

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: Andritz, Inc.
Facility Address: 35 Sherman Street, Muncy, PA 17756
Facility EPA ID #: PAD 003 031-903

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 Controls" 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).

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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)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale/Key Contaminants</u>
Groundwater	_____	<u>X</u>	_____	See below
Air (indoors) ²	_____	<u>X</u>	_____	See below
Surface Soil (e.g., <2 ft)	_____	<u>X</u>	_____	See below
Surface Water	_____	<u>X</u>	_____	See below
Sediment	_____	<u>X</u>	_____	See below
Subsurface Soil (e.g., >2 ft)	_____	<u>X</u>	_____	See below
Air (outdoors)	_____	<u>X</u>	_____	See below

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

_____ If yes (for any media) – continue after identifying key contaminants in 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 and Reference(s): _____

See following two pages for response to Question #2 (Rationale and Reference(s)).

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.

QUESTION #2 - HUMAN EXPOSURES - RATIONALE & REFERENCE(S)

RESPONSE:

Groundwater

During the Act 2 closure process, groundwater was investigated for the facility as a whole. A risk evaluation was performed to establish site-specific groundwater cleanup standards that would meet the goals established by Act 2 (e.g., incremental lifetime cancer risk $< 10^{-4} - 10^{-6}$ and hazard quotient < 1). The maximum detection in groundwater of each contaminant of concern was found to be below the corresponding site-specific standard, as shown in Table 2-1 from the *Act 2 Final Report* (EnSafe, 3/99), which was approved by PADEP. Since the maximum detections of contaminants of concern do not exceed the approved site-specific standards, it can be concluded that groundwater is not contaminated above applicable standards.

Air (Indoors)

This facility is permitted as a Title V facility and is considered a major volatile organic compound (VOC) source. The air emissions sources emit particulates, sulfur oxides (SOx), and VOCs. The Title V permit imposes protective emissions restrictions and requirements for monitoring, testing, recordkeeping, reporting, and work practices.

Contaminants in soil remaining on site are prevented from being volatilized and inhaled because contaminated soil areas are largely found in locations underneath existing manufacturing buildings and/or overlain by up to 12 feet of uncontaminated soil. (*Act 2 Remedial Investigation Report*, EnSafe, 9/98) Foster Wheeler found no evidence indicating that impacted indoor air existed during the EI site inspection.

Surface Soil (<2 ft.)

During the Act 2 closure process, a risk evaluation was performed to establish site-specific soil cleanup standards that would meet the goals established by Act 2 (e.g., incremental lifetime cancer risk $< 10^{-4} - 10^{-6}$ and hazard quotient < 1). The maximum detection in soil of each contaminant of concern was found to be below the corresponding site-specific standard, as shown in Table 2-1 from the *Act 2 Final Report* (EnSafe, 3/99), which was approved by PADEP. Since the maximum detections of contaminants of concern do not exceed the approved site-specific standards, it can be concluded that surface soil is not contaminated above applicable standards.

Surface Water

The facility ground surface slopes west and north toward the West Branch Susquehanna River. Surface water flows to storm sewers that feed into a 24-inch diameter storm sewer line that flows to Outfall #001, located west of Plant 1, which is the discharge point into the West Branch Susquehanna River (Pennsylvania Notice of Intent for Coverage under National Pollution Discharge Elimination System (NPDES) General Permit for Discharges of Storm Water, 11/16/01). The discharge is permitted under NPDES Permit #PAR 114801, which is valid through January 31, 2007. No monitoring data for the discharge is available as the facility elected to conduct an annual facility inspection in lieu of monitoring.

No reportable spills at the facility have occurred within the past three years, and no NPDES inspection violations were noted during the file review. Therefore, there is no indication that there is contamination of site surface water.

Contamination of off-site surface water could occur if contaminants dissolved in facility groundwater migrated to the West Branch Susquehanna River. However, analyses of groundwater samples from monitoring wells MWE-14 and MWE-15, which are located approximately halfway between Andritz and the river, did not indicate the presence of any contaminants of concern (*Act 2 Final Report*, EnSafe, 3/99), so it appears that contamination has not migrated to off-site surface water.

