To Memo To File

From M. Kirk Dunbar – HDR, Minneapolis

Date July 26, 2002

Subject Conformity Analysis for the Section 206 Aquatic Ecosystem Restoration Project Chester Creek, US Army Engineer District, Alaska, Project Number PWII63533

The United States Army Corps of Engineers (USACE) Section 206 Aquatic Ecosystem Restoration project for Chester Creek in Anchorage, Alaska, was evaluated with respect to existing and future air quality (specifically carbon monoxide) resulting from construction and operation of the proposed project. Because the source of funding for the project is the USACE and the United States Fish and Wildlife Service (FWS), it is necessary to evaluate the potential applicability of General Conformity (40 CFR Part 93, Subpart B). As discussed in the following sections, the net CO emissions increase resulting from the construction and operation of the proposed project is less than the threshold that triggers a conformity determination under general conformity. Therefore, pursuant to 40 CFR § 93.153(c)(1), the requirements of general conformity do not apply and the project is presumed to conform with the SIP for air quality.

1.0 INTRODUCTION

In June 1998, HDR Alaska, Inc., prepared a document titled "Anchorage International Airport – Terminal Redevelopment Project Air Quality Conformity Document" (hereafter referred to as the June 1998 document). The June 1998 document contained discussions regarding air quality standards and the current designation of the Anchorage Bowl (which includes the area in which the proposed project will be located) as a nonattainment area for carbon monoxide (CO). Rather than repeating those discussions here, please refer to Sections 1.1 and 1.2 of the June 1998 document (Attachment 1).

The CAA, as amended, included the concept of conformity, which is intended to ensure that the Federal government does not take, approve, or support actions that are inconsistent with a state's plan to attain and maintain the NAAQS for criteria pollutants. Conformity is divided into two categories. Transportation conformity applies to projects (or portions of a project) subject to approval, funding, or implementation by the Federal Highway Administration (FHWA) of the Federal Transit Administration (FTA). General conformity applies to all other federal actions, including projects under the auspices of the USACE and the FWS. These two categories of conformity are discussed in Sections 1.1 and 1.2 of this document.

1.1 Transportation Conformity

Pursuant to 40 CFR § 93.102(a)(1)(iii), FHWA/FTA funded projects must be found to conform with state or federal air quality implementation plans. This action is required under Section 176(c) of the CAA, as amended. The USACE, FWS, and Municipality of Anchorage are the agencies responsible for final approval, funding, and implementation of the proposed project. Therefore, because neither the FHWA nor the FTA is responsible for approval, funding, or implementation of the proposed project, transportation conformity is not applicable.

1.2 General Conformity

Pursuant to 40 CFR § 93.153(b), any federal action or portion thereof which is not specifically subject to transportation conformity, is subject to a general conformity determination for each pollutant where the total of direct[1] and indirect[2] emissions in a NAA caused by a federal action will equal or exceed any of the rates shown in paragraph (1) of the above referenced rule. If the project-related emissions increases are less than these thresholds, the action does not require a general conformity determination and is presumed to conform to the state implementation plan (SIP) for air quality. If the project-related emissions increases exceed the thresholds, a conformity determination is required for the federal action. The procedures for conducting a general conformity determination are detailed in the remaining sections of Subpart B of 40 CFR Part 93 (i.e., §§ 93.154 through 93.160).

2.0 DESCRIPTION OF THE PROPOSED PROJECT

The USACE plans to do a Section 206 aquatic ecosystem restoration project for Chester Creek in Anchorage, Alaska. In addition to USACE funding, the FWS has received funds to assist in the project. The federally funded (i.e., USACE and FWS) portion of the proposed project includes the following components:

- Construction of 1000 ft of open channel connecting the Knik Arm of Cook Inlet to the west end of the Westchester Lagoon (Figure 1).
- Construction of a two percent slope fish ramp to the Lagoon.
- Removal of existing railroad embankment and replacement with trestle.

Construction of the proposed project will not result in any increases in rail usage or vehicle traffic in the area.

