ERCB Stakeholder Feedback—ERCBH2S, Version 1.20

Stakeholder Feedback 1

According to ERCBH2S Volume 2: Emergency Response Planning Endpoints, section 8.2 p. 46-48: the ERCB EPZ (100 ppm for 60 minutes) is protective of unconsciousness, based on the uncertainty factor (UF = 759). In addition, according to the table and the discussion of uncertainty factors in 8.2, the PAZ (130 ppm for 60 minutes) is also protective of unconsciousness (UF = 300). However, the summary on page ii states "…the ERCB EPZ Endpoint is very protective of lethality and unconsciousness".

This creates some confusion as to what the ERCB EPZ endpoint is really protective of.

Comment	ERCB Response
Is it lethality or is it unconsciousness?	Based on the research literature the EPZ endpoint is protective of unconsciousness. Therefore by definition it will also be protective of lethality as it is set to a lower toxic load. As well as the endpoint, there are other conservative assumptions within the EPZ calculation that provide for added conservatism. When the ERCB revised ERCBH2S as detailed in *Bulletin 2009-041*, the technical reference documents (Volume 1-3) were not updated, and past definitions/information was available on outdated model versions. With the release of the finalized ERCBH2S Version 1.20, these reference documents will be undated and revised to reflect the models.
If the EPZ endpoint is unconsciousness, then why are both the PAZ and the EPZ endpoints unconsciousness but at different concentration/time levels?	The PAZ endpoint is protective of unconsciousness. The EPZ endpoint is protective of unconsciousness by ~2.5 times toxic load (i.e., a health endpoint less than unconsciousness). The ERCB unconsciousness endpoint (i.e., the PAZ endpoint) was derived from rat/mice lethality data and extrapolated towards humans with a significant extrapolation factor applied, that the ERCB believes is very conservative. The EPZ endpoint further includes an additional *safety factor* that the ERCB Board decided to apply.
If the EPZ endpoint is lethality, then there is an apparent disconnect between the EPZ and PAZ zones where it appears that, as the zones are drawn, the population is protected from death (a more serious health endpoint) further out than they are protected from serious and irreversible health effects as represented by unconsciousness.	There is no disconnect between the EPZ and PAZ endpoints. The PAZ endpoint is protective of unconsciousness. The EPZ endpoint is protective of unconsciousness by ~2.5 times toxic load (i.e., a health endpoint less than unconsciousness).

Comment	ERCB Response
As we understand it, the PAZ protects against "life threatening or serious and possibly irreversible health effects" (ERCB *Bulletin 2009-41*, page 2). If this is the case and if unconsciousness is indeed the health endpoint for the PAZ, how was the decision made that unconsciousness is the most appropriate "life threatening or serious and possibly irreversible" endpoint for calculation of the PAZ rather than respiratory, ocular, neurological or other effects?	The ERCB set its PAZ based on a non-unconsciousness endpoint as the purpose is to protect public safety (i.e., prevent unconsciousness that could prevent escape or sheltering) during an emergency. The toxic load, which is used to define the PAZ endpoint, is adjusted from the animal toxicity data (i.e., no deaths and no unconsciousness in test animals).

Stakeholder Feedback 2

Configuration of EPZ and PAZ: Our assessment and comment on the apparent configuration of the EPZ and PAZ in the draft D071 is contingent upon on the ERCB response to the previous toxicology concerns. Therefore, the following may not apply. However, based on our current reading of draft D071, the PAZ zone is a subset of the EPZ, lying within the EPZ. In ERCB *Bulletin 2009-41*, the ERCB indicates that this configuration is aligned with that of other jurisdictions.

However, this configuration is in apparent contradiction to what is indicated by other jurisdictions. Using Transport Canada as a jurisdictional example, CANUTEC indicates the IIZ (the ERCB equivalent to this is the EPZ) is an area of downwind life threatening concentrations and the PAZ is a larger area of incapacitation and serious or irreversible health effects. That is, the CANUTEC zone of serious or irreversible health effects is larger (not smaller) than the zone of lethality.

