
Using Data to Drive Design + Decision Making
Oil and Gas + Railway Study and Municipal Development Plan Presentation
Prepared for: WASP
March 15, 2022

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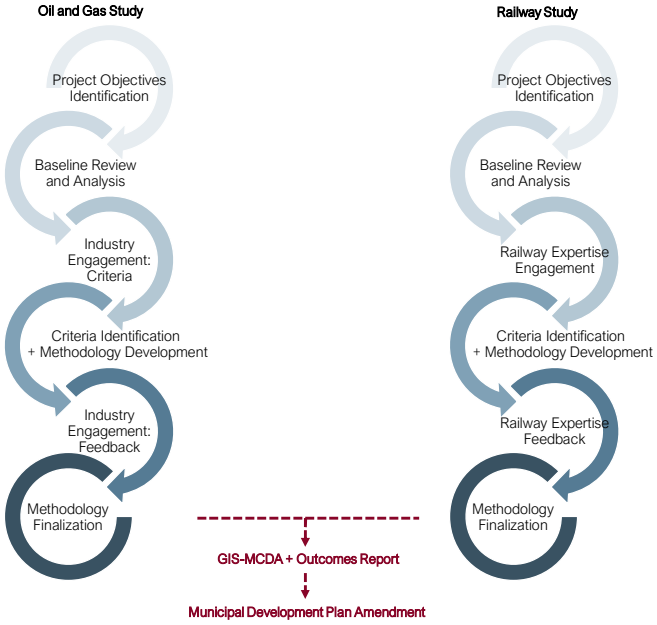
Project Process



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Oil and Gas Study + Railway Study Objectives

- To understand the oil and gas development opportunities within the County and future areas of possible exploration to assist in identifying potential infrastructure and servicing upgrades.
- To identify the infrastructure needs of the industry to enable the County to appropriately plan and budget for its implementation.
- To identify preferred locations for the development of railway spur lines and railway sidings that can support industry export and import of goods.
- To understand areas where future industry will expand to, or intensify, such as refinery processing facilities, laydown yards, trucking facilities, etc.
- To work with the industry to identify opportunities for joint pipeline rights-of-way or policy to guide the development of joint rights-of-ways to avoid sporadic location of the oil and gas infrastructure.
- To identify cost effective mitigation measures, that may be supported or championed by the County, to reduce the impact that industry development and/or expansion may have on area residents, recreational users, and other industries.

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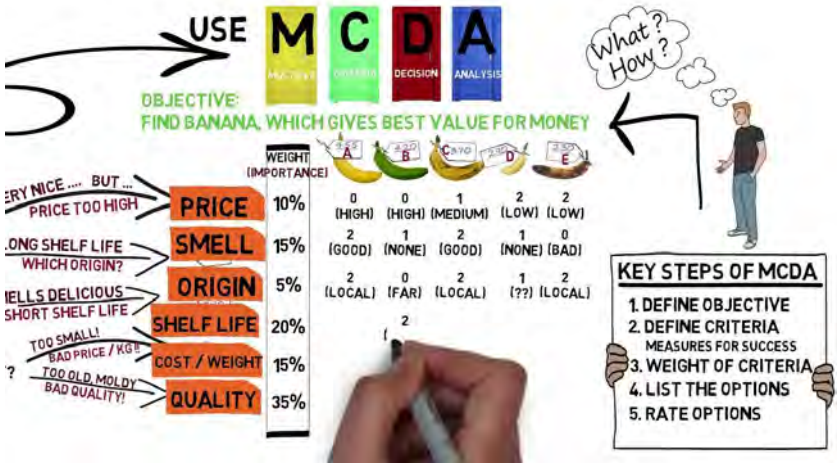
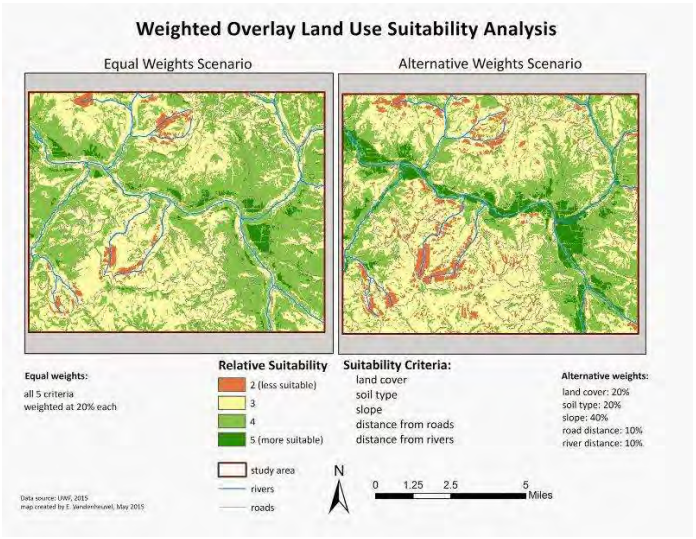
Traditional Multi-Criteria Decision Analysis (MCDA)



