

CHAPTER 3 TRANSPORT OF ETHANOL

This chapter summarizes OEA's analysis of the potential environmental impacts associated with the transportation of ethanol, a regulated hazardous material, over RJCP's proposed rail line. RRLLC submitted written correspondence to OEA on October 5, 2010 ([see Appendix A](#)) outlining several technological advances that have resulted in changes to its proposed development project. Most notable is RRLLC's planned development of a waste-to-ethanol facility and the transport of ethanol over RJCP's proposed rail line. Following RRLLC's announcement, RJCP submitted written correspondence to OEA on November 17, 2010 ([see Appendix A](#)) indicating that it already transports approximately 20 to 30 carloads of ethanol per month over its existing lines from an ethanol plant located in Clearfield, Pennsylvania, and that it would be willing to provide outbound transport of RRLLC's estimated five carloads of ethanol per day from the proposed waste-to-ethanol facility. OEA determined that RJCP's potential transport of ethanol over the proposed rail line was a substantial change in the information available when the DEIS was prepared and that the potential handling of ethanol should be assessed in an SDEIS.

To conduct the supplemental analysis, OEA considered each of the 12 environmental resource areas evaluated in Chapter 4, Environmental Impacts, of the DEIS to determine if the conclusions reached in the DEIS would be affected by the now-planned transportation of ethanol. OEA determined that the transportation of ethanol would have no substantive effect on the analysis of energy resources, air quality, noise and vibration, environmental justice, cultural/historic resources, and hazardous waste sites because there would be no change in the location or construction of the proposed rail line or in RJCP's anticipated train traffic over the proposed rail line. Apart from a minor increase in truck traffic on the local road system (which is discussed below under Transportation and Safety), the environmental impact analysis presented in Chapter 4 of the DEIS would not substantially change if ethanol were transported on the proposed rail line. Therefore, this SDEIS contains no supplemental analysis of these environmental resource areas. OEA's analysis is the same as the analysis presented in the DEIS.

The two primary environmental resource areas that would directly be affected by RJCP's potential transportation of ethanol are transportation and safety and hazardous materials transport. Because hazardous materials were not discussed in the DEIS (as no hazardous materials were expected to be transported as a result of this project), both of these categories have been evaluated in detail in Sections 3.1 and 3.2, respectively, of this SDEIS. Section 3.1 assesses the potential changes to RJCP's rail operations and rail operations safety procedures, and Section 3.2 addresses the potential risks and consequences associated with the transport of ethanol. Both of these sections are supported by a comprehensive Hazardous Materials Risk Assessment, which is included in Appendix B of this SDEIS.

Regarding land use, biological resources, water resources, socioeconomics, and geology and soils, OEA has determined that the only impact that would be associated with RJCP's transport of ethanol would come from a potential derailment that released ethanol into the environment. Therefore, OEA saw no need to address the potential environmental impacts and safety consequences associated with a release of ethanol under each of these individual environmental issue areas separately. Rather, OEA summarized the applicable findings and conclusions related to each of these issue areas in Section 3.2, Hazardous Materials Transport, to avoid repetition.

Consistent with Chapter 4 of the DEIS, OEA evaluated the potential environmental impacts associated with the transport of ethanol for both the Proposed Action and the Modified Proposed Action, as well as the Local Road System Upgrade alternative and the No-Action Alternative, as appropriate. The Proposed Action and the Modified Proposed Action are evaluated for the purpose of identifying the least environmentally damaging route.

3.1 TRANSPORTATION AND SAFETY

3.1.1 Methodology

To evaluate the potential transportation and safety impacts associated with RJCP's planned transport of ethanol, OEA employed a similar methodology to the methodology presented in Chapter 4 of the DEIS. In addition, OEA completed a comprehensive Hazardous Materials Risk Assessment addressing RJCP's planned transport of ethanol. This Hazardous Materials Risk Assessment (see Appendix B) consists of a quantitative assessment of the estimated volume of ethanol RJCP anticipates transporting, a qualitative evaluation of the relevant physical properties and chemical characteristics of ethanol, a statistical analysis of the probability of a derailment event that would result in a release of ethanol, and an evaluation of the potential environmental impacts/safety consequences that would be associated with a release of ethanol into the project area. Finally, OEA summarizes the applicable hazardous materials transportation safety requirements that RJCP would have to comply with, should the Board approve its petition. A summary of the findings and conclusions of the risk assessment can be found under Section 3.2, Hazardous Materials Transport.

