businesses at the lower end of the wage scale have a difficulty finding employees -- e.g., public services, retail, lodging, entertainment, and agriculture. Elderly, teachers and others on a fixed-income may not be able to afford the new cost of living and may be forced to relocate. “Boom Town Bifurcation” (Us vs. Them) (Haves vs. Have Nots)

Economic consequences of economic activity do not benefit everyone equally...

higher cost of living...S

HOSPITAL

SC

HOSPITAL

Medical facilities are insufficient. Mental health providers are usually absent. Schools are not equipped for increased enrollment and children with special needs. Police and fire protection are unable to serve the increased population. Shortages in childcare services and recreational options are overstretched.

Truck and construction traffic damages roadways that were not intended for intensive traffic use. Existing housing fills up rapidly and new housing takes years to manifest. Fear of crime increases. Change in occupational responsibilities, education shortfalls.

Mental Health Issues (Suicide, Breakdown)

Marital breakdown & marital instability

Alcohol and drug abuse

Experience of community satisfaction, alienation, and opinions of growth are far more negative for adolescents than for their adult counterparts.

“Energy development cycle summary”

Research
Businesses at the lower end of the wage scale have difficulty finding employees—e.g., public services, retail, lodging, entertainment, and agriculture.

Elderly, teachers, and others on a fixed-income may not be able to afford the new cost of living and may be forced to relocate.

- Social Consequences:
  - Experience of community satisfaction, alienation, and opinions of growth are far more negative for adolescents than for their adult counterparts.

- Economic Consequences:
  - Economic activity does not benefit everyone equally.

- Social Consequences:
  - "Boom Town Bifurcation" (Us vs. Them) (Haves vs. Have Nots)

- Economic Consequences:
  - Businesses at the lower end of the wage scale have difficulty finding employees—e.g., public services, retail, lodging, entertainment, and agriculture.

- Elderly, teachers, and others on a fixed-income may not be able to afford the new cost of living and may be forced to relocate.

- Social Consequences:
  - Mental Health Issues (Suicide, Breakdown)
  - Marital breakdown & marital instability
  - Alcohol and drug abuse

- Economic Consequences:
  - Businesses at the lower end of the wage scale have difficulty finding employees—e.g., public services, retail, lodging, entertainment, and agriculture.

- Elderly, teachers, and others on a fixed-income may not be able to afford the new cost of living and may be forced to relocate.
enerGy development cycles

Accelerated Growth

"Boom"

Shortages

- Fear of crime increases
- Mental health issues (Suicide, Breakdown)
- Alcohol and drug abuse
- Mental breakdown & mental instability
- Education shortfalls
- Change in occupational responsibilities

Social Consequences

"Experience of community satisfaction, alienation, and opinions of growth are far more negative for adolescents than for their adult counterparts."

Economic Consequences

- Economic activity does not benefit everyone equally.
- Businesses at the lower end of the wage scale may have difficulty filling employment gaps, e.g., public services, retail, lodging, entertainment, and agriculture
- "Boom Town Bifurcation" (Us vs. Them)
- "Have vs. Have Not"

Research Summary

1. Planning Phase
   - Temporary workforce
   - Promise of new jobs and higher wages

2. Exploration Phase
   - Temporary workforce is replaced
   - Land remediation

3. Production Phase
   - Permanent workforce
   - Increased infrastructure
   - Recreational options

4. Reclamation Phase
   - Existing housing fills up rapidly
   - New housing takes years to manifest

Elderly, teachers and others on a fixed income may not be able to afford the new cost of living and may be forced to relocate.

Hospitals and schools not responsive to increased enrollment and mental health needs.

Healthcare facilities are insufficient.

Mental health providers usually absent.

Schools not equipped for increased enrollment.

Police and fire protection unable to serve increased population.

Shortages in childcare services.

Traffic damage roadways that were not intended for intensive traffic use.

“Boom Town Bifurcation\u201d (Us vs. Them)

(Have vs. Have Not)
Businesses at the lower end of the wage scale have a difficulty finding employees -- e.g., public services, retail, lodging, entertainment, and agriculture. Elderly, teachers, and others on a fixed-income may not be able to afford the new cost of living and may be forced to relocate. "Boom Town Bifurcation" (Us vs. Them) (Haves vs. Have Nots) has economic consequences where economic activity does not benefit everyone equally...

Higher cost of living, hospital, school, medical facilities are insufficient, mental health providers usually absent, schools not equipped for increased enrollment & children with special needs. Police and fire protection unable to serve increased population, shortages in childcare services. Recreation options overstretched.

