

THE CITY OF EDMONTON'S RISK ASSESSMENT GUIDELINES FOR LAND DEVELOPMENT

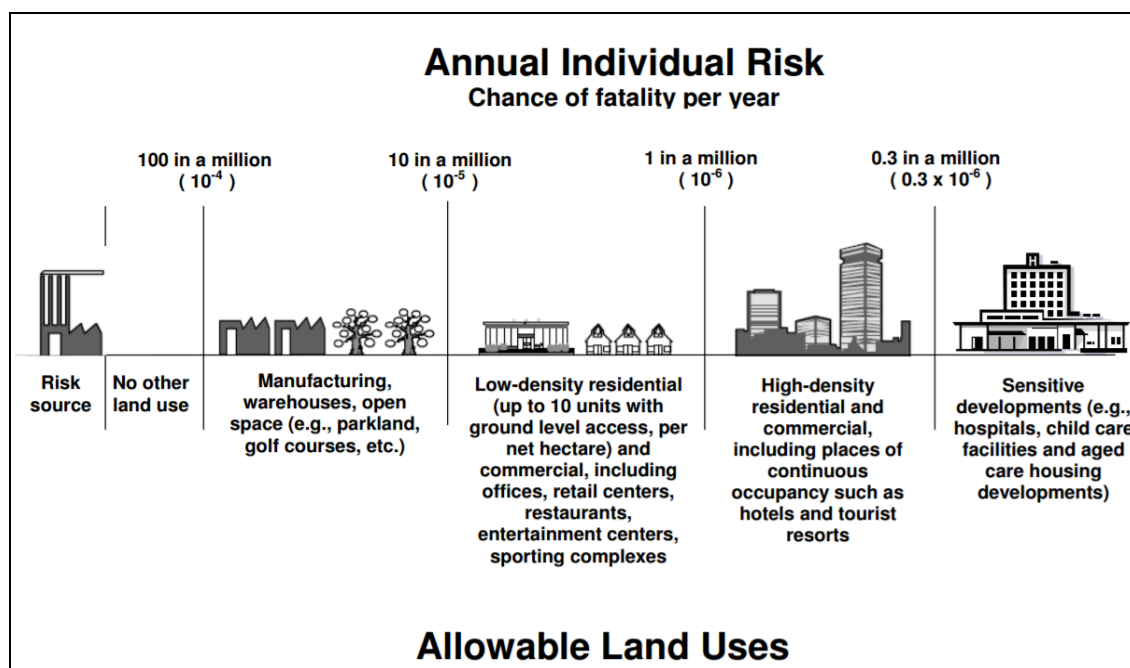
WHAT IS RISK AND WHAT IS A RISK ASSESSMENT

Risk is the probability of the occurrence of an event multiplied by the consequence of that incident. Here it refers to the risk of human fatalities as a result of an incident. A risk assessment evaluates the likelihood of an undesired event, the impact on public safety in terms of risk of fatality, the adequate separation of incompatible land uses, and the evaluation of appropriate responses or ways to decrease the effects of the undesired event if necessary.

THE ROLE OF A RISK ASSESSMENT

Risk assessments evaluate the threshold for safety for a particular land use or development in a specific location relative to sources of risk. Risk assessments can confirm whether a development should be located where it is being proposed or if additional measures need to be implemented to ensure public safety. The risk threshold is variable depending on the proposed development or land uses, which range from industrial and commercial to sensitive uses according to Major Industrial Accidents Council of Canada (MIACC) as shown in Figure 1.

Figure 1: MIACC annual individual risk threshold for allowable land uses



WHY A RISK ASSESSMENT IS REQUIRED

Land use planning and appropriate technical studies including risk assessments are key tools to mitigate risk and improve public safety. The City of Edmonton's Municipal Development Plan (Section 9.4: Risk Management) requires a risk assessment as part of the approval process in situations where there is a distance of 1.5 km between land that is planned for heavy industry or contains oil and gas facilities/corridors, and residential and selected institutional uses. This has since been reduced to 0.5 km in most cases based on in-depth risk assessments conducted by

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the City of Edmonton. It is a requirement to complete risk assessments at the planning (plan adoption or rezoning) stages and not to defer them to the development permit stage, in order to determine the full suitability of the proposed land uses for an area. However, for sites with approved zoning, the Zoning Bylaw Sections 14.6 and 14.9 further outline regulations on and steps to complete risk assessments at the development application stage in order to determine whether the site is suitable for the full range of uses or developments that are being proposed.

