Dangerous Goods Route and Truck Route Establishment in Lloydminster

Olivia Craig, E.I.T.
Transportation Engineer-in-Training
ISL Engineering and Land Services

Cameron Matwie, MBA, M.Sc., P.Eng., ENV SP
Manager, Transportation Planning
ISL Engineering and Land Services

James Rogers, P.Eng.
Senior Manager, Capital Infrastructure
City of Lloydminster

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Introduction

The City of Lloydminster (City) is centered along the Trans-Canada Highway (Highway 16) and straddles the Alberta/Saskatchewan interprovincial border along Highway 17. As an economic centre along major highways, the City attracts, and is impacted by, the movement and transport of goods and dangerous goods. The City has expressed concern over the movement of dangerous goods through the heart of the City along the major highways and has explored options to alter the truck routes and dangerous goods routes.

A June 2017 report presented to the Governance and Priorities committee offered options for the alteration and amendment of the truck routes and dangerous goods routes. The report proposed adding truck routes within the City along with some deletions, as well as rerouting dangerous goods traffic around the periphery of the City. At that time City Council recognized that changes to the truck routes and dangerous goods routes would require a lot of discussion between the City and stakeholders.

The purpose of the project was to further review and refine options for alternate truck routes and dangerous goods routes within the City of Lloydminster and to consult with industry, emergency services, carriers, local business owners, other community stakeholders, and the general public. In addition to route option development the project provided a comprehensive signage plan and cost estimate associated with the signage plan. This paper will discuss the process undertaken to review and revise the truck routes and dangerous goods routes within the City.

Background Conditions Review

The City, other municipalities, Alberta Transportation and the Saskatchewan government were consulted to gather more information on truck routes and dangerous goods routes. All of the information collected was grouped into four (4) reviews including: legislature and data review, jurisdiction review, current trucking pattern review, and a network review.

1. The **legislature and data review** was conducted to gain a better understanding of the context of existing dangerous goods routes and truck routes and how the City's current policies and practices relate to dangerous goods routes and truck routes. The key item found during the review was that the two (2) City bylaws contained conflicting information on a segment whereby one document referenced a dangerous goods route but not a truck route.
2. The **jurisdiction review** of six (6) cities in Alberta and two (2) in Saskatchewan was completed to help the City understand how other cities of similar size with bisecting highways identify and address dangerous goods routes and truck routes. The review noted that each municipality follows the appropriate provincial acts but have the flexibility to create truck routes, dangerous goods routes, and bylaws that provide specific restrictions and guidelines that best fit the City's needs.

3. The **current trucking patterns** in and through the City was completed to aid in the identification and evaluation of dangerous goods routes and truck routes by considering population and economic trends, which influence trucking and goods movement. From this review it was determined that long-haul truck traffic is growing, through trucks make up significant proportions of this traffic, and dangerous goods vehicles make up important proportions of through traffic.
4. The **network review** was completed of the existing dangerous goods routes and truck routes within the City to better understand how the existing routes function within the context of the data review and jurisdiction review. The results of the review were potential alternative truck routes in each of the four quadrants of the City.

Evaluation Framework Development

An evaluation framework was developed in order to objectively evaluate all of the potential dangerous goods routes and truck routes that could be identified in the City. The objective of the evaluation framework was to provide the City with a consistent methodology for designating dangerous goods routes and truck routes.

Having an evaluation framework will allow future reviews of possible dangerous goods routes and truck routes to use the same process and logic that was used in the creation of the network. Using the same logic and steps ensures that all potential routes are assessed consistently and objectively every time. The truck route evaluation framework was created separately from the dangerous goods route framework to allow a review of each network individually.

Truck Route Evaluation Framework Development

To initiate the creation of the truck routes, a best practice review was completed. Based on the criteria identified through completing the best practice review and many discussions with David Kriger Consulting Inc., a preliminary list of route evaluation criteria for truck routes was created and assessed for their applicability to the project. After the assessment, a focused list of criteria was proposed and used in Phase 1 of the public engagement to ask stakeholders and the general public for feedback on the route evaluation criteria.

A two-step process was suggested for the City's truck route evaluation framework based on the feedback received during the Phase 1 engagement session and the criteria used in the sources reviewed. The first component is the network functionality assessment and the second component is the route performance assessment. Both assessments use criteria that are applicable to the City and identified as important by industry stakeholders, the general public, and the City. The criteria used in the network functionality assessment includes route purpose, network connectivity, reduces trip length, and reduces off route trips. The criteria selected for the route performance assessment include roadway classification, roadway geometrics, surface conditions, at-grade rail crossings, and land use compatibility. Table 1

and Table 2 below contains the criteria selected as well as criteria descriptions and the assessment levels.