Source: https://www.youtube.com/watch?v=7OoKJHvsUbo

GIS-BASED MCDA



Source: https://storymaps.arcgis.com/stories/b60b7399f6944bca86d1be6616c178cf

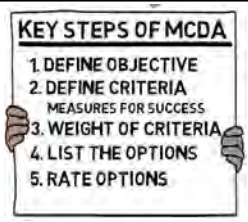
PROS:

- Transparency in criteria used
- Easy to receive input and feedback from stakeholders
- Can include any spatial data
- Methodology can be tracked in ArcMAP and reproduced
- Data Drives Design Decisions

CONS:

- Does not take into consideration non-spatial elements, such as aesthetics associated with a land use
- Can only be used to determine the development suitability/likelihood of one specific use
- Possibility of biased criteria

GIS-BASED MCDA



Step 1: Determine the Question

» What lands within the County are likely to see future oil and gas related development or railway siding/spur development?

Step 2: Determine Constraint Criteria

» Constraint criteria are lands where development cannot occur based off existing condition constraints (ex. environmentally significant lands) or deemed unsuitable for development by decision makers (ex. lands directly adjoining existing residential uses). Lands within the study boundary at this stage are binary – they are either considered suitable for development, or unsuitable.

Step 3: Determine Proximity Criteria

» Proximity criteria are the factors that enhances or detracts from the suitability of land based on a specific use (ex. lands next to existing waterline infrastructure are more suitable development or may act as a driver for development when compared to lands that are 1km away).

» It always as a spatial distance associated with it and we refer to this distance as “buffers”.

Step 4: Determine Proximity Criteria Buffer Values

» Multiple buffers are applied to each proximity criteria. The buffer distances are unique to the criterion and as the buffer values increase (i.e. get further away from the criterion) their suitability rating decrease. This is process is completed for all criteria.

Step 5: Determine Proximity Criteria Weights

» Each proximity criteria is weighted according to its importance/ percent of influence. These values are relative to one-another and the sum of the weights must equal 100%.

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Step 1: Determine the Question

1. What lands within the County are likely to see future oil and gas related activity?

2. Where in the County would railway siding and/or spur development be suitable?

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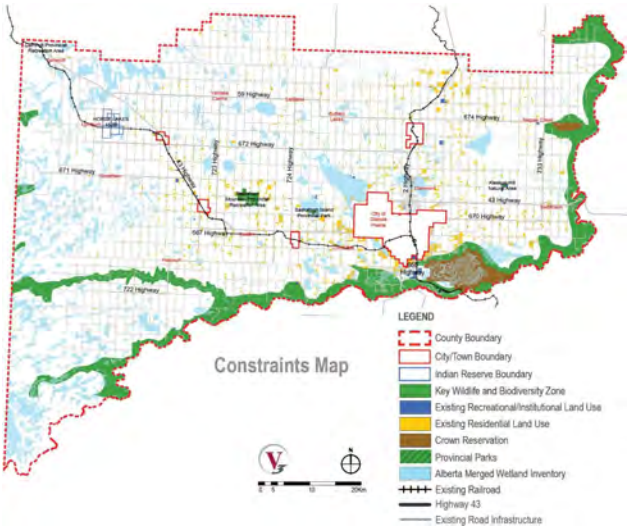
Step 2: Determine Constraint Criteria – Oil and Gas Study

CRITERIA	REASONING/DISCUSSION
Waterbodies (Rivers, Lakes, Streams, Ponds, etc.)	Oil and gas industry, apart from pipelines crossing waterbodies, cannot be located within waterbodies.
Crown Reservation	Oil and gas industry cannot be located within Crown Reservation lands.
Key Wildlife and Biodiversity Zone	This constraint is overlayed with a "hatch", as oil and gas activity may occur in these areas, however it is still a consideration for AER.
Provincial Parks	Oil and gas industry cannot locate within Provincial Parks.
Urbans (Cities/Towns/Villages)	Assuming that oil and gas industry will not occur in existing urban communities.
Existing Residential Dwelling	Oil and gas industry cannot locate within (at a minimum) of 100 m from existing residential dwellings. Also indicated in the industry engagement, companies seek to reduce impact on local residents. To evaluate this, we recommend using the lands districted as residential within the Land Use Bylaw.
Transportation Network and Railway Line	Oil and gas industry cannot be located on top of existing transportation infrastructure.