This project is located in the Municipality of Anchorage (MOA) NAA for CO (see June 1998 document for details regarding the NAA). Therefore, the project is required to demonstrate conformity with the area's applicable state and federal implementation plans with respect to CO

[1] Direct emissions are those caused by or initiated by the implementation and/or operation of an action, and that occur at the same time and place as the action. See Section 4.2.

[2] Indirect emissions are those caused by the implementation and/or operation of an action, are reasonably foreseeable, but which occur later in time and/or are farther removed in distance from the action itself. See Section 4.4 for complete definition.

emissions. The USACE and FWS are the only federal agencies involved in the National Environmental Policy Act (NEPA) process for the proposed project. Therefore, the project must be evaluated under the General Conformity rule. Neither the FHWA nor the FTA is the agency responsible for approving, funding, or implementing the proposed project. Therefore, the project is not subject to the requirements of the transportation conformity rule.

3.0 DISCUSSION OF PROJECT JUSTIFICATION

Chester Creek, located in Anchorage, Alaska, originates in the Chugach Mountains and runs through a highly urbanized watershed before draining into the Knik Arm of Cook Inlet. The creek has three major forks; the south fork forms the headwaters, which drain an undeveloped watershed in the Chugach foothills before reaching the Anchorage bowl. Within Anchorage, all forks of Chester Creek are impacted by development. The south fork has been channelized and straightened and sections of the middle fork have been routed through storm sewers.

The proposed restoration project consists of breaching the berm supporting the railroad line at the west end of Westchester Lagoon and reestablishing an open channel from the Inlet to the lagoon with a weir structure to maintain the water level in the lagoon. The project will relocate utilities on the inlet side of the berm and construct a trestle for the railroad line. The improvements will provide a fish passage for salmon by removing the major obstructions to in-migration and out-migration access at the mouth of the creek that have reduced Chester Creek salmon stocks almost to extinction.

4.0 GENERAL CONFORMITY ANALYSIS

4.1 General

A conformity determination under the General Conformity rules is required for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by a federal action would equal or exceed the conformity determination threshold rates specified in 40 CFR § 93.153(b). For CO (the only nonattainment or maintenance pollutant for the MOA NAA), the applicable threshold is an increase of 100 tons CO/year. As shown below, the net CO emissions increase resulting from the construction and operation of the proposed project is less than this threshold. Therefore, pursuant to 40 CFR § 93.153(c)(1), the requirements of general conformity do not apply and the project is presumed to conform with the SIP for air quality.

4.2 Construction Emissions

The CO emissions generated during the construction phase of the project were estimated based on projections of the type and activity level of the construction equipment expected to be used for the project. This information was developed by HDR personnel based on the nature of the project and experience with past projects similar in nature. A major assumption in developing the construction equipment information is that all excavated material will be used on-site rather than being trucked off-site.

As shown in the Attachment 2 to this memo, the construction-related CO emissions, over the expected 7-month duration of the proposed project, are estimated to be 4.65 tons. Attachment 3 presents emissions estimations for particulate matter, volatile organic compounds (ozone precursor), nitrogen oxides, and sulfur dioxide (lead was not included because of the extremely low level of emissions expected, based on a diesel engine lead emission factor of 0.00003 grams per HP-hr, per Fifth Edition AP-42, Table 1.3-10). Because the Anchorage area is classified as attainment for each of these pollutants, they are not part of the General Conformity analysis and are provided for informational purposes only.

4.3 Direct Emissions

Direct emissions are defined as "those emissions of a criteria pollutant ... that are caused or initiated by the federal action and occur at the same time and place as the action." The proposed project does not result in any increased rail usage or changes to traffic operations in the area. Therefore, the only direct emissions associated with the project are the periodic maintenance activities that will be associated with the new rail trestle, weir structure, and channel.

The project design was specifically selected so that the annual maintenance associated with the project will be very, very minimal. The trestle will have to be painted every 20 years (what little metal that is on it as it is mostly concrete), the channel should stand forever as it is all rock and designed to function as a natural channel, and the bike trail will require repaving in 10 to 15 years. Other than that there should be no maintenance. Based on this, the emissions associated with these maintenance activities are expected to be much less than the construction-related emissions presented above in Section 4.2 and, therefore, are not quantified.