Table 1 – Truck Route Evaluation Framework – Network Functionality Assessment

Network Functionality Assessment			
Criteria	**Description**	**Yes**	**No**
Route Purpose	Truck routes must either provide direct access to/from destinations within the City that produce or receive goods via trucks or provide for efficient movement of goods through the City	Route provides a direct connection of a location in the City that produces or receives goods or route provides for the safe and efficient movement of goods through the City	Route does not provide a connection to a location in the City that produces or receives goods or route does not facilitate the safe and efficient movement of goods through the City
Network Connectivity	Truck routes must provide a connection to the existing truck routes within the City or provide a connection to the regional networks	Route connects without creating "dead end" segments and connects to the network in a manner that allows efficient transportation of goods into and through the City	Route does not connect to the network and may create "dead end" segments. Route does not allow for efficient transportations of goods into and through the City
Reduces Trip Length	Truck routes add efficiencies to the network by reducing the trip length to destinations within the City and does not add unnecessary trip length for goods moving through the City	Route reduces trip length to destinations within the City and provides efficient movement of goods through the City	Route does not reduce trip length to destinations within the City and to goods moving through the City
Reduces Off Route Trips	Truck routes are connected in a manner that reduces the number of off route trips required for goods to reach their destination within the City as well as pass through the City	Route provides direct access to destinations with frequent use or route allows for efficient travel through the City	Route does not provide direct access to destinations and is not used frequently or route does not allow for safe and efficient movement of goods through the City

Table 2 - Truck Route Evaluation Framework – Route Performance Assessment

Route Performance Assessment			
Criteria	**Description**	**Good / Very Good**	**Fair / Poor**
Roadway Classification	Roadway classification as defined by the City's Municipal Development Standards document and includes Locals, Collectors, and Arterials as roadway types. Primary Highways are defined as those roadways that connect to the Provincial Highway networks (i.e. Hwy 16 and Hwy 17)	Highways and Arterials	Collectors and Locals
Roadway Geometrics	Roadway and intersection geometric factors such as lane width, available shoulders, and turning radii are appropriate for the safe use by trucks	Roadway geometrics are sufficient to accommodate frequent truck usage and allow for safe movements along the roadway and through intersections	Roadways and intersections do not easily accommodate truck traffic due to narrow lane widths, little to no existing shoulder, small turning radii
Surface Conditions / Structural Capacity	Existing roadway surface conditions are capable of supporting frequent truck use	Roadway structure has a high enough structural capacity to facilitate frequent truck use	Roadway structure does not have enough structural capacity to facilitate frequent truck use
At-Grade Rail Crossings	Truck Routes have few at-grade rail crossings to ensure safe and efficient transportation of goods around and through the City and reduce delays caused by trains	Route has one or no at-grade rail crossings	Route has two or more at-grade rail crossings
Land Use Compatibility	Current surrounding land use is appropriate for frequent trucks and often producing or receiving the goods which needs to be transported	Commercial and Industrial	Residential and Institutional (i.e. schools, public facilities, hospitals)

Route Performance Assessment			
Supports Future Development	Truck routes are located in a manner that supports future development as the City grows and changes	Route provides support for future development	Route does not provide support for future development

Note: Off route trips are defined as a trip or potion of a trip taken by a truck that is used to reach a delivery destination and/or pickup goods from a location that is not located on an existing or designated truck route. For example, the portion of a trip that deviates from a designated truck route for medical deliveries to a hospital is defined as an off route trip.

Dangerous Goods Route Evaluation Framework Development

Similar to truck routes, a best practice review was conducted for the dangerous goods routes evaluation framework. The reoccurring criteria formed the base of the dangerous goods route evaluation framework. The dangerous goods route evaluation framework for the City was also established as a two-step process, with a dangerous goods route functionality assessment and a safety assessment. The functionality assessment uses similar criteria to the truck routes functionality assessment with minor modifications. The difference between the two (2) functional assessments is that the dangerous goods routes functionality assessment has an additional criterion that ensures a dangerous goods route is a part of the existing truck route network. This ensures that the networks are consistent and clear for users trying to reach their destinations. The four (4) other criteria used in the dangerous goods route functionality assessment are identical to the truck route functionality assessment; however, when evaluating a potential dangerous goods route the functionality assessment is specifically related to its function as a dangerous goods route. Table 3 below contains the criteria selected for the dangerous goods route functionality assessment along with the descriptions and the assessment levels.

Table 3 – Dangerous Goods Route Evaluation Framework – Functionality Assessment

Dangerous Goods Route Functionality Assessment			
Criteria	**Description**	**Yes**	**No**
Route Purpose	Dangerous goods routes must either provide direct access to/from destinations within the City that produce or receive goods via trucks or provides for efficient movement of goods through the City	Route provides a direct connection of a location in the City that produces or receives goods or route provides for the safe and efficient movement of dangerous goods through the City	Route does not provide a connection to a location in the City that produces or receives goods or route does not facilitate the safe and efficient movement of dangerous goods through the City

