

Enbridge Liquid Pipelines Risk Management Overview

Risk Management



Dan Ferguson
Supervisor, Risk Management Services
Enbridge Pipelines Inc.



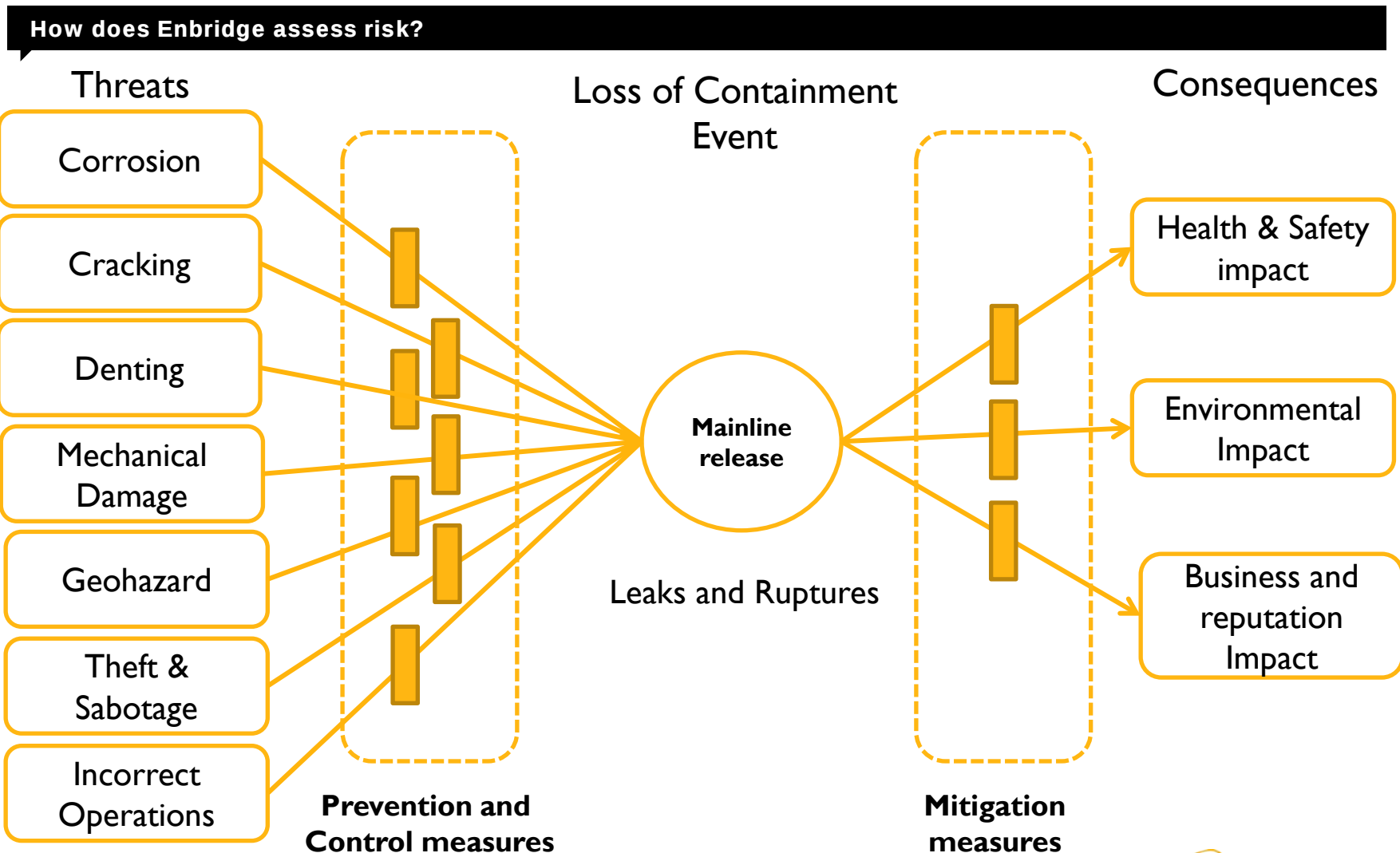
Topics

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1. How Enbridge Assesses Risk
 2. Understanding High Consequence Areas
 3. Valve Placement Basics