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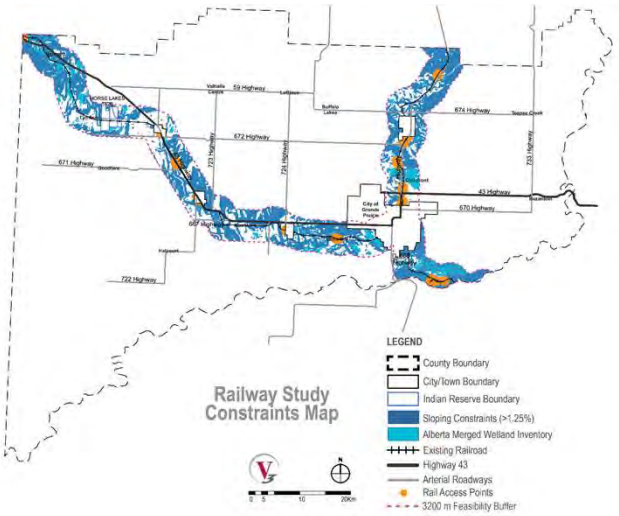
Step 2: Determine Constraint Criteria – Railway Study

CRITERIA	REASONING/DISCUSSION
Waterbodies (Rivers, Lakes, Streams, Ponds, etc.)	Railway siding/spur expansion across waterbodies is cost prohibitive and therefore unlikely.
Existing Residential Dwellings	Using the existing districting from the Land Use Bylaw, lands adjacent to residential development are likely unsuitable for railway spur/siding expansion due to the associated impacts (noise, vibration, etc.).
% Grade	The greater the variation is in the terrain, the less cost efficient the construction of railway spurs and sidings are. As a result, any lands that had a slope greater than 1.25% over 800 m was considered inappropriate to develop railway sidings/spurs on.
Existing Rail Access Points	While existing rail access points is considered a proximity criterion, as discussed below, there are setback distances required from access point to access point on the main rail line. This constraint criterion is recommended to be visualized along the railway line after the MCDA is prepared using the other constraint and proximity criteria.
Proximity to Existing Rail	Railway expansion, regardless if it is the primary network, or if it is for spur lines or sidings, requires a significant capital investment. Locating near existing rail is critical as it makes the expansion more feasible; developments that are further away become increasingly cost prohibitive. Therefore, any lands beyond 3,200m either side of a rail line has been excluded because it would be considered financially challenging. The most likely is viewed to happen within 1,600m of the railway line and opportunity exists for it to extent out to 3,200m for industries that have a higher revenue return like the oil and gas sector.



Step 3: Determine Proximity Criteria

OIL AND GAS CRITERIA
Transportation Network
- Major Highway
- Secondary Highway (arterial)
- Collector Roads
- Paved Local Roadway
- Unpaved Local Roadway
Existing Oil and Gas Industry
- Producer (Wells, etc.)
- Midstream (Batteries, etc.)
- Upstream (Refineries, etc.)
- Pipelines
Railway Access Points*
Electricity Infrastructure
Water Infrastructure
Wastewater Infrastructure
Gas Line Infrastructure

RAILWAY STUDY CRITERIA
Existing Rail
- Proximity to Existing Rail
- Proximity to Existing Rail Access Points
Land Uses
- Land Use Districts – Existing (RM, RM-1, RM-2, RM-3, RM-DC, RM-4, EX, AG)
- Industrial Lands – Future (MDP and Growth and Economic Development Strategy)
- Oil and Gas Study Outcomes*
Transportation
- Primary Highway
- Secondary Highway (arterial)
- Collector Roads
% Grade
- Sloping over 800 m