4.4 Indirect Emissions

Indirect emissions are defined in 40 CFR § 93.152 as "those emissions of a criteria pollutant or its precursors that: (1) are caused by the federal action but that may occur later in time and/or may be farther removed in distance from the action itself but are still reasonably foreseeable; and (2) the federal agency can practicably control and maintain control over due to a continuing program responsibility of the federal agency." Further, reasonably foreseeable emissions are defined as being "projected future indirect emissions that are identified at the time the conformity determination is made; the location of such emissions is known and the emissions are quantifiable, as described and documented by the federal agency based on its own information and after reviewing any information presented to the federal agency."

The only emissions anticipated in connection with this project are those associated with project construction and the minimal ongoing maintenance discussed previously. Therefore, the proposed project will not result in any indirect emissions.

4.5 Total Project Emissions

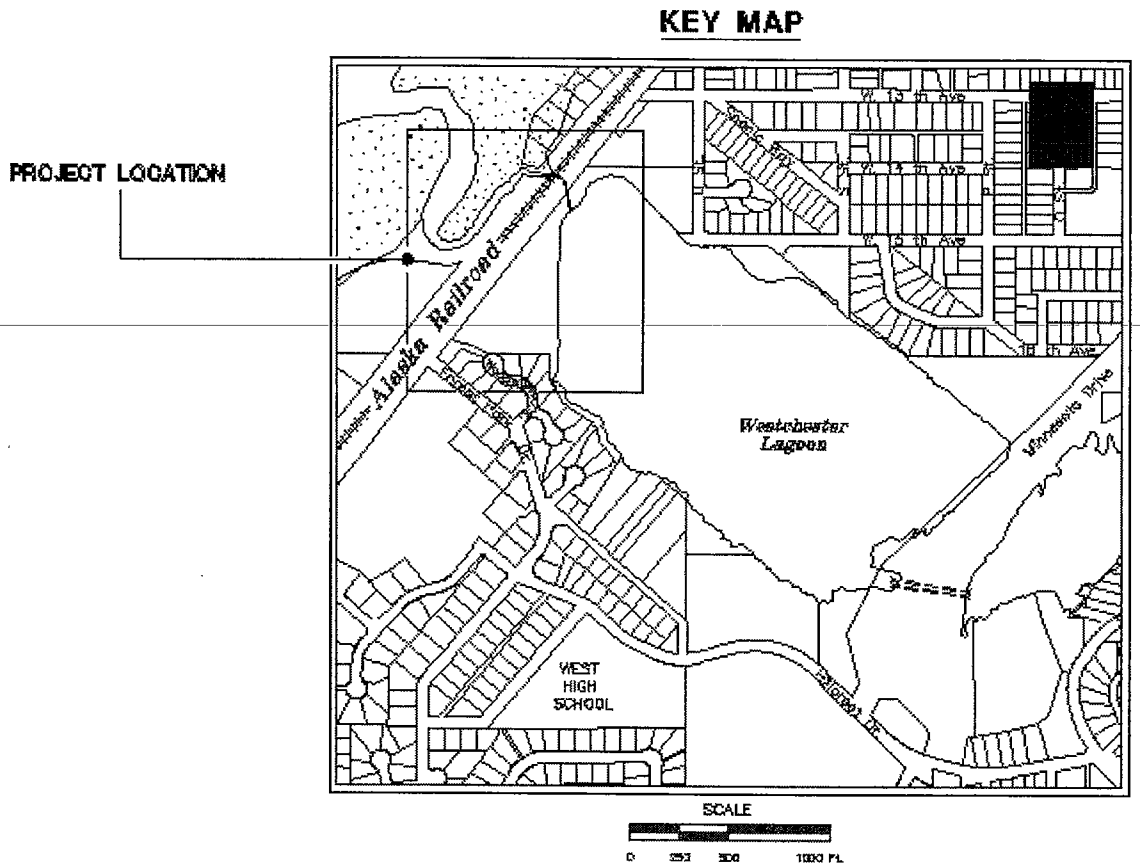
As discussed in the previous sections, the total direct and indirect emissions caused by the project during the construction phase were estimated to be 4.65 tons CO/year. The total direct and indirect emissions resulting from project operation will be substantially less than the construction-related CO emissions. Operation-related emissions will be due to occasional minor maintenance activities on the railroad trestle and bike path repaving. Therefore, the emission rates during both the construction phase and the operating phase are below the conformity determination threshold of 100 tons CO/year. As such, the project does not require a conformity determination and is presumed to conform with SIP for air quality.

