Final Task I Risk Assessment Amendment Number 2

Burlington Northern Livingston Shop Complex
Livingston, Montana

August 2012
Prepared by Montana Department of Environmental Quality (DEQ)

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Attachments

1.0 Introduction

The purpose of this Final Risk Assessment Amendment Number 2 (Amendment 2) is to finalize the residential and commercial indoor air cleanup levels for inhabitable structures at the Burlington Northern Livingston Shop Complex Facility (Facility). It has been prepared in response to comments received during the public comment period on the Final Draft Amendment 2. Attachment 1 provides DEQ's responses to the comments received during the comment period.

The cleanup levels for two compounds, benzene and ethylbenzene, were provided in the January 2010 Final Task I Risk Assessment Amendment and Montana Department of Environmental Quality Approved Remedy For Newly Identified Contaminants of Concern in Indoor Air (January 2010 Amendment), DEQ, January 2010). These cleanup levels remain the same and will merely be mentioned in this document for completeness. DEQ is preparing this amendment because the United States Environmental Protection Agency (EPA) has recently released final toxicity criteria for tetrachloroethene (PCE; EPA 2012) and trichloroethene (TCE; EPA 2011) and because recent indoor air and soil vapor samples collected on the railyard indicate that some contaminants of concern (COCs) may be eliminated because they are not impacting indoor air at the Facility above screening levels.

2.0 Background

The remedy for indoor air selected in DEQ's 2001 Record of Decision (ROD), which is outlined in greater detail in "Task I: Basement VOC Gas Investigation and Removal" of the August 2005 Spring Statement of Work (SOW), includes indoor air sampling at certain inhabitable structures to evaluate if these structures have indoor air concentrations of COCs above screening levels (SOW at 21, ROD at 47). If an exceedance of a screening level in an inhabitable structure is identified, the exceedance must be reproducible and reasonably attributable to vapor intrusion by volatile organic compounds (VOCs) migrating from the subsurface (SOW at 21, 23, 24, Figure 1 and Table 1 of Attachment 2). If the indoor air exceedance is reproducible and attributable, BNSF must conduct additional sampling, and implement mitigation systems to meet final site-specific cleanup levels, unless the VOCs in indoor air are not related to the Facility (SOW at 23, ROD at 47).

The procedures for ambient (outdoor) air sampling, indoor air sampling, and soil gas sampling at the Facility are described in the DEQ-approved *Final Task I Supplemental Investigation Work Plan for Indoor Air* (Kennedy/Jenks, 2005) and addenda thereto (DEQ, 2006a, 2007a, including February 2010 insert).

For the COCs that are identified in the ROD, this Task includes a provision for the development of alternate cleanup levels than those presented in the ROD (SOW at 21). BNSF previously developed site-specific screening levels that were included in the SOW and the SOW allows these screening levels to be used as cleanup levels. However, the SOW also allows for the development of alternate site-specific cleanup levels that comply with Attachment 2 of the SOW (SOW, Attachment 2, Section B).

In January 2009, BNSF requested that site-specific cleanup levels be developed for the Facility. DEQ developed cleanup levels that were based upon one of two things: (1) risk-based values derived to be protective of people who might be exposed to the contaminants; or (2) background concentrations of contaminants typically found in indoor air from sources not related to the railyard. The risk-based cleanup levels are calculated to meet the requirements in the ROD for the Facility and the SOW, as updated by the DEQ March 10, 2009 letter to BNSF. DEQ determined that it was necessary to update the parameters in the tables in Attachment 2 of the SOW, which must be used to calculate site-specific risk-based cleanup levels for indoor air at the Facility. These updated parameters, as well as an explanation as to why they must be used to calculate site-specific cleanup levels at the Facility, were provided in the January 2010 Amendment. DEQ is not updating these parameters in this Amendment 2. For completeness, DEQ has provided Tables 1 and 2, which have not been changed from the January 2010 Amendment. For contaminants like benzene and ethylbenzene that are typically found in indoor and outdoor air at concentrations greater than risk-based values for residential exposure, DEQ developed site-specific cleanup levels based upon background concentrations due to indoor and outdoor sources found in buildings with no contaminants in the soil gas beneath them. DEQ provided these cleanup levels in the January 2010 Amendment. DEQ will provide them in this document for completeness; however, these are the final cleanup levels for these compounds and DEQ is not soliciting comment on them.

