National Pollutant Discharge Elimination System (NPDES) Permit Program

F A C T S H E E T

Regarding an NPDES Permit to Discharge to Waters of the State of Ohio
for **Dover Chemical Corporation**

Public Notice No.: 11-10-026
Public Notice Date: October 14, 2011
Comment Period Ends: November 13, 2011

OEPA Permit No.: **0IF00040*OD**
Application No.: **OH0007269**

Name and Address of Applicant:

Dover Chemical Corporation
P.O. Box 40
Dover, Ohio 44622-0040

Name and Address of Facility Where Discharge Occurs:

Dover Chemical Corporation
3676 Davis Road NW
Dover, Ohio 44622
Tuscarawas County

Receiving Water: **Sugar Creek**
Goettge Run

Subsequent Stream Network: **Sugar Creek to Tuscarawas River to Muskingum River to Ohio River**

Introduction

Development of a Fact Sheet for NPDES permits is mandated by Title 40 of the Code of Federal Regulations, Section 124.8 and 124.56. This document fulfills the requirements established in those regulations by providing the information necessary to inform the public of actions proposed by the Ohio Environmental Protection Agency, as well as the methods by which the public can participate in the process of finalizing those actions.

This Fact Sheet is prepared in order to document the technical basis and risk management decisions that are considered in the determination of water quality based NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, instream biological, chemical and physical conditions, and the relative risk of alternative effluent limitations. This Fact Sheet details the discretionary decision-making process empowered to the Director by the Clean Water Act and Ohio Water Pollution Control Law (ORC 6111). Decisions to award variances to Water Quality Standards or promulgated effluent guidelines for economic or technological reasons will also be justified in the Fact Sheet where necessary.

Effluent limits based on available treatment technologies are required by Section 301(b) of the Clean Water Act. Many of these have already been established by U.S. EPA in the effluent guideline regulations (a.k.a. categorical regulations) for industry categories in 40 CFR Parts 405-499. Technology-based regulations for publicly-owned treatment works are listed in the Secondary Treatment Regulations

(40 CFR Part 133). If regulations have not been established for a category of dischargers, the director may establish technology-based limits based on best professional judgment (BPJ).

Ohio EPA reviews the need for water-quality-based limits on a pollutant-by-pollutant basis. Wasteload allocations are used to develop these limits based on the pollutants that have been detected in the discharge, and the receiving water's assimilative capacity. The assimilative capacity depends on the flow in the water receiving the discharge, and the concentration of the pollutant upstream. The greater the upstream flow, and the lower the upstream concentration, the greater the assimilative capacity is. Assimilative capacity may represent dilution (as in allocations for metals), or it may also incorporate the break-down of pollutants in the receiving water (as in allocations for oxygen-demanding materials).

The need for water-quality-based limits is determined by comparing the wasteload allocation for a pollutant to a measure of the effluent quality. The measure of effluent quality is called PEQ - Projected Effluent Quality. This is a statistical measure of the average and maximum effluent values for a pollutant. As with any statistical method, the more data that exists for a given pollutant, the more likely that PEQ will match the actual observed data. If there is a small data set for a given pollutant, the highest measured value is multiplied by a statistical factor to obtain a PEQ; for example if only one sample exists, the factor is 6.2, for two samples - 3.8, for three samples - 3.0. The factors continue to decline as samples sizes increase. These factors are intended to account for effluent variability, but if the pollutant concentrations are fairly constant, these factors may make PEQ appear larger than it would be shown to be if more sample results existed.

Summary of Permit Conditions

Treatment technology-based limits for total suspended solids, carbon tetrachloride and chloroform would be continued from the current permit; water quality-based limits for oil&grease, pH, chlorine, dioxin equivalents and carcinogen additivity would also continue from the current permit. The carcinogen additivity equation would be revised to include a slightly different set of pollutant parameters.

New water quality-based limits are needed for PCB compounds and several pesticide parameters. The draft permit would apply the compliance schedule already approved for dioxins to these parameters as well. Ohio EPA believes that controls to meet the dioxin limits will also effectively control pesticides and PCBs.

Permit limits for whole effluent toxicity are also included in this draft permit. The outfall 002 discharge exceeds the toxicity WLA more frequently during this permit cycle than during the last. Approximately 54% of chronic test results and 23% of acute test results exceed the WLA. The permit provides a three-year compliance schedule for toxicity to cover the possibility that controls on organic pollutants will not allow toxicity standards to be met.

The current effluent monitoring requirements for barium have been removed from the permit because barium does not have the reasonable potential to contribute to exceedances of WQS. In addition, Ohio EPA would remove the instream water and sediment testing requirements. The data collected during the current permit cycle is sufficient to assess residual stream impacts.

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Procedures for Participation in the Formulation of Final Determinations

The draft action shall be issued as a final action unless the Director revises the draft after consideration of the record of a public meeting or written comments, or upon disapproval by the Administrator of the U.S. Environmental Protection Agency.

Within thirty days of the date of the Public Notice, any person may request or petition for a public meeting for presentation of evidence, statements or opinions. The purpose of the public meeting is to obtain additional evidence. Statements concerning the issues raised by the party requesting the meeting are invited. Evidence may be presented by the applicant, the state, and other parties, and following presentation of such evidence other interested persons may present testimony of facts or statements of opinion.

Requests for public meetings shall be in writing and shall state the action of the Director objected to, the questions to be considered, and the reasons the action is contested. Such requests should be addressed to:

Legal Records Section
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Interested persons are invited to submit written comments upon the discharge permit. Comments should be submitted in person or by mail no later than 30 days after the date of this Public Notice. Deliver or mail all comments to:

Ohio Environmental Protection Agency
Attention: Division of Surface Water
Permits and Compliance Section
P.O. Box 1049
Columbus, Ohio 43216-1049

The OEPA permit number and Public Notice numbers should appear on each page of any submitted comments. All comments received no later than 30 days after the date of the Public Notice will be considered.

Citizens may conduct file reviews regarding specific companies or sites. Appointments are necessary to conduct file reviews, because requests to review files have increased dramatically in recent years. The first 250 pages copied are free. For requests to copy more than 250 pages, there is a five-cent charge for each page copied. Payment is required by check or money order, made payable to Treasurer State of Ohio.

For additional information about this fact sheet or the draft permit, contact Jennifer Witte at (740) 380-5206 (jennifer.witte@epa.ohio.gov) or Eric Nygaard at (614) 644-2024 (eric.nygaard@epa.ohio.gov).

Location of Discharge/Receiving Water Use Classification

Dover Chemical discharges to Sugar Creek at River Mile (RM) 2.1 (Outfall 002) and to Goettge Run at RM 0.1 (Outfall 003). Goettge Run enters Sugar Creek at RM 2.09. The approximate location of the facility is shown in Figure 1.

This segment of the Sugar Creek is described by Ohio EPA River Code: 17-400, U.S. EPA River Reach #: 05040001-003, County: Tuscarawas, Ecoregion: Western Allegheny Plateau. Sugar Creek is designated for the following uses under Ohio's Water Quality Standards (OAC 3745-1-24): Warmwater Habitat (WWH), Agricultural Water Supply (AWS), Industrial Water Supply (IWS), and Primary Contact Recreation (PCR – Class A).

Goettge Run is described by Ohio EPA River Code: 17-422, USEPA River Reach #: 05040001-NA, County: Tuscarawas, Ecoregion: Western Allegheny Plateau. Goettge Run is presently designated for the following uses: Warmwater Habitat (WWH), Agricultural Water Supply (AWS), Industrial Water Supply (IWS), and Primary Contact Recreation (PCR).

Use designations define the goals and expectations of a waterbody. These goals are set for aquatic life protection, recreation use and water supply use, and are defined in the Ohio WQS (OAC 3745-1-07). The use designations for individual waterbodies are listed in rules -08 through -32 of the Ohio WQS. Once the goals are set, numeric water quality standards are developed to protect these uses. Different uses have different water quality criteria.

Use designations for aquatic life protection include habitats for coldwater fish and macroinvertebrates, warmwater aquatic life and waters with exceptional communities of warmwater organisms. These uses all meet the goals of the federal Clean Water Act. Ohio WQS also include aquatic life use designations for waterbodies which can not meet the Clean Water Act goals because of human-caused conditions that can not be remedied without causing fundamental changes to land use and widespread economic impact. The dredging and clearing of some small streams to support agricultural or urban drainage is the most common of these conditions. These streams are given Modified Warmwater or Limited Resource Water designations.

Recreation uses are defined by the depth of the waterbody and the potential for wading or swimming. Uses are defined for bathing waters, swimming/canoeing (Primary Contact) and wading only (Secondary Contact - generally waters too shallow for swimming or canoeing).

Water supply uses are defined by the actual or potential use of the waterbody. Public Water Supply designations apply near existing water intakes so that waters are safe to drink with standard treatment. Most other waters are designated for agricultural and industrial water supply.