Step 4: Determine Proximity Criteria Buffer Values

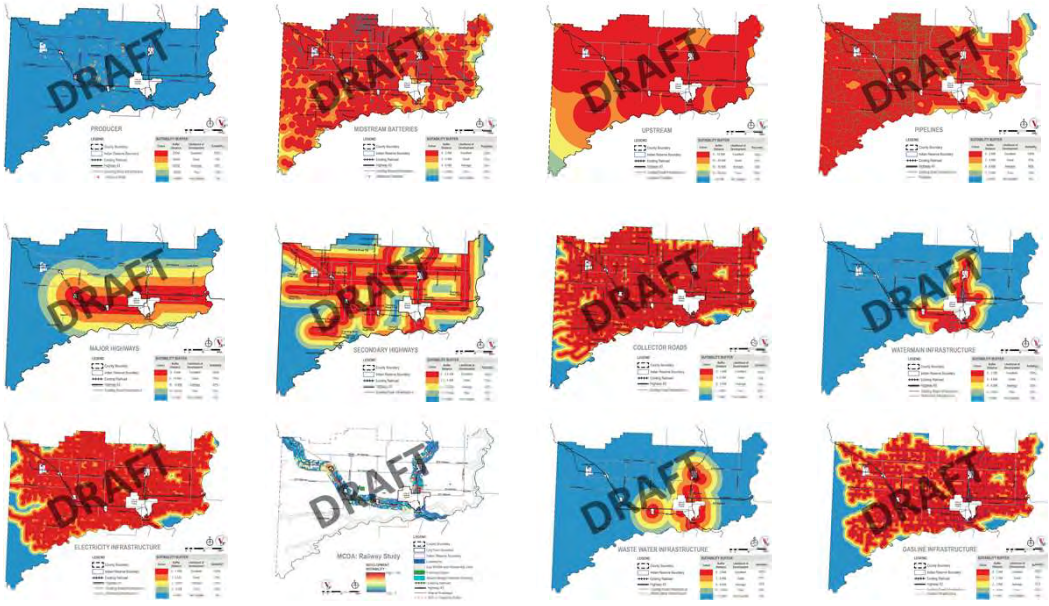
Oil and Gas Study

CRITERIA	SUITABILITY BUFFER VALUES				
Likelihood of Development	Excellent (4)	Good (3)	Average (2)	Poor (1)	Not Suitable (0)
% Suitability	100%	75%	50%	25%	0%
Transportation					
Major Highway	0 to 5KM	5 to 10KM	10 to 15KM	15 to 20KM	> 20KM
Secondary Highway (arterial)	0 to 2.5KM	2.5 to 5KM	5 to 7.5KM	7.5 to 10KM	>10KM
Collector Roads	0 to 1KM	1 to 2KM	2 to 3KM	3 to 4KM	>4KM
Existing Oil and Gas Industry					
Producer (new wells 2017-2021)	200M	400M	600M	800M	1000M
Midstream (Batteries, etc.)	0 to 2KM	2 to 4KM	4 to 6KM	6 to 8KM	>8 KM
Upstream (Refineries, etc.)	0 to 10KM	10 to 20KM	20 to 30KM	30 to 40KM	>40KM
Pipelines	0 to 2KM	2 to 4KM	4 to 6KM	6 to 8KM	>8KM
Water Infrastructure	0 to 2km	2 to 4KM	4 to 6KM	6 to 8KM	>8KM
Electricity Infrastructure	0 to 1KM	1 to 2KM	2 to 3KM	3 to 4KM	>4KM
Railway MCDA Outcomes*	75 – 100%	50 – 75%	50 – 25%	< 25%	< 25%
Waste Water Infrastructure	0 to 3KM	3 to 6KM	6 to 9KM	9 to 12KM	>12KM
Gas Line Infrastructure	0 to 1KM	1 to 2KM	2 to 3KM	3 to 4KM	>4KM

Railway Study

CRITIERA	SUITABILITY VALUES		
Likelihood of Development	Good (2)	Poor (1)	Not Feasible (0)
% Suitability	100 %	50 %	0 %
EXISTING RAIL			
Proximity to Existing Rail	0 - 1600 m	1600 - 3200 m	> 3200 m
Proximity to Existing Rail Access Points	0 - 1600 m	1600 - 3200 m	> 3200 m
LAND USES			
*Oil and Gas Study Outcomes**	0 - 800 m	800 - 1600 m	1600- 2400 m
Land Use Districts – Existing (RM, RM-1, RM-2, RM-3, RM-DC, RM-4, EX, AG)	Districted as: RM, RM-1, RM2, RM-3, RM-DC, RM-4, EX, AG = 100% Suitable All other land use district = 0% Suitable		
Industrial Lands – Future (MDP + Growth and Economic Development Strategy)	Designated for future Industrial Uses = 100% Suitable All other designations = 0% Suitable		
TRANSPORTATION			
Primary Highway	0 - 800 m	800 - 1600 m	1600 - 2400 m
Secondary Highway (arterial)	0 - 800 m	800 - 1600 m	1600 - 2400 m
Collector Roads	0 – 400 m	400 – 800 m	800 – 1200 m
% GRADE			
Minimal Sloping (over 800m)	0 – 0.75%	0.75 –1.25%	>1.25%