Although the ERCB uses some of the same nomenclature as CANUTEC, the definitions are different. The ERCB IIZ is an indoor concentration whereas for CANUTEC it is outdoor. Thus, the Transport Canada/CANUTEC definition of IIZ as an outdoor zone of life threatening heath effects is equivalent to the ERCB EPZ. The ERCB definition of IIZ is that it is the indoor zone of life threatening health effects. Transport Canada/CANUTEC has no equivalent to the ERCB definition of IIZ. Most significantly, the CANUTEC zone of serious and irreversible health effects is outside the lethality zone, which is opposite to the ERCB. We support the ERCB inclusion of an indoor zone.

- IIZ: an area surrounding the incident in which person may be exposed to dangerous (upwind) and life threatening (downwind) concentrations of materials. The distances show the areas likely to be affected during the first 30 minutes after the materials are spilled, and this distance could increase with time.
- PAZ: an area downwind from the incident in which persons may become incapacitated and unable to take protective action and/or incur serious or irreversible health effect.

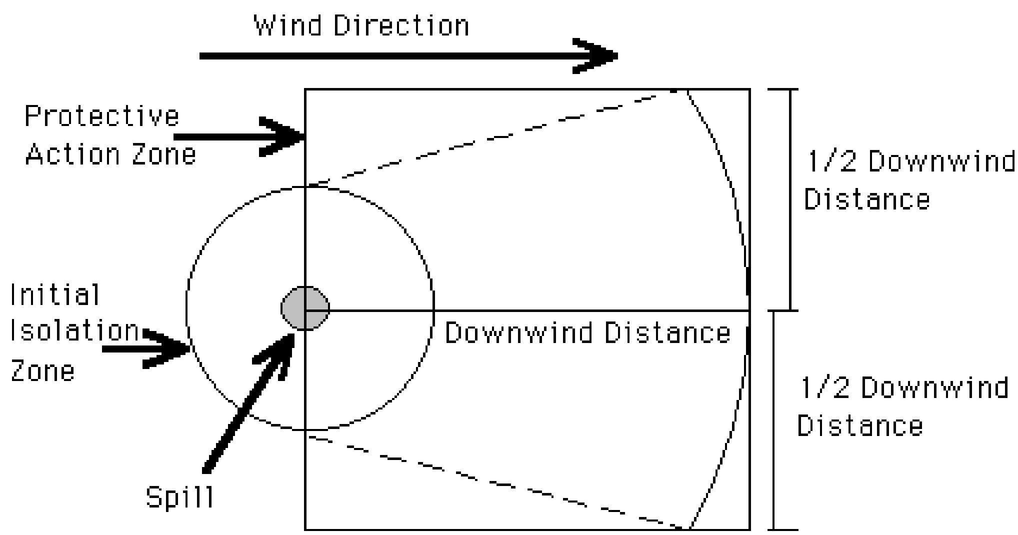

Figure 1. Illustration of IIZ and PAZ (Transport Canada)

