APPENDIX G

Questions Related to Risk Assessment Scoring

Appendix G

EA Relative Risk Assessment Issues

A commentor submitted four reports analyzing the EA relative risk model. Many specific questions and criticisms from these submittals are addressed individually in the Responsiveness Summary (RS). This appendix provides some additional response to issues raised which are difficult to properly address in the format of the RS.

General issues raised in the four submittals include:

- Weightings given to risk variables;
- Exclusion of the Leak Impact Factor (LIF); and
- Differences in points assigned to risk variables.

Weightings Given to Risk Variables:

The commentor, a person with expertise in the pipeline industry, agrees that in the absence of statistical data to precisely determine the weightings, weightings can be assigned based on engineering judgement and experience. He recommends alternative weightings to several of the approximately 60 variables scored. Since most of the suggested changes are numerically minor, they are not thought to materially impact results. The commentor makes very few changes to the choice of risk variables. This supports the belief that there is little disagreement among knowledgeable professionals as to what impacts risk and should be considered in a risk assessment. Some substantial changes recommended by commentor are shown below (in bold) with brief responses.

Remove "public education" as a risk variable under third-party damage
This might be an oversight on the part of the commentor. Few in industry or government dispute the value of public education as a means of preventing unintentional damages, enhancing the observation of the ROW, and facilitating emergency response.

Reduce the weighting of "patrol" under third-party damage
The commentor bases his view on the percentage of time per week that the right-of-way (ROW) is actually under observation. There are benefits to detecting activities some distance away from the ROW that could progress towards the ROW as well as detecting recent disturbances over the ROW that might prompt an investigation. In light of these benefits, patrol is actually a very power third-party damage prevention measure.

Increase the weighting of "cover" under third-party damage
The commentor's suggestion is to increase the weighting of this variable from 20 percent to 35 percent under the argument that sufficient cover can virtually eliminate third-party damage. This rationale can be equally applied to many other variables. If "one-call," "patrol," or "public education" were taken to extremes, they too could virtually eliminate this failure mode. Therefore, this is not a good basis for distinguishing the effectiveness of risk variables. The risk assessment process allows other variables to respond to extreme conditions. For example, if the

pipeline has 20 ft of cover, the "activity level score should be correspondingly good, since few activities would endanger a pipeline 20-ft deep. A change in weighting for "cover" is not warranted.

Add "in-line inspection" (ILI) under third-party damage
Since ILI provides data on current line integrity, it is primarily scored in the Design Index, where pipe strength is assessed. It is also considered as a part of the Corrosion Index. When the ILI detects past damages from external forces (dents, gouges, etc.), such data might be evidence of higher activity levels. This is true when the activity is still present and/or logically projected to occur in the future. The EA model considers ILI indications as part of the :activity level" variable in the Third-Party Damage Index.

Other changes suggested are minor and not supported by the commentor's rationale. No compelling evidence or rationale sufficient to warrant changes to the model are provided.

Exclusion of the Leak Impact Factor (LIF):

As addressed in the RS, the exclusion of the LIF is consistent with the risk assessment methodology. Separating the Index Sum as an indicator of "probability of failure" is an entirely appropriate use of the model. Original documentation describing and supporting the relative risk methodology emphasizes the need to examine risk components separately as well as in aggregate. The methodology is specifically designed to retain the intermediate calculations such as Index Sum, for the express purpose of using them as independent measures of specific risk aspects. In response to another comment, the RS also discusses possible changes to the results if the LIF had been used throughout the assessment.

Differences in Points Assigned to Risk Variables:

In one submittal, the commentor provided a relatively detailed analysis of post-mitigation scores using the draft EA and the reference on which the EA relative risk model is based: Muhlbauer's *Pipeline Risk Management Manual*. Although some portions of the commentor's report were not completely clear, every attempt has been made to accurately interpret his scores and respond to differences from draft EA assessments.