3.1.2 Impact Analysis – Local Road Traffic/Grade Crossing Delay

As detailed in Section 4.1.2 of the DEIS, both the Proposed Action and the Modified Proposed Action would result in a number of public road and private driveway crossings. Construction of these grade crossings would impact local traffic operations and movements on a short-term basis via temporary detours and/or lane restrictions. However, these construction-related impacts are anticipated to be minimal and of short duration. The more lasting impact would be associated with the operation of the proposed rail line and the subsequent vehicle delay at each of these grade crossings.

RJCP stated in its November 17, 2010 correspondence that it could transport as many as five carloads of ethanol per day outbound from RRLLC's proposed waste-to-ethanol facility at peak production. This five-carload per day peak transportation figure is based on RRLLC's estimated annual ethanol production capacity of 50,000,000 gallons. Based on a six-day work week, RRLLC's estimated annual ethanol production capacity would equal approximately 160,256 gallons per day. Transportation of this commodity using industry standard 33,000-gallon tanker cars generally would require five tanker cars per day, although some outbound trains could have more or less tanker cars depending on normal fluctuations in RRLLC's daily production levels. In its letter, RJCP stated that the addition of five cars of ethanol would not alter rail operations (expected to be one inbound train and one outbound train each day). Because the five ethanol cars would simply be added to the daily train, OEA concludes that the local road traffic/grade crossing delay impacts associated with the potential addition of up to five cars of ethanol per day would essentially be the same as the local road traffic/grade crossing delay impacts presented in the DEIS. There would be no change to the number

or location of public road and/or private driveway crossings, and there would be no substantial change to the average vehicle delay time at each grade crossing.

Regarding the Local Road System Upgrade alternative, RRLLC's proposed waste-to-ethanol facility would result in a greater number of trucks using the existing local road system. Based on the same 160,256-gallon-per-day peak shipping capacity used above, an estimated 64 additional trucks (32 loaded and 32 empty at 5,000 gallons each) could be added to the local road system. The addition of these trucks to the local road system would further compromise safety and increase the number of potential conflicts with other local and regional traffic.

The No-Action Alternative would continue to have no impact on local road traffic, nor would it introduce any grade crossings into the existing local road system.

3.1.3 Impact Analysis – Rail Operations

As noted above, RJCP could transport as many as five carloads of ethanol per day outbound from RRLLC's proposed waste-to-ethanol facility at peak production. This five-carload per day peak transport is based on RRLLC's estimated annual ethanol production capacity of 50,000,000 gallons. Based on a six-day work week, RRLLC's estimated annual ethanol production capacity would equal approximately 160,256 gallons per day. Transport of ethanol using industry standard 33,000-gallon tanker cars would typically equal five tanker cars per day. In its letter, RJCP stated that the addition of five cars of ethanol would not alter its planned operations of the rail line (i.e., one inbound train and one outbound train each day). The five ethanol cars would simply be added to the daily train, which would still consist of approximately 55 to 70 cars. Therefore, OEA concludes that the potential transport of ethanol would not significantly alter the analysis of RJCP's rail operations presented in the DEIS.

3.1.4 Impact Analysis – Rail Operations Safety

In preparing this SDEIS, OEA evaluated the potential impact the transport of ethanol would have on rail operations safety in a comprehensive Hazardous Materials Risk Assessment ([see Appendix B](#)). As part of that analysis, OEA determined that the transportation of hazardous materials is extensively regulated by USDOT, Pipeline and Hazardous Materials Safety Administration. As explained in more detail in the risk assessment, these regulations are found at 49 C.F.R. § 100-180. Regulations specific to the transportation of hazardous materials by rail are found at 49 C.F.R. § 174. Special handling requirements for Class 3 flammable liquids, such as ethanol, are found at 49 C.F.R. § 174.300. NS has incorporated these federal regulations into its United States Hazardous Materials Instructions for Rail (HM-1), which RJCP would be required to comply with. These regulations mandate certain operational procedures and safety requirements specific to the transportation of hazardous materials by rail. They include requirements for hazardous materials documentation (i.e., shipping papers, emergency response information, and location of hazardous materials cars within the train), rigorous inspections of hazardous material rail cars, placarding and marking of rail cars, placement within the train, emergency response procedures, and rail car construction/maintenance. The following two requirements are specific to the transport of Class 3 flammable liquids:

- Class 3 (flammable liquid) materials may not be loaded, transported, or stored in a rail car equipped with any type of lighted heater or open-flame device or

in a rail car equipped with any apparatus or mechanism utilizing an internal combustion engine in its operation.

- When train length permits, rail cars containing Class 3 flammable liquids must not be nearer than the sixth car from an engine or any occupied caboose, shoving platform, or passenger car. If length does not permit, those cars must be near the middle of the train, but never next to an engine or any occupied caboose, shoving platform, or passenger car.

