RDMS DocID 107875

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: Vishay Sprague Inc (fka) Sprague Electric Company
Facility Address: 1754 Main Street, Sanford, Maine 04073
Facility EPA ID #: MED077469864

1. 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 "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "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 ground water 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).

Vishay Sprague
MED 077469864
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#107875

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., 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?

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

_____ 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."

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

Rationale and Reference(s):

The primary reference document for this site is:

2007 Annual Environmental Sampling and Analysis Summary Report
for the
Former Sprague Electric Co. Site
Prepared for
Great American Financial Resources, Inc,
March 2008 by
Sevee & Maher Engineers, Inc.

This report provides an interpretation of the data collected through the calendar year 2007 which includes three rounds of sampling for most sampling points. The report has graphs showing contaminant trends over time at various well locations. Appendices include historical analytical data summaries for each sampling point throughout the life of this project. Some wells were installed and sampled as early as 1986, with the majority of the wells having been continuously monitored since 1995.

The following table 1 shows the average contaminant exceedances found in 2007.

Table 1 - Groundwater Contaminants Exceeding MEGs

Analyte	Maine CDC July 28,2008 MEG	Avg. for year (2007) Concentration	Location
METALS	**(ppb)**	**(ppb)**	
Arsenic	**10**	102	MW-102B
		75	MW-104A
		52	MW-106B
		275	MW-203B
VOCs			
trichloroethene (TCE)	**32**	220	MW-103B
		750	MW-104BR
		1430	MW-204B
		640	MW-701B
		200	MW-703B
1,1-dichloroethene (ethylene)	**0.6**	1	MW-102B
		6	MW-103B
		21	MW-104BR
		22	MW-204B
		3	MW-205B
		12	MW-701B
		2	MW-703B
		1	MW704B
Cis-1,2-dichloroethene	**70**	670	MW-103B
		2100	MW-104BR
		4300	MW-204B
		1580	MW-701B
		2200	MW-703B
		86	MW-704B
Chloroethane (ethyl chloride)	**4.6***	80	MW-103B
		30	MW-701B
Vinyl chloride	**0.2**	14	MW-102B
		230	MW-103B
		1200	MW-104BR
		42	MW-106B
		8	MW-203B
		68	MW-204B
		6	MW-205B
		110	MW-701B
		48	MW-702B
		920	MW-703B
		13	MW704B

* MCL from USEPA Region IX

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.

Footnotes:

[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.

Rationale and Reference(s):__Reference: **2007 Annual Environmental Sampling and Analysis Summary Report** for the Former Sprague Electric Co. Site, Prepared for Great American Financial Resources, Inc, March 2008 by Sevee & Maher Engineers, Inc, see: Section 3.3 – Groundwater Elevations and Flow Characteristics

The overburden aquifer at this site actually consists of two separate aquifer layers with notably different characteristics separated by a silty-clay layer which functions as an aquatard. Both the upper and lower overburden aquifer share similar groundwater flow surface potentiometric maps. This flow is generally from South to North from the facility to the Mousam River. The estimated geometric mean flow rates for the aquifers are dramatically different with the estimated flow of the upper aquifer at 250 to 400 feet per year and the lower aquifer flow estimated at 9 to 11 feet per year. Investigations have shown that the aquatard layer diminishes as it approaches the river allowing both aquifers to enter the river.

As shown in Table 1, the contaminants of concern are primarily chlorinated compounds (solvents and breakdown products) and arsenic. Initially, contaminants were found in both aquifers but in recent years the only contaminant of concern found in the upper aquifer has been elevated arsenic in some locations. A comprehensive monitoring program has been in place for this site for a number of years. This program was recently reviewed and modified (MEDEP letter of June 16, 2008 to Bruce Fowler of Sevee & Maher Engineers) allowing a reduction in sampling frequency from tri-annual to semi-annual sample collection. Minor changes were made in the selection of wells for monitoring with a particular emphasis on monitoring the plume boundaries (including up-

gradient to insure that new contamination is not coming in from off-site) along with several wells in the plume core to monitor the conditions in the areas of highest contaminant levels to assess movement and formation of breakdown products.

The groundwater at this site has been extensively investigated and monitored since the early 1990s. This has included the completion of many soil borings and the installation of about 40 monitoring wells. Sufficient information has been generated to define the location of the plume with reasonable accuracy, as well as provide data that is indicative of a slow but steady decline of contaminant levels. Based on the data amassed, about 18 wells have been selected as best located to monitor continued plume movement and contaminant decline. The data supports the determination that the groundwater plume is stabilized with respect to the lateral and vertical dimensions; however the plan for continued monitoring is sufficient to alert the Department and responsible party in the event of an unexpected change in the plume movement. There is evidence of a slow movement of the plume to toward the river with the river forming the final boundary of the plume. That issue is addressed in the next section.