Dangerous Goods Route Functionality Assessment			
Network Connectivity	Dangerous goods routes must provide a connection to the existing dangerous goods routes within the City or provide a connection to the regional networks	Route connects without creating "dead end" segments and connects to the network in a manner that allows efficient transportation of dangerous goods into and through the City	Route does not connect to the network and may create "dead end" segments. Route does not allow for efficient transportations of dangerous goods into and through the City
Route Compatibility	This criteria ensures that any and all proposed dangerous goods routes are apart of the existing truck routes network	Route is a part of the existing truck route network	Route is not currently designated as a truck route
Reduces Trip Length	Dangerous goods routes add efficiencies to the network by reducing the trip length to destinations within the City and does not add unnecessary trip length for dangerous goods moving through the City	Route reduces trip length to destinations within the City and provides efficient movement of dangerous goods through the City	Route does not reduce trip length to destinations within the City and to dangerous goods moving through the City
Reduces Off Route Trips	Dangerous goods routes are connected in a manner that reduces the number of off route trips required for dangerous goods to reach their destination within the City as well as pass through the City or reduces the number of off route permits required	Route provides direct access to destinations with frequent use or route allows for efficient travel through the City	Route does not provide direct access to destinations and is not used frequently or route does not allow for safe and efficient movement of goods through the City

The second component of the dangerous goods route evaluation framework is the safety assessment which is separated into two (2) subsections, the probability assessment and the significance assessment. The identified criteria were separated into criteria that assess the probability of an emergency or incident happening and criteria that assess the significance of the emergency or incident. The criteria used in the probability assessment include roadway geometrics, at-grade rail crossings, access control, traffic efficiency, and collisions. All of these criteria impact the likelihood of an emergency or incident happening and reflect the ability of dangerous goods to travel along the route safely. Table 4 below contains the criteria selected

for the dangerous goods route probability assessment along with the descriptions and the assessment levels.

Table 4 – Dangerous Goods Route Evaluation Framework – Probability Assessment

Probability Assessment			
Criteria	**Description**	**Good / Very Good**	**Fair / Poor**
Roadway Geometrics	Roadway and intersection geometric factors such as lane width, available shoulders, and turning radii are appropriate for the safe use by trucks	Roadway geometrics are sufficient to accommodate frequent truck usage and allow for safe movements along the roadway and through intersections	Roadways and intersections do not accommodate truck traffic due to narrow lane widths, little to no existing shoulder, small turning radii
At-grade Rail Crossings	Dangerous goods routes have few at-grade rail crossings to ensure safe and efficient transportation of goods around and through the City and reduce risks associated with rail/truck collisions	Route has one or no at-grade rail crossings	Route has two or more at-grade rail crossings
Access Control	Accesses along the route have higher levels of control, such as signals, to minimize risk of collision	Higher level of access control at all or most of the accesses	All or most accesses have lower levels to no access control
Traffic Efficiency	Route allows for efficient transportation of goods around and through the City due to few delays associated with congestion	Delays due to congestion are not likely or never to be experienced along the route	Delays due to congestion are likely or very likely to be experienced along the route
Collisions	Based on judgement from the City, does the dangerous goods route have potential for frequent or severe collisions	Route is likely to have a low frequency and severity of collisions	Route is likely to have a high frequency or severity of collisions

The second component of the safety assessment is the significance assessment as dangerous goods pose a higher risk to public safety than regular items transported by truck.

The significance assessment takes into consideration how the response to a potential emergency or incident would impact the City's roadways and users. The criteria used in the significance assessment include environmental impact, population exposure/land use, population responsiveness/evaluation potential, and emergency response. Table 5 below contains the criteria selected for the dangerous goods route significance assessment along with the descriptions and the assessment levels.

Table 5 – Dangerous Goods Route Evaluation Framework – Significance Assessment

Significance Assessment			
Criteria	**Description**	**Good / Very Good**	**Fair / Poor**
Environmental Impact	There are no sensitive or natural areas along the route (i.e. storm water ponds, water bodies, water courses, farmer's fields, existing landscaping and natural vegetation, and water treatment plants, etc.)	Few to no sensitive or natural areas are located along the route	Many sensitive or natural areas are located along the route
Population Exposure / Land Use	Land use surrounding the dangerous goods route is appropriate and reduces the number of people exposed in the event of an emergency	Industrial and Commercial land uses where fewer people are located	Residential and institutional land uses where large amounts of people may be located together (i.e. hospitals, high-density residential, etc.)
Population Responsiveness / Evacuation Potential	In the event of an emergency people have the ability to evacuate the area quickly and safely	There are no high-density land uses in the surrounding area (i.e. hospitals, nursing homes, high-density residential, etc.) and there are alternate roadways available for evacuation	Route is in close proximity to high-density land uses (i.e. hospitals, nursing homes, high-density residential, etc.) and does not have alternate roadways available for evacuation
Emergency Response	In the event of an emergency the dangerous goods route is located where the fire department can respond quickly	Route is located within the 4 to 6 minutes range from either fire hall	Route is located 8 or more minutes away from either fire hall

Route Options Development

Phase 1 of the stakeholder and public engagement was completed during the initial stages of the project to understand how the existing dangerous goods route and truck route networks currently function. Once feedback was received from stakeholders and the public on the existing routes, the potential route options were created. Stakeholder feedback included that most of the dangerous goods and truck traffic is local and concentrated in the northwest corner of the City. The public online feedback included a concern around public safety and truck traffic on current routes in or near residential areas and the city centre.

