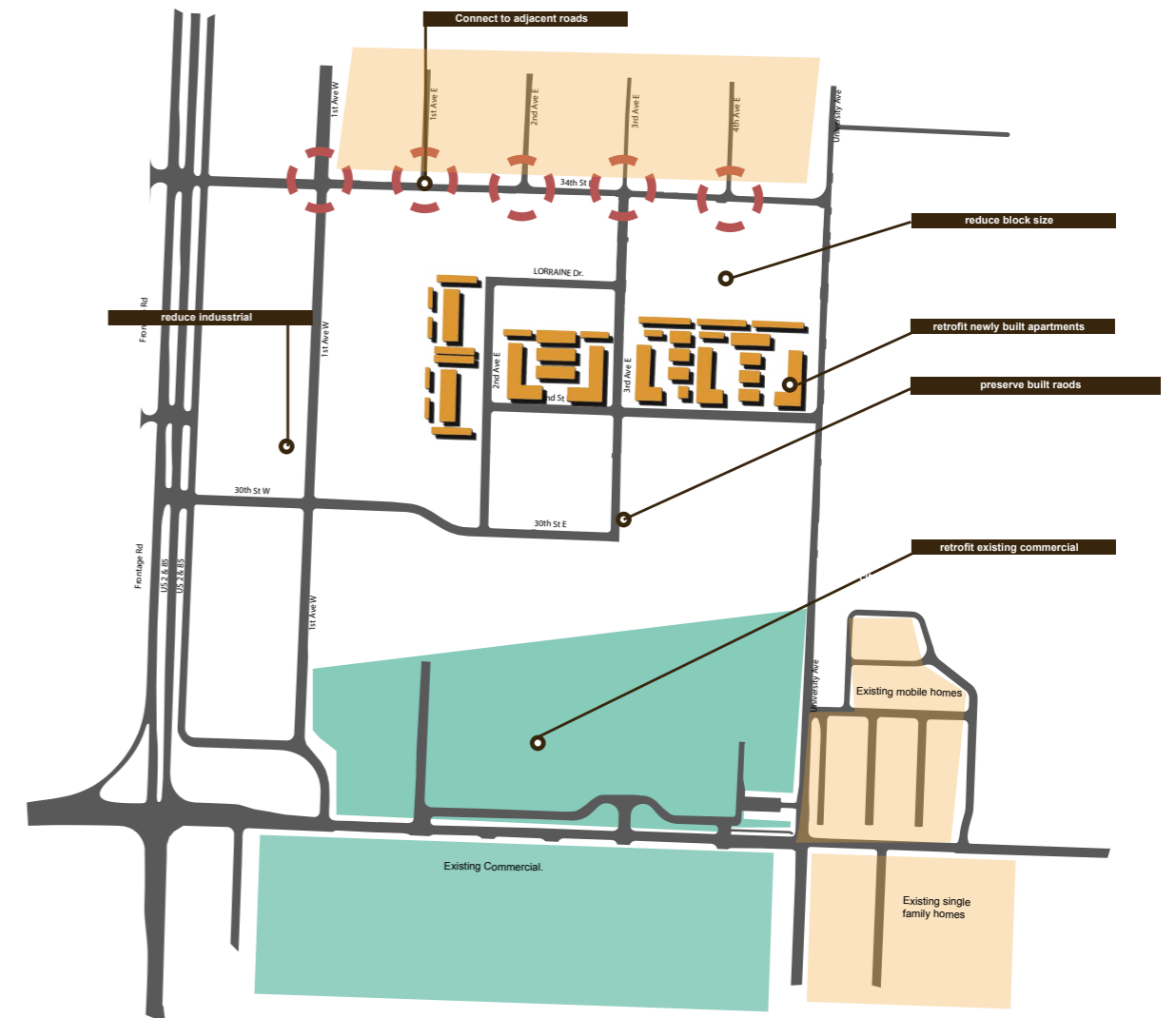
- Connect to adjacent roads and sites •
- use pedestrian shortcuts to create a pedestrian grid and shorten blocks •
- jog streets but allow sidewalks to continue through •

### Program Elements for Complete Neighborhoods

- \* Appropriate amounts of Retail / Commercial / Industrial
- \* Complete Streets
- \* Neighborhood Center (see above)
- \* Neighborhood School / daycare
- \* Multiple open spaces / Parks
- \* Housing Diversity
  - Commercial Lofts
  - Apartment Houses
  - Rowhouses
  - Cottages (elderly, empty nesters)
  - Large Houses
  - Garage Apartments



### Site Analysis | The requirements of the design solution



# Reference List

Angster, S. J. (2010). Fracture analysis of the Bakken Formation, Williston Basin; field studies in the Little Rocky Mountains and Big Snowy Mountains, MT, and Beartooth Mountains, WY, and 3D seismic data, Williston Basin. Retrieved from ProQuest Digital Dissertations.

