DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99
Revised 9/20/02

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: Hydrite Chemical Company
Facility Address: 2815 WCF&N Drive, Waterloo, Black Hawk County, Iowa
Facility EPA ID #: IAT200010593

DETERMINATION RESULT: YE

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.

Hydrite Chemical Company (Hydrite) is at 2815 WCF&N Drive, Waterloo, Black Hawk County, Iowa (see Figure 1). Figure 2 shows site layout and vicinity. In 1997, a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was performed at the Hydrite facility, and a Corrective Measures Study (CMS) was completed in 2001 (Fluor Daniels GTI [FDGTI] 1997; IT Corporation [IT] 2001). The RFI and CMS address two areas of contamination at Hydrite – the former aboveground storage tank (AST) farm and an area where an acid spill occurred (see Figure 3). Except where noted, description of the facility history and layout derives from the RFI and CMS.

Hydrite is an active industrial chemical manufacturing and distribution facility that encompasses about 22 acres. Previous operations at Hydrite include an AST farm that stored virgin, reclaimed, and spent organic chemicals from approximately 1981 to 1991. Hydrite also repackaged product solvents, blended dry and liquid products, and temporarily stored waste solvents. Chemicals distributed from Hydrite include organic solvents, inorganic acids, alkalis, aqua and anhydrous ammonia, chlorine, sulfur dioxide gas, and a variety of other organic and inorganic dry chemical products.

Hazardous Waste Storage Area (also known as the AST farm). The former AST farm is on the southeastern side of the Hydrite facility and is bounded on the north by the parking lot and on the south by the railroad siding (see Figure 3). Approximately 18 tanks stored virgin or reclaimed organic chemicals, and 4 vertical tanks stored organic solvent hazardous waste (FDGTI 1997).

In 1990, Hydrite submitted a RCRA permit application to the United States Environmental Protection Agency (EPA) to store hazardous wastes at this facility. However, Hydrite later rescinded its application and proceeded with formal closure of the AST farm instead. A Closure Plan addressing required closure activities was submitted to EPA Region 7 in November 1990 and approved by EPA in 1991 (Montgomery Watson 1993). On September 25, 1991, closure activities began at the Hydrite facility, including soil and groundwater sampling.

Analytical results presented in the RFI and CMS confirmed that soil and groundwater at Hydrite are contaminated with volatile organic compounds (VOC) (FDGTI 1997). Chemicals of potential concern (COPC) were identified for additional evaluation based on elevated concentrations of VOCs (IT 2001).

Acid Spill Area. Waste acid was spilled in an area adjacent to the railroad siding at Hydrite (see Figure 3). Information was not available on the date, nature, or amount of the acid spill in either the RFI or CMS. Soil samples collected from the spill area contained barium and mercury but no other metals (FDGTI 1997). Because the contamination was limited, no additional investigations were conducted in this area.

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

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 [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) 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):

Hydrite is an active industrial chemical manufacturing and distribution facility. Operation of an AST farm during the period from approximately 1981 to 1991 has led to contamination of soil and groundwater at the facility. The former AST farm stored virgin, reclaimed, and spent organic chemicals. Chemicals distributed from Hydrite include organic solvents, inorganic acids, alkalis, aqua and anhydrous ammonia, chlorine, sulfur dioxide gas, and other organic and inorganic dry chemical products. During various environmental investigations, soil and groundwater samples were collected at Hydrite. Analysis of soil and groundwater samples show elevated VOCs concentrations (FDGTI 1997; IT 2001).

A soil vapor and groundwater survey was performed at Hydrite in July 1992. Results of this were submitted to EPA for review. The survey identified potential VOC contamination of groundwater under the former AST farm (Montgomery Watson 1993). Between 1992 and 2000, 26 wells were installed at Hydrite (see Figure 3) (Montgomery Watson 1993; IT 2001). The "A" suffix for monitoring wells designates the shallow well in each cluster, at approximately 18 to 20 feet below grade. The "B" wells are intermediate in depth, at approximately 31 to 34 feet below grade. The "C" wells are the deepest, at approximately 59 to 60 feet below grade. One "D" well (MW-3D) is screened in the same hydrostratigraphic unit as the "C" wells, but deeper in the unit. In 1992, based on the results of the soil vapor and groundwater survey, four monitoring well clusters (MW-1 to MW-4), most consisting of three monitoring wells, were installed. In 1996, nine monitoring wells (MW-3D, MW-5A, MW-5B, MW-6A, MW-6B, MW-6C, MW-7A, MW-7B, MW-7C) were installed at Hydrite. Additional clusters (MW-8 through MW-10) were installed between 1998 and 2000 (IT 2001). Temporary monitoring wells have also been used to define the horizontal and vertical extent of VOCs in groundwater (FDGTI 1997).