Facility Description

The primary product of Dover Chemical is chlorinated paraffin, which is used as an extreme pressure lubricant, flame retardant, and process aid in plastic compounding. By-products of this process are hydrochloric acid and sodium hypochlorite. Other products include a complete line of organic phosphites with by-product hydrochloric acid. The plant also produces brominated compounds, metallic stearates and alkyl phenol.

The process operations performed at this facility are classified by the Standard Industrial Classification (SIC) codes 2869, "Industrial Organic Chemical Manufacturing" and 2819, "Industrial Inorganic Chemicals." Discharges resulting from process operations at Dover Chemical are subject to Federal Effluent Guideline Limitations, contained in Chapter 40 of the Code of Federal Regulations, Part 414, "Organic Chemicals, Plastics and Synthetic Fibers" (OCPSF) Industrial Category.

Description of Existing Discharge

The discharge from this facility consists of treated non-contact cooling water discharged to Sugar Creek via outfall 002. This outfall previously authorized discharges from a small sanitary plant on-site (outfall 602), and an organic chemicals process discharge (outfall 603). Since the last permit was issued, the sanitary wastewater was tied in to the City of Dover sanitary sewer system. Outfall 603 had never actually discharged; wastewaters had been drummed and hauled to a waste treatment company. That practice is projected to continue, and the wastewater treatment facilities for this process have been removed. As a result only cooling water and storm water would be allowed under this permit.

Outfall 002 contains the plant's non-contact cooling water. The source of the cooling water is a local groundwater supply, which contains chlorinated organic compounds from past disposal/treatment practices at the site. All 002 flows are treated by settling, oil separation and air stripping. The current 002 flows average approximately 4.1 MGD.

Outfall 003 discharges storm water from non-process areas of the facility to Goettge Run. This outfall is considered storm water from industrial activity, and should be submitting annual monitoring data required by Part V of the NPDES permit. This outfall is not treated.

Table 1 presents chemical specific data compiled from the NPDES renewal application, and data collected by Ohio EPA.

Table 2 presents a summary of unaltered Discharge Monitoring Report (DMR) data for outfall 0IF00040002. Data are presented for the period July 2005-July 2010, and current permit limits are provided for comparison.

Tables 3 and 4 summarize the results of acute and chronic whole effluent toxicity tests of the final effluent.

Assessment of Impact on Receiving Waters

The Attachment to this fact sheet contains the table from the *2010 Integrated Water Quality Monitoring and Assessment Report* (Ohio EPA) summarizing the attainment status of the Sugar Creek watershed from the Beach City reservoir to the Tuscarawas River. Flow and habitat alteration, metals, natural limitations (wetlands), pH, siltation and unknown toxicity are listed as "high magnitude causes" of impairment. Major industrial point sources (Dover Chemical), natural conditions and surface mining are listed among the "high magnitude sources" of impairment, along with agricultural practices.
Ohio EPA has completed a Total Maximum Daily Load (TMDL) for the Sugar Creek watershed. The TMDL addresses primarily nutrient discharges in the watershed, and does not contain any recommended changes to the Dover Chemical permit. The TMDL report is posted on the following web site:

http://www.epa.state.oh.us/dsw/tmdl/index.aspx#TMDL_Projects

Development of Water-Quality-Based Effluent Limits

Determining appropriate effluent concentrations is a multiple-step process in which parameters are identified as likely to be discharged by a facility, evaluated with respect to Ohio water quality criteria, and examined to determine the likelihood that the existing effluent could violate the calculated limits.

Parameter Selection Effluent data for the Dover Chemical were used to determine what parameters should undergo wasteload allocation. The parameters discharged are identified by the data available to Ohio EPA - Discharge Monitoring Report (DMR) data submitted by the permittee, compliance sampling data collected by Ohio EPA, and any other data submitted by the permittee, such as priority pollutant scans required by the NPDES application or by pretreatment, or other special conditions in the NPDES permit. The sources of effluent data used in this evaluation are as follows:

Self-monitoring data (DMR)	July 2005 through August 2010
NPDES Application data	2009
OEPA compliance sampling data	2009

A shorter period of DMR records (8/07-8/10) was used for chlorine and PCBs because the company began using a more sensitive test method for these pollutants in August 2007.

The data was evaluated for outliers and one value was removed from the data set for each of three parameters: oil&grease (138 mg/l), 1,2-Dichlorobenzene (54 ug/l) and gamma-hexachlorocyclohexane (2.3 ug/l). These values were significantly higher than the rest of the data set, and are not characteristic of the discharge. Also, five values for dioxin equivalents were removed (all values less than 0.005 pg/l). These data skewed the PEQ calculations, and were removed as unusual data points.

This data is evaluated statistically, and Projected Effluent Quality (PEQ) values are calculated for each pollutant. Average PEQ (PEQ_{avg}) values represent the 95th percentile of monthly average data, and maximum PEQ (PEQ_{max}) values represent the 95th percentile of all data points. The average and maximum PEQ values are presented in Table 5.

The PEQ values are used according to Ohio rules to compare to applicable water quality standards (WQS) and allowable wasteload allocation (WLA) values for each pollutant evaluated. Initially, PEQ values are compared to the applicable average and maximum WQS. If both PEQ values are less than 25 percent of the applicable WQS, the pollutant does not have the reasonable potential to cause or contribute to exceedances of WQS, and no wasteload allocation is done for that parameter. If either PEQ_{avg} or PEQ_{max} is greater than 25 percent of the applicable WQS, a wasteload allocation is conducted to determine whether the parameter exhibits reasonable potential and needs to have a limit or if monitoring is required. See Table 9 for a summary of the screening results.

Wasteload Allocation For those parameters that require a WLA, the results are based on the uses assigned to the receiving waterbody in OAC 3745-1. Dischargers are allocated pollutant loadings/concentrations based on the Ohio Water Quality Standards (OAC 3745-1). Most pollutants are allocated by a mass-balance method because they do not degrade in the receiving water. Wasteload allocations using this method are done using the following general equation: Discharger WLA =

(downstream flow x WQS) - (upstream flow x background concentration). Discharger WLAs are divided by the discharge flow so that the allocations are expressed as concentrations.

The applicable waterbody uses for this facility's discharge and the associated stream design flows are as follows:

Aquatic life (WWH)		
Toxics (metals, organics, etc.)	Average	Annual 7Q10
	Maximum	Annual 1Q10
Ammonia	Average	Summer 30Q10
		Winter 30Q10
Agricultural Water Supply		Harmonic mean flow
Human Health (nondrinking)		Harmonic mean flow

Allocations are developed using a percentage of stream design flow as specified in Table 7, and allocations cannot exceed the Inside Mixing Zone Maximum criteria.

The data used in the WLA are listed in Tables 6 and 7. The wasteload allocation results to maintain all applicable criteria are presented in Table 8.

Temperature WLA. Ohio EPA conducted a wasteload allocation using the mass-balance WLA procedures described above and professional judgment. Allocations were performed for summer (June-September). For Sugar Creek, if temperature standards are met during the summer, they will also be attained during other seasons.

During the summer, temperature standards for the Ohio River Basin are expressed as monthly average and daily values. To match these time periods, seasonal 30Q10 flows were selected as the critical flow for the monthly standards, and seasonal 1Q10 flows were selected as critical flows for the maximum standards. The specific WLA inputs are shown below:

Flow parameter	Flow Assumptions	Background Temp (C)	WQS (C)
1Q10	2.8 cfs	23 (BWQR - Muskingum Basin 75th percentile)	29.4 maximum
30Q10 (sum.)	8.7 cfs		27.8 monthly
Dover Chemical 002	7.41 cfs		

Allocations are done as a mass-balance, similar to chemical WLAs:

Summer avg. = [27.8 (8.7+7.41) – (23 x 8.7)] / 7.41 = 33.4 C

Summer max. = [29.4 (2.8+7.41) – (23 x 2.8)] / 7.41 = 31.8 C

The WLA to meet outside mixing zone maximum WQS is therefore the limiting WLA for Dover Chemical.

Whole Effluent Toxicity WLA Whole effluent toxicity (WET) is the total toxic effect of an effluent on aquatic life measured directly with a toxicity test. Acute WET measures short term effects of the effluent while chronic WET measures longer term and potentially more subtle effects of the effluent.

Water quality standards for WET are expressed in Ohio's narrative "free from" WQS rule [OAC 3745-1-04(D)]. These "free froms" are translated into toxicity units (TUs) by the associated WQS Implementation Rule (OAC 3745-2-09). Wasteload allocations can then be calculated using TUs as if they were water quality criteria.