In 2010, 2011, and 2012, BNSF collected additional indoor air, soil gas, and outdoor air samples at the Facility at DEQ's request. BNSF submitted these data to DEQ.

3.0 Selection of COCs

Five COCs were identified for indoor air in the ROD: PCE, TCE, cis-1,2-dichloroethene (DCE), vinyl chloride, and trans-1,2-DCE (ROD at 50). These were the five COCs identified in the SOW and BNSF developed site-specific screening levels for them (SOW at 22).

As outlined in its March 10, 2009 letter and January 10, 2010 Amendment, DEQ identified two additional COCs in indoor air for both residential structures and commercial/industrial structures located on the railyard: benzene and ethylbenzene, as well as three additional COCs for indoor air in commercial/industrial structures: chloroform, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. DEQ also eliminated contaminants as COCs, including the two 1,2-DCE compounds, because their indoor air concentrations did not exceed their screening levels for indoor air anywhere at the Facility.

In accordance with the ROD and the SOW, DEQ has considered the data collected during investigations at the Facility between 2005 and 2012, and DEQ has determined that the COCs for residential indoor air are benzene and ethylbenzene, both with final cleanup levels based upon indoor air background concentrations, as well as PCE and TCE. Based upon the data collected in 2011 and 2012, DEQ has determined that these same four COCs are the only COCs for commercial/industrial exposure on the railyard.

DEQ was able to eliminate vinyl chloride as a COC for non-railyard structures at the Facility in the Interim Final Task I Risk Assessment Amendment Number 2 (DEQ, 2011) because all of the data through 2010 showed that there was not an exceedance of the vinyl chloride cleanup level or screening level in an inhabitable structure that was reproducible and reasonably attributable to vapor intrusion by VOCs migrating from the subsurface (SOW at 23, ROD at 47). The 2011 and 2012 data for railyard structures indicates that there are no exceedances of commercial/industrial screening levels for chloroform, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene in indoor air and therefore, DEQ will eliminate these compounds as COCs for the railyard structures.

It is possible that some contaminants may be present in indoor air due to indoor or outdoor sources. However, as provided in the SOW, a COC for indoor air is a contaminant that exceeds an indoor air screening level in an inhabitable structure, and the exceedance is reproducible and reasonably attributable to vapor intrusion by VOCs migrating from the subsurface (SOW at 23, ROD at 47). The following is the list of compounds that meet the criteria provided in the SOW to be considered a COC for indoor air in residential or commercial/industrial structures at the Facility. DEQ notes that the "ROD selected remedy requires all residences and businesses that have indoor air VOC concentrations from subsurface vapor intrusion above site-specific cleanup levels for indoor air to have a protection system installed at no cost to the owner, **unless the VOCs in indoor air are not related to the Facility** (SOW at 23) (emphasis added).

Indoor Air COCs
Tetrachloroethene
Trichloroethene
Benzene
Ethylbenzene

While DEQ generally requires that all COCs be considered in calculating cumulative human health risks under the Comprehensive Environmental Cleanup and Responsibility Act (CECRA), DEQ must also take into account concentrations of compounds that are not present due to an environmental spill or release but may be found in the environment either naturally or through anthropogenic (related to human activities) causes. For this reason, DEQ considered benzene and ethylbenzene separately from the other COCs in indoor air in non-railyard buildings. The cleanup levels for the benzene and ethylbenzene for indoor air in non-railyard buildings at the Facility are based upon typical indoor air concentrations found in Livingston, and are not revised in this Amendment 2. Please refer to the January 2010 Amendment for further information.

4.0 Exposure Assumptions

The human health risk-based cleanup levels for PCE and TCE are developed based upon the type and magnitude of potential current and future human exposures to the COCs (DEQ, 2005b). Exposure assumptions are combined with chemical-specific toxicity values to derive cleanup levels. Please refer to the January 2010 Amendment for more detail. DEQ is providing the information included in the January 2010 Amendment regarding the exposure assumptions in this Amendment 2. However, DEQ will not solicit additional public comment on these

assumptions, because these assumptions have not changed from the assumptions used in the January 2010 Amendment.

4.1 Exposure Assumptions for Residential Exposure to Indoor Air

The residential exposure assumptions are included in **Table 1**. These exposure assumptions were contained within Attachment 2 of the SOW as clarified by the March 10, 2009 DEQ letter. (DEQ, 2009c). As stated above, these assumptions have not changed from those used in the January 2010 Amendment.