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

__X__ 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.

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

Rationale and Reference(s): Although no specific contaminated groundwater seeps have been identified, the groundwater flow surface potentiometric maps strongly support the presumption that the groundwater from this site discharges into the Mousam River. Four seep locations have been identified above the waterline along the river bank within the plume boundaries (see Figure 6-1). These seeps were sampled a total of seven times each between 2004 and 2007 and no contaminants were found. A surface water sample is collected as part of the ongoing monitoring program. The only contaminant of note that has been detected in recent samples is Cis-1,2-dichloroethene which has been found at levels of 1-2 ppb in the river water. Since this compound is the largest single contaminant in the groundwater plume, its presence in the surface waters support the presumption that the plume is entering the river. While a small possibility exists that some of the contaminated groundwater might actually pass beneath the river, this was not investigated due to the presence of a number of very large wastewater treatment lagoons belonging to the Town of Sanford Sewerage District immediately across the river from this facility covering an area greater than a half a mile wide. (See Figure 2-1 attached)

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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 concentration[3] 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 judgement/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.

__X__ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] 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 concentrations[3] greater than 100 times their appropriate groundwater "levels," the 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.

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

Rationale and Reference(s): Reference is the Sevee & Maher 2007 Report, Appendix I which was use to construct both Table 1 above and Table 2 below.

As Table 1 indicated, there are a number of contaminants of concern found in the groundwater at this site but also as shown in Table 2, by virtue of the magnitude of the exceedances, Vinyl chloride is by far the dominating factor for the groundwater concerns at this site. Data in Appendix I show slow but generally steady reductions in vinyl chloride levels in the wells where long term monitoring has taken place. Reductions of 50% to 75% are typical for these wells over a 10 year period. There have been no indications of significant increases in groundwater contaminant levels for contaminants of concern.

Table 2 - Groundwater Contaminants Exceeding 100X MEGs

Analyte	Maine CDC July 28,2008 MEG	Avg. for year (2007) Concentration	Location	MEG Exceedance X
VOCs				
Vinyl chloride	0.2	230	MW-103B **	1150X
		1200	MW-104BR	6000X
		42	MW-106B	210X
		68	MW-204B	340X
		110	MW-701B **	550X
		48	MW-702B **	240X
		920	MW-703B	4600X

** Denotes wells closest to the river

In order to make a determination of the contaminant loading to the Mousam River from the contaminated groundwater plume the Department first looked at the surface water sampling data that has been accumulated to date. As mentioned earlier, the only contaminant of concern that has been identified has been Cis-1,2-dichloroethene which has been found at levels of 1-2 ppb in the river water. While this impact to the river does appear to be a result of the discharge of contaminated groundwater, the levels are insignificant in comparison to the MEG of 70 ppb for this contaminant. In addition, the surface water data is not showing evidence of a number of other contaminants of concern that are present in the groundwater. To get a better estimation of the potential risk to the river, calculations were done using the available aquifer data to predict the contaminant loading to the river from the groundwater plume.

The calculations were done using information found in or interpreted from the previously mentioned Sevee & Maher 2007 Summary or a 1994 Report on this site conducted by Balsam Engineering. The following values were used for calculation of the plume contribution to the river: Plume cross sectional area was 900ft (275m) wide by 30ft (9m) deep as interpreted from Sevee & Maher and Balsam reports. Plume flow rate was reported at 9-11 ft/yr by Sevee & Maher and the value of 10 ft/yr was used in the calculations. The effective porosity of the aquifer soil (silt/clay as reported by Balsam) was interpreted with the use of a geology handbook (Fetter) to be 0.30. Using the above stated factors the groundwater discharge to the river from the contaminated plume was calculated to be approximately 254 liters/hour. In addition to the loading calculations described above, dilution calculations were performed using Mousam river discharge of 30 cfs (3,058,219 liters/hour) supplied by the Maine DEP, Bureau of Land and water. See attached sheet showing calculations.

The calculated contaminant contribution to the Mousam River from this plume is shown in Table 3 below. Although Vinyl chloride is only one of six contaminants listed in Table 1 with concentrations exceeding the MEGs, the contribution from VC represents at least 90% of the total MEG exceedance so to simplify the calculation, it was the only one listed. Please note also that the well (MW-103B) was not the well with the highest level of contamination present, rather it was selected as the highest contaminant levels for

wells determined to be closer to the river (see notation on Table 2). This selection was made as an attempt to estimate the current contribution potential from sections of the contaminant plume closer to the water. Wells with the highest contaminant levels are located such a distance from the river that with low plume flow rate of this aquifer it would take at least 20 years for that section of the plume to reach waters edge. While this may be a concern in future years, the monitoring program in place is sufficient to identify such a trend in ample time to take appropriate remedial action.