WHERE AND WHEN A RISK ASSESSMENT IS REQUIRED

A risk assessment may be requested when the new or existing use proposal creates a potential risk or when the new or existing use proposal is within the proximity of existing land uses that have the potential to create risk. Risk assessments are typically required for applications where proposed sensitive uses are in proximity to sources of risk:

- Sources of risk include heavy industrial development, dangerous goods corridors (roads and railways) and dangerous goods pipelines
- Sensitive uses typically include those with large gatherings and assemblies of people, those with an occupation over extensive periods of time, those that have sensitive populations like daycares, those that provide emergency response services and critical infrastructure, and those that are hard to evacuate due to mobility challenges like hospitals

Risk management and reduction can be achieved through the effective separation and removal of sensitive land uses close to risk sources, as well as mitigation measures such as design and placement of buildings, provision of buffers like heavy walls or berms, consideration of shelter factor or occupancy levels (Individual Specific Risk), and establishment of evacuation routes.

WHO DETERMINES THE REQUIREMENTS AND APPROVAL OF RISK ASSESSMENTS

The City of Edmonton's Urban Form and Corporate Strategic Development (UFCSD) determines when land development applications (new plans and amendments, and rezonings) and development permits require a risk assessment as part of the application process. A risk assessment should be prepared, signed and stamped by a registered and self-regulated professional or engineer. UFCSD reviews risk assessments and must be satisfied with the findings of the assessment.

STEPS TO COMPLETE A RISK ASSESSMENT

The applicant or proponent needs to complete either a limited scope or complex risk assessment on the basis of the proposed land use(s) and/or scale of development (small versus large gatherings of people), the source(s) of risk or changing source(s) of risk (like new cargo transported by rail), and the proximity of the proposal to the source of risk. A risk assessment need only be complex enough to demonstrate that the risk associated with the risk source does not pose undue harm to citizens.

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A **limited scope risk assessment** is done for a proposed land use or development that may include residential or sensitive uses. The subject site is typically in proximity to one source of risk, such as dangerous goods rail or road, pipeline(s) or a heavy industrial facility. The scale of the proposal is likely for a smaller intensification of the site uses or development. Enough analysis has to be provided to show that the risk threshold is acceptable for the proposed use and the reason why this is the case. For example, if the probability analysis proves low based on the likelihood of initiating events (Step 4) then there may be no need to complete additional analysis.

A **complex risk assessment** is done for a proposed land use or development that typically includes multiple sources of risk, large-scale sensitive development proposals in close proximity to sources of risk, and no previous risk assessments in the vicinity.