Exposure Time – Residents are assumed to potentially be exposed to indoor air in their homes for 24 hours a day resulting in an exposure time of 24 out of a total of 24 hours per day and a ratio of 1. This is meant to be protective of sensitive populations that may include young children, adults who stay at home, home-schooled children, or the elderly.

Exposure Frequency – Residents are assumed to be exposed to indoor air in their homes for 350 days per year allowing for two weeks away from home per year.

Exposure Duration – Residents are assumed to potentially be living in a given home for 30 years starting when someone is a baby.

Averaging Time (Cancer) – Carcinogenic risks are averaged over a lifetime, which is assumed to be 75 years based upon research conducted by the EPA. Averaging time is expressed by multiplying 75 years by 365 days per year resulting in an averaging time of 27,375 days.

Averaging Time (Non-Cancer) – Non-carcinogenic exposures are averaged over the exposure duration. The assumed duration of exposure is 30 years. The calculated non-cancer averaging time is 30 years multiplied by 365 days per year resulting in an averaging time of 10,950 days.

4.2 Exposure Assumptions for Commercial/Industrial Workers Exposure to Indoor Air

The commercial/industrial worker exposure assumptions are included in **Table 2**. These exposure assumptions were contained within Attachment 2 of the SOW as clarified by the March 10, 2009 DEQ letter. (DEQ, 2009c). As stated above, these assumptions have not changed from those used in the January 2010 Amendment.

Exposure Time – Workers are assumed to potentially be exposed to indoor air at work for 8 hours a day resulting in an exposure time of 8 out of a total of 24 hours per day or a ratio of 0.33.

Exposure Frequency – Workers are assumed to be exposed to indoor air at work for 250 days per year allowing for a five day work week and two weeks vacation per year.

Exposure Duration – Workers in Livingston are assumed to potentially work at a given business for 30 years. This assumption is based upon railyard employee interviews indicating that a typical Livingston railyard worker may spend at least 30 years working at the railyard.

Averaging Time (Cancer) – Carcinogenic risks are averaged over a lifetime, which is assumed to be 75 years based upon research conducted by the EPA. Averaging time is expressed by multiplying 75 years by 365 days per year resulting in an averaging time of 27,375 days.

Averaging Time (Non-Cancer) – Non-carcinogenic exposures are averaged over the exposure duration. The assumed duration of exposure is 30 years. The calculated non-cancer averaging time is 30 years multiplied by 365 days per year resulting in an averaging time of 10,950 days.

5.0 Risk Levels

Site-specific risk-based cleanup levels are calculated for two types of health effects. Some compounds are known or thought to cause cancer with long term exposure. These compounds are referred to as carcinogens and they may also cause other negative health effects (U.S. EPA, 2009e). Other non-carcinogenic compounds are not likely to cause cancer but are known to cause other negative health effects (U.S. EPA, 2009e). DEQ must address both types of health effects that may be associated with compounds linked to the Facility. For compounds associated with both carcinogenic and non-carcinogenic effects, DEQ selects the lowest cleanup level that is protective of both types of effects. For non-carcinogens, DEQ selects cleanup levels that are protective of non-cancer health effects.

Long-term exposure to any concentration of a cancer-causing compound is assumed to have some risk so DEQ must choose concentrations that are very protective (U.S. EPA, 1989). The term "excess lifetime cancer risk" is used because all people have a risk of getting cancer due to genetics or other causes not related to the Facility (U.S. EPA, 1989). According to the SEER Cancer Statistics Review, American men have a 44% lifetime risk of being diagnosed with cancer, while American women have a 38% lifetime risk (NCI 2009). This is a little over a 1 in 3 chance (or 33% or 0.33) that a person will get some type of cancer at some time in his or her life. The "excess lifetime cancer risk" that is referred to here is additional risk that someone might have of getting cancer if that person is exposed to compounds linked to the Facility as described in the January 2010 Amendment and summarized above. DEQ considers an additional or excess 1 in 100,000 chance (or 0.001% or 0.00001 or 1×10^{-5}) allowable (the Montana Legislature has directed that 1×10^{-5} is an allowable risk for state water, § 75-5-301, MCA, and based on that level, DEQ has determined that 1×10^{-5} is an appropriate risk). DEQ derives the site-specific cleanup levels such that they do not result in a cumulative excess lifetime cancer risk greater than 1 in 100,000.