An action is defined as regionally significant if the total emissions caused by the project represent 10 percent or more of a NAA's total emissions of that pollutant. If an action is regionally significant, a conformity determination is required even if the total emissions caused by the project are less than the conformity determination threshold for that pollutant (100 tons/year for CO).

As obtained from EPA's Emission Trends Viewer CD (1985-1995, Version 1.0, September 1996) emissions database, the total CO emitted in the MOA (referred to as Anchorage County in the database) in 1994 was 69,921 tons and in 1995 was 61,214 tons. Although a portion of these emissions would have been generated outside of the NAA boundary, it is reasonable to assume that most of these emissions were generated within the NAA boundaries. Based on these data, it is obvious that the maximum project caused emissions of 4.65 tons CO/year during construction is far below 10% of the area's emissions. Therefore, the project is not regionally significant.

Attachments

Figure 1. Project Location



ATTACHMENT 1

Anchorage International Airport – Terminal Redevelopment Project Air Quality Conformity Document

ANCHORAGE INTERNATIONAL AIRPORT

Terminal Redevelopment Project
Environmental Assessment
State Project #52346

Terminal Redevelopment Project Air Quality Conformity Document

Prepared by:

HDR Alaska, Inc.
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June 1998

Air Quality Conformity Document (Abbreviated)

1.0 Introduction

1.1 Air Quality Standards

The Federal Clean Air Act of 1970 required the U.S. Environmental Protection Agency (EPA) to adopt ambient air quality standards. These standards were established in order to protect public health, safety, and welfare from known or anticipated adverse effects of sulfur dioxide (SO_2), particulates (PM10, 10-micron and smaller), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). The National Ambient Air Quality Standards (NAAQS) for these criteria pollutants are listed in Table 1. Areas that were found to exceed these standards are classified as NAAs. States are required to develop and implement plans that detail the measures they will take to bring areas of nonattainment into compliance with the NAAQS.

TABLE 1: National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.03 ppm
	Twenty-Four Hour*	0.14 ppm
	Three-Hour* Secondary	0.50 ppm
Particulates (PM10)	Annual Arithmetic Mean: Primary and Secondary	50 $\mu g/m^3$
	Twenty-Four Hour:** Primary and Secondary	150 $\mu g/m^3$
Carbon Monoxide (CO)	One Hour*	35 ppm
	Eight Hour*	9 ppm
Ozone (O_3)	One Hour***	0.12 ppm
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.053 ppm
Lead (Pb)	Three Month Arithmetic Mean	1.5 $\mu g/m^3$

* *Not to be exceeded more than once per year.*
** *Statistically estimated number of days with exceedances, not to be more than once per year.*
*** *Not more than one expected exceedance per year on a three year average.*
ppm *Parts of pollutant per million parts of air (by volume at 25°C).*
$\mu g/m^3$ *Micrograms of pollutant per cubic meter of air.*

The CAA, as amended, included the concept of conformity, which is intended to ensure that the Federal government does not take, approve, or support actions that are inconsistent with a state's plan to attain and maintain the NAAQS for criteria pollutants. Conformity is divided into two categories. Transportation conformity applies to projects (or portions of a project) subject to approval, funding, or implementation by the Federal Highway Administration (FHWA). General conformity applies to all other federal actions, including projects under the auspices of the Federal Aviation Administration (FAA). These two categories of conformity are discussed in Sections 1.3 and 1.4 of this document.

1.2 Existing Air Quality

A portion of the Anchorage Bowl is currently classified as nonattainment for CO and attainment for all other pollutants (except for a small area of PM10 nonattainment located north of the

Anchorage Bowl near Eagle River). The proposed project is located inside of the CO NAA but outside of the PM10 NAA. Figure 1 shows the boundaries of the current CO NAA.

