DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: AK Steel Corporation - Zanesville Works
Facility Address: 1724 Linden Ave., Zanesville, Ohio 43702 - 1520
Facility EPA ID #: OHD 004 281 598

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

_X_ If yes - check here and continue with #2 below.

____ If no - re-evaluate existing data, or

____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures

Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			fluoride, hexavalent chromium, LNAPL
Air (indoors)[2]		X		Vapor concentrations of VOCs in LNAPL and groundwater are below residential screening criteria
Surface Soil (e.g., <2 ft)	X			arsenic, chromium, lead, PCB, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd) pyrene
Surface Water		X		Site hydrogeologic conditions and topography preclude the discharge of contaminated groundwater and surface water runoff from the facility to the Muskingum River
Sediment	X			arsenic, lead, PCBs
Subsurf. Soil (e.g., >2 ft)	X			arsenic, lead, PCB, benzo(a)pyrene
Air (outdoors)		X		VOCs are not a contaminant of concern at the facility

X If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

___ If yes (for any media) - continue after identifying key contaminants in

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

—— If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale: Sampling results of groundwater, surface soil, subsurface soil, and/or sediment from 19 AOCs and SWMUS were compared to Federal MCLs and Region IX Preliminary Remediation Goals (PRGs). Of these, several areas required further investigation and/or analysis because of incomplete characterization or constituent concentration above screening thresholds. Of these, the following are addressed in the EI:

a) SWMU 17 (Former Hazardous Waste Storage Area)
b) Bottom Ash Pile
c) LNAPL Area
d) SWMU 21 (Used Oil AST)
e) Black Beauty Area
f) SWMU 25 (Muskingum River)
g) Northern Portion of Southern Property

References:

Environmental Indicator Determination Report, RCRIS Codes CA 725 and CA 750, December 15, 2003
Environmental Indicator Determination Report, RCRIS Codes CA 725 and CA 750, Supplemental Addendum, March 12, 2004
MW-07 Water and MW-08 Oil Analytical Results, May 4, 2004
Response to U.S. EPA's Comments on the EI Determination Report, AK Steel Corporation - Zanesville Works, April 29, 2005
Supplemental Information Regarding the Human Health Environmental Indicator (CA725) for the AK steel Corporation -Zanesville Works Facility in Zanesville, Ohio, March 30, 2005
Quarterly Groundwater Monitoring Results

Table 1. Groundwater Monitoring Results Showing Highest Concentrations of Detected Analytes above Screening Levels (Suite Included Appendix IX: Metals and Other Inorganics, VOCs, SVOCs, PCBs)

Analyte	**Highest Concentration above Screening Level** **Unit mg/L**	**Protection Standard Fed MCL[1] except where indicated** **Unit mg/L**
Arsenic	.069	.010
Fluoride	57	4.0
Hexavalent Chromium	.14	.110 (Region IX PRG)[2]
Lead	.04	.015
Trichloroethene	.0011	.0005

1 Federal Maximum Contaminant Limit (MCL)
2Region IX Preliminary Remediation Goal (PRG), applied where MCL not available

Table 2. Surface Soil Results Showing Highest Concentrations of Detected Analytes above Screening Levels

Analyte	Highest Concentration above Screening Level Unit mg/kg	Protection Standard Region IX PRG Unit mg/kg
Arsenic	161	1.60
Chromium	598	450
Lead	4520	750
Aroclor 1260	4.30	0.740
Benzo(a)pyrene	580	0.210
Benzo(b)fluoranthene	14	2.10
Indeno(1.2.3-cd)pyrene	5	2.10

Table 3. Subsurface Soil Results Showing Highest Concentrations of Detected Analytes above Screening Levels

Analyte	Maximum Concentration above Screening Level Unit mg/kg	Protection Standard Unit mg/kg
Aroclor-1260	1.30	7.40
Benzo(a)pyrene	1.20	0.21

Table 4. Sediment Results Showing Highest Concentrations of Detected Analytes above Screening Levels

Analyte	Maximum Concentration above Protection Standard mg/kg	Protection Standard mg/kg
Arsenic	15	0.39
Lead	447	400
Aroclor-1254	.300	2.20

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Table 5. Summary of Exposure Pathway Evaluation under Current Conditions; Potential Human Receptors

Contaminated Medium	Residents	Workers	Day-care	Construction	Trespassers	Recreation	Food
Groundwater	no	no	no	no	no	no	no
~~Indoor Air~~	–	–	--	–	–	–	–
Surface Soil	no	yes	no	yes	yes	yes	no
~~Surface Water~~	–	–	--	–	–	–	–
Sediment	no	no	no	no	no	--	no
Subsurface soil	no	no	no	yes	no	--	no
~~Ambient Air~~	–	–	–	–	–	–	–

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

____ If "no" (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter 'YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major

pathways).