The wasteload allocation calculations for WET are similar to those for aquatic life criteria - using the chronic toxicity unit (TU_c) and 7Q10 flow for the average and the acute toxicity unit (TU_a) and 1Q10 flow for the maximum. These values are the levels of effluent toxicity that should not cause instream toxicity during critical low-flow conditions. For Dover Chemical, the wasteload allocation values are 0.4 TU_a and 1.51 TU_c.

The chronic toxicity unit (TU_c) is defined as 100 divided by the IC_{25}:

$$TU_c = 100/IC_{25}$$

This equation applies outside the mixing zone for warmwater, modified warmwater, exceptional warmwater, coldwater, and seasonal salmonid use designations except when the following equation is more restrictive (Ceriodaphnia dubia only):

$$TU_c = 100/\text{geometric mean of NOEC and LOEC}$$

The acute toxicity unit (TU_a) is defined as 100 divided by the LC_{50} for the most sensitive test species:

$$TU_a = 100/LC_{50}$$

This equation applies outside the mixing zone for warmwater, modified warmwater, exceptional warmwater, coldwater, and seasonal salmonid use designations.

When the acute wasteload allocation is less than 1.0 TU_a, it may be defined as:

Dilution Ratio (downstream flow to discharger flow)	Allowable Effluent Toxicity (percent effects in 100% effluent)
up to 2 to 1	30
greater than 2 to 1 but less than 2.7 to 1	40
2.7 to 1 to 3.3 to 1	50

The acute wasteload allocation for Dover Chemical outfall 002 is 30 percent mortality in 100 percent effluent based on the dilution ratio of 1.2 to 1.

Reasonable Potential/ Effluent Limits/Hazard Management Decisions

After appropriate effluent limits are calculated, the reasonable potential of the discharger to violate the water quality standards must be determined. Each parameter is examined and placed in a defined "group". Parameters that do not have a water quality standard or do not require a wasteload allocation based on the initial screening are assigned to either group 1 or 2. For the allocated parameters, the preliminary effluent limits (PEL) based on the most restrictive average and maximum wasteload allocations are selected from Table 8. The average PEL (PEL_{avg}) is compared to the average PEQ (PEQ_{avg}) from Table 5, and the PEL_{max} is compared to the PEQ_{max}. Based on the calculated percentage of the allocated value [($PEQ_{avg} \div PEL_{avg}$) X 100, or ($PEQ_{max} \div PEL_{max}$) X 100)], the parameters are assigned to group 3, 4, or 5. The groupings are listed in Table 9.

The final effluent limits are determined by evaluating the groupings in conjunction with other applicable rules and regulations. Table 10 presents the final effluent limits and monitoring requirements proposed for Dover Chemical outfall 0IF00040002 and the basis for their recommendation.

The limits for Outfall 002 contain both treatment technology-based limits and water quality-based limits. This discharge does not contain process wastewater regulated by effluent guidelines. The draft limits for total suspended solids, oil&grease, carbon tetrachloride and chloroform are based on past best professional judgments made when the current treatment system was designed. The original design of the treatment plant had limits of – TSS: 10 mg/l avg., 20 mg/l maximum; oil&grease: 10 mg/l maximum; carbon tetrachloride: 50 ug/l maximum; and chloroform: 50 ug/l avg., 75 ug/l maximum. The limits for carbon tetrachloride and chloroform will control other volatile organic compounds because these are the VOCs with the highest concentrations in the ground water.

When the last permit was issued, Dover Chemical requested to discharge additional cooling water flows up to 4.5 MGD. The company chose not to go through an antidegradation review at that time, and accepted lower concentration limits with the same loadings. Those concentrations and loadings have been included in this draft permit.

Limits proposed for pH are based on Water Quality Standards (OAC 3745-1-07). Because Dover Chemical monitors pH continuously at this outfall, the draft permit contains pH excursion language from 40 CFR 401.17. This rule allows an effluent to have short periods where pH limits are exceeded in exchange for continuous monitoring. This requirement meets Ohio WQS in Sugar Creek due to dilution/assimilation in the creek, and the short duration of exceedance allowed during a month.

Temperature levels in the 002 discharge do not have the reasonable potential to contribute to exceedances of WQS. The highest value measured in the effluent was 25.3 ^{o}C; this value is lower than the maximum WLA of 31.8 ^{o}C, and therefore the effluent has no reasonable potential to exceed WQS. The draft permit would continue the monitoring requirements to track cooling water temperatures; the discharge does contain added heat, and the instream dilution at critical flows is relatively low.

The Ohio EPA risk assessment (Table 9) places chlorine, aldrin, 4,4'DDD, 4,4'DDE, 4,4'DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, alpha-BHC, PCBs and dioxin compounds in group 5. This placement as well as the data in Tables 1, 2 and 5 indicate that the reasonable potential to exceed WQS exists and limits are necessary to protect water quality.

The draft limits for all pesticide pollutants, polychlorinated biphenyl compounds and dioxin compounds are based on the current WLA. The final dioxin limits are carried over from the current permit. The limits for all of these parameters except endrin are WQS applied at the discharge point based upon the mixing zone phase out which applies to BCCs (bioaccumulative chemical of concern) effective November 2010. All of these chemicals except endrin are considered BCCs. The endrin WLA is based on dilution in Sugar Creek.

The loading limits for these parameters are based on the current effluent flow of 4.79 MGD. Loading limits for allocated WQBELs must be based on the flow used in the wasteload allocation. This flow represents the 95th percentile of monthly average flows for July 2005-August 2010.

The current permit contains a compliance schedule for dioxin TEQs and carcinogen additivity that allows the company until August 1, 2012 to meet limits. This schedule has been continued in this draft permit. Ohio EPA has applied this compliance schedule to the pesticide parameters and PCBs that would have limits in the new permit. The Agency believes that controls put in-place to control dioxins will also control pesticides and PCB compounds.

The limits for chlorine are from the wasteload allocation and are very similar to the current permit limits.

Ohio EPA risk assessment (Table 9) places gamma-BHC in group 4. This placement as well as the data in Tables 1, 2 and 5 support that these parameters do not have the reasonable potential to contribute to WQS exceedances, and limits are not necessary to protect water quality. Monitoring for Group 4 pollutants (where PEQ exceeds 50 percent of the WLA) is required by OAC Rule 3745-33-07(A)(2).

Monitoring requirements for total dissolved solids would be continued in the draft permit. Effluent TDS concentrations are slightly higher than background, and this data is useful in interpreting effluent toxicity tests. Monitoring requirements for barium, beta-BHC and chlordane would be removed from the permit because these parameters do not have the reasonable potential to contribute to exceedances of WQS, and do not trigger monitoring requirements under Ohio permit rules.

The WLA for the Dover Chemical Corporation contains an additivity factor equation for the carcinogenic compounds listed below. Additivity is the combined toxic effect of carcinogenic pollutants. This section evaluates each quotient in the additivity factor equation to determine whether an additivity factor equation is necessary in the permit to limit the total carcinogen risk to 1 x 10^{-5} (1 in 100,000), whether other limits

are protective of carcinogen additivity, or whether there is no reasonable potential for the total carcinogen risk to be exceeded.

Name of Carcinogen	**No.**	**$WLA_{Human\ Health}$ ug/l**
Aldrin	1	0.024
Bis(2-ethylhexyl)phthalate	2	1014
Carbon tetrachloride	3	757
4,4'-DDD	4	0.0084
4,4'-DDE	5	0.0059
4,4'DDT	6	0.0059
Dieldrin	7	0.0014
Heptachlor	8	0.036
Hexachlorobenzene	9	0.0077
alpha-Hexachlorocyclohexane	10	0.13
gamma-Hexachloro-cyclohexane (Lindane)	11	0.63
Polychlorinated biphenyls (PCBs)	12	0.0017
Dioxin/Dibenzofuran congeners	13	0.00000014

The carcinogen additivity equation is defined by the monthly average concentration of pollutants divided by the human health wasteload allocation for each pollutant. The sum of the fractions for each chemical must be less than one if the total carcinogen risk is to be maintained:

$$\frac{MAC1}{0.024} + \frac{MAC2}{1014} + \frac{MAC3}{757} + \frac{MAC4}{0.0084} + \frac{MAC5}{0.0059} + \frac{MAC6}{0.0059} + \frac{MAC7}{0.0014} + \frac{MAC8}{0.036} +$$

$$\frac{MAC9}{0.0077} + \frac{MAC10}{0.13} + \frac{MAC11}{0.63} + \frac{MAC12}{0.0017} + \frac{MAC13}{0.00000014} \leq 1.0$$

To assess reasonable potential for carcinogen additivity, PEQavg values are substituted for the monthly average concentrations in the equation above. Based on this assessment, the sum of the fractions is greater than 1.0, and therefore a limit on carcinogen additivity is needed. Aldrin, carbon tetrachloride, heptachlor, alpha-HCH and gamma-HCH are included in the equation. Dieldrin, hexachlorobenzne and the DDT parameters are being removed from the equation because the effluent limits for these parameters are less than the analytical quantification level for these compounds. PCB compounds and dioxins (2,3,7,8-TCDD equivalents) are also being removed for similar reasons; depending on the congeners detected, the limits for these chemicals may also be less than the quantification level. Under OAC Rule 3745-33-07(A)(8), pollutants with limits less than QL can be removed. If these chemicals were left in the additive equation, any quantifiable amount would cause two exceedances of the permit for one measurement.