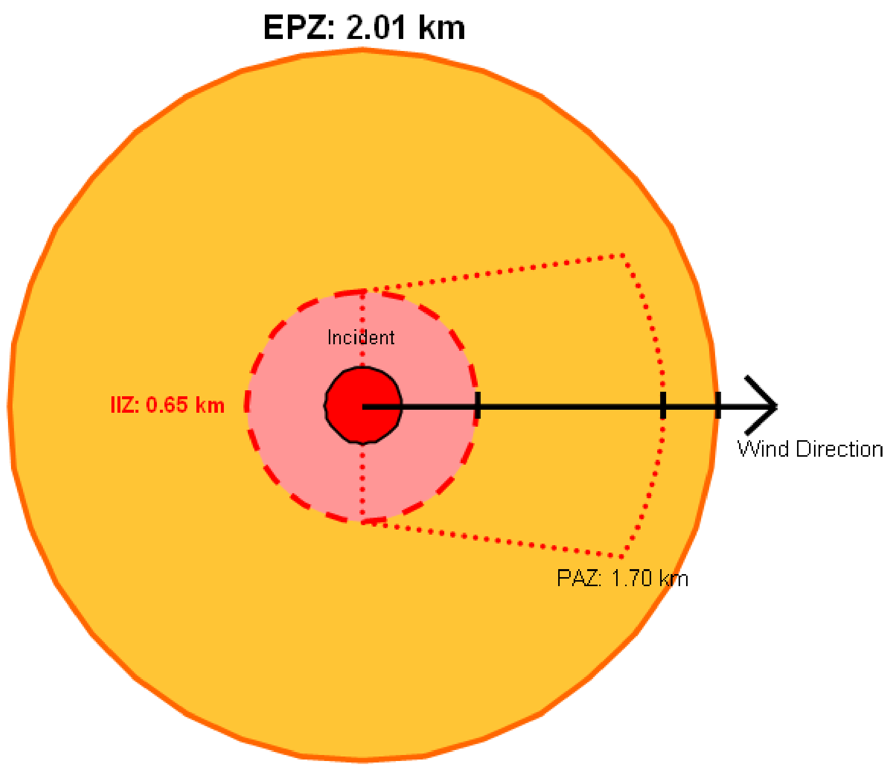

Figure 2. Illustration of PAZ and EPZ (ERCB)

Comment	ERCB Response
We recommend review and comparison of jurisdictional emergency planning areas and definitions to those used by the ERCB to ensure functional alignment and clarity.	The ERCB configuration of PAZ (unconsciousness—which is more serious) and EPZ (unconsciousness by ~2.5 times toxic load—which is less serious) is aligned with that of other jurisdictions, such as the Transport Canada IIZ (life threatening—which is more serious) and the Transport Canada PAZ (incur serious or irreversible health effect—which is less serious). When the ERCB revised ERCBH2S as detailed in *Bulletin 2009-041*, the technical reference documents (Volume 1-3) were not updated, and past definitions/information was available on outdated model versions. With the release of the finalized ERCBH2S Version 1.20, these reference documents will be undated and revised to reflect the models.

Stakeholder Feedback 3

Conceptual Definition of PAZ: In draft D071 and the supporting documents, the purpose and definition of the PAZ are not clearly defined. In fact, there are several contradictory statements that could contribute to the present confusion regarding the PAZ and EPZ. Examples of these statements in D071 and supporting documents are provided below:

- On page 77 of draft D071, ERCB defines PAZ as “A response zone downwind of an incident where responders focus immediate public protection actions before or shortly after a hazardous release to protect the public from the risk of exposure.”
- The ERCB in *Bulletin 2009-41* provides the public a clearer understanding of PAZ, “*Directive 071* (November 2008 edition) defines the PAZ as “an area downwind of a hazardous release where outdoor pollutant concentrations may result in life-threatening or serious and possibly irreversible health effects on the public.”” (page 2)
- In the same paragraph, ERCB goes on to clarify and support the ERCB 2008 definition, “This definition is derived substantially from available literature on emergency response tools and is materially consistent with the PAZ definition used by several North American jurisdictions.”
- The ERCB on page 3 of *Bulletin 2009-41* commits in principle to clarifying the precise nature of the PAZ, “Additionally, the ERCB will publish errata to *Directive 071* to reflect the corrected endpoint of the PAZ and other related changes.”

As with the PAZ, there is a need for improved clarity and consistency in the definition for the EPZ. The following examples illustrate the confusion on the definition of the EPZ.

Page 74 of draft D071, the EPZ is defined as, “A geographical area surrounding a well, pipeline, or facility containing hazardous product that requires specific emergency response planning by the licensee.”