As mentioned earlier, there has been a general decline in the contaminant levels observed over the last 10 years or more and there would be no additional new sources expected at this site especially since there is no longer any industrial activity taking place at this location. Likewise there have been no significant physical changes to the site that would be likely to alter the groundwater flow, especially to this lower aquifer where the contaminants are primarily located. There is an Environmental Covenant in place on this parcel that prohibits such activities that would impact or alter the groundwater flow.

Table 3 Vinyl Chloride Dilution by Mousam River

Contaminant	MEG (ppb)	NRWQC* Human Health Consumption of Water + Organism (ppb)	NRWQC* Human Health Consumption of Organism Only (ppb)	Maximum Concentration in near-river wells (MW-103B) (ppb)	Diluted Concentration (ppb)
Vinyl chloride	0.20	0.025	2.4	230	0.019 ppb

* NRWQC – National Recommended Water Quality Criteria

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 implemented[4])?

__X__ 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-assessment,[5] 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 "NO" status code, 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.

Footnotes:

[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.

Rationale and Reference(s): As shown in Table 3, the possible contaminant contribution from the most contaminated near-river well is well below even the most conservative water quality criteria. Another protective factor to consider (for human health exposure from contaminants at this site) is that the outfall from the Sanford Sewerage District treatment plant is located less than a half mile upstream from this site. No public water is drawn from this river and any private consumption is very unlikely.

The majority of the plume area lies on the facility property but portions appear to extend onto three other properties. The plume crosses the far back corner of a large residential property which is serviced by public water (as is the former manufacturing facility). The other two properties lie between the facility and the Mousam River, one a non-residential conservation area and the other an access road. Environmental Covenants to prevent groundwater use or disturbance have been placed on the facility property and one other. Covenants are being negotiated on the remaining two properties. These covenants prohibit or require Department approval for any activity that might alter the groundwater flow characteristics, or that include excavation that might expose contaminated media.

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?"

__X__ 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."

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

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

Rationale and Reference(s): A plan for regular ground water and surface water has been in place and implemented for many years and will be continued as long as necessary. As mentioned earlier, this plan was recently modified as stated in the MEDEP letter of June 16, 2008 to Bruce Fowler of Sevee & Maher Engineers. The previous plan was reassessed and due to the relative stability and slow movement of the plume, it was agreed that a reduction of sampling frequency from three per year to two per year appears to be appropriate at this time. There were some changes in the locations of the wells to be sampled to put more emphasis on monitoring the plume boundaries. The new plan calls for twice a year sampling of 18 wells and one surface water location. During each sampling event an additional 21 wells will be monitored for water level only. The data from the monitoring program will be evaluated on a regular basis and additional modifications will be made as warranted. Pore water sampling may be added to the monitoring to replace or supplement the surface water sample since monitoring of any groundwater discharges to surface water is important. The data collected by this monitoring program will be evaluated and corrective actions will be implemented as deemed necessary.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__X__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the:
Vishay Sprague Inc (fka) Sprague Electric Company facility,
EPA ID # **MED077469864** , located at:
1754 Main Street, Sanford, Maine 04073.
Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

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

Completed by (signature)_____ Date _____
(print)
(title)

Supervisor (signature) Stacy A. Lednes Date 9/30/08
(print)
(title) Supervisor

(EPA Region or State)_____

Locations where References may be found:

Maine Department of Environmental Protection
File Room, Ray Building
28 Tyson Dr.
Augusta, ME 04333