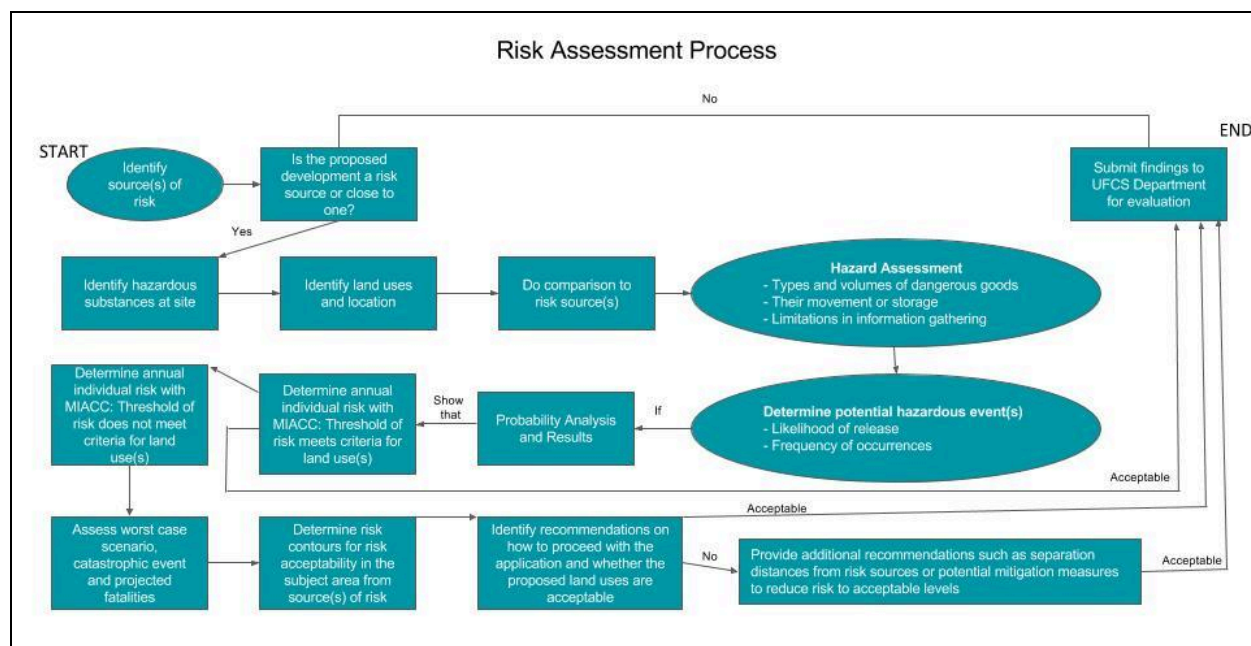
In both the limited scope and complex risk assessment analysis, a short summary of the findings may be sufficient, and can be submitted if the conclusion is that the risk is minimal. The City of Edmonton may ask for additional information upon evaluation of the risk assessment.

1. Identify the **source(s) of risk**. If the proposed development is a risk source, identify any hazardous substances on the site and the quantities of the substances.
2. Identify the **proposed land use or development application**, and the location of the proposal in comparison to the risk source(s).
3. Provide a **hazard assessment**, including types and volumes of dangerous goods, their movement, and any limitations in obtaining this information.
4. Estimate the **likelihood of release** or expected frequency of occurrence of a hazardous event. If this probability analysis is less than the threshold for risk based on the likelihood of the initiating event, there is no need to do the following consequence analysis. This may be enough information for the completion of a limited scope risk assessment. Proceed to Step 9 in this case.
5. Assess the **possible consequences** of a hazardous event, including the worst credible and catastrophic release consequence, and the probability of fatalities. For example, this may include the type of failure, description of event (gas release, explosion, fire), scale of event, area of impact, extent of exposure to hazardous materials, the routes through which risk exposure occurs, characterization of harm, the number of people affected, expected property damage, impact on environment, mitigating factors and duration of event.
6. Determine the **annual individual risk** by multiplying the frequency and consequence. Compare it to the MIACC risk acceptability threshold. For example, the annual individual risk for allowable land uses is the chance of one fatality per year in a million for a high-density residential use.
7. Include a **risk contour** from the source of risk for the applicable annual risk acceptability threshold on a map if appropriate.
8. Identify and recommend risk-based separation distances and/or buffers and other **mitigation measures** to reduce risk to an acceptable level for the land use. This could include the design

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of site and building to address source(s) of risk. Additional measures could include the reduction of risk at its source, including the siting of facilities, modifications to processes, conformity to legislation such as the Dangerous Goods Act, monitoring and training. This is typically done for heavy industrial proposals.

9. Submit the [risk assessment findings](#) and conclusion to the City of Edmonton for evaluation, which should include information on whether the proposed development or land use(s) are suitable for the site.