The commentor makes distinctions between applicability of scores. He terms location-specific scores "local," and overall scores "general." While not specifically explained in his report, his intention is interpreted to mean that some specific areas might score as much as the "local" score indicated, but that most of the line should score the "general" score indicated. The commentor also makes a distinction between "new" and "old" pipe, for scoring purposes.

To make comparisons, EA risk score changes, representing improvements from mitigations, are presented alongside the commentor's scores. The EA point values represent changes in going from pre-mitigation averages to post-mitigation averages, within each tier. Averages are needed because the additional points assigned are dependent upon the original condition of the variable (pre-mitigation), and the original conditions vary over the approximately 8,000 sections scored.

Since the commentor did not try to assess individual sections, his values are also thought to be average or representative scores.

The commentor's assessment of points for various conditions and activities were very close to those in the draft EA and in some cases he even awarded more points (i.e., was less conservative) than did the draft EA. Where his rationale for explaining his points is provided, it is generally accurate and consistent with the rationale used in the draft EA. Where the commentor's scores diverge from the draft EA, it is usually because the draft EA considers more information. For example, where the commentor awarded additional points for weekly pipeline patrol in Tier 1 areas, the EA risk model did not because a weekly patrol is not a change from pre-mitigation Tier 1 patrol frequency. Similarly, the commentor shows additional points for Tier 1 public education where the EA risk model does not, since changes in Tier 1 public education were not significant enough between pre- and post-mitigation plans. In the case of "cathodic protection," the EA awards more points because the EA model expands the variable "cathodic protection" to include the variables of "close-interval-surveys" and "test-leads," unlike the reference used by the commentor. Had the commentor used the equations shown in the draft EA Appendix 6D he would presumably have assigned similar points.

In general, the commentor's results differ from the draft EA's post-mitigation scores because the commentor considered only the 34 numbered Longhorn Mitigation Commitments (LMC) and not the detailed measures shown in the Longhorn Mitigation Plan, System Integrity Plan, and Operational Reliability Assessment. Examples of mitigations not scored by the commentor include the following risk variables:

- Safety Systems;
- Earth Movements;
- Integrity Test (combination of ILI and hydrostatic tests);
- Mechanical Corrosion (SCC);
- Interference (corrosion issue);
- Coating Buried; and
- Internal Corrosion.

Tables 1, 2, and 3 show specifics in comparing the commentor's assessments of mitigation improvements and the EA model assessments of improvements. Some of the commentor's rationale for point assignments is in the text of this report and is not shown in these tables. The commentor's full report is available as part of the administrative record of the EA.

The following table summarizes Tables 1, 2, and 3.

Tier	Commentor Score Improvements (point range)	Comparable EA Score Improvements (points)	Improvement Points Awarded in EA for Variables Not Scored by Commentor	Total EA Improvement Scores
1	15 to 27	19	44	63
2	11 to 43	27	70	97
3	15 to 47	33	86	119

Table 1A. Summary of Index Sum Scores Increases due to Tier 1 Mitigation Measures

Item No.[*]	Commentor's Submittal				Item	EA Model (Additional Points)	Comments
	Old Pipeline		New Pipeline				
	Local	General	Local	General			
1	0	0	-	-	**Hydrotest**	0	The EA Model does not give additional points to Tier 1 areas for a Proof Test (1.1 X MOP).
2	4	4	3	-	**ILI**	7	The EA Model awards 0-10 points for INI. Longhorn will run an ILI tool within three months of startup. All findings that fall within the repair criteria will be excavated and repaired, per LMP. The EA Model automatically awards 10 points for new pipe (1998 or newer).
3	2	2	2	2	**Patrol**	0	There was no additional mitigation points awarded for weekly patrols. The area field office patrolled weekly before mitigation and will after mitigation.
4	2.5	2.5	2.5	2.5	**Leak detection**	0	The EA Model doesn't award points for the Enhanced Leak Detection System.
5	2.5	2.5	2	2	**CP**	6	The EA Model awards 0-15 points for Cathodic Protection. Per the LMP, Longhorn fully complies with industry standards and regulations, including those by NACE.
6	5	5	4	3	**Pub ed**	0	The EA Model doesn't award points for enhancing public education and damage prevention program in Tier 1.
7	-	-	-	-	**SIP**	0	The EA Model doesn't award points for having a Systems Integrity Plan.
8	5	5	5	5	**ORA**	4	The EA Model additional points were awarded because of the integrity tests that are going to be performed on the line.
9 & 13	4	2	2	1	**ROW**	2	LMP specifies that the ROW will be cleared to excellent condition prior to startup and maintained to an excellent condition after startup.
10	1	0	1	0	**Surveys**	0	The EA Model doesn't award points for these kinds of procedures and surveys in the incorrect operations index.
11	1	-	-	-	**Spans**	0	Longhorn has performed studies on all pipeline spans. Remedial actions are to be taken prior to startup.
12	-	-	-	-	**Tanks**	0	The EA Model doesn't award points for storage tanks issues.
Total	27	23	21.5	15.5	**Total**	19	