Contact telephone and e-mail numbers

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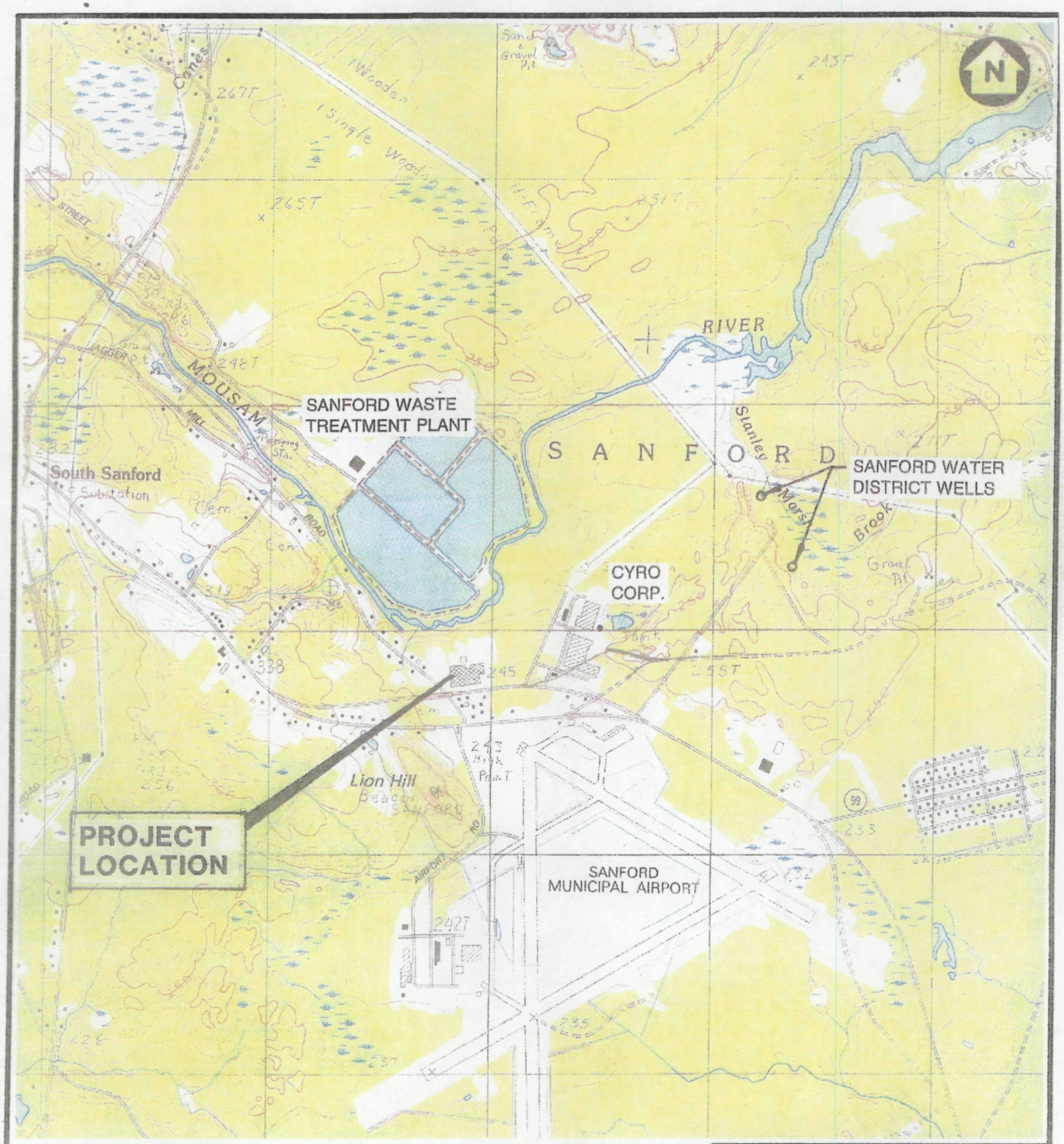