Truck & Construction traffic damage roadways that were not intended for intensive traffic use. Existing housing fills up rapidly and new housing takes years to manifest. Shortages fear of crime increases, change in occupational responsibilities, education shortfalls, mental health issues (Suicide, Breakdown) marital breakdown & marital instability, alcohol and drug abuse.

Williston, ND sits 16,000 feet above the deepest part of the Williston Basin.

- Petroleum resources considered “Unconventional Oil”
- Bakken formation reaches a max thickness of 160 feet and is approximately 2 miles below the surface.
- 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.
The Bakken formation first produced oil in 1951 near Tioga, ND. Due to the limits of the technology in the 1950’s it was difficult to drill into the formation and it was not possible to mass produced oil from the formation.

Although the discovery of oil led to a large boom within the region, many of the first wells soon failed. The first boom subsided in the 1960s as market fluctuations made production unprofitable. Williston suffered from decline and withered down to nearly nothing.
In the late 1970s spikes in energy prices led to the implementation of hundreds of new energy projects. The “boom” of that period ended in the early 1980s, leaving the community with vacant apartments, unoccupied mobile home parks, empty businesses, and huge public debt from the infrastructure investments that had been made to accommodate growth.
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/Three Forks formation.

**USGS estimated recoverable oil from Bakken**

- 1995: 150 Million
- 2008: 3 - 4.3 Billion
Mineral rights leasing

- community is excited about the promise of new jobs and higher wages -
1 rig = 120 temporary drilling jobs

185 rigs = 21,000 temporary drilling jobs
+ another 12,000 temporary jobs building infrastructure
Rig related Truckloads per Well = 2024

- 400 Water (Fresh)
- 80 Sand
- 100 Frac Trucks
- 200 Water (Waste)
- 80 Scoria/Gravel
- 50 Drilling Mud
- 15 Cement
- 15 Frac/Cement Pumper Trucks
- 7 Fuel Trucks
- 4 Chemical
- 1 Workover Rigs

Research summary
Bakken Well Production Curve

First year oil production:
- 55% decline from previous year
- 30% decline from previous year
- 15% decline from previous year
- 10% decline from previous year

Energy development Production Phase:
- Temporary workforce is replaced by permanent workforce.
in-migration = Boom Period

exploration phase

production phase

reclamation phase

promises of new jobs and higher wages

planning phase

temporary workforce

permanent workforce

land remediation

temporary workforce

permanent population

energy development cycles
How can communities prone to the energy development cycle grow during boom periods to prepare for either future growth or decline and lessen disruption during periods of fluctuation?
Concept | Urbanism should respond to the economic climates of energy development the same way landscapes endure the extreme weather climates of the region
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

1. Planning phase
   - Drought hardy species adapt to reduce "transpiration area" and increase "absorption area" during times of water prosperity.

2. Exploration phase
   - Time of water prosperity, plant grows foliage.

3. Production phase
   - Adapts growth to reduce "transpiration area" and increase "absorption area".

4. Reclamation phase
   - Twin homes
   - Single family homes
Fargo williston north dakota

introduction

project

Williston in comparison
## WILLIAMS COUNTY ECONOMIC BASE

**Table III-8: Summary of Williams County Total Population, 2012**

<table>
<thead>
<tr>
<th>Population Source</th>
<th>Total # of People</th>
<th>% of Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Population in Households</td>
<td>30,087</td>
<td>66.2%</td>
</tr>
<tr>
<td>Permitted Man Camp Residents</td>
<td>6,600</td>
<td>14.5%</td>
</tr>
<tr>
<td>Unpermitted Man Camp Residents</td>
<td>3,995</td>
<td>8.8%</td>
</tr>
<tr>
<td>Hotels/Motels*</td>
<td>1,663</td>
<td>3.7%</td>
</tr>
<tr>
<td>RV Parks**</td>
<td>1,089</td>
<td>2.4%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1,995</td>
<td>4.4%</td>
</tr>
<tr>
<td><strong>Total 2012 Williams County Population</strong></td>
<td><strong>45,429</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

## RESIDENTIAL MARKET ANALYSIS

**Table IV-12: Summary of Rent Trends in Williston, 2000-2010**

<table>
<thead>
<tr>
<th>Weighted Average Per Unit</th>
<th>2000 Summary</th>
<th>2006-2010 Average</th>
<th>2012</th>
<th>Percentage Increase From 2000 to 2010</th>
<th>Percentage Increase From 2010 to 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Bedrooms</td>
<td>$207</td>
<td>$378</td>
<td>N/A</td>
<td>82.8%</td>
<td>N/A</td>
</tr>
<tr>
<td>1 Bedroom</td>
<td>$289</td>
<td>$418</td>
<td>$1,566</td>
<td>44.5%</td>
<td>274.5%</td>
</tr>
<tr>
<td>2 Bedrooms</td>
<td>$353</td>
<td>$584</td>
<td>$2,078</td>
<td>65.4%</td>
<td>255.7%</td>
</tr>
<tr>
<td>3 or More Bedrooms</td>
<td>$454</td>
<td>$665</td>
<td>$2,572</td>
<td>46.5%</td>
<td>286.4%</td>
</tr>
<tr>
<td>Average</td>
<td>$326</td>
<td>$511</td>
<td>$2,072</td>
<td>57.0%</td>
<td>305.1%</td>
</tr>
</tbody>
</table>
Williston’s Growth Potential