X If "yes" (pathways are complete for any "Contaminated" Medium - Human Receptor combination) - continue after providing supporting explanation.

___ If "unknown" (for any "Contaminated" Medium - Human Receptor combination) - skip to #6 and enter "IN" status code.

Rationale:

1) Groundwater/Indoor Air/Ambient Air

a) All receptor exposure pathways are incomplete. There are no residential properties on or immediately downgradient of the facility. There are no known residential wells in any contaminated groundwater pathway. Under current conditions, contaminated groundwater flows north from the site onto an adjacent Superfund property (UTA/Lear) where a pump-and-treat remedy is in effect. The off-site monitoring wells show the plume to be below MCLs. Residents of Zanesville are serviced by municipal well fields which are across the River to the east; the well fields are unimpacted by the contaminated groundwater.

b) Construction worker exposure to contaminated groundwater is unlikely because the water table is approximately 30 feet below ground surface.

c) Vapor samples from MW-08, which is screened in the perched zone where the LNAPL is found, showed VOC concentrations at relatively low levels. Two constituents had measurements approaching the residential screening level, but were still below the threshold. Tetrachloroethene was measured at 0.53 ppbv and 1,2,4 trimethylbenzene was measured at 0.82 ppbv. These subslab soil gas concentrations are less than the residential screening concentration which is 1.2 ppbv for both constituents.

2) Sediment

Incomplete exposure pathway to trespasser or recreational user due to steepness of Muskingum River riverbank and 24-hour plant security. A fish consumption advisory on the Muskingum River eliminates the indirect ingestion pathway from food consumption.

3) Surface Soil in Operations Area and Trespasser Exposure

In the operational portion of the facility the trespasser scenario is highly unlikely as the site is fenced and has 24-hour security.

4) Other Exposure There are no day care services or food production activities at the plant.

Reference(s): *SEE REFERENCES LISTED ABOVE UNDER QUESTION TWO.*

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[3] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

X If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

[3] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

Rationale and Reference(s):

Considerations:

a) Surface Soil Much of the operations area is covered in asphalt or concrete. Nonetheless, workers and construction workers would come into contact with some contaminated surface soil.

Recreational exposure would occur in the ballfields, in the "Southern Property South" Area of Concern. Arsenic levels range from 5.3 ppm to 10.1 ppm and are all above Region IX PRGs screening levels, but below the site-specific background of 12.3 ppm.

b) Subsurface Soil/Groundwater The exposure of the construction worker to subsurface contamination in the operations area is not considered to be significant. The construction worker would come into contact with contaminated surface and subsurface soil, but not groundwater as the water table is approximately 30 ft bgs.

In the subsurface soil, the arithmetic mean of lead concentrations is 189 ppm, which is below the Region IX screening level of 750 ppm. Further, the exposure duration to the construction worker during excavations would be relatively brief and construction workers would be required to follow a health and safety plan to preclude adverse exposure.

The arsenic concentrations are comparable to site-specific background levels of 12.3 ppm.

Supplemental Investigation Results:

Former Hazardous Waste Storage Area (SWMU 17) Initial investigation detected 151 ppm of arsenic at one surface soil sample above the industrial PRG at 10^{-4} risk level. The area was not sufficiently delineated so AK took additional soil samples; arsenic detections were below site-specific background of ppm. The average concentration using the 95% upper confidence level (UCL) is 13.1 ppm, when removing the outlier arsenic sample of 151 ppm. This area is considered to be fully delineated and below the Region IX industrial PRG of 10^{-5} cancer risk.