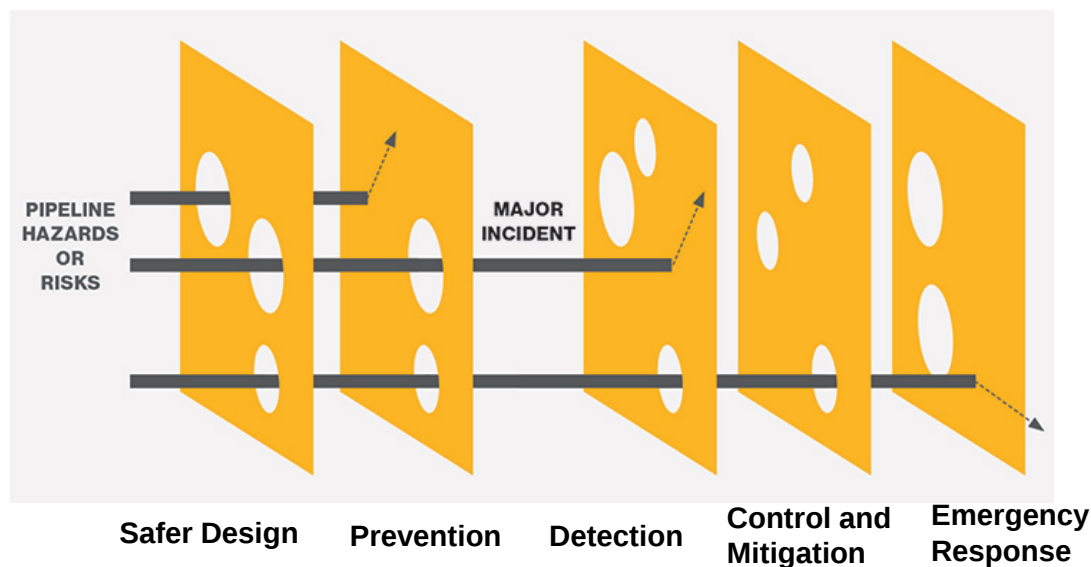
How Enbridge Assesses Risk

7	I	I	II	IV	IV	IV	IV
6	I	I	I	II	IV	IV	IV
5	I	I	I	II	II	IV	IV
4	I	I	I	II	II	II	IV
3	I	I	I	II	II	I	II
2	I	I	I	I	II	I	I
1	I	I	I	I	I	I	I
	1	2	3	4	5	6	7