Truck Route Options

For the purpose of this study, the assessment of truck routes was completed in “thirds” of the City which was comprised of the north sector, the southwest quadrant and the southeast quadrant. All of the options were created using the feedback from the City, stakeholders, and the public in regard to how the network currently functions as well as where the trucks and dangerous goods movement is concentrated today. In all cases the existing truck routes and dangerous goods were presented as Option Zero, keeping the existing routes without changing them which was considered the “do nothing” option. While it is acknowledged that the “do nothing” option may not be preferred and is likely unfavorable, the “do nothing” option remains a possibility that could be considered if no other alternatives were deemed preferable.

The options by quadrant are as follows:

- The majority of the industrial sector within the City is located in the northwest with some located in the northeast. For these reasons options were created for the entire north half of the City. Three (3) options were created which used different truck routes within the north half of the City.
- The southwest quadrant is primarily residential with some commercial land use along 44 Street (Highway 16) and 50 Avenue (Highway 17) as well as institutional land use such as Bud Miller Park and Lakeland College. Four (4) options were created which used different truck routes within the southwest quadrant of the City.
- The southeast quadrant is the smallest area of the three “thirds” and is mainly residential with some commercial land use along 44 Street (Highway 16) and 50 Avenue (Highway 17). Three (3) options were created which use different truck routes within the north half of the City.

Dangerous Goods Route Options

The assessment of options for the dangerous goods routes was completed on a City-wide basis as there are fewer dangerous goods route options than there are truck route options. All of the dangerous goods route options were created based on the feedback received by the City, stakeholders, and the public during Phase 1 of engagement. Option Zero for the dangerous goods routes was considered maintaining the existing dangerous goods routes in

place as per the current Traffic Bylaw. Four (4) options were created which use different dangerous goods routes throughout the City.

Restricted Roadways

During the development of route options, additional information was required on restricted roadways and potential truck storage locations. While developing the truck route and dangerous goods route options it was noted that there were some roadways that received conflicting feedback from the public and industry stakeholders. A restricted route was a potential solution as it would limit when trucks can use the route. During the stakeholder meetings, industry representatives were asked what type of restriction would work within the City. Since industry works seven days a week it was noted that a day of the week restriction may not work within the municipal boundaries. The feedback received from the City indicated a desire to restrict the time of day as opposed to the day of the week. The restrictions were updated to be between 06:00 to 22:00 for all restricted routes within the City to ensure standardization from a connections and enforcement perspective as well as to provide maximum flexibility during business hours while restricting truck activity during the late evening and overnight hours.

Potential Storage Locations

Potential storage locations were also investigated as part of the project. Currently the Husky Truck Stop, which is currently located along 44 Street (Highway 16) is where most trucks park if they have to stay overnight in the City. During the Phase 1 engagement, the City and the public noted that there are often trucks parked in residential neighborhoods or in alleys behind hotels (i.e., along 43 Street west of 40 and 41 Avenues). Potential storage locations would provide the City a designated area where trucks could stop and park if they need to stay overnight in the City.

As part of the Phase 2 engagement stakeholders were asked where a potential storage location could be. Stakeholders noted that the Husky Truck Stop is used frequently due to its proximity to amenities. No other locations around the City were identified by stakeholders as potential storage locations as most local businesses use their own industrial yards for truck storage. It is noted however that in the jurisdiction review other municipalities had included truck storage lots on the periphery of the City. Should it be desired to include formal truck storage/parking location opportunities exist in the east industrial area off 47 Street as well as just east of the east city limits on 35 Avenue and 44 Street. In addition, on the west side of the City potential opportunities exist north of 44 Street between 62 Avenue and the west City limit. Figure 4 below shows the storage/parking location opportunities.