A full copy of NS's United States Hazardous Materials Instructions for Rail (HM-1) containing all of the applicable hazardous materials transportation safety requirements is attached to the Hazardous Materials Risk Assessment in Appendix B.

These federal requirements were not discussed in the DEIS because RJCP was not planning to transport any hazardous materials on the proposed line when the DEIS was prepared. The supplemental analysis prepared for this SDEIS, however, shows that RJCP, like any other rail carrier, would be required to comply with these federal hazardous materials transportation safety requirements if it were to transport ethanol as part of this project. These existing requirements should substantially reduce the potential environmental impacts that would result in the event of a spill of ethanol from a derailment or other incident on the proposed rail line. OEA also has included in this SDEIS a new mitigation measure that would specifically require RJCP to comply with all applicable federal hazardous materials transportation safety requirements. This new mitigation measure is presented in Chapter 7 of this SDEIS.

3.2 HAZARDOUS MATERIALS TRANSPORT

3.2.1 Methodology

As previously mentioned, OEA completed a comprehensive Hazardous Materials Risk Assessment regarding RJCP's planned transport of ethanol. This Hazardous Materials Risk Assessment (see Appendix B) consists of a quantitative assessment of the estimated volume of ethanol RJCP anticipates transporting, a qualitative evaluation of the relevant physical properties and chemical characteristics of ethanol, a statistical analysis of the probability of a derailment event that would result in a release of ethanol, and an evaluation of the potential environmental impacts/safety consequences that would be associated with a release of ethanol into the project area. OEA based its evaluation of the potential environmental impacts associated with RJCP's planned transport of ethanol on the information and data presented in the Hazardous Materials Risk Assessment.

3.2.2 Impact Analysis – Hazardous Materials Transport

Characteristics of Ethanol

The only hazardous material RJCP anticipates transporting over the proposed rail line is fuel-grade or denatured (i.e., rendered undrinkable) ethanol. In the U.S., ethanol must be denatured before shipping (to render it non-potable to avoid taxes on alcohol that would otherwise apply) by adding

gasoline or gasoline-range hydrocarbons at a concentration of 2-5%.¹ In its November 17, 2010 correspondence, RJCP indicates that it currently transports approximately 20 to 30 carloads of ethanol per month over its existing lines from an ethanol plant located in Clearfield, Pennsylvania, and would be willing to provide outbound transport of RRLLC's estimated five carloads of ethanol per day from the proposed waste-to-ethanol facility as well. This five-carload per day peak transport is based on RRLLC's estimated annual ethanol production capacity of 50,000,000 gallons. Based on a six-day work week, RRLLC's estimated annual ethanol production capacity would equal approximately 160,256 gallons per day. Transport of this commodity using industry standard 33,000-gallon tanker cars would equal 4.86 tanker cars per day at peak production.

As previously noted, RJCP has indicated that the addition of five tanker cars of ethanol would not alter its planned rail operations (i.e., one inbound train and one outbound train per day). The five ethanol cars (inbound empty and outbound loaded) would simply be added to the daily train. Therefore, for purposes of this analysis, OEA has assumed a typical average daily hazardous material load of five 33,000-gallon tanker cars of ethanol on one outbound train, although that could vary somewhat depending on RRLLC's daily production levels.

Ethanol, also known as ethyl alcohol, pure alcohol, grain alcohol, or drinking alcohol, is a volatile, flammable, clear, colorless liquid. It is most commonly known as the type of alcohol in alcoholic beverages and thermometers. Ethanol is a straight-chain alcohol with a molecular formula of C_2H_5OH and an empirical formula of C_2H_6O . Ethanol is often abbreviated as EtOH, using the common organic chemistry notation representing the ethyl group (C_2H_5) with Et. Ethanol has widespread use as a solvent of substances intended for human contact or consumption, including scents, flavorings, colorings, and medicines. In the chemical manufacturing industry, it is commonly used as a base chemical for the production of other organic compounds. It has a long history as a fuel for heat and light, and more recently as a fuel for internal combustion engines.² According to the American Coalition for Ethanol, it is a clean-burning, high-octane motor fuel that is produced from renewable resources. USEPA recommends ethanol as an oxygen rich additive to promote more controlled burning in the manufacture of reformulated gasoline. This recommendation is based on ethanol's physical properties that allow it to quickly biodegrade (breakdown) when released into the environment. According to USEPA,³ the reported half-life of ethanol in surface waters is short, spanning 6.5 to 26 hours. The reported half-life of ethanol under anaerobic conditions (meaning without oxygen) ranges from 1 to 4.3 days. Tables 3-1 and 3-2 summarize the health and safety characteristics and natural resource hazard classifications of ethanol, specifically fuel-grade or denatured ethanol.