Enbridge risk management program



Enbridge risk management program



Preventative Measures

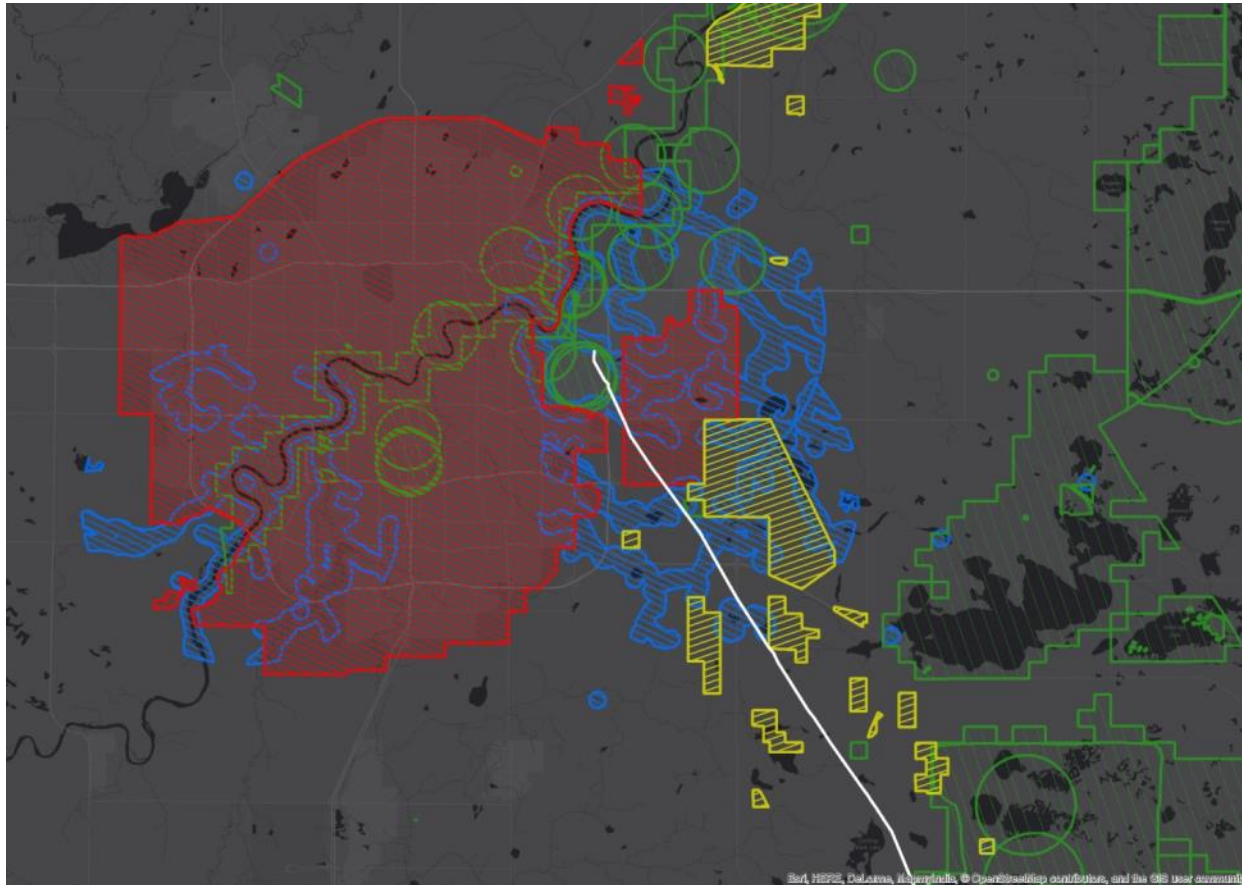
- Inherently safer design and construction
- Public Awareness
- Damage Prevention
- In Line Inspection
- Preventative maintenance
- Right of Way Monitoring

Response Measures

- Leak Detection
- Control Center
- Remote Controlled Valves
- Emergency Response