Step 4: Mapping Outcomes



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Step 5: Determine Proximity Criteria Weights

Oil and Gas Study

CRITERIA	WEIGHTING (%)
Likelihood of Development % Suitability	*Equals to 100 %*
EXISTING OIL AND GAS INDUSTRY	
Producer (New wells 2017-2021)	25%
Midstream (Batteries, etc.)	5%
Upstream (Refineries, etc.)	5%
Pipelines	5%
TRANSPORTATION	
Major Highway	20%
Secondary Highway (arterial)	
Collector Roads	
WATER INFRASTRUCTURE	10%
ELECTRICITY INFRASTRUCTURE	10%
RAILWAY STUDY OUTCOMES	10%
WASTEWATER INFRASTRUCTURE	5%
GAS LINE INFRASTRUCTURE	5%

Railway Study

CRITERIA	WEIGHTING (%)
Likelihood of Development % Suitability	*Equals to 100 %*
EXISTING RAIL	
Proximity to Existing Rail	25%
Proximity to Existing Rail Access Points	25%
LAND USES	
Oil and Gas Study Outcomes	12%
Land Use Districts (existing) (RM, RM-1, RM-2, RM-3, RM-DC, RM-4, EX, AG)	8%
Industrial Lands – Future (MDP + Growth and Economic Development Strategy)	5%
TRANSPORTATION	
Primary Highway	4.5%
Secondary Highway (arterial)	3.5%
Collector Roads	2%
% GRADE	
Minimal Sloping (over 800m)	15%

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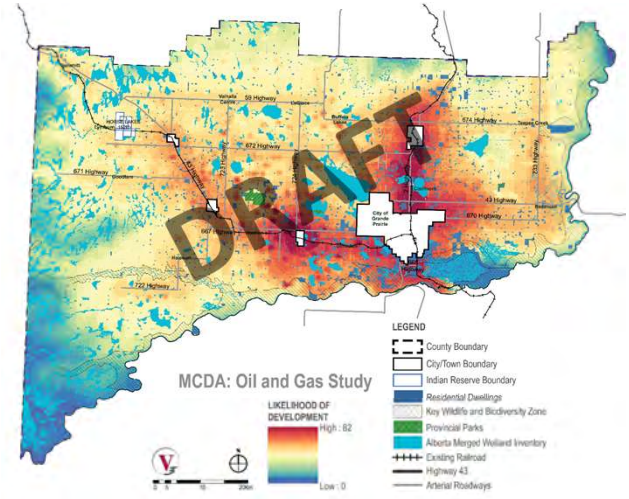
GIS-MCDA Outcomes – Oil and Gas Study



Key Outcomes

- When merging each proximity criterion map with their associated weighting and the constraint criteria, the likelihood of development reached a maximum value of 82%. This means that, based off the merged proximity criteria and the constraint criteria, there are no areas within the County that will definitively see oil and gas activity.
- The areas in the County that is most likely to see future industry development is the corridor between the Towns of Wembley and Sexsmith and the City of Grande Prairie, lands surrounding Bezanson, and areas where companies have existing mineral rights through AER.
- Opportunities exist to capitalize on key corridors where the County may want to carry out additional engagement with the industry to identify how it can further support its exploration and development of the oil and gas sector.