Bis(2-ethylhexyl) phthalate is also being removed from the equation. Based on a comparison of the PEQ concentrations to the human health WLA, bis-2EHP is not a significant contribution to the carcinogen

equation and does not have the reasonable potential to contribute to the carcinogen risk of pollutants discharged.

Whole Effluent Toxicity Reasonable Potential
Based on evaluating the whole effluent toxicity data presented in Tables 3 and 4 and other pertinent data under the provisions of OAC 3745-33-07(B), the Dover Chemical 002 discharge is placed in Category 1 with respect to whole effluent toxicity. The discharge has the reasonable potential to contribute to exceedances of narrative toxicity standards; effluent limits of 1.0 TUa and 1.51 TUc are included in the final effluent table. A three-year compliance schedule is being proposed to meet these limits.

The determination of reasonable potential is most clearly made using the chronic toxicity data. Fifty-four percent (14 of 26) of the test results shown in Table 4 indicate effluent toxicity values greater than the chronic WLA of 1.51 TUc. Both the average exceedance score and the maximum exceedance score are in the Category 1 range.

For acute toxicity, 23% of results exceed the acute WLA of 30% acute effect in 100% effluent. While average toxicity metrics are acceptable, the maximum effluent values are more than three times the measure of rapid lethality (1.0 TUa).

Other Requirements

Storm Water Compliance
Dover Chemical discharges storm water associated with industrial activity from Outfalls 002 and 003. The permit contains pollution prevention and monitoring for storm water in Parts IV, V and VI of the draft permit. These conditions are very similar to conditions in the current permit.

The permit contains a compliance schedule to set up a new sampling location for Outfall 003. The current location is frequently flooded, making representative sampling very difficult. This schedule would allow time for the facility to construct a manhole in the storm sewer line to allow sampling.

Outfall Signage
Part II of the permit includes requirements for signs to be maintained at each outfall to Sugar Creek, providing information about the discharge. Signage at outfalls is required pursuant to Ohio Administrative Code 3745-33-08(A).

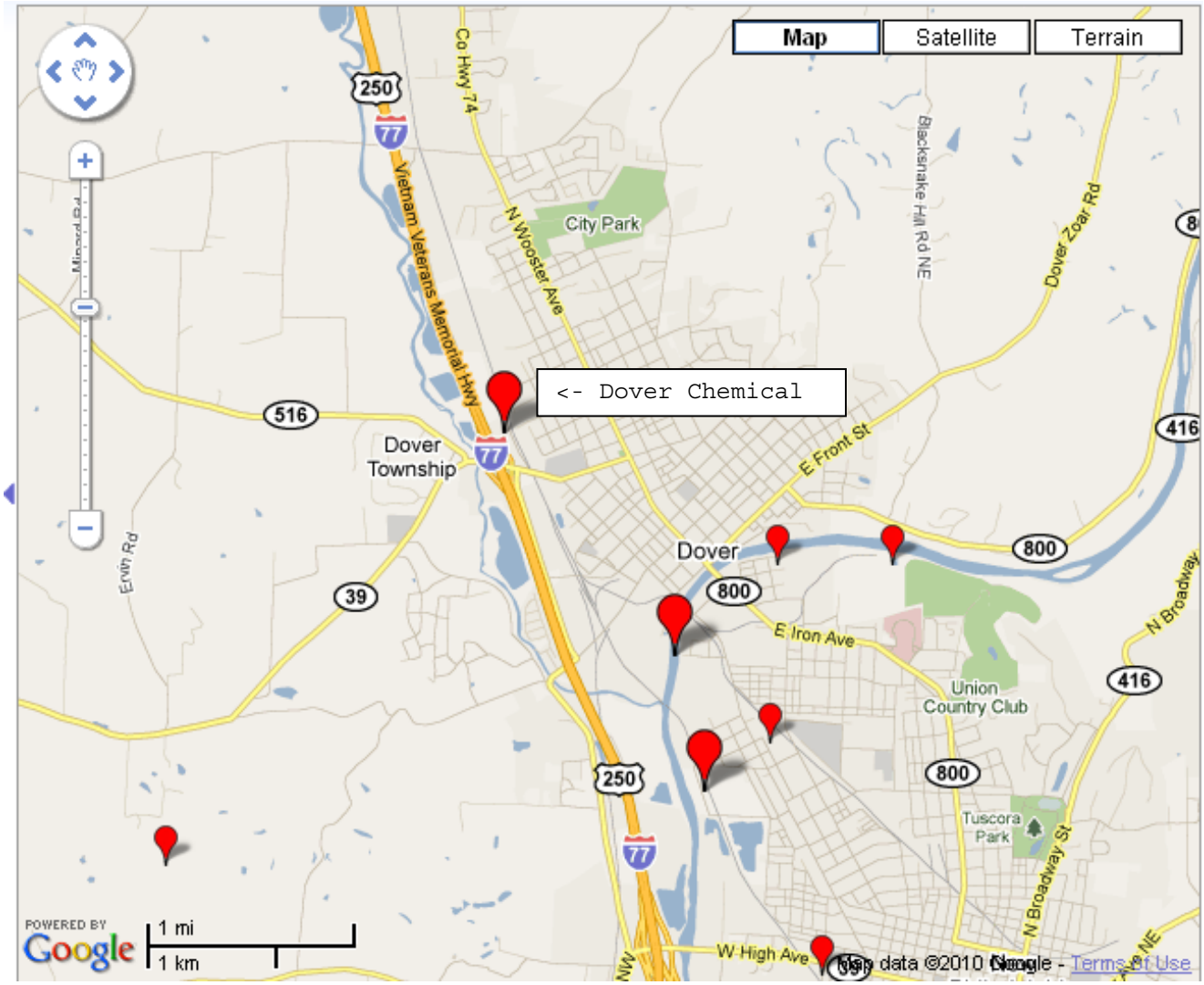

Figure 1. Approximate location of Dover Chemical. Balloons indicate NPDES permitted discharges. Large balloons are major dischargers.

Table 1. Effluent Characterization Using Application and Ohio EPA Data

Summary of analytical results for Dover Chemical outfall 0IF00040002. All values are in ug/l unless otherwise indicated. OEPA = data from analyses by Ohio EPA; ND = below detection (detection limit); NA = not analyzed; * = maximum 30-day values. Decision Criteria: PEQ_{avg} = monthly averages; PEQ_{max} = daily maximum analytical results.

	OEPA	Dover Chemical App. Form 2C				DECISION CRITERIA	
PARAMETER	10/06/09	N	mean	maximum		PEQ_{avg}	PEQ_{max}
COD mg/l	<20	1	--	0.0			
Dissolved Solids mg/l 556	NA	NA	NA		570	616	
Chloride mg/l	64.4	NA	NA	NA		76	92
Sulfate mg/l	NA	1	--	199		901	1234
Nitrate/nitrite-N mg/l	0.82	1	--	0.0		2.27	3.12
Phosphorus mg/l	0.093	1	--	0.12		0.33	0.46
Hardness mg/l	359	NA	NA	NA			
Barium	86	1	--	<100		75	103
Magnesium mg/l	29	1	--	28100		80	110
Manganese	99	1	--	95300		86	121
Nickel	3.6	1	--	<100		16	22
Potassium mg/l	4	NA	NA	NA			
Strontium	198	NA	NA	NA		896	1228
Bromomethane	0.95	NA	NA	NA		4.3	5.9
Carbon Tetrachloride	2.75	96	--	11.64*		96	132
Chloroform	15.0	96	--	28.28*		31	53
1,2-Dichlorobenzene	2.76	1	--	0.0		2.85	5.65
1,3-Dichlorobenzene	2.10	1	--	0.0		9.7	13.3
1,4-Dichlorobenzene	2.49	1	--	0.0		4.1	7.8
1,2,3-Trichlorobenzene	2.21	NA	NA	NA			
1,2,4-Trichlorobenzene	2.42	1	--	0.0		7.7	10.5
Hexachlorobenzene	0.088	1	--	0.0		0.24	0.33
Bis(2-ethylhexyl)phthalate	0.78	NA	NA	NA		3.5	4.8
Aldrin	<0.0021	12	--	1.1		1.3	1.8
Alpha-BHC	0.12	240	--	1.37		0.2	0.24
Beta-BHC	0.062	240	--	1.45		0.1	0.13
Gamma-BHC	0.031	240	--	2.3		0.035	0.048
Delta-BHC	0.015	NA	NA	NA			
4,4'-DDT	<0.0063	60	--	2.1		1.5	2.1
4,4'-DDE	0.0072	60	--	1.43		1.0	1.4
4,4'-DDD	<0.0063	60	--	1.23		0.9	1.2
Dieldrin	<0.0021	60	--	1.03		0.75	1.03
Endrin	<0.0021	60	--	1.22		0.89	1.22
Alpha-Endosulfan	0.0066	60	--	0.78		0.57	0.78
Beta-Endosufan	<0.0021	60	--	0.75		0.55	0.75
Endosulfan sulfate	<0.021	60	--	1.22		0.89	1.22
Heptachlor	<0.0021	60	--	1.93		1.41	1.93

Table 2. Effluent Characterization Using DMR Data

Summary of current permit limits and unaltered monthly operating report (MOR) data for Dover Chemical outfall 0IF00040002. All values are based on annual records unless otherwise indicated. N = Number of Analyses. * = For pH, 5th percentile shown in place of 50th percentile; ** = For dissolved oxygen, 5th percentile shown in place of 95th percentile; A = 7 day average. Decision Criteria: PEQ_{avg} = monthly average; PEQ_{max} = daily maximum analytical results.