Understanding HCAs

High Consequence Areas

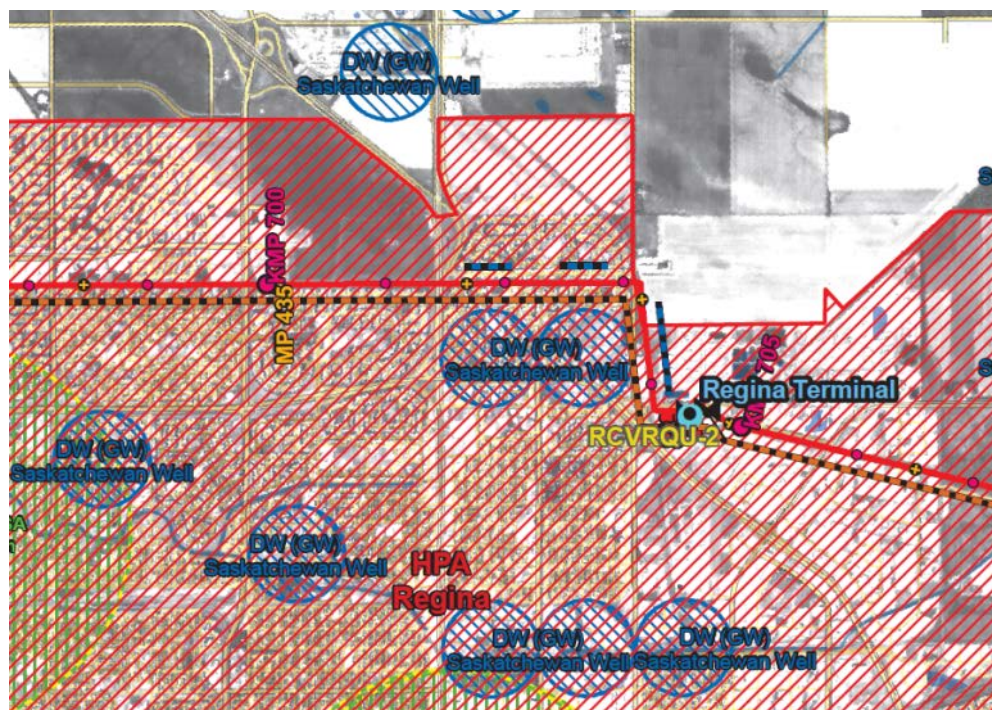


5 HCA types

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- **HPA** = High Population Area
 - **OPA** = Other Populated Area
 - **ESA** = Environmentally Sensitive Area
 - **DW** = Drinking Water
 - **CNW** = Commercially Navigable Waterway

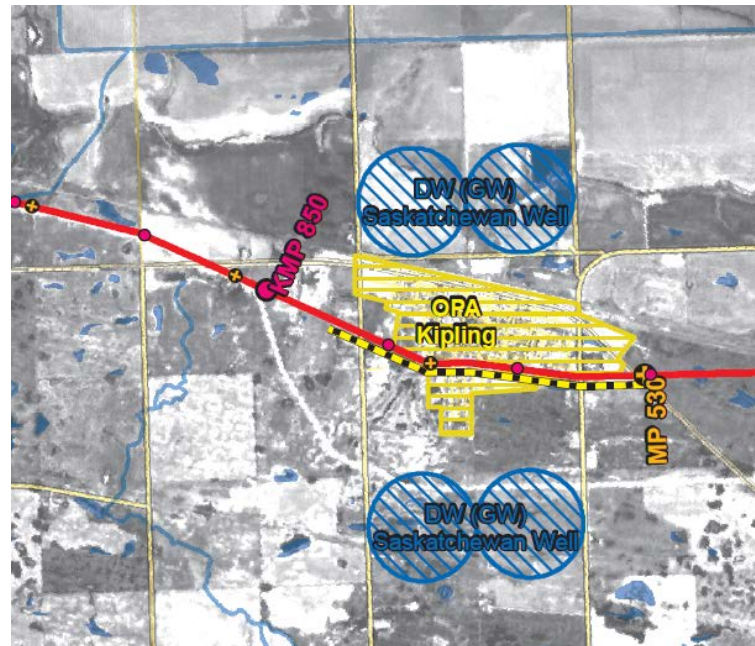
High Population Area (HPA)

- Captures large municipalities with a population greater than 50,000 people, and a density of $\geq 1,000$ people/mile²
- Examples of HPAs:
 - Toronto, ON
 - Regina, SK



Other Populated Areas (OPA)

- Identifies clusters of population that do not meet the criteria of an HPA, but are still of concern
- OPAs must have a density of ≥ 46 dwellings within 0.64 km^2
 - This density is based off the class location definition for Class 3 Areas
- Examples of OPAs:
 - Kipling, SK
 - Morden, MB



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- The left map shows the proposed rail alignment (red line) starting at Strome Station and heading southeast. It passes through a green hatched area labeled 'Alberta-Brownhead ESA' and 'Important Bird Area'. Key points marked include 'MP 70' and 'MP 110'. The right map shows the alignment continuing from Mildren T.O. Station, passing through a green hatched area labeled 'Important Bird Area Barber Lake'. Key points marked include 'MP 165' and 'MP 200'. A 'DW (GW) Saskatchewan Well' is also indicated near the station.