Sediment

No records were located of site-related sediment sampling data. The nearest downgradient body of water is the West Branch Susquehanna River. Contamination of off-site sediments could occur if contaminants dissolved in facility groundwater migrated to the West Branch Susquehanna River. However, analyses of groundwater samples from monitoring wells MWE-14 and MWE-15, which are located approximately halfway between Andritz and the river, did not indicate the presence of any contaminants of concern (*Act 2 Final Report*, EnSafe, 3/99), so it appears that contamination has not migrated to the river and its sediments.

QUESTION #2 - HUMAN EXPOSURES - RATIONALE & REFERENCE(S)

RESPONSE: (CONTINUED)

Subsurface Soil (>2 ft.)

During the Act 2 closure process, a risk evaluation was performed to establish site-specific soil cleanup standards that would meet the goals established by Act 2 (e.g., incremental lifetime cancer risk $< 10^{-4} - 10^{-6}$ and hazard quotient < 1). Surface and subsurface soil data were both subjected to the same evaluation against the site-specific soil standards. The maximum detection in subsurface soil of each contaminant of concern was found to be below the corresponding site-specific standard, as shown in Table 2-1 from the *Act 2 Final Report* (EnSafe, 3/99), which was approved by PADEP. Since the maximum detections of contaminants of concern do not exceed the approved site-specific standards, it can be concluded that subsurface soil is not contaminated above applicable standards.

Air (Outdoors)

This facility is permitted as a Title V facility and is considered a major VOC source. The air emissions sources emit particulates, SO_x, and VOCs. The Title V permit imposes protective emissions restrictions and requirements for monitoring, testing, recordkeeping, reporting, and work practices. The site is located within a mixed industrial, commercial, residential, and agricultural area.

Foster Wheeler found no evidence indicating that impacted outdoor air existed during the EI site inspection. No records were located of air emissions violations that occurred after 1989.

A scenario in which outdoor air contamination could potentially occur would be if contaminants that remain in facility soil were volatilized. However, this is unlikely given that contaminants of concern remaining at the facility are mainly found in locations underneath existing manufacturing buildings and/or overlain by up to 12 feet of uncontaminated soil. (*Act 2 Remedial Investigation Report*, EnSafe, 9/98)

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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?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated Media" Residents Workers Day-Care Construction Trespassers Recreation Food³

Groundwater
Air (indoors)
Soil (surface, e.g., <2 ft)
Surface Water
Sediment
Soil (subsurface e.g., >2 ft)
Air (outdoors)

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.

_____ If yes (pathways are complete for any "Contaminated" Media – Human Receptor combination) – continue after providing supporting explanation..

_____ If unknown (for any "Contaminated" Media – Human Receptor combination) – skip to #6 and enter "IN" status code.

Rationale and Reference(s):

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"** (i.e., potentially⁴ "unacceptable" levels) 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)?

_____ 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.

Rationale and Reference(s): _____

⁴ 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.

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

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) – continue and enter a "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).