Although this project is located within the boundary of the CO NAA, it is unlikely that CO violations occur in the vicinity of this project. Monitoring data collected by the Anchorage Air Pollution Control Agency (MOA) have demonstrated that most of the area currently within the nonattainment boundary meets the federal CO standard. Further, Anchorage's CO levels in 1991 were roughly one-half of the levels recorded in 1984. The *1992 Air Quality Attainment Plan for Anchorage, Alaska* describes the location of five CO monitoring sites within the nonattainment boundary. They are shown on Figure 1. The MOA Air Quality Program Section confirms that the monitoring site at 7th Ave. and C Street is no longer in operation.

Review of recent CO concentrations (1994 through 1996) from these five monitoring stations indicate that the Benson at Spenard site had three exceedances in 1996 and the Seward Highway at Benson site had three exceedances in 1996 and two exceedances in 1994. The Sand Lake site, which is nearest to the airport and the proposed project but approximately two miles away, has not experienced a violation since the early 1980s. In addition, per a telephone conversation with the MOA Air Quality Program Section, a CO saturation study was recently completed at the Federal Express parking lot approximately one mile north of the AIA South Terminal, which involved several monitors. The results of that study (scheduled for completion in summer 1998) and the data collected from those monitors indicate that the portion of the airport not included in the NAA and the portion of the NAA that encompasses the airport did not experience any exceedances during the winter of 1997-1998.

Table 2 presents a summary of the 8-hour monitoring results from the five monitoring sites discussed above (obtained from EPA Region 10 Internet site). The results for the monitoring series performed at the Federal Express facility located on AIA property are not currently available and are not included in the summary.

TABLE 2: CO Monitoring Results for the Anchorage Area (8-hour averaging period)

Monitoring Site	Year	First Maximum (ppm)	Second Maximum (ppm)	Exceed Standard?
Sand Lake	1994	5.8	5.7	No
	1995	6.7	6.3	No
	1996	7.7	6.9	No
Seward Highway at Benson	1994	11.3	11.0	Yes
	1995	9.0	8.4	No
	1996	10.8	10.5	Yes
Benson at Spenard	1994	8.4	8.3	Yes
	1995	9.2	7.6	No
	1996	11.0	9.6	Yes
Garden	1994	9.4	8.6	No
	1995	8.4	7.4	No
	1996	8.9	8.7	No

7th and C Street	1994	5.7	5.3	No
	1995	7.0	5.0	No
	1996	NA	NA	NA

NOTE: Values less than 9.5 are rounded to 9.0. The standard is exceeded when the second high 8-hour average (second maximum above the limit) is greater than 9.0 ppm.

NA = Not available. Monitoring at this site has been discontinued.

ATTACHMENT 2

Construction CO Emissions

Chester Creek/Westchester Lagoon
Emissions Estimates for Construction Activities

Pollutant: Carbon Monoxide

NONROAD EQUIPMENT

Nonroad Equipment Type [a]	Use Of Equipment	Number Of Units	Unit Days	Total Unit Hours	HP Rating	Load Factor	Load Factor and Emission Factor Source [b, c]	Emission Factor (grams per hp-hr)	Emissions (lb/hr)	Emissions (tons)
1. Channel Construction										
Track Dozer (Cat D7 or similar)	Channel	2	100	1,600	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	4.30	0.81	0.65
Backhoe Loader (Cat 420D or similar)	Channel	2	100	1,600	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	6.80	0.73	0.58
Large front-end loader (cat 973C or similar)	Channel	2	100	1,600	210	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	6.80	1.73	1.39
Ditcher	Ground Grid	1	5	40	18	0.75	NR-005A and NEVES (for trencher)	9.14	0.27	0.01
Pile driver/hammer	Channel	1	7	56	161	0.62	NR-005A and NEVES (for other construction)	9.20	2.02	0.06
Large crane	Channel	1	7	56	194	0.43	NR-005A and NEVES (for cranes)	4.20	0.77	0.02
Welder generator	Channel	1	3	24	35	0.45	NR-005A and NEVES (for welders)	5.00	0.17	0.00
Paver	Trail	1	4	32	25	0.62	NR-005A and NEVES (for asphalt pavers)	3.20	0.11	0.00
Roller compactor cc102	Trail	1	2	16	29	0.56	NR-005A and NEVES (for rollers)	3.10	0.11	0.00
2. Railroad Bridge Construction										
Large Crane	Bridge	2	50	400	194	0.43	NR-005A and NEVES (for cranes)	4.20	0.77	0.15
Diesel pile driver	Bridge	1	30	240	161	0.62	NR-005A and NEVES (for other construction)	9.20	2.02	0.24
Vibratory pile driver (ICE 216 or similar)	Bridge	1	15	120	175	0.62	NR-005A and NEVES (for other construction)	9.20	2.20	0.13
Excavator (Cat 320CL or similar)	Bridge	2	100	800	138	0.57	NR-005A and NEVES (for excavator)	5.20	0.90	0.36
Large Front End Loader (Cat 973C or similar)	Bridge	2	100	800	210	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	6.80	1.73	0.69
Roller compactors	Bridge	2	30	240	29	0.56	NR-005A and NEVES (for rollers)	3.10	0.11	0.01