The term cumulative risk means that the risks from all the different carcinogens are added together and, for the cleanup levels to be protective, the total risk cannot exceed 1 in 100,000. Therefore, if there are ten carcinogenic compounds in indoor air at a facility, cleanup levels might be calculated so that each compound represents one-tenth or a 1 in 1,000,000 risk. That way if all ten compounds are present in the indoor air at the cleanup level, the risk would still not exceed 1 in 100,000. Similarly, if there are three carcinogenic compounds in indoor air at a facility, each one might represent one-third of the total risk. If only two carcinogenic compounds are present, each one might represent half the total risk.

For non-cancer health effects, there is a concentration of each compound at which negative health effects do not appear to occur (U.S. EPA, 1989). DEQ requires cleanup levels for each compound at the Facility that are designed to prevent negative health effects to any organ in the body or any bodily function even if someone is also exposed to other compounds linked to the

Facility that affect the same organ or bodily function. To do this DEQ uses a ratio, called a hazard index, to compare concentrations of contaminants at the Facility to concentrations that have not been found to cause negative health effects in scientific studies (U.S. EPA, 1989). A hazard index of 1 indicates that the concentrations at the Facility are no higher than those found to cause negative health effects (U.S. EPA, 1989). The same cumulative equations also apply to non-carcinogens. If two compounds affect the same organ of the body, each one may represent half of the total non-cancer risk for that organ.

The COCs for indoor air at the Facility, benzene, ethylbenzene, PCE, and TCE are known or thought to cause cancer with long term exposure and they all also have non-cancer effects. Each compound has a different non-cancer critical effect or target organ so cumulative non-cancer effects are not anticipated. Because benzene and ethylbenzene are typically present in indoor air at concentrations higher than residential screening levels, DEQ considered benzene and ethylbenzene separately from the other COCs in indoor air in non-railyard buildings. The cleanup levels for the benzene and ethylbenzene for indoor air in non-railyard buildings at the Facility are based upon typical indoor air concentrations found in Livingston, and are not revised in this Amendment 2. DEQ calculated site-specific health risk-based commercial/industrial cleanup levels for the railyard buildings at the Facility. Benzene and ethylbenzene are not typically present in indoor air at concentrations that are higher than site-specific risk-based commercial/industrial cleanup levels so it was not necessary for DEQ to base the commercial/industrial cleanup levels on typical indoor air concentrations. DEQ also used the recently released final toxicity criteria for PCE and TCE to recalculate residential and commercial/industrial health risk-based cleanup levels for these two compounds as well.

6.0 Toxicity Assessment

The SOW provided that DEQ would update the toxicity values as necessary, and DEQ would apply the hierarchy described in OSWER Directive 9285.7-53 Human Health Toxicity Values in Superfund Risk Assessments (December 2003) to the process of updating to the toxicity values. EPA has been evaluating the toxicity of PCE and TCE for many years. In 2011, in order to be protective of public health, safety and welfare, rather than finalizing the cleanup levels based upon proposed toxicity criteria, DEQ developed a range of cleanup levels to be used in the interim until the final EPA toxicity criteria were released (DEQ, 2011). EPA published its final Toxicological Reviews for TCE and PCE on the Integrated Risk Information System (IRIS) in September 2011 (EPA 2011) and February 2012 (EPA 2012), respectively. DEQ is now proposing final indoor air cleanup levels based upon these final toxicity criteria. **Tables 3 and 4** provide the toxicity values that DEQ used to develop its cleanup levels.

7.0 Derivation of Site-Specific Cleanup Levels for Indoor Air

For non-railyard buildings, DEQ calculated cleanup levels for indoor air for PCE and TCE based upon a cumulative excess lifetime cancer risk of 1 $x10^{-5}$ and protective of non-cancer effects using the equations presented in Table 1. For the railyard buildings, DEQ calculated cleanup levels for indoor air for PCE, TCE, benzene, and ethylbenzene based upon a cumulative excess lifetime cancer risk of 1 $x10^{-5}$ and protective of non-cancer effects also using the equations

presented in Table 2. DEQ chose either the level protective of cancer risk or that protective of non-cancer risk, whichever was lower for each of the calculated levels. In doing so, DEQ chose the levels that would be protective of both types of health effects. The following table provides a summary of the levels calculated for each compound for each type of health effect. The lowest levels for each compound are highlighted.