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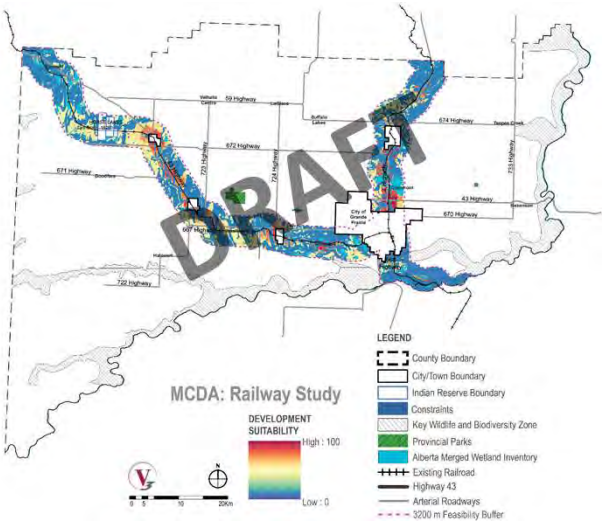
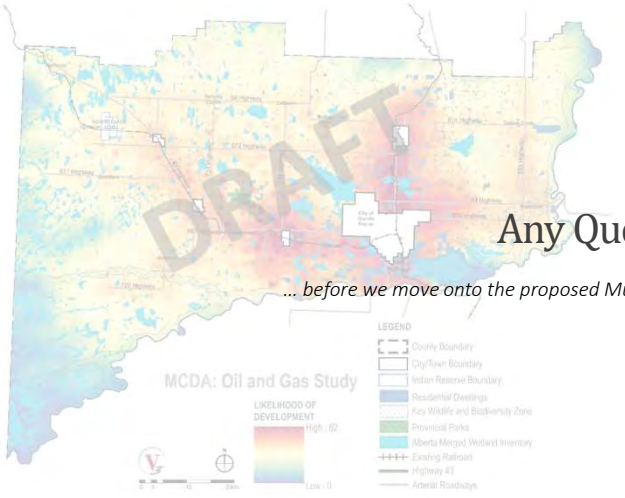
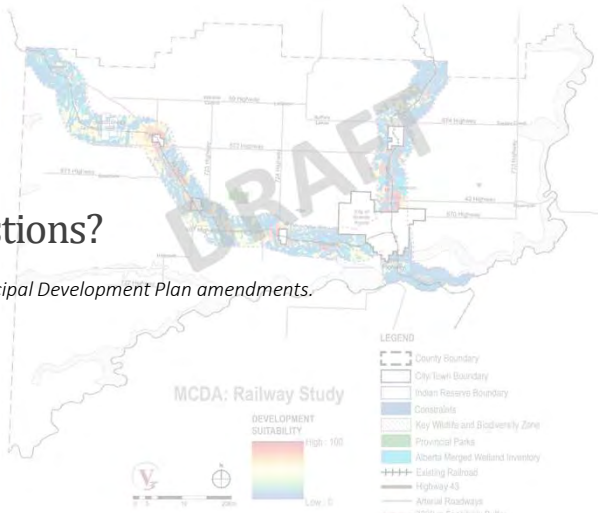
GIS-MCDA Outcomes – Railway Study



Key Outcomes

- When merging each proximity criterion map with their associated weighting and the constraint criteria, the likelihood of development reached a maximum value of 100%. This means that, based off the merged proximity criteria and the constraint criteria, there are some areas of the County that are 100% suitable for future railway spur/siding expansion.
- As key criterion for future railway spur/siding expansion is being in close proximity to the existing railway line, the majority of the "hot" spots are along the railway corridor.
- While this analysis indicates the preferred location for railway sidings and spur lines, a more granular, site-specific study will be required to determine exact placement and alignment of railway spur/siding expansion as there are specific development considerations required, such as existing location of buildings, land ownership, turning radiuses, and distances between railway access points.





Any Questions?

… before we move onto the proposed Municipal Development Plan amendments.

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Municipal Development Plan Amendments

Proposed Amendments:

- New section titled "Oil and Gas Development in Rural Areas"
- Intent of the amendment is to:
  - Support industry development through infrastructure expansion and upgrades.
  - Balance development impacts on landowners, other industries, and recreational users.
  - Capitalize and expand on railway infrastructure to support industry growth.