3. Shoofly Construction & Removal

Construction

Locomotive on site	Shoofly Construction	4	5	20	3000	0.1	Load Factor Estimated, Emission Factor for Switch Engines [d]	1.83	1.21	0.01
Locomotive in transit	Shoofly Construction	4	5	100	3000	0.1	Load Factor Estimated, Emission Factor for Line Haul Engines [d]	1.28	0.85	0.04
Backhoe Loader (Cat 420D or similar)	Shoofly Construction	1	10	80	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	6.80	0.73	0.03
Track Dozer (Cat D7 or similar)	Shoofly Construction	1	7	56	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	4.30	0.81	0.02
Motor grader	Shoofly Construction	1	7	56	140	0.61	NR-005A and NEVES (for graders)	3.80	0.72	0.02
Roller compactor	Shoofly Construction	1	7	56	235	0.56	NR-005A and NEVES (for rollers)	3.10	0.90	0.03
Removal										
Backhoe Loader (Cat 420D or similar)	Shoofly Removal	1	5	40	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	6.80	0.73	0.01
Track Dozer (Cat D7 or similar)	Shoofly Removal	1	5	40	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	4.30	0.81	0.02
TOTAL Emissions from On-Site Equipment										**4.48**

TRUCKS

Truck Type [a]	Use Of Equipment	Number Of Units	Days	Trips Per Day	Total Trips	Miles Per Trip	Total Miles	Emission Factor (grams/veh-mile) [e]	Emissions (tons)	
1. Channel construction										
6-wheelers w/ Pup (20 CY per truck)	Channel	4	50	2	100	10	1000	10.15	0.01	
Maintenance trucks	Channel	1	100	1	100	20	2000	10.15	0.02	
2. Railroad Bridge Construction										
Dump trucks	Bridge	3	4	2	24	8	192	10.15	0.00	
Concrete trucks	Bridge	1	50	1	50	10	500	10.15	0.01	
Maintenance trucks	Bridge	4	100	1	400	20	8000	10.15	0.09	
3. Shoofly Construction & Removal										
Maintenance trucks	Shoofly C & R	2	100	1	200	15	3000	10.15	0.03	
TOTAL Emissions from Trucks									**0.16**	
TOTAL EMISSIONS FROM CONSTRUCTION									**4.65 tons**	

[a] Equipment and truck types, activity levels, horsepower ratings, and trip lengths estimated by HDR personnel.
[b] EPA Report No. NR-005A, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", December 9, 1997 - revised June 15, 1998.
[c] EPA Publication 460/3-91-02 (21A-2001), "Nonroad Engine and Vehicle Emissions Study (NEVES)", November 1991.
[d] Locomotive load factor estimated by HDR personnel. Locomotive emission factors obtained from EPA Publication 420-F-97-051, "Emission Factors for Locomotives - Technical Highlights".
[e] Emission factor from MOBILE5b model, for HDDVs, average of four conditions: January 55 mph, January 15 mph, July 55 mph, and July 15 mph.