Contaminants of Concern	**Cleanup Levels Based Upon Residential Cancer Toxicity ($\mu g/m^3$)**	**Cleanup Levels Based Upon Residential Non-Cancer Toxicity ($\mu g/m^3$)**	**Cleanup Levels Based Upon Commercial Cancer Toxicity ($\mu g/m^3$)**	**Cleanup Levels Based Upon Commercial Non-Cancer Toxicity ($\mu g/m^3$)**
Tetrachloroethene (PCE)	50	**42**	**105**	175
Trichloroethene (TCE)	**2**	**2**	**7**	9
Benzene	**2.2***		**4**	131
Ethylbenzene	**2.3***		**11**	4,380

*Based upon typical residential indoor air concentrations in Livingston.

As provided in the SOW that BNSF agreed to follow, residential site-specific cleanup levels apply uniformly to all residential and off-railyard commercial/industrial structures with screening level exceedances due to subsurface vapor intrusion. DEQ and BNSF agreed in the SOW that commercial/industrial site-specific cleanup levels apply only to commercial/industrial structures located on the railyard. The ROD and the SOW, as updated by DEQ's March 10, 2009 letter, do not provide for the performance of building-specific risk assessments on specific properties sampled by BNSF. In addition, in making decisions about indoor air mitigation, DEQ does not allow building-specific risk assessment for vapor intrusion because of the extreme variability involved and the number of factors influencing indoor air concentrations. Rather, in order to be protective of public health, safety and welfare, and conservative, DEQ requires that screening or cleanup levels (sometimes referred to as target or action levels) be applied uniformly to buildings within a given facility.

The ROD selected remedy requires all residences and businesses that have indoor air VOC concentrations from subsurface vapor intrusion above site-specific cleanup levels for indoor air to have a protection system (mitigation system) installed at no cost to the owner, unless the VOCs in indoor air are not related to the Facility. In order to remain protective, these systems must be maintained until cleanup levels are continually met without operation of the system. BNSF shall install and maintain a mitigation system at all inhabitable residences and businesses that do not meet the site-specific cleanup levels in the ROD and developed as outlined in the SOW, at no cost to the owner.

8.0 References

Full citations to certain of the references cited herein can be found within the administrative record in Attachment 3 of the January 2010 Amendment. However, not all of the documents contained within the administrative record are specifically referenced within this document, because the administrative record also contains all documents DEQ relied upon or considered in

developing this document. Additional references specific to this document include the following:

Kennedy/Jenks Consultants (Kennedy/Jenks). June 2010. Task I – 2010 Soil Gas/Indoor Air Data Summary Report. June 24, 2010.

Montana Department of Environmental Quality (DEQ). January 2010. Final Task I Risk Assessment Amendment and Montana Department of Environmental Quality Approved Remedy For Newly Identified Contaminants of Concern in Indoor Air. January 2010.

DEQ. October 2010. Correspondence from Aimee Reynolds, project manager, DEQ, Helena, Montana, to BNSF Railway Company regarding BNSF Request to Recalculate Proposed Site-Specific Cleanup Levels for Indoor Air Included in the June 24, 2010 Task I – 2010 Soil Gas/Indoor Air Data Summary Report. October 25, 2010.

U.S. Environmental Protection Agency (U.S. EPA). December 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December 2003.

U.S. EPA. September 2011. Toxicological Review of Trichloroethylene. September 2011.

U.S. EPA. February 2012. Toxicological Review of Tetrachloroethylene. February 2012.

TABLE 1
EXPOSURE ASSUMPTIONS FOR RESIDENTS - VOLATILES IN INDOOR AIR
BNSF Livingston Shop Complex Facility