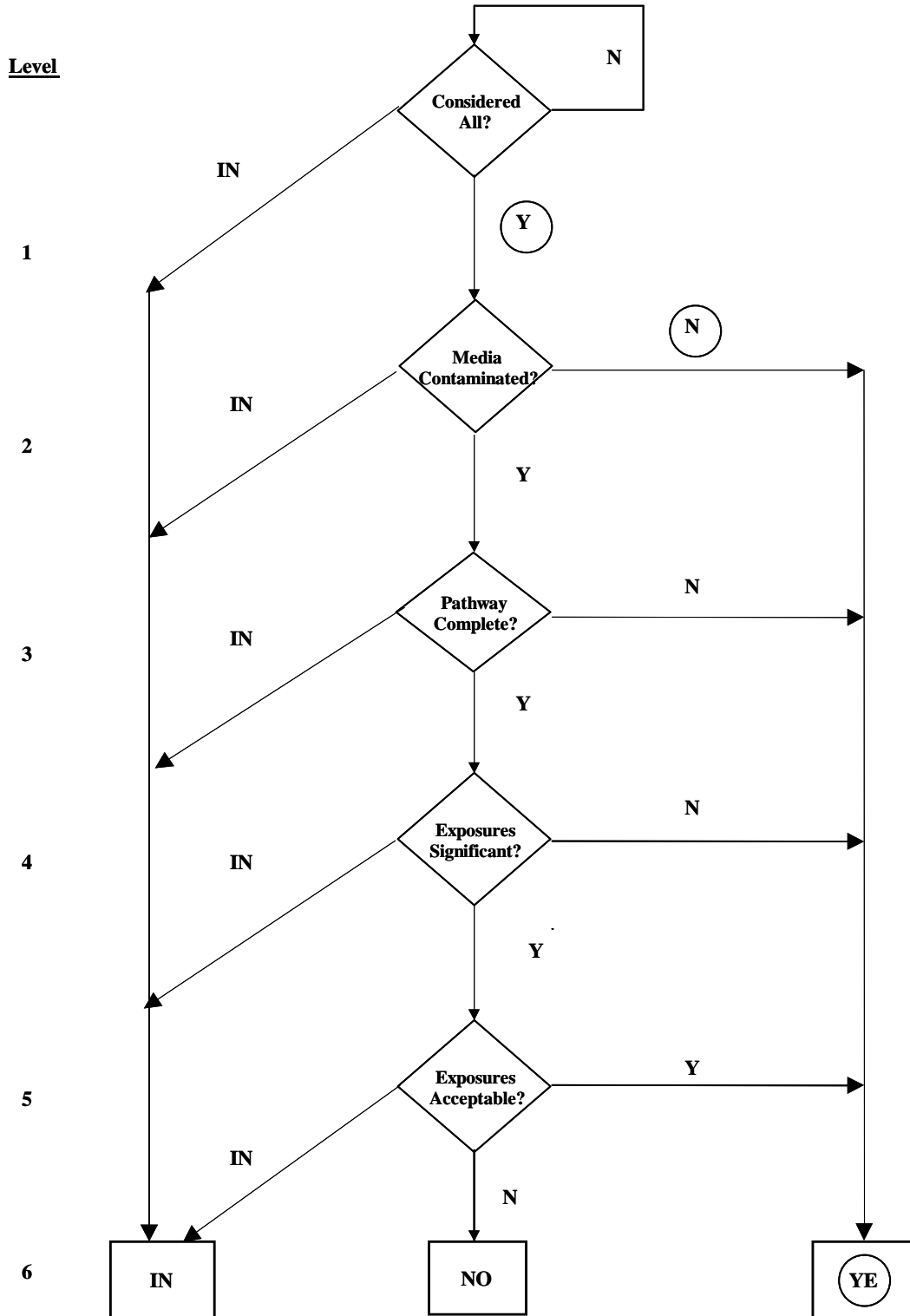
_____ If no (there are current exposures that can be reasonably expected to be "unacceptable") – continue and enter a "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) – continue and enter "IN" status code.

Rationale and Reference(s): _____

Facility Name: **Andritz, Inc.**
 EPA ID #: **PAD 003 031 903**
 Location: **35 Sherman Street, Muncy, PA 17756**

CURRENT HUMAN EXPOSURES UNDER CONTROL (CA 725)



DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name:	<u>Andritz, Inc.</u>
Facility Address:	<u>35 Sherman Street, Muncy, PA 17756</u>
Facility EPA ID #:	<u>PAD 003 031 903</u>

- Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, 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 #8 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 Controls" 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 "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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).

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2. Is **groundwater** 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 anywhere at, or from, the facility?

If yes – continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

X

If no – skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated." *(In order to present a more complete representation of the site, the reviewer has chosen not to skip to #8.)*

If unknown (for any media) – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

See following two pages for response to Question 2 (Rationale and Reference(s)).