¹ See U.S. National Response Team 2010, *Quick Reference Guide: Fuel Grade Ethanol Spills (Including E85)*.

² See Meyers, R. L. & Myers, R. L. 2007, *The 100 Most Important Chemical Compounds: A Reference Guide*.

³ On March 24, 2000, USEPA published an Advance Notice of Intent To Initiate Rulemaking in the *Federal Register* regarding its authority under the Toxic Substances Control Act (40 C.F.R. § 755) to eliminate or limit the use of Methyl Tertiary Butyl Ether (MTBE) as a fuel additive in gasoline due to its documented potential to pollute the environment. In this publication, USEPA states that the most likely substitute based on current usage is ethanol and documents the differences in environmental toxicity that exist between MTBE and ethanol, including reported half-lives.

TABLE 3-1
HEALTH AND SAFETY CHARACTERISTICS OF ETHANOL

CHARACTERISTIC	ETHANOL¹
Natural State	Clear, colorless liquid
USDOT Shipping Name	Denatured Alcohol
USDOT Hazard Class	Class 3 (Flammable Liquid)
NFPA Chemical Hazard Rating ²	Health = 2 Flammability = 3 Reactivity = 0
Spill or Leak Considerations	Remove all sources of ignition including use of spark-proof tools.
Firefighting Considerations	Flammable liquid and vapor, lighter than water and soluble in water.
Toxicity Concerns	Causes severe eye irritation, respiratory tract irritation, and moderate skin irritation. May cause adverse reproductive and fetal effects in humans.
Stability	Stable though incompatible with strong oxidizing agents.

¹ Information taken from the Material Safety Data Sheet for Denatured Alcohol

² Explanation of National Fire Protection Association (NFPA) Chemical Hazard Rating System:

Health

- 4 – Danger – May be fatal on short exposure. Specialized protective equipment required
- 3 – Warning – Corrosive or toxic. Avoid skin contact or inhalation
- 2 – Warning – May be harmful if inhaled or absorbed
- 1 – Caution – May be irritating
- 0 – No unusual hazard

Flammability

- 4 – Danger – Flammable gas or extremely flammable liquid
- 3 – Warning – Flammable liquid flash point below 100°F
- 2 – Caution – Combustible liquid flash point of 100 to 200°F
- 1 – Combustible if heated
- 0 – Not combustible

Reactivity

- 4 – Danger – Explosive material at room temperature
- 3 – Danger – May be explosive if shocked, heated under confinement or mixed with water
- 2 – Warning – Unstable or may react violently if mixed with water
- 1 – Caution – May react if heated or mixed with water but not violently
- 0 – Stable – Not reactive when mixed with water

TABLE 3-2
NATURAL RESOURCE HAZARD CLASSIFICATIONS OF ETHANOL

NATURAL RESOURCE HAZARD	ETHANOL
Marine Pollutant ¹	No
Aquatic Toxicity	Not expected to significantly bioaccumulate
GESAMP Damage to Living Resources (Non-human) Ranking ²	1
GESAMP Bioaccumulation and Tainting Ranking ²	O

¹ Marine Pollutant identified by USDOT regulations 49 C.F.R. § 172.101.

² Explanation of Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) Hazard Profile Ranking System:

Damage to Living Resources (96-hour lethal concentration)

5 – Extremely toxic (less than 0.01 mg/l)

4 – Highly toxic (less than 1 mg/l)

3 – Moderately toxic (1-10 mg/l)

2 – Slightly toxic (10-100 mg/l)

1 – Practically nontoxic (100-1,000 mg/l)

0 – Non-hazardous (greater than 1,000 mg/l)

Bioaccumulation and Tainting

+ – Bioaccumulation to significant extent and known to produce a hazard to aquatic life and human health

Z – Bioaccumulation with attendant risk to aquatic organisms or human health; however, with short retention of the order of one week or less

T – Liable to produce tainting of seafood

O – No evidence to support one of the above ratings (+,Z,T)

Assessment of Probability for a Release of Ethanol

Using national accident/incident statistics on the Federal Railroad Administration (FRA) Office of Safety Analysis website, OEA calculated both an average annual mainline train accident (i.e., accidents occurring along mainline railroad routes, not including yards, sidings or spurs) rate per million train miles and an average annual mainline train accident rate for accidents that would result in a release of hazardous materials per million train miles for smaller Class III rail carriers like RJCP. These national Class III railroad average annual mainline train accident rates were then used to calculate an estimated probability of annual occurrence and return year interval (an estimate of time between accidents) for each type of accident on RJCP's proposed rail line. OEA calculated an average annual mainline train accident rate and an average annual mainline train accident rate for accidents that would result in a release of hazardous materials to quantify the statistical disparity between these two types of events. OEA's analysis shows that a very small number of train accidents actually results in a release of hazardous materials. OEA used mainline train accident data for Class III railroads because these statistical data are most similar to RJCP's anticipated operations over the proposed rail line.