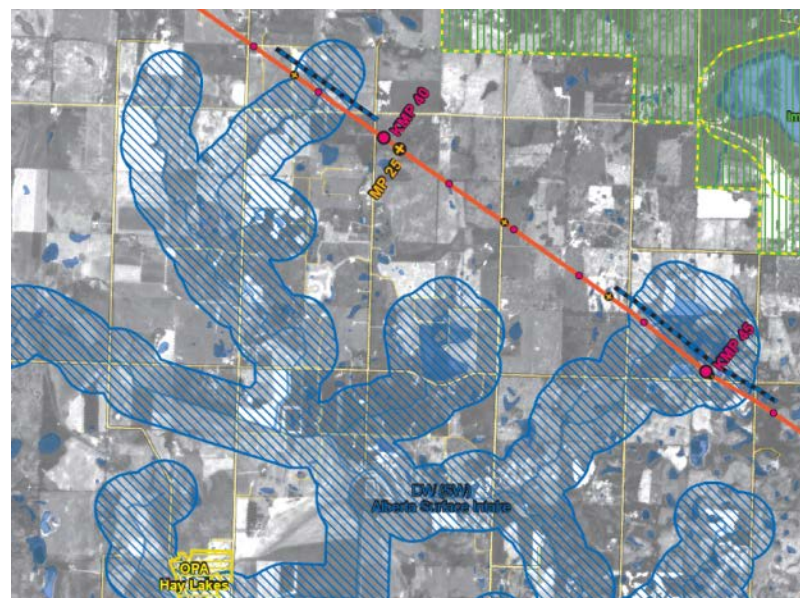
Code of Federal Regulations definitions - ESAs

- 49 CFR 195.6 ([link to eCFR](#))

- (b) An USA ecological resource is:
 - (1) An area containing a critically imperiled species or ecological community;
 - (2) A multi-species assemblage area;
 - (3) A migratory waterbird concentration area;
 - (4) An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or an imperiled ecological community where the species or community is aquatic, aquatic dependent, or terrestrial with a limited range; or
 - (5) An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or imperiled ecological community where the species or community occurrence is considered to be one of the most viable, highest quality, or in the best condition, as identified by an element occurrence ranking (EORANK) of A (excellent quality) or B (good quality).

Drinking Water (DW)

- Identifies the location of water wells / intakes used for human consumption
- Includes both groundwater sources (e.g. Class I/II or karst aquifer) and intakes from surface water (e.g. municipal intake from a lake, river, stream)



Commercially Navigable Waterways (CNW)

- Indicates the presence of large rivers or shipping lanes where the presence of commercial watercraft is likely
- Includes barges, commercial fishing vessels and ferries

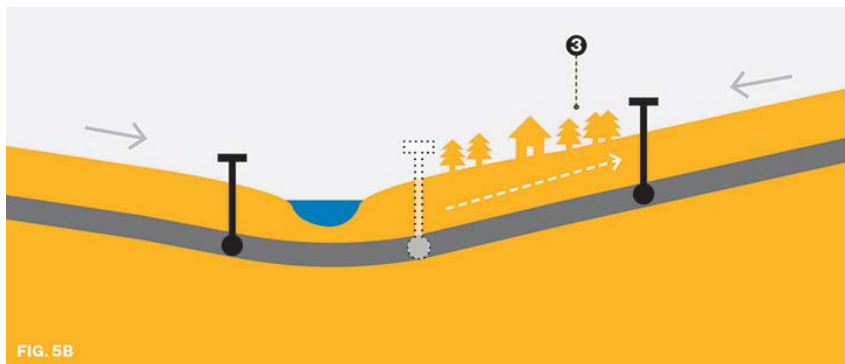
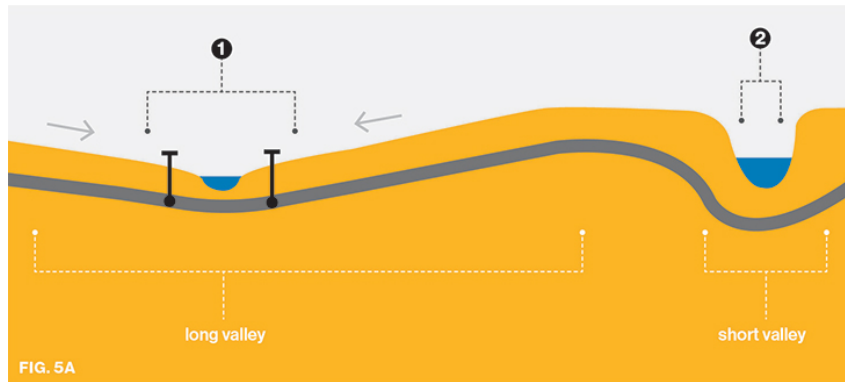