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 appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

QUESTION #2 - GROUNDWATER MIGRATION - RATIONALE & REFERENCE(S)

RESPONSE:

AREAS OF CONCERN (AOCs)

Various areas of concern for groundwater were identified during the course of the investigations performed at the site. These areas and the associated investigations and remedial actions areas are summarized below:

– **Former Drum Storage Area**

This area is near the facility's southern property line. In 1990, chlorinated solvents were detected in a nearby monitoring well (MWE-43). Also, TPH and 1,1,1-trichloroethane (1,1,1-TCA) were detected in the soil, exceeding PADER Groundwater Protection Level 2 standards. Soil removal and off-site disposal was performed in 1994. Confirmation samples indicated that the site-specific cleanup standards were met. The excavation was backfilled. PADEP approved No Further Action for the site on May 2, 1995.

– **Groundwater at Main Plant Complex (including Building 66 and Building 18)**

The Main Plant Complex is a large building that is sectioned into various connected "buildings", including Building 66 and Building 18. Investigation of the soil and groundwater at the Main Plant Complex was performed by EnSafe in 1991. Floating product was detected in monitoring well MWE-05, which is near the property line. However, after the initial accumulation of free product was removed, it was not detected again. Borings and observation points in the immediate vicinity of MWE-05 did not indicate the presence of free product, so the previous free product observations were not considered to represent a source of free product contamination. Also, groundwater contamination from chlorinated solvents appeared minimal.

No remediation was performed and there is no ongoing monitoring. The risk evaluation performed during the Act 2 investigation determined that the risks posed by contaminants remaining in the groundwater at the facility, including the Main Plant Complex, are less than the goals established by Act 2 (e.g., incremental lifetime cancer risk $< 10^{-4} - 10^{-6}$ and hazard quotient < 1). PADEP approved closure of this site when it approved the *Act 2 Final Report* (EnSafe, 3/99).

– **Building 70**

Building 70 housed the Die Department from 1971 to 1995. In 1989, cutting oil contamination was discovered by PADEP. Investigation was performed during 1991-93. Extensive soil and groundwater contamination were detected. From 1990 to 1992, soil removal was performed and free oil recovery wells were installed and operated. In 1995, additional contaminated soil was removed, down to the confining unit. Verification samples met Act 2 Background Remediation standards for TPH and volatile organic compounds (VOCs).

There is no ongoing monitoring. PADEP approved closure of this site when it approved the *Act 2 Final Report, Building 70, Area 1* (EnSafe, 7/96) on January 3, 1997; and the *Act 2 Final Report* (EnSafe, 3/99).

– **Groundwater at Plant 2**

Investigations of the Plant 2 soil and groundwater were performed in 1991-92. Chlorinated solvents detected in the groundwater exceeded Federal Drinking Water Standards. No soil source was located. Andritz operations appeared to be downgradient of the affected wells, so an off-site source was suspected.

The risk evaluation performed during the Act 2 investigation determined that the risks posed by contaminants remaining in the groundwater at the facility, including the Plant 2 area, are less than the goals established by Act 2 (e.g., incremental lifetime cancer risk $< 10^{-4} - 10^{-6}$ and hazard quotient < 1). PADEP approved closure of this site when it approved the *Act 2 Final Report* (EnSafe, 3/99).

QUESTION #2 - GROUNDWATER MIGRATION - RATIONALE & REFERENCE(S)

RESPONSE: (CONTINUED)

AQUIFER USAGE

The aquifer at the facility was used for potable water supply for residents located downgradient of the site, until institutional controls were implemented during the 1991-96 time period. (*Act 2 Remedial Investigation Report*, EnSafe, 9/98) Any current and future anticipated direct exposures to groundwater through potable or domestic use were eliminated by Andritz, by connecting residences to the Muncy Borough Water Authority And abandoning all private downgradient residential wells. The aquifer is currently not used for commercial, agricultural, or potable purposes.

Since the downgradient area between the facility and the West Branch Susquehanna River is classified as a floodplain, new construction is prohibited by Muncy Township at elevations lower than 1½ feet above the level of the 100-year flood or that could restrict the passage of the 100-year flood. This makes future construction and new groundwater usage highly unlikely.

Andritz, Inc. asserts that the groundwater pathway of exposure has been eliminated.