Parameter	Season	Units	Current Permit Limits		# Obs.	Percentiles		Data Range	Decision Criteria		
			30 day	Daily		50th	95th		# Obs.	PEQ_{ave}	PEQ_{max}
Outfall 002											
Water Temperature	Annual	C	Monitor		1127	20.4	22.3	7.6-25.3			
Total Precipitation	Annual	Inches	--	--	761	0	0.8	0-4.3			
Residue, Total Dissolved	Annual	mg/l	Monitor		504	541	609	344-810	504	569.85	615.98
Residue, Total Dissolved	Annual	kg/day	--	--	504	8750	10900	3700-12200			
Total Suspended Solids	Annual	mg/l	9	18	504	0	5	0-35	504	3.1583	5.5393
Total Suspended Solids	Annual	kg/day	153	307	504	0	75.8	0-578			
Oil and Grease, Total	Annual	mg/l	--	9	505	0	0	0-138	504	8.453	11.58
Oil and Grease, Total	Annual	kg/day	--	153	505	0	0	0-2200			
Chloride, Total	Annual	mg/l	--	--	100	61.3	81	22.4-145	100	75.767	91.894
Chloride, Total	Annual	kg/day	--	--	100	919	1240	360-1440			
Barium, Total Recoverable	Annual	ug/l	Monitor		36	0	0	0-0	36	--	--
Barium, Total Recoverable	Annual	kg/day	--	--	36	0	0	0-0			
Manganese, Total Recoverable	Annual	ug/l	--	--	25	54	81.6	15-96	25	83.111	115.63
Manganese, Total Recoverable	Annual	kg/day	--	--	25	0.837	1.29	0.233-1.31			
Carbon Tetrachloride	Annual	ug/l	--	44	572	0	9.45	0-670	571	96.36	132
Carbon Tetrachloride	Annual	kg/day	--	0.75	572	0	0.146	0-7.71			
Chloroform	Annual	ug/l	44	67	572	6.75	39.4	0-9700	572	31.491	53.416
Chloroform	Annual	kg/day	0.75	1.15	572	0.108	0.621	0-112			

Alpha BHC	Annual	ug/l	Monitor		252	0.15	0.235	0-0.34	252	0.19719	0.24394
Alpha BHC	Annual	kg/day	--	--	252	0.00246	0.00364	0-0.00649			
Beta BHC	Annual	ug/l	Monitor		252	0.073	0.13	0-0.23	252	0.10391	0.13395
Beta BHC	Annual	kg/day	--	--	252	0.00118	0.0021	0-0.00428			
1,1,1-Trichloroethane	Annual	ug/l	--	--	252	0	0	0-8	252	4.088	5.6
1,1,1-Trichloroethane	Annual	kg/day	--	--	252	0	0	0-0.124			
1,2-Dichlorobenzene	Annual	ug/l	--	--	252	0	5.45	0-54	252	5.012	6.2406
1,2-Dichlorobenzene	Annual	kg/day	--	--	252	0	0.0623	0-0.773			
1,2,4-Trichlorobenzene	Annual	ug/l	--	--	252	0	0	0-15	252	7.665	10.5
1,2,4-Trichlorobenzene	Annual	kg/day	--	--	252	0	0	0-0.215			
1,3-Dichlorobenzene	Annual	ug/l	--	--	252	0	0	0-19	252	2.9714	3.2956
1,3-Dichlorobenzene	Annual	kg/day	--	--	252	0	0	0-0.272			
1,4-Dichlorobenzene	Annual	ug/l	--	--	252	0	7	0-47	252	4.0446	7.9413
1,4-Dichlorobenzene	Annual	kg/day	--	--	252	0	0.0972	0-0.672			
2,3,7,8 TCDD	Annual	ng/l	Monitor		23	0	0	0-0	23	--	--
2,3,7,8 TCDD	Annual	kg/day	--	--	23	0	0	0-0			
Gamma-BHC, Total	Annual	ug/l	Monitor		252	0.0205	0.044	0-2.3	251	0.034813	0.047493
Gamma-BHC, Total	Annual	kg/day	--	--	252	0.000332	0.000788	0-0.0361			
Chlordane	Annual	ug/l	Monitor		36	0	0	0-0	36	--	--
Chlordane	Annual	kg/day	--	--	36	0	0	0-0			
Heptachlor	Annual	ug/l	Monitor		36	0	0	0-0	36	--	--
Heptachlor	Annual	kg/day	--	--	36	0	0	0-0			
PCBS	Annual	ug/l	Monitor		37	0	0.0293	0-0.035	12	0.04088	0.056
PCBS	Annual	kg/day	--	--	37	0	0.000543	0-0.00058			
Chlorobenzene	Annual	ug/l	--	--	252	0	0	0-8	252	4.088	5.6
Chlorobenzene	Annual	kg/day	--	--	252	0	0	0-0.114			
Flow Rate	Annual	MGD	Monitor		1884	4.15	4.99	0.001-5.6			
Chlorine, Total Residual	Annual	mg/l	Monitor		510	0	0.0555	0-2.2	509	0.041506	0.063181
Chlorine, Total Residual	Annual	kg/day	--	--	510	0	0.904	0-38.1			
Carcinogen Additivity Factor	Annual	Admin Units	Calculate		35	0.36	1.04	0.01-1.06			

Acute Toxicity, Ceriodaphnia dubia	Annual	TUa	Monitor		26	0	1.93	0-3.7			
Chronic Toxicity, Ceriodaphnia dubia	Annual	TUc	Monitor		23	2	16.2	0-34.6			
Acute Toxicity, Pimephales promelas	Annual	TUa	Monitor		8	0	0.625	0-0.8			
Chronic Toxicity, Pimephales promelas	Annual	TUc	Monitor		8	0.55	1.57	0-1.6			
pH, Maximum	Annual	S.U.	--	9.0	1881	8.1	8.56	7.19-9.8			
pH, Minimum	Annual	S.U.	--	6.5	1881	8	8.4	3.4-8.8			
Chlorinated Hydrocarbons, General	Annual	ug/l	Monitor		59	12	75.6	0.1-327	59	116.4	159.27
Chlorinated Hydrocarbons, General	Annual	kg/day	--	--	59	0.189	1.19	0.00193-4.29			
Toxicity Equivalent	Annual	pg/l	Monitor		60	11	45.3	0-143	38	12.77	17.49
Toxicity Equivalent	Annual	kg/day	--	--	60	0	0	0-0			

Chlorinated hyrdrocarbons is the reporting parameter for chlorinated paraffins.
Toxicity Equivalent is the reporting parameter for dioxin congeners.

Table 3. Summary of acute toxicity test results on the Dover Chemical Outfall 002 effluent**.** Notes are at the end of the table.