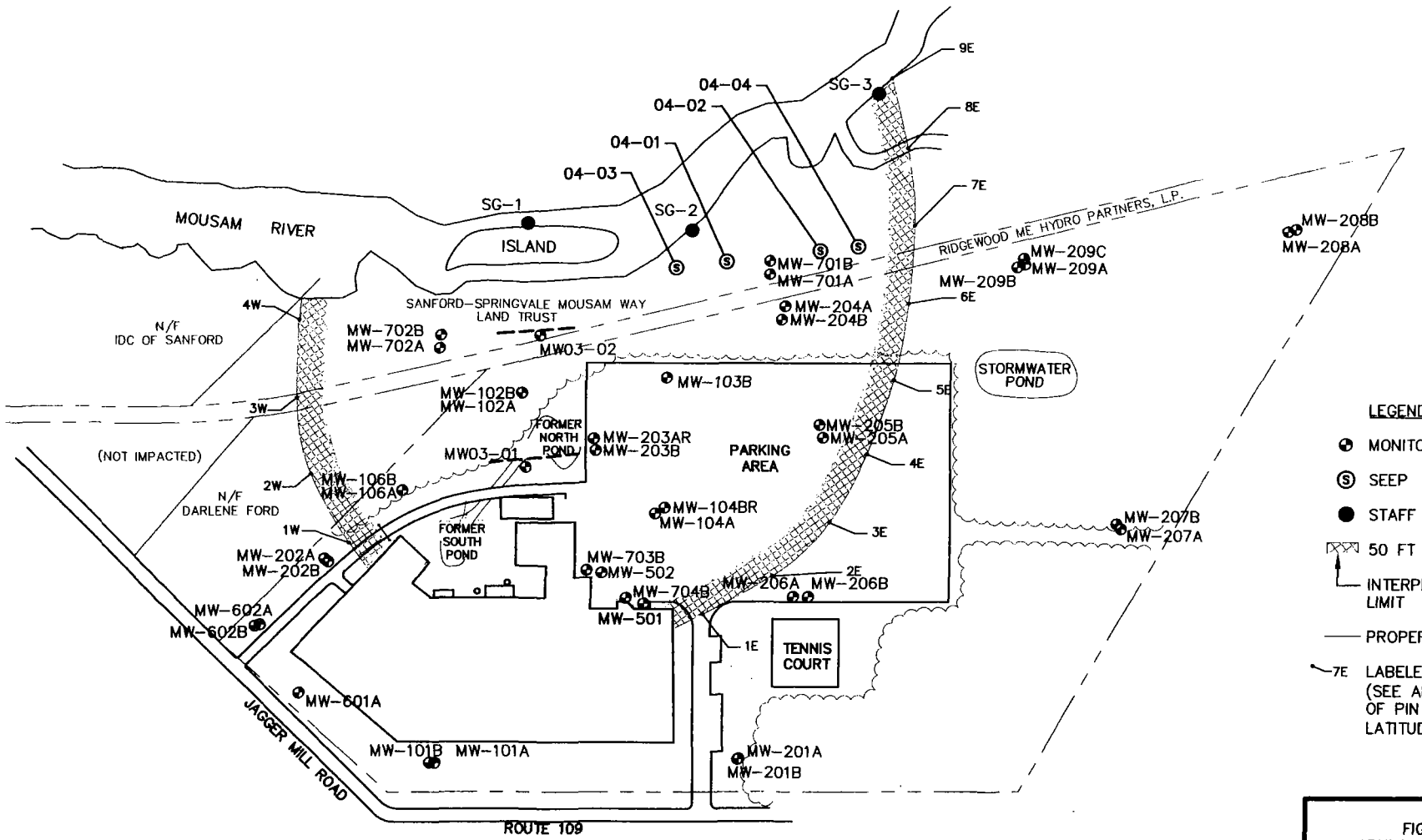
BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLE
ALFRED, MAINE–1983

1000 0 2000 4000 FEET

FIGURE 2–1
SITE PROJECT SETTING
FORMER SPRAGUE FACILITY
SANFORD, MAINE

SME
Sevee & Maher Engineers, Inc.

DWG: SITELOC LMN: CTB: HPSTD REV: 2/27/08



NOTE:

NORTHERN BUILDING CORNERS AND MONITORING POINTS WITHIN CAH PLUME AREA RESURVEYED IN SEPTEMBER 2004 BY BOUNDARY ENGINEERING OF BUXTON, MAINE. VISHAY SPRAGUE PROPERTY BOUNDARIES, LATERALLY DISTANT WELLS OUTSIDE CAH PLUME LIMITS (BOTH WEST AND EAST) AND TENNIS COURT AREA FEATURES RELOCATED BY MAINE DEP GPS SURVEY.

FIGURE 6-1
ABUTTING PROPERTIES,
CAH PLUME DELINEATION
SPRAGUE FACILITY
SANFORD, MAINE

SME
Sevee & Maher Engineers, Inc.

Groundwater Flow Calculations for Table 3
(Vinyl Chloride Dilution by Moosam River)

Information Source

River flow Rate 30 cfs (3,058,219 L/hr) - MEDEP

V= Plume Flow rate 10 ft/yr (3 m/yr) - Sevee + Maher

3 m/yr x 8760 hr/yr = 0.00034 m/hr

A= Plume cross section area: 900 ft (275 m) wide - Sevee + Maher
30 ft (9 m) depth - Balsam

A= 275 m x 9 m = 2475 m²

N= Effective Porosity 0.30 (silt/clay aquifer) Fetter / Balsam

Q= Groundwater Discharge to River Q = VNA

Q = 0.00034 m/hr x 0.30 x 2475 m²/hr = 0.254 M³/hr

0.254 M³/hr x 1000 L/M³ = 254 L/hr

Maximum contaminant from near-River wells (MW-103B)
Vinyl Chloride @ 230 ug/L (ppb)

230 ug/L x 254 L/hr = 58,420 ug/hr Vinyl chloride

58,420 ug/hr / 3,058,219 L/hr = 0.019 ug/L (ppb)
(VC contribution) / (River Flow) (VC Dilution in River)