The first step in the statistical analysis was to compile national data on the total number of annual mainline train accidents involving Class III railroad operators for the years available on the FRA Office of Safety Analysis website. Once the total number of annual mainline train accidents for Class III railroads was identified, the total mainline train mileage was used to calculate a mainline train accident rate per million train miles for each year included in the assessment. OEA calculated a mainline train accident rate for the years 2001-2009. See Table B-3 in Appendix B. These data were

then used to calculate an average annual mainline train accident rate per million train miles for the nine-year period.

Using the average annual mainline train accident rate combined with the estimated annual train miles for RJCP's anticipated rail operations, OEA was able to calculate an annual probability of occurrence and return year interval for a mainline train accident on RJCP's proposed rail line. OEA decided to use the 20-mile project length of the Proposed Action instead of the 19-mile project length of the Modified Proposed Action because that would produce a conservative "worst-case scenario" from an annual mileage perspective (i.e., 12,480 annual train miles under the Proposed Action as opposed to 11,856 annual train miles under the Modified Proposed Action). OEA's analysis, however, shows that this 600-mile difference in annual train mileage between the Proposed Action and the Modified Proposed Action produces only minimally different results (i.e., less than one half of one percent) in the statistical probability of an annual occurrence. See Table 3-3 below.

TABLE 3-3
ESTIMATED ANNUAL TRAIN ACCIDENT RATE
FOR RJCP'S PROPOSED RAIL LINE

2001-2009 Average Annual Mainline Train Accident Rate Per Million Train Miles for Class III Railroad Operators	7.8
Estimated RJCP Train Mileage Per Year (1 train/day @ 40 miles/roundtrip @ 312 days/year)	12,480
Estimated RJCP Train Accident Rate Per Year	0.097 (9.7%)
Estimated RJCP Train Accident Return Year Interval	10.3

Based on OEA's analysis, there is a 0.097 (9.7%) annual probability of occurrence for a mainline train accident on the proposed rail line. This would result in an estimated return year interval (an estimate of time between accidents) of one accident every 10.3 years.

After calculating RJCP's annual probability of occurrence and return year interval for a mainline train accident, OEA, using that data, calculated mainline train accidents that would result in a release of hazardous materials. OEA used national accident/incident statistics for Class III railroad operators over the same nine-year period discussed above (2001 to 2009) to calculate an average annual mainline train accident rate for accidents that would result in a release of hazardous materials. See Table B-5 in Appendix B. Using this figure combined with the estimated annual outbound train miles for RJCP's proposed project, OEA calculated an annual probability of occurrence and return year interval for a mainline train accident that would result in a release of hazardous materials on RJCP's proposed rail line. OEA again decided to use the 20-mile project length of the Proposed Action instead of the 19-mile project length of the Modified Proposed Action in order to capture the "worst-case scenario" from an annual outbound mileage perspective. Table 3-4 shows the data used in the calculations, as well as the calculation results.

TABLE 3-4
ESTIMATED ANNUAL TRAIN ACCIDENT RATE
FOR ACCIDENTS THAT WOULD RESULT IN A
RELEASE OF HAZARDOUS MATERIALS
FOR RJCP'S PROPOSED RAIL LINE

2001-2009 Average Annual Mainline Train Accident Rate For Accidents that Would Result in a Release of Hazardous Materials Per Million Train Miles for Class III Railroad Operators	0.116
Estimated RJCP Outbound Train Mileage Per Year (1 train/day @ 20 miles/outbound trip @ 312 days/year)	6,240
Estimated RJCP Annual Train Accident Rate for Accidents that Would Result in a Release of Hazardous Materials	0.0007 (0.07%)
Estimated RJCP Train Accident Return Year Interval for Accidents that Would Result in a Release of Hazardous Materials	1,428

Based on OEA's analysis, there would be a 0.0007 (0.07%) annual probability of occurrence for a mainline train accident resulting in a release of hazardous materials on the proposed rail line. This annual probability of occurrence would equal an estimated return year interval of one accident that would result in a release of hazardous materials every 1,428 years. Thus, there is little likelihood that a mainline train accident resulting in a release of hazardous materials would occur on the proposed rail line. OEA notes that the planned 25 mph maximum operating speed for the proposed rail line likely would further reduce the probability of an occurrence.