Test Date(a)	*Ceriodaphnia dubia 48 hours*						*Fathead Minnows 96 hour*					
	UP[b]	C[c]	LC_{50}[d]	%M[g]	TUa[h]	NF[i]	UP[b]	C[c]	LC_{50}[d]	%M[g]	TUa[h]	NF[i]
08/15/05 (E)	0	NR	>100	0	<1.0	NT	5	NR	>100	0	<1.0	NT
11/04/05 (E)	0	NR	>100	0	<1.0	NT	2	NR	>100	0	<1.0	NT
02/24/06 (E)	0	NR	>100	0	<1.0	NT	2	NR	>100	40	0.8	NT
05/05/06 (E)	0	NR	>100	0	<1.0	NT	2	NR	>100	0	<1.0	NT
08/18/06 (E)	0	NR	>100	0	<1.0	NT	18	NR	>100	0	<1.0	NT
11/06/06 (E)	0	NR	>100	0	<1.0	NT	5	NR	>100	0	<1.0	NT
02/05/07 (E)	0	NR	91	>50	1.1	NT	2	NR	>100	15	0.3	NT
05/07/07 (E)	0	NR	>100	0	<1.0	NT	5	NR	>100	0	<1.0	NT
08/27/07 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
10/19/07 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
12/21/07 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
02/15/08 (E)	0	NR	>100	45	0.9	NT	NT	NT	NT	NT	NT	NT
04/18/08 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
06/18/08 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
08/18/08 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
12/15/08 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT

Table 3. continued**.**

Test Date(a)	*Ceriodaphnia dubia 48 hours*						*Fathead Minnows 96 hour*					
	UP[b]	C[c]	LC_{50}[d]	%M[g]	TUa[h]	NF[i]	UP[b]	C[c]	LC_{50}[d]	%M[g]	TUa[h]	NF[i]
02/16/09 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
04/17/09 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
06/19/09 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
08/07/09 (E)	0	NR	>100	10	0.2	NT	NT	NT	NT	NT	NT	NT
10/06/09 (O)	0	0	<100	85-100	>1.0	35	0	0	>100	0	<1.0	0
10/23/09 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
12/08/09 (E)	0	NR	27	>50	3.7	NT	NT	NT	NT	NT	NT	NT
02/19/10 (E)	0	NR	45	>50	2.2	NT	NT	NT	NT	NT	NT	NT
04/16/10 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
06/18/10 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
08/06/10 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
10/15/10 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
12/17/10 (E)	0	NR	>100	0	<1.0	NT	NT	NT	NT	NT	NT	NT
02/02/11 (E)	0	NR	22	>50	4.5	NT	NT	NT	NT	NT	NT	NT

[a] O = EPA test; E = entity test [b] UP = upstream control water [c] C = laboratory water control
[d] LC_{50} = median lethal concentration [g] %M = percent mortality in 100% effluent [h] TUa = acute toxicity units
[i] NF = near field sample (OEPA 1:1 manual mixing zone) NR = not reported in OEPA database NT=not tested

Table 4. Summary of chronic toxicity test results on the Dover Chemical Outfall 002 effluent**.** Notes are at the end of the table.

Test Date (a)	*Ceriodaphnia dubia 7-Day*											*Fathead Minnows 7-Day*				
	UP[b]	C[c]	IC_{25}[d]	TU_c[e]	Survival			Reproduction			FF[i]	UP[b]	C[c]	IC_{25}[d]	TU_c[e]	FF[i]
					LOEC[f]	NOEC[g]	TU_c[h]	LOEC[f]	NOEC[g]	TU_c[h]						
08/15/05 (E)	NT	NR	NR	3.2	NR	NR	3.2	NR	NR	3.2	NT	NT	NR	62.5	1.6	NT
11/04/05 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NR	>100	<1.0	NT
02/24/06 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NR	67	1.5	NT
05/05/06 (E)	NT	NR	NR	1.2	NR	NR	1.2	NR	NR	1.2	NT	NT	NR	>100	<1.0	NT
08/18/06 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NR	>100	<1.0	NT
11/06/06 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NR	>100	<1.0	NT
02/05/07 (E)	NT	NR	NR	2	NR	NR	2	NR	NR	2	NT	NT	NR	91	1.1	NT
05/07/07 (E)	NT	NR	NR	1.2	NR	NR	1.2	NR	NR	1.2	NT	NT	NR	83	1.2	NT
08/27/07 (E)	NT	NR	NR	1.2	NR	NR	1.2	NR	NR	1.2	NT	NT	NT	NT	NT	NT
10/19/07 (E)	NT	NR	NR	3.2	NR	NR	3.2	NR	NR	3.2	NT	NT	NT	NT	NT	NT
12/21/07 (E)	NT	NR	NR	1.2	NR	NR	1.2	NR	NR	1.2	NT	NT	NT	NT	NT	NT
02/15/08 (E)	NT	NR	NR	16.8	NR	NR	16.8	NR	NR	16.8	NT	NT	NT	NT	NT	NT
04/18/08 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NT	NT	NT	NT
06/16/08 (E)	NT	NR	NR	10.6	NR	NR	10.6	NR	NR	10.6	NT	NT	NT	NT	NT	NT

Table 4. continued.

Test Date (a)	*Ceriodaphnia dubia 7-Day*											*Fathead Minnows 7-Day*				
	UP[b]	C[c]	IC_{25}[d]	TU_c[e]	Survival			Reproduction			FF[i]	UP[b]	C[c]	IC_{25}[d]	TU_c[e]	FF[i]
					LOEC[f]	NOEC[g]	TU_c[h]	LOEC[f]	NOEC[g]	TU_c[h]						
08/18/08 (E)	NT	NR	NR	2.5	NR	NR	2.5	NR	NR	2.5	NT	NT	NT	NT	NT	NT
10/15/08 (E)	NT	NR	NR	34.6	NR	NR	34.6	NR	NR	34.6	NT	NT	NT	NT	NT	NT
12/15/08 (E)	NT	NR	NR	1.3	NR	NR	1.3	NR	NR	1.3	NT	NT	NT	NT	NT	NT
02/16/09 (E)	NT	NR	NR	3.2	NR	NR	3.2	NR	NR	3.2	NT	NT	NT	NT	NT	NT
08/07/09 (E)	NT	NR	NR	2	NR	NR	2	NR	NR	2	NT	NT	NT	NT	NT	NT
10/23/09 (E)	NT	NR	NR	2.2	NR	NR	2.2	NR	NR	2.2	NT	NT	NT	NT	NT	NT
04/16/10 (E)	NT	NR	NR	2	NR	NR	2	NR	NR	2	NT	NT	NT	NT	NT	NT
06/18/10 (E)	NT	NR	NR	2	NR	NR	2	NR	NR	2	NT	NT	NT	NT	NT	NT
08/06/10 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NT	NT	NT	NT
10/15/10 (E)	NT	NR	NR	2	NR	NR	2	NR	NR	2	NT	NT	NT	NT	NT	NT
12/17/10 (E)	NT	NR	>100	<1.0	>100	100	<1.0	>100	100	<1.0	NT	NT	NT	NT	NT	NT
02/02/11 (E)	NT	NR	NR	7.27	NR	NR	7.27	NR	NR	7.27	NT	NT	NT	NT	NT	NT

[a]O = EPA test; E = entity test
[b]UP = upstream control water
[c]C = laboratory water control
[d]IC_{25} = inhibition concentration twenty-five
[e]TU_c = chronic toxicity units based on IC_{25}
[f]LOEC = lowest observed effects concentration
[g]NOEC = no observed effects concentration
[h]TU_c = chronic toxicity units based on LOEC and NOEC
[i]FF = far-field effect
NR = not reported in OEPA database
[j]STU_c = TUc based on LOEC NOEC for survival
[k]GTU_c = TUc based on LOEC NOEC for growth
NT = not tested

Table 5. **Effluent Data for the Dover Chemical**

Parameter	Units	Number of Samples	Number > MDL	PEQ Average	PEQ Maximum
Aldrin	ug/l	13	1	1.2848	1.76
Barium	ug/l	31	1	75.336	103.2
Bis(2-ethylhexyl)phthalate	ug/l	1	1	3.53028	4.836
Bromomethane	ug/l	1	1	4.2997	5.89
Carbon tetrachloride	ug/l	571	45	96.36	132
Chlordane	ug/l	37	0	--	--
Chlorides	mg/l	100	100	76	92
Chlorine - TRes	mg/l	309	217	0.021	0.035
Chlorobenzene	ug/l	252	1	4.088	5.6
Chloroform (Trichloromethane)	ug/l	572	346	31	53
4,4-DDD	ug/l	61	1	0.8979	1.23
4,4-DDE	ug/l	61	2	1.0439	1.43
4,4-DDT	ug/l	61	1	1.533	2.1
1,2-Dichlorobenzene	ug/l	252	14	2.85	5.65
1,3-Dichlorobenzene	ug/l	253	8	9.709	13.3
1,4-Dichlorobenzene	ug/l	253	25	4.11	7.77
Dieldrin	ug/l	61	1	0.7519	1.03
Dissolved solids	mg/l	505	505	570	616
Endosulfan	ug/l	61	3	0.5694	0.78
alpha-Endosulfan	ug/l	61	2	0.5694	0.78
beta-Endosulfan	ug/l	61	1	0.5475	0.75