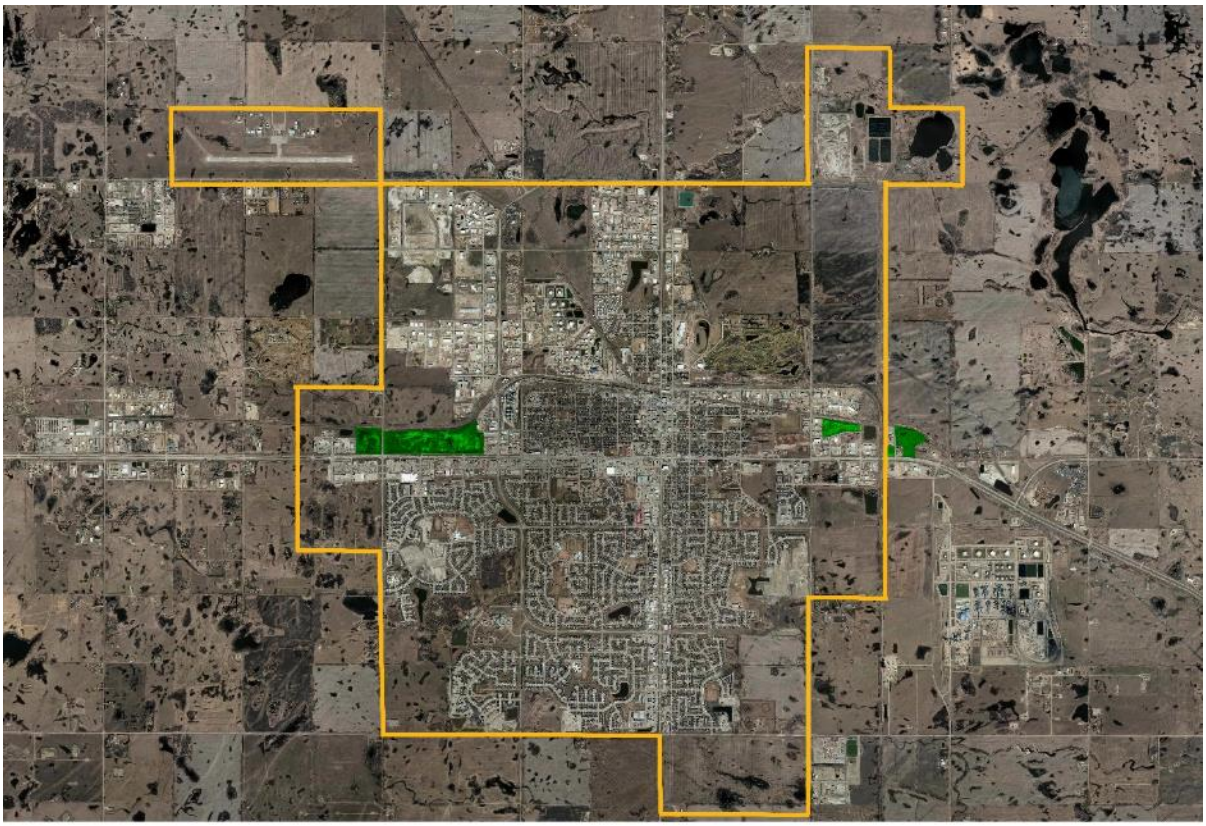

Figure 4 – Potential Truck Storage/Parking Locations

Route Option Evaluation

Phase 2 of the stakeholder and public engagement was completed as a key component of the route evaluation and assessment to receive feedback on how the potential options would impact users and residents. The feedback received from stakeholders and the public on the potential options influenced the evaluation of the options. After the public engagement was completed the potential dangerous goods routes and truck routes were analysed using the evaluation framework to determine the routes with the highest potential as dangerous goods routes and truck routes. Stakeholder feedback indicated a preference for north truck route option 3, southeast truck route option 1, and southwest truck route option 3. The stakeholders indicated how the preferred options could be improved for local use of the truck routes. The public's feedback indicated a preference for options that kept trucks and dangerous goods out of the city centre.

Truck Route Evaluation

The evaluation framework was created to ensure that the City could apply a consistent methodology for designating truck routes. Testing the evaluation framework on the potential truck routes allowed for any potential issues or uncertainties to be clarified. The potential truck

routes identified were separated into smaller segments for assessment based on network linkage and cross street connectivity.

The first component in the evaluation process is a network functionality assessment which acts as an initial check to determine if a route is compatible with the existing truck route network. The network functionality assessment consists of four criteria that were addressed with questions through either a “yes” or a “no” response. The second component of the truck route evaluation is the route performance assessment, which reviews the specific route to ensure it will be a suitable truck route. The framework for route performance used good/very good and fair/poor as the potential outcomes of the assessment.

The industrial areas were assessed similarly to the route segments but some of the criteria did not apply. All criteria in the network functionality assessment were considered and received a “yes” answer. In the route performance assessment two of the six criteria apply, land use compatibility and supports future development.

Truck Route Assessment

To complete the City-wide truck route assessment, all of the candidate truck routes were assessed for the network functionality first. The initial assessment for network functionality identified viable options based on answering “yes” to the route purpose and network connectivity criteria. As noted the potential route should serve a purpose to the network and be a beneficial addition and may not reduce trip length or reduce off-route trips but should provide efficient movement of goods through and around the City.

Routes that answered “Yes” to route purpose and network connectivity were then assessed using the route performance criteria. A candidate rating recommendation was established to categorize the evaluated routes. A strong, good, or poor candidate truck route rating was based on the total number of criteria assess as “fair” as follows:

- 1-2 fair outcomes with all other outcomes assessed as “good” or “very good” is a strong candidate for a truck route
- 3-4 fair outcomes with all other outcomes assessed as “good” or “very good” is a good candidate for a truck route that may require mitigations/consideration of other routes
- >5 fair outcomes with all other outcomes assessed as “good” or “very good” is most likely a poor candidate for a truck route.