Environmental Impacts of an Ethanol Release

As discussed in the Hazardous Materials Risk Assessment in Appendix B, OEA also evaluated the potential environmental impacts and safety consequences that would be associated with a release of ethanol into the project area. Ethanol is a polar/water soluble liquid that is flammable. Accordingly, it is important that any large spill of ethanol be accompanied by an immediate evacuation of all persons 1,000 feet downwind of the spill site because of public health and safety concerns. In the case of a spill involving a fire, the evacuation should be expanded to include all persons within one-half mile (in every direction) of the accident site.⁴ OEA used these recommended evacuation distances for the land area potentially affected by a major release of ethanol. The environmental impacts associated with a release of a large volume of ethanol into a stream or river would likely extend beyond the one-half mile fire evacuation zone.

In general, if ethanol were released on land, standard USEPA recommended spill control and countermeasure responses, found at 40 C.F.R. § 112, would include constructing a holding area (pit, pond, etc.) or a dike (soil, sand bags, foamed polyurethane, or foamed concrete) to contain the liquid. If surface waters were impacted, the use of natural barriers or control booms to limit spill travel could also be implemented. If ethanol were released into the soil or water, it should readily biodegrade (breakdown) and would not be expected to significantly bioaccumulate (increase in concentration). If ethanol were released into the atmosphere, it should photodegrade (breakdown)

⁴ USDOT 2008, Emergency Response Guidebook: A Guidebook for First Responders during the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident, 200-201.

within hours in polluted urban areas and within an estimated range of four to six days in less polluted areas.⁵

The potential environmental impacts and safety consequences associated with a release of ethanol would vary depending upon several factors, including the location of the release (i.e., developed area or undeveloped area), the nature of the release (i.e., land spill or water spill or both), the magnitude of the release, how well the release was contained, and if the ethanol was ignited or not. If a release were to occur in an undeveloped area (such as the Eastern Segment of the proposed rail line) with effective containment measures and without fire or ethanol entering into surface water, the adverse effect would likely be minimal due to the biodegradable and photodegradable characteristics of ethanol discussed above. Apart from localized vegetation and soil impacts, such an event would likely have little to no long-term environmental effects. If, however, a release were to occur in a developed area (i.e., certain sections of the Western Segment of the Proposed Action or Modified Proposed Action) and the ethanol ignited or spilled directly into surface water, the adverse effects would be substantially greater. A release in a populated area would result in the evacuation of people, potential health and safety concerns, and potential property damage.

An accident involving a release of ethanol directly into surface water would likely result in the death of some aquatic organisms for a particular distance downstream. The distance of downstream impact would depend on a number of factors, including the volume of ethanol entering the watercourse (any flowing body of water), the rate at which the ethanol enters the watercourse, and the dilution potential of that watercourse (i.e., smaller streams with less dilution potential would have a greater downstream impact). A worst-case scenario would involve an uncontained release of a large volume of ethanol or an explosive release of ethanol in a highly urbanized area. Such an event could result in human health and safety impacts up to and including destruction of personal property, and even death. The following sections summarize the potential impacts of a release of ethanol on land use, biological resources, water resources, socioeconomics, and geology and soils.

Land Use

As noted above, the potential environmental impacts and safety consequences associated with a release of ethanol into the project area would depend on the location of the particular release. A release of ethanol within the Western Segment of either the Proposed Action or the Modified Proposed Action would have a substantially greater impact on land use than a release of ethanol within the Eastern Segment. This is due to the substantial differences in land use that exist between the Eastern Segment and both alternatives for the Western Segment. In general, a release of ethanol within the Western Segment of the Proposed Action or the Modified Proposed Action would have a greater potential to impact developed land uses (i.e., residential, commercial, and industrial), whereas a release of ethanol within the undeveloped Eastern Segment would have virtually no potential to impact these types of land uses. A release of ethanol within the Eastern Segment would have a greater potential to impact biological resources, as discussed further below.

Potential impacts of a release of ethanol would also differ along both alternatives of the Western Segment. For example, as noted in Section 4.2 of the DEIS, the Modified Proposed Action's Alternate Route from Philipsburg to Munson would traverse a much less developed area than the

⁵ Howard, P. H. 1990, Handbook of Environmental Fate and Exposure for Organic Chemicals, 222-226.