Based on estimates prepared for Williston’s updated comprehensive plan, Williston has the potential to grow by at least 2,700 acres by the year 2020 and 5,300 acres by the year 2050. This growth is based on continued growth in the energy industry, which will stimulate population and household growth, and encourage the spin-off of other industries. Figure 3 shows the anticipated growth areas by 2020 and 2035. This level of city growth is contingent upon the city having the physical area into which new city development can be placed. In the spring of 2010, the city had approximately 360 acres inside its corporate limits that remained unplatted and undeveloped. Some of that land is currently in the process of being zoned and subdivided, making it ready for development. Approximately 80 acres of this land southeast of the airport is affected by the airport zoning of Sloin Field International Airport, which places certain limitations on the types of land uses that can or should be placed there. Some of these limitations are in the form of prohibited uses, and others are recommended guidelines.

Implications of Annexing or Not Annexing

As a community considers its decisions with respect to annexation, it is important to understand the consequences of physical expansion as well as the consequences of not expanding.

Tax Base

As a population base grows within a certain region, government facilities, health care organizations, religious and educational institutions grow to serve the growing population. Most of these facilities choose to locate within the corporate limits of the city that already serves as the regional hub for other government, economic and social activity. As a result, these cities typically experience an expansion in tax exempt development. This generalization applies as well to Williston, since the community serves as the economic and social hub of the region as well as the location of local, county and state government facilities, churches, schools, and numerous religious institutions. These facilities serve the community and generally improve convenience and quality of life.

As Williston grows in population, the city also has the opportunity to strengthen their tax base through new or expanded retail sales and service businesses, industries, and financial institutions. These new developments help to build the city’s tax base, providing city and county government with the funds to carry out basic municipal services, such as police and fire service, street maintenance, and other city functions. They also help to supplement the tax base generated by residential growth, which generates less tax revenue per acre than most commercial and industrial development.

Annexation Study

Williston, North Dakota

March, 2011
Prepared by SRF Consulting Group, Inc.
North Dakota Petroleum Sector Employment

 tempListStart

NORTH DAKOTA PETROLEUM SECTOR EMPLOYMENT

introduction


Dean A. Bangsund               Nancy M. Hodur
North Dakota State University                     Fargo, North Dakota 58108

NDSU is an EO/AA University
total employment Williston region 2000-2036
Draft BLM Hydraulic Fracturing rule could double federal drilling permit approval time or worse. Final rule likely in June 2013.

Draft EPA guidance on diesel fuel in hydraulic fracturing could triple drilling permit approval time or worse. Final rule planned spring 2013.

The future looks promising for sustained Bakken/Three Forks development.

World and U.S. economies continue to struggle. If China joins the downward spiral oil price could fall enough to make most areas uneconomic.

Current administration budget contains tax changes that could reduce drilling capital 35-50%.

slide from Oil & Gas Division presentation 1/2013
Green Network | Protect & Utilize rivers, floodplains, wetlands, & streams

- Prohibit development within the Green Network
- Use storm drainage channels for recreational trails
- Daylight buried creek under airport and adjacent neighborhoods
Existing Neighborhoods

605 Acres of Undeveloped open space in existing developable 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
- neighborhood bulletin board
- Bike Racks
- waste receptacles
- neighborhood map
- drinking fountain

- bus shelter & signage for wait
- seating
- Clock
- neighborhood bulletin board
- City owned off-street parking
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
* Housing Diversity
  - Commercial Lofts
  - Apartment Houses
  - Rowhouses
  - Cottages (elderly, empty nesters)
  - Large Houses
  - Garage Apartments

INTENDED GROWTH ZONES
HWY 2/85 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.

- convert highway to boulevard with traffic control at intersections to improved pedestrian crossing
- properties bordering highway will become a greenway that will better connect neighborhoods
Growth Boundary | prohibit leapfrog development, only allow contiguous growth

The city of Williston has grown by 12.84 square miles, almost tripling the size of the city limits. Without precaution sprawling city form will result. The city should focus efforts on infill of current developed areas and then allow contiguous growth towards the boundary of the city limits.