Ideally the candidate truck routes should have no “poor” rating in the evaluation; however, it was noted that this condition may not always be achievable when assessing existing roadways and networks. A “poor” rating in roadway classification and roadway geometrics indicates the route should not be a potential truck route; however, surface conditions/structural capacity improvements can improve a “poor” rating of a potential truck route once improvements are completed. The land use compatibility and supports future development criteria are assessed together with the rest of the criteria. For example, routes that have poor

land use compatibility often also have no purpose and therefore would not be good potential truck routes.

Dangerous Goods Route Evaluation

Testing the evaluation framework on the potential dangerous goods routes allowed for any potential issues or uncertainties to be clarified.

The functionality assessment was evaluated on a route by route basis. The routes were separated into east/west routes through the City, north/south routes through the City, and routes servicing key destinations within the City. The functional assessment used similar criteria as the truck routes with an additional criterion that ensures the dangerous goods route is a part of the existing truck route network. The functionality assessment criteria were addressed with questions through either a “yes” or “no” response.

The safety assessment of potential dangerous goods routes was completed on a segment by segment basis. All of the potential dangerous goods routes identified in the proposed network options were separated into smaller segments based on key network intersections. The safety assessment consists of two (2) sub-sections: the probability assessment and the significance assessment. The framework for the safety assessment used “good”, “very good”, and “fair/poor” as the potential outcomes of the assessment.

Dangerous Goods Route Assessment

To complete the City-wide dangerous goods route assessment, all of the candidate routes were assessed individually for route purpose, network connectivity, and route compatibility. Each route needed to answer “yes” to these first three (3) questions in the functionality assessment in order to be considered a strong potential route. The criteria for reduces trip length and reduces off route trips require a comparison with the current approved dangerous goods route city-wide network. Comparing to the current routes allowed a determination as to if the potential routes would add benefit to the existing network.

Routes that answered “yes” to the three (3) initial functionality assessment criteria, were then assessed in segments for overall feasibility based on the number of criteria assess as “fair” in the safety assessment as follows:

- 1-2 fair outcomes with all other outcomes assessed as “good” or “very good” is a strong candidate for a dangerous goods route
- 3-5 fair outcomes with all other outcomes assessed as “good” or “very good” is a good candidate for a dangerous goods route that may require mitigations/consideration of other routes
- >6 fair outcomes with all other outcomes assessed as “good” or “very good” is most likely a poor candidate for a dangerous goods route and should not be considered

Ideally the candidate dangerous goods route should have no “poor” ratings in the evaluation; however, it was noted in the evaluation that this may not always be achievable when assessing existing roadways as “poor” ratings within the significance criteria can be improved with proper mitigation. In addition, the two “poor” ratings in the environmental impact criteria noted during the evaluation were for roadways that pass the water treatment plant and are also next to fields used for farming whereby the rating for the environmental impact can be improved with mitigation strategies.

Recommendations

To develop the recommended dangerous goods routes and truck routes, the project team reviewed the stakeholder input and feedback from both Phase 1 and Phase 2 engagement sessions as well as input from City staff on the potential operational and enforcement issues and challenges with the proposed dangerous goods route and truck route networks. The technical evaluations of the candidate dangerous goods routes and truck routes as assessed with the evaluation framework were also used to support the recommendations. This thorough city-wide assessment was completed to support the recommendations for the inclusion and exclusion of roadways as truck routes and dangerous goods routes.

Truck Route Recommendations

The truck route options were developed and presented in sections of the City for the north sector, southwest quadrant, and southeast quadrant. The route recommendations that were developed considered the stakeholder input from Phase 2 engagement as well as the technical assessment. The technical assessment found the following ratings for potential truck route candidates.

- 36 segments of roadway were evaluated along roadways identified as highways and arterials within the Transportation Master Plan. 27 were rated as “strong” candidates for truck routes, 6 were “good” candidates for truck routes and 3 were “poor” candidates for truck routes.
- 6 segments of roadway were evaluated along four roadways identified as collectors within the Transportation Master Plan. 2 were rated as “strong” candidates for truck routes and 4 were rated as “poor” candidates for truck routes.
- 16 segments of roadway were evaluated along 13 roadways identified as local roads within the Transportation Master Plan. 11 industrial locals were rated as “strong” candidates for truck routes and 3 industrial locals were rated as “good” candidates for truck routes. 51 Street from 50 Avenue to 55 Avenue was evaluated as an alternative to the existing truck route along 55 Avenue to serve the business area along 51 Street. As a comparison 51 Street received a rating of “good” while 55 Avenue received a rating of “poor”.

Stakeholders identified option 3 for the north sector, option 2 for the southeast quadrant, and option 4 for the southwest quadrant as the preferred route options. The recommended truck routes for the City, based on stakeholder, public and staff input along with the technical evaluation which are represented in Figure 5.