Proposed Action's Wallaceton to Munson Route. There are significant differences in the number of adjacent residential properties on these two alternative routes (i.e., 147 versus 20). Additionally, approximately 26,863 linear feet (or 76%) of the Modified Proposed Action's Alternate Route from Philipsburg to Munson is located adjacent to undeveloped land consisting of a combination of wetlands, woodlands, and active/former mining areas. Therefore, a release of ethanol along the Modified Proposed Action's Alternate Route from Philipsburg to Munson would have a lower potential to impact developed land uses than a release along the Proposed Action's Wallaceton to Munson Route.

Impacts to developed land are significant because they are typically associated with people. A train derailment resulting in a release of ethanol in a residentially developed area (i.e., Wallaceton, Morrisdale, Allport, Munson, Hawk Run, Winburne) would likely involve some property damage (i.e., impacts to landscaping/vegetation), potential health and safety concerns to residents (i.e., eye, skin, and respiratory tract irritation), and difficulties to citizens caused by the implementation of mandatory evacuation procedures until the spill is cleaned up. In a worst-case scenario, involving an uncontained release of a large volume of ethanol or an explosive release of ethanol in a residential area, potential health and safety impacts could be significant or even life-threatening. However, as discussed above, the risk of any release, let alone a significant release, of ethanol on this proposed line is not high; the characteristics of ethanol make it likely that the effects of the release would not be long term; and existing federal regulations and containment procedures are in place to minimize the risk that exists. Thus, an uncontained release of a large volume of ethanol or an explosive release of ethanol in a residential neighborhood in the project area is unlikely.

Biological Resources

Similar to land use impacts, the potential impacts to biological resources (i.e., wildlife and habitat) associated with a release of ethanol would depend on the location of the release. As noted above, an ethanol release within the Eastern Segment or within the Modified Proposed Action's Alternate Route from Philipsburg to Munson would have a greater potential to impact biological resources than an ethanol release within the Proposed Action's Wallaceton to Munson Route. This is due to the more undeveloped setting and the greater biological diversity of these areas.

The adverse effect on biological resources of a small release or a larger release that is effectively contained by hazardous materials response crews would likely be minimal due to the biodegradable and photodegradable characteristics of ethanol.⁶ Apart from localized vegetation and soil impacts, such an event would likely have little to no long-term environmental effects. Conversely, a significant release of ethanol in an undeveloped area would likely result in more severe impacts to biological resources, including death of certain localized plants and animals. The degree of impact would depend on the amount of ethanol that was released into the environment and the ability of hazardous materials response crews to contain the release. In a worst-case scenario, a large volume of ethanol released into the environment and ignited, with little to no containment, could result in a wildfire that extends beyond the immediate ethanol impact area. A large-scale release of ethanol that does not ignite would likely kill plants in the saturated soil area. However, the effects would not be long-lasting due to the rapid oxidation (breakdown) of ethanol discussed above.

⁶ See Appendix B, pp. B-2 and B-3.

Water Resources

Any accident that results in the release of a hazardous material into a surface water resource (i.e., creek, stream, river, etc.) is a serious environmental issue. The severity of the impact of these types of accidents is directly dependent upon the chemical characteristics and physical properties of the particular hazardous material and the amount of the hazardous material that is released. Non-soluble hazardous materials that are denser than water (i.e., sink below the water column) can be very detrimental to aquatic organisms and difficult to remediate. Ethanol is not one of those types of hazardous materials, however. As the discussion above explains, ethanol is soluble and easily diluted in water. In other words, the chemical bonds that hold ethanol together are easily broken in water, allowing the individual molecules of ethanol to readily disperse throughout the water column. Nonetheless, in the unlikely event that a significant volume of ethanol was to spill directly into a watercourse, it could result in the death of some aquatic organisms in the area. The distance of potential downstream impacts on water resources would depend on a number of factors, including the volume of ethanol entering the water, the rate at which the ethanol enters the water, and the dilution potential of that water (i.e., smaller streams with less dilution potential would have a greater downstream impact). Apart from the initial shock to the aquatic system (and the subsequent death of some aquatic organisms), no long-term adverse effects would be anticipated because once the spill is contained and ethanol is no longer entering the watercourse, the ethanol would quickly flush downstream and become diluted as additional tributary streams contribute to the water flow of the particular watercourse. This impact would, to some degree, be minimized if the ethanol were entering water already impacted by acid mine drainage from surface and subsurface coal mining.