In ERCBH2S Volume 2, ERCB variously defines the EPZ as,

- "The ERCB EPZ Endpoint objective is to prevent lethality so the no deaths data was reviewed in more detail. A study that used unconsciousness in mice as the endpoint was also available to define a load that prevents unconsciousness." (page i)
- "to pre-plan priority responses within the emergency planning zone (EPZ)." (page i)
- As an areas to prevent both lethality and unconsciousness, "Emergency response actions are taken to prevent exposure to hydrogen sulphide (H_2S) near the release site which could result in immediate fatality. Further from the release site the concentration decreases until at the outer limit of the EPZ, as defined by the ERCB EPZ toxic load endpoint, the exposure should not result in unconsciousness." (page i)
- The ERCB EPZ is protective of both lethality and unconsciousness, with the unconsciousness endpoint as a subset of the lethality endpoint. That is, "The uncertainty factors required to produce the ERCB EPZ Endpoint is 759, about two and one half times the value of 300 supported by the unconsciousness data analysis. With this extra safety factor, exposure to H_2S at the ERCB EPZ Endpoint will not result in unconsciousness that would impair escape." And, in the following paragraph, "The H_2S exposure endpoints were also compared to two human exposure studies with high concentration exposures. The comparison showed that the proposed ERCB L50 probit parameters are based on reasonable uncertainty factors and that the ERCB EPZ Endpoint is very protective of lethality and unconsciousness." (page ii)
- "The ERCB EPZ criterion aims to prevent immediate fatalities from significant exposure to sour gas, ..." (page 46)
- "A ***three hundred-fold*** uncertainty factor is recommended for the ERCB EPZ to provide an adequate margin of safety. This accounts for adjusting animal lethality data to humans, people that might be more sensitive to H_2S exposure (e.g. children and the elderly), increased inhalation during an emergency and unconsciousness that would prevent escape or sheltering." (page 46)
- "The ERCB EPZ endpoint has been set at 100 ppm for 60 minutes with an exponent *n* of 3.5. Table 11 and Figure 9 compare the concentrations and time pairs defined by the toxic load for various uncertainty factors." (page 46)
- "The proposed ERCB EPZ endpoint is protective of unconsciousness in humans." (page 48)

Comment	ERCB Response
In draft D071 and the supporting documents, the purpose and definition of the PAZ are not clearly defined. In fact, there are several contradictory statements that could contribute to the present confusion regarding the PAZ and EPZ.	When the ERCB revised ERCBH2S as detailed in *Bulletin 2009-041*, the technical reference documents (Volume 1-3) were not updated, and past definitions/information was available on outdates model versions. With the release of the finalized ERCBH2S Version 1.20, these reference documents will be updated and revised to reflect the models.

Stakeholder Feedback 4

Comment	ERCB Response
Now that ERCBH2S 119 was released, a person can go back and back-calculate the 10 ppm potential evacuation distance (this can be out to say 9.00 km). When I look at Appendix 8, related to evacuation and sheltering criteria, one could infer that a person at 8.9 km could be directly effected. Once it was known that ERCBH2S had the ability to calculate the 10 ppm distance it is impossible to 'unknow' this information.	With the release of ERCBH2S Version 1.19 (update) and Version 1.20Beta, Version 1.19 became 'obsolete' and calculations using this model were not recognized by the ERCB. Should a licensee determine that an individual 8.9km (and assumed to be outside of an EPZ) could be directly affected should a release occur on its development it is prudent for the licensee to extend emergency response measures and procedures towards addressing this individual.

Stakeholder Feedback 5

Comment	ERCB Response
AOF determination can be based on flow up tubing if the completion is done in the production mode (meaning that a tubing and packer have been run in the well and the wellhead is installed before the completion is conducted). The table agrees with the current *Directive 071*. However, the words conflict with *Directive 56*, which states; Completion/servicing calculations may be adjusted for the effects of friction loss using the configuration of the pipe cemented in the hole, regardless of the type of completion (e.g., wellhead on). Or Interim Directive *ID 90-1*, which states: the maximum potential H_2S release rate which shall be calculated using the maximum wellhead natural gas deliverability that can be obtained at any time through the casing against zero wellhead pressure (unless other flow configurations result in a higher release rate), and shall be expressed in the units m^3/s at standard conditions. Although we agree with the principal in *Directive 071*, we believe that the ERCB should	As per Directive 56: Completion/servicing calculations may be adjusted for the effects of friction loss using the configuration of the pipe cemented in the hole, regardless of the type of completion (e.g., wellhead on). The completion/servicing H_2S release rate may be adjusted for the effects of friction loss. The wellhead AOF is affected by the value of sandface AOF, depth and well configuration, or the method used to complete/service the well. If completion/servicing operation is conducted with wellhead off, the wellhead AOF is calculated based on flow up casing. If completion/servicing operation is done with wellhead on (production mode), AOF is calculated based on flow up tubing. Using IPR instead of AOF, the same is applicable for oil wells as well. The ERCB notices the inconsistency of AOF determination between the *Directive 071* and *Directive 056*. This comment will be passed to the *Directive 056* review committee.

amend *Directive 056* for consistency and rescind the H_2S release rate determination section of *ID 90-1*. We also suggest that H_2S release rate requirements should be consolidated into a single directive.	