Table 1B. Additional Points for Mitigation Measures, Not Considered by Commentor[**]

No.[*]	Description	Additional Point Value	Comments
1	Safety Systems	4	On site two or more levels of safety along with remote observation and control.
2	Earth Movements	11	Completed Earth Movement Studies which include seismic, scouring and landslide potential.
3	Integrity Test	10	ILI credit
4	Mechanical Corrosion	3	Performance of the Stress Corrosion Cracking study.
5	Interference	3	Longhorn received three additional points for interference monitoring, networking, bonds, pipe to soil readings, and monitoring ground beds.
6	Coating Buried	6	Close Interval Survey = 14 points from IR-compensated survey in 1998, areas not yet surveyed will be done before start-up. Test Leads = 14 points. Readings of 0.85 with proper IR compensation, assuming correction of all low readings, per LMP.
7	Internal Corrosion	7	Product is corrosive only under special conditions and internal protection consists of internal monitoring, inhibitor injections, operational measures, and pigging.
Total additional points, not considered		44	
Maximum additional points		**63**	

[*] The commentor's item numbers are not consistent between tiers and do not correspond to LMP mitigation numbers.
[**] Reflect changes in pre- to post-mitigation averages within the tier.

Table 2A. Summary of Index Sum Scores Increases due to Tier 2 Mitigation Measures[**]

Item No.[*]	Commentor's Submittal				Item	EA Model (Additional Points)	Comments
	Old Pipeline		New Pipeline				
	Local	General	Local	General			
Tier 1	27	23	-	-	Tier 1	19	
1	5	5	-	-	Hydrotest	4	Performing new hydrotest in Tier 2 areas.
3	3	3	3	3	Patrol	0	From the original scores, there was no increase in the point values in patrolling 2.5 time per week.
6	-	1	-	-	Emergency	0	The EA Model doesn't award points for enhancing emergency response plans.
8	1	7.5	1	1	CP	4	The EA Model awards 0-15 points for Cathodic Protection. Per the LMP, Longhorn fully complies with industry standards and regulations, including those by NACE.
14	7.5		7.5	7.5	Surge	-	Surge scores were not effected.
Total	43.5	39.5	11.5	11.5	Total	27	

[*] The commentor's item numbers are not consistent between tiers and do not correspond to LMP mitigation numbers.

[**] Reflect changes in pre- to post-mitigation averages within the tier.

Table 2B. Additional Points for Mitigation Measures, Not Considered by Commentor[**]

