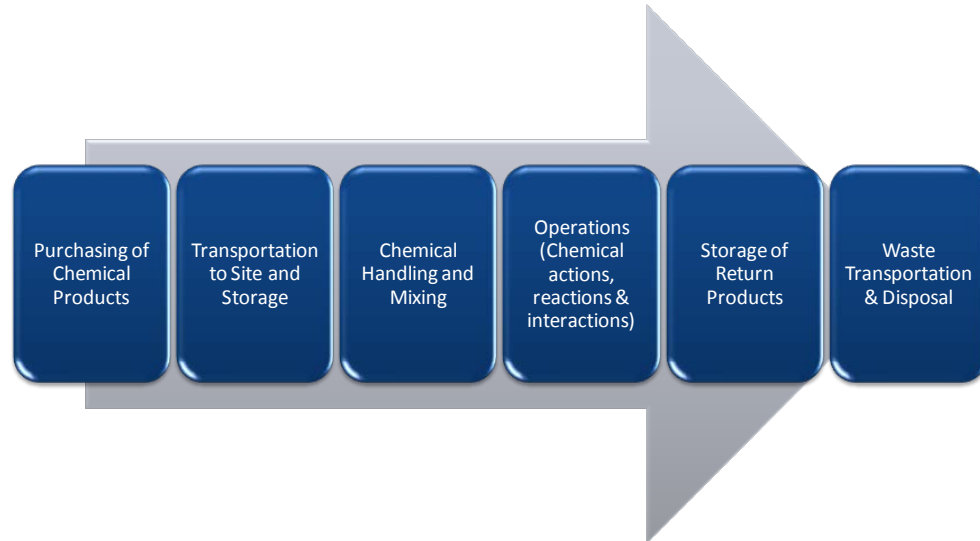


# Hydraulic Fracturing Hazard Assessment

## 7-step Approach

### 1. Identify Operations that Involve Chemical Exposure

To complete the chemical hazard assessment, it is important to consider the full range of operations as highlighted in the diagram below:

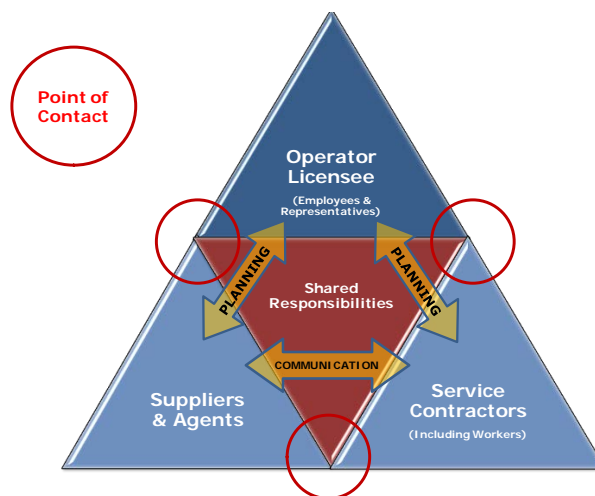


### 2. Identify and Confirm Responsibilities for Chemical Control and Use

It is important to work closely with both contractors and suppliers during the planning and design of well operations. Primary responsibilities include:

- Identification of chemicals required to achieve drilling objectives
- Provided chemical hazard information.
- Assess potential hazard and recommend alternate products as required.

### Key Stakeholders in Chemical Hazard Assessment Process



### 3. Identify the Potential Chemical Exposure Hazards

Ensure each of the chemicals proposed for use is identified. The Chemical Listing must include a complete inventory of the chemicals proposed for use and copies of the Material Safety Data Sheets (MSDS) for each of the chemicals obtained from the supplier.

### 4. Assess the Chemical Hazards.

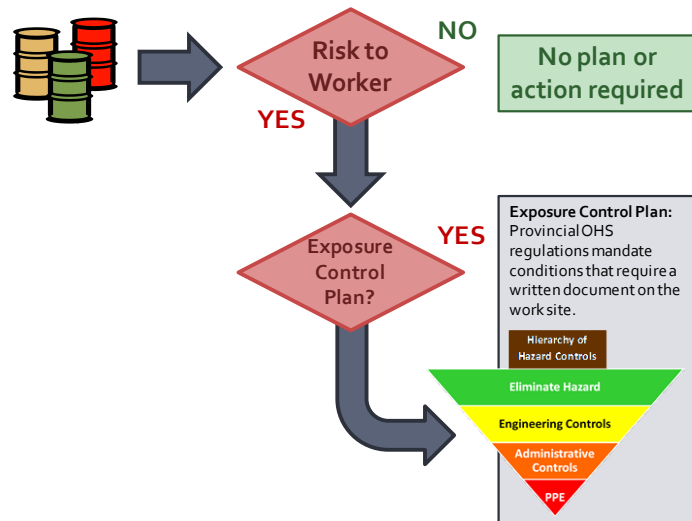
To complete the hazard assessment, consider the risk to workers, the public and the environment. While each of these are important, the risk to workers is a critical consideration in that contractors have the potential of being directly exposed to chemicals if required to handle chemical products during well operations.

Chemical risk assessments must consider the following three elements:

**Source:** The location of a contaminant in, on or under the land that has the potential to cause harm to human health, water resources or the wider environment.

**Pathway:** The means or route by which a source of contamination can migrate so that an identified receptor can be exposed to, or be affected by an identified source.

**Receptor:** Something which could come to harm, including human health, water resources, surface water courses or the wider environment.



### 5. Evaluate and Analyze the Chemical Hazards

The overall assessment needs to consider both human and environmental risks using the risk phrases identified by each MSDS. A summary of the key concepts and processes used to evaluate and analyze chemical hazards is described in the *Enform Planners Guide*.

### 6. Decide on the Hazard Control Approach

As part of the overall process, consider the hierarchy of hazard controls. More specifically, preventive and control measures are normally implemented according to the following priorities:

- 1) Eliminate the hazard;
- 2) Substitute with other materials, processes, or equipment;
- 3) Use engineering controls;
- 4) Use safer work systems that increase awareness of potential hazards;
- 5) Provide administrative controls, such as training and procedures; and
- 6) Provide personal protective equipment, including measures to ensure its appropriate use and maintenance.

As part of the overall process, it is important to also complete a detailed suite of hazard assessments based on Interim IRP #24 guidelines. Hazard assessments should consider:

- Geological Hazard Review
- Wellbore Integrity Review
- Frac Operations Review

Based on these reviews, a summary risk register can be developed to assist field operations personnel.

## 7. Confirm that the Controls Work.

Integral to any effective plan is establishing the appropriate monitoring process to confirm that the controls are working as planned. This includes identifying required monitoring processes. A key element to this will be the Management of Change (MOC) process: that is, consider the impact of any decisions to change chemical additives. The key components of an MOC process are highlighted in the adjacent figure.