Scenario Timeframe: Current & Future
Medium: Indoor Air
Exposure Medium: Indoor Air
Receptor Population: Resident
Receptor Age: Carcinogenic (Lifetime) Exposure - Age Adjusted Factor Approach
Noncarcinogenic exposure - 0-6 years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name (EPA 2009)
	ET	Exposure Time	unitless	1	SOW 2005	
	EF	Exposure Frequency	days/year	350	EPA 2002, CDM 1993	
Inhalation of VOCs	ED	Exposure Duration (Total - Carcinogenic Exposure)	years	30	EPA 2002, CDM 1993	NCL = THQ*AT-N*CF
Migrating to Indoor	ED-A	Exposure Duration (Adult)	years	24	EPA 2002, CDM 1993	EF*ED*ET*1/RfC
Air from Subsurface	ED-C	Exposure Duration (Child)	years	6	EPA 2002	
	BW-A	Body Weight - Adult	kg	70	EPA 2002, CDM 1993	CCL = TR*AT-C
	BW-C	Body Weight - Child	kg	15	EPA 1997	EF*ED*ET*IUR
	AT-C	Averaging Time (Cancer)	days	27,375	EPA 1997	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA 1989	
	IRA-A	Inhalation Rate (Adult)	m^3/day	15.2	EPA 1997	
	IRA-C	Inhalation Rate (Child)	m^3/day	7.5	EPA 1997	
	IRAadj	Age Adjusted Inhalation Rate Factor	m^3-y/kg-day	8.0	Calculated	

Sources:

CDM 1993. Final Report Baseline Risk Assessment Livingston Rail Yard, May.

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part A) Interim Final, December. EPA/540/1-89/002.

EPA 1997. Exposure Factors Handbook, August. EPA /600/P-95/002 Fa.

EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December. OSWER 9355.4-24.

EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)

NCL = Noncarcinogenic cleanup level

CCL - Carcinogenic cleanup level

CF = 1000 ug/mg

ET = 24 hours/day*1 day/24 hours (August 2005 Spring Scope of Work)

THQ = Target hazard quotient (1)

TR = Target cancer risk (1×10^{-5})

RfC = Reference concentration

IUR = Inhalation Unit Risk

TABLE 2

EXPOSURE ASSUMPTIONS FOR COMMERCIAL/INDUSTRIAL WORKER - VOLATILES IN INDOOR AIR

BNSF Livingston Shop Complex Facility

Scenario Timeframe: Current & Future

Medium: Indoor Air

Exposure Medium: Indoor Air

Receptor Population: Commercial/Industrial Worker

Receptor Age: Adults

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name (EPA 2009)
	ET	Exposure Time	unitless	0.33	SOW 2005	
	EF	Exposure Frequency	days/year	250	EPA 1991	NCL = $\frac{THQ*AT\text{-}N*CF}{EF*ED*ET*1/RfC}$
Inhalation of VOCs	ED	Exposure Duration	years	30	CDM 1993	
Migrating to Indoor	BW-A	Body Weight - Adult	kg	70	EPA 2002, CDM 1993	
Air from Subsurface	AT-C	Averaging Time (Cancer)	days	27,375	EPA 1997	CCL = $\frac{TR*AT\text{-}C}{EF*ED*ET*IUR}$
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA 1989	
	IRA-A	Inhalation Rate (Adult)	m^3/day	10.4	EPA 1997	

Sources:

CDM 1993. Final Report Baseline Risk Assessment Livingston Rail Yard, May.

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part A) Interim Final, December. EPA/540/1-89/002.

EPA 1991. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) Interim, December. EPA/540/1-92/003.

EPA 1997. Exposure Factors Handbook, August. EPA /600/P-95/002 Fa.

EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December. OSWER 9355.4-24.

EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)

NCL = Noncarcinogenic cleanup level

CCL = Carcinogenic cleanup level

CF = 1000 ug/mg

ET = 8 hours/24 hours (August 2005 Spring Scope of Work)

THQ = Target hazard quotient (1)

TR = Target cancer risk (1×10^{-5})

RfC = Reference concentration

IUR = Inhalation Unit Risk

TABLE 3
CANCER TOXICITY DATA -- INHALATION
BNSF Livingston Shop Complex Facility

Chemical of Potential Concern	Inhalation Unit Risk	Units	Cancer Guideline Description	Source	Date
Benzene	7.80E-06	$(ug/m^3)^{-1}$	Class A	IRIS	2012
Ethylbenzene	2.50E-06	(ug/m3)-1	NA	CA EPA	2012
Tetrachloroethylene	2.60E-07	(ug/m3)-1	**liver cancer	IRIS	2012
Trichloroethylene	1.00E-06	(ug/m3)-1	*kidney cancer	IRIS	2012
Trichloroethylene	3.10E-06	(ug/m3)-1	*liver cancer	IRIS	2012
Trichloroethylene	3.10E-06	(ug/m3)-1	*lymphoma	IRIS	2012
Trichloroethylene	4.10E-06	(ug/m3)-1	*adult-only	IRIS	2012