Valve Placement Basics



Understanding Valve Placement



- Isolation valves are used to halt the flow of crude oil and other liquids
- Enbridge's valve placement methodology considers the topography when determining the optimal placement of valves
- Valves are placed where they will provide the maximum benefit for protecting water crossings and high-consequence areas (HCAs),
- Before a valve can be placed other factors must be taken into consideration, such as: the location of flood plains, land ownership, accessibility, and geotechnical limitations.

Valves

Understanding Valves

— Valves Do NOT:

- Prevent a release from occurring
- Prevent oil from reaching water courses in the event of a release
- Provide any mitigation for small leaks

— Valves Do:

- Isolate a section of the pipeline
- Reduce the volume released once a rupture has been detected, the pumps have shut down and valves have been closed
- Help minimize the impact to HCA's and water crossings
- Increase likelihood

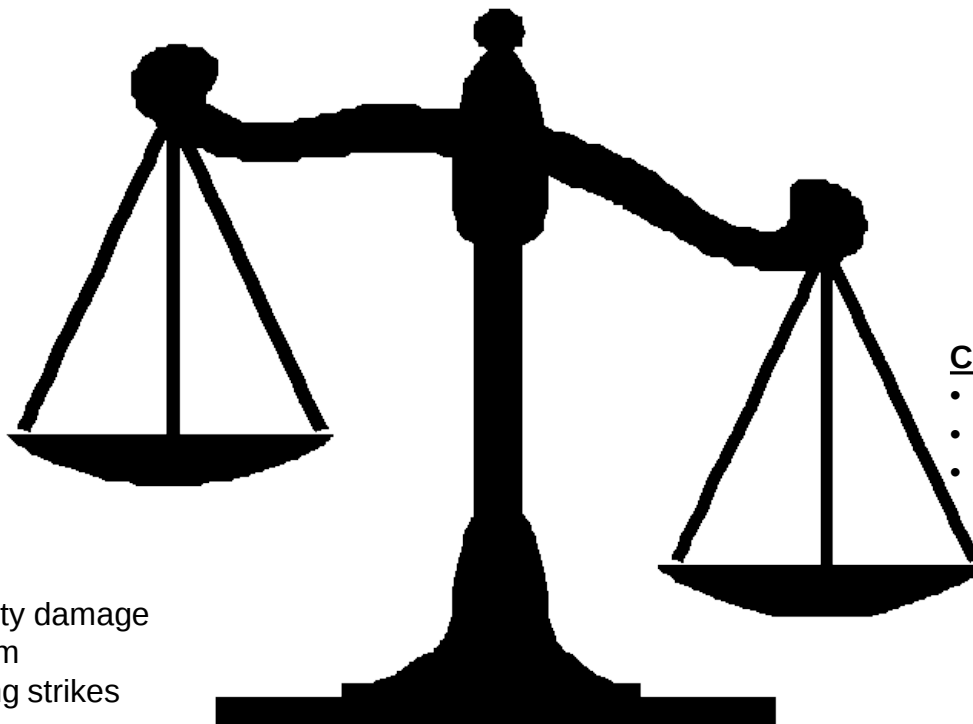


Balancing Risk

- $RISK = Likelihood \times Consequence$
- Valves are very effective at reducing Consequence, however valves sites also increase likelihood – therefore the proper balance is required to manage the risk.

Likelihood

- Leaks
- Cracking
- Third party damage
- Vandalism
- Lightning strikes



Consequence

- Volume out reduction
- Protect water courses
- HCA protection

Valve placement criteria