Comment	ERCB Response
Both *Directive 071* and Draft *Directive 071* state for Sour Oil Wells, Sour Water Disposal Wells and Sour Observation Wells: The EPZ is determined by the H_2S release rate and is calculated using the maximum expected H_2S concentration in the gas phase (at stock tank conditions), the maximum gas-to-liquid ratio for the fluids (at stock tank conditions), and the maximum liquid flow rate. The solution gas composition of the stock tank gas (15°C and 101.325 kilopascals [kPa], dry gas) is entered into ERCBH2S. For wells that cannot flow to the surface without mechanical assistance, the H_2S release rate is considered zero. These wells therefore do not require an ERP. We disagree with the principle that the maximum gas to liquid ratio (GOR) should be matched with the maximum flow rate to determine the theoretical maximum flow rate. High rate oil wells tend not to be the wells that have comparatively high GORs. Matching high GOR wells with the high oil rate wells will generate inappropriately high gas rates. In summary, the oil inflow capability of a well is affected by its GOR. Our position is reflected in the original *CAPP H2S Release Rate Assessment Guidelines* (November 26, 1998), which states: Wells which concurrently produce	The EPZ is determined by the H_2S release rate. Please see Directive 56 for details regarding the H_2S release rate calculation methodology. This comment will be passed to the *Directive 056* review committee.

gas from the gas cap usually have relatively low oil rates because of the high mobility of gas in comparison to oil. Nonetheless, wells which cone gas often exhibit the highest produced gas rates. Because the H_2S release rate potential is a function of the maximum produced gas rate, it is important to analyze the gas flow rates (or gas/oil ratios) for each offsetting well rather than focusing on the oil flow data only. Assigning a single arbitrary gas/oil ratio to calculated oil rates will usually result in inappropriate gas rate estimates as the gas/oil ratios will vary from well to well.

When analyzing the potential H2S release rate of an oil well, the company must indicate whether a gas cap may exist. Any well which may potentially encounter a gas cap must incorporate an assessment of the flow capability of the gas cap when determining the H2S release rate potential of the well. Conversely, if it can be established that the proposed well will not penetrate the gas cap, then flow rate calculations may be restricted to the oil leg.

Directive 56 also picks up the requirement to consider the gas cap. To consolidate the various concepts, the wording could be adjusted as follows:

Because the H_2S release rate potential is a function of the maximum produced gas rate, it is important to analyze the gas flow rates (or the oil rate times the gas/oil ratio) from the oil producing intervals for each offsetting well rather than matching oil flow data with gas/oil ratio data from independent wells. For wells that are drilled through a gas cap, the H_2S release rate potential for the drilling operations should incorporate an assessment of the production capability of the gas cap.

For wells that cannot flow to the surface without mechanical assistance, the H_2S release rate is considered zero. These wells therefore do not require an ERP.

The solution gas composition of

the stock tank gas (15°C and 101.325 kilopascals [kPa], dry gas) is entered into ERCBH2S." We recommend that *Directive 071* (or *Directive 56*) wording reflects the intent of the above statements, to more accurately represent the potential H_2S release rate associated with oil wells.	

Stakeholder Feedback 6

Comment	ERCB Response
Completion programs have been developed that allow the SCSSSV to be installed prior to the well being perforated and could take advantage of the 3 minute timing. The only way to do this now is to choose a Producing/Suspended case due to default model settings for Completions. Would the ERCB consider adding the 3 minute stop flow mitigation timing to the Completion case?	This suggestion will not be considered for ERCBH2S at this time. The Emergency Planning and Assessment Group will consider this for future versions of ERCBH2S. Licensees are required to use ERCBH2S models properly so that the calculations are reflective of the actual operating conditions/scenarios upon which the response zones were determined. Licensees should be prepared to defend and provide any documentation for all user selected inputs in the determination of the response zones, should the ERCB call in documentation supportive of the data used. Failure to provide such documentation or the provision of documentation that does not support the inputs used may be subject to enforcement.