NA = Not Applicable or Not Available

References

CA EPA = California EPA as referenced in the EPA Regional Screening Levels Table, April 2012

IRIS = EPA Integrated Risk Information System

EPA Group:

A - Human carcinogen

* - carcinogenic to humans

** - likely to be carcinogenic to humans

These toxicity data have been updated as of May 2012 following the hierarchy described in OSWER Directive 9285.7-53 Human Health Toxicity Values in Superfund Risk Assessments (December 2003). DEQ will update these toxicity data as necessary in the future, following the hierarchy described in OSWER Directive 9285.7-53 Human Health Toxicity Values in Superfund Risk Assessments (December 2003).

TABLE 4
NONCANCER TOXICITY DATA -- INHALATION
BNSF Livingston Shop Complex Facility

Chemical of Potential Concern	Inhalation Reference Concentration	Units	Primary Target Organ	Source	Date
Benzene	3.00E-02	mg/m^3	Decreased lymphocyte count	IRIS	2012
Ethylbenzene	1.00E+00	mg/m^3	Developmental toxicity	IRIS	2012
Tetrachloroethylene	4.00E-02	mg/m^3	Neurotoxicity	IRIS	2012
Trichloroethylene	2.00E-03	mg/m^3	Thymus/Cardiac	IRIS	2012

NA = Not Applicable or Not Available

References

IRIS = EPA Integrated Risk Information System

These toxicity data have been updated as of May 2012 following the hierarchy described in OSWER Directive 9285.7-53 Human Health Toxicity Values in Superfund Risk Assessments (December 2003). DEQ will update these toxicity data as necessary in the future, following the hierarchy described in OSWER Directive 9285.7-53 Human Health Toxicity Values in Superfund Risk Assessments (December 2003).

ATTACHMENT 1

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY FOR
FINAL DRAFT TASK I RISK ASSESSMENT AMENDMENT NUMBER 2

1.0 INTRODUCTION

The Montana Department of Environmental Quality (DEQ) solicited public comment on the June 2012 Final Draft Task I Risk Assessment Amendment Number 2 (Amendment 2) for the Burlington Northern Livingston Shop Complex Facility (Facility) during a public comment period that ran from July 27, 2012 to August 29, 2012. DEQ received written comments from one entity during the public comment period. DEQ also held a public meeting on August 9, 2012, in which DEQ discussed the proposed cleanup levels, as well as other issues related to the Facility, but did not accept oral public comment at the public meeting.

1.1 Community Involvement Background

It is the intent of DEQ that the citizens of Montana have the opportunity to be actively involved in the DEQ decision-making process with respect to state Superfund sites. The 2005 Spring Statement of Work (SOW) (DEQ, 2005) also provided for public comment on any risk assessment amendments.

1.2 Notification of Public Comment Period

Printed notices were published in the Bozeman Daily Chronicle and the Livingston Enterprise, daily newspapers, and on DEQ's website. DEQ sent notice of the public comment period and the August 9, 2012 meeting to the approximately 400 people on its mailing list for the Facility, including members of local government. DEQ also provided notice to the Associated Press and other state and local news organizations for media distribution. In addition, DEQ provided a copy of the document to the Park County Environmental Council for its review.

1.3 Explanation of Responsiveness Summary

All comments received during the public comment period on Amendment 2 have been reviewed and considered by DEQ in the decision-making process and are addressed in this Responsiveness Summary. To assist in developing responses, DEQ added its own numbering to comments where appropriate to add clarity. Each specific written comment is stated verbatim. In order to avoid duplication of some responses, similar comments are usually addressed only once for the first occurrence of the comment and thereafter referenced to the appropriate response. All documents cited, relied upon or considered in Amendment 2, including the Responsiveness Summary; or in the Final Task I Risk Assessment Amendment and Montana Department of Environmental Quality Approved Remedy for Newly Identified Contaminants of Concern in Indoor Air are part of the administrative record for Amendment 2.

2.0 COMMENTS AND RESPONSES

Kennedy/Jenks Consultants: As consultant to the BNSF Railway Company (BNSF), Kennedy/Jenks Consultants submitted the following comments on BNSF's behalf.