Endosulfan sulfate	ug/l	61	1	0.8906	1.22
Endrin	ug/l	61	1	0.8906	1.22
Heptachlor	ug/l	61	1	1.4089	1.93
Hexachlorobenzene	ug/l	2	1	0.244112	0.3344
alpha-Hexachlorocyclohexane	ug/l	253	240	0.2	0.24
beta-Hexachlorocyclohexane	ug/l	253	210	0.1	0.13
gamma-Hexachloro-cyclohexane (Lindane)	ug/l	252	239	0.035	0.048
Magnesium	mg/l	2	2	80.446	110.2
Manganese - TR	ug/l	26	26	86	121
Nickel - TR	ug/l	1	1	16.2936	22.32
Nitrate-N + Nitrite-N	mg/l	2	1	2.27468	3.116
Phosphorus	mg/l	2	2	0.33288	0.456
Polychlorinated biphenyls (PCBs)	ug/l	12	12	0.04088	0.056
Strontium	ug/l	1	1	896.148	1227.6
Sulfates	mg/l	1	1	900.674	1233.8
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	pg/l	21	19	15.0891	20.67
TCDD Toxicity Equivalents	pg/l	38	38	12.77	17.49
1,2,4-Trichlorobenzene	ug/l	253	4	7.665	10.5
1,1,1-Trichloroethane	ug/l	252	1	4.088	5.6

Table 6. **Water Quality Criteria in the Study Area**

Parameter	Units	Outside Mixing Zone Criteria: Average: Human Health	Outside Mixing Zone Criteria: Average: Agri-culture	Outside Mixing Zone Criteria: Aquatic Life	Outside Mixing Zone Criteria: Maximum Aquatic Life	Inside Mixing Zone Maximum
Aldrin	ug/l	0.0014c	--	--	--	--
Barium	ug/l	--	--	220	2000	4000
Bis(2-ethylhexyl)phthalate	ug/l	59c	--	8.4	1100	2100
Bromomethane	ug/l	4000	--	16	38	75
Carbon tetrachloride	ug/l	44c	--	240	2200	4400
Chlordane (BPO)	ug/l	0.022c	--	--	--	--
Chlordane (APO)	ug/l	0.022c	--	--	--	--
Chlorides	mg/l	--	--	--	--	--
Chlorine - TRes	mg/l	--	--	0.011	0.019	0.038
Chlorobenzene	ug/l	21000	--	47	420	850
Chloroform (Trichloromethane)	ug/l	4700c	--	140	1300	2600
4,4-DDD	ug/l	0.0084c	--	--	--	--
4,4-DDE	ug/l	0.0059c	--	--	--	--
4,4-DDT	ug/l	0.0059c	--	--	--	--
1,2-Dichlorobenzene	ug/l	17000	--	23	130	260
1,3-Dichlorobenzene	ug/l	2600	--	22	79	160
1,4-Dichlorobenzene	ug/l	2600	--	9.4	57	110
Dieldrin	ug/l	0.0014c	--	0.056	0.24	0.47
Dissolved solids	mg/l	--	--	1500	--	--
Endosulfan	ug/l	240	--	--	--	--
alpha-Endosulfan	ug/l	--	--	--	--	--
beta-Endosulfan	ug/l	--	--	--	--	--
Endosulfan sulfate	ug/l	--	--	--	--	--
Endrin	ug/l	0.81	--	0.036	0.086	0.17

Heptachlor	ug/l	0.0021c	--	--	--	--
Hexachlorobenzene	ug/l	0.0077c	--	--	--	--
alpha-Hexachlorocyclohexane	ug/l	0.13c	--	--	--	--
beta-Hexachlorocyclohexane	ug/l	0.46c	--	--	--	--
gamma-Hexachloro-cyclohexane (Lindane)	ug/l	0.63c	--	0.057	0.95	1.9
Magnesium	mg/l	--	--	--	--	--
Manganese - TR	ug/l	--	--	--	--	--
Nickel - TR	ug/l	4600	200	160	1400	2900
Nitrate-N + Nitrite-N	mg/l	--	100	--	--	--
Phosphorus	mg/l	--	--	--	--	--
Polychlorinated biphenyls (PCBs)	ug/l	0.0017c	--	--	--	--
Strontium	ug/l	--	--	21000	40000	81000
Sulfates	mg/l	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	pg/l	0.14c	--	--	--	--
TCDD Toxicity Equivalents	pg/l	0.14c	--	--	--	--
1,2,4-Trichlorobenzene	ug/l	940	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	76	690	1400

C - carcinogen

Table 7. **Instream Conditions and Discharger Flow**

Parameter	Units	Season	Value	Basis
Stream Flows				
1Q10	cfs	annual	2.8	USGS 03124520
7Q10	cfs	annual	3.8	USGS 03124520
30Q10	cfs	summer	8.7	USGS 03124520
		winter	37	USGS 03124520
Harmonic Mean	cfs	annual	120	USGS 03124520
Mixing Assumption	%	average	100	
	%	maximum	100	
Hardness	mg/l	annual	376	STORET 1983-98, N=15
Dover Chemical flow	cfs	annual	7.41	95th percentile of monthly avg. 7/05-8/10.
Background Water Quality				
Aldrin	ug/l		0	No representative data available.
Barium	ug/l		51	STORET; 1998-02; n=7; 0<MDL; mean value
Bis(2-ethylhexyl)phthalate	ug/l		0	No representative data available.
Bromomethane	ug/l		0	No representative data available.
Carbon tetrachloride	ug/l		0	No representative data available.

Chlordane	ug/l	0	No representative data available.
Chlorides	mg/l	49	STORET; 1998-02; n=7; 0<MDL; mean value
Chlorine - TRes	mg/l	0	No representative data available.
Chlorobenzene	ug/l	0	No representative data available.
Chloroform (Trichloromethane)	ug/l	0	No representative data available.
4,4-DDD	ug/l	0	No representative data available.
4,4-DDE	ug/l	0	No representative data available.
4,4-DDT	ug/l	0	No representative data available.
1,2-Dichlorobenzene	ug/l	0	No representative data available.
1,3-Dichlorobenzene	ug/l	0	No representative data available.
1,4-Dichlorobenzene	ug/l	0	No representative data available.
Dieldrin	ug/l	0	No representative data available.
Dissolved solids	mg/l	631	STORET; 1998-02; n=7; 0<MDL; mean value
Endosulfan	ug/l	0	No representative data available.
alpha-Endosulfan	ug/l	0	No representative data available.
beta-Endosulfan	ug/l	0	No representative data available.
Endosulfan sulfate	ug/l	0	No representative data available.
Endrin	ug/l	0	No representative data available.
Heptachlor	ug/l	0	No representative data available.
Hexachlorobenzene	ug/l	0	No representative data available.
alpha-Hexachlorocyclohexane	ug/l	0	No representative data available.
beta-Hexachlorocyclohexane	ug/l	0	No representative data available.
gamma-Hexachloro-cyclohexane (Lindane)	ug/l	0	No representative data available.
Magnesium	mg/l	40	STORET; 1998-02; n=7; 0<MDL; mean value
Manganese - TR	ug/l	698	STORET; 1998-02; n=7; 0<MDL; mean value
Nickel - TR	ug/l	0	STORET; 1998-02; n=7; 7<MDL; all values <MDL
Nitrate-N + Nitrite-N	mg/l	1.36	STORET; 1998-02; n=7; 0<MDL; mean value
Phosphorus	mg/l	0.212	STORET; 1998-02; n=7; 0<MDL; mean value

Polychlorinated biphenyls (PCBs)	ug/l	0	No representative data available.
Strontium	ug/l	331	STORET; 1998-02; n=7; 0<MDL; mean value
Sulfates	mg/l	218	STORET; 1998-02; n=7; 0<MDL; mean value
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	pg/l	0.044	Dover Chem. 801 ust. Mean; n=7; 5<MDL;
TCDD Toxicity Equivalents	pg/l	0.000775	Dover Chemical 801 median; N=16, 4<MDL
1,2,4-Trichlorobenzene	ug/l	0	No representative data available.
1,1,1-Trichloroethane	ug/l	0	No representative data available.