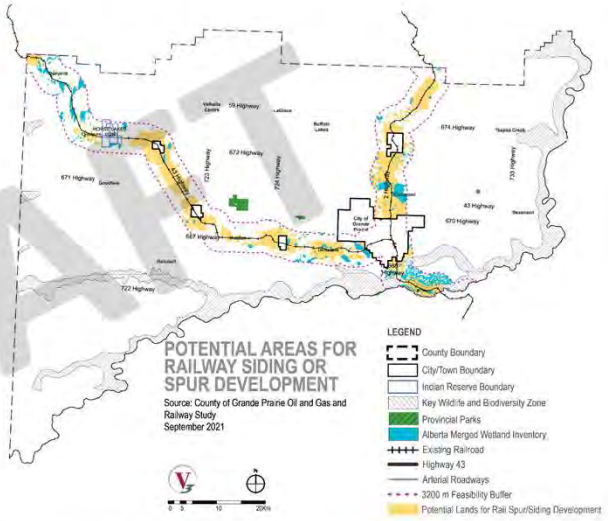
Proposed Objectives:

- To be proactive in providing the necessary infrastructure to support the oil and gas industry.
- To manage and mitigate the impacts of oil and gas industry development on residents, agricultural industries, and recreational users.

Municipal Development Plan Amendments

Proposed Policies:

1. The County **shall** continue to collaborate with the oil and gas industry and the Alberta Energy Regulator to assist with identifying future developments that need to be supported by municipal infrastructure.
2. The County **should** identify opportunities along the existing railway network within the County that could assist with development of the resource sector through the provision of enabling resource base land uses in those areas that are suitable for the development of sidings and railway yards as indicated in Figure 1: Potential Areas for Railway Siding or Spur Development.



▲ Figure 1: Potential Areas for Railway Siding or Spur Development

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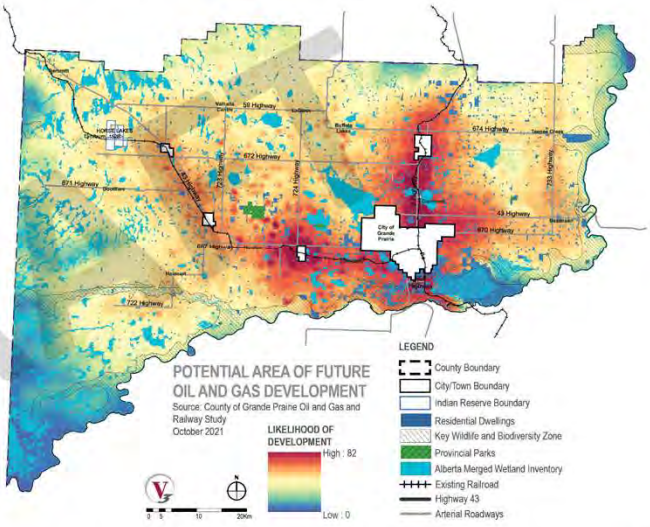
Municipal Development Plan Amendments

Proposed Policies:

3. The County **should**, in collaboration with the Alberta Energy Regulator and the oil and gas industry, investigate opportunities to create shared easements and pipeline rights-of-ways to limit the impact development has on the landscape and fragmentation of land.

4. The County **should** develop a municipal servicing management plan to plan and budget for infrastructure upgrades and expansion to service areas that have concentrated oil and gas development as indicated in Figure 2: Potential Areas of Future Oil and Gas Development.

5. The County **shall** collaborate with the oil and gas industry to develop a program to self-monitor the use of municipal roads, aimed at preventing industry related vehicular traffic from using non-designated routes. The County **shall** also look to develop a road management plan that directs oil and gas industry related vehicular traffic to designated routes that are designed to handle the increased volume in areas of high oil and gas activity. The road management plan **shall** consider the most efficient routes to serve industry developments, outline phasing to upgrade the designated routes, and include methods to mitigate impacts on residents, other industries and recreational users.



▲ Figure 2: Potential Areas of Future Oil and Gas Development

Municipal Development Plan Amendments

Proposed Policies:

6. The County **should** establish an off-site levy system to fund new infrastructure, and to upgrade, maintain, and operate existing infrastructure that benefits oil and gas industry development. Once established, the levies **shall** be reviewed and revised by the County on a yearly basis to correlate with interest rates and inflation.

7. The County **should** work with the oil and gas industry and AER to provide an online communication platform to keep County residents informed on oil and gas developments.

8. The County **may** require that oil and gas related development mitigate the visual impact on adjacent landowners by using screening methods, which could include vegetation earth berms, etc of oil and gas infrastructure that are in accordance with AER's regulations.

9. The County **should** explore other cost-effective measures to reduce the impact oil and gas industry development has on area residents, the agricultural industry, and recreational users. Examples of measures that **may** be explored include providing free or low-cost vegetation to screen development; partnering with local school districts and community groups to plant vegetation screens; and/or running public awareness campaign(s) to better explain the County's role in oil and gas industry development, the benefits that the industry brings, and ways that the County is balancing the needs of residents with future development.