Comment 1: Overall, BNSF agrees with the exposure assumptions and toxicity criteria used by DEQ to derive the cleanup levels for indoor air, including the DEQ's use of IRIS as the primary source of toxicity values. BNSF also agrees that the cleanup levels for PCE and TCE should be based upon a cumulative excess lifetime cancer risk of 1 x 10-5 and a hazard index of 1. However, BNSF disagrees with apportioning the cumulative cancer risk and hazard index based on the number of contaminants of concern to derive the cleanup levels. The need for mitigation should be determined based on the cumulative excess lifetime cancer risk of 1 x 10-5 and a hazard index of 1, not on the apportioned cleanup levels.

Response: Comment noted. As DEQ has explained to BNSF on numerous occasions and as stated in Amendment 2, the ROD and the SOW, as updated by DEQ's March 10, 2009 letter, do not provide for the performance of building-specific risk assessments on specific properties sampled by BNSF. In addition, in making decisions about indoor air mitigation, DEQ does not allow building-specific risk assessment for vapor intrusion because of the extreme variability involved and the number of factors influencing indoor air concentrations. Rather, in order to be protective of public health, safety and welfare, and conservative, DEQ requires that screening or cleanup levels (sometimes referred to as target or action levels) be applied uniformly to buildings within a given facility. This comment does not require a change to Amendment 2.

Comment 2: BNSF continues to believe that benzene and ethylbenzene detected in both onsite and offsite structures are not reasonably attributable to vapor intrusion and that these compounds should not be included as COCs. The detailed basis for this comment is provided in the prior submittals by Kennedy/Jenks Consultants on behalf of BNSF dated 23 October 2009, 24 June 2010, and 23 November 2010.

Response: Comment noted. DEQ notes that BNSF's comments are not directly pertinent to Amendment 2 because Amendment 2 does not address the benzene or ethylbenzene indoor air cleanup levels. DEQ interprets BNSF's use of the terms "onsite" and "offsite" to mean "on the railyard" or "off the railyard," either of which may be part of the Facility if hazardous or deleterious substances have come to be located there. The basis for DEQ's determination that benzene and ethylbenzene are COCs for indoor air is provided in the January 2010 Final Task I Risk Assessment Amendment and Montana Department of Environmental Quality Approved Remedy For Newly Identified Contaminants of Concern, including the Responsiveness Summary; DEQ's October 25, 2010 comments on the Task I Soil Gas/ Indoor Air Data Summary Report dated June 24, 2010; and the March 2011 Interim Final Task I Risk Assessment Amendment Number 2. DEQ will not reiterate the determinations in these documents here. These DEQ documents were also responsive to the BNSF documents dated 23 October 2009, 24 June 2010, and 23 November 2010 referenced in BNSF's Comment 2. This comment does not require a change to Amendment 2.

Comment 3: In Section 7.0, DEQ should acknowledge that the indoor air data indicate that detections of chemicals in indoor air may be due to indoor sources.

Response: DEQ has made changes to Sections 2.0 and 3.0 of Amendment 2 in response to this comment. The potential contribution of secondary indoor sources is one of the multiple lines of evidence that DEQ evaluates to determine whether vapor intrusion is occurring at a structure. Section 7.0 of Amendment 2 provides the derivation of the cleanup levels, and does not apply the cleanup levels to specific structures at the Facility. An acknowledgment of the potential for indoor sources has been more appropriately included in Sections 2.0 and 3.0 of Amendment 2. DEQ has also included this information in its previous evaluations of vapor intrusion at the Facility, and DEQ will also include this information (as well as the other lines of evidence) in the analysis of vapor intrusion DEQ will conduct using the final cleanup levels in Amendment 2.

Comment 4: The last sentence of Section 7.0 should be revised to "…that **do not** meet the site-specific cleanup levels….".

Response: DEQ has made the requested change. Thank you for bringing this typographical error to DEQ's attention.

Comment 5: In closing, BNSF understands that the DEQ has determined vapor intrusion mitigation is not required at the Facility based on the application of the cleanup levels as proposed in the draft Amendment 2.

Response: DEQ has not yet made this determination. DEQ intends to compare all the vapor intrusion investigation data for each structure to the final indoor air cleanup levels and determine if any additional actions will be required. DEQ will inform BNSF of the results of its review. In addition, DEQ has already informed BNSF that it must continue to operate the soil vapor extraction systems in the Electric and Locomotive Shops as remediation systems and that BNSF may need to work with some property owners regarding institutional controls if residential cleanup levels cannot be met. This comment does not require a change to Amendment 2.