Bottom Ash Pile During the initial investigation, constituents were detected above the Region IX industrial PRGs. Benzo(a)pyrene (BaP) was detected at .58 ppm (PRG .21 ppm). Chromium was detected at 598 ppm (PRG of 450 ppm). These were both within the acceptable risk range of 10^{-5}. Nonetheless, the BaP was at a high enough level such that its extent needed to be delineated. The additional sampling resulted in non-detects for BaP. The calculated 95% UCL of four arsenic measurements exceeded the maximum concentration of 22.5 ppm. The Region IX screening concentration of 16 ppm of arsenic is based on a hypothetical worker exposure scenario of 250 days for an eight-hour duration. The realistic exposure scenario at this area is considerably less than the basis for the arsenic PRG. Therefore, this area is considered to be sufficiently delineated and current human health exposures are not considered to be significant.
LNAPL AK Steel investigated LNAPL within a perched zone on the west side of the operations

area around and under Repair Building Nine. The LNAPL was determined to be a total petroleum hydrocarbon product. AK sampled well-head space and ambient air to determine any risk for indoor air vapor intrusion. The results were compared with indoor air target levels based on 10^{-5} cancer risk, as recommended for EI determinations in the USEPA vapor intrusion guidance. Tetrachloroethene (PCE) and 1,2,4-trimethylbenzene were the only VOC s detected that approached the target levels, at .53 ppbv and at 0.82 ppbv, respectively. The USEPA target levels for both VOCs is 1.2 ppb. Based on these results, the LNAPL may contain low concentrations of VOCs, however, the subsurface vapor in the vicinity of the LNAPL does not pose a threat to human health via the vapor intrusion pathway.

Used Oil AST Arsenic concentrations are above the industrial PRG screening concentration at 10^{-6} but below the PRG at 10^{-4}. The average concentration calculated using the 95% UCL of 28 ppm corresponds to an excess cancer risk of 1.8^{-5} using the Region IX PRG which is based on 250 days of eight-hour exposures. However, workers are at the tank approximately 24 days per year (two times per month) for less than eight hours per visit. Considering the limited exposure at this area, for the purposes of the EI, the level of exposure to the arsenic concentrations in this area is acceptable.

Black Beauty Area Concentrations of arsenic, and PAHs exceed the industrial PRGs in this area. Supplemental information indicates that the PAHs were collected near railroad tracks, and that PAHs were not constituents widely distributed in this area. The railroad tracks are suspected to be the source of the PAHs. Although the 95% UCL of the average surface soil concentrations exceed the 10^{-5} cancer risk individually for arsenic, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-d)pyrene, the cumulative risk due to overall contamination is calculated to be less than 10^{-4}, and is considered to be acceptable based on USEPA's risk policy. Further, this area is no longer in use and is rarely accessed by plant workers.

Muskingum River Of the six sediment samples collected, there were some minor exceedences of the residential PRGs for soil (used as a surrogate for unavailable sediment PRGs). However, the river is quite inaccessible along the AK property. A fish consumption advisory makes the exposure pathway for ingestion of fish affected by the sediment incomplete. Therefore, for the purposes of the EI, this area does not present an unacceptable risk to recreational users or trespassers.

Northern Portion of Southern Property This unused 10- to 12-acre area outside the main operations portion of the facility was investigated per historic photography which revealed the presence of a buried trench. Soil sampling results showed elevated levels of PCBs in surface and subsurface samples. The extent of contamination appeared to be incomplete as the easternmost samples had PCB detections.

Additional samples were taken to delineate the extent. The supplemental surface soil samples having detected concentrations of PCBs were below the Region IX PRG screening levels. The PCB concentration of 4.3 ppm (Aroclor 1260) is within the Region IX 10^{-5} excess cancer risk.

Therefore, for the purposes of the EI, this area does not present an unacceptable risk of human exposure. Further, a fence is currently being installed around the area to preclude a complete exposure pathway for any human scenario.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_X_ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YES - "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the AK Steel Corporation, Zanesville Works facility,
EPA ID # OHD 004 281 598 located in Zanesville, Ohio, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by _____ Date _____

Carolyn Bury
Project Manager

Supervisor _____ Date _____

George Hamper
Chief, Corrective Action Section
EPA Region 5

Locations where References may be found:

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.