ATTACHMENT 3

Construction PM, VOC, NO_x, and SO_2 Emissions

Chester Creek/Westchester Lagoon
Emissions Estimates for Construction Activities

Pollutant: Particulate Matter (PM, PM_{10}, $PM_{2.5}$)

NONROAD EQUIPMENT

Nonroad Equipment Type [a]	Use Of Equipment	Number Of Units	Unit Days	Total Unit Hours	HP Rating	Load Factor	Load Factor and Emission Factor Source [b, c]	PM Emission Factor (grams per hp-hr)	Emissions (lb/hr)	Emissions (tons)
1. Channel Construction										
Track Dozer (Cat D7 or similar)	Channel	2	100	1,600	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	1.11	0.21	0.17
Backhoe Loader (Cat 420D or similar)	Channel	2	100	1,600	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	1.05	0.11	0.09
Large front-end loader (cat 973C or similar)	Channel	2	100	1,600	210	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	1.05	0.27	0.21
Ditcher	Ground Grid	1	5	40	18	0.75	NR-005A and NEVES (for trencher)	1.44	0.04	0.00
Pile driver/hammer	Channel	1	7	56	161	0.62	NR-005A and NEVES (for other construction)	1.44	0.32	0.01
Large crane	Channel	1	7	56	194	0.43	NR-005A and NEVES (for cranes)	1.44	0.26	0.01
Welder generator	Channel	1	3	24	35	0.45	NR-005A and NEVES (for welders)	1.00	0.03	0.00
Paver	Trail	1	4	32	25	0.62	NR-005A and NEVES (for asphalt pavers)	0.90	0.03	0.00
Roller compactor cc102	Trail	1	2	16	29	0.56	NR-005A and NEVES (for rollers)	0.78	0.03	0.00
2. Railroad Bridge Construction										
Large Crane	Bridge	2	50	400	194	0.43	NR-005A and NEVES (for cranes)	1.44	0.26	0.05
Diesel pile driver	Bridge	1	30	240	161	0.62	NR-005A and NEVES (for other construction)	1.44	0.32	0.04
Vibratory pile driver (ICE 216 or similar)	Bridge	1	15	120	175	0.62	NR-005A and NEVES (for other construction)	1.44	0.34	0.02
Excavator (Cat 320CL or similar)	Bridge	2	100	800	138	0.57	NR-005A and NEVES (for excavator)	1.44	0.25	0.10
Large Front End Loader (Cat 973C or similar)	Bridge	2	100	800	210	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	1.05	0.27	0.11
Roller compactors	Bridge	2	30	240	29	0.56	NR-005A and NEVES (for rollers)	0.78	0.03	0.00

3. Shoofly Construction & Removal										
Construction										
Locomotive on site	Shoofly Construction	4	5	20	3000	0.1	Load Factor Estimated, Emission Factor for Switch Engines [d]	0.44	0.29	0.00
Locomotive in transit	Shoofly Construction	4	5	100	3000	0.1	Load Factor Estimated, Emission Factor for Line Haul Engines [d]	0.32	0.21	0.01
Backhoe Loader (Cat 420D or similar)	Shoofly Construction	1	10	80	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	1.05	0.11	0.00
Track Dozer (Cat D7 or similar)	Shoofly Construction	1	7	56	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	1.11	0.21	0.01
Motor grader	Shoofly Construction	1	7	56	140	0.61	NR-005A and NEVES (for graders)	1.00	0.19	0.01
Roller compactor	Shoofly Construction	1	7	56	235	0.56	NR-005A and NEVES (for rollers)	0.78	0.23	0.01
Removal										
Backhoe Loader (Cat 420D or similar)	Shoofly Removal	1	5	40	88	0.55	NR-005A and NEVES (for tractor\loader\backhoe)	1.05	0.11	0.00
Track Dozer (Cat D7 or similar)	Shoofly Removal	1	5	40	134	0.64	NR-005A and NEVES (for crawler dozer, crawler tractor)	1.11	0.21	0.00
TOTAL Emissions from On-Site Equipment									**PM**	**0.85**
									PM_{10} [e]	**0.70**
									$PM_{2.5}$ [f]	**0.68**