SITEWIDE GROUNDWATER

During the various facility investigations, 54 monitoring wells were installed and sampled at Plant 1, and Plant 2, and off-site. Solvents and TPH are the most common contaminants detected.

During the Act 2 closure process, groundwater was investigated for the facility as a whole, rather than as individual AOCs. A risk evaluation was performed to establish site-specific groundwater cleanup standards. The attached Table 2-1, from the *Act 2 Final Report* (EnSafe, 3/99) presents the maximum detection in groundwater of each contaminant of concern, along with the site-specific cleanup standard. The maximum detection is below the site-specific standard for each compound.

PADEP approved the *Act 2 Final Report*, which included sitewide groundwater. All monitoring wells have been abandoned, and no monitoring has been performed since the *Act 2 Final Report* was issued, according to the site contact.

Since the maximum detections of contaminants of concern do not exceed the approved site-specific standards, it can be concluded that groundwater is not contaminated above applicable standards.

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"² as defined by the monitoring locations designated at the time of this determination)?

 X

If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"²)

If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"²) - skip to #8 and enter "NO" status code, after providing an explanation.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Andritz has installed and sampled wells outside the facility property lines north and west of Plant 1. Groundwater from five of the wells (MWE-14, MWE-15, MWE-16, MWE-17, and MWE-19) was never found to contain VOCs. At various times during the sampling period from 1991 to 1995, groundwater from wells MWE-18, MWE-20, MWE-21, MWE-22, MWE-23, and MWE-24 contained one or more of the following: 1,1-dichloroethane, 1,1,1-trichloroethane, chloroethane, 1,2-dichloroethylene, trichloroethylene, tetrachloroethylene, chloroform, 2-butanone, and acetone. These were all detected at levels less than 0.100 mg/L, with the exception of acetone, which was detected in MWE-23 at 0.130 mg/L. (*Act 2 Remedial Investigation Report*, EnSafe, 9/98)

The groundwater investigations also indicate that groundwater contamination is confined to the aquifer located in the alluvial material above bedrock. Analysis of samples collected by PADEP from a deep residential well (approximately 100 feet deep) did not indicate the presence of target compounds. A 140-foot production well located adjacent to Building 70 was sampled at discrete intervals. Analyses of samples from the discrete zones resulted in acetone detections only, in the upper two intervals. Andritz concluded, with PADEP concurrence, that the acetone was introduced during the sampling process or was a result of the decontamination of the packers used to seal the borehole for discrete testing. (*Act 2 Final Report*, EnSafe, 3/99)

Since off-site sampling for VOCs has resulted in non-detections or very low detections at some wells, and site-related contamination is confined to the aquifer located in the alluvial material above bedrock, it appears that the migration of site-related groundwater contamination has stabilized. However, all site monitoring wells have been abandoned, and no future monitoring, to verify that further migration is not occurring, is planned.

² "Existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

- _____ If yes - continue after identifying potentially affected surface water bodies.
- _____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.
- X
- _____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater from the facility flows west or northwest to the West Branch Susquehanna River. During the Act 2 investigation, a dilutional factor of 32,000 was calculated based on the maximum flow expected from the aquifer to the river, and the minimum flow of the river as reported by PADEP. The dilutional factor was used along with applicable water quality criteria and risk analyses, to calculate site-specific groundwater standards for each contaminant of concern. None of the detections of contaminants of concern exceeded the site-specific groundwater standards (*Act 2 Final Report*, EnSafe, 3/99). Based on the fact that the contaminants of concern did not exceed the site-specific groundwater standards, it does not appear that contaminated groundwater is discharging into the surface water.

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5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate "level(s)," and if estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing. .

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): _____

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") – skip to #8 and enter a "NO" status, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems..

If unknown – skip to 8 and enter "IN" status code.

Rationale and Reference(s):

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ X

If no - enter "NO" status code in #8.

If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

All site monitoring wells have been abandoned, and no future monitoring is planned.

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**MIGRATION OF CONTAMINATED GROUNDWATER
 UNDER CONTROL (CA 750)**