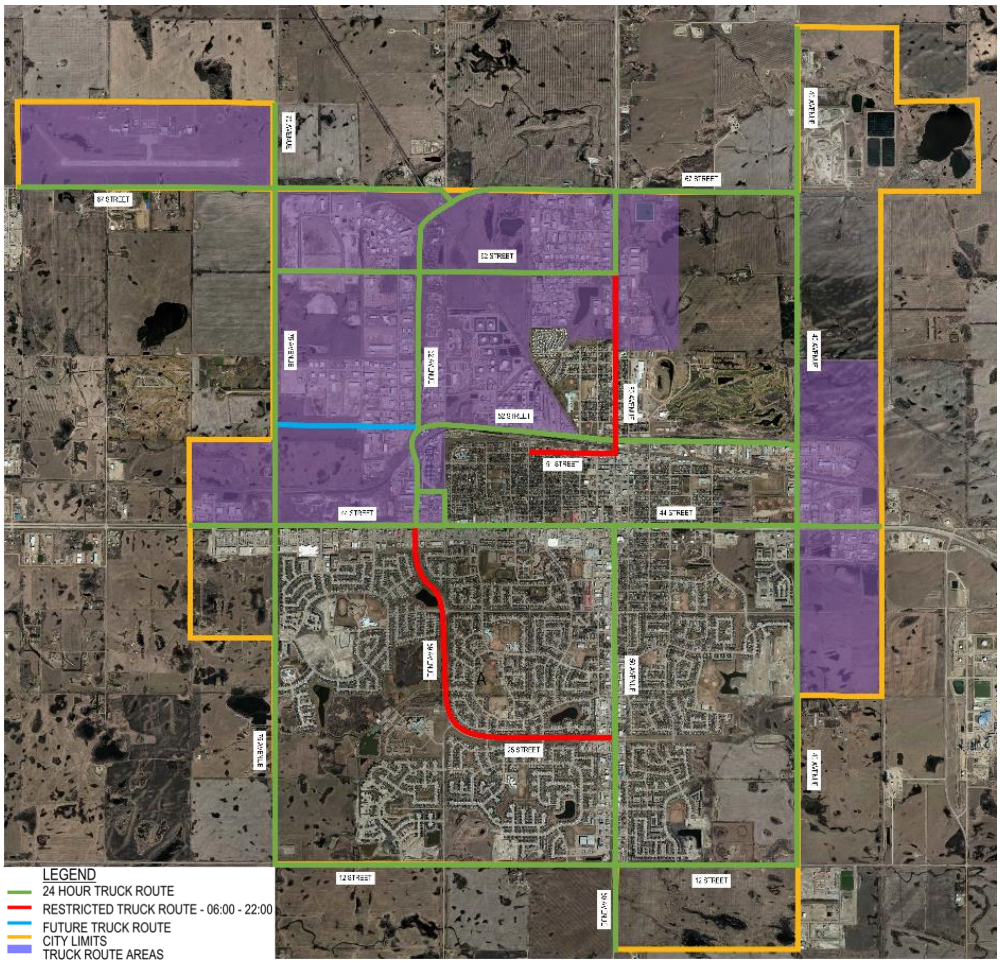

Figure 5 – Recommended Truck Route Network

On a city-wide basis only three (3) roadways were recommended for the designation of restricted truck routes. These roadways were recognized as important components to the overall truck route network with the correlated recognition that these roadways may not be required on a twenty-four (24) hour basis. As such the following three (3) routes have been recommended as restricted truck routes due to the adjacent residential developments:

- College Drive from 44 Street (Highway 16) to 50 Avenue (Highway 17)
- 51 Street from 50 Avenue to 55 Avenue
- 50 Avenue from 51 Street to 62 Street

Dangerous Goods Route Recommendations

The dangerous goods route options were developed and presented as city-wide options. The route recommendations that were developed considered the stakeholder input from the Phase 2 engagement as well as the technical assessment.

The technical assessment found the following ratings for potential truck route candidates. 27 segments of roadway were evaluated along roadways identified as highways and arterials within the Transportation Master Plan.

- 17 roadway segments received a “strong” rating as candidate dangerous goods routes.
- 10 roadway segments received a “good” rating as candidate dangerous goods routes.
- No roadway segments received a “poor” rating as a candidate dangerous goods route.

The stakeholder feedback identified sections of option 3 and option 4 as the preferred dangerous goods route network. The recommended truck routes for the City, based on stakeholder, public and staff input along with the technical evaluation which are represented in Figure 6.