10. The County **should** collaborate with the oil and gas industry to develop measures and emergency responses plans to mitigate and manage oil and gas development to mitigate against accidents.

11. The County **should** work with the oil and gas industry through supporting initiatives in carrying out reclamation of abandon wells and pipelines.

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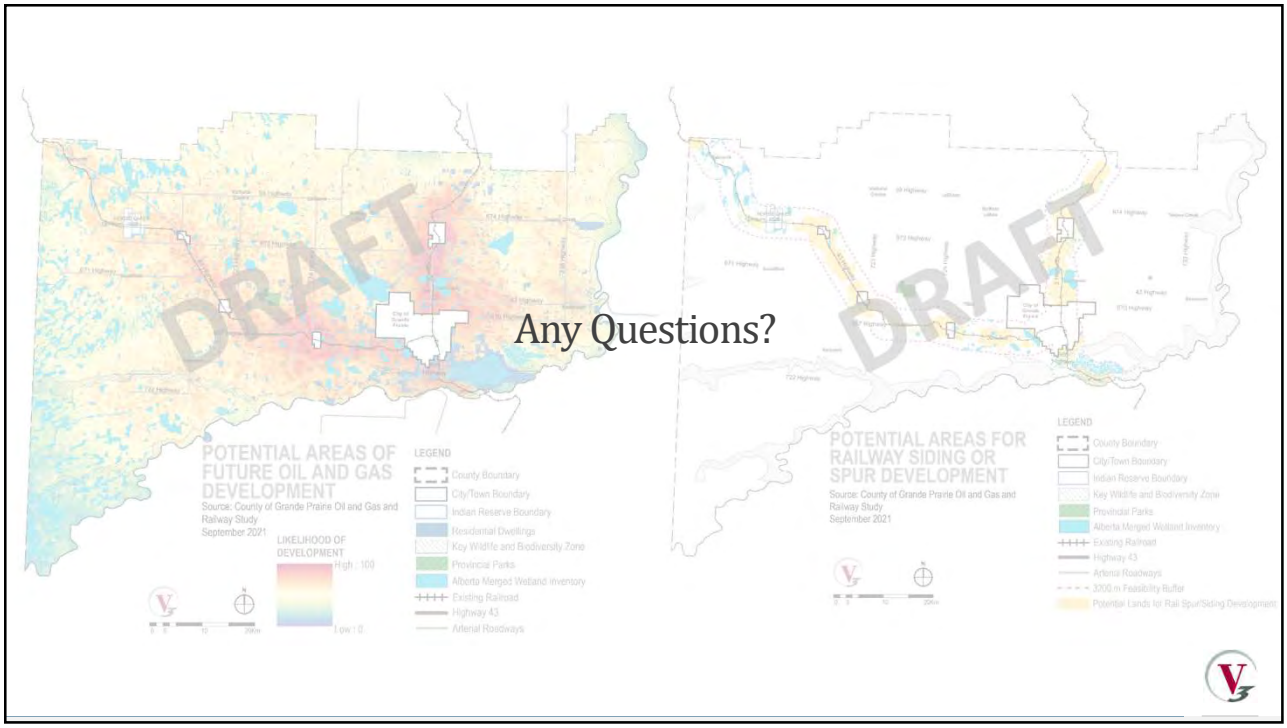
DRAFT
Any Questions?
POTENTIAL AREAS OF FUTURE OIL AND GAS DEVELOPMENT
Source: County of Grande Prairie Oil and Gas and Railway Study
September 2021
LIKELIHOOD OF DEVELOPMENT
High : 100
Low : 0
LEGEND
County Boundary
City/Town Boundary
Indian Reserve Boundary
Residential Dwellings
Key Wildlife and Biodiversity Zone
Provincial Parks
Alberta Merged Wetland Inventory
Existing Railroad
Highway 43
Arterial Roadways
DRAFT
POTENTIAL AREAS FOR RAILWAY SIDING OR SPUR DEVELOPMENT
Source: County of Grande Prairie Oil and Gas and Railway Study
September 2021
LEGEND
County Boundary
City/Town Boundary
Indian Reserve Boundary
Key Wildlife and Biodiversity Zone
Provincial Parks
Alberta Merged Wetland Inventory
Existing Railroad
Highway 43
Arterial Roadways
3200 m Feasibility Buffer
Potential Lands for Rail Spur/Siding Development

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