Stakeholder Feedback 7

In accordance with ERCB *Bulletin 2009-32*, dated October 1, 2009, we hereby submit the results of recalculation of EPZ's associated with a representative sampling of the sour facilities it operates. This sampling is a repeat of facilities analyzed using the ERCBH2S V1.19 model with results submitted to the ERCB under a separate cover (Dec. 23, 2008).

As part of our review of the ERCBH2S (V1.20Beta) model, we maintained all input data and factors used during the review of the V1.19 version of the model. This was done to ensure consistency and integrity of the input data between both versions of the ERCBH2S models.

It should be noted to again repeat the selection criteria used during the review of ERCBH2S (V1.19) of the model. We operate over 3500 km of pipelines in Alberta. To gain a representative sample, the selection of facilities was based on a number of factors including operating conditions, pipeline size (length & diameter), licensed H_2S content and licensed operating pressure. A total of 17 pipelines were analyzed in preparing these results. The range in service conditions included licensed H_2S content from ppm levels to 30% in raw gas gathering and included several acid gas injection pipelines. A range of operating pressures was also included in the sample.

Comment	ERCB Response
Key findings from this analysis of the V1.20 model (Beta) were: 1) The model calculates a "**maximum** weighted hazard distance" for all planning zones, which on our review are the same planning zone results as calculated under the V1.19 version of the model. 2) On the sample pipelines reviewed approximately half of the emergency planning zones decreased in size when compared to existing planning zones (nomograph model). Conversely the other fifty percent increased in size by a factor of 1.5 to 2 times on average. These results are based on the use of planning zones determined by utilizing the "Probability Weighted Average" calculations. 3) Most means of mitigation continue to show minimal reductions or are ineffective in providing a meaningful reduction to planning zone sizes. 4) The most effective means of reducing EPZ continues to be achieved by minimizing the span between the low and high pressure shutdown settings on ESD valves. 5) It appears the new model continues to utilize an iteration calculation on pipeline failures due to largest undetected hole size, thus rendering existing ESD's with current instrumentation configurations (without Pressure Rate of Change [PROC]) ineffective. Fundamentally, the initial results utilizing a dispersion condition	**Response to Key Finding 1:** The ERCBH2S V1.20 (Beta) calculates the EPZ size based on the weighted probability of occurrence of the dispersion conditions. This weighted probability was based on data obtained from Alberta Environment's historical databases of meteorological occurrences. Using this meteorological weighting **reduces** EPZ sizes from previous versions of the model. The EPZ sizes calculated from the new version of the model are more reasonable and manageable. **Response to Key Finding 2-5:** The ERCB acknowledges the findings from your company and has being aware of these comments since the model was developed. These have been in the ERCBH2S Volume 1 Technical Reference Documents. **Response to Key Finding 6:** The purpose of ERCBH2S is to determine an approximate hazard area for a sour gas release on which to base an emergency response plan. The ERCB considers that the ERCBH2S model is calculating sour gas release and subsequent dispersion properly over arrange of viable scenarios. This is based on ERCB data, valve configurations (fundamentally valves do not close instantaneously and time is taken reach a trigger point that is dependent on the leak size which is then reflected in the hazard distance) and dispersion conditions that has been weighted-averaged in accordance with Alberta Environment historical data showing the likelihood of each event occurring. a) The ERCB appreciates the operational constraints that may preclude operational changes that will result in smaller hazard zones. However, the intent of ERCBH2S models is not to promote or deter the placement of ESDVs within a system, thus influencing (however significantly) the EPZ size. The intent of ERCBH2S is to reflect the response zones that may result given the operational constraints that exist on a particular line or system. ESDVs are in place to limit the non-isolatable volume of gas so that segment isolation can occur in the event of a failure. The questions to be addressed are: how is public safety best served, and what is the appropriate assumptions and scenario for the purpose of emergency response planning for low risk events. The risk is dominated by the low failure probability but once a line fails then the consequences can be significant hence the need for an emergency management program. To address this, ERCBH2S considers the most appropriate scenario for defining an EPZ. An emergency management

weighting shows results that tend to utilize a more reasonable risk based approach to planning zone determination. Our concern is that:

6) The foundation of the model has not changed and a maximum weighted hazard distance or "worse case scenario" is still being calculated.
   a) Increased public hazard due to fewer ESD valves installed due to ineffectiveness imposed within current version of models.
   b) Risk based methodology not applied constantly within the model.
7) These maximum weighted hazard distance numbers are still based on failure mechanism not typically experienced by industry. This concern has been raised by us in the past [through various means].
8) The dispersion condition weighting calculated under this new version of the model is subject to interpretation and therefore may lead to greater confusion and uncertainty for both the licensee and public. This may lead to further challenges to both the ERCB and licensee for new and/or ongoing sour operations within Alberta.

program is still expected to address the range of possible events from small failures to catastrophic events.

b) The goal of emergency planning, preparedness and response is to reduce the consequences of a hazard. It does not consider the risk, the product of consequence and likelihood, of the industrial activity, which the ERCB addresses through stringent engineering standards, procedures and training and regular inspections. The ERCB also applies setbacks to ensure that the land-use (i.e., recreational land-use as opposed to dense residential) is appropriate for the level of risk. As with the concepts of hazard and risk, EPZs and ERPs should not be confused with setbacks since the objectives are very different.

Response to Key Finding 7:

The ERCB staff collated data on all pipeline failures for the last 30 years. It was found that, while leaks were the most common pipeline failure, there were cases that the 10% hole size did occur. One option that was considered for this data was to weight the hole sizes in the same way as meteorological conditions were weighted in V.1.20Beta. It was decided that this approach was not defensible as the ERCB did not have an adequate data set to determine probability of each failure type despite the extensive database of pipeline failures that was information was collected from.

Response to Key Finding 8:

The dispersion condition weighting calculated under V1.20Beta is not subject to interpretation.

In the previous version of the model, pipeline EPZ sizes were getting, in many cases, exponentially larger. Some stakeholders felt that these sizes were unreasonable and unmanageable. The ERCB recognized that this was a problem. Therefore, the ERCB released V1.20Beta version of the model in which EPZ sizes are more reasonable and manageable.

Although meteorological weighting reduces EPZ sizes from previous versions of the model, the EPZs calculated are still very conservative. The worst dispersion scenario may be useful for determining how severe an emergency situation might be; however, this scenario has a very low probability of occurrence. The ERCB has determined that this does not properly characterize the hazard and should not be the basis on which emergency response planning is developed.

The ERCB is always conducting a review of its data, and will revisit this issue when re-evaluating ERCBH2S models through its quality assurance process. While ERCBH2S models will determine the most appropriate response zones upon which the emergency response plan is founded on, the ERCB would like to remind licensees, that an emergency management program must

	be fluid and effective enough to consider and be applicable to other viable scenarios within the ERCB's jurisdiction for inclusion in its ERP.

Stakeholder Feedback 8

Comment	ERCB Response
We have raised concerns with respect to the establishment of EPZs for sour gas facilities and the philosophy underlying the development of the ERCBH2S model. The model uses largest undetected hole size as the pipeline failure mechanism, which, based on our research (including a review of publicly available ERCB data), is a worst case scenario that is one of the least likely failure mechanisms. We recommend that the ERCB delay implementation of those aspects of the proposed *Directive 071* dealing with EPZs for sour gas facilities and continue to work on a revised model using an approach that is based on assumptions and an underlying philosophy that better reflects the risks that these facilities pose.	ERCBH2S models is a conservative calculation tool, that while separate from *Directive 071*, is a key component of developing and maintaining ERPs. The ERCB will not delay the release of ERCBH2S.

Stakeholder Feedback 9

Comment	ERCB Response
Please outline, in layman's detail, why the ERCB has begun calculating EPZ's based on a weighted probability and not the "worst case conditions" communicated to stakeholders in the September 16, 2004, letter from the ERCB Several dispersion modeling experts (who have testified in ERCB hearings for both the proponent and interveners) have expressed concern with this methodology. Their calculations have shown that potentially more than 33% of people may be exposed to more than the	The ERCB's new approach to determining an EPZ for sour oil and gas facilities is based on a worst-expected case for planning purposes. The ERCB requires industry to be aware of the absolute worst case hazard distance if the highly unlikely worst release and worst meteorology occur simultaneously. If this absolute worst situation does occur, emergency responders will be required to extend operations and take appropriate action to protect the public. This is managed through requirements for industry to coordinate emergency response procedures with the local municipal authority and other responders during development of the emergency response plan. In the past, the ERCB required industry to plan for a "worst case scenario" by using the worst release and worst dispersion conditions. The new ERCB method in *Bulletin 2009-32* required industry to formulate plans based on scientifically and statistically defensible releases and meteorology conditions that define the "worst-expected" acute toxic hazard zone as described below.