Bangsund, D.A., & Hodur, N.M. (2012). Modeling Direct and Secondary Employment in the petroleum Sector in North Dakota. Agribusiness and Applied Economics Report No.694. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

Berry, H.E., Krannich, R.S., Greider, T. (1990) A longitudinal analysis of neighboring in rapidly changing rural places. *Journal of Rural Studies*, 6(2), 175-186.

Brown, R., Dorius, S. & Krannich, R. (2005) The boom-bust-recover cycle: dynamic change in community satisfaction and social integration in delta, Utah. *Rural Sociology*, 70(10), 28-49.

Brown, R., Geertsen, H., & Krannich, R. (1989). Community satisfaction and social integration in a boom town: A longitudinal analysis. *Rural Sociology*, 54, 568-586.

Caponetto, M. (2010). Fracking myths [Model]. Retrieved from <http://www.popularmechanics.com/science/energy/coal-oil-gas/top-10-myths-about-natural-gas-drilling-6386593#slide-1>

Cortese, C.F. & Jones, B. (1977) The sociological Analysis of Boomtowns. *Western Sociological Review*, 8, 76-90.

Danelak, A. (2012, Fall) Housing incentive fund helps housing crisis. *Basin Buts*, 88-90. Freudenburg, W.R. (1984) Boomtown's youth: the differential impacts of rapid community growth upon adolescents and adults. *American Sociological Review*, 49, 697-705

Gilmore, J. S., & Duff, M. K. (1975) Boomtown growth management: A case study of rock prings, WY. Boulder, CO: Westview Press.

Goldenberg, S., Shoveller, J., Koehoorn, M., & Ostry, A. (2010) And they call this progress? Consequences for young people of living and working in resource-

Gordon, D. (2012) Understanding unconventional oil [Supplemental material]. The Carnegie Papers. Retrieved from [http://bcs.bedfordstmartins.com/resdoc5e/RES5e\\_ch09\\_s1-0002.html#RES5e\\_ch09\\_p0283extraction](http://bcs.bedfordstmartins.com/resdoc5e/RES5e_ch09_s1-0002.html#RES5e_ch09_p0283extraction) communities. *Critical Public Health*, 20, 157-168.

Halseth, G. (1999) 'We came for the work': situating employment migration in B.C.'s small, resource-based communities. *The Canadian Geographer*, 43, 363-381.

Haslam-McKenzie, F., Brereton, D., Birdsall-Jones, C., Phillips, R. & Rowley, S. (2008) A review of the contextual issues regarding housing market dynamics in resource boom towns. Australian Housing and Urban Research Institute Positioning Paper No. 105, Housing and Urban Research Institute of Western Australia, Perth.

Haslam-McKenzie, F., Phillips, R., Rowley, S., Brereton, D. & Birdsall-Jones, C. (2008) Housing market dynamics in resource boom towns. Australian Housing and Urban Research Institute Positioning Paper No. 135, Housing and Urban Research Institute of Western Australia, Perth.

Headwater Economics. (2012). Benefiting from unconventional oil: state fiscal policy is unprepared for the heightened community impacts of unconventional oil plays. Retrieved from [http://headwaterseconomics.org/wphw/wp-content/uploads/ND\\_Unconventional\\_Oil\\_Communities.pdf](http://headwaterseconomics.org/wphw/wp-content/uploads/ND_Unconventional_Oil_Communities.pdf)

Hostetter, E. (2011). Boomtown Landscapes. *Material Culture*, 43(2), 59-79.

Hunter, L., Krannich, R., & Smith, M. (2002) Rural migration, rapid growth, and fear of crime. *Rural Sociology*, 67(1), 71-89.

Karaim, R. (2012). Welcome to the boomtown. *Architect*, 101(7), 120-136.

Key, J. (1962) Word and picture story of Williston and area. Retrieved from <http://www.rockinthebakken.com/OilInWilliston.aspx?ID=91>

LeFever, J. A. (1991). History of oil production from the Bakken Formation, North Dakota. In

W.B. Hansen (ed.), *Guidebook to geology and horizontal drilling of the Bakken Formation: Montana Geological Society* (pp.3-17) Billings, MT.