Avoiding leapfrog development by concentrating new growth in locations contiguous to existing development will reduce the cost of and services for residents of the city.
299 dwelling units
59 parcels of industrial
8 parcels of commercial

HWY 2 Corridor
Industrial
Commercial
Existing Housing
EXISTING STREET NETWORK
NOTE: edge of sidewalk at property line. Varying right-of-way widths cause boulevard widths to vary.

- **Property line**
- **5' walk**
- **5' rain garden**
- **Boulevard widths vary**

**EXISTING**

- 36’ back-of-curb to back-of-curb

- 9’ parking/bulb out
- 9’ drive lane
- 9’ drive lane
- 9’ parking/bulb out

- 5’ rain garden
- 5’ walk

**Rocky soil**
- Holds water and seeps into subgrade

**Reflective road studs**
- Distinguish parking lane and help enclose driving land

**Water loving trees**

**5’ rain garden**
- Water loving trees

**6” concrete panel**
- Extend 3’ deep and fill with rocky soil

**Water loving trees**

**Commons**

**Buffalo berry**
NOTE: edge of sidewalk at property line. Varying right-of-way widths cause boulevard widths to vary.

EXISTING 36' back-of-curb to back-of-curb

5' walk

Boulevard widths vary

7' parking/bulb out 5.5' bike lane 9' drive lane 9' drive lane 5.5' bike lane

5' walk

EXISTING STREET ADAPTATION OPTIONS
PROPOSED STREET NETWORK
proposed street network

commons

buffalo berry

proposed Vehicular Alleys

(Concrete Cellular Turfgrass)

12' SWALE

absorbs and filters rainwater from street

8' SWALE

sloped to one side to direct rainwater into filtering

Erosion Control Membrane

City Storm Drain

Larger Storm Events seep into city storm drains

property line

rocky soil

holds water until it seeps into

60' RIGHT OF WAY

30' STREET

holds water until it seeps into

rocks soil

50' RIGHT OF WAY

12' SWALE

holds water until it seeps into

rocks soil

50' RIGHT OF WAY
proposed Vehicular Alleys

(Concrete Cellular Turfgrass)

Concrete edging

1" concrete edging

Seed or plug planting

Infill with topsoil

Concrete cellular turfgrass

Sand Setting Bed

Aggregate Base

12' concrete cellular turfgrass
• convert highway to boulevard with traffic control at intersections to improved pedestrian crossing
• properties bordering highway will become a greenway that will better connect neighborhoods
12' Pervious Multi-Modal Trail

- 4 INCHES OF AGGREGATE BASE
- PLASTIC CELLULAR GRID
- FILL GRID WITH 3/16" GRAVEL FILL FOR ADA ACCESSIBILITY
- PREPARED SUBGRADE

PROPOSED PEDESTRIAN NETWORK
PROPOSED PEDESTRIAN NETWORK
Time of water prosperity
Plant grows foliage

Adapts growth to reduce "transpiration area" and increase "absorption area"
18 Units
10 Units
<table>
<thead>
<tr>
<th>Multi-Family</th>
<th>Single Family</th>
<th>duplex</th>
<th>Single Family</th>
<th>duplex</th>
</tr>
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<tbody>
<tr>
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<td><img src="image5.png" alt="duplex" /></td>
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18 Units

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</table>

10 Units

---

**Adaptable Housing**
Rowhousing to reflect the height of adjacent apartments

Rowhousing is highly adaptable to different uses and density. It will help the neighborhood remain resilient to new economic conditions.
Garage Apartments| to screen apartment complex parking

By infilling the street with apartment garages the street becomes enclosed while providing parking that was removed.
Adaptable Housing | to allow neighborhood to range from 490 units to units 734 units

Adaptable housing that fits in with adjacent housing types will help the neighborhood remain resilient to new economic conditions.
Small Apartments | 6-10 units to fit comfortably with single family homes

These should be located along streets fronts and not within a parking lot. The parking should be access by a drive or through an alley.
retrofit buildings to create new facades and entrances

locate windows and permeable facades towards walking alleys to create sense of safety

pedestrian Alley to connect to parking located on the former entrance side of the retrofitted buildings

see detail C4 for permeable material
160 acres site

Vehicular Roads

Greenbelt 46 acres
31% of developable land

Residential 67 acres
46% of developable land

Industrial 42 acres
29% of developable land

Commercial 35 acres
25% of developable land

491 dwelling units that are able to adapt to 734 dwelling units
Thank You | Questions?
* temporary
* rapid solution
* reduces population influx within city (lower social disruption)
* no long-term benefit to

* temporary
* reduces population influx within city (lower social disruption)
* no long-term benefit to

* services & infrastructure will benefit community after boom period
* community has larger tax base to fund expenditures