Table 8. Summary of Effluent Limits to Maintain Applicable WQ Criteria

		Outside Mixing Zone Criteria				Inside
		Average			Maximum	Mixing
Parameter	Units	Human Health	Agri-culture	Aquatic Life	Aquatic Life	Zone Maximum
Aldrin	ug/l	0.024	--	--	--	--
Barium	ug/l	--	--	307	2736	4000
Bis(2-ethylhexyl)phthalate	ug/l	1014	--	13	1516	2100
Bromomethane	ug/l	68777	--	24	52	75
Carbon tetrachloride	ug/l	757	--	363	3031	4400
Chlordane	ug/l	0.022	--	--	--	--
Chlorides	mg/l	--	--	--	--	--
Chlorine - TRes	mg/l	--	--	0.017	0.026	0.038
Chlorobenzene	ug/l	361081	--	71	579	850
Chloroform (Trichloromethane)	ug/l	80813	--	212	1791	2600
4,4-DDD	ug/l	0.0084	--	--	--	--
4,4-DDE	ug/l	0.0059	--	--	--	--
4,4-DDT	ug/l	0.0059	--	--	--	--
1,2-Dichlorobenzene	ug/l	292304	--	35	179	260
1,3-Dichlorobenzene	ug/l	44705	--	33	109	160
1,4-Dichlorobenzene	ug/l	44705	--	14	79	110
Dieldrin	ug/l	0.0014	--	0.056	0.24	0.47
Dissolved solids	mg/l	--	--	1946	--	--
Endosulfan	ug/l	4127	--	--	--	--
alpha-Endosulfan	ug/l	--	--	--	--	--
beta-Endosulfan	ug/l	--	--	--	--	--
Endosulfan sulfate	ug/l	--	--	--	--	--
Endrin	ug/l	14	--	0.054	0.12	0.17
Heptachlor	ug/l	0.036	--	--	--	--

Hexachlorobenzene	ug/l	0.0077	--	--	--	--
alpha-Hexachlorocyclohexane	ug/l	0.13	--	--	--	--
beta-Hexachlorocyclohexane	ug/l	0.46	--	--	--	--
gamma-Hexachloro-cyclohexane (Lindane)	ug/l	0.63	--	0.057	0.95	1.9
Magnesium	mg/l	--	--	--	--	--
Manganese - TR	ug/l	--	--	--	--	--
Nickel - TR	ug/l	79094	3439	242	1929	2900
Nitrate-N + Nitrite-N	mg/l	--	1697	--	--	--
Phosphorus	mg/l	--	--	--	--	--
Polychlorinated biphenyls (PCBs)	ug/l	0.0017	--	--	--	--
Strontium	ug/l	--	--	31599	54990	81000
Sulfates	mg/l	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	pg/l	0.14	--	--	--	--
TCDD Toxicity Equivalents	pg/l	0.14	--	--	--	--
1,2,4-Trichlorobenzene	ug/l	16163	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	115	951	1400

Table 9. **Parameter Assessment**

Group 1: Due to a lack of criteria, the following parameters could not be evaluated at this time.

Chlorides	alpha-Endosulfan	beta-Endosulfan
Endosulfan sulfate	Delta-Hexachlorocyclohexane	Magnesium
Manganese - TR	Phosphorus	Potassium
1,2,3-Trichlorobenzene	Sulfates	

Group 2: PEQ < 25 percent of WQS or all data below minimum detection limit. WLA not required. No limit recommended; monitoring optional.

Chlordane	Chlorobenzene	Chloroform
1,2-Dichlorobenzene	Endosulfan	beta-Hexachlorocyclohexane
Nickel - TR	Nitrate-N + Nitrite-N	Strontium
1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	

Group 3: PEQ_{max} < 50 percent of maximum PEL and PEQ_{avg} < 50 percent of average PEL. No limit recommended; monitoring optional.

Barium	Bis(2-ethylhexyl)phthalate	Bromomethane
Carbon tetrachloride	1,3-Dichlorobenzene	1,4-Dichlorobenzene
Dissolved solids		

Group 4: PEQ_{max} >= 50 percent, but < 100 percent of the maximum PEL or PEQ_{avg} >= 50 percent, but < 100 percent of the average PEL. Monitoring is appropriate.

gamma-Hexachloro-cyclohexane (Lindane)

Group 5: Maximum PEQ >= 100 percent of the maximum PEL or average PEQ >= 100 percent of the average PEL, or either the average or maximum PEQ is between 75 and 100 percent of the PEL and certain conditions that increase the risk to the environment are present. Limit recommended.

Limits to Protect Numeric Water Quality Criteria

			Recommended Effluent Limits	
Parameter	Units	Period	Average	Maximum
Aldrin	ug/l		0.024	--
Chlorine TRes	mg/l		0.017	0.026
4,4-DDD	ug/l		0.0084	--
4,4-DDE	ug/l		0.0059	--

4,4-DDT	ug/l	0.0059	--
Dieldrin	ug/l	0.0014	0.24
Endrin	ug/l	0.054	0.12
Heptachlor	ug/l	0.036	--
Hexachlorobenzene	ug/l	0.0077	--
alpha-Hexachlorocyclohexane	ug/l	0.13	--
Polychlorinated biphenyls (PCBs)	ug/l	0.0017	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	pg/l	0.14	--
TCDD Toxicity Equivalents	pg/l	0.14	--

Table 10. Final effluent limits and monitoring requirements for Dover Chemical outfall 0IF00040002 and the basis for their recommendation.

		Effluent Limits				
		Concentration		Loading (kg/day)[a]		
Parameter	Units	30 Day Average	Daily Maximum	30 Day Average	Daily Maximum	Basis[b]
Flow	MGD	- - - - - - - - - - - -	Monitor	- - - - - - - - - - - - - - -		M[c]
Temperature	^{o}C	- - - - - - - - - - - -	Monitor	- - - - - - - - - - - - - - -		M[c]
Dissolved Solids	mg/l	- - - - - - - - - - - -	Monitor	- - - - - - - - - - - - - - -		M[c]
Suspended Solids	mg/l	9	18	153	307	ABS/EP
Oil and Grease	mg/l	--	9	--	153	ABS/EP
pH	S.U.	- - - - - - - - - - - - -	6.5 to 9.0	- - - - - - - - - - - - -		WQS
pH excursions >60 minutes	#	--	0	--	--	40 CFR 401.17
pH excursions	min/mo.	--	446	--	--	40 CFR 401.17
Chlorine Residual	mg/l	0.017	0.026	--	--	WLA
Carbon Tetrachloride	µg/l	--	44	--	0.75	ABS/EP
Chloroform	µg/l	44	67	0.75	1.15	ABS/EP
Alpha-BHC	µg/l	0.13	--	0.0024	--	WLA
Gamma-BHC	µg/l	- - - - - - - - - - - -	Monitor	- - - - - - - - - - - - - - -		M[c]
Aldrin	µg/l	0.024	--	0.00044	--	WLA
4,4'-DDD	µg/l	0.0084	--	0.00015	--	WLA
4,4'-DDE	µg/l	0.0059	--	0.00011	--	WLA
4,4'-DDT	µg/l	0.0059	--	0.00011	--	WLA
Dieldrin	µg/l	0.0014	0.24	0.000025	0.0044	WLA
Endrin	µg/l	0.054	0.12	0.00098	0.0022	WLA
Heptachlor	µg/l	0.036	--	0.00065	--	WLA
Hexachlorobenzene	µg/l	0.0077	--	0.00014	--	WLA
PCBs	µg/l	0.0017	--	0.000031	--	WLA
Chlorinated Paraffins	µg/l	- - - - - - - - - - - -	Monitor	- - - - - - - - - - - - - - -		M[c]
Dioxin Toxicity Eq.	pg/l	0.14	--	2.5E-9	--	WLA
Carcinogen Additivity	units	--	1.0	--	--	WLA
Whole Effluent Toxicity						
Acute	TUa	--	1.0	--	--	WET/RP
Chronic	TUc	1.51	--	--	--	WET/RP

Table 10. Con't.

[a] Effluent loadings for total suspended solids, oil&grease, carbon tetrachloride and chloroform are based on a past average flow of 4.5 MGD; effluent loadings for all other parameters are based on the current average flow of 4.79 MGD.

[b] Definitions: ABS = Antibacksliding Rule (OAC 3745-33-05(E) and 40 CFR Part 122.44(l)); EP = Existing Permit; M = Monitoring; RP = Reasonable Potential for requiring water quality-based effluent limits and monitoring requirements in NPDES permits (3745-33-07(A)); WET = Whole Effluent Toxicity (OAC 3745-33-07(B)) ; WLA = Wasteload Allocation procedures (OAC 3745-2); WQS = Ohio Water Quality Standards (OAC 3745-1).

[c] Monitoring of flow and other indicator parameters is specified to assist in the evaluation of effluent quality and treatment plant performance.

Attachment –
Segment Summary from Ohio 2010 Integrated Water Quality Report

Assessment Unit Name: Brandywine Creek-Sugar Creek

Hydrologic Unit Code: 05040001 11 05
Assessment Unit Size: 36.9 square miles
Priority Points: 0
Monitoring Scheduled: 2017
TMDL Scheduled: 2020

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
22.2%	39.1%	21.3%	15.6%	1.8%

Aquatic Life Use Assessment

Reporting Category: 4Ax
Aquatic Life Uses: WWH
Sampling Years: 1998
Watershed Score: 28.0

Causes of Impairment:

- direct habitat alterations
- metals
- natural limits (wetlands)
- pH
- siltation
- unknown toxicity

Sources of Impairment:

- channelization - agriculture
- flow regulation/modification - agriculture
- landfills
- major industrial point source
- natural conditions (flow or habitat)
- nonirrigated crop production
- pasture land
- removal of riparian vegetation - agriculture
- streambank modification/destabilization - ag.
- surface mining

Comments: None

Recreation Use Assessment

Reporting Category: 4Ax
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Sugar Creek