The physical properties of ethanol allow it to quickly biodegrade when released into the environment. Ethanol is soluble in water and is reported as having a half-life under anaerobic conditions of 1 to 4.3 days.⁷ This rate of degradation suggests that ethanol would present only a limited risk to contaminate groundwater in the event of release caused by rail operations. Additionally, the extent of groundwater contamination would be limited by the permeability of the underlying bedrock geology (i.e., how easily or quickly a liquid passes through a layer of rock). A rock layer having low permeability would inhibit groundwater contamination. However, if a significant volume of ethanol were to be released into the environment without effective containment measures, the possibility for groundwater contamination could exist. Nevertheless, given the chemical properties of ethanol, any groundwater contamination should naturally remediate in a relatively short time period. Moreover, in the case of a significant groundwater contamination event, chemical oxidation could be used as a means to treat the contaminated groundwater.⁸

Socioeconomics

From a socioeconomic perspective, a train derailment or other event resulting in a release of ethanol would require the services of local and regional emergency response service providers, including hazardous materials response crews. Such an event would result in an increased demand

⁷ See Appendix B, pp. B-2 and B-3.

⁸ Chemical oxidation is a pollution treatment technology in which an oxidant, such as hydrogen peroxide (H₂O₂), ozone (O₃), or permanganate (MnO₄), is introduced into a contaminated substance (i.e., soil, groundwater, etc.) to react with contaminants such as MTBE, other fuel oxygenates, and other organic compounds, converting them to innocuous products, such as carbon dioxide and water. USEPA 2004, *Technologies for Treating MTBE and Other Fuel Oxygenates*, 4-34.

on emergency response crews. However, given the low probability of occurrence,⁹ this increased service demand would be minimal and within the operational capacity of existing local and regional emergency response service providers. Additionally, RJCP has its own Derailment Services Division stationed in Pittsburgh, Pennsylvania, to handle any and all derailment and emergency management incidents, including hazardous materials spills, on a 24/7 basis.

Geology and Soils

Apart from the potential vegetation impacts mentioned above, the geology and soil impacts associated with a release of ethanol would be relatively minor because of the biodegradable and water soluble characteristics of ethanol. If ethanol does enter the soil or underlying geology, it would likely biodegrade within a relatively short time period given its reported half-life.¹⁰

Summary/Conclusions

When evaluating the potential environmental impacts and safety consequences of an ethanol spill for the various project alternatives, OEA relied on the affected environment information presented in Chapter 3 of the DEIS. Based on this information, OEA has concluded that an ethanol spill along the Proposed Action would have a greater potential to impact people, whereas an ethanol spill along the Modified Proposed Action would have a greater potential to impact the natural environment (i.e., biological resources, water resources, etc.). This would result from the notable differences in land use between the Western Segment's two alternate routes to Munson. Impacts of a spill on the natural environment would, of course, also be undesirable. But potential impacts to people are generally considered more significant than potential impacts to natural resources. Therefore, a train accident resulting in a release of ethanol on the Proposed Action's Western Segment would generally be more significant than a train accident resulting in a release of ethanol on the Modified Proposed Action's Western Segment. In addition, OEA has concluded that the significantly greater number of grade crossings associated with the Proposed Action compared to the Modified Proposed Action (i.e., 17 versus 4) would likely increase the probability of occurrence of a train accident for the Proposed Action.

An ethanol spill associated with the Local Road System Upgrade alternative would have impacts similar to those caused by a spill along the proposed rail line. A vehicular accident involving a release of ethanol in an urban area would have a greater potential impact on people, whereas a vehicular accident involving a release of ethanol in a more rural area would have a greater potential impact on natural resources. The primary differences would be the significantly greater statistical probability for such an event to occur (i.e., vehicular accidents occur far more frequently than train accidents) and the significantly lower volume of ethanol likely to be released (i.e., a single truck can carry approximately 15% of the load of a single railroad tanker car).

The No-Action Alternative would have no environmental impacts or safety consequences related to a release of ethanol.

⁹ See Appendix B, Table B-6.

¹⁰ See Appendix B, pp. B-2 and B-3.

Based on the analysis, OEA has determined that the statistical probability of occurrence for a train accident resulting in a release of ethanol into the project area would be extremely low. OEA calculated a 0.0007 (0.07%) annual probability of occurrence for a mainline train accident that would result in a release of hazardous materials on the proposed rail line. This annual probability of occurrence would equal an estimated return year interval of one accident resulting in a release of hazardous materials every 1,428 years.¹¹ The planned 25 mph maximum operating speed for the proposed rail line likely would further reduce the probability of an occurrence. Existing federal regulations and containment procedures are in place to minimize the risk of an occurrence, and emergency response service providers are available in the project area to remediate possible damage in the event of a spill. Additionally, ethanol's ability to biodegrade (breakdown) quickly when released into the environment makes it unlikely that the effects of a release would be long term.

¹¹ See Appendix B, Table B-6.