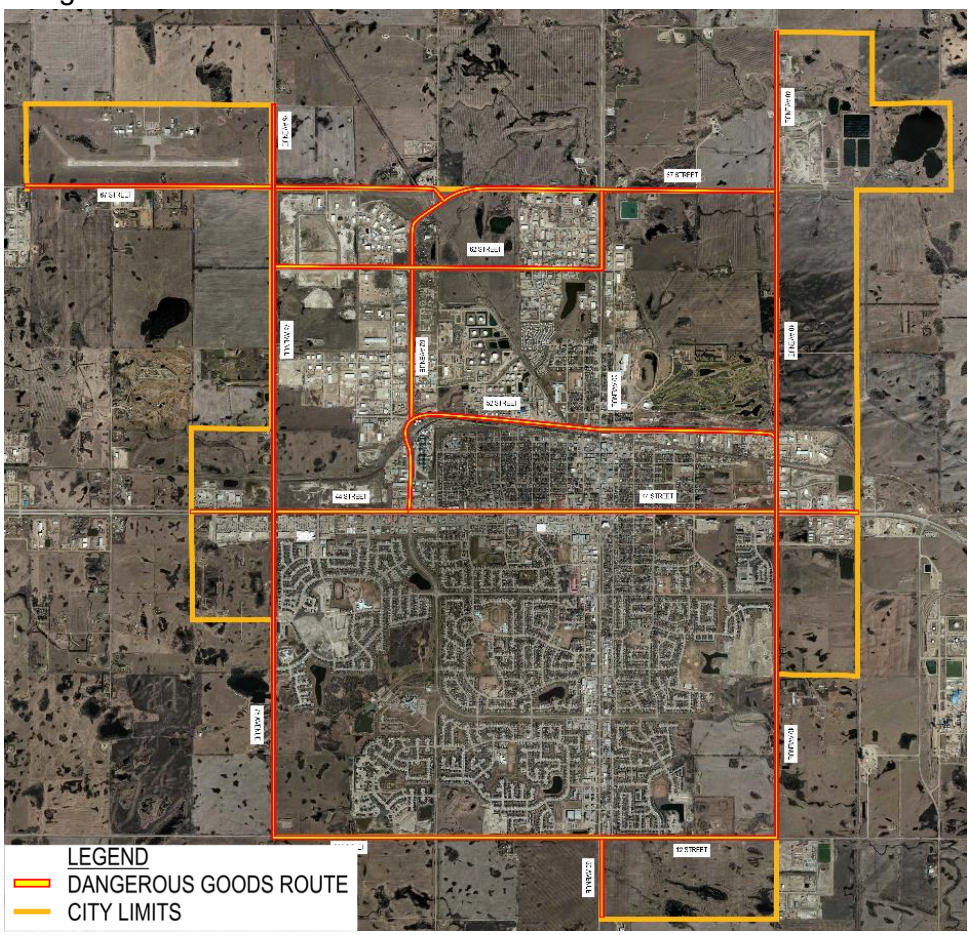

Figure 6 – Recommended Dangerous Goods Routes Network

Recommended Signage Plan

As part of the recommendations for dangerous goods route and truck routes, a regulatory and directional wayfinding signage plan was developed to support the implementation of the recommended dangerous goods routes and truck routes and assist the City in determining

the number of signs required to accurately sign the dangerous goods route and truck route network.

A best practice review was conducted to determine existing best practices for dangerous goods route and truck route signage placement. The two (2) documents that were reviewed were the Government of Alberta's Guidelines for the Establishment of Dangerous Goods routes in Alberta Municipalities and the Transportation Association of Canada's Manual of Uniform Traffic Control Devices for Canada (MUTCD) Fifth Edition.

The recommended dangerous goods route and truck route networks were used as the base of the signage plan to determine potential signage locations along all routes. During the creation of the signage plan for the City's dangerous goods routes and truck routes the following items were considered:

- Recommended dangerous goods routes and truck routes,
- Locations of major intersections along the routes,
- Key decision points along the route,
- Locations with route changes from the previous truck route and dangerous goods route networks; and
- Distance traveled between signs.

A field level review of signage placement was completed to gain an understanding of how the MUTCD guidelines could be applied within municipal boundaries. The field level review was conducted within the City of Edmonton and observations were made as to the order of the signs when placed on a post as well as the location of the restricted route signs in relation to the twenty-four (24) hour route signage. The field review found that when the dangerous goods routes and truck routes are the same, the dangerous goods route sign is located above the truck route sign and the directional arrow tab is located below the truck route sign. The required signs for the City signage plan include the permissive and prohibitive truck route and dangerous goods route signs as well as the directional arrow tab, "LOCAL TRUCK TRAFFIC ONLY" signs, restricted time of day signs, and the "END" signs.

Proposed Bylaw Amendments

Proposed bylaw amendments were prepared for the City in order to ensure that the Traffic Bylaw and the Transportation Systems Bylaw are in sync with the proposed network changes as recommended in the Dangerous Goods Route and Truck Route Establishment Study. It was recommended to separate the truck routes and dangerous goods route information from the Weights and Size Loads section of the Traffic Bylaw as well as having additional maps and definitions of terms included to provide more clarity around the routes. The route descriptions in a schedule of the Transportation System Bylaw were recommended to be updated to reflect the new routes. As the schedule has not been recently updated it was also recommended that a holistic review and potential rewrite be completed to ensure the Transportation Systems Bylaw contains the most current information.

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