Depth to groundwater at Hydrite ranges from approximately 11 to 16.5 feet below ground surface (bgs). Shallow, intermediate, and deep groundwater flow direction at the Hydrite facility is from the northeast to southwest (see Figure 4) (FDGTI 1997). The three hydrostratigraphic units at the facility are: (1) shallow, saturated, alluvial deposits monitored by the "A" wells; (2) highly weathered carbonate limestone bedrock monitored by the "B" wells; and (3) fractured and fossiliferous dolomitic limestone bedrock monitored by the "C" and "D" wells (IT 2001). Groundwater flows through all three of these units, and no confining layers are present.

Laboratory analytical results from sampling activities from 1999 through 2002 indicate VOC concentrations that

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[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).

Laboratory analytical results from sampling activities from 1999 through 2002 indicate VOC concentrations that exceed maximum contaminant levels (MCL) or EPA Region 9 preliminary remediation goals (PRG), including benzene, 1,2-dichloroethane (DCA), 1,1-dichloroethene (DCE), 1,2-DCE, tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and vinyl chloride (VC) (IT 2001; EPA 2002a, 2002b). Table 1 shows the maximum concentrations for this period. In the most recent groundwater report (December 2002), 1,2-DCA, 1,1-DCE, 1,2-DCE, PCE, 1,1,1-TCA, and TCE still exceed MCLs or PRGs (see Table 2)(Arrowhead Contracting, Inc. [Arrowhead] 2003). The most contaminated wells are in clusters MW-3 and MW-7, but wells in clusters MW-4 and MW-6 are also contaminated above MCLs or PRGs (Arrowhead 2003).

Contaminants identified in the December 2002 groundwater sampling events include a number of chlorinated VOCs, including 1,1-DCE, PCE, and TCE (Arrowhead 2003). Contaminated groundwater has been found in well cluster MW-3, nearest the main buildings, and well cluster MW-6, which defines the southernmost boundary of the property (see Figure 2). Monitoring well cluster MW-8 (offsite), which is located in a residential area south of the facility, does not have detectable concentrations of VOCs. However, the plume front cannot be precisely located between MW-6 and MW-8, and contaminated groundwater may be located beneath residential properties, the Peavy Company buildings, or a church/day care center (see Figure 2).

Appendix A includes graphs that show changes in concentrations of VOCs in groundwater over time. These graphs are derived from the CMS and the most recent groundwater report (IT 2001; Arrowhead 2003).

Table 1 – Maximum Concentrations of Compounds Detected in Groundwater

Compound	Maximum Concentration Detected (ppb)	Well ID#	Date	MCL** (ppb)	Exceeds MCL or PRG?
Benzene*	72.5	MW7B	12/05/00	5	Y
Bromodichloromethane	1.6	MW-4B	09/23/98	0.18	Y
1,1-Dichloroethane*	498	MW-3B	06/14/99	810	N
1,2-Dichloroethane*	90.3	MW-7A	06/15/99	5	Y
1,1-Dichloroethene*	1,930	MW-3B	06/14/99	7	Y
cis-1,2-Dichloroethene*	4,690	MW-3B	06/14/99	70	Y
Methylene chloride	669	MW-3B	06/14/99	4.3	Y
Tetrachloroethene*	2,610	MW-7A	06/14599	5	Y
Toluene*	55.1	MW-3B	06/14/99	1,000	N
1,1,1-Trichloroethane*	20,800	MW-3B	06/14/99	200	Y
Trichloroethene	709	MW-3B	06/14/99	5	Y
1,2,4-Trimethylbenzene	73	MW-3B	06/14/99	12	Y
1,3,5-Trimethylbenzene	26.4	MW-3B	06/14/99	12	Y
Vinyl chloride*	3.5	MW7C	9/14/99	2	Y
Xylene (total)*	322	MW-3B	06/14/99	10,000	Y

Notes:

* Identified as a chemical of potential concern

** MCLs from U.S. Environmental Protection Agency's (EPA) Safe Drinking Water Act Regulations and Health Advisories (2002a). PRGs from EPA Region 9 PRGs table (2002b) for compounds with no established MCL

This table is derived from the Corrective Measures Study (IT 2001).

N = No

MCL = Maximum contaminant level

ppb = Parts per billion

PRG = Preliminary remedial goals

Y = Yes

Table 2 – Compounds Detected in December 2002 Groundwater Samples

Compound	Maximum Concentration Detected (ppb)	Well ID	MCL** (ppb)	Exceeds MCL? (Y or N)
1,1-Dichloroethane*	280	MW-3B	810	N
1,2-Dichloroethane*	29.0	MW-3B	5	Y
1,1-Dichloroethene*	1,090	MW-3B	7	Y
cis-1,2-Dichloroethene*	1,980	MW-3B	70	Y
Tetrachloroethene*	752	MW-3B	5	Y
1,1,1-Trichloroethane*	6,350	MW-3B	200	Y
Trichloroethene	339	MW-3B	5	Y

Notes:

* Identified as a chemical of potential concern

** MCLs from U.S. Environmental Protection Agency's (EPA) Safe Drinking Water Act Regulations and Health Advisories (2002a). PRGs from EPA Region 9 PRGs table (2002b) for compounds with no MCL.