No.[*]	Description	Additional Point Value	Comments
1	Safety Systems	4	On site two or more levels of safety along with remote observation and control.
2	Earth Movements	11	Completed Earth Movement Studies which include seismic, scouring and landslide Potential.
3	Integrity Test	13	ILI (crack tool) credit plus hydrotest to 1.25.
4	Mechanical Corrosion	4	Performance of the Stress Corrosion Cracking study.
5	Interference	3	Longhorn received three additional points for interference monitoring, networking, bonds, pipe to soil readings, and monitoring ground beds.
6	Coating Buried	4	Close Interval Survey = 14 points from IR-compensated survey in 1998, areas not yet surveyed will be done before start-up. Test Leads = 14 points. Readings of 0.85 with proper IR compensation, assuming correction of all low readings, per LMP.
7	Internal Corrosion	8	Product is corrosive only under special conditions and internal protection consists of internal monitoring, inhibitor injections, operational measures and pigging.
8	Public Education	4	Longhorn will enhance their public education/damage prevention program by door-to-door visits with public in areas adjacent to the pipeline.
9	ROW Conditions	2	Longhorn will clear all ROW to excellent condition before start-up and maintain to excellent condition.
10	In-Line Inspection	8	Longhorn will perform ILI within three months of startup, and thereafter on ORA-driven schedule.
11	Fatigue	4	The additional points were awarded because of the ORA-driven integrity tests specified in the ORA, but still reflect the influence of low-frequency ERW.
12	Construction Design	5	New construction, performance of studies, and extensive integrity verification offsets construction uncertainties of older sections.
Total additional points, not considered		70	
Maximum additional points		**97**	

[*] The commentor's item numbers are not consistent between tiers and do not correspond to LMP mitigation numbers.
[**] Reflect changes in pre- to post-mitigation averages within the tier.

Table 3A. Summary of Index Sum Scores Increases Due to Tier 3 Mitigation Measures[**]

Item No.[*]	Commentor's Submittal				Item	EA Model (Additional Points)	Comments
	Old Pipeline		New Pipeline				
	Local	General	Local	General			
Tier 2	43.5	39.5	11.5	11.5	**Tier 2**	27	
14	4	4	4	4	**CIS**	6	Close Interval Survey = 14points from IR-compensated survey in 1998, areas not yet surveyed will be done before start-up. Test Leads = 14 points. Readings of 0.85 with proper IR compensation, assuming correction of all low readings, per LMP.
Total	47.5	43.5	15.5	15.5	**Total**	33	

[*] The commentor's item numbers are not consistent between tiers and do not correspond to LMP mitigation numbers.

[**] Reflect changes in pre- to post-mitigation averages within the tier.

Table 3B. Additional Points for Mitigation Measures, Not Considered by Commentor

No.*	Description	Additional Point Value	Comments
1	Safety Systems	4	On site two or more levels of safety along with remote observation and control.
2	Earth Movements	12	Completed Earth Movement Studies which include seismic, scouring and landslide potential.
3	Integrity Test	18	ILI (crack tool) credit plus hydrotest to 1.25.
4	Mechanical Corrosion	4	Performance of the Stress Corrosion Cracking study.
5	Interference	4	Longhorn received three additional points for interference monitoring, networking, bonds, pipe to soil readings, and monitoring ground beds.
6	Coating Buried	6	Close Interval Survey = 14 points from IR-compensated survey in 1998, areas not yet surveyed will be done before start-up. Test Leads = 14 points. Readings of 0.85 with proper IR compensation, assuming correction of all low readings, per LMP.
7	Internal Corrosion	8	Product is corrosive only under special conditions and internal protection consists of internal monitoring, inhibitor injections, operational measures and pigging.
8	Public Education	4	Longhorn will enhance their public education/damage prevention program by door-to-door visits with public in areas adjacent to the pipeline.
9	ROW Conditions	2	Longhorn will clear all ROW to excellent condition before start-up and maintain to excellent condition.
10	In-line Inspection	9	Longhorn will perform ILI within three months of startup, and thereafter on ORA-driven schedule.
11	Fatigue	4	The additional points were awarded because of the ORA-driven integrity tests specified in the ORA, but still reflect the influence of low-frequency ERW.
12	Construction Design	5	New construction, performance of studies, and extensive integrity verification offsets construction uncertainties of older sections.
13	Cathodic Protection	6	
Total additional points, not considered		86	
Maximum additional points		**119**	

* The commentor's item numbers are not consistent between tiers and do not correspond to LMP mitigation numbers.

** Reflect changes in pre- to post-mitigation averages within the tier.