TRUCKS

Truck Type [a]	Use Of Equipment	Number Of Units	Days	Trips Per Day	Total Trips	Miles Per Trip	Total Miles	PM Emission Factor (grams/veh-mile) [g]	Emissions (tons)	
1. Channel construction										
6-wheelers w/ Pup (20 CY per truck)	Channel	4	50	2	100	10	1000	5.25	0.01	
Maintenance trucks	Channel	1	100	1	100	20	2000	5.25	0.01	
2. Railroad Bridge Construction										
Dump trucks	Bridge	3	4	2	24	8	192	5.25	0.00	
Concrete trucks	Bridge	1	50	1	50	10	500	5.25	0.00	
Maintenance trucks	Bridge	4	100	1	400	20	8000	5.25	0.05	
3. Shoofly Construction & Removal										
Maintenance trucks	Shoofly C & R	2	100	1	200	15	3000	5.25	0.02	
TOTAL Emissions from Trucks								**PM, PM_{10}, $PM_{2.5}$ [h]**	**0.09**	

PROJECT MATERIAL HANDLING AND CONSTRUCTION OPERATIONS [l]

Material Handled	Material	Times Handled	Amount Handled (ton)	Moisture Content (%)	Average Wind Speed (mph)	PM Emission Factor (lb/ton material/transfer)	Emissions (tons)
Excavated Material and Topsoil	Dirt and Rock	1	9403	2.1	7	0.003425	0.02
Riprap and Stream Substrate	Rock	1	10220	2.1	7	0.003425	0.02

Construction Operations [j]	Area Disturbed (acre)	Duration of Project (months)	PM Emission Factor (ton/acre/month)	Emissions (tons)
Disturbance of Area	1	7	1.2	8.4

TOTAL Emissions from Material Handling and Construction Operations — **PM, PM_{10}, $PM_{2.5}$ [k]** — **8.43**

TOTAL EMISSIONS FROM CONSTRUCTION

PM	9.37 tons
PM_{10}	9.22 tons
$PM_{2.5}$	9.20 tons

[a] Equipment and truck types, activity levels, horsepower ratings, and trip lengths estimated by HDR personnel.

[b] EPA Report No. NR-005A, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", December 9, 1997 - revised June 15, 1998.

[c] EPA Publication 460/3-91-02 (21A-2001), "Nonroad Engine and Vehicle Emissions Study (NEVES)", November 1991.

[d] Locomotive load factor estimated by HDR personnel. Locomotive emission factors obtained from EPA Publication 420-F-97-051, "Emission Factors for Locomotives - Technical Highlights".

[e] Based on information obtained from Table 3.4-2 of Fifth Edition AP-42, Supplement B, the ratio of PM_{10} to PM is 0.8221.

[f] Based on information obtained from Table 3.4-2 of Fifth Edition AP-42, Supplement B, the ratio of $PM_{3.0}$ to PM is 0.7977. Because no information was given for $PM_{2.5}$, the $PM_{3.0}$ value was used.

[g] Emission factor from PART5 model, for HDDVs, at 33,000 lb weight, average of 2 speeds: 55 mph and 15 mph. Includes paved road fugitive emissions. On-site unpaved road fugitives assumed minimal due to watering as needed.

[h] Because the emissions estimate includes both engine emissions and road fugitive emissions, the ratio of small particulate to PM is unknown. Therefore, it was assumed that $PM_{2.5} = PM_{10} = PM$.

[l] Material handling emissions calculated based on material use estimated by HDR personnel, emission factor calculation methods and constants obtained from Fifth Edition AP-42, Chapter 13.2.4, and annual average wind speed data obtained for Anchorage.

[j] Construction operations emissions based on a total area disturbed value of 3.5 acres estimated by HDR personnel, an assumption that the equivalent of 1 acre of that total is disturbed on a monthly average basis, and an emission factor from Fifth Edition AP-42, Chapter 13.2.3. For a number of reasons explained in AP-42, the construction operations emissions estimate is conservatively high.

[k] Because the material handling emissions are so small, they were not further classified by size. No information is available to estimate the PM_{10} and $PM_{2.5}$ portion of the construction operations emissions. Therefore, $PM_{2.5} = PM_{10} = PM$.