Lawrie, M., Tonts, Matthew. & Plummer, P. (2011) Boomtowns, resource dependence, and socio-economic well-being. *Australian Geographer*, 42(2), 139-164.

Little, R.L. (1977) Some Social Consequences of boomtowns. *North Dakota Law Review*, 53, 401-425.

Macke, D., & Gardner, D. (2012). Policy education white paper- western North Dakota energy project. [PDF document] Retrieved from <http://visionwestnd.com/pdf/meetingminutes/sept12/PolicyEducationWhitePaperWNDEP.pdf>

Markussen, A. 1978. Socioeconomic Impact Models for Boomtown Planning and Policy Evaluation Presented at the Western Regional Science Association Meetings February 25, 1978.

Nesheim, T. O. (2012). History of horizontal drilling in the Tyler Formation, North Dakota. *Geo News*, 39(1), 3-6.

Nordeng, S. (2010). A brief history of oil production from the Bakken Formation in the Williston Basin. *Geo News*, 37(1), 5-9.

North Dakota Department of Mineral Resources. (2012) Bakken basics [Presentation slides]. Retrieved from <https://www.dmr.nd.gov/oilgas/presentations/MinotChamberEnergy120512.pdf>

Ryser, L. & Halseth, G. (2011) Housing costs in an oil and gas boom town: issues for low-income senior women living alone. *Journal of Housing For the Elderly*, 25(3), 306-325.

Smith, M. D., Krannich, R. S., & Hunter, L. M. (2001). Growth, Decline, Stability, and Disruption: A Longitudinal Analysis of Social Well-Being in Four.. *Rural Sociology*, 66(3), 425-450.

Stedman, R. C., Parkins, J. R., & Beckley, T. M. (2004). Resource Dependence and Community Well-Being in Rural Canada. *Rural Sociology*, 69(2), 213-234.

THK Associates. (2012) Development and Construction Opportunities and Challenge. Paper presented at the 2012 Bakken Housing Summit, Williston, ND.

Thompson, J. G. (1979) The gillette syndrome: a myth revisited?. *Wyoming* 2(2) 30-5.

Tolbert, C.M. (Ed.). (2006). Sustainable community in oil and gas country: Final report. U.S. Department of the Interior, Minerals Management Service, New Orleans, LA.

Tolbert, C. (2006) Sustainable community in oil and gas country: Final report. New Orleans, LA: US Department of the Interior, Minerals Management Service, Gulf of Mexico OCS

U.S. Geological Survey. (2008). Assessment of undiscovered oil resources in the Devonian-Missippian Bakken formation, Williston Basin Province, Montana and North Dakota, 2008. Retrieved from [http://pubs.usgs.gov/fs/2008/3021/pdf/FS08-3021\\_508.pdf](http://pubs.usgs.gov/fs/2008/3021/pdf/FS08-3021_508.pdf) Study MMS 2006-011.

Warnica, R. (2012). Boom, bust and trouble. *Maclean's*, 125(19), 32.

Wilson, L. J. (2004). Riding the Resource Roller Coaster: Understanding Socioeconomic Differences between Mining Communities. *Rural Sociology*, 69(2), 261-281.

Yates, J., Randolph, W., & Holloway, D. (2006) Are housing affordability problems creating labour shortages?. Melbourne, Australia: Australian Housing and Urban Research Institute.



# Previous Design Studio Experience

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## Fall Semester 2009 | Kathleen Pepple

- The Teahouse | Community Garden
- The Fine Arts Club | Residential Design

## Spring Semester 2010 | Dominic Fischer + Mathew Chambers

- Cold Smoke | Urban Open Space
- Woodlawn Park | Urban Planning

## Summer Semester 2010 | Ron Ramsey

- North Coast College Duluth , MN | Campus Design

## Spring Semester 2011 | Kathleen Pepple

- What is a Neighborhood? | Neighborhood Planning
- Fort Yates Reservation | Equestrian Center
- Woodlawn Park Chicago | Urban community Garden

## Fall Semester 2011 | Jason Kost

- Buildings, Streets, Blocks | Urban Design Workshops
- Form Based Codes | City Planning
- The Denver Project | Urban Planning + Site Design

## Spring Semester 2012 | Tyler Kirchner and Dominic Fischer

- Becker County Landfill | Remediation & Reuse
- Midtown Dam - Fargo, ND | Urban Planning

## Fall Semester 2012 | Merhan Madani

- Fargo Civic Center | Urban Design
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"Greatness is a lot of small things done well, stacked on top of each other." -Ray Lewis