This table is derived from the most recent groundwater report (Arrowhead 2003).

N = No

MCL = Maximum contaminant level

ppb = Parts per billion

PRG = Preliminary Remedial Goals

Y = Yes

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):

The exact location of the plume front between well clusters MW-6 , MW-8, and MW-9 is unknown. However, based on the pattern of VOC concentrations over time in groundwater at Hydrite, the horizontal and vertical migration of the plume appears to have stabilized. Figures 2 and 3 show the locations of all well clusters.

Concentrations of VOCs in samples collected at the most downgradient wells support the conclusion that contaminated groundwater is not migrating further off the Hydrite property. In 1999, a few samples collected from the wells in well cluster MW-8 had very low concentrations of VOCs (benzene, 1,1,1-TCA, and toluene). In the 11 sampling events since 1999, any VOCs present in groundwater collected from MW-8 have been below detection limits. In all cases, detectable concentrations and detection limits were below the MCLs (IT 2001; Arrowhead 2003). Similarly, samples collected from MW-9 in 1999 and 2000 had very low concentrations of VOCs (bromodichloromethane, chlorodibromomethane, chloroform, *cis*-1,2-DCE, toluene, and 1,1,1-TCA). In the eight sampling events since 2000, any VOCs present in groundwater collected from MW-8 have been below detection limits. Again, detectable concentrations and detection limits were below the MCLs. Concentrations of VOCs in samples collected from well cluster MW-6 continue to exceed MCLs, as of the most recent groundwater data (Arrowhead 2003). However, as shown in the graphs in Appendix A, concentrations of VOCs are not rising over the period from 1999 to late 2002. Concentrations fluctuate over time, but the total VOCs remain constant or are declining.

That the horizontal migration of the plume has stabilized is also supported by concentrations of contaminants in wells closer to the source areas. Concentrations of VOCs in groundwater from some wells near the operational areas at Hydrite (MW-3A, MW-3B, MW-3C, MW-4B, MW-7A, and MW-7B) remain very high, well above MCLs.

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[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.

Samples from other wells in the operational areas occasionally have VOCs that exceed MCLs. However, as shown in the graphs in Appendix A, the total concentration of VOCs in groundwater from operational areas at Hydrite is declining or remaining relatively constant over time. Only one well, MW-7B, shows a slight increase in total VOC concentrations. Stability of VOC concentrations in these wells suggests that contaminants from the source areas will not increase future migration of contaminated groundwater.

The stability of vertical migration of VOCs at the Hydrite facility is less certain, but the monitoring data seem to indicate that the vertical migration of groundwater is not significant. As shown in the graphs in Appendix A, the concentrations of VOCs in the deepest well in cluster MW-7 are decreasing relative to the concentrations in the shallower wells. Similarly, the deepest wells in clusters MW-4 and MW-6 do not have detectable concentrations of VOCs in the most recent sampling events. MW-4C has not had detectable concentrations of VOCs in the two sampling events since 2000, and MW-6C has not had detectable concentrations of VOCs in the eight sampling events since February 2001 (IT 2001; Arrowhead 2003). Of all the deep wells, only MW-3D has shown an increase in VOC detections (see Appendix A). After a period of declining VOC concentrations (only two detections of VOCs since the end of 2000), groundwater collected from MW-3D in the last two sampling events has had detectable concentrations of a range of VOCs. All are below EPA MCL. The sudden increase in VOC concentrations may be related to the flow of denser, contaminated groundwater along a preferential pathway, such as a fracture, or it may be related to unknown changes to recharge pathways. Given the results in the other deep wells, it seems unlikely that substantial downward migration is continuing at Hydrite, but the facility should continue to monitor any changes in MW-3D.

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

____ If yes - continue after identifying potentially affected surface water bodies.

_X_ 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):

Based on the available documentation, it appears unlikely that contaminated groundwater is discharging into surface-water bodies. No permanent bodies of surface water lie within the Hydrite property (see Figures 2 and 3). Moreover, the small ephemeral stream in the western part of the property has a shallow bottom (2 to 3 feet bgs), so it will only function as a groundwater discharge zone under the highest water table conditions (IT 2003).

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.

_____ 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.

Rationale and Reference(s):

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

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])?

_____ 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.

Rationale and Reference(s):

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[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.

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."

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

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

Rationale and Reference(s):

8. Check the appropriate RCRA Info 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 Hydrite facility, EPA ID #IAT200010593, located at 2815 WCF&N Drive, Waterloo Iowa. 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 _____ Date 7/10/03
(signature)
John Delashmit
Project Manager, RCRA Corrective Action & Permits Branch
EPA Region 7

The original evaluation was signed by John Smith, Branch Chief of the RCRA Corrective Action & Permits Branch on 7/10/03. This evaluation form is a recreation of the original.

Supervisor _____ Date 5/29/05
(signature)
Jody Hudson
RCRA Corrective Action & Permits Branch
EPA Region 7

Locations where References may be found:

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REFERENCES

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