planning zone endpoint. They have also expressed the concern, which we echo, that timely and effective procedures will not be in place to protect the safety of people outside of the EPZ. To ensure credibility and reliability this methodology requires wide-scale scientific peer-review by all interested professionals, not just those picked by developers of the model.	Following this description the ERCB provided a comparison of the new worst-expected EPZ calculation method with the regulations and recommendations of other jurisdictions and agencies. The term "worst-expected EPZ" is used to describe the new ERCB approach. This EPZ uses the worst release condition (the one that produces the largest hazard zone) for each of 54 different meteorological conditions to get 54 different worst-release hazard distances. The statistically-expected (weighted-average) value of these 54 distances is calculated by multiplying the hazard distance in each of the 54 categories by the fraction of time that each meteorological condition occurs. This definition of worst-expected EPZ has the great advantage that it is very clear in its focused use of statistical results. No statistical probabilities are assigned to the many processes that can lead to a release. Instead, the combination of processes (rupture distance from an emergency pipeline shutdown valve, size of rupture hole, etc.) that produce the largest hazard distance are selected to define a true worst-case release. The "expected" EPZ is obtained by using well-defined frequency-of-occurrence statistics (obtained from Alberta Environment) for the 54 different meteorological conditions. This produces a worst-expected value instead of the unrealistic worst-release plus worst-meteorology condition and gives planners a statistically based estimate of the response size so that resources and action can be planned for should a release occur. At the same time ERCBH2S does provide calculation tables that make planners aware of the absolute worst case that could occur. This is available so that planners are aware of the need to have a flexible response plan that does not end the response to a real emergency at some rigidly-defined calculated location. The EPZ has traditionally been based on the worst release during the worst dispersion conditions that results in the largest possible zone. While it is important to know this zone, regulators throughout the world agree that the planning should be based on the worst probable release. This issue with this however is the worst probable case is not defined. For example leaks are much more probable than blowouts and ruptures. To avoid the uncertainty in selecting the most probable release, a conservative approach was taken and the worst release was used. The average or typical dispersion conditions could be used to define the most probable dispersion conditions but this is hard to define as the zones vary non-linearly with the dispersion condition. The statistical expected value (weighted-average) of the zones for all dispersion conditions can be determined by "weighting the zones for each dispersion condition by the probability of each dispersion condition" and then summing the results. This weighted EPZ is the average of the zones if the worst release occurred. The ERCB has defined this "weighted" EPZ to be the worst-expected zone. Instead of using the worst release and worst dispersion condition to plan for the worst imaginable case we now determine the statistical expected value of the zones if the worst case release occurs under the range of dispersion conditions. The absolute worst possible hazard zone is accounted for by its relative contribution to the weighted-average

	of the individual hazard zones calculated using all 54 possible meteorological conditions. All of the zones predicted for each dispersion condition are credible and are considered in determining the worst-expected zone. If an accidental release does occur, there is a very low probability that the worst-expected EPZ will be underestimated by ERCBH2S Version 1.20. Given the uncertainty in defining releases and the certainty in dispersion conditions, the ERCB believes its statistically based expected value (weighted-average) is a reasonable worst-expected EPZ for realistic and effective emergency planning.
Please calculate and provide the size of the emergency planning zone for the Amoco blowout well under the old method and by using ERCBH2S v. 1.19 and v. 1.20	This event (commonly referred to as the Lodgepole blowout) occurred over twenty-eight years ago, under a completely different regulatory requirement regime, and was subject to a public inquiry that lead to significant regulatory change. Since then there have been many Board reviewed and sanctioned changes to requirements to minimize the likelihood of future occurrence. ERCBH2S model is publicly available for all stakeholders to use. While the ERCB will not undertake additional calculations for an historical incident that occurred under now outdated requirements, members of the public are free to utilize this calculation tool for their own purposes.