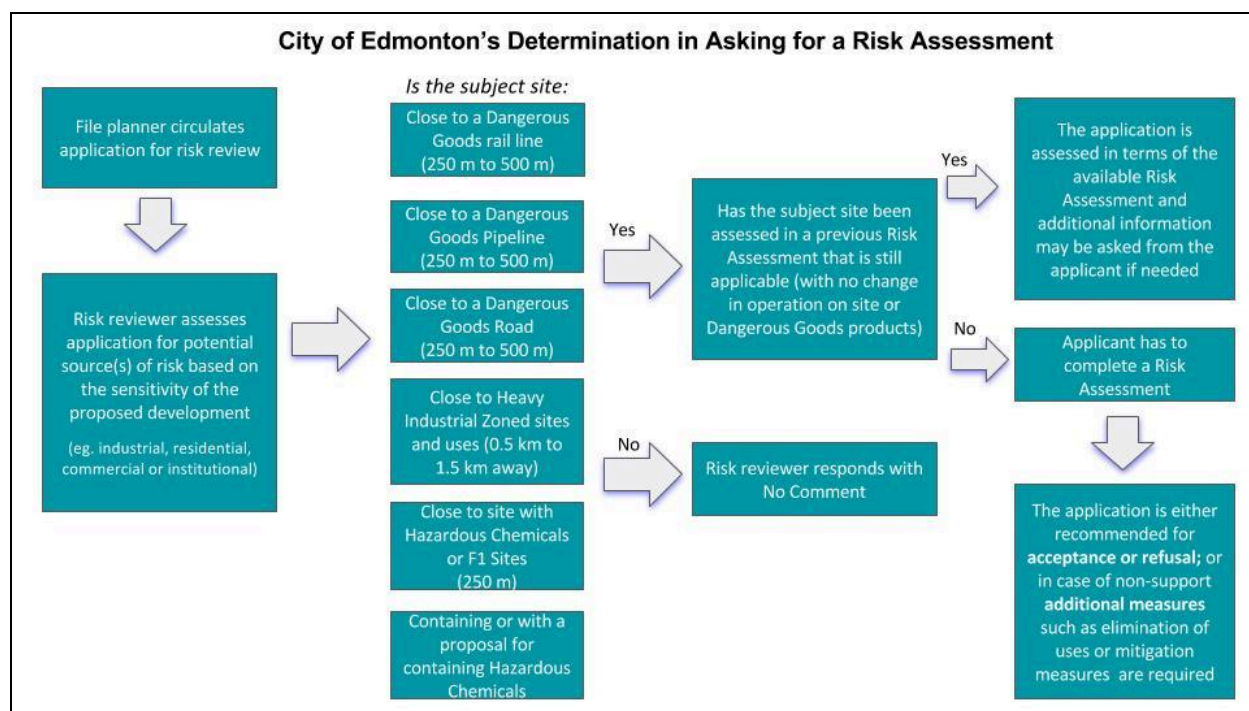
SOURCES OF RISK IN EDMONTON FOR WORK ON RISK ASSESSMENTS

There are a number of risk sources in Edmonton that should be reviewed and included as part of a risk assessment. The risk sources are part of the process in determining whether a risk assessment is needed:

- Proximity to dangerous goods rail lines - Contact rail companies
- Proximity to dangerous goods pipelines - Contact companies operating natural gas, high pressure gas or crude oil products
- Proximity to dangerous goods routes and roads - See edmonton.ca/transportation/RoadsTraffic/Apr2015_CoE_Truck_Route_Front_map.pdf and edmonton.ca/transportation/RoadsTraffic/Apr2015_CoE_Truck_Route_Back_map.pdf
- Heavy industrial operations - Contact companies or associations representing heavy industrial developers such as Strathcona Industrial Association

The next page contains a diagram showing how City of Edmonton evaluates applications during risk review and when it asks for risk assessments.

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FURTHER GUIDANCE

Urban Form and Corporate Strategic Development Department is available to meet and discuss with proponents of development when a risk assessment is required in order to provide direction and clarification. For additional information, please contact Kenan Handzic at kenan.handzic@edmonton.ca or 780.496.6193.